APPENDIX B

Air Quality Study

Air Quality Study for Proposed South Quarry Project in Lucerne Valley, California

Mitsubishi Cement Corporation

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Lucerne Valley, CA 92356

October 2016

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List of Acronyms and Abbreviations

AAQS	Ambient Air Quality Standards
AB 32	Assembly Bill 32, Global Warming Solutions Act
ADA	Acid Deposition Analysis
AERMOD	Atmospheric Dispersion Modeling System
ANC	Acid Neutralizing Capacity
AP 42	USEPA Compilation of Air Pollutant Emission Factors
AQ	Air Quality
AQRV	Air Quality Related Value
AVAQMD	Antelope Valley Air Quality Management District
BACT	Best Available Control Technology
BAU	Business as Usual
Btu	British Thermal Unit
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CalEEMod	California Emissions Estimator Model
CALPUFF	USEPA Air Dispersion Model
CAM	Compliance Assurance Monitoring
CARB	California Air Resources Board
CCR	California Code of Regulations
CEIR	Comprehensive Emission Inventory Report
CEQ	Council of Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EKAPCD	Eastern Kern Air Pollution Control District
EPCRA	Emergency Planning and Community Right-to-Know Act
ERC	Emission Reduction Credit
°F	Degrees Fahrenheit
FLAG	Federal Land Managers' Air Quality Related Values Work Group
FLM	Federal Land Manager
g/s	Grams per Second
GBUAPCD	Great Basin Unified Air Pollution Control District
GHG	Greenhouse Gas (e.g., CO_2)
GWP	Global Warming Potential

H_2S	Hydrogen Sulfide
HAP	Hazardous Air Pollutant
HARP	Hotspots Analysis and Reporting Program
HI	Hazard Index
HP	Horsepower
HRA	Health Risk Assessment
HSC or H&SC	Health and Safety Code
IC	Internal Combustion
IWAQM	Interagency Workgroup on Air Quality Modeling
kg/ha/yr	Kilogram per Hectare per Year
km	Kilometer
LAER	Lowest Achievable Emission Rate
m/s	Meters per Second
MAGIC-WAND	USEPA Air Dispersion Model
MCC	Mitsubishi Cement Corporation
MDAB	Mojave Desert Air Basin
MDAQMD	Mojave Desert Air Quality Management District
MEIR	Maximally Exposed Individual Resident
MEIW	Maximally Exposed Individual Worker
mm	Millimeter
MMBtu	Million British Thermal Units
MMtpy	Million Tons per Year
MT	Metric Ton
MT/yr	Metric Tons per Year
N_2O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NO_2	Nitrogen Dioxide
NO_x	Total Oxides of Nitrogen: NO Plus NO_2
NONROAD	USEPA Emissions Calculation Model
NPS	National Park Service
NSPS	New Source Performance Standards
NSR	New Source Review
NWS	National Weather Service
O_3	Ozone
OFFROAD	Off-Road Emissions Model
OEHHA	Office of Environmental Health Hazard Assessment
Pb	Lead
PM	Particulate Matter (or Project Manager)
$PM_{2.5}$	Particulate Matter Less Than 2.5 Microns in Diameter (Fine)

PM_{10}	Particulate Matter Less Than 10 Microns in Diameter (Respirable)
ppb	Parts per Billion
ppm	Parts per Million
PSD	Prevention of Significant Deterioration
SB	Senate Bill
SCAQMD	South Coast Air Quality Management District
SO_2	Sulfur Dioxide
SO_4	Sulfate
SO_x	Total Oxides of Sulfur
TAC	Toxic Air Contaminant
tpy	Tons per Year
TRI	Toxics Release Inventory
ULSD	Ultra-Low-Sulfur Diesel
$\mu g/m^3$	Microgram per Cubic Meter
µm	Micrometer
URBEMIS	Urban Emissions Model
U.S.C.	United States Code
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
VIA	Visibility Impairment Analysis
VISCREEN	Plume Visual Impact Screening Model
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compound (Excluding Exempt Compounds)

Air Quality Study for Proposed South Quarry Project in Lucerne Valley, California

EXECUTIVE SUMMARY

This Air Quality Study is prepared as part of the permit application submittal by Mitsubishi Cement Corporation (MCC) that proposes to establish a new South Quarry at its existing Cushenbury location in Lucerne Valley, California (hereinafter known as the South Quarry Project or Project). MCC proposes to shift a portion of the existing limestone production to a new South Quarry, without an increase in overall mine throughput. This air quality (AQ) study is intended to support a California Environmental Quality Act (CEQA)/National Environmental Policy Act (NEPA) environmental document meeting federal, state, and local requirements.

Criteria pollutant emission calculations were performed for the baseline and post-Project mine activities, including both the construction and operational phases, and the Project construction and operational emission increases were compared with Mojave Desert Air Quality Management District (MDAQMD) CEQA emissions significance thresholds. For both the construction and operational phases, the Project emissions consist of the difference between the baseline and post-Project emissions.

For the construction phase, the baseline consists of operation in the East and West Pits and the post-Project consists of the ongoing operation in the East and West Pits, which are unchanged, plus the construction associated with the South Quarry. The Project emissions (difference between baseline and post-Project emissions) for the construction phase consist of the construction emissions associated with the South Quarry.

For the operational phase, the baseline consists of operation in the East and West Pits and the post-Project consists of the reduced operation in the East and West Pits, plus operation of the new South Quarry. For both the construction and operational phases, the worst-case year was chosen for the Project emissions (year with the largest difference between post-Project and baseline emissions).

Toxic air contaminant (TAC) emission calculations were prepared and a Project health risk assessment (HRA) was performed for the construction and operational phases and compared with the MDAQMD CEQA health risk significance thresholds. Greenhouse gas (GHG) emission calculations were prepared for the construction and operational phases and the Project GHG emissions increase (sum of amortized construction increase and operational increase) was compared with the South Coast Air Quality Management District (SCAQMD) interim CEQA GHG significance threshold for industrial projects. All Project design features, assumptions, emission factors, and throughput calculations are described in this document.

For both the construction and operational phases, based on the Project design features, the Project was found to be below the MDAQMD CEQA emissions and health risk significance thresholds. For the combination of the construction and operational phases, the Project was found to be below the SCAQMD industrial CEQA GHG significance threshold for industrial projects without mitigation (see below for the explanation as to why the SCAQMD industrial threshold was applied in this report). The SCAQMD industrial threshold was used with the concurrence of the lead agencies. Therefore, no further mitigation is required beyond the Project design features indicated.

The West Pit was reviewed in an Environmental Impact Report (EIR) certified by San Bernardino County (the County) in 2004 (SCH No. 2001101044). CEQA guidelines state that where an EIR has been completed for a project, no further environmental review is necessary, except under certain conditions that are not present here (CEQA Guidelines §15162). Therefore, to be consistent with the CEQA guidelines, the starting point for this analysis is the mining development and activities that were reviewed in the 2004 EIR and approved by the County. However, due to changing air quality regulations, this Air Quality Study does not rely exclusively on the 2004-approved West Pit project as the baseline for the South Quarry Project. As discussed in Section 2.0 of this report, California has adopted regulations that require MCC to upgrade its haul truck fleet, and some of the fleet changes will occur over the next several years regardless of whether or not the South Quarry Project is approved. If the 2004-approved West Pit project is used as the only baseline, then emission reductions caused by rule compliance would appear to result from the South Quarry Project. To avoid inadvertently crediting the South Quarry Project with unrelated emission reductions, this report also compares the South Quarry Project emissions to the estimated emissions likely to occur from MCC's mining operations over the next several years without the South Quarry Project. Emission estimates with and without the Project were compared for each year from 2017 to 2022 inclusive. Where appropriate, estimates were also compared with and without Project design features/mitigation measures.

