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NEPA Air Quality Impact Analysis Report

Goldrush Mine

PREPARED FOR:
NEVADA GOLD MINES LLC

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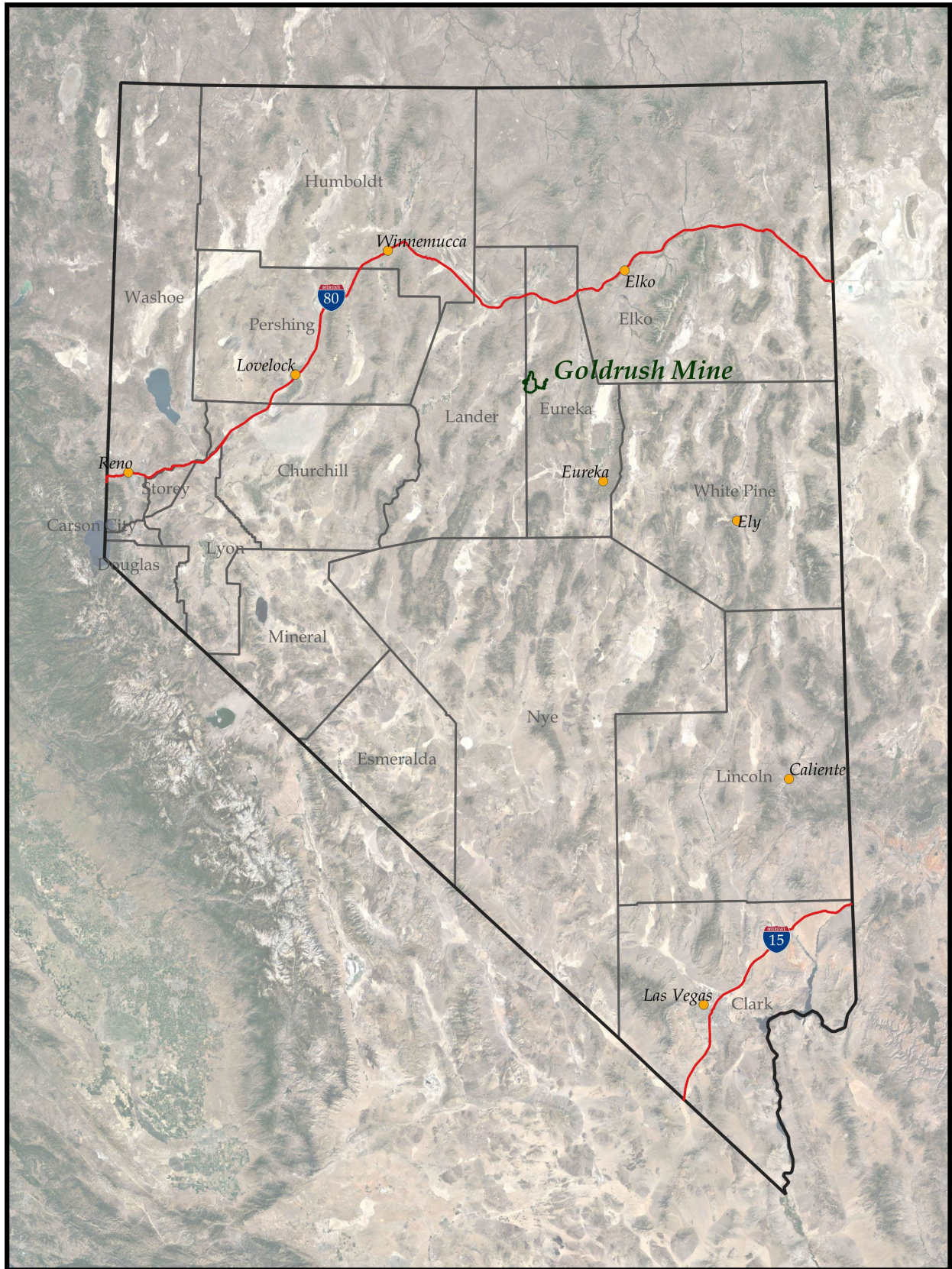
1.0 INTRODUCTION

Nevada Gold Mines LLC (NGM) is proposing the construction and operation of a new underground mine, the Goldrush Mine, for extracting gold mineral resources. In support of the environmental analysis required by the National Environmental Policy Act (NEPA), NGM has conducted an air quality analysis to quantify and evaluate the impact of mine development on ambient air quality. The air quality analysis for the Goldrush on-site mining operations is presented in Section 2.0. The air quality analysis for off-site ore transport and processing is presented in Section 3.0.

The Goldrush Mine is located in Eureka and Lander counties, approximately 60 miles southwest of Elko, Nevada. The area is sparsely populated and used primarily for ranching and farming. Figure 1 shows the mine's location, which is in the Pine Valley, Crescent Valley, and Grass Valley Hydrographic Areas (HAs 53, 54, and 138, respectively). These planning areas have not been triggered for prevention of significant deterioration (PSD) baseline for any pollutant.

This air quality impact analysis was performed consistent with the methodologies and data sets outlined in the modeling protocol submitted by NGM to the Bureau of Land Management on January 8, 2020, with the exception of using the more recent version of the AERMOD modeling system.

Figure 1. Goldrush Mine Location



1.1 Mining Operations

The Goldrush Mine will include both underground mining and surface support activities. Underground infrastructure will include a materials handling system which will be used for transporting ore, waste rock, supplies, and aggregate between the surface and underground workings. Surface support activities will include backfill operations, bulk material storage, and generators.

The Goldrush Mine will produce an average of 2,100,000 tons per year of ore and 1,100,000 tons per year of waste rock. Ore and waste rock from the Goldrush Mine will be hauled from underground to the portal pad. Surface trucks will then haul the ore and waste to the Cortez facility for storage – the waste to a waste rock facility and the ore to the ore stockpile. Ore from the stockpile will be transferred to a loadout bin and then hauled by over-the-road trucks from the Cortez facility to either the Goldstrike or Gold Quarry mines for processing. Crushed aggregate from the Cortez facility will be used in the Goldrush backfill operations.

Pollutants emitted from the material hauling, transfers, and associated activities include fugitive dust, which contains trace amounts of hazardous air pollutant (HAP) metals, and combustion products from mobile equipment tailpipes, including HAPs. Fugitive dust emissions from haul roads will be controlled by a combination of watering and the application of chemical dust suppressants. When practical, fugitive dust emissions from the wind erosion of exposed areas will be controlled by watering or re-vegetation.

The aggregate crushing operations have the potential to emit particulate from material transfers, crushing, and screening and will be controlled by water sprays and best operating practices.

The surface backfill operations consist of cemented rock fill (CRF) operations that have the potential to create particulate emissions from material transfers and CRF mixing. Particulate emissions from the material transfers and mixing will be controlled by enclosures and best operating practices. Particulate emissions from loading of the cement and fly ash storage silos will be controlled by vent filters.

The emergency and non-emergency generators have the potential to emit diesel combustion products, including HAPs, and the bulk fuel storage tanks have the potential to emit volatile organics.

Concurrent with the underground mining, NGM will conduct ongoing surface exploration operations. These operations have the potential to create fugitive dust and tailpipe emissions from the exploration drilling.

As part of the water management for the mine, two rapid infiltration basin (RIB) galleries will be constructed. Construction of the RIB galleries has the potential to create fugitive dust emissions that will be controlled by best management practices.

1.2 Criteria Pollutant Emissions

The estimated facility-wide potential annual emissions in tons per year are presented in Table 1. Detailed emission calculations are included in Appendix A.

Table 1. Facility-wide Criteria Pollutant Potential Annual Emissions (ton/yr)

Source Category	PM ₁₀	PM _{2.5}	CO	NO _x	SO ₂	VOC
Process	36.9	7.6	28.2	56.6	1.4	18.4
Fugitive	76.7	13.5	237.3	208.1	0.3	25.7
Facility Total	113.5	21.1	265.5	264.7	1.7	44.2

1.3 HAP and Greenhouse Gas (GHG) Emissions

As discussed above, the Goldrush Mine is expected to generate HAP and GHG emissions from fuel combustion by process sources and mobile mining equipment. HAP emissions are also generated from dust emissions that contain trace amounts of metals.

The potential facility-wide HAP emissions are 1.4 tons per year of total HAPs and 0.3 tons per year of the highest single HAP, arsenic. The potential facility-wide GHG emissions are 76,882 tons per year. The Goldrush Mine HAP and GHG emission calculations are provided in Appendix A.

1.4 Regulatory Basis

As shown in Table 1, the facility-wide potential process source emissions are less than the 250 tons per year threshold for non-listed stationary source categories (Code of Federal Regulations, Title 40, Part 52.21 [40 CFR 52.21]) for Prevention of Significant Deterioration (PSD) applicability for each criteria pollutant. Thus, the Goldrush Mine is considered a minor source for New Source Review (NSR).¹ In addition, given that the facility-wide potential process source emissions are below the 100 tons per year threshold for the Title V program, the Goldrush Mine will be considered a minor source, which is not subject to Title V permitting.

As discussed in Section 1.3, the Goldrush Mine facility-wide HAP emissions are less than 10 tons per year for any single HAP and 25 tons per year for all HAP emissions in aggregate. Therefore, the Goldrush Mine is considered an area source for National Emission Standards for Hazardous Air Pollutants (NESHAP) applicability.

The Goldrush Mine is not a major stationary source subject to PSD and there are no Federal Class I areas within 100 kilometers of the Goldrush Mine boundary.²

¹ Fugitive emissions are not counted for determining PSD applicability for this source type per 40 CFR 52.21(b)(1)(iii).

² The nearest Class I area to the Goldrush Mine is the Jarbidge Wilderness, located approximately 180 kilometers to the northeast.

2.0 AIR QUALITY ANALYSIS OF ON-SITE OPERATIONS

Air dispersion models are a collection of mathematical algorithms packaged into a computer program to simulate the atmospheric dispersion of an air pollutant. Air dispersion models typically require source data (emissions, location, physical characteristics, etc.) and meteorological data (wind speed and direction, temperature, mixing height, etc.) to predict the pollutant concentrations resulting from a source's emissions at receptor locations. These air dispersion models are widely used to assess changes in the ambient air resulting from a project's air emissions and to demonstrate compliance with applicable ambient air quality standards.

2.1 Model Selection

This analysis was conducted using the most recent version (22112) of the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) modeling system. AERMOD is an enhanced, steady-state Gaussian plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources and both simple and complex terrain (EPA 2004). The AERMOD modeling system is listed as the recommended model for short-range analysis (up to 50 kilometers) on the EPA-maintained Guideline on Air Quality Models, which is published as Appendix W to the Code of Federal Regulations, Title 40, Part 51 (40 CFR 51).

AERMOD has routinely been used for NEPA analyses of facilities located in Nevada and other similar locations where the nearby topography consists of valleys and elevated terrain. Based on a review of the terrain surrounding the Goldrush Mine, it is expected that the potential for this terrain regime to generate complex winds (e.g., multi-day stagnation events, shoreline fumigation, other wind circulations) is low, making AERMOD the appropriate model selection for this analysis.

The AERMOD input and output files for this analysis are included in Appendix B.

2.2 Modeled Sources

The air pollution sources modeled in this air quality analysis include the following source categories:

- Process emission sources: material handling, storage silos, generators, etc.
- Fugitive emission sources: exploration drilling; material loading, unloading, and hauling; dozing, grading, and water truck travel; wind erosion of exposed surfaces; and mobile machinery tailpipes

2.3 Air Pollutants

This air quality analysis included modeling for the following air pollutants and averaging periods:

- Carbon monoxide (CO): 8-hour and 1-hour averaging periods
- Nitrogen dioxide (NO₂): Annual and 1-hour averaging periods
- Particulate matter less than 2.5 microns in aerodynamic diameter (PM_{2.5}): Annual and 24-hour averaging periods
- Particulate matter less than 10 microns in aerodynamic diameter (PM₁₀): 24-hour averaging period
- Sulfur dioxide (SO₂): 3-hour and 1-hour averaging periods

2.4 Modeled Emissions and Source Characterization

The modeled short-term emission rates for the process sources were derived from the maximum design hourly process rates. The long-term emission rates were derived using the maximum hourly process rates and estimated annual utilization factors. The modeled emission rates for fugitive sources were based on the annual activity rates. The modeled emission rates in grams per second for each source are provided in Appendix A.

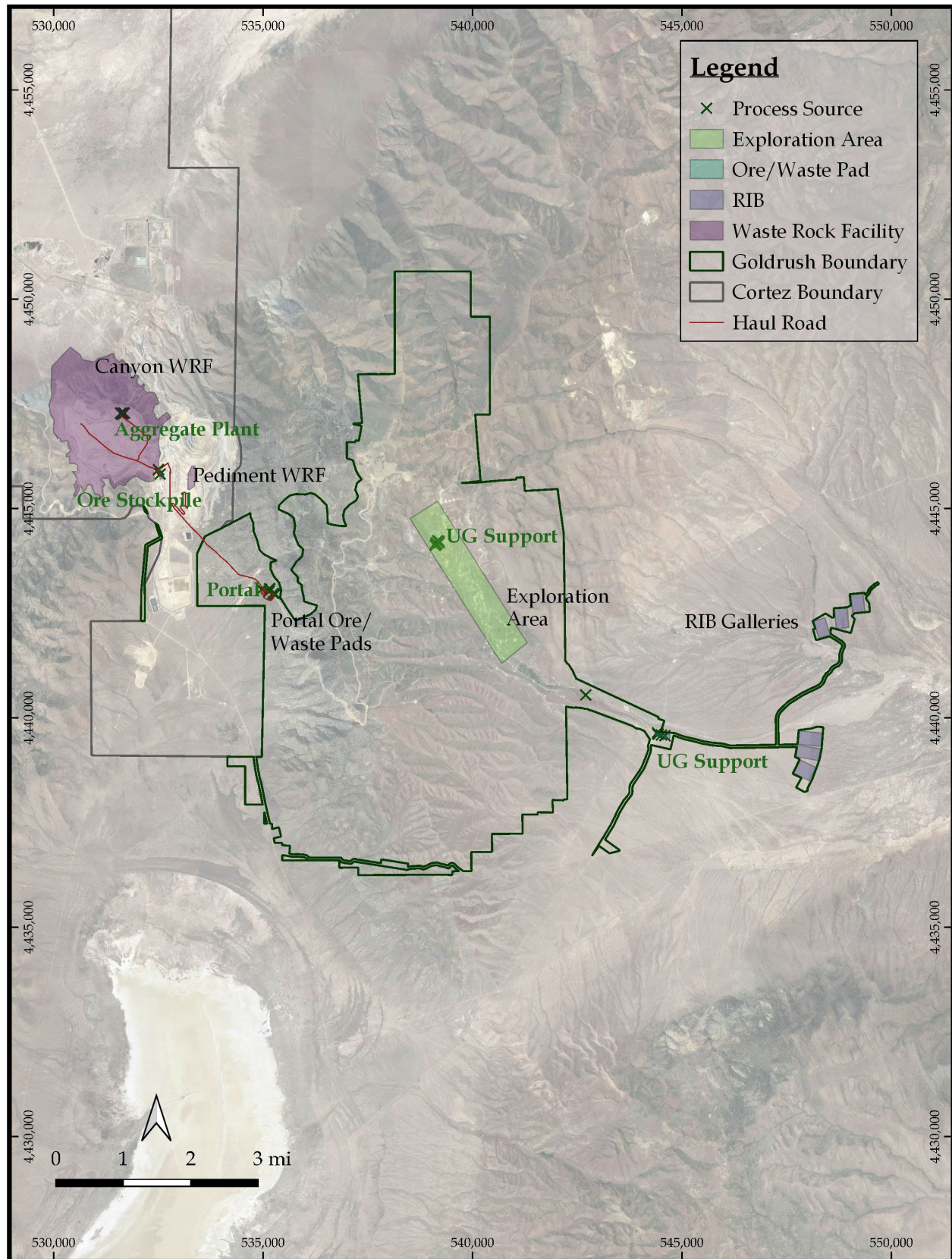
All the emission sources at the Goldrush Mine were modeled as POINT, POINTHOR, VOLUME, or AREA sources for this analysis. The model input parameters for each source are presented in Appendix A. Sources with exhaust stacks, such as generators and silos equipped with vent filters, were modeled as POINT or POINTHOR sources. Process fugitive sources, such as material transfers, were modeled as VOLUME sources. All fugitive mining activity locations, except the surface exploration area, were characterized as VOLUME sources. The surface exploration area and RIB galleries were characterized as AREA sources. The haul road network was modeled as a series of VOLUME sources.

Fugitive mining source emissions (exploration drilling; material loading, unloading, and hauling; dozing, grading, and water truck travel; wind erosion of exposed surfaces; and mobile machinery tailpipes) were aggregated by activity location. These activity locations and the emission activities associated with these locations are presented in Table 2. A plot plan showing the general layout of fugitive mining activity locations and process sources is shown in Figure 2.

Table 2. Modeled Fugitive Mining Activity Locations

Model ID	Activity Location	Associated Emission Activities
PWP	Portal Waste Pad	Waste unloading/reloading, dozing, wind erosion, and tailpipes from dozers, shovels, and loaders
PAG	Portal Lined PAG Pad	Waste unloading/reloading, dozing, wind erosion, and tailpipes from dozers, shovels, and loaders
LOP1	Portal Lined Ore Pad 1	Ore unloading/reloading, dozing, wind erosion, and tailpipes from dozers, shovels, and loaders
LOP2	Portal Lined Ore Pad 2	Ore unloading/reloading, dozing, wind erosion, and tailpipes from dozers, shovels, and loaders
ASP	Portal Aggregate Storage Pad	Aggregate unloading, dozing, wind erosion, and tailpipes from dozers, shovels, and loaders
CanWRF	Canyon Waste Rock Facility	Waste unloading and aggregate loading, dozing, wind erosion, and tailpipes from dozers, shovels, and loaders
Ped	Pediment Waste Rock Facility	Waste unloading, dozing, wind erosion, and tailpipes from dozers, shovels, and loaders
CHC	Cortez Hills Crusher Stockpile	Aggregate unloading/reloading, dozing, wind erosion, and tailpipes from dozers, shovels, and loaders
OS	Ore Stockpile	Ore unloading/reloading, dozing, wind erosion, and tailpipes from dozers, shovels, and loaders
HR*	On-site Hauling (series of VOLUME sources)	Ore, waste, aggregate, and CRF hauling, grading, water trucking, wind erosion, and tailpipes from graders, and haul, water and service trucks
Expl	Surface Exploration	Exploration drilling and tailpipes from drill rigs
Gal1-2	RIB Galleries 1 and 2	Construction activities

Figure 2. Plot Plan



Fugitive emissions from surface exploration drilling were estimated based on the maximum annual drilling schedule and allocated across the surface exploration area.

Material hauling emissions were calculated for the haul road network using vehicle miles traveled (VMT) along each road route. Total hauling and water truck dust emissions were distributed along the active hauling sections based on VMT on each route.

Material unloading and loading emissions were allocated to each activity location (portal pads, waste rock facilities, and stockpile/storage areas) based on the maximum annual production rate and the percentage of ore, waste, and aggregate handled at each location.

Dozing emissions were allocated to each activity location (portal pads, waste rock facilities, and stockpile/storage areas) based on the proportion of material handled at each location. Grading emissions were divided among the road routes based on the haul truck VMT on each route.

Wind erosion emissions were calculated for each activity location (portal pads, waste rock facilities, stockpile/storage areas, and haul roads) based on surface area and erosion potential.

Mobile machinery tailpipe emissions for the shovels, dozers, loaders, and support equipment were divided among the activity locations (portal pads, waste rock facilities, and stockpile/storage areas) based on the proportion of material handled at each location. Tailpipe emissions from graders and haul, water, and service trucks were divided among the road routes based on the haul truck VMT on each route. The drill rig tailpipe emissions were allocated to the surface exploration area.

As stated above, all fugitive source activity locations, except the surface exploration area and RIB galleries, were characterized as VOLUME sources. The surface exploration area and RIB galleries were characterized as AREA sources. The applicable initial lateral and vertical dispersion coefficients for the VOLUME and AREA sources were determined according to methods recommended in the AERMOD user's guide (EPA 2019b) and the Haul Road Workgroup Memorandum (EPA 2012).

A road network for hauling mined material and aggregate to appropriate destinations was developed for model input. The haul road network was characterized as a series of alternating VOLUME sources according to methods recommended in the Haul Road Workgroup Memorandum (EPA 2012). The initial lateral and vertical dispersion coefficients for the haul road VOLUME sources were determined according to the Haul Road Workgroup Memorandum (EPA 2012). Fugitive dust and tailpipe emissions associated with each haul road route were distributed equally among the segments for that route. Where two haul road routes overlap, the emissions were combined for that section of road. The haul road network is also shown in Figure 2.

2.5 Coordinate System

The Universal Transverse Mercator (UTM) coordinate system projected in North American Datum of 1983 (NAD83), Zone 11 was used in the modeling analysis to define the locations of all sources, buildings, and receptors in the modeling domain.

2.6 Building Downwash

The effects of building-induced downwash were incorporated into this modeling analysis. Building downwash parameters were calculated using the most recent version of the Building Profile Input Program (BPIP) with the Plume Rise Model Enhancements (PRIME) algorithm (BPIP-PRIME version 04274).

2.7 Receptors

A series of the following nested receptor grids was used to assess ground-level impacts from the Goldrush Mine air emissions:

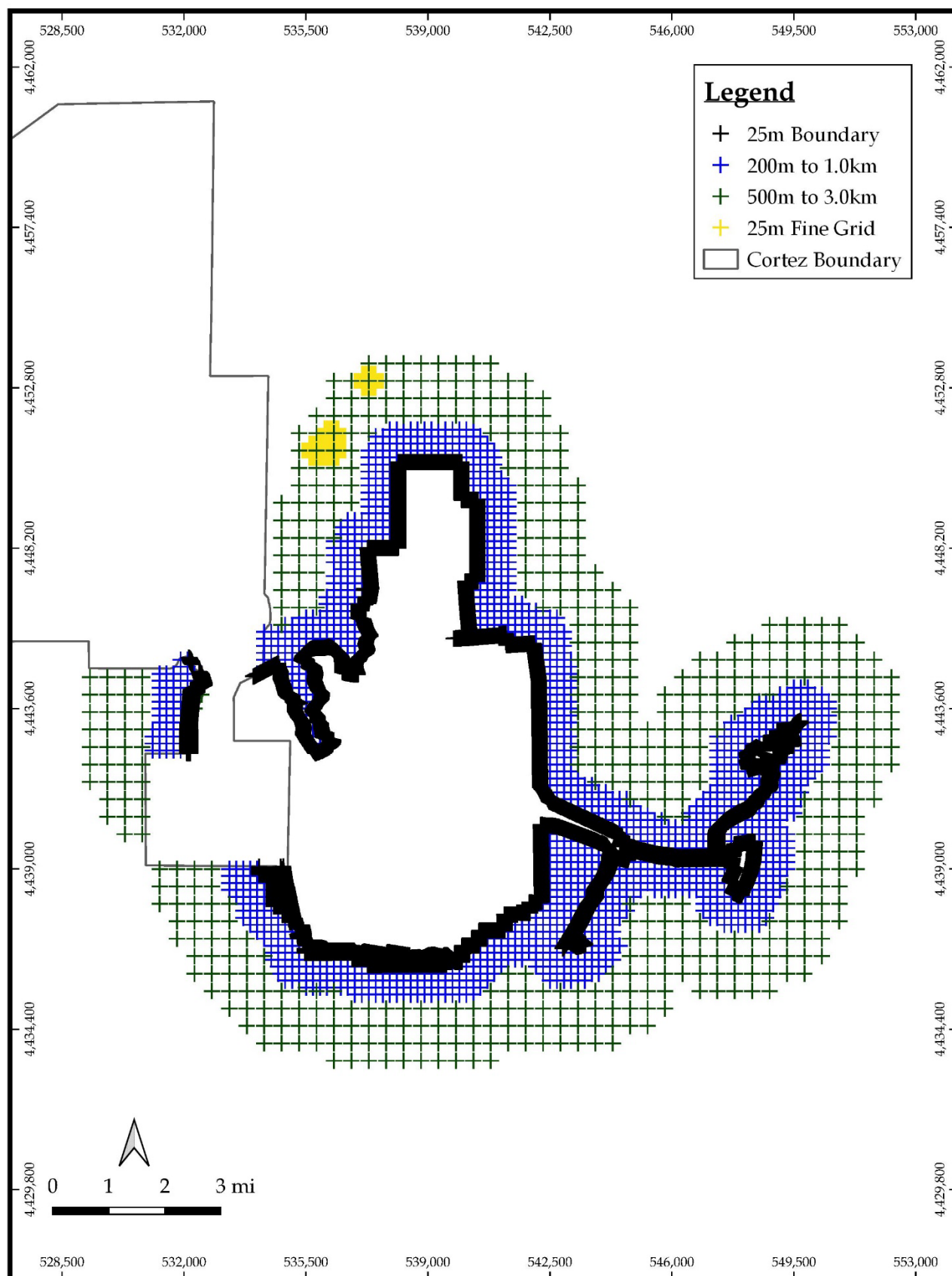
- Near-field receptors at 200-meter spacing, out to 1 km from the modeling boundary
- Far-field receptors at 500-meter spacing, out to 3 km from the modeling boundary

In addition, the modeling analysis included receptors at 25-meter spacing located along the modeling boundary. This modeling boundary (ambient air boundary) delineates where public access is restricted and primarily follows the plan of operations boundary. A combination of fences, gates, berms, signs, and terrain is used along the boundary to restrict public access. Receptors within the modeling boundary were not modeled. Additionally, receptors were not modeled within NGM's Cortez Mine ambient air boundary, where public access is also restricted by NGM. The modeled receptors are shown in Figure 3.

Finally, based on initial cumulative impact modeling runs (see Section 2.13), maximum impacts for short-term CO (1-hour and 8-hour averages) were found to be located beyond the modeling boundary in the far-field receptor grids. Thus, additional receptors at 25-meter spacing were used to evaluate impacts at these locations; the additional fine receptor grids are also shown in Figure 3.

All receptors were processed with the AERMOD terrain preprocessor AERMAP (version 18081) to generate receptor terrain elevations and hill height values using 1/3 Arc-second National Elevation Dataset (NED) elevation data obtained from the National Map Seamless Server (<http://www.mrlc.gov/>) in a United States Geological Survey (USGS) GeoTIFF file format that is compatible with AERMAP.

Figure 3. Modeled Receptors



2.8 Meteorological Data

AERMOD requires the input of hourly meteorological data to estimate pollutant concentrations in the ambient air resulting from modeled source emissions. The EPA's Guideline on Air Quality Models (Appendix W to 40 CFR 51) states that one year of site-specific data, or five years of representative hourly surface data, should be used for AERMOD dispersion modeling.

This analysis was conducted using one year (October 1, 2015, through September 30, 2016) of site-specific surface meteorological data from Pine Valley Station combined with concurrent upper-air meteorological data from Elko, Nevada. AERMOD-ready meteorological data files were provided by the Nevada Division of Environmental Protection, Bureau of Air Quality Planning (NDEP-BAQP) on August 30, 2022. The Pine Valley Station data was provided by NDEP-BAQP as the appropriate data to use at the project location. These files were processed by NDEP-BAQP using the most recent version (22112) of the AERMOD meteorological preprocessor AERMET, including adjusted u^* (ADJ_U*) processing.

2.9 Background Concentrations

Monitored pollutant concentrations, termed background concentrations, are considered to be representative of the prevailing air pollution from the existing sources in the region. These background concentrations are added to the modeled ambient impacts from project emissions to estimate the total ambient concentrations at the modeled receptor locations.

Table 3 presents the NDEP-approved background concentrations for air quality impact analyses for projects located in rural areas of Nevada.

Table 3. NDEP-approved Background Concentrations for Rural Locations

Pollutant	Averaging Period	Background Concentration ($\mu\text{g}/\text{m}^3$)
CO	8-hour	0
	1-hour	0
NO ₂	annual	0
	1-hour	0
PM _{2.5}	annual	2.3
	24-hour	8
PM ₁₀	24-hour	10.2
SO ₂	3-hour	0
	1-hour	0

As shown in Table 3, background concentrations of CO, NO₂, and SO₂ are considered negligible in rural Nevada by NDEP (NDEP 2017a). However, to determine non-zero representative background concentrations, a review of nearby ambient monitoring stations that collect CO,

NO₂, and SO₂ data that are representative of rural areas, such as the project location, was conducted.

Taking into consideration the surrounding setting (terrain, land use, and proximity of sources), the ambient monitoring data collected at station 06-043-0003 (Yosemite National Park–Turtleback Dome [Yosemite]) in California may be used to provide representative background concentrations for rural areas of Nevada. This station collected CO and NO₂ background concentrations in 2006 and 2007 but not SO₂ data. For similar reasons, monitoring station 06-027-0002 (White Mountain Research Center–Owens Valley Lab [White Mountain]) in California may be considered representative of a rural area of Nevada for conservative SO₂ background concentrations. Both the Yosemite and White Mountain stations are in relatively rural settings in terms of nearby population centers and traffic activity. Ambient monitoring data from these stations were downloaded from the EPA’s Air Data Webpage (EPA 2022).

Table 4 provides the representative background concentrations (in units of µg/m³ and parts per billion [ppb]) for the Goldrush facility. These background data are a combination of the NDEP-approved PM₁₀ and PM_{2.5} background concentrations for rural Nevada and the CO, NO₂, and SO₂ background concentrations measured at the Yosemite and White Mountain stations.

Table 4. Representative Background Concentrations

Pollutant	Averaging Period	Background Concentration		Data Source
		(ppb)	(µg/m ³)	
CO	8-hour	700	801.4	Yosemite 2006-07 (highest 2 nd high)
	1-hour	900	1,030.4	Yosemite 2006-07 (highest 2 nd high)
NO ₂	annual	1.02	1.9	Yosemite 2006-07 (annual mean)
	1-hour	4.90	9.2	Yosemite 2006-07 (average 98 th percentile)
PM _{2.5}	annual	--	2.3	NDEP-BAPC approved
	24-hour	--	8	NDEP-BAPC approved
PM ₁₀	24-hour	--	10.2	NDEP-BAPC approved
SO ₂	3-hour	0.6	1.6	White Mountain 2019-21 (highest 2 nd high)
	1-hour	0.5	1.2	White Mountain 2019-21 (average 99 th percentile)

2.10 Ambient Air Quality Standards

Ambient air quality standards establish maximum allowable concentrations of pollutants in ambient air. These maximum levels are considered protective of public health. These standards are established by environmental regulatory authorities and apply to air pollutants with known or anticipated human health effects. The estimated total ambient concentrations (modeled concentrations plus applicable background concentrations) from this analysis were compared

with the EPA-promulgated National Ambient Air Quality Standards (NAAQS). The NAAQS are presented in Table 5.

Table 5. NAAQS for Compliance Demonstration

Pollutant	Averaging Period	NAAQS		Form
		(ppm)	($\mu\text{g}/\text{m}^3$)	
CO	8-hour	9	10,000	Not to be exceeded more than once per year
	1-hour	35	40,000	
NO ₂	annual	0.053	100	Annual mean
	1-hour	0.1	188	98 th percentile of 1-hour daily maximum concentrations, averaged over 3 years
PM _{2.5}	annual	N/A	12	Annual mean, averaged over 3 years
	24-hour	N/A	35	98 th percentile, averaged over 3 years
PM ₁₀	24-hour	N/A	150	Not to be exceeded more than once per year, on average, over 3 years
SO ₂	3-hour	0.5	1,300	Not to be exceeded more than once per year
	1-hour	0.075	196	99 th percentile of 1-hour daily maximum concentrations, averaged over 3 years

In addition to the criteria pollutants listed in Table 5, the EPA has also promulgated a NAAQS for the ozone (O₃) 8-hour averaging period. However, unlike the other criteria pollutants, O₃ is not directly emitted from industrial sources. Instead, it is formed on a regional scale through a series of complex photochemical reactions involving volatile organic compounds (VOC), nitrogen oxides (NO_x), and other gases in the atmosphere. Therefore, O₃ impacts cannot be modeled using AERMOD. To estimate potential O₃ impacts (and secondary PM_{2.5} formation), an evaluation using the EPA's guidance for the development of Modeled Emission Rates for Precursors (MERPs) was conducted, as discussed in Section 2.14.

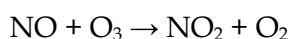
The EPA has also promulgated a NAAQS for lead; however, lead emissions from the Goldrush Mine are expected to be negligible (less than 0.01 ton/yr), and therefore lead is not addressed further.

2.11 Modeling Methodology

Regulatory default options in AERMOD were used to estimate the ground-level concentrations for all pollutants and averaging periods. The modeling approach for NO₂ and the treatment of intermittent emissions for 1-hour analyses are detailed in the following subsections.

2.11.1 NO₂ Modeling Method

The NO_x emissions from combustion sources are principally composed of nitrogen oxide (NO) and NO₂. Once in the atmosphere, most of the NO is converted to NO₂ through the following chemical reaction with ambient O₃:



Currently, the EPA's Guideline on Air Quality Models (40 CFR 51, Appendix W) offers a three-tiered approach to converting annual NO_x impacts to annual NO₂ impacts for comparison to the annual NO₂ NAAQS. In the EPA memoranda dated June 28, 2010 (EPA 2010) and March 1, 2011 (EPA 2011), the applicability of 40 CFR 51, Appendix W is further discussed in the context of modeling for compliance with the 1-hour NO₂ standard. To address the atmospheric conversion process, the Ozone Limiting Method (OLM) with the combined plume option (keywords OLMGROUP ALL) was used to estimate NO₂ impacts for this analysis.

The additional AERMOD-input parameters for the OLM option include the following:

- Background O₃ Concentrations – The use of the OLM option in AERMOD requires the input of background O₃ concentrations. The O₃ concentrations may be entered as a single value, hourly values to correspond with the meteorological data, or as a temporally varying profile. Hourly O₃ background concentration data from the Great Basin National Park monitoring station (concurrent with the NDEP-approved meteorological data) were used for this analysis. These O₃ data were obtained from the EPA's Clean Air Status and Trends Network (CASTNET) database. Missing hourly O₃ values were filled by conservatively using the 90th percentile value for hourly ozone concentration for the same period as the meteorological data.
- Ambient Equilibrium NO₂/NO_x Ratio – The AERMOD default NO₂/NO_x ambient equilibrium ratio of 0.90 was used in this analysis.
- In-Stack NO₂/NO_x Ratio – Pertinent literature and previous NEPA analyses were reviewed to determine appropriate in-stack NO₂/NO_x ratios for each NO_x-emitting source. The San Joaquin Valley Air Pollution Control District (SJVAPCD) has provided recommended NO₂/NO_x in-stack ratios for a variety of source categories in the California Air Pollution Control Officers Association's (CAPCOA) guidance document for NO₂ 1-hour modeling (CAPCOA 2011). The SJVAPCD recommends an NO₂/NO_x in-stack ratio in the range of 6 percent to 11 percent for heavy-duty diesel trucks. The highest value from the range, 11 percent, was used for this analysis. The SJVAPCD also recommends a default ratio of 20 percent for diesel-fired internal combustion (IC) engines.

2.11.2 Treatment of Intermittent Emissions for 1-hour Analyses

In its guidance on 1-hour modeling (EPA 2011), the EPA has recognized that intermittent sources that do not operate continuously or frequently enough, specifically emergency generators, are less likely to contribute significantly to the annual distribution of daily maximum 1-hour values. The EPA recommends that "compliance demonstrations for the 1-hour NO₂ NAAQS be based on emission scenarios that can logically be assumed to be relatively continuous or which occur frequently enough to contribute significantly to the annual distribution of daily maximum 1-hour concentrations" (EPA 2011).

The Goldrush Mine will include emergency generators to supply power to critical networks and equipment in the event that normal power supply is interrupted. The potential to emit for these emergency engines was determined using the 100 hours per year allowed by the applicable NSPS/NESHAP regulations for maintenance and readiness testing; however, emergency engines typically operate for only a few hours and on a random schedule. Thus, the operation of emergency generators is not frequent enough to significantly contribute to the annual distribution of daily maximum 1-hour concentrations. As such, using the maximum hourly emission rate does not represent a logical emission scenario. Therefore, emissions from these intermittently operating engines were based on an average hourly rate rather than the maximum hourly emissions for the 1-hour analyses.

2.12 Model Results for the Goldrush Mine

The modeled maximum concentrations attributable to the Goldrush Mine and the estimated total ambient concentrations (modeled concentrations plus background concentrations) and their comparison to the applicable NAAQS are presented in Table 6.

Table 6. Model Results and Comparison with NAAQS – Goldrush Mine

Pollutant	Averaging Period	Modeled Impact (µg/m³)	Background Conc. (µg/m³)	Total Impact (µg/m³)	NAAQS (µg/m³)	Compliance
CO	8-hour ^a	134.1	801.4	935.5	10,000	Yes
	1-hour ^a	876.5	1,030.4	1,906.9	40,000	Yes
NO ₂	Annual	5.9	1.9	7.8	100	Yes
	1-hour ^b	114.2	9.2	123.4	188	Yes
PM _{2.5}	Annual	0.8 ^e	2.3	3.1	12	Yes
	24-hour ^c	3.5 ^e	8.0	11.5	35	Yes
PM ₁₀	24-hour ^a	79.5	10.2	89.7	150	Yes
SO ₂	3-hour ^a	4.6	1.6	6.2	1,300	Yes
	1-hour ^d	6.0	1.2	7.2	196	Yes

^a Highest second-high modeled concentration

^b Highest eighth-high daily maximum 1-hour modeled concentration

^c Highest eighth-high modeled concentration

^d Highest fourth-high modeled concentration

^e PM_{2.5} modeled impacts for the facility include both direct PM_{2.5} (from AERMOD) and secondary PM_{2.5} (see Section 2.14, Table 11 below)

As shown in Table 6, based on the Goldrush Mine emissions, the maximum total ambient concentrations for all the pollutants and averaging periods are below the applicable NAAQS.

2.13 Cumulative Impact Analysis

To quantify cumulative air impacts, sources of significant air emissions located within the air quality cumulative effect study area (CESA) were included in the modeling analysis. The sources of significant air emissions located within the CESA boundary are the Cortez Mine, the

proposed Robertson Mine, and the Fire Creek Mine. Potential impacts from small nearby sources, including agricultural activities and traffic, are included in the background concentrations, as discussed in Section 2.9, to estimate the total cumulative impacts.

For this cumulative impact analysis, the Cortez Mine emissions were obtained from the Cortez – Northwest Deeps Plan of Operations Amendment NEPA Air Quality Impact Analysis Report (Air Sciences 2022). The Robertson Mine emissions were obtained from the Robertson Mine NEPA Air Quality Impact Analysis Report (Air Sciences 2021). The Fire Creek Mine emissions were obtained from the Fire Creek Mine Project Environmental Assessment (BLM 2015). The nearby source emissions used for this cumulative impact analysis are provided in Table 7.

Table 7. Nearby Source Emissions (ton/yr)

Nearby Source	PM ₁₀	PM _{2.5}	CO	NO _x	SO ₂
Cortez Mine	638	166	2,135	2,088	6.0
Robertson Mine	458	114	1,341	1,262	1.4
Fire Creek Project	15.2	2.4	58.3	12.7	0.8

As the Cortez Mine and Robertson Mine are both also owned by NGM, model input files from the referenced NEPA projects were used for specific source characterization. The Fire Creek Mine was characterized as a 500-meter by 500-meter AREA source centered on the facility, with a nominal release height of 3 meters and an associated initial vertical dispersion of 1.4 meters.

The results of the cumulative impact modeling for the Goldrush Mine and the nearby mining sources of Cortez, Robertson, and Fire Creek, are provided in Table 8. This table also lists the applicable NAAQS for compliance determination.

Table 8. Cumulative Model Results and Comparison with NAAQS

Pollutant	Averaging Period	Cumulative Impact ($\mu\text{g}/\text{m}^3$)^e	Background Conc. ($\mu\text{g}/\text{m}^3$)	Total Impact ($\mu\text{g}/\text{m}^3$)	NAAQS ($\mu\text{g}/\text{m}^3$)	Compliance
CO	8-hour ^a	422.6	801.4	1,224.0	10,000	Yes
	1-hour ^a	3,013.0	1,030.4	4,043.4	40,000	Yes
NO ₂	Annual	6.2	1.9	8.1	100	Yes
	1-hour ^b	115.5	9.2	124.7	188	Yes
PM _{2.5}	Annual	0.8	2.3	3.1	12	Yes
	24-hour ^c	3.7	8.0	11.7	35	Yes
PM ₁₀	24-hour ^a	79.8	10.2	90.0	150	Yes
SO ₂	3-hour ^a	4.6	1.6	6.2	1,300	Yes
	1-hour ^d	6.0	1.2	7.2	196	Yes

^a Highest second-high modeled concentration

^b Highest eighth-high daily maximum 1-hour modeled concentration

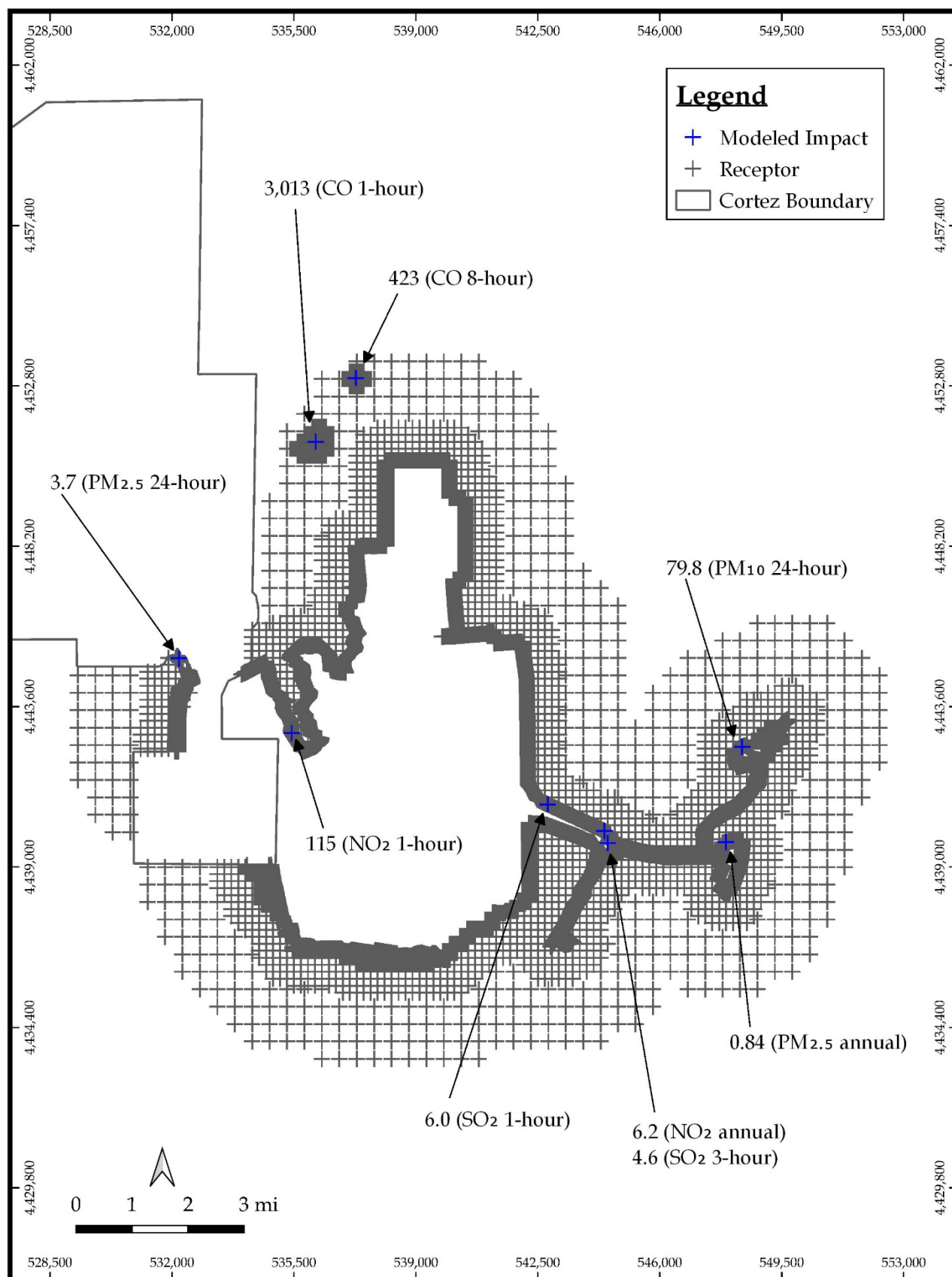
^c Highest eighth-high modeled concentration

^d Highest fourth-high modeled concentration

^e Combined impact from Goldrush, Cortez, Robertson, and Fire Creek mines

As shown in Table 8, the predicted maximum total cumulative ambient concentrations resulting from the Goldrush Mine and the nearby sources of significant emissions (including background concentration) for all the pollutants and averaging periods are below the applicable NAAQS. The locations of the cumulative modeled impacts are shown in Figure 4.

Figure 4. Locations of the Maximum Cumulative Impacts ($\mu\text{g}/\text{m}^3$)



2.14 Ozone Compliance with NAAQS

As discussed in Section 2.10, formation of O₃ and secondary PM_{2.5} cannot be modeled with AERMOD. In 2017, EPA promulgated an update to its Guideline on Air Quality Models (EPA 2017) in 40 CFR 51, Appendix W, to incorporate a tiered demonstration approach to address the secondary chemical formation of O₃ and PM_{2.5} associated with precursor emissions from single sources such as the Goldrush Mine.

For the Goldrush Mine, a Tier 1 assessment of the potential impacts of O₃ and PM_{2.5} due to secondary formation was performed. This analysis was based on EPA's Guidance for the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM_{2.5} under the PSD Permitting Program (EPA 2019a). The guidance document and associated spreadsheet contain information about hypothetical sources across the Continental United States, including locations, precursor emission rates, and impacts from Photochemical Grid Modeling (PGM) performed by EPA. The guidance also provides a suggested methodology for estimating a source's impacts from secondary formation.

The following process was used to evaluate secondary impacts:

1. Identification of a representative hypothetical source from the guidance.
2. Acquisition of the hypothetical source's characteristics and modeling results from EPA's on-line spreadsheet (EPA 2018).
3. For each precursor, use of the following equation to estimate the facility's impacts due to secondary formation:

$$\text{Facility Impact} = \text{Facility Precursor Emission Rate} \times \frac{\text{Hypothetical PGM Impact from PGM}}{\text{Hypothetical Precursor Emission Rate}}$$

The secondary impacts for each pollutant are summed to estimate total secondary impacts. For this analysis, the estimated total secondary impacts were compared to the applicable significant impact levels (SILs) to determine if the impacts are insignificant.

Taking into consideration the proximity of urban areas, EPA's PGM source #16, located in rural southwestern Utah, is most representative of the Goldrush facility's rural setting. Source #16 is located away from the influence of urban/metropolitan area precursor emissions and is also the modeled source located closest to the Great Basin National Park (GBNP) monitoring station, which NDEP has recommended as a location with PM₁₀ background concentrations representative of the facility location. In addition, the background O₃ data from the GBNP monitoring station is used for the 1-hour NO₂ modeling analyses of the Goldrush Mine.

In this analysis, the precursor pollutants for O₃ formation are NO_x and VOC. For PM_{2.5} formation, the precursors are NO_x and SO₂. The Goldrush Mine facility-wide precursor emission rates, in tons per year, are provided in Table 9.

Table 9. Goldrush Mine Precursor Emission Rates

Precursor	Emission Rate (ton/yr)
SO ₂	1.7
NO ₂	264.7
VOC	44.2

For EPA's hypothetical sources, emission rates were modeled for each precursor at 500 tons per year, 1,000 tons per year, and 3,000 tons per year. For the Goldrush Mine evaluation, the 500 tons per year rate was selected as being the most similar emission rate for all precursors.

Following the formula provided above and using the emission rates and impacts from EPA's PGM for the selected hypothetical source, estimates of secondary formation due to Goldrush Mine precursor emissions are provided in Table 10.

Table 10. PGM and Estimated Goldrush Mine Secondary Impacts

Pollutant	Averaging Period	Precursor	Hypothetical Emissions (ton/yr)	Impact from PGM (ppb)	Impact from PGM (µg/m³)	Facility Emissions (ton/yr)	Estimated Impacts (ppb)	Estimated Impacts (µg/m³)
PM _{2.5}	Annual	SO ₂	500	--	0.00365	1.7	--	0.00001
		NO ₂	500	--	0.00117	264.7	--	0.00062
	24-hour	SO ₂	500	--	0.096	1.7	--	0.0003
		NO ₂	500	--	0.035	264.7	--	0.0185
O ₃	8-hour	VOC	500	0.054	--	44.2	0.005	--
		NO ₂	500	0.687	--	264.7	0.364	--

For each pollutant, the secondary impacts are summed to estimate the total secondary impacts from the facility. The total secondary impacts are presented and compared to the applicable SILs in Table 11.

Table 11. Secondary Impact Analysis Results

Pollutant	Averaging Period	Secondary Impact		SIL		Insignificant?
		(ppb)	(µg/m³)	(ppb)	(µg/m³)	
PM _{2.5}	Annual	--	0.000631	--	0.2	Yes
	24-hour	--	0.0189	--	1.2	Yes
O ₃	8-hour	0.369	-	1.0	-	Yes

As shown in Table 11, the estimated impacts from secondary formation for both O₃ and PM_{2.5} are below the applicable SILs, and therefore are considered to be insignificant.

3.0 OFF-SITE AIR QUALITY ANALYSIS

To support the Goldrush Mine, NGM proposes to transport up to 2,100,000 tons of Goldrush ore per year for processing at either the Gold Quarry Mine or the Goldstrike Mine in Eureka County, Nevada. The transportation and processing of Goldrush ore at the Gold Quarry or Goldstrike mines will result in off-site air emissions. The following sections provide an air quality impact analysis of the transportation and processing of the ore at each destination. This analysis is consistent with previous NEPA analyses (BLM 2011a), (BLM 2011b), and (BLM 2018) conducted for off-site ore transportation from the Cortez facility. NGM has previously received authorization to transport up to 2,500,000 tons of Cortez ore per year for processing at either Gold Quarry or Goldstrike. A cumulative analysis of the potential air quality impacts from transporting and processing both Goldrush and Cortez ore is included in each section.

3.1 Impacts from Ore Processing at Gold Quarry

The analyses in this section address the air quality impacts from transporting and processing up to 2,100,000 tons of Goldrush ore per year through the Gold Quarry roasters.

3.1.1 Off-site Ore Transport Emissions

Ore mined at Goldrush and transported to Gold Quarry will travel approximately 70 miles from the Goldrush ore stockpile at the Cortez facility to the Gold Quarry roasters. The emissions resulting from ore transport are presented in Table 12.

Table 12. Emissions from Off-site Ore Transport to Gold Quarry

Source	PM ₁₀ (ton/yr)	PM _{2.5} (ton/yr)	CO (ton/yr)	NO _x (ton/yr)	SO ₂ (ton/yr)	GHG (ton/yr)
Off-site Ore Transport	88.7	16.7	11.9	54.0	0.093	13,857

Detailed emission calculations are provided in Appendix A. These emissions are based on hauling 53,290 loads of ore per year. Particulate emissions from the paved and unpaved roads along the route were estimated based on the EPA AP-42 Sections 13.2.1 and 13.2.2, respectively (EPA n.d.). Tailpipe, brake wear, and tire wear emissions were estimated based on the EPA Motor Vehicle Emission Simulator (MOVES) program, version 2014b (EPA 2014). The ore shipping route from Goldrush to Gold Quarry is shown in Figure 5.

Figure 5. Off-site Transport Routes



The cumulative emissions from the combined transport of Goldrush and Cortez ore to Gold Quarry are presented in Table 13.

Table 13. Emissions from Transport of Goldrush and Cortez Ore to Gold Quarry

	PM ₁₀ (ton/yr)	PM _{2.5} (ton/yr)	CO (ton/yr)	NO _x (ton/yr)	SO ₂ (ton/yr)	GHG (ton/yr)
Total Goldrush Off-site Ore Transport	88.7	16.7	11.9	54.0	0.10	13,857
Total Cortez Off-site Ore Transport ^(a)	54.1	14.0	9.7	41.4	0.11	12,884
Cumulative Off-site Ore Transport	142.8	30.7	21.6	95.4	0.21	26,741

^(a) (Air Sciences 2019b)

3.1.2 Off-site Ore Processing Emissions

3.1.2.1 PM₁₀, PM_{2.5}, CO, NO₂, and SO₂ Emissions

Emissions of PM₁₀, PM_{2.5}, CO, NO₂, and SO₂ from processing Goldrush ore at the Gold Quarry roasters were calculated by scaling Gold Quarry's facility-wide emission rates as reported in the 2017 calendar year actual production and emissions report (NDEP 2017c). Gold Quarry's 2017 facility-wide ore throughput was 15,949,319 tons (Air Sciences 2019b). The fugitive dust emissions from transporting and unloading Goldrush ore within the Gold Quarry Mine area were estimated based on EPA AP-42 emission factors (EPA n.d.). Tailpipe, brake wear, and tire wear emissions from the Goldrush ore hauling within the Gold Quarry Mine area were estimated based on the EPA MOVES program (EPA 2014). The total Goldrush ore processing at Gold Quarry emissions are presented in Table 14.

Table 14. Emissions from Processing Goldrush Ore at Gold Quarry

Off-site Ore Processing	PM ₁₀ (ton/yr)	PM _{2.5} (ton/yr)	CO (ton/yr)	NO _x (ton/yr)	SO ₂ (ton/yr)
Goldrush Ore at Gold Quarry	24.0	8.5	15.5	14.5	1.6

Gold Quarry will process the Goldrush ore within its currently permitted processing limits, resulting in no change to Gold Quarry's permitted emission rates.

Table 15 shows the estimated cumulative emissions from both Goldrush and Cortez ore being processed at Gold Quarry.

Table 15. Emissions from Processing Goldrush and Cortez Ore at Gold Quarry

	PM ₁₀ ton/yr	PM _{2.5} ton/yr	CO ton/yr	NO _x ton/yr	SO ₂ ton/yr
Total Goldrush Off-site Ore Processing	24.0	8.5	15.5	14.5	1.6
Total Cortez Off-site Ore Processing ^(a)	39.5	15.3	49.4	69.4	5.9
Cumulative Off-site Ore Processing	63.5	23.8	64.9	84.0	7.6

^(a) (Air Sciences 2019b)

3.1.2.2 PM₁₀, PM_{2.5}, CO, NO₂, and SO₂ Impacts

An estimate of the impacts from the cumulative emissions from processing Goldrush and Cortez ore at Gold Quarry, as shown in Table 15, was developed based on the Final Environmental Impact Statement for the South Operations Area Project Amendment at Gold Quarry (SOAPA EIS) (BLM 2002) and the Draft Environmental Impact Statement for the Genesis Project at the North Operations Area (BLM 2010). Table 16 provides the Gold Quarry emissions and impacts for the SOAPA EIS along with the applicable NAAQS.

The SOAPA EIS addressed the impacts from PM₁₀, CO, NO₂, and SO₂ emissions from Gold Quarry. However, because the 1-hour NO₂ and SO₂ standards were promulgated after the SOAPA EIS analysis had been conducted, the impacts for these averaging periods were estimated from the modeled averaging periods using the scaling ratios from the AERSCREEN User's Guide (EPA 2016a). The User's Guide provides both AERSCREEN and SCREEN3 scaling ratios. The more conservative SCREEN3 ratios were used to estimate the 1-hour NO₂ and SO₂ impacts provided in Table 16. In addition, the SOAPA EIS did not include PM_{2.5} emissions and impacts, therefore, the PM_{2.5} emissions and impacts from Gold Quarry are estimated from the ratio of PM_{2.5} to PM₁₀ emissions from Cortez ore processing at Gold Quarry (Air Sciences 2019a).

By scaling the Gold Quarry emissions and impacts with the Goldrush and Cortez ore emissions provided in Table 15, the apportioned impacts from processing Goldrush and Cortez ore at Gold Quarry were estimated. These impacts are provided in Table 16.

Table 16. Impacts from Processing Goldrush and Cortez Ore at Gold Quarry

Pollutant	Averaging Period	Gold Quarry		Goldrush & Cortez Ore Processing		NAAQS (µg/m ³)
		Emissions (ton/yr) ^(a)	Modeled Impact (µg/m ³) ^(b)	Emissions (ton/yr)	Estimated Impact (µg/m ³)	
PM ₁₀	24-hour	568	59	63.5	6.6	150
PM _{2.5}	annual	220 ^(c)	2.3 ^(c)	23.8	0.3	12
	24-hour		22.8 ^(c)		2.5	35
CO	8-hour	337	272	64.9	52.4	10,000
	1-hour		1,098		211.5	40,000
NO ₂	annual	354	3.5	84.0	0.8	100
	1-hour		43.8 ^(d)		10.4	188
SO ₂	3-hour	276	122	7.6	3.3	1,300
	1-hour		135.6 ^(d)		3.7	196

^(a) (BLM 2010)

^(b) (BLM 2002)

^(c) PM_{2.5} emissions and impacts were not provided in the SOAPA EIS (BLM 2002). Therefore, the PM_{2.5} emissions and impacts from Gold Quarry are estimated from the ratio of PM_{2.5} to PM₁₀ emissions from Cortez ore processing at Gold Quarry of 0.39 (Air Sciences 2019b).

^(d) Estimated using the SCREEN3 scaling ratios provided in the AERSCREEN User's Guide.

As shown in Table 16, the maximum impacts from processing Goldrush and Cortez ore at Gold Quarry are all well below the NAAQS. Because the processing of the Goldrush and Cortez ore will be done within Gold Quarry's currently permitted throughput and emission limits, there

will be no actual change to Gold Quarry's impacts shown in Table 16. As shown in Table 17, the maximum impacts from ore processing at Gold Quarry would not exceed the NAAQS.

Table 17. Cumulative Impacts from Processing Goldrush and Cortez Ore at Gold Quarry

Pollutant	Averaging Period	Cumulative Impact (µg/m³)^(a)	NDEP Background Conc.^(b) (µg/m³)	Total Impact (µg/m³)	Alternative Background Conc.^(b) (µg/m³)	Total Impact (µg/m³)	NAAQS (µg/m³)
PM ₁₀	24-hour	59	10.2	69.2	10.2	69.2	150
PM _{2.5}	annual	2.3	2.3	4.6	2.3	4.6	12
	24-hour	22.8	8.0	30.8	8.0	30.8	35
CO	8-hour	272	0	272.0	801.4	1,073	10,000
	1-hour	1,098	0	1,098	1,030.4	2,128	40,000
NO ₂	annual	3.5	0	3.5	1.9	5.4	100
	1-hour	43.8	0	43.8	9.2	53.0	188
SO ₂	3-hour	122	0	122.0	1.6	123.6	1,300
	1-hour	135.6	0	135.6	1.2	136.8	196

^(a) As Gold Quarry's currently permitted throughput and emission limits will not change due to the processing of the Goldrush and Cortez ore, Gold Quarry's maximum impacts shown in Table 16 represent the total cumulative impacts.

^(b) See Section 2.9.

3.1.2.3 HAP Emissions

Gold Quarry's 2016 HAP emission inventory showed a total of 11.4 tons per year for all HAPs combined (Air Sciences 2019b). These emissions were calculated from both the mining and processing of Gold Quarry ore. Scaling from the 2017 facility-wide ore processing rate of 15,949,319 tons per year (Air Sciences 2019b), the total HAP emissions associated with processing 2,100,000 tons per year of Goldrush ore at Gold Quarry are estimated to be 1.5 tons per year. Because the Gold Quarry HAP emissions come from both mining and processing, the calculated HAP emissions from the Goldrush ore are a conservatively high estimate. This is because the Goldrush ore will not have any mining emissions at the Gold Quarry facility.

Using the same scaling method, it is estimated that processing 2,500,000 tons per year of Cortez ore at Gold Quarry would result in HAP emissions of 1.79 tons per year (Air Sciences 2019b). The cumulative HAP emissions from processing both Goldrush and Cortez ore are estimated to be 3.29 tons per year. Goldrush and Cortez ore will displace Gold Quarry ore and the processing of total ore at Gold Quarry will not result in total HAP emissions in excess of the major HAP emission threshold of 25 tons per year.