The environmental setting, regulatory requirements, and significance thresholds are presented in Sections 1.0, 2.0, and 3.0, respectively. Section 4.0 provides the Project description and assumptions. Section 5.0 analyzes the criteria pollutants emitted during Project construction and operation. TACs are presented in Section 6.0 and GHG emissions are presented in Section 7.0. Section 8.0 presents the Class I area analysis and Section 9.0 presents conclusions about significance findings and the aforementioned Class I area analysis.

1.0 ENVIRONMENTAL SETTING

1.1 Regional Climate and Meteorological Data

The Project is located within the Mojave Desert Air Basin (MDAB) at an elevation of approximately 4,300 feet above mean sea level. The MDAB is characterized by an array of mountain ranges intermixed with long broad valleys, which often contain dry lake beds. The Sierra Nevada Mountains are to the north and the San Bernardino Mountains border the Mojave Desert to the southwest. Additional mountains separate the MDAB from the coastal region of southern California and the central California regions. Contours of topography, along with the Project area, are shown in Figure 1-1.

During the summer, a large subtropical high pressure system off the coast of California limits cloud formation and encourages sunny conditions in the Mojave Desert. The presence of a thermal low pressure region above the Mojave Desert promotes atmospheric transport from the Los Angeles Basin. During the winter months, the Pacific high pressure area weakens, producing 20 to 30 frontal systems in the region. Some of these frontal systems are strong enough to produce rainfall. Occasionally during the late summer, moist high pressure systems from the west collide with the rising heated air from the desert, producing short and intense thunderstorms that have the potential to produce high winds and flash flooding. The Project area climate is typical of high desert semi-arid regions with hot, dry summers and cool winters with limited precipitation. During the fall and winter months, dry Santa Ana winds come from the northeast, causing severe temperature fluctuations.

Both temperature and precipitation data (Tables 1-1 and 1-2) are obtained from the Barstow-Daggett Airport, referred to as Daggett for the remainder of this document (the Barstow station is a different station and is referenced in some of the other tables in Section 1.0). The Daggett station is about 35 miles northwest of the Project. The Daggett station is close to the Project, is the same station used for the modeling of meteorological data (see below), and offers a comprehensive set of meteorological and ambient air quality data. Other stations are closer to the Project, such as Big Bear City, Crestline, and Hesperia (Table 1-5). However, these stations do not offer a data set as complete as that provided by the Daggett station. Mean monthly temperatures ranged from 48 to 90 degrees Fahrenheit (°F) and daily temperatures ranged from 30 to 100°F. From the period of 2012 to 2014, the maximum daily rainfall was 23.7 millimeters (mm) and the highest monthly rainfall total observed was 45.5 mm. For the 3-year period, average daily rainfall ranged from 0.0 to 0.5 mm.

Table 1-1: Temperature Data (°F) for Daggett, CA, 2012-2014

Month	Maximum	Minimum	Average
January	61.23	30.38	48.46
February	68.82	41.43	53.69
March	75.01	44.54	61.07
April	85.21	50.86	68.21
May	89.66	60.70	76.67
June	99.84	67.93	86.10
July	99.77	79.38	90.41
August	98.00	75.78	88.49
September	91.99	63.70	82.77
October	85.51	53.29	68.92
November	71.89	43.60	57.15
December	61.90	32.65	47.89
Annual	99.84	30.38	69.21

Notes:

1. Data obtained from http://www.arb.ca.gov/aqmis2/metselect.php (Daggett Airport Station).
2. Hourly data is consolidated into daily data, then the daily data is used to calculate the maximum, minimum, and average of the daily data of all three years.
3. Entries in the table are the maximum, minimum, and average of the three years of daily data. For example, for January:
   The maximum column has the highest daily temperature out of January 2012, January 2013, and January 2014.
   The minimum column has the lowest daily temperature out of January 2012, January 2013, and January 2014.
   The average column has the average temperature of all the days in January 2012, January 2013, and January 2014.
4. Data downloaded on March 16, 2016.

Table 1-2: Precipitation Data (mm) for Daggett, CA, 2012-2014

Month	Average Daily	Highest Monthly	Highest Daily
January	0.11	8.90	6.30
February	0.09	6.30	6.00
March	0.11	8.40	8.40
April	0.13	6.30	4.80
May	0.01	0.60	0.30
June	0.00	0.00	0.00
July	0.24	13.80	13.80
August	0.38	19.40	19.10
September	0.16	14.90	12.90
October	0.00	0.30	0.30
November	0.50	45.50	23.70
December	0.37	16.20	9.40
Annual	0.18	45.50	23.70

Notes:

1. Data obtained from http://www.arb.ca.gov/aqmis2/metselect.php (Daggett Airport Station).
2. Hourly data is consolidated into daily data, then the daily data is used to calculate the maximum, minimum, and average of the daily data of all three years.

3. Entries in the table are the average daily, highest monthly, and highest daily values of the three years of daily data. For example, for January:
   The average daily column has the average daily precipitation out of January 2012, January 2013, and January 2014.
   The highest monthly column has the highest monthly precipitation out of January 2012, January 2013, and January 2014.
   The highest daily column has the highest daily precipitation of all the days in January 2012, January 2013, and January 2014.

4. Data downloaded on March 16, 2016.

A wind rose is shown in Figure 1-2 and is based on wind data collected from a National Weather Service (NWS) station located at the Barstow-Daggett Airport near Daggett, California (hereinafter identified as Daggett), during the 5-year period from 2010 through 2014. (The Barstow station is a different station and is referenced in some of the other tables in Section 1.0.) Of the two closest meteorological stations to the Project site, Victorville (29 miles) and Daggett (35 miles), the Daggett site is more representative of the Project area from the perspective of topography and land use. Similar to MCC, the Daggett site is located just north of an east-west oriented mountain range in a rural location. In contrast, the Victorville site is located in an open valley in a suburban location. Based on these considerations, the wind characteristics at the Daggett site are expected to be similar to those at the MCC facility. The wind rose shows that prevailing winds are persistent from the west. The average wind speed at the Daggett site was 5.1 meters per second during the period of record.

1.2 Attainment Status

National and California ambient air quality standards are obtained from the California Air Resources Board (CARB) (http://www.arb.ca.gov/research/aaqs/aaqs2.pdf, October 1, 2015 version) and are shown in Table 1-3.