3.1.2.4 GHG Emissions

Ore processing at Gold Quarry produces GHG emissions from fuel combustion and roasting. The 2018 GHG emissions from fuel combustion at Gold Quarry totaled 85,353 tons CO_{2e} per year (Air Sciences 2019b). An estimate of GHG emissions from fuel combustion associated with processing Goldrush ore at Gold Quarry was determined by scaling based on the relative ore processing rates. In addition, GHG emissions from roasting Goldrush ore at Gold Quarry were estimated by scaling Goldstrike ore roasting GHG emissions of 175,061 tons CO_{2e} per year and

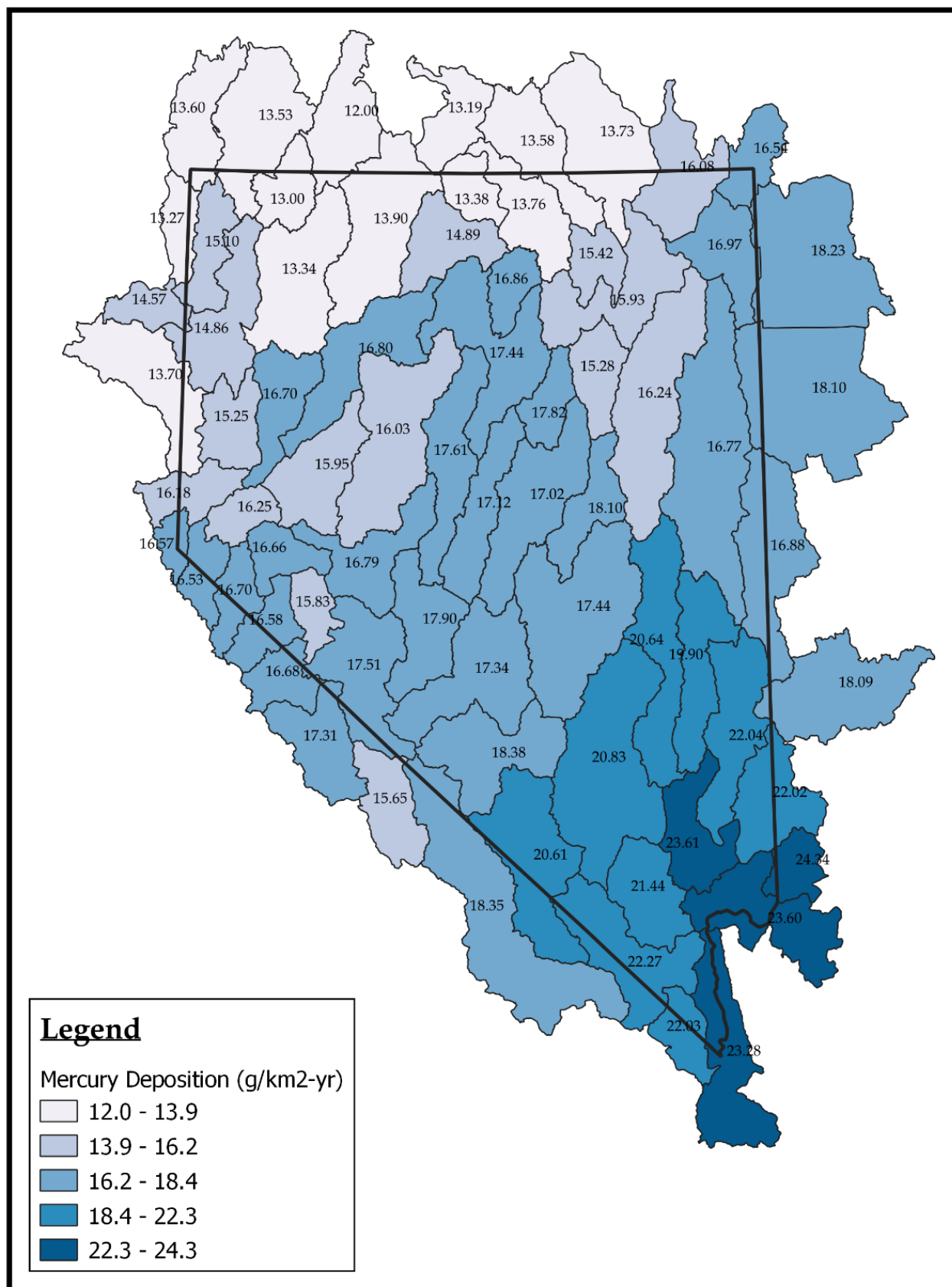
throughput (Air Sciences 2019b). The estimated total GHG emissions associated with processing 2,100,000 tons per year of Goldrush ore at Gold Quarry are estimated to be 76,433 tons CO₂e per year. Summing the GHG emissions of 82,546 tons per year from Cortez ore processing at Gold Quarry with the Goldrush ore GHG emissions results in total cumulative emissions of 158,979 tons CO₂e per year.

3.1.2.5 Mercury Emissions and Deposition

Mercury emissions resulting from the processing of Goldrush ore at the Gold Quarry roasters were estimated by scaling Gold Quarry's 2017 roaster ore processing rate of 3,580,661 tons and facility-wide mercury emissions of 194 pounds (NDEP 2017b). Using the potential of 2,100,000 tons of ore per year from Goldrush, the calculated mercury emissions from processing Goldrush ore are 114 pounds per year.

Consistent with the methodology supporting previously approved NEPA actions (Cortez Hills Expansion Project SEIS (BLM 2011a), Genesis Project EIS (BLM 2011b), and Betze Pit Expansion Project EIS (BLM 2008)), mercury deposition impacts were estimated based on the EPA's computer simulation modeling using the Regional Modeling System for Aerosols and Deposition (REMSAD) to quantify contributions from specific sources of mercury deposition within each of the lower 48 states (EPA 2008). Figure 6 shows the global background mercury deposition rates as determined by the 2008 RESMAD modeling.

Figure 6. Global Background Mercury Deposition



The Gold Quarry mine was included in the 2008 REMSAD analysis with mercury emissions of 318 pounds per year. The mercury deposition, in units of grams per square kilometer per year (g/km²-yr), from Gold Quarry emissions in each of the hydrographic subbasins surrounding the Gold Quarry mine is shown in Figure 7. The subbasin with the highest impacts is shown in dark blue.³ As presented in Figure 7, the highest-impacted subbasin is the subbasin in which Gold Quarry is located, and mercury deposition decreases as distance from the mine increases.

As previously discussed, the estimated mercury emissions from the 2,100,000 tons of Goldrush ore to be processed at Gold Quarry are 114 pounds per year. This emission rate represents 36% of the Gold Quarry mercury emissions used in the REMSAD modeling. For the subbasin that saw the highest mercury deposition rate of 1.7 g/km²-yr from Gold Quarry emissions, processing Goldrush ore would contribute an estimated 0.61 g/km²-yr of mercury deposition. This mercury deposition would represent 3.8% of the global background mercury deposition rate of 15.9 g/km²-yr.

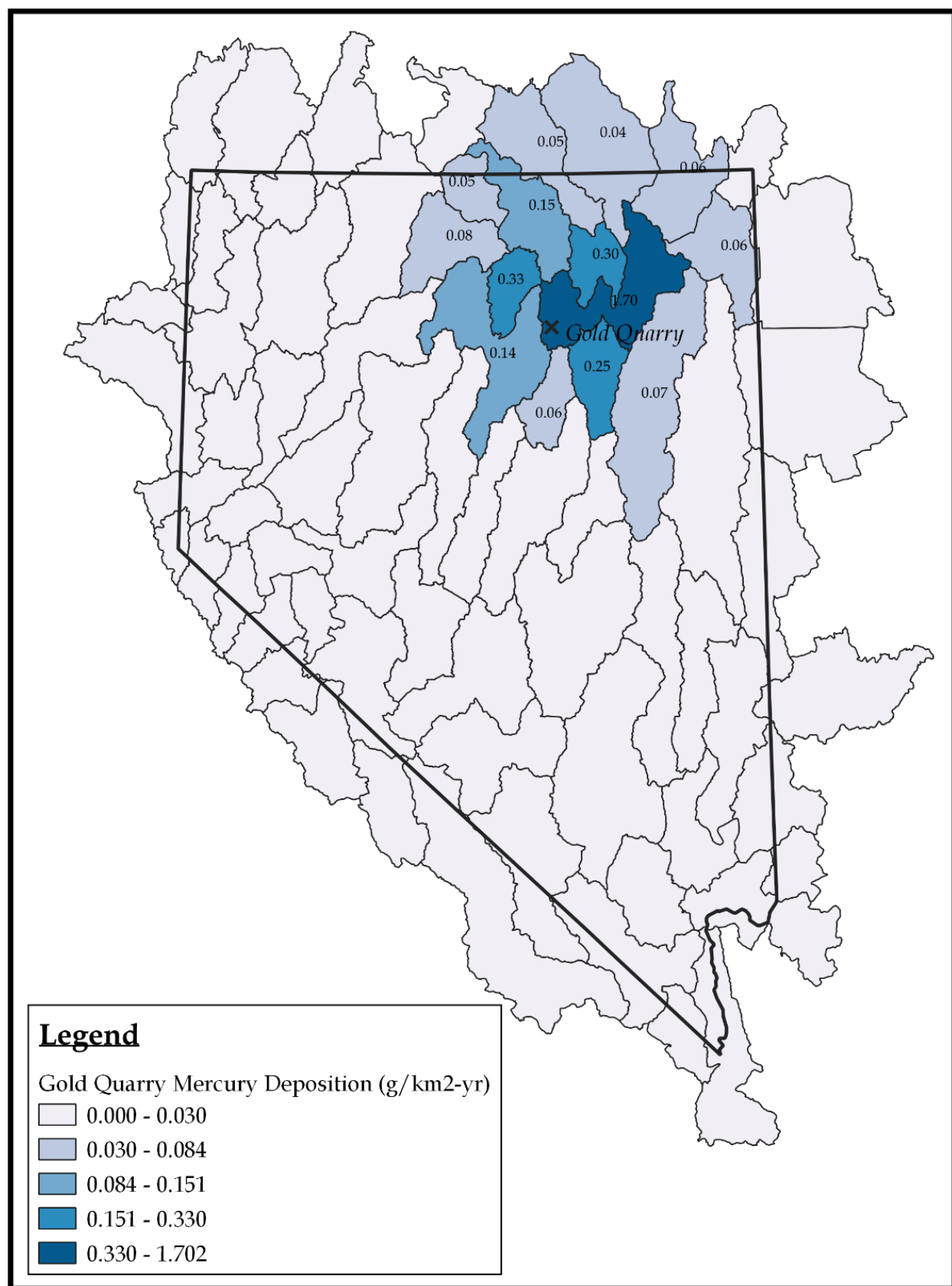
Mercury emissions resulting from Cortez ore being processed at Gold Quarry are estimated to be 199.2 pounds per year (Air Sciences 2019b). Summing the Goldrush and Cortez ore emissions results in a total of 313 pounds per year, 98% of the 2008 REMSAD modeled mercury emissions for Gold Quarry. For the subbasin that saw the highest mercury deposition rate of 1.7 g/km²-yr from Gold Quarry emissions, processing both Goldrush and Cortez ore would contribute 1.67 g/km²-yr of mercury deposition. The cumulative mercury deposition would represent 10.5% of the global background mercury deposition rate of 15.9 g/km²-yr, as summarized in Table 18.

Table 18. Mercury Deposition from Goldrush and Cortez Ore Processing at Gold Quarry

Mine	REMSAD Hg Emissions (lb/yr)	REMSAD Highest-impacted Subbasin (g/km ² -yr)	Goldrush and Cortez Ore Hg Emissions (lb/yr)	Goldrush and Cortez Ore Impact (g/km ² -yr)	Global Background (g/km ² -yr)	Goldrush and Cortez Ore Impact Percent of Background (g/km ² -yr)
Gold Quarry	318	1.7	313	1.67	15.9	10.5%

³ The highest-impacted subbasin was determined using the Jenks natural breaks classification method with five classes. This method minimizes the variance within classes and maximizes the variance between classes.

Figure 7. Gold Quarry Mercury Deposition



3.2 Impacts from Ore Processing at Goldstrike

The analyses in this section address the air quality impacts from transporting and processing up to 2,100,000 tons of Goldrush ore per year through the Goldstrike roasters or autoclaves.

3.2.1 Off-site Ore Transport Emissions

Ore mined at Goldrush and transported to Goldstrike will travel approximately 90 miles from the Goldrush ore stockpile at the Cortez facility to the Goldstrike facility. The emissions resulting from ore transportation are presented in Table 19.

Table 19. Emissions from Off-site Ore Transport to Goldstrike

Source	PM ₁₀ (ton/yr)	PM _{2.5} (ton/yr)	CO (ton/yr)	NO _x (ton/yr)	SO ₂ (ton/yr)	GHG (ton/yr)
Off-site Ore Transport	124.0	22.2	15.5	69.2	0.119	17,795

Detailed emission calculations are provided in Appendix A. These emissions are based on hauling 53,290 loads of ore per year. Particulate emissions from the paved and unpaved roads along the route were estimated based on the EPA AP-42 Sections 13.2.1 and 13.2.2, respectively (EPA n.d.). Tailpipe, brake wear, and tire wear emissions were estimated based on the EPA MOVES program, version 2014b. The ore shipping route from Goldrush to Goldstrike is shown in Figure 5.

The cumulative emissions from the combined transport of Goldrush and Cortez ore to Goldstrike are presented in Table 20.

Table 20. Emissions from Transport of Goldrush and Cortez Ore to Goldstrike

	PM ₁₀ (ton/yr)	PM _{2.5} (ton/yr)	CO (ton/yr)	NO _x (ton/yr)	SO ₂ (ton/yr)	GHG (ton/yr)
Total Goldrush Off-site Ore Transport	124.0	22.2	15.5	69.2	0.12	17,795
Total Cortez Off-site Ore Transport ^(a)	95.9	20.5	13.5	55.7	0.15	17,262
Cumulative Off-site Ore Transport	219.9	42.7	29.0	124.9	0.27	35,057

^(a) (Air Sciences 2019b)

3.2.2 Off-site Ore Processing Emissions

3.2.2.1 PM₁₀, PM_{2.5}, CO, NO₂, and SO₂ Emissions

Emissions of PM₁₀, PM_{2.5}, CO, NO₂, and SO₂ resulting from processing Goldrush ore at the Goldstrike roasters or autoclaves were calculated by scaling Goldstrike's facility-wide emission rates as reported in the 2017 calendar year actual production and emissions report (NDEP 2017c). Goldstrike's 2017 facility-wide ore throughput was 10,350,200 tons (NDEP 2017b). The fugitive dust emissions from transporting and unloading Goldrush ore within the Goldstrike mine area were estimated based on EPA AP-42 emission factors (EPA n.d.). Tailpipe, brake wear, and tire wear emissions from the Goldrush ore hauling within the Goldstrike mine area

were estimated based on the EPA MOVES program (EPA 2014). The total Goldrush ore processing at Goldstrike emissions are presented in Table 21.

Table 21. Emissions from Processing Goldrush Ore at Goldstrike

Off-site Ore Processing	PM ₁₀ (ton/yr)	PM _{2.5} (ton/yr)	CO (ton/yr)	NO _x (ton/yr)	SO ₂ (ton/yr)
Goldrush Ore at Goldstrike	49.73	22.13	12.25	30.78	14.21

Goldstrike will process the Goldrush ore within its currently permitted processing limits, resulting in no change to Goldstrike's permitted emission rates.

Table 22 shows the estimated cumulative emissions from both Goldrush and Cortez ore being processed at Goldstrike.

Table 22. Emissions from Processing Goldrush and Cortez Ore at Goldstrike

	PM ₁₀ ton/yr	PM _{2.5} ton/yr	CO ton/yr	NO _x ton/yr	SO ₂ ton/yr
Total Goldrush Off-site Ore Processing	49.7	22.1	12.2	30.8	14.2
Total Cortez Off-site Ore Processing ^(a)	52.4	24.7	19.2	38.0	18.2
Cumulative Off-site Ore Processing	102.1	46.8	31.4	68.7	32.4

^(a) (Air Sciences 2019b)

3.2.2.2 PM₁₀, PM_{2.5}, CO, NO₂, and SO₂ Impacts

An estimate of the impacts from the cumulative emissions from processing Goldrush and Cortez ore at Goldstrike, shown in Table 22, was developed based on the Draft Supplemental Environmental Impact Statement for the Betze Pit Expansion Project at Goldstrike (Betze EIS) (BLM 2008). Table 23 provides the Goldstrike emissions and impacts from the Betze EIS along with the NAAQS.

The Betze EIS addressed the impacts from PM₁₀, CO, NO₂, and SO₂ emissions from Goldstrike. However, because the 1-hour NO₂ and SO₂ standards were promulgated after the Betze EIS analysis had been conducted, the impacts for these averaging periods are estimated from the modeled averaging periods using the scaling ratios from the AERSCREEN User's Guide (EPA 2019a). The User's Guide provides both AERSCREEN and SCREEN3 scaling ratios. The more conservative SCREEN3 ratios were used to estimate the 1-hour NO₂ and SO₂ impacts provided in Table 23. In addition, the Betze EIS did not include PM_{2.5} emissions and impacts, therefore, the PM_{2.5} emissions and impacts from Goldstrike were estimated from the ratio of PM_{2.5} to PM₁₀ emissions (Air Sciences 2017a).

By scaling the Goldstrike emissions and impacts with the Goldrush and Cortez ore emissions provided in Table 22, the apportioned impacts from processing Goldrush and Cortez ore at Goldstrike were estimated. These impacts are provided in Table 23.

Table 23. Impacts from Processing Goldrush and Cortez Ore at Goldstrike

Pollutant	Averaging Period	Goldstrike		Goldrush & Cortez Ore Processing		NAAQS ($\mu\text{g}/\text{m}^3$)
		Emissions (ton/yr) ^(a)	Modeled Impact ($\mu\text{g}/\text{m}^3$) ^(a)	Emissions (ton/yr)	Estimated Impact ($\mu\text{g}/\text{m}^3$)	
PM ₁₀	24-hour	579	16.7	102.1	2.9	150
PM _{2.5}	annual	318 ^(b)	5.8 ^(b)	46.8	0.9	12
	24-hour		9.2 ^(b)		1.3	35
CO	8-hour	400	38.3	31.4	3.0	10,000
	1-hour		216.5		17.0	40,000
NO ₂	annual	311	0.8	68.7	0.2	100
	1-hour		10.4 ^(c)		2.3	188
SO ₂	3-hour	996	13.0	32.4	0.4	1,300
	1-hour		14.5 ^(c)		0.5	196

(a) (BLM 2008)

(b) PM_{2.5} emissions and impacts were not provided in the Betze EIS (BLM 2008). Therefore, the PM_{2.5} emissions and impacts from Goldstrike are estimated from the ratio of PM_{2.5} to PM₁₀ emissions of 0.55 (Air Sciences 2017a).

(c) Estimated using the SCREEN3 scaling ratios provided in the AERSCREEN User's Guide.

As shown in Table 23, the maximum impacts from processing Goldrush and Cortez ore at Goldstrike are all well below the NAAQS. Because the processing of the Goldrush and Cortez ore will be done within Goldstrike's currently permitted throughput and emissions limits, there will be no actual change to Goldstrike's impacts shown in Table 23. As shown in Table 24, the maximum impacts from ore processing at Goldstrike would not exceed the NAAQS.

Table 24. Cumulative Impacts from Processing Goldrush and Cortez Ore at Goldstrike

Pollutant	Averaging Period	Cumulative Impact ($\mu\text{g}/\text{m}^3$) ^(a)	NDEP		Alternative		NAAQS ($\mu\text{g}/\text{m}^3$)
			Background Conc. ^(b) ($\mu\text{g}/\text{m}^3$)	Total Impact ($\mu\text{g}/\text{m}^3$)	Background Conc. ^(b) ($\mu\text{g}/\text{m}^3$)	Total Impact ($\mu\text{g}/\text{m}^3$)	
PM ₁₀	24-hour	16.7	10.2	26.9	10.2	26.9	150
PM _{2.5}	annual	5.8	2.3	8.1	2.3	8.1	12
	24-hour	9.2	8.0	17.2	8.0	17.2	35
CO	8-hour	38.3	0	38.3	801.4	839.7	10,000
	1-hour	216.5	0	216.5	1,030.4	1,247	40,000
NO ₂	annual	0.8	0	0.8	1.9	2.7	100
	1-hour	10.4	0	10.4	9.2	19.6	188
SO ₂	3-hour	13.0	0	13.0	1.6	14.6	1,300
	1-hour	14.5	0	14.5	1.2	15.7	196

(a) As Goldstrike's currently permitted throughput and emission limits will not change due to the processing of the Goldrush and Cortez ore, Goldstrike's maximum impacts shown in Table 23 represent the total cumulative impacts.

(b) See Section 2.9.

3.2.2.3 HAP Emissions

Goldstrike's 2019 potential HAP emission inventory showed a total of 14.53 tons per year for all HAPs combined (Air Sciences 2019a). These emissions were calculated from both the mining and processing of Goldstrike ore. Scaling from the potential ore processing rate of 16,651,300 tons per year (Air Sciences 2019a), the total HAP emissions associated with processing 2,100,000

tons per year of Goldrush ore at Goldstrike are estimated to be 1.83 tons per year. Because the Goldstrike HAP emissions come from both mining and processing, the calculated HAP emissions from the Goldrush ore are a conservatively high estimate. This is because the Goldrush ore will not have any mining emissions at the Goldstrike facility.

Using the same scaling method, it is estimated that processing 2,500,000 tons per year of Cortez ore at Goldstrike would result in HAP emissions of 2.97 tons per year (Air Sciences 2016). The cumulative HAP emissions from processing both Goldrush and Cortez ore are estimated to be 4.80 tons per year. Goldrush and Cortez ore will displace Goldstrike ore and the processing of total ore at Goldstrike will not result in total HAP emissions in excess of the major HAP emission threshold of 25 tons per year.

3.2.2.4 GHG Emissions

Ore processing at Goldstrike produces GHG emissions from fuel combustion, roasting, and autoclaving. The potential GHG emissions from ore processing at Goldstrike are 1,060,796 tons CO₂e per year (Air Sciences 2019a). Scaling from the potential ore processing rate of 16,651,300 tons per year (Air Sciences 2019a), the total GHG emissions associated with processing 2,100,000 tons per year of Goldrush ore at Goldstrike are estimated to be 133,784 tons CO₂e per year. Summing the GHG emissions of 119,033 (Air Sciences 2019a) tons CO₂e per year from Cortez ore processing at Goldstrike with the Goldrush ore GHG emissions results in total cumulative emissions of 252,817 tons CO₂e per year.

3.2.2.5 Mercury Emissions and Deposition

Mercury emissions resulting from the processing of Goldrush ore at the Goldstrike roasters or autoclaves were estimated by scaling Goldstrike's 2017 facility-wide ore processing rate of 10,350,200 tons and mercury emissions of 178 pounds (NDEP 2017b). Using the potential of 2,100,000 tons of ore per year from Goldrush, the calculated mercury emissions are 36 pounds per year.

As discussed in Section 3.1.2.5, EPA's 2008 REMSAD modeling was used to estimate the mercury deposition resulting from mercury emissions from processing Goldrush ore at Goldstrike. The Goldstrike mine was also included in the 2008 REMSAD analysis with mercury emissions of 624 pounds per year. Mercury deposition from Goldstrike emissions in each of the hydrographic subbasins surrounding the Goldstrike mine is shown in Figure 8. The subbasin with the highest impact is shown in dark blue.⁴ As presented in Figure 8, the highest-impacted subbasin is adjacent to the subbasin in which Goldstrike is located, and mercury deposition decreases as distance from the mine increases.

As previously discussed, the estimated mercury emissions from the 2,100,000 tons of Goldrush ore are 36.0 pounds per year. This emission rate represents 5.8% of the Goldstrike mercury emissions used in the REMSAD modeling. For the subbasin that saw the highest mercury

⁴ The highest-impacted subbasin was determined using the Jenks natural breaks classification method with five classes. This method minimizes the variance within classes and maximizes the variance between classes.

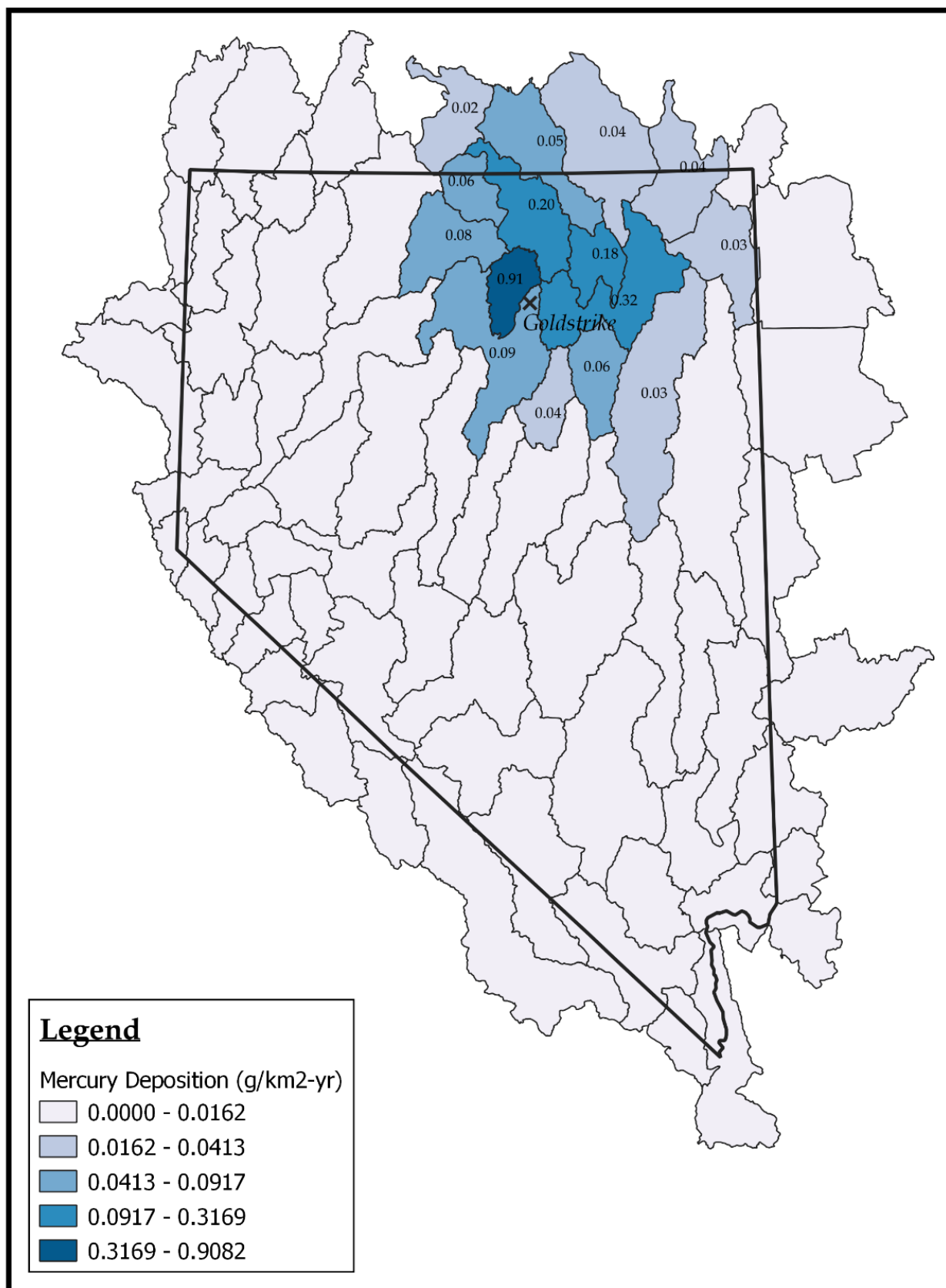
deposition rate of 0.91 g/km²-yr from Goldstrike emissions, processing Goldrush ore would contribute an estimated 0.05 g/km²-yr of mercury deposition. This mercury deposition would represent 0.31% of the global background mercury deposition rate of 16.9 g/km²-yr.

Mercury emissions resulting from Cortez ore being processed at Goldstrike are estimated to be 80.0 pounds per year (Air Sciences 2016). Summing the Goldrush and Cortez ore mercury emissions yields a total of 116.0 pounds per year, 18.6% of the 2008 REMSAD modeled mercury emissions for Goldstrike. For the subbasin that saw the highest mercury deposition rate of 0.91 g/km²-yr from Goldstrike emissions, processing both Goldrush and Cortez ore would contribute 0.17 g/km²-yr of mercury. The cumulative mercury deposition would represent 1.0% of the global background mercury deposition rate of 16.9 g/km²-yr, as summarized in Table 25.