Table 1-3: National and California Ambient Air Quality Standards

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		National Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)[8]	1 Hour	0.09 ppm (180 $\mu g/m^3$)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 $\mu g/m^3$)		0.070 ppm (137 $\mu g/m^3$)		
Respirable Particulate Matter (PM10)[9]	24 Hour	50 $\mu g/m^3$	Gravimetric or Beta Attenuation	150 $\mu g/m^3$	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 $\mu g/m^3$		—		
Fine Particulate Matter (PM2.5)[9]	24 Hour	—	—	35 $\mu g/m^3$	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 $\mu g/m^3$	Gravimetric or Beta Attenuation	12.0 $\mu g/m^3$	15 $\mu g/m^3$	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	—	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	
Nitrogen Dioxide (NO_2)[10]	1 Hour	0.18 ppm (339 $\mu g/m^3$)	Gas Phase Chemiluminescence	100 ppb (188 $\mu g/m^3$)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 $\mu g/m^3$)		0.053 ppm (100 $\mu g/m^3$)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[11]	1 Hour	0.25 ppm (655 $\mu g/m^3$)	Ultraviolet Fluorescence	75 ppb (196 $\mu g/m^3$)	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	—		—	0.5 ppm (1300 $\mu g/m^3$)	
	24 Hour	0.04 ppm (105 $\mu g/m^3$)		0.14 ppm (for certain areas)[10]	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)[10]	—	
Lead[12,13]	30 Day Average	1.5 $\mu g/m^3$	Atomic Absorption	—	—	High Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 $\mu g/m^3$ (for certain areas)[12]	Same as Primary Standard	
	Rolling 3-Month Average	—		0.15 $\mu g/m^3$		
Visibility Reducing Particles[14]	8 Hour	See footnote 13	Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24 Hour	25 $\mu g/m^3$	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 $\mu g/m^3$)	Ultraviolet Fluorescence			
Vinyl Chloride[12]	24 Hour	0.01 ppm (26 $\mu g/m^3$)	Gas Chromatography			

See footnotes on next page …

1. California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and particulate matter (PM10, PM2.5, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the U.S. EPA for further clarification and current national policies.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. Any equivalent measurement method which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7. Reference method as described by the U.S. EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the U.S. EPA.

8. On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm.

9. On December 14, 2012, the national annual PM2.5 primary standard was lowered from 15 $\mu g/m^3$ to 12.0 $\mu g/m^3$. The existing national 24-hour PM2.5 standards (primary and secondary) were retained at 35 $\mu g/m^3$, as was the annual secondary standard of 15 $\mu g/m^3$. The existing 24-hour PM10 standards (primary and secondary) of 150 $\mu g/m^3$ also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.

10. To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

11. On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

    Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

12. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

13. The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

14. In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

The Project is under the jurisdiction of the MDAQMD. The attainment status of the Project area for the national and California ambient air quality standards for ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than 10 micrometers (μm) in aerodynamic diameter (PM_{10}), particulate matter less than 2.5 μm in aerodynamic diameter ($PM_{2.5}$), and lead (Pb) is summarized in Table 1-4.

Table 1-4: Summary of the Attainment Status of the Mojave Desert Air Basin

Pollutant	Standard[2,3]	Attainment Status	
		National Standard	California Standard
O_3	1-hr	-	Nonattainment
	8-hr	Severe Nonattainment	Nonattainment
CO	1-hr	Unclassifiable/Attainment	Attainment
	8-hr	Unclassifiable/Attainment	Attainment
NO_2	1-hr	Unclassifiable/Attainment	Attainment
	Annual Arithmetic Mean	Unclassifiable/Attainment	Attainment
SO_2	1-hr	Unclassifiable/Attainment	Attainment
	3-hr	Unclassifiable/Attainment	-
	24-hr	Unclassifiable/Attainment	Attainment
	Annual Arithmetic Mean	Unclassifiable/Attainment	-
PM_{10}	24-hr	Moderate Nonattainment	Nonattainment
	Annual Arithmetic Mean	-	Nonattainment
$PM_{2.5}$	24-hr	Unclassifiable/Attainment	-
	Annual Arithmetic Mean	Unclassifiable/Attainment	Nonattainment
Pb	30-Day Average	-	Attainment
	Calendar Quarter	Unclassifiable/Attainment	-
	Rolling 3-Month Average	Unclassifiable/Attainment	-
Visibility Reducing Particles	8-hr	-	Unclassified
Sulfates	24-hr	-	Attainment
Hydrogen Sulfide	1-hr	-	Unclassified
Vinyl Chloride[4]	24-hr	-	-

Notes:

1. Attainment status as of January 15, 2016.
2. Standards based on table available at http://www.arb.ca.gov/research/aaqs/aaqs2.pdf.
3. The year of the standards can be found at http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr81_main_02.tpl.
4. Attainment status is not provided as part of the Area Designation Maps (http://www.arb.ca.gov/desig/adm/adm.htm#state) or area designations list (http://www.arb.ca.gov/regact/2013/area13/area13fro.pdf)

1.3 Ambient Air Quality Data

Several monitoring stations within San Bernardino and surrounding counties measure particulate matter (PM) and gaseous pollutants. The locations of these stations, the pollutants monitored, and approximate distance from the Project are shown in Table 1-5 and Figure 1-3.

Table 1-5: Monitoring Sites Near the Project Site

Monitoring Site	O_3	NO_2	SO_2	CO	PM_{10}	$PM_{2.5}$	Approximate Distance from Project (mi)
Big Bear City – 501 West Valley Boulevard						X	6
Crestline	X				X	X	24
Hesperia – Olive Street	X				X		25
Victorville – 14306 Park Avenue	X	X	X	X	X	X	29
San Bernardino – 4th Street	X	X		X	X	X	29
Joshua Tree – National Monument	X						32
Barstow	X	X		X	X		37
Fontana – Arrow Highway	X	X	X	X	X	X	37
Phelan – Beekley Road and Phelan Road	X						40
29 Palms							48
Lancaster							75
Mojave National Preserve	X						87
Trona – Athol and Telegraph	X	X	X		X		101

Notes:

1. Standards based on table available at http://www.arb.ca.gov/research/aaqs/aaqs2.pdf.
2. The year of the standards can be found at http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr81_main_02.tpl.
3. Attainment status is not provided as part of the Area Designation Maps (http://www.arb.ca.gov/desig/adm/adm.htm#state) or area designations list (http://www.arb.ca.gov/regact/2013/area13/area13fro.pdf)

The Big Bear City monitoring station is the closest to the Project site, but only provided $PM_{2.5}$ data. The closest site to the Project providing data for all pollutants is the Victorville monitoring station (located at 14306 Park Avenue). Tables 1-6 to 1-11 provide summaries of air quality data for monitoring stations close to the Project site, along with any exceedances of the California and National Ambient Air Quality Standards (CAAQS and NAAQS). Data from the 29 Palms, Lancaster, Mojave, and Trona stations are not tabulated due to being incomplete or too far from the Project. In many cases, the stations are in close proximity to major highways and urban developments, so reported concentrations are expected to be conservative estimates compared to the remote location of the Project.

The MDAB is an area of nonattainment for the California and national ozone standards and this is reflected in Table 1-6, which shows multiple days during 2012-2014 where the California and national standards were exceeded.

Table 1-7 shows the PM_{10} data from the years 2012-2014. The MDAB is an area of nonattainment for both the California and national PM_{10} standards. Numerous exceedances of the PM_{10} California standard are reported. The national PM_{10} standard was not exceeded in 2012, but was exceeded in 2013 and 2014. Table 1-8 shows multiple exceedances of the 24-hr $PM_{2.5}$ NAAQS for 2012, 2013, and 2014. Concentrations of CO, NO_2, and SO_2 (Tables 1-9 to 1-11) are below the California and national standards and are consistent with the attainment status for these pollutants.