Table 25. Mercury Deposition from Goldrush and Cortez Ore Processing at Goldstrike

Mine	REMSAD Hg Emissions (lb/yr)	REMSAD Highest- impacted Subbasin (g/km²-yr)	Goldrush and Cortez Ore Hg Emissions (lb/yr)	Goldrush and Cortez Ore Impact (g/km²-yr)	Global Background (g/km²-yr)	Goldrush and Cortez Ore Impact Percent of Background (g/km²-yr)
Goldstrike	624	0.91	116	0.17	16.9	1.0%

Figure 8. Goldstrike Mercury Deposition



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Appendix A – Emission Calculations

Facility-Wide Emissions

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE:	BY:
	Goldrush	G. Barthel
	PROJECT NO:	PAGE: OF: SHEET:
	59-70-9	1 1 Summary
	SUBJECT:	DATE:
	Summary	September 16, 2022

Scenario Option 1

Facility-Wide Emissions

	PM10	PM2.5	CO	NOX	SO2	VOC
Activity	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
Process	36.9	7.6	28.2	56.6	1.4	18.4
Fugitive and Construction	76.7	13.5	237.3	208.1	0.3	25.7
Total	113.5	21.1	265.5	264.7	1.7	44.2

Short-Term Facility-Wide Emissions

	PM10	PM2.5	CO	NOX	SO2
Activity	lb/day	lb/day	lb/hr	lb/hr	lb/hr
Process	330.0	75.9	32.2	70.9	0.4
Fugitive and Construction	544.2	80.5	54.2	47.5	0.1
Total	874.2	156.4	86.3	118.5	0.5

Facility-Wide Emissions - HAP, GHG, & Other Regulated Pollutants

	HAP	GHG
Activity	ton/yr	ton/yr
Process	0.46	42,129
Fugitive Dust	0.44	N/A
Mobile Tailpipes	0.54	34,753
Total	1.44	76,882

Process Source Emissions

SOURCE DESCRIPTION		OPERATING LIMITS								EMISSION FACTORS										EMISSION CONTROLS	
Model ID	Source Description	unit/hr	unit/day	Design Throughput unit/yr	units	Material	Operating hr/day	Schedule hr/yr	hp Other	PM	PM10	PM2.5	CO	NOX	SO2	VOC	unit	reference	control system	eff.	
GEN1	Cummins Diesel Generator #1 (324 hp, DSGAA-1344859, mfg: 2013)	8.87	213	77,701	gallon	diesel	24	8,760	324 hp	0.11	0.11	0.11	1.03	2.70	0.17	1.12	g/hp-hr	100DSGAA Exhaust Specs. (eds-1083b & EPA-1117g) & AP-42, Table 3.3-1 (VOC)	none	0%	
GEN2	Cummins Diesel Generator #2 (324 hp, DSGAA-1344859, mfg: 2013)	8.87	213	77,701	gallon	diesel	24	8,760	324 hp	0.11	0.11	0.11	1.03	2.70	0.17	1.12	g/hp-hr	100DSGAA Exhaust Specs. (eds-1083b & EPA-1117g) & AP-42, Table 3.3-1 (VOC)	none	0%	
GAS	5,000 Gallon Gasoline Storage Tank			240,000	gallon	gasoline	24	8,760								1,642.03	lb/yr	EPA Tanks 4.0.9d	none	0%	
GEN3	CAT 3500 Series Emergency Generator (3,634 hp CAT 3516C, mfg: 2018 or later)	175.3	4,207	17,530	gallon	diesel	24	100	3,634 hp	0.05	0.05	0.05	0.76	6.38	0.005	0.14	g/hp-hr	Manufacturer Specifications; SO2 - mass balance (15ppm ULSD)	none	0%	
GEN4	Decline Diesel Generator #2 (3,627 hp, CAT, mfg: Post 2014)	172.9	4,150	1,514,604	gallon	diesel	24	8,760	3,627 hp	0.03	0.03	0.03	0.21	0.67	0.006	0.19	g/kW-hr	NOX, PM, VOC - 40 CFR 1039.101, Table 1, Tier 4 Final; CO - Engine Test Data; SO2 - mass balance lb/gal diesel (15ppm ULSD)	none	0%	
GEN5	Decline Diesel Generator #3 (3,627 hp, CAT, mfg: Post 2014)	172.9	4,150	1,514,604	gallon	diesel	24	8,760	3,627 hp	0.03	0.03	0.03	0.21	0.67	0.006	0.19	g/kW-hr	NOX, PM, VOC - 40 CFR 1039.101, Table 1, Tier 4 Final; CO - Engine Test Data; SO2 - mass balance (15ppm ULSD)	none	0%	
BIN1_L	Feed Bin 1 Loading	350	8,400	1,450,000	ton	aggregate	24	8,760		0.0069	0.0033	0.0005					lb/ton	AP-42, Table 11.12-2, aggregate transfer, unctrl; PM2.5=PM10*0.053/0.35	none	0%	
BIN1_U	Feed Bin 1 discharge to Feed Conveyor	350	8,400	1,450,000	ton	aggregate	24	8,760		0.0069	0.0033	0.0005					lb/ton	AP-42, Table 11.12-2, aggregate transfer, unctrl; PM2.5=PM10*0.053/0.35	enclosure	50%	
BIN2_L	Feed Bin 2 Loading	350	8,400	1,450,000	ton	aggregate	24	8,760		0.0069	0.0033	0.0005					lb/ton	AP-42, Table 11.12-2, aggregate transfer, unctrl; PM2.5=PM10*0.053/0.35	none	0%	
BIN2_U	Feed Bin 2 discharge to Feed Conveyor	350	8,400	1,450,000	ton	aggregate	24	8,760		0.0069	0.0033	0.0005					lb/ton	AP-42, Table 11.12-2, aggregate transfer, unctrl; PM2.5=PM10*0.053/0.35	enclosure	50%	
CON_MIX	Feed Conveyor transfer to Mixing Screw 1 or 2	350	8,400	1,510,000	ton	aggregate	24	8,760		0.0069	0.0033	0.0005					lb/ton	AP-42, Table 11.12-2, aggregate transfer, unctrl; PM2.5=PM10*0.053/0.35	enclosure	50%	
CEM_SILO	Cement Silo loading	100	2,400	876,000	ton	cement	24	8,760		0.00099	0.00034	0.0001					lb/ton	AP-42, Table 11.12-2, silo loading, ctrl; PM2.5=PM10*0.053/0.35	vent filter		
SLO_MIX	Cement Silo discharge to Mixing Screw 1 or 2	100	2,400	876,000	ton	cement	24	8,760		0.0048	0.0028	0.0004					lb/ton	AP-42, Table 11.12-2, hopper loading, unctrl; PM2.5=PM10*0.053/0.35	enclosure	50%	
FA_SILO	Fly Ash Silo loading	50	1,200	46,000	ton	fly ash	24	8,760		0.0089	0.0049	0.0007					lb/ton	AP-42, Table 11.12-2: Cement Supplement Unloading to Elevated Storage Silo (controlled); PM2.5=PM10*0.053/0.35	vent filter		
FA_UNLD	Fly Ash Silo discharge	50	1,200	46,000	ton	fly ash	24	8,760		0.0048	0.0028	0.0004					lb/ton	AP-42, Table 11.12-2, hopper loading, unctrl; PM2.5=PM10*0.053/0.35	enclosure	50%	
GEN6	Portal Generator (2,700 kW, Tier 4)	181.04	4,345	181,035	gal	diesel	24	1,000	3,621 hp	0.03	0.03	0.03	3.5	0.67	0.0063	0.19	g/kW-hr	40CFR 1039.101 Table 1	none	0%	
GEN7	UG Support Emergency Generator (3516c, 2014 or later)	172.9	4,150	17,290	gallon	diesel	24	100	3,627 hp	0.0300	0.0300	0.0300	0.21	0.67	0.0063	0.19	g/kW-hr	NOX, PM, VOC - 40 CFR 1039.101, Table 1, Tier 4 Final; CO - Engine Test Data; SO2 - mass balance lb/gal diesel (15ppm ULSD)	none	0%	
UG_CSILO	UG Support Cement Silo Loading (sealed unloading)	50	1,200	92,000	ton	cement	24	8,760		0.00099	0.00034	0.0001					lb/ton	AP-42, Table 11.12-2, silo loading, ctrl; PM2.5=PM10*0.053/0.35	vent filter		
UG_FSILO	UG Support Fly Ash Silo Loading (sealed unloading)	50	1,200	46,000	ton	fly ash	24	8,760		0.0089	0.0049	0.0007					lb/ton	AP-42, Table 11.12-2: Cement Supplement Unloading to Elevated Storage Silo (controlled); PM2.5=PM10*0.053/0.35	vent filter		
HOP_L	Hopper Loading	250	6,000	2,190,000	ton	aggregate	24	8,760		0.0069	0.0033	0.0005					lb/ton	AP-42, Table 11.12-2, aggregate transfer, unctrl; PM2.5=PM10*0.053/0.35	none	0%	
HOP_U	Hopper transfer to Discharge Conveyor	250	6,000	2,190,000	ton	aggregate	24	8760		0.0069	0.0033	0.0005					lb/ton	AP-42, Table 11.12-2, aggregate transfer, unctrl; PM2.5=PM10*0.053/0.35	enclosure	50%	

SOURCE DESCRIPTION		HOURLY EMISSIONS							DAILY EMISSIONS							ANNUAL EMISSIONS						
Model ID	Source Description	PM lb/hr	PM10 lb/hr	PM2.5 lb/hr	CO lb/hr	NOX lb/hr	SO2 lb/hr	VOC lb/hr	PM lb/day	PM10 lb/day	PM2.5 lb/day	CO lb/day	NOX lb/day	SO2 lb/day	VOC lb/day	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr
GEN1	Cummins Diesel Generator #1 (324 hp, DSGAA-1344859, mfg: 2013)	0.079	0.079	0.079	0.736	1.929	0.121	0.800	1.886	1.886	1.886	17.657	46.287	2.914	19.207	0.344	0.344	0.344	3.222	8.447	0.532	3.50
GEN2	Cummins Diesel Generator #2 (324 hp, DSGAA-1344859, mfg: 2013)	0.079	0.079	0.079	0.736	1.929	0.121	0.800	1.886	1.886	1.886	17.657	46.287	2.914	19.207	0.344	0.344	0.344	3.222	8.447	0.532	3.50
GAS	5,000 Gallon Gasoline Storage Tank							0.187														0.821
GEN3	CAT 3500 Series Emergency Generator (3,634 hp CAT 3516C, mfg: 2018 or later)	0.401	0.401	0.401	6.089	51.114	0.038	1.122	9.614	9.614	9.614	146.132	1226.737	0.907	26.919	0.020	0.020	0.020	0.304	2.556	0.002	0.056
GEN4	Decline Diesel Generator #2 (3,627 hp, CAT, mfg: Post 2014)	0.179	0.179	0.179	1.252	3.995	0.038	1.133	4.293	4.293	4.293	30.053	95.883	0.906	27.191	0.784	0.784	0.784	5.49	17.499	0.165	4.962
GEN5	Decline Diesel Generator #3 (3,627 hp, CAT, mfg: Post 2014)	0.179	0.179	0.179	1.252	3.995	0.038	1.133	4.293	4.293	4.293	30.053	95.883	0.906	27.191	0.784	0.784	0.784	5.49	17.499	0.165	4.962
BIN1_L	Feed Bin 1 Loading	2.42	1.155	0.1749					57.960	27.720	4.198					5.003	2.3925	0.3623				
BIN1_U	Feed Bin 1 discharge to Feed Conveyor	1.21	0.58	0.087					28.980	13.860	2.099					2.501	1.196	0.1811				
BIN2_L	Feed Bin 2 Loading	2.42	1.16	0.175					57.960	27.720	4.198					5.003	2.393	0.3623				
BIN2_U	Feed Bin 2 discharge to Feed Conveyor	1.21	0.58	0.087					28.980	13.860	2.099					2.501	1.196	0.1811				
CON_MIX	Feed Conveyor transfer to Mixing Screw 1 or 2	1.21	0.58	0.087					28.980	13.860	2.099					2.605	1.246	0.1886				
CEM_SILO	Cement Silo loading	0.10	0.03	0.005					2.376	0.816	0.124					0.434	0.149	0.0226				
SLO_MIX	Cement Silo discharge to Mixing Screw 1 or 2	0.24	0.14	0.021					5.760	3.360	0.509					1.051	0.613	0.0929				
FA_SILO	Fly Ash Silo loading	0.45	0.25	0.037					10.680	5.880	0.890					0.205	0.113	0.0171				
FA_UNLD	Fly Ash Silo discharge	0.12	0.07	0.011					2.880	1.680	0.254					0.055	0.032	0.0049				
GEN6	Portal Generator (2,700 kW, Tier 4)	0.179	0.179	0.179	20.834	3.988	0.038	1.131	4.286	4.286	4.286	500.009	95.716	0.904	27.143	0.089	0.089	0.089	10.417	1.994	0.019	0.565
GEN7	UG Support Emergency Generator (3516c, 2014 or later)	0.179	0.179	0.179	1.252	3.995	0.038	1.133	4.293	4.293	4.293	30.053	95.883	0.906	27.191	0.009	0.009	0.009	0.063	0.200	0.002	0.057
UG_CSILLO	UG Support Cement Silo Loading (sealed unloading)	0.050	0.017	0.003					1.188	0.408	0.062					0.046	0.016	0.002				
UG_FSILO	UG Support Fly Ash Silo Loading (sealed unloading)	0.445	0.245	0.037					10.680	5.880	0.890					0.205	0.113	0.017				
HOP_L	Hopper Loading	1.725	0.825	0.125					41.400	19.800	2.998					7.556	3.614	0.547				
HOP_U	Hopper transfer to Discharge Conveyor	0.863	0.413	0.062					20.700	9.900	1.499					3.778	1.807	0.274				

SOURCE DESCRIPTION		NAD 83 LOCATION			RELEASE PARAMETERS INPUT							MODEL EMISSION RATES / RELEASE PARAMETERS													
Model ID	Source Description	UTM E m	UTM N m	elev m	POINT VOLUME	rel ht (ft) rel ht (ft)	temp (F) width (ft)	flow (dscfm) vert. ln (ft)	flow (acfm) grnd ht (ft)	dia (ft) oz type	PM ₁₀₋₂₄ gps	PM _{2.5-24} gps	CO-ALL gps	NO _x -1 gps	SO ₂ -1 gps	SO ₂ -ST gps	PM _{2.5} -AN gps	NO _x -AN gps	SO ₂ -AN gps	ht (m) ht (m)	temp (K) oy (m)	vel (m/s) oz (m)	dia (m) ISR	NO ₂ /NO _x	
GEN1	Cummins Diesel Generator #1 (324 hp, DSGAA-1344859, mfg: 2013)	544,422	4,439,647	1,819	POINT	7.9	807	1,106	1,106	0.33	0.0099	0.0099	0.0927	0.2430	0.0153	0.0153	0.0099	0.2430	0.0153	2.408	703.71	65.6903	0.1006	0.2	
GEN2	Cummins Diesel Generator #2 (324 hp, DSGAA-1344859, mfg: 2013)	542,708	4,440,548	1,860	POINT	7.9	807	1,106	1,106	0.33	0.0099	0.0099	0.0927	0.2430	0.0153	0.0153	0.0099	0.2430	0.0153	2.408	703.71	65.6903	0.1006	0.2	
GAS	5,000 Gallon Gasoline Storage Tank	544,437	4,439,610	1,818	POINT																				
GEN3	CAT 3500 Series Emergency Generator (3,634 hp CAT 3516C, mfg: 2018 or later)	535,154	4,443,085	2,002	POINT	13	915	19,579	19,579	0.67	0.0505	0.0505	0.7672	0.0735	0.0001	0.0048	0.0006	0.0735	0.0001	3.962	763.71	282.108	0.2042	0.2	
GEN4	Decline Diesel Generator #2 (3,627 hp, CAT, mfg: Post 2014)	535,159	4,443,083	2,003	POINT	15	910	15,096	15,096	1.30	0.0225	0.0225	0.1578	0.5034	0.0048	0.0048	0.0225	0.5034	0.0048	4.572	760.93	57.7762	0.3962	0.2	
GEN5	Decline Diesel Generator #3 (3,627 hp, CAT, mfg: Post 2014)	535,164	4,443,081	2,003	POINT	15	910	15,096	15,096	1.30	0.0225	0.0225	0.1578	0.5034	0.0048	0.0048	0.0225	0.5034	0.0048	4.572	760.93	57.7762	0.3962	0.2	
BIN1_L	Feed Bin 1 Loading	535,143	4,443,025	1,992	VOLUME	17	6	4	19	elev src w/o bldg	0.1455	0.0220					0.0104			5.182	0.43	0.2835			
BIN1_U	Feed Bin 1 discharge to Feed Conveyor	535,143	4,443,025	1,992	VOLUME	5.5	3	3	7	elev src w/o bldg	0.0728	0.0110					0.0052			1.676	0.21	0.2127			
BIN2_L	Feed Bin 2 Loading	535,146	4,443,024	1,991	VOLUME	17	6	4	19	elev src w/o bldg	0.1455	0.0220					0.0104			5.182	0.43	0.2835			
BIN2_U	Feed Bin 2 discharge to Feed Conveyor	535,146	4,443,024	1,991	VOLUME	5.5	3	3	7	elev src w/o bldg	0.0728	0.0110					0.0052			1.676	0.21	0.2127			
CON_MIX	Feed Conveyor transfer to Mixing Screw 1 or 2	535,140	4,443,017	1,989	VOLUME	10	3	10	15	elev src w/o bldg	0.0728	0.0110					0.0054			3.048	0.21	0.7088			
CEM_SILO	Cement Silo loading	535,139	4,443,016	1,989	POINTHOR	57	ambient	1,600	1,600	1.00	0.0043	0.0006					0.0006			17.374	0.00	10.3489	0.3048		
SLO_MIX	Cement Silo discharge to Mixing Screw 1 or 2	535,139	4,443,016	1,989	VOLUME	6	1	8	10	elev src w/o bldg	0.0176	0.0027					0.0027			1.829	0.07	0.5671			
FA_SILO	Fly Ash Silo loading	535,143	4,443,072	2,002	POINTHOR	55	ambient	1,600	1,600	1.00	0.0309	0.0047					0.0005			16.764	0.00	10.3489	0.3048		
FA_UNLD	Fly Ash Silo discharge	535,143	4,443,072	2,002	VOLUME	6	1	8	10	elev src w/o bldg	0.0088	0.0013					0.0001			1.829	0.07	0.5671			
GEN6	Portal Generator (2,700 kW, Tier 4)	535,296	4,442,962	2,014	POINT	15	910	15,096	15,096	1.30	0.0225	0.0225	2.6250	0.5025	0.0047	0.0047	0.0026	0.0574	0.0005	4.572	760.93	57.7762	0.3962	0.2	
GEN7	UG Support Emergency Generator (3516c, 2014 or later)	535,164	4,443,081	2,003	POINT	15	910	15,096	15,096	1.30	0.0225	0.0225	0.1578	0.0057	0.0001	0.0048	0.0003	0.0057	0.0001	4.572	760.93	57.7762	0.3962	0.2	
UG_CSILO	UG Support Cement Silo Loading (sealed unloading)	539,165	4,444,236	2,105	POINT	70	ambient	1,600	1,600	1.00	0.0021	0.0003					0.0001			21.336	0.00	10.3489	0.3048		
UG_FSILO	UG Support Fly Ash Silo Loading (sealed unloading)	539,171	4,444,225	2,104	POINT	70	ambient	1,600	1,600	1.00	0.0309	0.0047					0.0005			21.336	0.00	10.3489	0.3048		
HOP_L	Hopper Loading	534,926	4,443,035	1,965	VOLUME	10	4	4	12	srf src	0.1039	0.0157					0.0157			3.048	0.28	0.5671			
HOP_U	Hopper transfer to Discharge Conveyor	534,926	4,443,035	1,965	VOLUME	6	4	4	8	srf src	0.0520	0.0079					0.0079			1.829	0.28	0.5671			

SOURCE DESCRIPTION		OPERATING LIMITS								EMISSION FACTORS										EMISSION CONTROLS	
Model ID	Source Description	unit/hr	unit/day	Design Throughput unit/yr	units	Material	Operating hr/day	Schedule hr/yr	hp Other	PM	PM10	PM2.5	CO	NOX	SO2	VOC	unit	reference	control system	eff.	
AGG_C	Discharge Conveyor transfer to Feed Conveyor	250	6,000	2,190,000	ton	aggregate	24	8760		0.0069	0.0033	0.0005					lb/ton	AP-42, Table 11.12-2, aggregate transfer, unctrl; PM2.5=PM10*0.053/0.35	enclosure	50%	
MIX	CRF Batch Mixer Loading	270	6,000	2,365,200	ton	aggregate	24	8760		0.0184	0.0055	0.0008					lb/ton	AP-42, Table 11.12-2, aggregate transfer, unctrl; PM2.5=PM10*0.053/0.35	enclosure/ sprays		
CRFCEM1	CRF Cement Silo 1 loading	50	1,200	175,200	ton	cement	24	8,760		0.00099	0.00034	0.0001					lb/ton	AP-42, Table 11.12-2, silo loading, ctrl; PM2.5=PM10*0.053/0.35	vent filter		
CRFCEM2	CRF Cement Silo 2 loading	50	1,200	175,200	ton	cement	24	8,760		0.00099	0.00034	0.0001					lb/ton	AP-42, Table 11.12-2, silo loading, ctrl; PM2.5=PM10*0.053/0.35	vent filter		
CRFCEM3	CRF Cement Silo 3 loading	50	1,200	175,200	ton	cement	24	8,760		0.00099	0.00034	0.0001					lb/ton	AP-42, Table 11.12-2, silo loading, ctrl; PM2.5=PM10*0.053/0.35	vent filter		
WHOP_L	Cement Screw to Weigh Hopper	20	480	175,200	ton	cement	24	8,760		0.0048	0.0028	0.0004					lb/ton	AP-42, Table 11.12-2, hopper loading, unctrl; PM2.5=PM10*0.053/0.35	enclosure	50%	
STACK	Ore Stacker to Stockpile	240	5,753	2,100,000	ton	ore	24	8,760		0.003	0.0011	0.0002					lb/ton	AP-42, Table 11.19.2-2, conveyor transfer, unctrl	none	0%	
FD2	Stockpile to Apron Feeders	240	5,753	2,100,000	ton	ore	24	8,760		0.003	0.0011	0.0002					lb/ton	AP-42, Table 11.19.2-2, conveyor transfer, unctrl	enclosure	50%	
FD2_CV3	Apron Feeders to Ore Conveyor 3	240	5,753	2,100,000	ton	ore	24	8,760		0.003	0.0011	0.0002					lb/ton	AP-42, Table 11.19.2-2, conveyor transfer, unctrl	enclosure	50%	
CV3_BN	Ore Conveyor 3 to Loadout Bin	240	5,753	2,100,000	ton	ore	24	8,760		0.003	0.0011	0.0002					lb/ton	AP-42, Table 11.19.2-2, conveyor transfer, unctrl	enclosure	50%	
BN_FD3	Loadout Bin to Apron Feeder	240	5,753	2,100,000	ton	ore	24	8,760		0.003	0.0011	0.0002					lb/ton	AP-42, Table 11.19.2-2, conveyor transfer, unctrl	enclosure	50%	
FD3_TR	Apron Feeder to OTR Truck	240	5,753	2,100,000	ton	ore	24	8,760		0.003	0.0011	0.0002					lb/ton	AP-42, Table 11.19.2-2, conveyor transfer, unctrl	none	0%	
PF1151	Loader Transfer to Feeder via Dump Hopper (with Grizzly)	600	14,400	2,200,000	ton	aggregate	24	8,760		0.003	0.0011	0.0002					lb/ton	AP-42 Table 11.19.2-2 (8/04), Conveyor transfer (uncontrolled), PM2.5=PM10*(0.053/0.35), 5/31/2017 BAPC	none	0%	
PF1152	Primary Jaw Crusher with Rock Breaker and associated transfers in (Loader) & out (Conveyor CV-1)	600	14,400	2,200,000	ton	aggregate	24	8,760		0.0054	0.0024	0.0004					lb/ton	AP-42 Table 11.19.2-2 (8/04), Tertiary Crushing (uncontrolled), PM2.5=PM10*(0.053/0.35), 5/31/2017 BAPC	water sprays	85%	
PF1153	Double Deck Screen and associated transfers in (CV-2) and out (Conveyor CV-3, CV-6, & CV-8)	600	14,400	2,200,000	ton	aggregate	24	8,760		0.003	0.0011	0.0002					lb/ton	AP-42 Table 11.19.2-2 (8/04), Conveyor transfer (uncontrolled), PM2.5=PM10*(0.053/0.35), 5/31/2017 BAPC	water sprays	85%	
PF1154	Secondary Cone Crusher and associated transfers in (CV-8) and out (CV-9, Oversize Chute)	600	14,400	2,200,000	ton	aggregate	24	8,760		0.003	0.0011	0.0002					lb/ton	AP-42 Table 11.19.2-2 (8/04), Conveyor transfer (uncontrolled), PM2.5=PM10*(0.053/0.35), 5/31/2017 BAPC	water sprays	85%	
PF1155	Conveyor CV-1 transfer to Conveyor CV-2	600	14,400	2,200,000	ton	aggregate	24	8,760		0.025	0.0087	0.0013					lb/ton	AP-42 Table 11.19.2-2 (8/04), Screening (uncontrolled), PM2.5=PM10*(0.053/0.35), 5/31/2017 BAPC	water sprays	85%	
PF1156	Conveyor CV-2 to Aggregate Stockpile	600	14,400	2,200,000	ton	aggregate	24	8,760		0.003	0.0011	0.0002					lb/ton	AP-42 Table 11.19.2-2 (8/04), Conveyor transfer (uncontrolled), PM2.5=PM10*(0.053/0.35), 5/31/2017 BAPC	water sprays	85%	
PF1157	Conveyor CV-3 transfer to Conveyor CV-4	600	14,400	2,200,000	ton	aggregate	24	8,760		0.003	0.0011	0.0002					lb/ton	AP-42 Table 11.19.2-2 (8/04), Conveyor transfer (uncontrolled), PM2.5=PM10*(0.053/0.35), 5/31/2017 BAPC	water sprays	85%	
PF1158	Conveyor CV-4 transfer to Conveyor CV-5	600	14,400	2,200,000	ton	aggregate	24	8,760		0.003	0.0011	0.0002					lb/ton	AP-42 Table 11.19.2-2 (8/04), Conveyor transfer (uncontrolled), PM2.5=PM10*(0.053/0.35), 5/31/2017 BAPC	water sprays	85%	
PF1159	Conveyor CV-5 to Backfill Stockpile	600	14,400	2,200,000	ton	aggregate	24	8,760		0.003	0.0011	0.0002					lb/ton	AP-42 Table 11.19.2-2 (8/04), Conveyor transfer (uncontrolled), PM2.5=PM10*(0.053/0.35), 5/31/2017 BAPC	water sprays	85%	
PF1160	Conveyor CV-6 transfer to Conveyor CV-07	600	14,400	2,200,000	ton	aggregate	24	8,760		0.003	0.0011	0.0002					lb/ton	AP-42 Table 11.19.2-2 (8/04), Conveyor transfer (uncontrolled), PM2.5=PM10*(0.053/0.35), 5/31/2017 BAPC	water sprays	85%	

SOURCE DESCRIPTION		HOURLY EMISSIONS							DAILY EMISSIONS							ANNUAL EMISSIONS						
Model ID	Source Description	PM lb/hr	PM10 lb/hr	PM2.5 lb/hr	CO lb/hr	NOX lb/hr	SO2 lb/hr	VOC lb/hr	PM lb/day	PM10 lb/day	PM2.5 lb/day	CO lb/day	NOX lb/day	SO2 lb/day	VOC lb/day	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr
AGG_C	Discharge Conveyor transfer to Feed Conveyor	0.863	0.413	0.062					20.700	9.900	1.499					3.778	1.807	0.274				
MIX	CRF Batch Mixer Loading	4.968	1.485	0.225					110.400	33.000	4.997					21.760	6.504	0.985				
CRFCEM1	CRF Cement Silo 1 loading	0.05	0.02	0.003					1.188	0.408	0.062					0.087	0.030	0.0045				
CRFCEM2	CRF Cement Silo 2 loading	0.05	0.02	0.003					1.188	0.408	0.062					0.087	0.030	0.0045				
CRFCEM3	CRF Cement Silo 3 loading	0.05	0.02	0.003					1.188	0.408	0.062					0.087	0.030	0.0045				
WHOP_L	Cement Screw to Weigh Hopper	0.05	0.03	0.004					1.152	0.672	0.102					0.210	0.123	0.0186				
STACK	Ore Stacker to Stockpile	0.719	0.264	0.040					17.260	6.329	0.958					3.150	1.155	0.175				
FD2	Stockpile to Apron Feeders	0.360	0.132	0.020					8.630	3.164	0.479					1.575	0.578	0.087				
FD2_CV3	Apron Feeders to Ore Conveyor 3	0.360	0.132	0.020					8.630	3.164	0.479					1.575	0.578	0.087				
CV3_BN	Ore Conveyor 3 to Loadout Bin	0.360	0.132	0.020					8.630	3.164	0.479					1.575	0.578	0.087				
BN_FD3	Loadout Bin to Apron Feeder	0.360	0.132	0.020					8.630	3.164	0.479					1.575	0.578	0.087				
FD3_TR	Apron Feeder to OTR Truck	0.719	0.264	0.040					17.260	6.329	0.958					3.150	1.155	0.175				
PF1151	Loader Transfer to Feeder via Dump Hopper (with Grizzly)	1.800	0.660	0.100					43.200	15.840	2.399					3.300	1.210	0.183				
PF1152	Primary Jaw Crusher with Rock Breaker and associated transfers in (Loader) & out (Conveyor CV-1)	0.486	0.216	0.033					11.664	5.184	0.785					0.891	0.396	0.060				
PF1153	Double Deck Screen and associated transfers in (CV-2) and out (Conveyor CV-3, CV-6, & CV-8)	0.270	0.099	0.015					6.480	2.376	0.360					0.495	0.182	0.027				
PF1154	Secondary Cone Crusher and associated transfers in (CV-8) and out (CV-9, Oversize Chute)	0.270	0.099	0.015					6.480	2.376	0.360					0.495	0.182	0.027				
PF1155	Conveyor CV-1 transfer to Conveyor CV-2	2.250	0.783	0.119					54.000	18.792	2.846					4.125	1.436	0.217				
PF1156	Conveyor CV-2 to Aggregate Stockpile	0.270	0.099	0.015					6.480	2.376	0.360					0.495	0.182	0.027				
PF1157	Conveyor CV-3 transfer to Conveyor CV-4	0.270	0.099	0.015					6.480	2.376	0.360					0.495	0.182	0.027				
PF1158	Conveyor CV-4 transfer to Conveyor CV-5	0.270	0.099	0.015					6.480	2.376	0.360					0.495	0.182	0.027				
PF1159	Conveyor CV-5 to Backfill Stockpile	0.270	0.099	0.015					6.480	2.376	0.360					0.495	0.182	0.027				
PF1160	Conveyor CV-6 transfer to Conveyor CV-07	0.270	0.099	0.015					6.480	2.376	0.360					0.495	0.182	0.027				

SOURCE DESCRIPTION		NAD 83 LOCATION			RELEASE PARAMETERS INPUT							MODEL EMISSION RATES / RELEASE PARAMETERS												
Model ID	Source Description	UTM E m	UTM N m	elev m	POINT VOLUME	rel ht (ft) rel ht (ft)	temp (F) width (ft)	flow (dscfm) vert. ln (ft)	flow (acfm) grnd ht (ft)	dia (ft) oz type	PM ₁₀₋₂₄ gps	PM _{2.5-24} gps	CO-ALL gps	NO _x -1 gps	SO ₂ -1 gps	SO ₂ -ST gps	PM _{2.5} -AN gps	NO _x -AN gps	SO ₂ -AN gps	ht (m) ht (m)	temp (K) oy (m)	vel (m/s) oz (m)	dia (m) ISR	NO ₂ /NO _x
AGG_C	Discharge Conveyor transfer to Feed Conveyor	534,926	4,443,035	1,965	VOLUME	6	4	4	8	srf src	0.0520	0.0079					0.0079			1.829	0.28	0.5671		
MIX	CRF Batch Mixer Loading	534,926	4,443,035	1,965	VOLUME	6	4	4	8	srf src	0.1732	0.0262					0.0283			1.829	0.28	0.5671		
CRFCEM1	CRF Cement Silo 1 loading	534,916	4,443,066	1,965	POINTHOR	55	ambient	1,600	1,600	1.00	0.0021	0.0003					0.0001			16.764	0.00	10.3489	0.3048	
CRFCEM2	CRF Cement Silo 2 loading	534,906	4,443,058	1,965	POINTHOR	55	ambient	1,600	1,600	1.00	0.0021	0.0003					0.0001			16.764	0.00	10.3489	0.3048	
CRFCEM3	CRF Cement Silo 3 loading	534,896	4,443,048	1,965	POINTHOR	55	ambient	1,600	1,600	1.00	0.0021	0.0003					0.0001			16.764	0.00	10.3489	0.3048	
WHOP_L	Cement Screw to Weigh Hopper	534,926	4,443,035	1,965	VOLUME	6	1	8	10	elev src w/o bldg	0.0035	0.0005					0.0005			1.829	0.07	0.5671		
STACK	Ore Stacker to Stockpile	532,544	4,445,825	1,777.0	VOLUME	20	4	10	25	srf src	0.0332	0.0050					0.0050			6.096	0.28	1.4177		
FD2	Stockpile to Apron Feeders	532,544	4,445,825	1,777.0	VOLUME	1.50	4	1	2	srf src	0.0166	0.0025					0.0025			0.457	0.28	0.1418		
FD2_CV3	Apron Feeders to Ore Conveyor 3	532,544	4,445,825	1,777.0	VOLUME	1.50	4	1	2	srf src	0.0166	0.0025					0.0025			0.457	0.28	0.1418		
CV3_BN	Ore Conveyor 3 to Loadout Bin	532,504	4,445,932	1,772.1	VOLUME	38	4	4	40	elev src w/o bldg	0.0166	0.0025					0.0025			11.582	0.28	0.2835		
BN_FD3	Loadout Bin to Apron Feeder	532,504	4,445,932	1,772.1	VOLUME	15	2	2	16	srf src	0.0166	0.0025					0.0025			4.572	0.14	0.2835		
FD3_TR	Apron Feeder to OTR Truck	532,504	4,445,932	1,772.1	VOLUME	12	2	4	14	srf src	0.0332	0.0050					0.0050			3.658	0.14	0.5671		
PF1151	Loader Transfer to Feeder via Dump Hopper (with Grizzly)	531,620	4,447,282	1,812	VOLUME	10	10	4	12	srf src	0.0832	0.0126					0.0053			3.048	0.71	0.5671		
PF1152	Primary Jaw Crusher with Rock Breaker and associated transfers in (Loader) & out (Conveyor CV-1)	531,616	4,447,286	1,811	VOLUME	25	4	4	27	srf src	0.0272	0.0041					0.0017			7.620	0.28	0.5671		
PF1153	Double Deck Screen and associated transfers in (CV-2) and out (Conveyor CV-3, CV-6, & CV-8)	531,609	4,447,290	1,811	VOLUME	25	4	4	27	srf src	0.0125	0.0019					0.0008			7.620	0.28	0.5671		
PF1154	Secondary Cone Crusher and associated transfers in (CV-8) and out (CV-9, Oversize Chute)	531,598	4,447,280	1,811	VOLUME	25	4	4	27	srf src	0.0125	0.0019					0.0008			7.620	0.28	0.5671		
PF1155	Conveyor CV-1 transfer to Conveyor CV-2	531,580	4,447,307	1,810	VOLUME	6	4	4	8	srf src	0.0987	0.0149					0.0063			1.829	0.28	0.5671		
PF1156	Conveyor CV-2 to Aggregate Stockpile	531,595	4,447,320	1,810	VOLUME	40	4	20	50	elev src w/o bldg	0.0125	0.0019					0.0008			12.192	0.28	1.4177		
PF1157	Conveyor CV-3 transfer to Conveyor CV-4	531,607	4,447,329	1,811	VOLUME	6	4	4	8	srf src	0.0125	0.0019					0.0008			1.829	0.28	0.5671		
PF1158	Conveyor CV-4 transfer to Conveyor CV-5	531,620	4,447,338	1,811	VOLUME	6	4	4	8	srf src	0.0125	0.0019					0.0008			1.829	0.28	0.5671		
PF1159	Conveyor CV-5 to Backfill Stockpile	531,562	4,447,316	1,813	VOLUME	40	4	20	50	elev src w/o bldg	0.0125	0.0019					0.0008			12.192	0.28	1.4177		
PF1160	Conveyor CV-6 transfer to Conveyor CV-07	531,549	4,447,323	1,815	VOLUME	6	4	4	8	srf src	0.0125	0.0019					0.0008			1.829	0.28	0.5671		

SOURCE DESCRIPTION		OPERATING LIMITS							EMISSION FACTORS										EMISSION CONTROLS	
Model ID	Source Description	unit/hr	unit/day	Design Throughput unit/yr	units	Material	Operating hr/day	Schedule hr/yr	hp Other	PM	PM10	PM2.5	CO	NOX	SO2	VOC	unit	reference	control system	eff.
PF1161	Conveyor CV-9 transfer to CV-10	600	14,400	2,200,000	ton	aggregate	24	8,760		0.003	0.0011	0.0002					lb/ ton	AP-42 Table 11.19.2-2 (8/04), Conveyor transfer (uncontrolled), PM2.5=PM10*(0.053/0.35), 5/31/2017 BAPC	water sprays	85%
PF1162	Conveyor CV-7 transfer to Conveyor CV-10	600	14,400	2,200,000	ton	aggregate	24	8,760		0.003	0.0011	0.0002					lb/ ton	AP-42 Table 11.19.2-2 (8/04), Conveyor transfer (uncontrolled), PM2.5=PM10*(0.053/0.35), 5/31/2017 BAPC	water sprays	85%
PF1163	Conveyor CV-10 transfer to Stacker Conveyor CV-11	600	14,400	2,200,000	ton	aggregate	24	8,760		0.003	0.0011	0.0002					lb/ ton	AP-42 Table 11.19.2-2 (8/04), Conveyor transfer (uncontrolled), PM2.5=PM10*(0.053/0.35), 5/31/2017 BAPC	water sprays	85%
PF1165	Stacker Conveyor CV-11 transfer to Stacker Conveyor CV-12	600	14,400	2,200,000	ton	aggregate	24	8,760		0.0054	0.0024	0.0004					lb/ ton	AP-42 Table 11.19.2-2 (8/04), Tertiary Crushing (uncontrolled), PM2.5=PM10*(0.053/0.35), 5/31/2017 BAPC	water sprays	85%
PF1164	Stacker Conveyor CV-12 transfer to Product Stockpile	600	14,400	2,200,000	ton	aggregate	24	8,760		0.003	0.0011	0.0002					lb/ ton	AP-42 Table 11.19.2-2 (8/04), Conveyor transfer (uncontrolled), PM2.5=PM10*(0.053/0.35), 5/31/2017 BAPC	none	0%
DTANK1	Diesel Storage Tank #1						24	8,760									ton/ yr	0.0032 Tanks 4.0.9d		
DTANK2	Diesel Storage Tank #2						24	8,760									ton/ yr	0.0032 Tanks 4.0.9d		
FIBER	Polyfiber Feed System	0.01	0.2	88	ton	polyfiber	24	8,760		0.0048	0.0028	0.0006					lb/ ton	AP-42, Table 11.12-2, hopper loading, unctri; PM2.5=PM10* (0.38/1.92) Table 11.12-4 (6/06) uncontrolled central mix loading		
DTANK3	Diesel Storage Tank #3			450,000	gal	diesel	24	8,760									ton/ yr	0.0045 Tanks 4.0.9d		
DTANK4	Diesel Storage Tank #4			450,000	gal	diesel	24	8,760									ton/ yr	0.0045 Tanks 4.0.9d		
DTANK5	Diesel Storage Tank #5			450,000	gal	diesel	24	8,760									ton/ yr	0.0045 Tanks 4.0.9d		
DTANK6	Diesel Storage Tank #6			450,000	gal	diesel	24	8,760									ton/ yr	0.0045 Tanks 4.0.9d		
Total																				

SOURCE DESCRIPTION		HOURLY EMISSIONS							DAILY EMISSIONS							ANNUAL EMISSIONS						
Model ID	Source Description	PM lb/hr	PM10 lb/hr	PM2.5 lb/hr	CO lb/hr	NOX lb/hr	SO2 lb/hr	VOC lb/hr	PM lb/day	PM10 lb/day	PM2.5 lb/day	CO lb/day	NOX lb/day	SO2 lb/day	VOC lb/day	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr
PF1161	Conveyor CV-9 transfer to CV-10	0.270	0.099	0.015					6.480	2.376	0.360					0.495	0.182	0.027				
PF1162	Conveyor CV-7 transfer to Conveyor CV-10	0.270	0.099	0.015					6.480	2.376	0.360					0.495	0.182	0.027				
PF1163	Conveyor CV-10 transfer to Stacker Conveyor CV-11	0.270	0.099	0.015					6.480	2.376	0.360					0.495	0.182	0.027				
PF1165	Stacker Conveyor CV-11 transfer to Stacker Conveyor CV-12	0.486	0.216	0.033					11.664	5.184	0.785					0.891	0.396	0.060				
PF1164	Stacker Conveyor CV-12 transfer to Product Stockpile	1.800	0.660	0.100					43.200	15.840	2.399					3.300	1.210	0.183				
DTANK1	Diesel Storage Tank #1							0.001							0.017							0.0032
DTANK2	Diesel Storage Tank #2							0.001							0.017							0.0032
FIBER	Polyfiber Feed System	4.80E-05	2.80E-05	5.54E-06					1.15E-03	6.72E-04	1.33E-04					2.10E-04	1.23E-04	2.43E-05				
DTANK3	Diesel Storage Tank #3							0.001							0.025							0.0045
DTANK4	Diesel Storage Tank #4							0.001							0.025							0.0045
DTANK5	Diesel Storage Tank #5							0.001							0.025							0.0045
DTANK6	Diesel Storage Tank #6							0.001							0.025							0.0045
Total		32.1	13.9	3.2	32.2	70.9	0.4	7.4	762.5	330.0	75.9	771.6	1,702.7	10.4	174.2	89.4	36.9	7.6	28.2	56.6	1.4	18.4

SOURCE DESCRIPTION		NAD 83 LOCATION			RELEASE PARAMETERS INPUT						MODEL EMISSION RATES / RELEASE PARAMETERS													
Model ID	Source Description	UTM E m	UTM N m	elev m	POINT VOLUME	rel ht (ft) rel ht (ft)	temp (F) width (ft)	flow (dscfm) vert. ln (ft)	flow (acfm) grnd ht (ft)	dia (ft) oz type	PM ₁₀ -24 gps	PM _{2.5} -24 gps	CO-ALL gps	NO _x -1 gps	SO ₂ -1 gps	SO ₂ -ST gps	PM _{2.5} -AN gps	NO _x -AN gps	SO ₂ -AN gps	ht (m) ht (m)	temp (K) oy (m)	vel (m/s) oz (m)	dia (m) ISR	NO ₂ /NO _x
PF1161	Conveyor CV-9 transfer to CV-10	531,549	4,447,323	1,811	VOLUME	6	4	4	8	srf src	0.0125	0.0019					0.0008			1.829	0.28	0.5671		
PF1162	Conveyor CV-7 transfer to Conveyor CV-10	531,534	4,447,341	1,813	VOLUME	6	4	4	8	srf src	0.0125	0.0019					0.0008			1.829	0.28	0.5671		
PF1163	Conveyor CV-10 transfer to Stacker Conveyor CV-11	531,534	4,447,341	1,813	VOLUME	6	4	4	8	srf src	0.0125	0.0019					0.0008			1.829	0.28	0.5671		
PF1165	Stacker Conveyor CV-11 transfer to Stacker Conveyor CV-12	531,569	4,447,326	1,811	VOLUME	6	4	4	8	srf src	0.0272	0.0041					0.0017			1.829	0.28	0.5671		
PF1164	Stacker Conveyor CV-12 transfer to Product Stockpile	531,521	4,447,355	1,815	VOLUME	40	4	20	50	elev src w/o bldg	0.0832	0.0126					0.0053			12.192	0.28	1.4177		
DTANK1	Diesel Storage Tank #1	544,427	4,439,612	1,818	POINT																			
DTANK2	Diesel Storage Tank #2	544,430	4,439,611	1,818	POINT																			
FIBER	Polyfiber Feed System	535,250	4,442,975	2,003	VOLUME	5	4	2	6	srf src	3.53E-06	6.98E-07					6.98E-07			1.5240	0.28	0.2835		
DTANK3	Diesel Storage Tank #3	534,972	4,443,070	1,973																				
DTANK4	Diesel Storage Tank #4	539,111	4,444,129	2,087																				
DTANK5	Diesel Storage Tank #5	539,112	4,444,125	2,087																				
DTANK6	Diesel Storage Tank #6	539,114	4,444,122	2,087																				
Total											1.7325	0.3985	4.0509	2.075	0.0450	0.0544	0.2185	1.6294	0.0408					

Fugitive Source Emissions

Air Sciences Inc. AIR EMISSION CALCULATIONS							PROJECT TITLE:		BY:					
							Goldrush		G. Barthel					
							PROJECT NO:		PAGE:		OF:		SHEET:	
							59-70-9		1		20		Mine	
							SUBJECT:		DATE:					
							Mining Activity		September 16, 2022					
Scenario														
Option 1														
Mining Activity Emissions Summary														
By Area/Model ID		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	VOC_TPY	
Area/	Location of	PM	PM10	PM2.5	CO	NOX	SO2	VOC						
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr	
PWP	Portal Waste Pad	0.38	0.66	0.12	0.37	0.07	0.56	2.47	0.48	2.10	0.001	0.004	0.19	
PAG	Portal Lined PAG Pad	0.38	0.66	0.12	0.37	0.07	0.56	2.47	0.48	2.10	0.001	0.004	0.19	
LOP1	Portal Lined Ore Pad 1	0.73	1.28	0.23	0.71	0.13	1.09	4.78	0.93	4.06	0.002	0.009	0.37	
LOP2	Portal Lined Ore Pad 2	0.73	1.28	0.23	0.71	0.13	1.09	4.78	0.93	4.06	0.002	0.009	0.37	
ASP	Portal Aggregate Storage	1.30	2.09	0.38	1.40	0.26	2.29	10.03	1.94	8.52	0.004	0.018	0.77	
HR	Haul Roads	196.06	232.42	42.42	27.11	4.95	13.96	61.14	13.42	58.79	0.026	0.114	3.52	
Expl	Exploration	5.69	31.99	5.69	31.26	5.68	26.74	117.10	22.62	99.10	0.019	0.082	17.66	
CanWRF	Canyon WRF	0.85	2.15	0.39	1.39	0.25	3.13	13.73	2.66	11.66	0.006	0.024	1.06	
Ped	Pediment	0.16	0.26	0.05	0.17	0.03	0.28	1.23	0.24	1.05	0.001	0.002	0.10	
CHC	Cortez Hills Crusher	1.53	2.69	0.49	1.49	0.27	2.29	10.03	1.94	8.52	0.004	0.018	0.77	
OS	Ore Stockpile	1.46	2.57	0.47	1.42	0.26	2.18	9.57	1.86	8.13	0.004	0.017	0.74	
Total		209.26	278.06	50.59	66.39	12.09	54.19	237.33	47.51	208.09	0.07	0.302	25.73	
By Activity														
		PM_TPY												
		chk	chk	chk	chk	chk	chk	chk	chk	chk	chk	chk	chk	
		PM	PM10	PM2.5	CO	NOX	SO2	VOC						
Activity		ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr	
Surface Exploration Drilling		0.01	0.86	0.01	0.13	0.00								
Onsite Hauling		147.30	167.15	30.50	16.71	3.05								
Material Load / Unload		1.21	3.13	0.57	0.47	0.09								
Mobile Equipment (Tailpipes)		7.42	40.64	7.42	40.08	7.31	54.19	237.33	47.51	208.09	0.07	0.30	25.73	
Dozing		4.40	3.03	0.55	2.53	0.46								
Grading		10.48	17.93	3.27	1.78	0.32								
Water Truck Travel		37.39	42.42	7.74	4.24	0.77								
Wind Erosion		1.06	2.91	0.53	0.44	0.08								
Total		209.26	278.06	50.59	66.39	12.09	54.19	237.33	47.51	208.09	0.07	0.30	25.73	

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					Goldrush				G. Barthel			
					PROJECT NO: 59-70-9				PAGE: 2		OF: 20	SHEET: Mine
					SUBJECT: Mining Activity				DATE: September 16, 2022			
Scenario Option 1												
Mining Activity Source Parameters Summary												
description		TYPE	UTM_E	UTM_N	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M	XINIT_M	YINIT_M	PITVOL_M3	ANGL_DEG
	Location of	Source	UTM NAD 83		Elev.	Rel. Ht.	Sigma-y	Sigma-z	Len. X	Len. Y	Pit Vol.	Angle
Model ID	Activity	Type	E m	N m	m	m	m	m	m	m	m³	deg
PWVP	Portal Waste Pad	VOLUME	535,126	4,442,836	1,970	4.31	9.12	4.01	-	-	-	-
PAG	Portal Lined PAG Pad	VOLUME	535,219	4,443,036	2,006	4.31	9.02	4.01	-	-	-	-
LOP1	Portal Lined Ore Pad 1	VOLUME	535,140	4,442,865	1,975	4.31	10.22	4.01	-	-	-	-
LOP2	Portal Lined Ore Pad 2	VOLUME	535,155	4,442,898	1,980	4.31	10.13	4.01	-	-	-	-
ASP	Portal Aggregate Storage	VOLUME	534,967	4,442,977	1,968	4.31	6.60	4.01	-	-	-	-
HR	Haul Roads	VOLUME	See ROADS worksheet			4.31	9.03	4.01	-	-	-	-
Expl	Exploration	AREA	540,681	4,441,331	2,051	2.10	0	1.95	773.36	4068.08	-	-32.29
CanWRF	Canyon WRF	VOLUME	531,283	4,447,076	1,731	4.31	604.72	4.01	-	-	-	-
Ped	Pediment	VOLUME	533,295	4,445,730	1,878	4.31	66.34	4.01	-	-	-	-
CHC	Cortez Hills Crusher	VOLUME	531,649	4,447,251	1,760	4.31	1.83	4.01	-	-	-	-
OS	Ore Stockpile	VOLUME	532,544	4,445,825	1,777	4.31	36.03	4.01	-	-	-	-
			chk	chk	chk	chk6	chk	chk	chk	chk		
			PM10_PPD	PM2.5_PPD	PM2.5_TPY	CO_PPH	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY		
Source			PM10	PM2.5	PM2.5	CO	NOX	NOX	SO2	SO2	NO2/NOX	
Model ID	Type	Units	24-hr	24-hr	Annual	1-hr & 8-hr	1-hr	Annual	1-hr & 3-hr	Annual	ISR	
PWVP	VOLUME	g/s	3.48E-03	1.93E-03	1.93E-03	7.10E-02	6.03E-02	6.03E-02	1.27E-04	1.27E-04	0.11	
PAG	VOLUME	g/s	3.48E-03	1.93E-03	1.93E-03	7.10E-02	6.03E-02	6.03E-02	1.27E-04	1.27E-04	0.11	
LOP1	VOLUME	g/s	6.74E-03	3.73E-03	3.73E-03	1.38E-01	1.17E-01	1.17E-01	2.46E-04	2.46E-04	0.11	
LOP2	VOLUME	g/s	6.74E-03	3.73E-03	3.73E-03	1.38E-01	1.17E-01	1.17E-01	2.46E-04	2.46E-04	0.11	
ASP	VOLUME	g/s	1.10E-02	7.35E-03	7.35E-03	2.88E-01	2.45E-01	2.45E-01	5.15E-04	5.15E-04	0.11	
HR	VOLUME	g/s	1.22E+00	1.42E-01	1.42E-01	1.76E+00	1.69E+00	1.69E+00	3.29E-03	3.29E-03	0.11	
Expl	AREA	g/s-m2	5.34E-08	5.22E-08	5.20E-08	1.07E-06	9.06E-07	9.06E-07	7.51E-10	7.51E-10	0.11	
CanWRF	VOLUME	g/s	1.13E-02	7.28E-03	7.28E-03	3.95E-01	3.35E-01	3.35E-01	7.05E-04	7.05E-04	0.11	
Ped	VOLUME	g/s	1.35E-03	9.04E-04	9.04E-04	3.55E-02	3.02E-02	3.02E-02	6.34E-05	6.34E-05	0.11	
CHC	VOLUME	g/s	1.41E-02	7.82E-03	7.82E-03	2.88E-01	2.45E-01	2.45E-01	5.15E-04	5.15E-04	0.11	
OS	VOLUME	g/s	1.35E-02	7.47E-03	7.47E-03	2.75E-01	2.34E-01	2.34E-01	4.91E-04	4.91E-04	0.11	
Conversions												
3,28084 ft/m		8,760 hr/yr										
453.592 g/lb		24 hr/day										
2,000 lb/ton		3,600 sec/hr										

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	Mining Activity	September 16, 2022		

Scenario	Option 1
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Activity Information

	Ore_tpy	Canyon_tpy	Pediment_tpy	
	Ore	Canyon	Pediment	Total
	ton/yr	ton/yr	ton/yr	ton/yr
Ore	2,100,000			2,100,000
Waste		812,666	270,889	1,083,555

Route Number	Route Origin	Destination	Truck	Material Type	Material Rate ton/yr	Truck Loads load/yr	Rnd Trip Distance* mi	Total Travel VMT**/yr
1	Portal	Ore Pad	UG	Ore	2,100,000	30,239	0.67	20,292
2	Portal	Waste Pad	UG	Waste	1,083,555	15,603	0.64	10,026
3	Ore Pad	Ore Stockpile	Surface	Ore	2,100,000	21,084	6.30	132,930
4	Waste Pad	Canyon WRF	Surface	Waste	812,666	8,159	8.70	70,946
5	Waste Pad	Pediment Pit	Surface	Waste	270,889	2,720	6.50	17,674
6	Canyon WRF	Aggregate Plant	Surface	Backfill	2,200,000	22,088	3.84	84,874
7	Aggregate Plant	Aggregate Storage	Surface	Backfill	2,200,000	22,088	8.54	188,681
8	Aggregate Storage	CRF Plant	Surface	Backfill	2,200,000	22,088	0.10	2,209
9	CRF Plant	Portal	UG	CRF	2,365,200	34,058	0.33	11,368
Total Unpaved Hauling Distance								538,999

** VMT - Vehicle miles traveled

Truck	Description	Payload ton	Empty Wt ton	Height m	Travel VMT/yr	Avg Wt ton
Surface	Caterpillar 777G	99.6	81.9	5.2	497,313	131.7
UG	Sandvik TH663i	69.4	53.4	3.5	41,686	88.1
	Fleet Weighted Average	97.3	79.7	5.1		128

Conversions

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Scenario

Option 1

Onsite Hauling - continued

Emission Factors

Unpaved roads

Emission factor equation

$E = k(s/12)^a (W/3)^b [(365-P)/365]$

AP-42, Sec. 13.2.2, Eq. 1a, 11/06

s = Surface material silt content

1.7 %

AP 42, Sec. 13.2.2, Related Information

W = Mean vehicle weight

128

P = Days/year with ≥ 0.01 in precip.

70 day/yr

AP-42 Fig. 13.2.2-1, 11/06

PM

PM10

PM2.5

k = Size-specific empirical constant

4.9

1.5

0.15

AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06

a = Size-specific empirical constant

0.7

0.9

0.9

AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06

b = Size-specific empirical constant

0.45

0.45

0.45

AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06

E = Size-specific emission factor

5.47

1.13

0.11

lb/VMT

Emission Controls

Unpaved roads - periodic application of water and chemical dust suppressant

Control efficiency

90%

(Air Sciences 2018)

Emissions by Area

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY
		PM	PM10		PM2.5	
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr
HR	Haul Roads	147.30	167.15	30.50	16.71	3.05
	Total	147.30	167.15	30.50	16.71	3.05

See worksheet ROADS for haul road (HR) emissions by Model ID.

Road Width

Haul Roads

44 ft

(NGM 2020)

Plume Parameter	Calculation	Const.	Value (m)
Plume top (PT) - unpaved	$1.7 \times VH$	1.7	8.61
Release height - unpaved	$0.5 \times PT$	0.5	4.31
Plume width (PW)	$RW + 6 \text{ m}$	6	19.41
Sigma-z - unpaved	$PT / 2.15$	2.15	4.01
Sigma-y	$PW / 2.15$	2.15	9.03

(EPA 2012)

Source Parameters

		TYPE	UTM_E	UTM_N	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M
	Location of	Source	UTM NAD 83		Elev.	Rel. Ht.	S-y	S-z
Model ID	Activity	Type	E m	N m	m	m	m	m
HR	Haul Roads	VOLUM	See ROADS worksheet			4.31	9.03	4.01

Conversions

2,000 lb/ton

3.28 ft/m

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Scenario Option 1								
Material Load / Unload								
Activity Information								
Operating schedule				365 day/yr				
Throughput Rates								
	Location of	Material	Description	Rate ⁽¹⁾	Type of			
Model ID	Activity			ton/yr	Xfer			
LOP1	Portal Lined Ore Pad 1	Ore	Ore transfer to/from Portal lined ore pad #1	1,050,000	Both			
LOP2	Portal Lined Ore Pad 2	Ore	Ore transfer to/from Portal lined ore pad #2	1,050,000	Both			
OS	Ore Stockpile	Ore	Ore unloaded to stockpile; loaded for off-site transj	2,100,000	Both			
PWP	Portal Waste Pad	Waste	Rock transfer to/from Portal waste pad	541,778	Both			
PAG	Portal Lined PAG Pad	Waste	Rock transfer to/from Portal lined PAG pad	541,778	Both			
CanWRF	Canyon WRF	Canyon_tpy	Waste	Rock unloaded at Canyon WRF	812,666	Unload		
Ped	Pediment	Pediment_tpy	Waste	Rock unloaded at Pediment	270,889	Unload		
CanWRF	Canyon WRF	Total_tpy	Backfill	Rock loaded for transport to aggregate crusher	2,200,000	Load		
CHC	Cortez Hills Crusher	Total_tpy	Backfill	Rock transfer to/from aggregate crusher	2,200,000	Both		
ASP	Portal Aggregate Storage	CRF_tpy	Backfill	Aggregate unloaded at CRF plant	2,200,000	Unload		
(1) (NGM 2019), (NGM 2020)								
Emission Factors								
		PM	PM10	PM2.5				
k = Particle size multiplier		0.74	0.35	0.053	AP-42, Sec. 13.2.4, Pg. 4, 11/06			
E = Emission factor	Load	0.00021	0.0001	1.51E-05 lb/ton	AP-42, Tab. 11.19.2-2, 8/04 (truck loading - crushed stone)			
	Unload	0.00003	0.000016	2.42E-06 lb/ton	AP-42, Tab. 11.19.2-2, 8/04 (truck unloading - fragmented stone)			
	Both	0.00025	0.00012	0.00002 lb/ton				
Emissions by Model ID								
				PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY
	Location of	Type of	Total Rate	PM	PM10	PM2.5		
Model ID	Activity	Xfer	ton/yr	ton/yr	lb/day	ton/yr	lb/day	ton/yr
LOP1	Portal Lined Ore Pad 1	Both	1,050,000	0.129	0.334	0.061	0.051	0.009
LOP2	Portal Lined Ore Pad 2	Both	1,050,000	0.129	0.334	0.061	0.051	0.009
OS	Ore Stockpile	Both	2,100,000	0.258	0.667	0.122	0.101	0.018
PWP	Portal Waste Pad	Both	541,778	0.066	0.172	0.031	0.026	0.005
PAG	Portal Lined PAG Pad	Both	541,778	0.066	0.172	0.031	0.026	0.005
CanWRF	Canyon WRF	Unload	812,666	0.014	0.036	0.007	0.005	0.001
Ped	Pediment	Unload	270,889	0.005	0.012	0.002	0.002	0.000
CanWRF	Canyon WRF	Load	2,200,000	0.233	0.603	0.110	0.091	0.017
CHC	Cortez Hills Crusher	Both	2,200,000	0.270	0.699	0.128	0.106	0.019
ASP	Portal Aggregate Storage	Unload	2,200,000	0.037	0.096	0.018	0.015	0.003
Total				1.206	3.125	0.570	0.473	0.086
Conversions 2,000 lb/ton								

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ScenarioOption 1

Material Load / Unload - continued

Source Parameters		TYPE	UTM_E	UTM_N	ELEV_M	Area	SIG_Y_M	RELHT_M	SIG_Z_M
	Location of	Source	UTM NAD 83		Elev.	Area ⁽¹⁾	S-y	Rel. Ht.	S-z
Model ID	Activity	Type	E m	N m	m	m²	m	m	m
LOP1	Portal Lined Ore Pad 1	VOLUME	535,140	4,442,865	1,975	1,932	10.2	4.31	4.0
LOP2	Portal Lined Ore Pad 2	VOLUME	535,155	4,442,898	1,980	1,898	10.1	4.31	4.0
OS	Ore Stockpile	VOLUME	532,544	4,445,825	1,777	23,996	36.0	4.31	4.0
PWP	Portal Waste Pad	VOLUME	535,126	4,442,836	1,970	1,537	9.1	4.31	4.0
PAG	Portal Lined PAG Pad	VOLUME	535,219	4,443,036	2,006	1,504	9.0	4.31	4.0
CanWRF	Canyon WRF	VOLUME	531,283	4,447,076	1,731	6,761,645	604.7	4.31	4.0
Ped	Pediment	VOLUME	533,295	4,445,730	1,878	81,364	66.3	4.31	4.0
CHC	Cortez Hills Crusher	VOLUME	531,649	4,447,251	1,760	62	1.8	4.31	4.0
ASP	Portal Aggregate Storage	VOLUME	534,967	4,442,977	1,968	805	6.6	4.31	4.0

⁽¹⁾ Areas calculated from GIS

Vehicle height (VH)5.1m

Plume Parameter	Calculation	Const. ⁽¹⁾	Value (m)
Plume top (PT)	1.7 x VH	1.7	8.61
Release height	0.5 x PT	0.5	4.31
Sigma-z	PT / 2.15	2.15	4.01

⁽¹⁾ (EPA 2012)

sigma-y = length of side / 4.3(EPA 2019)

Air Sciences Inc. 			
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AIR EMISSION CALCULATIONS

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Goldrush

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ScenarioOption 1

Mobile Equipment (Tailpipes) - continued

Off-Road Vehicles

Final emission factor options:
EPA Engine Certification Data
EPA Non-Road Standards
EPA AP-42 - Diesel

AP-42 Emission Factors

Engine Description	Emission Factor (lb/hp-hr)				Reference	
	PM	CO	NOX	VOC		
Diesel industrial engines ≤600 hp	0.0022	0.0067	0.0310	0.0025	AP-42, Tab. 3.3-1, 10-96	01
Large stationary diesel engines >600 hp	0.0007	0.0055	0.0240	0.00064	AP-42, Tab. 3.4-1, 10-96	600

SO2 emission factor:

Diesel Sulfur Content0.0015%40 CFR 80.510 sulfur content of non-road diesel

0.0015% lb-S

6.943 lb Fuel

64.064 lb SO2

=

0.000208 lb SO2

lb Fuel

gal Fuel

32.065 lb-S

gal Fuel

Conversions
292.9 kW-hr/MMBtu32.065 lb S
1.341 hp/kW64.064 lb SO2
453.592 g/lb6.943 lb/gal distillate oil