Table 1-6: Ozone Data for Sites Near the Project Site

Monitoring Site	Exceedance Days			Maximum (ppb)	
	1-hr CAAQS	8-hr CAAQS	2008 8-hr NAAQS	1-hr	8-hr
Calendar Year 2014					
Crestline	50	94	68	130	106
Hesperia – Olive Street	8	40	27	121	94
Victorville – 14306 Park Avenue	3	40	18	122	97
San Bernardino – 4th Street	38	76	51	121	100
Joshua Tree – National Monument	8	65	37	114	96
Barstow	0	37	17	94	87
Fontana – Arrow Highway	31	52	37	127	106
Phelan – Beekley Road and Phelan Road	18	62	36	137	100
Calendar Year 2013					
Crestline	45	101	72	120	106
Hesperia – Olive Street	1	35	12	100	85
Victorville – 14306 Park Avenue	9	60	31	120	97
San Bernardino – 4th Street	22	53	36	139	113
Joshua Tree – National Monument	6	61	26	103	91
Barstow	1	31	10	99	93
Fontana – Arrow Highway	34	68	42	151	123
Phelan – Beekley Road and Phelan Road	11	58	31	113	97
Calendar Year 2012					
Crestline	56	103	86	140	112
Hesperia – Olive Street	21	93	55	116	97
Victorville – 14306 Park Avenue	6	58	28	111	95
San Bernardino – 4th Street	41	77	54	124	109
Joshua Tree – National Monument	16	72	48	109	97
Barstow	0	36	15	90	85
Fontana – Arrow Highway	60	88	62	124	110
Phelan – Beekley Road and Phelan Road	23	87	47	119	108

Notes:

1. Data obtained from http://www.arb.ca.gov/adam/welcome.html.
2. Data downloaded on January 15, 2016.

Table 1-7: PM_{10} Data for Sites Near the Project Site

Monitoring Site	Exceedance Days		State Annual Average (μg/m^3)	High 24-hr Average	
	24-hr NAAQS	24-hr CAAQS		National	State
Calendar Year 2014					
Crestline	0	0	15.6	47.0	39.0
Hesperia – Olive Street	0	*	*	82.7	82.7
Victorville – 14306 Park Avenue	1.0	*	*	246.2	*
San Bernardino – 4th Street	1.0	12.0	32.7	157.2	131.0
Barstow	1.0	*	*	305.8	*
Fontana – Arrow Highway	0	*	*	68.0	65.0
Calendar Year 2013					
Crestline	0	0	18.0	37.0	32.0
Hesperia – Olive Street	*	*	*	49.0	46.3
Victorville – 14306 Park Avenue	*	*	*	77.9	70.6
San Bernardino – 4th Street	1.0	11.5	30.1	177.3	98.0
Barstow	0	*	*	87.1	85.6
Fontana – Arrow Highway	0	90.2	38.8	90.0	86.0
Calendar Year 2012					
Crestline	0	0	15.9	43.0	36.0
Hesperia – Olive Street	0	*	*	45.0	41.0
Victorville – 14306 Park Avenue	0	*	*	45.0	40.0
San Bernardino – 4th Street	0	*	*	68.1	51.0
Barstow	0	0	19.2	42.0	39.0
Fontana – Arrow Highway	0	29.7	32.9	67.0	65.0

Notes:

1. Data obtained from http://www.arb.ca.gov/adam/welcome.html.
2. * indicates insufficient data.
3. Data downloaded on January 15, 2016.

Table 1-8: $PM_{2.5}$ Data for Sites Near the Project Site

Monitoring Site	Exceedance Days 24-hr NAAQS	Annual Average (µg/m^3)		Maximum 24-hr Average (µg/m^3)	
		National	State	National	State
Calendar Year 2014					
Big Bear City – 501 W. Valley Blvd	*	*	*	24.2	24.2
Victorville – 14306 Park Avenue	*	*	*	24.1	24.1
San Bernardino – 4th Street	*	*	*	73.9	73.9
Fontana – Arrow Highway	3.8	13.1		78.9	78.9
Calendar Year 2013					
Big Bear City – 501 W. Valley Blvd	5.8	9.6	6.9	35.5	35.5
Victorville – 14306 Park Avenue	*	*	*	13.1	13.8
San Bernardino – 4th Street	3.3	11.4	*	55.3	55.3
Fontana – Arrow Highway	3.0	12.2	12.2	43.6	43.6
Calendar Year 2012					
Big Bear City – 501 W. Valley Blvd	*	*	*	36.4	36.4
Victorville – 14306 Park Avenue	*	*	*	12.0	12.0
San Bernardino – 4th Street	0	11.7	*	34.8	34.8
Fontana – Arrow Highway	10.6	12.8	*	39.9	39.9

Notes:
1. Data obtained from http://www.arb.ca.gov/adam/welcome.html.
2. * indicates insufficient data.
3. Data downloaded on January 15, 2016.

Table 1-9: CO Data for Sites Near the Project Site

Monitoring Site	Highest Observation [parts per million (ppm)]		Exceedance Days	
	1-hr	8-hr	1-hr, 8-hr NAAQS	1-hr, 8-hr CAAQS
Calendar Year 2012				
Victorville – 14306 Park Avenue	1.9	1.83	0	0
Barstow	0.9	0.66	0	0
Calendar Year 2011				
Victorville – 14306 Park Avenue	1.9	1.51	0	0
Barstow	4.4	1.35	0	0
Calendar Year 2010				
Victorville – 14306 Park Avenue	15.9	5.17	0	0
Barstow	0.9	0.89	0	0

Notes:
1. Data obtained from http://www.arb.ca.gov/adam/welcome.html.
2. Data downloaded on January 19, 2016.

Table 1-10: NO_2 Data for Sites Near the Project Site

Monitoring Site	Max 1-hr (ppm)	Exceedance Days 1-hr CAAQS
Calendar Year 2014		
Victorville – 14306 Park Avenue	0.06	0
Barstow	0.07	0
Calendar Year 2013		
Victorville – 14306 Park Avenue	0.06	0.0
Barstow	0.08	0.0
Calendar Year 2012		
Victorville – 14306 Park Avenue	0.07	0.0
Barstow	0.15	0.0

Notes:
1. Data obtained from http://www.arb.ca.gov/adam/welcome.html.
2. Data downloaded on January 19, 2016.

Table 1-11: SO_2 Data for Sites Near the Project Site

Monitoring Site	Max 1-hr (ppm)	Exceedance Days 1-hr CAAQS
Calendar Year 2013		
Victorville – 14306 Park Avenue	0.002	0.0
Calendar Year 2012		
Victorville – 14306 Park Avenue	0.003	0.0
Calendar Year 2011		
Victorville – 14306 Park Avenue	0.007	0.0

Notes:
1. Data obtained from http://www.arb.ca.gov/adam/welcome.html.
2. Data downloaded on January 19, 2016.