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Scenario Option 1													
Mobile Equipment (Tailpipes) - continued													
Mobile Equipment Specifications and Activity ⁽¹⁾													
Equipment	Category	Total Units	Model Year	At Surface	Rating hp	Oper. hr/yr	Avg Load Factor ⁽²⁾	Output hp-hr/yr	Diesel gal/yr	Rating kW	Power Category		
Excavator CAT 326	Excavator	2	2015	100%	201	5,606	50%	1,126,806	56,340	150	130≤kW<560, Ph-out chk		
Backhoe CAT 420e	Backhoe	1	2010	100%	993	2,190	53%	1,141,702	57,085	740	kW>560 chk		
Dozers CAT D9	Dozer	3	2015	100%	474	4,000	58%	3,270,600	163,530	353	130≤kW<560, Ph-out chk		
Grader - Cat 18	Grader	3	2015	100%	362	3,300	40%	1,433,520	71,676	270	130≤kW<560, Ph-out chk		
UG Haul Truck Sandvik	UG Haul Truck	16	2015	10%	760	4,800	50%	2,918,400	145,920	567	kW>560 chk		
Surface Haul Truck CAT	Mining Truck	8	2015	100%	1,025	4,800	35%	13,776,000	688,800	764	kW>560 chk		
Water Truck CAT 777	Mining Truck	2	2015	100%	1,025	3,800	35%	2,726,500	136,325	764	kW>560 chk		
Exploration Drill Rig Boz	Mining Truck	5	2009	100%	310	8,760	35%	4,752,300	237,615	231	225≤kW<450, ≤2010 chk		
Exploration Deep Capac	Mining Truck	9	2000	100%	400	8,760	35%	11,037,600	551,880	298	225≤kW<450, ≤2010 chk		
Forklift JLG 10054	Telehandler	7	2015	43%	74	2,500	35%	194,898	9,745	55	37≤kW<56, Opt2 chk		
Front End Loader CAT 9	Loader	4	2015	100%	1,093	5,606	58%	14,092,923	704,646	815	kW>560 chk		
Skid Steer CAT 272D3 X	Skid Steer	4	2008	100%	110	2,000	50%	440,000	22,000	82	75≤kW<130, ≤2011 chk		
⁽¹⁾ (NGM 2020)													
⁽²⁾ Average medium application load factor by equipment category (Caterpillar 2016), pages 25-9 to 25-40.													
EPA Non-Road Standards													
Equipment	Model		EPA		EPA Non-Road Standards (g/kW-hr)								
	Year	Power Category	Tier	PM	CO	NOX	VOC	Lookup ID					
Excavator CAT 326	2015	130≤kW<560, Ph-out	4	0.02	3.5	0.4	0.19	T4-130≤kW≤560 2015					
Backhoe CAT 420e	2010	kW>560	2	0.2	3.5	6.4	-	§89-kW>560 2006					
Dozers CAT D9	2015	130≤kW<560, Ph-out	4	0.02	3.5	0.4	0.19	T4-130≤kW≤560 2015					
Grader - Cat 18	2015	130≤kW<560, Ph-out	4	0.02	3.5	0.4	0.19	T4-130≤kW≤560 2015					
UG Haul Truck Sandvik TH663i	2015	kW>560	4	0.04	3.5	3.5	0.19	T4-kW>560 2015					
Surface Haul Truck CAT 777G	2015	kW>560	4	0.04	3.5	3.5	0.19	T4-kW>560 2015					
Water Truck CAT 777	2015	kW>560	4	0.04	3.5	3.5	0.19	T4-kW>560 2015					
Exploration Drill Rig Boart LF230	2009	225≤kW<450, ≤2010	3	0.2	3.5	4	-	§89-225≤kW<450 2006					
Exploration Deep Capacity Core Rig	2000	225≤kW<450, ≤2010	1	0.54	11.4	9.2	1.3	§89-225≤kW<450 1996					
Forklift JLG 10054	2015	37≤kW<56, Opt2	4	0.03	5	4.7	4.7	T4-37≤kW<56 2015					
Front End Loader CAT 993k	2015	kW>560	4	0.04	3.5	3.5	0.19	T4-kW>560 2015					
Skid Steer CAT 272D3 XE	2008	75≤kW<130, ≤2011	3	0.3	5	4	-	§89-75≤kW<130 2007					
Conversions													
1.341 hp/kW													
7,000 Btu/hp-hr													
140,000 Btu/gal diesel													

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Scenario									Option 1				
Mobile Equipment (Tailpipes) - continued													
Final Emission Factors													
		PM	CO	NOX	VOC	SO2							
Equipment		lb/hp-hr	lb/hp-hr	lb/hp-hr ⁽¹⁾	lb/hp-hr ⁽¹⁾	lb/gal	Final Emission Factor						
Excavator CAT 326		0.00003	0.00575	0.00066	0.00031	0.00021	EPA Non-Road Standards						
Backhoe CAT 420e		0.00033	0.00575	0.01052	0.00064	0.00021	EPA Non-Road Standards						
Dozers CAT D9		0.00003	0.00575	0.00066	0.00031	0.00021	EPA Non-Road Standards						
Grader - Cat 18		0.00003	0.00575	0.00066	0.00031	0.00021	EPA Non-Road Standards						
UG Haul Truck Sandvik TH663i		0.00007	0.00575	0.00575	0.00031	0.00021	EPA Non-Road Standards						
Surface Haul Truck CAT 777G		0.00007	0.00575	0.00575	0.00031	0.00021	EPA Non-Road Standards						
Water Truck CAT 777		0.00007	0.00575	0.00575	0.00031	0.00021	EPA Non-Road Standards						
Exploration Drill Rig Boart LF230		0.00033	0.00575	0.00658	0.00247	0.00021	EPA Non-Road Standards						
Exploration Deep Capacity Core Rig		0.00089	0.01874	0.01512	0.00214	0.00021	EPA Non-Road Standards						
Forklift JLG 10054		0.00005	0.00822	0.00773	0.00773	0.00021	EPA Non-Road Standards						
Front End Loader CAT 993k		0.00007	0.00575	0.00575	0.00031	0.00021	EPA Non-Road Standards						
Skid Steer CAT 272D3 XE		0.00049	0.00822	0.00658	0.00247	0.00021	EPA Non-Road Standards						
(1) If the EPA Non-Road Standard is a combined NOX+VOC limit, then NOX = NOX+VOC and VOC is taken from AP-42.													
Emissions by Area													
		PM	PM10	PM2.5	CO	NOX	SO2	VOC					
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
MINE	Excavator CAT 326	0.02	0.10	0.02	0.10	0.02	0.74	3.24	0.08	0.37	0.001	0.006	0.18
MINE	Backhoe CAT 420e	0.19	1.03	0.19	1.03	0.19	0.75	3.28	1.37	6.01	0.001	0.006	0.37
MINE	Dozers CAT D9	0.05	0.29	0.05	0.29	0.05	2.15	9.41	0.25	1.08	0.004	0.017	0.51
HR	Grader - Cat 18	0.02	0.13	0.02	0.13	0.02	0.94	4.12	0.11	0.47	0.002	0.007	0.22
HR	UG Haul Truck Sar	0.10	0.53	0.10	0.53	0.10	1.92	8.40	1.92	8.40	0.003	0.015	0.46
HR	Surface Haul Truck	0.45	2.48	0.45	2.48	0.45	9.05	39.63	9.05	39.63	0.016	0.072	2.15
HR	Water Truck CAT 7	0.09	0.49	0.09	0.49	0.09	1.79	7.84	1.79	7.84	0.003	0.014	0.43
Expl	Exploration Drill R	0.78	4.28	0.78	4.28	0.78	3.12	13.67	3.57	15.63	0.006	0.025	5.87
Expl	Exploration Deep C	4.90	26.85	4.90	26.85	4.90	23.61	103.43	19.06	83.47	0.013	0.057	11.79
MINE	Forklift JLG 10054	0.00	0.03	0.00	0.03	0.00	0.18	0.80	0.17	0.75	0.000	0.001	0.75
MINE	Front End Loader C	0.46	2.54	0.46	2.54	0.46	9.26	40.55	9.26	40.55	0.017	0.073	2.20
MINE	Skid Steer CAT 272	0.11	0.59	0.11	0.59	0.11	0.41	1.81	0.33	1.45	0.001	0.002	0.54
	Total Non-Road Em	7.18	39.34	7.18	39.34	7.18	53.93	236.19	46.95	205.64	0.07	0.30	25.47
	Total On-Road Emi	0.24	1.30	0.24	0.74	0.14	0.26	1.14	0.56	2.45	0.001	0.006	0.26
	Total Tailpipe Emis	7.42	40.64	7.42	40.08	7.31	54.19	237.33	47.51	208.09	0.07	0.30	25.73
MINE = Pits, dumps, and stockpiles													
HR = Haul roads													
		chk	chk	chk	chk	chk	chk	chk	chk	chk	chk-17	chk	chk
Conversions													
453.592 g/lb													
1.341 hp/kW													

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Scenario	Option 1
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Subtotals by Area		PM_TPY	PM10_PTD	PM10_TPY	PM2.5_PTD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	VOC_TPY
		PM	PM10	PM2.5	CO	NOX	SO2	VOC					
Area		ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
MINE	Mine	0.84	4.58	0.84	4.58	0.84	13.49	59.09	11.46	50.20	0.02	0.11	4.55
HR	Haul Roads	0.90	4.92	0.90	4.37	0.80	13.96	61.14	13.42	58.79	0.03	0.11	3.52
Expl	Exploration	5.68	31.13	5.68	31.13	5.68	26.74	117.10	22.62	99.10	0.02	0.08	17.66
Total	Mobile Tailpipes	7.42	40.64	7.42	40.08	7.31	54.19	237.33	47.51	208.09	0.07	0.30	25.73

Short-term emissions are based on annual emissions divided by 365 day/yr and 24 hr/day.

MINE Emission Allocation by Model ID

Model ID	Area ID	Location of Activity	Rate	
			ton/yr	MINE
PWP	MINE	Portal Waste Pad	541,778	4.2%
PAG	MINE	Portal Lined PAG Pad	541,778	4.2%
LOP1	MINE	Portal Lined Ore Pad 1	1,050,000	8.1%
LOP2	MINE	Portal Lined Ore Pad 2	1,050,000	8.1%
ASP	MINE	Portal Aggregate Storage	2,200,000	17.0%
CanWRF	MINE	Canyon WRF	3,012,666	23.2%
Ped	MINE	Pediment	270,889	2.1%
CHC	MINE	Cortez Hills Crusher	2,200,000	17.0%
OS	MINE	Ore Stockpile	2,100,000	16.2%

Conversions
2000 lb/ton
453.592 g/lb

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Scenario Option 1													
Mobile Equipment (Tailpipes) - continued													
<i>Emissions by Model ID</i>													
		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	VOC_TPY
		PM	PM10		PM2.5		CO		NOX ⁽¹⁾		SO2		VOC
Model ID	Location	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
PWP	Portal Waste Pad	0.03	0.19	0.03	0.19	0.03	0.56	2.47	0.48	2.10	0.001	0.004	0.19
PAG	Portal Lined PAG Pad	0.03	0.19	0.03	0.19	0.03	0.56	2.47	0.48	2.10	0.001	0.004	0.19
LOP1	Portal Lined Ore Pad	0.07	0.37	0.07	0.37	0.07	1.09	4.78	0.93	4.06	0.002	0.009	0.37
LOP2	Portal Lined Ore Pad	0.07	0.37	0.07	0.37	0.07	1.09	4.78	0.93	4.06	0.002	0.009	0.37
ASP	Portal Aggregate Stockpile	0.14	0.78	0.14	0.78	0.14	2.29	10.03	1.94	8.52	0.004	0.018	0.77
CmnWRF	Canyon WRF	0.19	1.07	0.19	1.07	0.19	3.13	13.73	2.66	11.66	0.006	0.024	1.06
Ped	Pediment	0.02	0.10	0.02	0.10	0.02	0.28	1.23	0.24	1.05	0.001	0.002	0.10
CHC	Cortez Hills Crusher	0.14	0.78	0.14	0.78	0.14	2.29	10.03	1.94	8.52	0.004	0.018	0.77
OS	Ore Stockpile	0.14	0.74	0.14	0.74	0.14	2.18	9.57	1.86	8.13	0.004	0.017	0.74
HR	Haul Roads	0.90	4.92	0.90	4.37	0.80	13.96	61.14	13.42	58.79	0.026	0.114	3.52
Expl	Exploration	5.68	31.13	5.68	31.13	5.68	26.74	117.10	22.62	99.10	0.019	0.082	17.66
Total		7.42	40.64	7.42	40.08	7.31	54.19	237.33	47.51	208.09	0.07	0.30	25.73
(1) NO2/NOX In-stack Ratio (ISR)		11% (CAPCOA 2011)											
		chk	chk	chk	chk	chk	chk	chk	chk	chk	chk-17	chk	chk
Truck Specifications													
Description			Height		Oper.								
			m		hr/yr								
Forklift JLG 10054			2.57		2,500		(NGM 2019), (JLG 2019)						
Skid Steer CAT 272D3 XE			2.1		2,000		(NGM 2019), (Caterpillar 2019a)						
Fleet Average			2.4										
Plume Parameter				Calculation	Const.	Value (m)							
Plume top (PT) - unpaved				1.7 x VH	1.7	4.04	(EPA 2012)						
Release height - unpaved				0.5 x PT	0.5	2.02	(EPA 2012)						
Sigma-z - unpaved				PT / 2.15	2.15	1.88	(EPA 2012)						
Conversions													
12 in/ft													
3.28084 ft/m													

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE: Goldrush		BY: G. Barthel	
	PROJECT NO: 59-70-9		PAGE: 14	OF: SHEET: 20 Mine
	SUBJECT: Mining Activity		DATE: September 16, 2022	

Scenario

Option 1

Dozing and Grading

Activity Information

Operating schedule

365 day/yr

Average Grader Speed

6 mile/hr

(NGM 2020)

Dozer and Grader Fleet

Equipment	Activity
Dozer	12,000 hr/yr
Grader	9,900 hr/yr
	59,400 VMT/yr

Dozing Emission Factors

Emission Factor Equation

TSP (lb/hr) = 5.7 (s)^{1.2} / (M)^{1.3}

AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden)

PM15 (lb/hr) = 1.0 (s)^{1.5} / (M)^{1.4}

AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden)

s = Surface material silt content

1.7 %

AP 42 Sec. 13.2.2, Related Information

M = Material moisture content

7.9 %

AP-42, Tab. 11.9-3, 07/98, (bulldozers, overburden)

TSP(PM)

0.734 lb/hr

PM15

0.123 lb/hr

Dozing PM Scaling Factors

PM10

0.75

AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)

PM2.5

0.105

AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)

Grading Emission Factors

Emission Factor Equation

TSP (lb/VMT) = 0.04 (S)^{2.5}

AP-42, Tab. 11.9-1, 07/98, (grading)

PM15 (lb/VMT) = 0.051 (S)²

AP-42, Tab. 11.9-1, 07/98, (grading)

S - Grader average speed

6.0 mile/hr

TSP(PM)

3.527 lb/VMT

PM15

1.836 lb/VMT

Grading PM Scaling Factors

PM10

0.6

AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)

PM2.5

0.031

AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)

Emission Controls

Unpaved roads - periodic application of water and chemical dust suppressant

Control efficiency:

90%

(Air Sciences 2018)

Emissions by Area

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY
		PM	PM10	PM2.5		
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr
MINE	Dozing	4.40	3.03	0.55	2.53	0.46
HR	Grading	10.48	17.93	3.27	1.78	0.32

Conversions

2,000 lb/ton

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE:	BY:
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	Mining Activity	September 16, 2022

Scenario	Option 1
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Dozing and Grading - continued

Waste Rock Destination

<i>PWP</i>	Portal Waste Pad	541,778 ton/yr	<i>Waste_tpy</i>
<i>PAG</i>	Portal Lined PAG Pad	541,778 ton/yr	<i>Waste_tpy</i>
<i>LOP1</i>	Portal Lined Ore Pad 1	1,050,000 ton/yr	<i>Ore_tpy</i>
<i>LOP2</i>	Portal Lined Ore Pad 2	1,050,000 ton/yr	<i>Ore_tpy</i>
<i>ASP</i>	Portal Aggregate Storage	2,200,000 ton/yr	<i>CRF_tpy</i>
<i>CantWRF</i>	Canyon WRF	812,666 ton/yr	<i>Canyon_tpy</i>
<i>Ped</i>	Pediment	270,889 ton/yr	<i>Pediment_tpy</i>
<i>CHC</i>	Cortez Hills Crusher	2,200,000 ton/yr	<i>Total_tpy</i>
<i>OS</i>	Ore Stockpile	2,100,000 ton/yr	<i>Ore_tpy</i>

		chk	chk	chk	chk	chk
<i>Emissions by Model ID</i>		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY
		PM	PM10		PM2.5	
<i>Model ID</i>	<i>Activity</i>	ton/yr	lb/day	ton/yr	lb/day	ton/yr
<i>PWP</i>	Dozing	0.22	0.15	0.03	0.13	0.02
<i>PAG</i>	Dozing	0.22	0.15	0.03	0.13	0.02
<i>LOP1</i>	Dozing	0.43	0.30	0.05	0.25	0.05
<i>LOP2</i>	Dozing	0.43	0.30	0.05	0.25	0.05
<i>ASP</i>	Dozing	0.90	0.62	0.11	0.52	0.09
<i>CamWRF</i>	Dozing	0.33	0.23	0.04	0.19	0.03
<i>Ped</i>	Dozing	0.11	0.08	0.01	0.06	0.01
<i>CHC</i>	Dozing	0.90	0.62	0.11	0.52	0.09
<i>OS</i>	Dozing	0.86	0.59	0.11	0.49	0.09
<i>HR</i>	Grading	10.48	17.93	3.27	1.78	0.32

Air Sciences Inc. AIR EMISSION CALCULATIONS				PROJECT TITLE:		BY:	
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				Mining Activity		September 16, 2022	
Scenario Option 1							
Water Truck Travel							
Activity Information							
Operating schedule		365 day/yr					
Average truck speed		10 mph		(NGM 2020)			
Truck Fleet							
	Payload	Empty	Gross			Average	
	Capacity	Weight	Weight	Units	Oper.	Weight	
	ton	ton	ton		hr/yr	ton	
Water Truck							
Water Truck CAT 777	83.4	123	206	2	7,600	165	(NGM 2020)
International 7600 Water Trucl	22	9	31	2	8,640	20	(Ritchie 2019)
Total vehicle miles traveled (VMT)		162,400 VMT/yr					
Emission Factors							
Emission factor equation		E = k(s/12) ^a (W/3) ^b [(365-P)/365]				AP-42, Sec. 13.2.2, Eq. 1a, 11/06	
s = Surface material silt content		1.7 %				AP 42, Sec. 13.2.2, Related Information	
W = Mean vehicle weight		88 ton					
P = Days/year with ≥0.01 in precip.		70 day/yr				AP-42 Fig. 13.2.2-1, 11/06	
		PM	PM10	PM2.5			
k = Size-specific empirical constant		4.9	1.5	0.15	AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06		
a = Size-specific empirical constant		0.7	0.9	0.9	AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06		
b = Size-specific empirical constant		0.45	0.45	0.45	AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06		
E = Size-specific emission factor		4.60	0.95	0.10	lb/VMT		
Emission Controls							
Periodic application of water and chemical dust suppressant							
Control efficiency:		90%		(Air Sciences 2018)			
Emissions by Area							
		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	
		PM	PM10		PM2.5		
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	
HR	Water Truck Travel	37.39	42.42	7.74	4.24	0.77	
Conversions							
2,000 lb/ton							
8.34 lb H2O/gal							

Air Sciences Inc.		PROJECT TITLE:		BY:																																																								
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AIR EMISSION CALCULATIONS		59-70-9		17 20 Mine																																																								
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		Mining Activity		September 16, 2022																																																								
Scenario Option 1																																																												
Wind Erosion																																																												
Activity Information																																																												
Operating schedule		365 day/yr																																																										
Threshold velocity to cause wind erosion on flat surfaces:		16.04 m/s																																																										
The maximum hourly wind speed in the onsite data:		11.6 m/s																																																										
Therefore wind erosion on flat surfaces will not be included in tabulated data.																																																												
Erodible Area																																																												
<table><tr><td></td><td></td><td>Type</td><td>Rate</td><td>Erod. Area</td></tr><tr><td>Model ID</td><td>Location</td><td></td><td>ton/yr</td><td>(acre/yr)⁽¹⁾</td></tr><tr><td>PWP</td><td>Portal Waste Pad</td><td>PILE</td><td>541,778</td><td>75</td></tr><tr><td>PAG</td><td>Portal Lined PAG Pad</td><td>PILE</td><td>541,778</td><td>75</td></tr><tr><td>LOP1</td><td>Portal Lined Ore Pad 1</td><td>PILE</td><td>1,050,000</td><td>146</td></tr><tr><td>LOP2</td><td>Portal Lined Ore Pad 2</td><td>PILE</td><td>1,050,000</td><td>146</td></tr><tr><td>ASP</td><td>Portal Aggregate Storage</td><td>PILE</td><td>2,200,000</td><td>306</td></tr><tr><td>CanWRF</td><td>Canyon WRF</td><td>PILE</td><td>812,666</td><td>113</td></tr><tr><td>Ped</td><td>Pediment</td><td>PILE</td><td>270,889</td><td>38</td></tr><tr><td>CHC</td><td>Cortez Hills Crusher</td><td>PILE</td><td>2,200,000</td><td>306</td></tr><tr><td>OS</td><td>Ore Stockpile</td><td>PILE</td><td>2,100,000</td><td>292</td></tr></table>								Type	Rate	Erod. Area	Model ID	Location		ton/yr	(acre/yr) ⁽¹⁾	PWP	Portal Waste Pad	PILE	541,778	75	PAG	Portal Lined PAG Pad	PILE	541,778	75	LOP1	Portal Lined Ore Pad 1	PILE	1,050,000	146	LOP2	Portal Lined Ore Pad 2	PILE	1,050,000	146	ASP	Portal Aggregate Storage	PILE	2,200,000	306	CanWRF	Canyon WRF	PILE	812,666	113	Ped	Pediment	PILE	270,889	38	CHC	Cortez Hills Crusher	PILE	2,200,000	306	OS	Ore Stockpile	PILE	2,100,000	292
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⁽¹⁾ Pile surface area calculations:																																																												
Truck dump (TD) size		97.3 ton																																																										
Material density		132.2 lb/ft³		AP-42, tab. 11.9-6, average of overburden density, 10/98																																																								
		0.066 ton/ft³																																																										
Material specific volume		15.1 ft³/ton																																																										
TD volume (V)		1,472 ft³																																																										
Conical surface calculations																																																												
Side slope		38 deg		Typical value																																																								
		0.7 rad																																																										
Conical surface area (SA)		Π × r × (h² + r²)^0.5																																																										
Conical volume (V)		(Π × h × r²) ÷ 3																																																										
Conical base radius		r = s × cos(slope)																																																										
Conical height		h = s × sin(slope)																																																										
Sloped side length		s = (h² + r²)^0.5																																																										
Solution of conical volume equation																																																												
Replacing h and r with s × sin(slope) and s × cos(slope), respectively:																																																												
s = [3 × V/(pi × sin(slope) × cos²(slope))]^(1/3)		15.4 ft																																																										
r		12.2 ft																																																										
h		9.5 ft																																																										
SA		590 ft²																																																										
		0.014 acre																																																										
		1.4E-4 acre/ton-TD																																																										
Scaling Factors																																																												
PM10		0.5		AP-42, Pg. 13.2.5-3, 11/06																																																								
PM2.5		0.075		AP-42, Pg. 13.2.5-3, 11/06																																																								
Conversions																																																												
3,280.84 ft/m		43,560 ft²/acre																																																										
4,046.86 m²/acre		1,609.34 m/mi																																																										

Air Sciences Inc. AIR EMISSION CALCULATIONS						PROJECT TITLE:			BY:		
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						Mining Activity			September 16, 2022		

Scenario

Option 1

Wind Erosion - continued

Stockpile Surface Wind Erosion Event Emission Calculations

Based on

1 acre/yr

8,760 hr/yr

0.00011 acre/hr

Event	Date/Hour	u10	u10+	u* (m/s)			Hours Elapsed			Erodible Surface Area (acre)		
		(m/s)	(m/s)	ID-A	ID-B	ID-C	ID-A	ID-B	ID-C	ID-A	ID-B	ID-C
		(1)	(2)	(3)	(3)	(3)	(4)	(4)	(4)	(5)	(5)	(5)
0	12/31/10 23:00											
1	2/7/2011 16:00	10.3	12.36	1.1124	0.7416	0.2472	905	905	905	0.0124	0.0496	0.0413
2	2/7/2011 17:00	9.7	11.64	1.0476	0.6984	0.2328	1	906	906	0.0000	0.0496	0.0414
3	3/16/2011 13:00	9.6	11.52	1.0368	0.6912	0.2304	884	1,790	1,790	0.0121	0.0981	0.0817
4	3/20/2011 8:00	9.6	11.52	1.0368	0.6912	0.2304	91	1,881	1,881	0.0012	0.1031	0.0859
5	3/20/2011 9:00	10.3	12.36	1.1124	0.7416	0.2472	1	1,882	1,882	0.0000	0.1031	0.0859
6	3/20/2011 10:00	10	12	1.08	0.72	0.24	1	1,883	1,883	0.0000	0.1032	0.0860
7	3/20/2011 13:00	10.1	12.12	1.0908	0.7272	0.2424	3	1,886	1,886	0.0000	0.1033	0.0861
8	3/20/2011 14:00	9.6	11.52	1.0368	0.6912	0.2304	1	1,887	1,887	0.0000	0.1034	0.0862
9	3/20/2011 15:00	11.4	13.68	1.2312	0.8208	0.2736	1	1,888	1,888	0.0000	0.1035	0.0862
10	3/20/2011 16:00	9.6	11.52	1.0368	0.6912	0.2304	1	1,889	1,889	0.0000	0.1035	0.0863
11	5/15/2011 10:00	9.7	11.64	1.0476	0.6984	0.2328	1,338	3,227	3,227	0.0183	0.1768	0.1474
12	5/15/2011 11:00	9.7	11.64	1.0476	0.6984	0.2328	1	3,228	3,228	0.0000	0.1769	0.1474
13	5/31/2011 13:00	9.5	11.4	1.026	0.684	0.228	386	3,614	3,614	0.0053	0.1980	0.1650
14	12/1/2011 9:00	10	12	1.08	0.72	0.24	4,412	8,026	8,026	0.0604	0.4398	0.3665
15	12/1/2011 10:00	11.1	13.32	1.1988	0.7992	0.2664	1	8,027	8,027	0.0000	0.4398	0.3665
16	12/1/2011 11:00	9.5	11.4	1.026	0.684	0.228	1	8,028	8,028	0.0000	0.4399	0.3666
17	12/1/2011 12:00	10.6	12.72	1.1448	0.7632	0.2544	1	8,029	8,029	0.0000	0.4399	0.3666
18	12/1/2011 13:00	11.4	13.68	1.2312	0.8208	0.2736	1	8,030	8,030	0.0000	0.4400	0.3667
19	12/1/2011 14:00	11.6	13.92	1.2528	0.8352	0.2784	1	8,031	8,031	0.0000	0.4401	0.3667
20	12/1/2011 15:00	10.8	12.96	1.1664	0.7776	0.2592	1	8,032	8,032	0.0000	0.4401	0.3668

Conversions

2,000 lb/ton

Air Sciences Inc. AIR EMISSION CALCULATIONS								PROJECT TITLE: Goldrush		BY: G. Barthel			
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								SUBJECT: Mining Activity		DATE: September 16, 2022			
Scenario Option 1													
Wind Erosion - continued													
Stockpile Surface Wind Erosion Event Emission Calculations - continued													
Threshold	Erosion Potential (lb/acre) ⁽¹⁾			PM Emissions (lb)				PM10 (lb)	PM2.5 (lb)				
Wind	ID-A	ID-B	ID-C	ID-A	ID-B*	ID-C*	Total	Total	Total				
Event	(6)	(6)	(6)	(7)	(7)	(7)	(8)	(9)	(10)				
1	25.03	0.00	0.00	3.10E-01	--	--	3.10E-01	1.55E-01	2.33E-02				
2	6.55	0.00	0.00	8.97E-05	--	--	8.97E-05	4.49E-05	6.73E-06				
3	3.89	0.00	0.00	4.71E-02	--	--	4.71E-02	2.36E-02	3.54E-03				
4	3.89	0.00	0.00	4.85E-03	--	--	4.85E-03	2.43E-03	3.64E-04				
5	25.03	0.00	0.00	3.43E-04	--	--	3.43E-04	1.71E-04	2.57E-05				
6	15.25	0.00	0.00	2.09E-04	--	--	2.09E-04	1.04E-04	1.57E-05				
7	18.39	0.00	0.00	7.56E-04	--	--	7.56E-04	3.78E-04	5.67E-05				
8	3.89	0.00	0.00	5.33E-05	--	--	5.33E-05	2.67E-05	4.00E-06				
9	70.19	0.00	0.00	9.61E-04	--	--	9.61E-04	4.81E-04	7.21E-05				
10	3.89	0.00	0.00	5.33E-05	--	--	5.33E-05	2.67E-05	4.00E-06				
11	6.55	0.00	0.00	1.20E-01	--	--	1.20E-01	6.00E-02	9.00E-03				
12	6.55	0.00	0.00	8.97E-05	--	--	8.97E-05	4.49E-05	6.73E-06				
13	1.36	0.00	0.00	7.17E-03	--	--	7.17E-03	3.59E-03	5.38E-04				
14	15.25	0.00	0.00	9.21E-01	--	--	9.21E-01	4.61E-01	6.91E-02				
15	56.42	0.00	0.00	7.73E-04	--	--	7.73E-04	3.86E-04	5.80E-05				
16	1.36	0.00	0.00	1.86E-05	--	--	1.86E-05	9.29E-06	1.39E-06				
17	35.90	0.00	0.00	4.92E-04	--	--	4.92E-04	2.46E-04	3.69E-05				
18	70.19	0.00	0.00	9.61E-04	--	--	9.61E-04	4.81E-04	7.21E-05				
19	79.97	0.00	0.00	1.10E-03	--	--	1.10E-03	5.48E-04	8.22E-05				
20	43.74	0.00	0.00	5.99E-04	--	--	5.99E-04	3.00E-04	4.49E-05				
Final Emission Factors (lb/acre-yr)													
Surface Type	PM	PM10	PM2.5										
Pile	1.42	0.71	0.11										
Emissions by Model ID													
			PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY						
	Location of	PM	PM10	PM2.5									
Model ID	Activity	Type	ton/yr	lb/day	ton/yr	lb/day	ton/yr						
PWP	Portal Waste Pad	PILE	0.05	0.15	0.03	0.022	0.00						
PAG	Portal Lined PAG Pad	PILE	0.05	0.15	0.03	0.022	0.00						
LOP1	Portal Lined Ore Pad 1	PILE	0.10	0.28	0.05	0.043	0.01						
LOP2	Portal Lined Ore Pad 2	PILE	0.10	0.28	0.05	0.043	0.01						
ASP	Portal Aggregate Storage	PILE	0.22	0.59	0.11	0.089	0.02						
CanWRF	Canyon WRF	PILE	0.08	0.22	0.04	0.033	0.01						
Ped	Pediment	PILE	0.03	0.07	0.01	0.011	0.00						
CHC	Cortez Hills Crusher	PILE	0.22	0.59	0.11	0.089	0.02						
OS	Ore Stockpile	PILE	0.21	0.57	0.10	0.085	0.02						
	Total		1.06	2.91	0.53	0.436	0.08						

Construction Emissions

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE:	Goldrush		BY:	G. Barthel	
	PROJECT NO:	59-70-9		PAGE:	OF:	SHEET:
	SUBJECT:	RIB Construction		1	2	RIBs
				DATE:	September 16, 2022	

RIB Construction Emissions Summary

	PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY
	PM	PM10		PM2.5	
Model ID	ton/yr	lb/day	ton/yr	lb/day	ton/yr
Gal1a	12.4	44.4	4.3	2.4	0.2
Gal1b	12.4	44.4	4.3	2.4	0.2
Gal1c	12.4	44.4	4.3	2.4	0.2
Gal2a	12.4	44.4	4.3	2.4	0.2
Gal2b	12.4	44.4	4.3	2.4	0.2
Gal2c	12.4	44.4	4.3	2.4	0.2
Total	74.5	266.1	26.1	14.1	1.4
	chk	chk	chk	chk	chk

RIB Construction Source Parameters Summary

	description	TYPE	UTM_E	UTM_N	ELEV_M	RELHT_M	XINIT_M	YINIT_M	ANGL_DEG	SIG_Z_M
		Source	UTM NAD 83 ⁽¹⁾		Elev. ⁽²⁾	Rel. Ht.	Len. X	Len. Y	Angle	Sigma-z
Model ID	Description	Type	E m	N m	m	m	m	m	deg	m
Gal1a	RIB Gallery 1a	AREA	547,781	4,439,370	1,749	3.40	545.8	322.0	5.3	3.16
Gal1b	RIB Gallery 1b	AREA	547,723	4,439,073	1,749	3.40	550.0	286.4	9.5	3.16
Gal1c	RIB Gallery 1c	AREA	547,675	4,438,679	1,749	3.40	413.9	357.8	26.0	3.16
Gal2a	RIB Gallery 2a	AREA	548,280	4,441,895	1,740	3.40	284.8	432.7	-18.4	3.16
Gal2b	RIB Gallery 2b	AREA	548,684	4,442,135	1,740	3.40	306.6	468.4	-4.4	3.16
Gal2c	RIB Gallery 2c	AREA	549,080	4,442,503	1,740	3.40	294.3	449.7	-4.5	3.16

⁽¹⁾ GIS

⁽²⁾ Google Earth

			chk	chk	chk
			PM10_PPD	PM2.5_PPD	PM2.5_TPY
Model ID	Source	Units	PM10	PM2.5	PM2.5
	Type		24-hr	24-hr	Annual
Gal1a	AREA	g/s-m2	1.3E-06	7.0E-08	3.8E-08
Gal1b	AREA	g/s-m2	1.5E-06	7.8E-08	4.2E-08
Gal1c	AREA	g/s-m2	1.6E-06	8.3E-08	4.5E-08
Gal2a	AREA	g/s-m2	1.9E-06	1.0E-07	5.4E-08
Gal2b	AREA	g/s-m2	1.6E-06	8.6E-08	4.6E-08
Gal2c	AREA	g/s-m2	1.8E-06	9.3E-08	5.0E-08

Vehicle height (VH):

Dozers CAT D9

4.00 m

(Caterpillar 2016)

Plume Parameter	Calculation	Const.	Value (m)
Plume top (PT)	1.7 x VH	1.7	6.80
Release height	0.5 x PT	0.5	3.40
Sigma-z	PT / 2.15	2.15	3.16

(EPA 2012)

Conversions

3,281 ft/m

3,600 sec/hr

2,000 lb/ton

8,760 hr/yr

453.592 g/lb

24 hr/day

Air Sciences Inc.

HAP & GHG Emissions

Air Sciences Inc.	PROJECT TITLE:		BY:	
	Goldrush		G. Barthel	
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	SUBJECT:		DATE:	
	HAP and GHG Emissions		September 16, 2022	
Hazardous Air Pollutants and Greenhouse Gas Emissions - Stationary Sources				
Scenario			Option 1	
HAP Emissions Summary - Stationary Sources				
Emissions				
Pollutant/Group			ton/yr	
1,3-Butadiene			0.0008	
2-Methylnaphthalene POM			-	
3-Methylchloranthrene POM			-	
7,12-Dimethylbenz(a)anthracene POM			-	
Acenaphthene POM			0.0011	
Acenaphthylene POM			0.0023	
Acetaldehyde			0.0212	
Acrolein			0.0037	
Anthracene POM			0.0003	
Benz(a)anthracene POM			0.0002	
Benzene			0.2029	
Benzo(a)pyrene POM			0.0001	
Benzo(b)fluoranthene POM			0.0003	
Benzo(g,h,i)perylene POM			0.0001	
Benzo(k)fluoranthene POM			0.0001	
Chrysene POM			0.0004	
Dibenz(a,h)anthracene POM			0.0001	
Dichlorobenzene			-	
Fluoranthene POM			0.0011	
Fluorene POM			0.0036	
Formaldehyde			0.0422	
Hexane			-	
Indeno(1,2,3-cd)pyrene POM			0.0001	
Naphthalene POM			0.0326	
Phenanthrene POM			0.0103	
Pyrene POM			0.0010	
Toluene			0.0749	
Xylenes			0.0515	
Antimony			0.0446	
Arsenic			0.2579	
Beryllium			0.0003	
Cadmium			0.0005	
Chromium			0.0174	
Cobalt			0.0019	
Lead			0.0097	
Manganese			0.0916	
Mercury			0.0079	
Nickel			0.0132	
Phosphorus			0.0014	
Selenium			0.0007	
POM Subtotal			0.0536	
Highest Single HAP: Arsenic			0.2579	
Total HAP			0.8980	
Arsenic			#N/A 2 chk	

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	Goldrush		G. Barthel	
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AIR EMISSION CALCULATIONS	59-70-9		2 9 HAP&GHG	
	SUBJECT:		DATE:	
HAP and GHG Emissions		September 16, 2022		

Hazardous Air Pollutants and Greenhouse Gas Emissions - Mobile Sources

HAP Emissions Summary - Mobile Sources

		Emissions
Pollutant/Group		ton/yr
1,3-Butadiene		0.0036
2-Methylnaphthalene		-
3-Methylchloranthrene		-
7,12-Dimethylbenz(a)anthracene		-
Acenaphthene		0.0007
Acenaphthylene	POM	0.0016
Acetaldehyde		0.0730
Acrolein	POM	0.0094
Anthracene	POM	0.0003
Benz(a)anthracene		0.0002
Benzene		0.1792
Benzo(a)pyrene	POM	0.0000
Benzo(b)fluoranthene	POM	0.0001
Benzo(g,h,i)perylene		0.0001
Benzo(k)fluoranthene	POM	0.0000
Chrysene		0.0002
Dibenz(a,h)anthracene	POM	0.0001
Dichlorobenzene	POM	-
Fluoranthene	POM	0.0012
Fluorene		0.0042
Formaldehyde		0.1172
Hexane		-
Indeno(1,2,3-cd)pyrene		0.0001
Naphthalene		0.0235
Phenanthrene	POM	0.0076
Pyrene	POM	0.0009
Toluene		0.0714
Xylenes		0.0494
Antimony	POM	-
Arsenic	POM	-
Beryllium		-
Cadmium		-
Chromium	POM	-
Cobalt		-
Lead		-
Manganese	POM	-
Mercury		-
Nickel		-
Phosphorus		-
Selenium	POM	-
POM Subtotal		2.13E-02
Total HAP		0.54

chk

GHG Emissions Summary - Mobile Sources

		CO2e
		(ton/yr)
Source Category		
On-Highway Vehicles		2,163
Diesel Mobile Equipment		32,590
Total GHGs		34,753

chk

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE:	BY:
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	HAP and GHG Emissions	September 16, 2022

Hazardous Air Pollutants and Greenhouse Gas Emissions - Summary

Stationary Sources

	HAP	CO2e
Description	ton/yr	ton/yr
Diesel Generators	0.451	42,129
Propane Heaters	0.000	0
Cement Silos	5.02E-03	
Total	0.456	42,129
	chk	chk

Fugitive Sources

	HAP	CO2e
Description	ton/yr	ton/yr
Fugitive Dust Sources - HAP Emissions	0.442	N/A
Total	0.442	N/A

Mobile Sources

	HAP	CO2e
Description	ton/yr	ton/yr
Total On-Highway Vehicles	0.05	2163
Total Mobile Diesel Engines	0.49	32,590
Total	0.54	34,753
	chk	chk

Diesel

Air Sciences Inc.			PROJECT TITLE:			BY:			
			Goldrush			G. Barthel			
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			SUBJECT:			DATE:			
			HAP and GHG Emissions			September 16, 2022			
Stationary Source - Diesel Engines									
Source Data									
		Power Rating		Operation		Output		Fuel Consumption*	
		kW hp		hr/yr		hp-hr/yr		MMBtu/hr MMBtu/yr	
Source II Source Description								HAP CO2e	
		ton/yr ton/yr							
S2.001	Cummins Diesel Generator #1 (324 hp, DSI	242	324	8,760	2,838,240	2.3	19,868	3.8E-02	1,625
S2.002	Cummins Diesel Generator #2 (324 hp, DSI	242	324	8,760	2,838,240	2.3	19,868	3.8E-02	1,625
S2.006	CAT 3500 Series Emergency Generator (3,6	2,710	3,634	100	363,400	25.4	2,544	2.0E-03	208
S2.007	Decline Diesel Generator #2 (3,627 hp, CAI	2,705	3,627	8,760	31,772,520	25.4	222,408	1.7E-01	18,194
S2.008	Decline Diesel Generator #3 (3,627 hp, CAI	2,705	3,627	8,760	31,772,520	25.4	222,408	1.7E-01	18,194
S19.200	Portal Generator (2,700 kW, Tier 4)	2,700	3,621	1,000	3,620,700	25.3	25,345	2.0E-02	2,073
S19.203	UG Support Emergency Generator (3516c, I	2,705	3,627	100	362,700	25.4	2,539	2.0E-03	208
Total Small Diesel Engines (<=600 hp)					5,676,480	4.5	39,735		
Total Large Diesel Engines (>600 hp)					67,891,840	126.9	475,243		
Based on		7,000 Btu/hp-hr		AP-42, Sec. 3.3, (diesel engine fuel use per hp output)			chk		chk
Diesel HAP Emission Factors and Emissions									
Pollutant		POM		Emission Factor*		Emissions			
				Small Large					
				Diesel Engines Diesel Engines					
				<=600 hp >600 hp					
				lb/MMBtu lb/MMBtu		lb/hr		ton/yr	
Benzene				9.33E-04 7.76E-04		1.03E-01		2.03E-01	
Toluene				4.09E-04 2.81E-4		3.75E-02		7.49E-02	
Xylenes				2.85E-04 1.93E-4		2.58E-02		5.15E-02	
1,3-Butadiene				3.91E-05 0.00E+0		1.77E-04		7.77E-04	
Formaldehyde				1.18E-03 7.89E-5		1.54E-02		4.22E-02	
Acetaldehyde				7.67E-04 2.52E-5		6.68E-03		2.12E-02	
Acrolein				9.25E-05 7.88E-6		1.42E-03		3.71E-03	
Naphthalene		POM		8.48E-05 1.30E-4		1.69E-02		3.26E-02	
Acenaphthylene		POM		5.06E-06 9.23E-6		1.19E-03		2.29E-03	
Acenaphthene		POM		1.42E-06 4.68E-6		6.01E-04		1.14E-03	
Fluorene		POM		2.92E-05 1.28E-5		1.76E-03		3.62E-03	
Phenanthrene		POM		2.94E-05 4.08E-05		5.31E-03		1.03E-02	
Anthracene		POM		1.87E-06 1.23E-06		1.65E-04		3.29E-04	
Fluoranthene		POM		7.61E-06 4.03E-06		5.46E-04		1.11E-03	
Pyrene		POM		4.78E-06 3.71E-06		4.93E-04		9.77E-04	
Benz(a)anthracene		POM		1.68E-06 6.22E-07		8.66E-05		1.81E-04	
Chrysene		POM		3.53E-07 1.53E-06		1.96E-04		3.71E-04	
Benzo(b)fluoranthene		POM		9.91E-08 1.11E-06		1.41E-04		2.66E-04	
Benzo(k)fluoranthene		POM		1.55E-07 2.18E-07		2.84E-05		5.49E-05	
Benzo(a)pyrene		POM		1.88E-07 2.57E-07		3.35E-05		6.48E-05	
Indeno(1,2,3-cd)pyrene		POM		3.75E-07 4.14E-07		5.43E-05		1.06E-04	
Dibenz(a,h)anthracene		POM		5.85E-07 3.46E-07		4.66E-05		9.38E-05	
Benzo(g,h,i)perylene		POM		4.89E-07 5.56E-07		7.28E-05		1.42E-04	
POM Subtotal					2.76E-02		5.36E-02		
Total HAP					2.17E-01		4.51E-01		
* AP-42, Table 3.3-2, (10/96), Diesel Industrial Engines; Tables 3.4-3 & 3.4-4, (10/96), Large Stationary Diesel Engines									
Conversions									
2,000 lb/ton									
907.184 kg/ton									
1.341 hp/kW									

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE:	BY:
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Stationary Source - Diesel Engines - Continued

Diesel GHG Emission Factors: 73.96 kg CO₂/MMBtu 40 CFR Part 98, Table C-1 to Subpart C (11/2013) No.2
3.0E-03 kg CH₄/MMBtu 40 CFR Part 98, Table C-2 to Subpart C (11/2013) Petroleum
6.0E-04 kg N₂O/MMBtu 40 CFR Part 98, Table C-2 to Subpart C (11/2013) Petroleum

Total Diesel Combustion 514,978 MMBtu/yr

Diesel GHG Emissions

Greenhouse Gas	Emissions ton/yr	Global Warming Potential*	CO ₂ e ton/yr
CO ₂	41,984.6	1	41,984.6
CH ₄	1.70	25	42.58
N ₂ O	0.34	298	101.50
Total GHG			42,128.7

* 40 CFR 98, Table A-1

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE:	BY:
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	HAP and GHG Emissions	September 16, 2022

Mobile Source - Diesel & Gasoline Engines

Oh-Highway Vehicles

Description	VMT/yr	Fuel	Fuel Cons.	HAP	CO2e
			MMBtu/yr	ton/yr	ton/yr
Underground Personnel Carriers (475 hp)	84,000	Diesel	1,809	0.0035	148
Surface Pickup Trucks (475 hp)	50,000	Diesel	3,877	0.0075	317
Ford F150 Pickup Truck (375 hp)	50,000	Gas	3,250	0.0063	252
Ford F550 Service Truck (475 hp)	384,000	Diesel	8,271	0.0160	677
UG Service Truck (475 hp)	96,020	Diesel	2,068	0.0040	169
International 7600 Dump Truck (380 hp)	86,400	Diesel	3,665	0.0071	300
International 7600 Water Truck (380 hp)	86,400	Diesel	3,665	0.0071	300
Total			26,606	0.0515	2,163

Mobile Equipment

Description	Fuel	Output	Fuel Consumption	HAP	CO2e
		hp-hr/yr	MMBtu/yr*	ton/yr	ton/yr
Mobile Small Diesel Engines (<=600 hp)	Diesel	22,255,724	155,790	0.3017	12,745
Mobile Large Diesel Engines (>600 hp)	Diesel	34,655,525	242,589	0.1909	19,845
Total			398,379	0.4926	32,590

* Based on brake specific fuel consumption of 7,000 Btu/hp-hr AP-42, Table 3.3-1 chk chk

Diesel and Gasoline HAP Emission Factors and Emissions

Pollutant	POM	Emission Factor*		Emissions
		Gas & Sm Diesel Engir Lg Diesel Engines		
		<=600 hp	>600 hp	
		lb/MMBtu	lb/MMBtu	ton/yr
Benzene		9.33E-04	7.76E-04	1.79E-01
Toluene		4.09E-04	2.81E-4	7.14E-02
Xylenes		2.85E-04	1.93E-4	4.94E-02
1,3-Butadiene		3.91E-05	0.00E+0	3.57E-03
Formaldehyde		1.18E-03	7.89E-5	1.17E-01
Acetaldehyde		7.67E-04	2.52E-5	7.30E-02
Acrolein		9.25E-05	7.88E-6	9.39E-03
Naphthalene	POM	8.48E-05	1.30E-4	2.35E-02
Acenaphthylene	POM	5.06E-06	9.23E-6	1.58E-03
Acenaphthene	POM	1.42E-06	4.68E-6	6.97E-04
Fluorene	POM	2.92E-05	1.28E-5	4.22E-03
Phenanthrene	POM	2.94E-05	4.08E-05	7.63E-03
Anthracene	POM	1.87E-06	1.23E-06	3.20E-04
Fluoranthene	POM	7.61E-06	4.03E-06	1.18E-03
Pyrene	POM	4.78E-06	3.71E-06	8.86E-04
Benz(a)anthracene	POM	1.68E-06	6.22E-07	2.29E-04
Chrysene	POM	3.53E-07	1.53E-06	2.18E-04
Benzo(b)fluoranthene	POM	9.91E-08	1.11E-06	1.44E-04
Benzo(k)fluoranthene	POM	1.55E-07	2.18E-07	4.06E-05
Benzo(a)pyrene	POM	1.88E-07	2.57E-07	4.83E-05
Indeno(1,2,3-cd)pyrene	POM	3.75E-07	4.14E-07	8.44E-05
Dibenz(a,h)anthracene	POM	5.85E-07	3.46E-07	9.53E-05
Benzo(g,h,i)perylene	POM	4.89E-07	5.56E-07	1.12E-04
POM Subtotal				0.04
Total HAP				0.54

* AP-42, Table 3.3-2, (10/96), Gasoline and Diesel Industrial Engines; Tables 3.4-3 & 3.4-4, (10/96), Large Stationary Diesel and all Stationary Dual-fuel Engines

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Mobile Source - Diesel & Gasoline Engines - Continued

Scenario	Option 1
----------	----------

GHG Emission Factors:	73.96 kg CO ₂ /MMBtu	40 CFR Part 98, Table C-1 to Subpart C (11/2013) No.2
	0.003 kg CH ₄ /MMBtu	40 CFR Part 98, Table C-2 to Subpart C (11/2013) Petroleum
	0.0006 kg N ₂ O/MMBtu	40 CFR Part 98, Table C-2 to Subpart C (11/2013) Petroleum
	70.22 kg CO ₂ /MMBtu	41 CFR Part 98, Table C-1 to Subpart C (11/2013) Motor Gasoline

<i>Mobile Equipment Diesel Combustion</i>	421,735 MMBtu/yr
---	------------------

<i>Mobile Equipment Gasoline Combustion</i>	3,250 MMBtu/yr
---	----------------

Mobile Equipment GHG Emissions

	Emissions	Global Warming	CO2e
Greenhouse Gas	ton/yr	Potential*	ton/yr
CO2	34,634	1	34,634
CH4	1.41	25	35
N2O	0.28	298	84
Total Mobile Equipment GHG			34,753

* 40 CFR 98, Table A-1

Conversions

2,000 lb/ton

907.184 kg/ton

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Fugitive Dust Sources - HAP Emissions

Scenario

Option 1

Ore

2,100,000 ton

Waste

1,083,555 ton

Activity Information

PM_TPY

Activity	PM ton/yr	
Surface Exploration Drilling	0.01	See Mine Sheet
Onsite Hauling	147.30	See Mine Sheet
Material Load / Unload	1.21	See Mine Sheet
Dozing	4.40	See Mine Sheet
Grading	10.48	See Mine Sheet
Water Truck Travel	37.39	See Mine Sheet
Wind Erosion	1.06	See Mine Sheet
Process Sources ore aggregate	84.54	See Process Sheet
Ore/Waste Subtotal	286.39	

Compound	Ore ppm	Waste ppm	Average ppm	Emissions ton/yr
Arsenic	1205.95	306.11	899.68	0.258
Beryllium	0.93	0.90	0.92	0.000
Cadmium	2.06	1.50	1.87	0.001
Cobalt	6.80	5.84	6.47	0.002
Chromium	68.48	44.73	60.40	0.017
Mercury	37.45	8.34	27.54	0.008
Manganese	221.67	480.31	309.70	0.089
Nickel	47.25	41.54	45.30	0.013
Lead	39.13	23.44	33.79	0.010
Antimony	196.85	75.68	155.60	0.045
Selenium	2.22	2.54	2.33	0.001
Total				0.442

(NGM 2019d)

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE:	BY:
	Goldrush	G. Barthel
	PROJECT NO:	PAGE: OF: SHEET:
	59-70-9	9 9 HAP&GHG
	SUBJECT:	DATE:
	Process HAP and GHG Emissions	September 16, 2022

Cement Silos

Source Data

Source ID	Source Description	Activity	ton/yr
S2.010	Cement Silo loading	Cement Silo Filling	876,000
S19.204	UG Support Cement Silo Loading (sealed unloading)	Cement Silo Filling	92,000
S19.205	UG Support Fly Ash Silo Loading (sealed unloading)	Cement Supplement Silo Filling	46,000
PF1.009	Feed Conveyor transfer to Mixing Screw 1 or 2	Central Mix Batching	1,510,000

Cement Silo Emission Factors*

All emission factors are for activities with fabric filter.

	Cement Silo Filling	Cement Supplement	Central Mix	Truck Loading
		Silo Filling	Batching	
Pollutant	lb/ton	lb/ton	lb/ton	lb/ton
Arsenic	4.24E-09	1.00E-06	2.96E-07	6.02E-07
Beryllium	4.86E-10	9.04E-08	0.00E+00	1.04E-07
Cadmium	4.68E-09	1.98E-10	7.10E-10	9.06E-09
Chromium	2.90E-08	1.22E-06	1.27E-07	4.10E-06
Lead	1.09E-08	5.20E-07	3.66E-08	1.53E-06
Manganese	1.17E-07	2.56E-07	3.78E-06	2.08E-05
Nickel	4.18E-08	2.28E-06	2.48E-07	4.78E-06
Phosphorus	2.36E-07	3.54E-06	1.60E-06	1.23E-05
Selenium	0.00E+00	7.24E-08	0.00E+00	1.13E-07

*AP-42, Table 11.12-8 (6/06) Concrete Batching

Cement Silo Emissions

	Cement Silo Filling	Cement Supplement	Central Mix	Truck Loading	Total
		Silo Filling	Batching		
Pollutant	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
Arsenic	2.05E-06	2.30E-05	2.23E-04	0.00E+00	2.49E-04
Beryllium	2.35E-07	2.08E-06	0.00E+00	0.00E+00	2.31E-06
Cadmium	2.27E-06	4.55E-09	5.36E-07	0.00E+00	2.81E-06
Chromium	1.40E-05	2.81E-05	9.59E-05	0.00E+00	1.38E-04
Lead	5.28E-06	1.20E-05	2.76E-05	0.00E+00	4.49E-05
Manganese	5.66E-05	5.89E-06	2.85E-03	0.00E+00	2.92E-03
Nickel	2.02E-05	5.24E-05	1.87E-04	0.00E+00	2.60E-04
Phosphorus	1.14E-04	8.14E-05	1.21E-03	0.00E+00	1.40E-03
Selenium	0.00E+00	1.67E-06	0.00E+00	0.00E+00	1.67E-06
Total HAP	2.15E-04	2.07E-04	4.60E-03	0.00E+00	5.02E-03

Conversions

2,000 lb/ton

Storage Tank Emissions

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE:	BY:
	Goldrush	G. Barthel
	PROJECT NO:	PAGE: OF: SHEET:
	59-70-9	1 4 Tanks
	SUBJECT:	DATE:
	Fuel Storage Tanks	November 6, 2019

Fuel Storage Tanks⁽¹⁾

Storage Tank	Type	Capacity gal	Dimensions		Throughput gal/yr	VOC Emissions ⁽²⁾	
			Dia ft	L ft		lb/yr	ton/yr
Gasoline Storage Tank		5,000	8	14.6	240,000	2,347.17	1.174
Diesel Storage Tank #1		10,000	8	26	450,000	6.35	0.003
Diesel Storage Tank #2		10,000	8	26	450,000	6.35	0.003
Diesel Storage Tank #3	horiz	12,000	8	32	450,000	8.96	0.004
Diesel Storage Tank #4	horiz	12,000	8	32	450,000	8.96	0.004
Diesel Storage Tank #5	horiz	12,000	8	32	450,000	8.96	0.004
Diesel Storage Tank #6	horiz	12,000	8	32	450,000	8.96	0.004

⁽¹⁾ (NGM 2020)

⁽²⁾ EPA Tanks 4.0.9d (EPA 2008)

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE:	Goldrush	BY:	G. Barthel
	PROJECT NO:	59-70-9	PAGE:	2
	SUBJECT:	Fuel Storage Tanks	OF:	4
			SHEET:	Tanks
			DATE:	November 6, 2019

Diesel Storage Tanks

8.96 lb/yr

TANKS 4.0.9d

Emissions Report - Summary Format

Tank Identification and Physical Characteristics

Identification

User Identification: Goldrush Diesel

City:

State:

Company:

Type of Tank: Horizontal Tank

Description:

Tank Dimensions

Shell Length (ft): 32.00

Diameter (ft): 8.00

Volume (gallons): 12,000.00

Turnovers: 0.00

Net Throughput(gal/yr): 450,000.00

Is Tank Heated (y/n): N

Is Tank Underground (y/n): N

Paint Characteristics

Shell Color/Shade: White/White

Shell Condition: Good

Breather Vent Settings

Vacuum Settings (psig): -0.03

Pressure Settings (psig): 0.03

Meteorological Data used In Emissions Calculations: Winnemucca, Nevada (Avg Atmospheric Pressure = 12.6 psia)

TANKS 4.0.9d

Emissions Report - Summary Format

Liquid Contents of Storage Tank

Goldrush Diesel - Horizontal Tank

Mixture/Component	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mol. Weight	Vapor Fract.	Liquid Fract.	Mol. Basis for Vapor Pressure Calculations
	Month	Avg.	Min.		Max.	Avg.	Min.					
Distillate fuel oil no. 2 All	51.10	43.23	58.97	49.10	0.0047	0.0036	0.0063	130.0000		188.00	Option 1: VP50 = .0045 VP60 = .0065	

TANKS 4.0.9d

Emissions Report - Summary Format

Individual Tank Emission Totals

Emissions Report for: Annual

Goldrush Diesel - Horizontal Tank

Components	Losses(lbs)		
	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	6.57	2.39	8.96

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE:	Goldrush	BY:	G. Barthel	
	PROJECT NO:	59-70-9	PAGE:	3	OF: 4
	SUBJECT:	Fuel Storage Tanks	SHEET:	Tanks	
			DATE:	November 6, 2019	

Gasoline Storage Tank

2347.17 lb/yr

TANKS 4.0.9d
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification
 User Identification: Goldrush Gasoline
 City:
 State:
 Company:
 Type of Tank: Horizontal Tank
 Description: Goldrush Gasoline Storage Tank

Tank Dimensions
 Shell Length (ft): 14.60
 Diameter (ft): 8.00
 Volume (gallons): 5,000.00
 Turnovers: 0.00
 Net Throughput(gal/yr): 240,000.00
 Is Tank Heated (y/n): N
 Is Tank Underground (y/n): N

Paint Characteristics
 Shell Color/Shade: White/White
 Shell Condition: Good

Breather Vent Settings
 Vacuum Settings (psig): -0.03
 Pressure Settings (psig): 0.03

Meteorological Data used in Emissions Calculations: Winnemucca, Nevada (Avg Atmospheric Pressure = 12.6 psia)

TANKS 4.0.9d
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Goldrush Gasoline - Horizontal Tank

Mixture/Component	Month	Daily Liquid Surf.			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Mol. Weight	Liquid Vapor Fract.	Vapor Liquid Vapor Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Gasoline (RVP 9)	All	51.10	43.23	58.97	48.10	3.8582	3.2784	4.5181	57.0000			92.00	Option 4: RVP=9, ASTM Slope=3

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

Emissions Report for: Annual

Goldrush Gasoline - Horizontal Tank

Components	Losses(lbs)		
	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 9)	1,477.13	870.03	2,347.17

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE:	BY:
	PROJECT NO:	PAGE: OF: SHEET:
	SUBJECT:	DATE:
	Goldrush	G. Barthel
	59-70-9	4 4 Tanks
	Fuel Storage Tanks	November 6, 2019

Diesel Storage Tanks #1 & #2 6.35 lb/yr

TANKS 4.0.9d

Emissions Report - Summary Format

Tank Identification and Physical Characteristics

Identification

User Identification:

Goldrush #1 & #2

City:

Elko

State:

Nevada

Company:

Type of Tank:

Horizontal Tank

Description:

Tank Dimensions

Shell Length (ft):

26.00

Diameter (ft):

8.00

Volume (gallons):

10,000.00

Turnovers:

35.00

Net Throughput(gal/yr):

350,000.00

Is Tank Heated (y/n):

N

Is Tank Underground (y/n):

N

Paint Characteristics

Shell Color/Shade:

White/White

Shell Condition:

Good

Breather Vent Settings

Vacuum Settings (psig):

-0.03

Pressure Settings (psig):

0.03

Meterological Data used In Emissions Calculations: Elko, Nevada (Avg Atmospheric Pressure = 12.25 psia)

TANKS 4.0.9d

Emissions Report - Summary Format

Liquid Contents of Storage Tank

Goldrush #1 & #2 - Horizontal Tank

Elko, Nevada

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Distillate fuel oil no. 2	All	48.72	41.35	56.09	48.77	0.0043	0.0033	0.0057	130.0000			188.00	Option 1: VP40 = .0031 VP50 = .0045

TANKS 4.0.9d

Emissions Report - Summary Format

Individual Tank Emission Totals

Emissions Report for: Annual

Goldrush #1 & #2 - Horizontal Tank

Elko, Nevada

Components	Losses(lbs)		
	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	4.68	1.67	6.35

Gold Quarry Off-Site Transport Emissions

Air Sciences Inc. <			
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Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE: Goldrush		BY: G. Barthel		
	PROJECT NO: 59-70-9		PAGE: 2	OF: 4	SHEET: GQHaul
	SUBJECT: Off-site Hauling to Gold Quarry		DATE: November 6, 2019		

Scenario

Option 1

Off-site Hauling to Gold Quarry

Activity Information

Operating schedule	24 hr/day	365 day/yr	
Ore hauling from Goldrush to Gold Quarry		2,100,000 ton/yr	Ore_tpy
Truck weight (loaded)	104,000 lb	52 ton	(Matrix 2019)
Truck payload	79,000 lb	39.5 ton	(Matrix 2019)
Average Weight		32.25 ton	Loaded trucks one way
Truck loads			
Load/day	146		
Load/year	53,290		

Road Dust Emissions

Route	Haul Length mi*	Road Type	Unpaved Road Control	Control Efficiency	Control Efficiency Reference	Round Trip mi	Total Travel VMT**/yr
Ore Stockpile to SR-306	13.0	Unpaved	Water/Chemical	90%	(Air Sciences 2018)	26.0	1,385,540
SR-306	29.8	Paved	NA	0%		59.6	3,176,084
I-80	19.7	Paved	NA	0%		39.4	2,099,626
SR-766 to Gold Quarry	5.6	Paved	NA	0%		11.2	596,848
Gold Quarry Access Road	1.1	Paved	NA	0%		2.2	117,238
Gold Quarry Haul Road	0.5	Unpaved	Water/Chemical	90%	(Air Sciences 2018)	1	53,290

*Route length provided by Google Maps

** VMT - Vehicle miles traveled

Emission Factors

Paved roads

Emission factor equation

$E = k(sL)^{0.91} * (W)^{1.02}$
AP-42, Sec. 13.2.1, Eq. 1, 1/11

sL = Road surface silt loading:

SR-306	0.2 g/m²	AP-42, Tab. 13.2.1-2, 1/11 (ADT*** = 500-5,000); (NDOT 2014)
I-80	0.06 g/m²	AP-42, Tab. 13.2.1-2, 1/11 (ADT = 5,000-10,000); (AARoads 2003)
SR-766 to Gold Quarry	0.2 g/m²	AP-42, Tab. 13.2.1-2, 1/11 (ADT = 500-5,000); (NDOT 2014)
Gold Quarry Access Road	0.6 g/m²	AP-42, Tab. 13.2.1-2, 1/11 (ADT = < 500)

W = Mean vehicle weight

32.25 ton

*** ADT - Average daily traffic

P = Days/year with ≥0.01 in precip

70 day/yr

AP-42 Fig. 13.2.1-2, 1/11

	PM	PM10	PM2.5
k = Size-specific empirical constant	0.011	0.0022	0.00054

lb/VMT AP-42, Tab. 13.2.1-1, 1/11

Conversions

2,000 lb/ton

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE:	Goldrush		BY:	G. Barthel	
	PROJECT NO:	59-70-9		PAGE:	OF:	SHEET:
	SUBJECT:	Off-site Hauling to Gold Quarry		3	4	GQHaul
DATE: November 6, 2019						

Scenario

Option 1

Off-site Hauling to Gold Quarry - continued

Unpaved roads

Emission factor equation

$E = k(s/12)^a (W/3)^b [(365-P)/365]$

s = Surface material silt content

1.7 %

W = Mean vehicle weight

32.25 ton

P = Days/year with ≥ 0.01 in precip.