2.0 REGULATORY REQUIREMENTS

2.1 Federal Requirements

Federal air quality policies are regulated through the Clean Air Act (CAA), which was adopted by Congress in 1970 and amended in 1977 and 1990. In accordance with the CAA, nationwide air quality standards were established. The NAAQS indicate the maximum allowable atmospheric concentrations for the seven criteria pollutants, specifically PM_{10}, $PM_{2.5}$, O_3, CO, NO_2, SO_2, and Pb.

The applicability of federal requirements is summarized in Table 2-1. The following background information on the Project is relevant to the applicability discussion for each of the federal regulations discussed in the table:

- This Project is not subject to most federal requirements for stationary sources because this is a mining project and there are no stationary sources included in the Project.
- Mine emission sources include mobile sources (such as haul trucks and other vehicles) and fugitive dust sources, such as roads, active disturbed mine areas, and material handling operations using mobile equipment. There are no stationary internal combustion (IC) engines or other stationary equipment associated with the mine.
- All existing stationary material handling equipment on-site is already permitted and is not being modified as part of this Project. Cement plant throughput and mine throughput are unaffected by the Project.
- The emission changes associated with the Project are due to shifting a portion of activity from the current mine section (East and West Pits) to a proposed mine section (South Quarry).
- In the case of Prevention of Significant Deterioration (PSD) for a project where there are no changes to the cement manufacturing plant, the changes to the mine operations are not included in the PSD applicability determination (only in the evaluation of PSD requirements, once a determination has been reached that PSD applies to the Project). Therefore, this Project, with changes to the mine operations only, is not a PSD project and does not require comparison to PSD thresholds or a PSD increment analysis.
- In the case of a conformity analysis, this Project is below the conformity analysis thresholds, which are 25 ton/year for NO_x and VOCs and 100 ton/year for CO, PM_{10}, $PM_{2.5}$, and SO_x.
- A Class I area analysis, which is a CEQA/NEPA requirement, is discussed in Section 8.0.

The federal requirements applicability determination shown in Table 2-1 is based on the Project features shown in Table 4-2.

Air emissions may have impacts on desert plants near the MCC mine, as shown in the Padgett 2007 paper (Padgett, P., Dobrowolski, W., Arbaugh, M., and S. Eliason, 2007. Patterns of carbonate dust deposition: Implications for four federally endangered plant species. Madroño 54(4): 275-285), and these plant impacts will be evaluated in the biological reports, rather than in this air quality report.

2.2 State Requirements

CARB oversees California air quality policies. CAAQS are shown in Table 1-3 and are typically more stringent than the NAAQS. CAAQS also include four additional pollutants, specifically sulfates, hydrogen sulfide, vinyl chloride, and visibility reducing particulates. California Health and Safety Code (H&SC) Section 41700 prohibits discharges of quantities of air contaminants that cause injury, detriment, nuisance, or annoyance. MDAQMD Rule 402 implements the nuisance provisions of H&SC Section 41700, as discussed below, under local requirements. California H&SC Section 41701 prohibits the discharge of air contaminants (other than uncombined water vapor) by any source for a period of more than an aggregate of three minutes in any one hour if darker in shade than Ringelmann No. 2 (40% opacity). MDAQMD Rule 401 implements stricter restrictions on visible emissions (Ringelmann No. 1) than H&SC 41701. The reduction of PM and criteria pollutant emissions from in-use off-road diesel-fueled vehicles [25 horsepower (hp) or greater] is regulated by CARB through California Code of Regulations (CCR) Title 13, Sections 2449 through 2449.3 (https://www.arb.ca.gov/msprog/ordiesel/ordiesel.htm), referred to as the off-road diesel rule. The purpose of this regulation is to reduce the PM and criteria pollutant emissions from in-use off-road diesel-fueled vehicles 25 hp or greater. All mine equipment must comply with the off-road diesel rule, which requires various fleet changes over a 15-year period, including ongoing vehicle retirements and replacements. We have evaluated the impact of the off-road diesel rule by calculating a baseline that includes the effect of the rule but not the effect of MCC's additional commitment to accelerated turnover of the fleet (as reflected in the post-Project scenario with mitigation).

Under California's Assembly Bill 32 (AB 32), a series of GHG rules have been promulgated for industrial sources, including rules pertaining to GHG reporting and GHG reduction over the next few years. The various AB 32 rules applying to industrial sources affect both stationary sources and mobile sources, and include the following:

- AB 32 mandatory reporting, which requires annual reporting of GHG emissions;
- AB 32 cap-and-trade facility requirements, which require facilities to purchase emission credits for GHG emissions beyond a diminishing allocation of credits;
- AB 32 cap-and-trade fuel requirements (applied to transportation fuel suppliers), where fuel suppliers purchase credits from the same credit market as stationary facilities;
- Senate Bill 375 (SB 375), which regulates government planning efforts and promotes infill projects and other strategies to reduce vehicle use; and
- Other AB 32 Scoping Plan measures for smaller sources that are not subject to AB 32 cap-and-trade, including agricultural and other sources.

For the MCC South Quarry Project, there are no stationary sources in the new quarry that are subject to the AB 32 cap-and-trade facility regulations on a facility basis. However, the GHG from the fuels used in mobile sources have been accounted for in the AB 32 cap-and-trade program. Hence, the main effect of the AB 32 rule suite on the South Quarry Project is that fuel purchases for existing sources and for Project increases will be accounted for in the AB 32 cap-and-trade program and GHG from fuel usage will be subjected to a collective declining cap. The fuel suppliers, not the customers, are responsible for regulatory compliance, but the fuel suppliers may pass on these costs to the customers. SB 375 aims to reduce emissions from automobiles and light-duty trucks through land use and transportation planning, but does not apply to the South Quarry Project because the Project does not increase the use of automobiles or light-duty trucks. The first update to the Scoping Plan (dated May 2014) identified future GHG emission reduction measures relating to energy assessment, energy efficiency standards for industrial equipment, water conservation and water efficiency standards, and off-road diesel truck GHG standards, among others. As CARB adopts regulations implementing the measures, MCC may be required to take additional steps to reduce GHGs in accordance with the adopted regulations.

2.3 Local Requirements

The Project is subject to specific MDAQMD prohibitory regulations as discussed below. The applicability of MDAQMD requirements is summarized in Table 2-1. No MDAQMD Regulation Xl source-specific standards apply to the Project.

2.3.1 Regulation IV – Prohibitions

2.3.1.1 Rule 401 – Visible Emissions: Limits the opacity of exhaust into the atmosphere darker than Ringelmann No. 1 (20% opacity) to no more than an aggregate of three minutes in any one hour.

The Project will comply with Rule 401 because there will be measures in place to control visible emissions, including the watering of unpaved roads and other controls.

2.3.1.2 Rule 402 – Nuisance: Prohibits the discharge of air contaminants that cause injury, detriment, nuisance, or annoyance to any considerable number of people or damage to any business or property.

The Project will comply with Rule 402 because there will be control measures in place to avoid nuisance due to fugitive dust or mobile source emissions. The control measures to address mobile source emissions include compliance with the CARB off-road diesel control measure and accelerated haul truck retrofit that goes beyond the requirements of the CARB off-road diesel rule. The control measures to address fugitive dust emissions are listed under Rule 403.

2.3.1.3 Rule 403 – Fugitive Dust: Prohibits the emissions of fugitive dust from any transport, handling, construction, or storage activity that remains visible beyond the property line of the emission source.