70 day/yr

	<u>PM</u>	<u>PM10</u>	<u>PM2.5</u>	
k = Size-specific empirical constant	4.9	1.5	0.15	AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06
a = Size-specific empirical constant	0.7	0.9	0.9	AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06
b = Size-specific empirical constant	0.45	0.45	0.45	AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06

E = Size-specific emission factors:

2.94

0.61

0.06

lb/VMT

Controlled Emission Factors

Route	Type	PM	PM10	PM2.5	Units
Ore Stockpile to SR-306	Unpaved	0.294	0.061	0.006	lb/VMT
SR-306	Paved	0.088	0.018	0.004	lb/VMT
I-80	Paved	0.029	0.006	0.001	lb/VMT
SR-766 to Gold Quarry	Paved	0.088	0.018	0.004	lb/VMT
Gold Quarry Access Road	Paved	0.239	0.048	0.012	lb/VMT
Gold Quarry Haul Road	Unpaved	0.294	0.061	0.006	lb/VMT

Emissions by Area

	PM_TPY	PM10_TPY	PM2.5_TPY
Location of	PM	PM10	PM2.5
Activity	ton/yr	ton/yr	ton/yr
Ore Stockpile to SR-306	203.39	42.12	4.21
SR-306	139.60	27.92	6.85
I-80	30.85	6.17	1.51
SR-766 to Gold Quarry	26.23	5.25	1.29
Gold Quarry Access Road	14.00	2.80	0.69
Gold Quarry Haul Road	7.82	1.62	0.16
Total Road Emissions	421.9	85.9	14.7

Conversions

2,000 lb/ton

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE:	BY:	
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	SUBJECT:	DATE:	
	Goldrush	G. Barthel	
	59-70-9	4 4 GQHaul	
	Off-site Hauling to Gold Quarry	November 6, 2019	

Scenario

Option 1

Off-site Hauling to Gold Quarry - continued

Tailpipe, Brake Wear, and Tire Wear
EPA MOVES2014b Emission Factors (lb/mi)

Route	PM10	PM2.5	CO	NOX	SO2	VOC	GHG
Ore Stockpile to SR-306	1.6E-03	9.3E-04	4.2E-03	1.7E-02	3.0E-05	6.8E-04	4.5
SR-306	5.9E-04	4.3E-04	3.0E-03	1.3E-02	2.2E-05	5.1E-04	3.3
I-80	5.1E-04	4.1E-04	2.8E-03	1.5E-02	2.6E-05	4.5E-04	3.9
SR-766 to Gold Quarry	5.9E-04	4.3E-04	3.0E-03	1.3E-02	2.2E-05	5.1E-04	3.3
Gold Quarry Access Road	1.6E-03	9.3E-04	4.2E-03	1.7E-02	3.0E-05	6.8E-04	4.5
Gold Quarry Haul Road	1.6E-03	9.3E-04	4.2E-03	1.7E-02	3.0E-05	6.8E-04	4.5

(MOVES 2019)

Emissions by Area

	PM_TPY	PM10_TPY	PM2.5_TPY	CO_TPY	NOX_TPY	SO2_TPY	VOC_TPY	GHG_mt
Location of	PM ⁽¹⁾	PM10	PM2.5	CO	NOX	SO2	VOC	GHG
Activity	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
Ore Stockpile to SR-306	1.09	1.09	0.64	2.94	11.77	0.021	0.47	3,122
SR-306	0.93	0.93	0.68	4.75	20.80	0.035	0.82	5,292
I-80	0.53	0.53	0.43	2.97	16.08	0.027	0.47	4,064
SR-766 to Gold Quarry	0.18	0.18	0.13	0.89	3.91	0.007	0.15	995
Gold Quarry Access Road	0.09	0.09	0.05	0.25	1.00	0.002	0.04	264
Gold Quarry Haul Road	0.04	0.04	0.02	0.11	0.45	0.001	0.02	120
Total Tailpipe Emissions	2.86	2.86	1.96	11.92	54.01	0.093	1.97	13,857

⁽¹⁾ PM = PM10

Conversions
2,000 lb/ton

Gold Quarry Off-Site Processing Emissions

Air Sciences Inc. AIR EMISSION CALCULATIONS			PROJECT TITLE: Goldrush			BY: G. Barthel		
			PROJECT NO: 59-70-9			PAGE: 1	OF: 5	SHEET: GQProcess
			SUBJECT: Gold Quarry Ore Processing			DATE: November 6, 2019		

Scenario

Option 1

Gold Quarry Ore Processing Emissions Summary

By Area ID	PM10_TPY	PM2.5_TPY	CO_TPY	NOX_TPY	SO2_TPY	VOC_TPY	Hg_TPY	HAP_TPY	GHG_mt
	PM10	PM2.5	CO	NOX	SO2	VOC	Hg	HAP	GHG
Activity	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	lb/yr	ton/yr	ton/yr
Gold Quarry Ore Processing	19.46	7.53	15.14	13.09	1.62	3.67	113.75	1.50	76,433
Gold Quarry Ore Unloading	0.017	0.003							
Gold Quarry Road Travel	4.55	0.93	0.36	1.45	0.003	0.06			
Total Gold Quarry Ore Processing	24.03	8.46	15.50	14.54	1.62	3.73	113.75	1.50	76,433
	chk	chk	chk	chk	chk	chk	chk	chk	chk

Off-site Ore Processing Cumulative (Goldrush and Cortez) Emissions Summary - Gold Quarry

	PM10	PM2.5	CO	NOX	SO2	GHG
	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
Total Goldrush Off-site Ore Processing	24.0	8.5	15.5	14.5	1.6	76,433
Total Cortez Off-site Ore Processing	39.5	15.3	49.4	69.4	5.93	82,546
Cumulative Off-site Ore Processing	63.5	23.8	64.9	84.0	7.6	158,979

(Air Sciences 2019a)

Conversions

1.10231 ton/mt

Air Sciences Inc.		PROJECT TITLE:		BY:			
		Goldrush		G. Barthel			
		PROJECT NO:		PAGE: OF: SHEET:			
AIR EMISSION CALCULATIONS		59-70-9		2 5 GQProcess			
		SUBJECT:		DATE:			
		Gold Quarry Ore Processing		November 6, 2019			
Scenario Option 1							
Goldrush Ore Processing at Gold Quarry: Criteria and Hg Emissions							
Activity Information							
Total Goldrush Ore Shipped to Gold Quarry		2,100,000 ton/yr		Ore_tpy			
2017 Gold Quarry Information							
Facility-Wide Ore Throughput		15,949,319 ton/yr		(Air Sciences 2019a)			
Roatser Ore Throughput		3,580,661 ton/yr		(NDEP 2017a)			
Reported Emissions ⁽¹⁾							
	PM10	PM2.5 ⁽²⁾	CO	NOx	SO2	VOC	Hg
	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	lb/yr
Gold Quarry	147.80	57.20	114.96	99.41	12.32	27.86	193.95
⁽¹⁾ (NDEP 2017a), (NDEP 2017b)							
⁽²⁾ PM _{2.5} emissions estimated from the ratio of PM _{2.5} to PM ₁₀ emissions of:				0.387		(Air Sciences 2019a)	
Projected Emissions from Processing Goldrush Ore at Gold Quarry							
	PM10	PM2.5	CO	NOx	SO2	VOC	Hg
Activity	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	lb/yr
Gold Quarry Ore Processing	19.46	7.53	15.14	13.09	1.62	3.67	113.75
Goldrush Ore Processing at Gold Quarry: Fugitive Dust Emissions							
Material Unloading							
Activity Information							
Goldrush ore unloading at Gold Quarry		2,100,000 ton/yr					
Emission Factors							
Emission Factor	PM10	1.6E-05 lb/ton		AP-42, Table 11.19.2-2, 8/04, Truck Unloading - Fragmented Stone			
	PM	PM10	PM2.5				
k = Particle size multiplier	0.74	0.35	0.053	AP-42, Sec. 13.2.4, Pg. 4, 11/06			
E = Emission factor	3.4E-05	1.6E-05	2.4E-06	lb/ton	AP-42, Table 11.19.2-2, 8/04 (truck unloading - fragmented stone)		
Emissions from processing Goldrush Ore at Gold Quarry							
	PM10_TPY	PM2.5_TPY					
Activity	ton/yr	ton/yr					
Gold Quarry Ore Unloading	0.017	0.003					
Conversions							
2,000 lb/ton							

Air Sciences Inc. AIR EMISSION CALCULATIONS		PROJECT TITLE: Goldrush		BY: G. Barthel	
		PROJECT NO: 59-70-9		PAGE: 3	OF: 5 SHEET: GQProcess
		SUBJECT: Gold Quarry Ore Processing		DATE: November 6, 2019	

Goldrush Ore Processing at Gold Quarry: Fugitive Dust Emissions - continued

Ore Hauling

Activity Information

Goldrush ore hauling at Gold Quarry2,100,000 ton/yr

Truck weight (loaded)104,000 lb52 ton(Matrix 2019)

Truck payload79,000 lb39.5 ton(Matrix 2019)

Truck loads53,290 load/yr

Road Dust Emissions

Route	Haul Length mi*	Road Type	Unpaved Road Control	Control Efficiency	Control Efficiency Reference	Round Trip mi	Total Travel VMT**/yr
Gold Quarry Access Road	1.1	Paved	NA	0		2.2	117,238
Gold Quarry Haul Road	0.5	Unpaved	Water/Chemical	90%	(Air Sciences 2018)	1	53,290

*Route length provided by Google Maps

** VMT - Vehicle miles traveled

W = Mean vehicle weight32.25 tonLoaded one way

P = Days/year with ≥0.01 in precip.70 day/yrAP-42 Fig. 13.2.1-2, 1/11

Paved roads

Emission factor equationE = k(sL)^{0.91} * (W)^{1.02}AP-42, Sec. 13.2.1, Eq. 1, 1/11

sL = Road surface silt loading:

Gold Quarry Access Road0.6 g/m³AP-42, Tab. 13.2.1-2, 1/11 (ADT = < 500)

k = Size-specific empirical constant0.0110.00220.00054lb/VMTAP-42, Tab. 13.2.1-1, 1/11

E = Size-specific emission factor0.2390.0480.012lb/VMTGold Quarry Access Road

Unpaved roads

Emission factor equationE = k(s/12)^a (W/3)^b [(365-P)/365]

s = Surface material silt content1.7 %

k = Size-specific empirical constant4.91.50.15AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06

a = Size-specific empirical constant0.70.90.9AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06

b = Size-specific empirical constant0.450.450.45AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06

E = Size-specific emission factors:2.940.610.06lb/VMTGold Quarry Haul Road

Controlled emission factors0.2940.0610.006lb/VMT

Emissions by Area

	PM10_TPY	PM2.5_TPY
Location of	PM10	PM2.5
Activity	ton/yr	ton/yr
Gold Quarry Access Road	2.8	0.7
Gold Quarry Haul Road	1.6	0.2
Total Gold Quarry Road Emissions	4.4	0.8

Conversions

2,000 lb/ton

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE: Goldrush		BY: G. Barthel	
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Goldrush Ore Processing at Gold Quarry: Tailpipe Emissions

Tailpipe Emissions

Tailpipe, Brake Wear, and Tire Wear

EPA MOVES2014b Emission Factors (lb/mi)

Route	PM10	PM2.5	CO	NOX	SO2	VOC
Gold Quarry Access Road	0.002	0.001	0.004	0.017	3.0E-05	0.001
Gold Quarry Haul Road	0.002	0.001	0.004	0.017	3.0E-05	0.001

(MOVES 2019)

Emissions by Area

	PM10_TPY	PM2.5_TPY	CO_TPY	NOX_TPY	SO2_TPY	VOC_TPY
Location of	PM10	PM2.5	CO	NOX	SO2	VOC
Activity	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
Gold Quarry Access Road	0.09	0.05	0.25	1.00	0.002	0.04
Gold Quarry Haul Road	0.04	0.02	0.11	0.45	0.001	0.02
Total Gold Quarry Tailpipe Emissions	0.13	0.08	0.36	1.45	0.003	0.06

Goldrush Ore Processing at Gold Quarry: HAP and GHG Emissions

Activity Information

Total Goldrush Ore Shipped to Gold Quarry

2,100,000 ton/yr

Gold Quarry HAP Emissions

2017 Ore Production

15,949,319 ton/yr

(Air Sciences 2019a)

Potential HAP emissions

11.4 ton/yr

(Air Sciences 2019a)

Gold Quarry GHG Emissions

2018 Ore Production

15,502,344 ton/yr

(Air Sciences 2019a)

2018 GHG Emissions (Combustion)

85,353 ton/yr

(Air Sciences 2019a)

2014 Goldstrike Roaster Production

5,667,061 ton/yr

(Air Sciences 2019a)

2014 GHG Emissions (Goldstrike Roaster

175,061 ton/yr

(Air Sciences 2019a)

HAP and GHG Emissions from processing Goldrush Ore

	HAP_TPY	GHG_mt
	HAP	GHG
Activity	ton/yr	ton/yr
Goldrush Ore Processing	1.50	76,433

Conversions

2,000 lb/ton

1.102 ton/mt

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE:	Goldrush		BY:	G. Barthel	
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Goldrush Ore Processing at Gold Quarry

Mercury Deposition

2008 EPA REMSAD modeling

REMSAD PPTM Results: Mercury Deposition Contribution Analysis⁽¹⁾

	Hg0 tpy	Hg2 tpy	HgP tpy	Total lb/yr
Newmont Mining Corporation - Gold Quarry Operations	0.106	0.045	0.008	318

⁽¹⁾ (EPA 2008), page 7-7

Emissions from processing Goldrush ore at Gold Quarry

113.75 lb Hg/yr

36% Goldrush ore mercury emissions represented as a percentage of the Gold Quarry 2008 REMSAD mercury emissions

Maximum Gold Quarry Hg deposition	1.7 g/km ² -yr
Background Hg deposition in same subbasin	15.93 g/km ² -yr
Maximum Goldrush ore Hg deposition	0.61 g/km ² -yr
Goldrush ore Hg deposition as percentage of background	3.8%

Emissions from processing Cortez and Goldrush ore at Gold Quarry

113.7 lb Hg/yr from Goldrush ore	
199.2 lb Hg/yr from Cortez ore	(Air Sciences 2019a)
<u>312.9 lb Hg/yr total</u>	

98% Goldrush and Cortez ore mercury emissions represented as a percentage of the Gold Quarry 2008 REMSAD mercury emissions

Maximum Gold Quarry Hg deposition area	1.7 g/km ² -yr
Background Hg deposition in same area	15.93 g/km ² -yr
Maximum Goldrush and Cortez ore Hg deposition	1.67 g/km ² -yr
Goldrush and Cortez ore Hg deposition as percentage of background	10.5%

Conversion
2,000 lb/ton

Goldstrike Off-Site Transport Emissions

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Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE:	Goldrush			BY:	G. Barthel		
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	SUBJECT:	Off-site Hauling to Goldstrike			DATE:	November 6, 2019		

Scenario

Option 1

Off-site Hauling to Goldstrike - continued

Unpaved roads

Emission factor equation

$E = k(s/12)^a (W/3)^b [(365-P)/365]$

s = Surface material silt content

1.7 %

W = Mean vehicle weight

32.25 ton

P = Days/year with ≥ 0.01 in precip.

70 day/yr

	PM	PM10	PM2.5	
k = Size-specific empirical constant	4.9	1.5	0.15	AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06
a = Size-specific empirical constant	0.7	0.9	0.9	AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06
b = Size-specific empirical constant	0.45	0.45	0.45	AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06

E = Size-specific emission factors:

2.94

0.61

0.06

lb/VMT

Controlled Emission Factors

Route	Type	PM	PM10	PM2.5	Units
Ore Stockpile to SR-306	Unpaved	0.294	0.061	0.006	lb/VMT
SR-306	Paved	0.088	0.018	0.004	lb/VMT
I-80	Paved	0.029	0.006	0.001	lb/VMT
SR-766 to Goldstrike	Paved	0.088	0.018	0.004	lb/VMT
Goldstrike Access Road	Unpaved	0.294	0.061	0.006	lb/VMT
Goldstrike Haul Roads	Unpaved	0.294	0.061	0.006	lb/VMT

Emissions by Area

	PM_TPY	PM10_TPY	PM2.5_TPY
Location of	PM	PM10	PM2.5
Activity	ton/yr	ton/yr	ton/yr
Ore Stockpile to SR-306	203.39	42.12	4.21
SR-306	139.60	27.92	6.85
I-80	30.85	6.17	1.51
SR-766 to Goldstrike	89.01	17.80	4.37
Goldstrike Access Road	70.41	14.58	1.46
Goldstrike Haul Roads	56.17	11.63	1.16
Total Road Emissions	589.43	120.22	19.57

Conversions

2,000 lb/ton

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE: Goldrush		BY: G. Barthel	
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	SUBJECT: Off-site Hauling to Goldstrike		DATE: November 6, 2019	

Scenario

Option 1

Off-site Hauling to Goldstrike - continued

Tailpipe, Brake Wear, and Tire Wear

EPA MOVES2014b Emission Factors (lb/mi)

Route	PM10	PM2.5	CO	NOX	SO2	VOC	CO2e
Ore Stockpile to SR-306	1.6E-03	9.3E-04	4.2E-03	1.7E-02	3.0E-05	6.8E-04	4.5
SR-306	5.9E-04	4.3E-04	3.0E-03	1.3E-02	2.2E-05	5.1E-04	3.3
I-80	5.1E-04	4.1E-04	2.8E-03	1.5E-02	2.6E-05	4.5E-04	3.9
SR-766 to Goldstrike	5.9E-04	4.3E-04	3.0E-03	1.3E-02	2.2E-05	5.1E-04	3.3
Goldstrike Access Road	1.6E-03	9.3E-04	4.2E-03	1.7E-02	3.0E-05	6.8E-04	4.5
Goldstrike Haul Roads	1.6E-03	9.3E-04	4.2E-03	1.7E-02	3.0E-05	6.8E-04	4.5
Goldstrike Haul Roads	1.6E-03	9.3E-04	4.2E-03	1.7E-02	3.0E-05	6.8E-04	4.5

(MOVES 2019)

Emissions by Area

	PM_TPY	PM10_TPY	PM2.5_TPY	CO_TPY	NOX_TPY	SO2_TPY	VOC_TPY	GHG_mt
Location of	PM*	PM10	PM2.5	CO	NOX	SO2	VOC	CO2e
Activity	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
Ore Stockpile to SR-306	1.09	1.09	0.64	2.94	11.77	0.021	0.47	3,122
SR-306	0.93	0.93	0.68	4.75	20.80	0.035	0.82	5,292
I-80	0.53	0.53	0.43	2.97	16.08	0.027	0.47	4,064
SR-766 to Goldstrike	0.59	0.59	0.44	3.03	13.26	0.023	0.52	3,374
Goldstrike Access Road	0.38	0.38	0.22	1.02	4.08	0.007	0.16	1,081
Goldstrike Haul Roads	0.30	0.30	0.18	0.81	3.25	0.006	0.13	862
Total Tailpipe Emissions	3.82	3.82	2.59	15.53	69.24	0.12	2.57	17,795

* PM = PM10

Conversions

2,000 lb/ton

Goldstrike Off-Site Processing Emissions

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE: Goldrush		BY: G. Barthel	
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Scenario

Option 1

Goldstrike Ore Processing Emissions Summary

	PM10_TPY	PM2.5_TPY	CO_TPY	NOX_TPY	SO2_TPY	VOC_TPY	Hg_TPY	HAP_TPY	GHG_mt
Activity	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr	Hg lb/yr	HAP ton/yr	GHG ton/yr
Goldrush Ore Processing	37.81	20.80	11.44	27.53	14.21	3.13	36.03	1.83	133,784
Goldrush Ore Unloading	0.017	0.003							
Goldstrike Road Travel	11.90	1.34	0.81	3.24	0.01	0.13			
Total Goldstrike Ore Processing	49.73	22.13	12.25	30.78	14.21	3.26	36.03	1.83	133,784
	chk	chk	chk	chk	chk	chk	chk	chk	chk

Off-site Ore Hauling Cumulative (Cortez and Goldrush) Emissions Summary - Goldstrike

	PM10	PM2.5	CO	NOX	SO2	GHG
	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
Total Goldrush Off-site Ore Processing	49.7	22.1	12.2	30.8	14.2	133,784
Total Cortez Off-site Ore Processing	52.4	24.7	19.2	38.0	18.2	119,033
Cumulative Off-site Ore Processing	102.1	46.8	31.4	68.7	32.4	252,817

(Air Sciences 2019a)

Conversions

1.10231 ton/mt

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE: Goldrush		BY: G. Barthel	
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	SUBJECT: Goldstrike Ore Processing		DATE: November 6, 2019	

Scenario

Option 1

Goldrush Ore Processing at Goldstrike: Criteria and Hg Emissions

Activity Information

Total Goldrush Ore Shipped to Goldstrike

2,100,000 ton/yr

Ore_tpy

2017 Goldstrike Information

Ore Throughput

10,350,200

(NDEP 2017a)

Reported Emissions⁽¹⁾

	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOx ton/yr	SO2 ton/yr	VOC ton/yr	Hg lb/yr
Goldstrike Emissions	186.35	102.49	56.36	135.70	70.02	15.41	177.57

(1) (NDEP 2017a), (NDEP 2017b)

(2) PM_{2.5} emissions estimated from the ratio of PM_{2.5} to PM₁₀ emissions of:

0.55

(Air Sciences 2017)

Projected Emissions from Processing Goldrush Ore at Goldstrike

	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOx ton/yr	SO2 ton/yr	VOC ton/yr	Hg lb/yr
Goldrush Ore Processing	37.81	20.80	11.44	27.53	14.21	3.13	36.03

Goldrush Ore Processing at Goldstrike: Fugitive Dust Emissions

Material Unloading

Activity Information

Goldrush ore unloading at Goldstrike

2,100,000 ton/yr

Emission Factors

		PM	PM10	PM2.5	
k = Particle size multiplier		0.74	0.35	0.053	AP-42, Sec. 13.2.4, Pg. 4, 11/06
E = Emission factor	Unload	3.4E-05	1.6E-05	2.4E-06	lb/ton AP-42, Table 11.19.2-2, 8/04 (truck unloading - fragmented stone)

Emissions from processing Goldrush Ore

	PM10_TPY	PM2.5_TPY
Activity	PM10 ton/yr	PM2.5 ton/yr
Total Goldrush Ore Unloading	0.017	0.003

Conversions

2,000 lb/ton

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE: Goldrush		BY: G. Barthel	
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Goldrush Ore Processing at Goldstrike: Fugitive Dust Emissions - continued

Ore Hauling

Activity Information

Operating Schedule 365 day/yr

Goldrush ore hauling from Goldrush to Goldstrike 2,100,000 ton/yr

Truck weight (loaded) 104,000 lb 52 ton (Matrix 2019)

Truck payload 79,000 lb 39.5 ton (Matrix 2019)

Truck loads 53,165 load/yr

Route	Haul Length mi ⁽¹⁾	Road Type	Unpaved Road Control	Control Efficiency	Control Efficiency Reference	Round Trip mi	Total Travel VMT/yr
Goldstrike Haul Roads	3.59	Unpaved	Water/Chemical	90%	(Air Sciences 2018)	7.18	381,722

⁽¹⁾ Route length provided by Google Maps

Emission Factors

Emission factor equation $E = k(s/12)^a (W/3)^b [(365-P)/365]$

s = Surface material silt content 1.7 %

W = Mean vehicle weight

Goldstrike Haul Roads 32.25 ton Loaded trucks one way

P = Days/year with ≥0.01 in precip 70 day/yr AP-42 Fig. 13.2.1-2, 1/11

	PM	PM10	PM2.5	
k = Size-specific empirical constant	4.9	1.5	0.15	AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06
a = Size-specific empirical constant	0.7	0.9	0.9	AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06
b = Size-specific empirical constant	0.45	0.45	0.45	AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06
E = Size-specific emission factors:				
Goldstrike Haul Roads	2.94	0.61	0.06	lb/VMT
Controlled emission factors				
Goldstrike Haul Roads	0.294	0.061	0.006	lb/VMT

	PM10_TPY	PM2.5_TPY
Location of Activity	PM10 ton/yr	PM2.5 ton/yr
Goldstrike Haul Roads	11.60	1.16

Conversions
2,000 lb/ton

Air Sciences Inc.

AIR EMISSION CALCULATIONS

Tailpipe Emissions

Route	PM10	PM2.5	CO	NOX	SO2	VOC
Goldstrike Haul Roads (MOVES 2019)	0.002	0.001	0.004	0.017	0.000	0.001

$$^{(1)} \overline{PM} = PM_{10}$$

Activity Information

Goldstrike HAP Emissions		
Maximum Ore Throughput	16,651,300 ton/yr	(Air Sciences 2019)
Potential HAP emissions	14.53 ton/yr	(Air Sciences 2019)
Potential GHG Emissions	1,060,796 ton/yr	(Air Sciences 2019)

Conversions
2,000 lb/ton

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE:	Goldrush			BY:	G. Barthel				
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Goldrush Ore Processing at Goldstrike

Mercury Deposition

2008 EPA REMSAD modeling

REMSAD PPTM Results: Mercury Deposition Contribution Analysis⁽¹⁾

	Hg0 tpy	Hg2 tpy	HgP tpy	Total lb/yr
Barrick Goldstrike Mines, Inc	0.282	0.023	0.007	624

⁽¹⁾ (EPA 2008), page 7-7

Emissions from processing Goldrush ore at Goldstrike

36.03 lb Hg/yr

5.8% Goldrush mercury emissions represented as a percentage of the 2008 REMSAD mercury emissions

Maximum Goldstrike Hg deposition area	0.91 g/km ² -yr
Background Hg deposition in same area	16.86 g/km ² -yr
Maximum Goldrush ore Hg deposition	0.05 g/km ² -yr
Goldrush ore Hg deposition as percentage of background	0.31%

Emissions from processing Goldrush and Cortez ore at Goldstrike

36.0 lb Hg/yr from Goldrush ore	
<u>80 lb Hg/yr from Cortez ore</u>	(Air Sciences 2016)
116.03 lb Hg/yr total	

18.6% Goldrush mercury emissions represented as a percentage of the 2008 REMSAD mercury emissions

Maximum Goldstrike Hg deposition area	0.91 g/km ² -yr
Background Hg deposition in same area	16.86 g/km ² -yr
Maximum Goldrush ore Hg deposition	0.17 g/km ² -yr
Goldrush ore Hg deposition as percentage of background	1.00%

Conversion
2,000 lb/ton

Conversion Factors

Air Sciences Inc.	PROJECT TITLE:		BY:		
	Goldrush		G. Barthel		
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AIR EMISSION CALCULATIONS	59-70-9		1	2	Conv
	SUBJECT:		DATE:		
	Conversions and Constants		November 6, 2019		

Conversions

60 sec/min
3,600 sec/hr
60 min/hr
24 hr/day
8,760 hr/yr
365 day/yr
7,000 gr/lb
453.592 g/lb
1,000 kg/mt
2.20462 lb/kg
2,000 lb/ton
907.184 kg/ton
1.10231 ton/mt
12 in/ft
5280 ft/mi
3.28084 ft/m
1609.34 m/mi
2.2369 mi/hr per m/s
4046.9 m²/acre
43,560 ft²/acre
27 ft³/yd³
35.3147 ft³/m³
7.48052 gal/ft³
3785.41 cm³/gal
3.78541 L/gal
22.4 L/mol
1.341 hp/kW
292.9 kW-hr/MMBtu
459.67 °R at 0°F
68 °F, standard
273.15 K at 0°C
32 °F at 0°C
1.8 °F/°C
1 atm, standard
8.34 lb H₂O/gal
1.0E+06 Btu/MMBtu
1,000 gal/kgal
51.7149 mmHg/psi

Fuel Specifications

15 ppm S content
6.943 lb/gal distillate oil
32.065 lb/lb-mol S, and
64.06 lb/lb-mol SO2
0.007 MMBtu/hp-hr
7,000 Btu/hp-hr
140,000 Btu/gal diesel
0.14 MMBtu/gal diesel
91,500 Btu/gal propane
0.0915 MMBtu/gal Propane
4.24 lb/gal Propane @ 60
6.17 lb/gal gasoline
0.13 MMBtu/gal gasoline
8.34 lb/gal water
1,020 Btu/scf natural gas

Molecular Weights

64.0638 M.W. SO2
32.065 M.W. S
15.9994 M.W. O
28.01 M.W. CO
1.008 M.W. H
35.453 M.W. Cl
14.0067 M.W. N

Model Conversions

1 (g/s)/(g/s)
0.126 (g/s)/(lb/hr)
0.00525 (g/s)/(lb/day)
0.02877 (g/s)/(ton/yr)
1.4E-05 (g/s)/(lb/yr)

Diesel SO2

15 parts S
1.0E+06

6.943 lb
gal diese

64.06 SO2
32.065 S

gal
140,000 Btu

7,440 Btu*
hp-hr

=

1.1E-05 lb SO2
hp-hr

*Conservative value for Clarke Fire Pump Engines 1609.34

15 parts S
1.0E+06

6.943 lb
gal diese

64.06 SO2
32.065 S

=

2.1E-04 lb SO2
gal diesel

gal
0.14 MMBtu

=

0.0015 lb SO2
MMBtu

Propane S

185 lb S
1.00E+06 lb C3H8

44.08 lb C3H8
lb-mol

lb-mol
359.05 SCF (0C)

7,000 gr
lb

100 SCF
100SCF

=

15.90 gr S
100 SCF

AP-42, Chapter 13.2.4 Particle Size Fractions

0.35 PM10
0.053 PM2.5

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Appendix B – Electronic Modeling Files