The Project will comply with Rule 403 because fugitive dust emissions will be controlled such that no dust remains visible beyond the property line, which, in this case, is the Project boundary shown on Figure 1-4. Watering is used as a fugitive dust control measure in the baseline for the West Pit and will be extended to the following activities in the South Quarry:

- Bulldozing, scraping, and grading of materials;
- Material handling (limestone ore and waste rock); and
- Unpaved roads (wind erosion and dust entrainment).

2.3.1.4 Rule 403.2 – Fugitive Dust Control for the Mojave Desert Planning Area

Rule 403.2 includes fugitive dust control requirements for the watering of unpaved roads, minimizing trackout onto paved surfaces, stabilizing graded surfaces, conveyor and transfer point dust controls, storage pile controls, and other similar dust controls, including both general requirements and requirements specific to limestone processing facilities.

MCC is already in compliance with these requirements for the existing mine, and the Project will comply with these requirements in the same manner.

2.3.1.5 Rule 431 – Sulfur Content of Liquid Fuels: Places limits on the sulfur content of diesel and other liquid fuels to control the formation of sulfur oxides and particulates during combustion.

The Project will comply with Rule 431 because the diesel fuel used will be ultra-low-sulfur diesel (ULSD).

Table 2-1: Regulation Applicability

Regulation	Description	Applicability
Federal Requirements		
Ambient Air Quality Standards, Code of Federal Regulations (CFR) Title 40 Part 50	Establishes Ambient Air Quality Standards (AAQS) for criteria pollutants.	The NAAQS are not enforced directly against a source, but are relevant to the impact analysis.
National Emission Standards for Hazardous Air Pollutants (NESHAP), 40 CFR Part 63	Establishes emission standards for hazardous air pollutants (HAPs).	Not applicable because no stationary sources are being modified.
PSD CAA §160-169A, United States Code (U.S.C.) Title 42 §7470-7491, 40 CFR Part 52	Requires preconstruction review, facility permitting, Best Available Control Technology (BACT), and increment consumption analysis for significant emissions from new major sources.	Not applicable because the Project is below PSD major modification thresholds.
Nonattainment New Source Review (NSR) CAA, §171-193, 42 U.S.C. §7501, 40 CFR Part 51	Requires preconstruction review, facility permitting, Lowest Achievable Emission Rate (LAER), and emission offsets for construction or modification of specified stationary sources. NSR applies to pollutants in cases where the area in which the project is located is designated nonattainment for NAAQS.	Not applicable because there are no modifications to permitted stationary sources.
Acid Rain Protection CAA, §401 (Title IV), 42 U.S.C. §7651, 40 CFR Part 72	Requires reductions in NO_x and SO_2 emissions to reduce acid deposition.	Not applicable because no stationary sources are being modified.
Federal Operating Permits Program CAA, §501 (Title V), 42 U.S.C. §7661, 40 CFR Part 70	Establishes a comprehensive operating permit program for major stationary sources.	Not applicable because no stationary sources are being modified.
New Source Performance Standards (NSPS) CAA, §111, 42 U.S.C. §7411, 40 CFR Part 60	Establishes national performance standards for new stationary sources.	Not applicable because no stationary sources are being modified.
Compliance Assurance Monitoring (CAM) CAA, §114, 42 U.S.C. §7414, 40 CFR Part 64	Requires the operation, maintenance, and monitoring of emission control systems.	Not applicable because no stationary sources are being modified.

Regulation	Description	Applicability
Emergency Planning and Community Right-to-Know Act (EPCRA) Toxic Release Inventory (TRI), 42 U.S.C. Ch. 116, 40 CFR Part 372	Requires reporting releases of toxic materials to the environment if the facility manufactures, processes, or otherwise uses more than specified quantities of toxics,	Not applicable because limestone mining operations are not subject to TRI requirements.
State Requirements		
California H&SC §41700	Prohibits discharges of quantities of air contaminants that cause injury, detriments, nuisance, or annoyance. See MDAQMD Rule 402 for nuisance provisions.	Applicable
California H&SC §41701	Prohibits the discharge of air contaminants (other than uncombined water vapor) by any source for a period of no more than an aggregate of three minutes in any one hour if darker in shade than Ringelmann No. 2 (40% opacity).	Applicable
CCR Title 13 §2449-2449.3	The purpose of this regulation is to reduce the PM and criteria pollutant emissions from in-use off-road diesel-fueled vehicles 25 hp or greater.	Applicable. All mine equipment must comply with the off-road diesel rule, which requires various fleet changes over a 15-year period, including ongoing vehicle retirements and replacements. We have evaluated the impact of the off-road diesel rule by calculating a baseline that includes the effect of the rule but not the effect of MCC's additional commitment to accelerated turnover of the fleet (as reflected in the post-Project scenario with mitigation).

Regulation	Description	Applicability
AB 32, California H&SC Division 25.5, §38500, CCR Title 17, Article 5	AB 32 rules include rules for GHG reporting, GHG cap-and-trade, and other GHG reduction measures.	AB 32 is not directly applicable to the South Quarry Project, because the South Quarry emissions are not subject to AB 32 cap-and-trade for facilities. However, the GHG from the fuels used in mobile sources have been accounted for in the AB 32 cap-and-trade program (through the regulation of fuel suppliers) and are subjected to the collective declining cap.
Local Requirements		
Regulation I – General Provisions	Includes general provisions, such as definitions, district boundaries, source test reporting, authorities, certifications, and programs.	Applicable in connection with prohibitions under MDAQMD Regulation IV.
MDAQMD Regulation II – Permits	Defines the requirements for stationary sources to obtain permits.	Not applicable because no stationary sources are being modified.
MDAQMD Regulation III – Fees	Identifies the required fees to obtain permits for various activities.	Not applicable because no stationary sources are being modified.
MDAQMD Regulation IV – Prohibitions R401 (Visible Emissions) R402 (Nuisance) R403 (Fugitive Dust) R403.2 (Fugitive Dust Control, Mojave Desert Planning Area) R431 (Sulfur Content of Fuel)	Establishes activities and emissions that are prohibited.	The Project is subject to the indicated rules only.
Regulation V – Procedures Before the Hearing Board	Describes Hearing Board procedures.	Not applicable at this stage because the Hearing Board does not have a role in approving this Project.

Regulation	Description	Applicability
Regulation VI – Orchard or Citrus Grove Heaters (Rescinded)	Rescinded	Not applicable because the regulation was rescinded.
Regulation VII – Emergencies	Describes procedures for air quality emergencies.	Not applicable at this stage because emergencies will be as announced by the MDAQMD in the future.
Regulation VIII – Orders for Abatement	Describes procedures for abatement orders.	Not applicable at this stage because there are no abatement orders for this Project.
MDAQMD Regulation IX – Standards of Performance for New Stationary Sources (NSPS)	Implements federal NSPS.	Not applicable because no stationary sources are being modified.
Regulation X – Emission Standards for Additional Specific Air Contaminants (NESHAP)	Provides emission standards for hazardous air pollutants.	Not applicable because no stationary sources are being modified.
MDAQMD Regulation XI – Source-Specific Standards	Provides emissions standards for specific source types.	Not applicable because no new sources subject to Regulation XI are being modified.
MDAQMD Regulation XII – Federal Operating Permit Program (Title V)	Implements the federal Title V Operating Permits Program and the Title IV Acid Rain Program.	Not applicable because no stationary sources are being modified.
MDAQMD Regulation XIII – NSR for Criteria Pollutants (NSR)	Provides the preconstruction permitting requirements for major stationary sources of air pollution.	Not applicable because no stationary sources are being modified.
Regulation XIV – Emission Reduction Credit (ERC) Banking	Describes procedures for ERC banking.	Not applicable because this Project is not involved in ERC banking.
Regulation XV – Emission Standards for Specific TACs	Describes inventory procedures for TACs.	Not applicable because South Quarry Project is not a new facility subject to the regulation.
Regulation XVII – Indirect Sources and Transportation Control	Rescinded	Not applicable because the regulation was rescinded.
Regulation XX – Conformity	Describes how transportation programs conform with state and federal air quality goals.	Not applicable because the South Quarry Project is not associated with a transportation program.

3.0 SIGNIFICANCE THRESHOLDS

3.1 Criteria Pollutants and TACs

The County and the United States Forest Service (USFS) have not adopted air quality significance thresholds for CEQA or NEPA review of emissions of criteria pollutants or TACs. Appendix G of the state CEQA Guidelines, Section III, Air Quality, states the following: "Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the (significance) determinations." The County's CEQA checklist is similar to Appendix G. It includes a similar list of questions to probe air quality impacts and a similar statement that the significance criteria of the relevant air quality management district may be used to determine the significance of air quality impacts. The County's CEQA Checklist provides:

> Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Will the Project:
>
> 1. Conflict with or obstruct implementation of the applicable air quality plan?
> 2. Violate any air quality standard or contribute substantially to an existing or projected air quality violation?
> 3. Result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions, which exceed quantitative thresholds for ozone precursors)?
> 4. Expose sensitive receptors to substantial pollutant concentrations?
> 5. Create objectionable odors affecting a substantial number of people?

The MDAQMD has adopted CEQA significance thresholds, which can be found in its *California Environmental Quality Act (CEQA) and Federal Conformity Guidelines,* dated August 2016. The County reviewed the Air Quality Study and has confirmed it will be acceptable to rely on the MDAQMD's CEQA significance thresholds in evaluating the impacts of the South Quarry Project (e-mail correspondence from Reuben Arceo, who works in the Land Use Services Department at the County, to Anne Surdzial, of ECORP Consulting, Inc., dated September 16, 2016). Thus, the thresholds adopted by the MDAQMD are applied here.

The MDAQMD's CEQA significance thresholds for criteria pollutants, TACs, and GHGs are listed in Table 3-1. These include emission significance thresholds, Project health risk significance thresholds, and other significance thresholds.

Table 3-1: MDAQMD Significance Thresholds

Any project is significant if it triggers or exceeds the most appropriate evaluation criteria. The District will clarify upon request which threshold is most appropriate for a given project; in general, the emissions comparison (criteria number I) is sufficient:

1. Generates total emissions (direct and indirect) in excess of the thresholds given in Table 6;
2. Generates a violation of any ambient air quality standard when added to the local background;
3. Does not conform with the applicable attainment or maintenance plan(s)[1]; and
4. Exposes sensitive receptors to substantial pollutant concentrations, including those resulting in a cancer risk greater than or equal to 10 in a million and/or a Hazard Index (HI) (non-cancerous) greater than or equal to 1[2].

[1] A project is deemed to not exceed this threshold, and hence not be significant, if it is consistent with the existing land use plan. Zoning changes, specific plans, general plan amendments and similar land use plan changes which do not increase dwelling unit density, do not increase vehicle trips, and do not increase vehicle miles traveled are also deemed to not exceed this threshold.

[2] Sensitive Receptor Land Uses

Residences, schools, daycare centers, playgrounds and medical facilities are considered sensitive receptor land uses. The following project types proposed for sites within the specified distance to an existing or planned (zoned) sensitive receptor land use must be evaluated using significance threshold criteria number 4 (refer to the significance threshold discussion):

- Any industrial project within 1,000 feet;
- A distribution center (40 or more trucks per day) within 1,000 feet;
- A major transportation project (50,000 or more vehicles per day) within 1,000 feet;
- A dry cleaner using perchloroethylene within 500 feet; and
- A gasoline dispensing facility within 300 feet.

A significant project must incorporate mitigation sufficient to reduce its impact to a level that is not significant. A project that cannot be mitigated to a level that is not significant must incorporate all feasible mitigation. Note that the emission thresholds are given as a daily value and an annual value, so that multi-phased project (such as project with a construction phase and a separate operational phase) with phases shorter than one year can be compared to the daily value.

Criteria Pollutant	Annual Threshold (tons)	Daily Threshold (pounds)
Greenhouse Gases (CO_2e)	100,000	548,000
Carbon Monoxide (CO)	100	548
Oxides of Nitrogen (NO_x)	25	137
Volatile Organic Compounds (VOCs)	25	137
Oxides of Sulfur (SO_x)	25	137
Particulate Matter (PM_{10})	15	82
Particulate Matter ($PM_{2.5}$)	12	65
Hydrogen Sulfide (H_2S)	10	54
Lead (Pb)	0.6	3

Notes:
1. MDAQMD CEQA and Federal Conformity Guidelines, August 2016, http://www.mdaqmd.ca.gov/index.aspx?page=13.

The MDAQMD's *CEQA and Federal Conformity Guidelines* state: "In general, the emissions comparison (criteria number 1) is sufficient." The *Guidelines* further explain that criteria 2 through 4 are not applicable to all projects and that the most appropriate evaluation criteria should be selected (in consultation with MDAQMD staff, if necessary).

For the South Quarry Project, MDAQMD staff confirmed that significance criteria 1 and 4 should be applied, but that criteria 2 and 3 are not required (via a telephone conversation with Alan DeSalvio on January 21, 2016). Industrial projects that are below the emissions and health risk significance thresholds are also considered less than significant vis a vis the thresholds relating to violation of an AAQS or nonconformance with the applicable attainment plan. This is because, in the experience of the MDAQMD, an industrial project with emissions less than the MDAQMD mass emissions significance thresholds (significance threshold #1) is unlikely to generate a violation of an AAQS when added to the local background (significance threshold #2), and therefore it is not necessary to conduct ambient air quality modeling for projects with emissions below the mass emissions threshold. Also, an industrial project with emissions of criteria pollutants less than the MDAQMD mass emissions significance thresholds (significance threshold #1) is considered to conform with the applicable attainment or maintenance plans (significance criteria #3).

The MDAQMD CEQA significance thresholds (emissions and health risk) are intended to address all air quality questions in the County's CEQA checklist, except the odor question. The Project will not generate any odors affecting a substantial number of people for the following reasons:

- The only potential odor sources associated with the Project are the diesel emission sources, and the emissions from these sources will be controlled per CARB's off-road diesel control measure.
- For any residual odors that are not eliminated by the PM control equipment implemented for compliance with the CARB off-road diesel control measure and for accelerated haul truck retrofit that goes beyond the requirements of the CARB off-road diesel rule, these odors are expected to be dissipated by the property line, which is some distance from the emission point.
- The nearest residences and businesses to MCC are located approximately one-half mile from the property line. The nearest sensitive receptors are over three miles from the property line.

Therefore, odors will not be evaluated further in this Air Quality Study.

3.2 GHG Emissions and Global Climate Change

3.2.1 NEPA

There is no adopted quantitative threshold for determining the significance of climate change impacts under NEPA. On August 1, 2016, the Council of Environmental Quality (CEQ) issued final guidance to assist federal agencies in their consideration of the effects of GHG emissions and climate change [Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews (the Final Guidance)]. The Final Guidance recognizes that the totality of climate change impacts is not attributable to any single action, but is exacerbated by a series of actions, including actions and decisions by federal agencies. As such, a NEPA document should do more than state that the emissions from the proposed federal action represent only a small fraction of global GHG emissions. The Final Guidance recommends that agencies quantify the direct and indirect GHG emissions of a project using available data and quantification tools. The Final Guidance "does not establish any particular quantity of GHG emissions as 'significantly' affecting the quality of the human environment," but agencies should "focus on significant potential effects and conduct an analysis that is proportionate to the environmental consequences of the proposed action." The CEQ's guidance confirms that federal agencies should continue to apply basic NEPA principles as set forth in CEQ Regulations (40 CFR §1502.16). NEPA regulations require that the federal agency consider both context and intensity, in addition to setting out ten factors that should be taken into account to determine whether impacts are significant (40 CFR §1508.27).

USFS guidance regarding NEPA and climate change encourages quantitative or qualitative analysis where there is a cause-and-effect relationship between the proposed project and GHG emissions or the carbon cycle. Such analysis would be meaningful to a reasoned choice among alternatives (Climate Change Considerations in Project Level NEPA Analysis, January 13, 2009). The USFS guidance reviews the ten intensity factors that, together with context, are used to determine the significance of impacts under NEPA. When applying these factors to federal action involving a site-specific project, the USFS guidance explains that significance usually depends on the effects in the locale, rather than the world as a whole. For this reason, actions potentially having effects on climate change that are not discernable at the global scale are unlikely to be determined significant for climate change impacts. The guidance states that "[b]ecause the context of individual projects and their effects cannot be meaningfully evaluated globally to inform individual project decisions, it is not possible and it is not expected that climate change effects can be found to be 'significant' under NEPA and therefore require EIS preparation." However, in cases where a state has adopted a GHG threshold by law or regulation, the USFS guidance states that the environmental analysis needs to address the project's relationship to that threshold.

The Project would not ordinarily trigger detailed NEPA review of climate change impacts under the USFS climate change guidance alone. However, because certain local agencies have adopted local significance thresholds and the GHG emissions will be quantified for the purposes of CEQA, the USFS climate change guidance states that the emissions quantification and analysis is also relevant to its review of the Project. Therefore, if the Project's climate change impact is determined to be less than significant under CEQA, it will be considered less than significant under NEPA as well.

3.2.2 CEQA

Under CEQA Guidelines Section 15064, a lead agency has the discretion to develop and apply a significance threshold that it determines is appropriate for the specific project before it (*Save Cuyama Valley v. County of Santa Barbara* (2013) 213 Cal.App.4th 1059). Alternatively, under CEQA Guidelines 15064.7, an agency may develop and publish thresholds of significance intended for general use as part of the agency's environmental review process. Significance thresholds may be quantitative, qualitative, or performance-based levels. For assessing climate change impacts in particular, the significance threshold may also be based on compliance with a statewide, regional, or local plan designed to reduce or mitigate GHGs (CEQA Guidelines Section 15064.4).

At the time MCC submitted its proposed Plan of Operations and Reclamation Plan, neither the County nor the MDAQMD had adopted a discrete significance threshold for evaluating the global climate change impacts of a project under CEQA. Accordingly, as approved by the County (via a telephone conversation between Doug Feremenga, from the County, and Jocelyn Thompson, of Alston & Bird LLP, on December 3, 2009), the initial Air Quality Study for the South Quarry Project applied the industrial CEQA GHG significance threshold for industrial projects adopted by the SCAQMD (SCAQMD Industrial Threshold). Under the SCAQMD Industrial Threshold, the Project would be considered to have a significant impact on climate change if it would generate more than 10,000 MT/year of GHG emissions [carbon dioxide equivalent (CO_2e)].

Since that time, both the County and the MDAQMD have adopted CEQA significance thresholds for GHGs and climate change. The County followed the approach described in CEQA Guidelines Section 15064.4, adopting a regional plan with mitigation and emissions reduction measures. A project that complies with the plan is considered less than significant under CEQA. The MDAQMD adopted a quantitative threshold that is considerably higher than the SCAQMD threshold applied in the prior version of this Air Quality Study. Both of these thresholds are described in greater detail below.

In 2011, the County amended its General Plan to include the *San Bernardino County Regional Greenhouse Gas Reduction Plan* (GHG Emissions Reduction Plan) (see latest version dated March 2014). At the same time, it amended the County Development Code through the addition of Chapter 84.30, Greenhouse Gas Emission Reduction Plan Implementation, which requires new projects to comply with the development standards in Appendix F of the GHG Emissions Reduction Plan. Also, Section 85.03.040 of the County Development Code was amended to require the evaluation of potential GHG impacts from land use applications subject to CEQA review. The County's guidance document, titled *GHG Development Review Processes* (Development Review Process), was updated most recently in March 2015.

An important County objective in adopting the GHG Emissions Reduction Plan was to provide for streamlined CEQA review of future projects that are consistent with the GHG Emissions Reduction Plan. The GHG Emissions Reduction Plan includes an emissions inventory, a reduction target, goals, policies, and measures designed to achieve the target reductions, and a mechanism to monitor progress. The reduction target is a 15% reduction in GHG emissions from the 2007 emissions inventory by 2020, which the County determined corresponds to the AB 32 objective of reducing GHG emissions to 1990 emissions levels by 2020. In addition, the County explained that the GHG Emissions Reduction Plan would set it on a path to achieve more substantial long term reductions in the post-2020 period.

The County's GHG Emission Reduction Plan has several pathways for assessing CEQA significance. First, the GHG Emissions Reduction Plan establishes a review threshold of 3,000 MT/year CO_2e. Projects that are exempt from CEQA and projects with emissions below the review threshold that comply with applicable provisions in the County

Development Code and California law (e.g., energy efficiency provisions of the Building Code) are considered consistent with the GHG Emissions Reduction Plan and less than significant under CEQA. Such projects do not require further detailed analysis. Second, at such time that the SCAQMD or the MDAQMD adopt GHG performance standards, the County will consider such standards in assessing CEQA significance. Third, the GHG Emissions Reduction Plan includes screening tables that identify GHG reduction measures and assign points to each measure based on its expected value in reducing emissions. Projects with emissions exceeding the 3,000 MT/year review threshold may use the screening tables to select appropriate reduction measures, and projects that incorporate measures garnering 100 points or more are considered consistent with the GHG Emissions Reduction Plan and therefore less than significant under CEQA. Fourth, projects with emissions exceeding the 3,000 MT/year review threshold may be considered consistent with the GHG Emissions Reduction Plan and less than significant under CEQA if they achieve the equivalent level of GHG emissions efficiency as a 100-point project. A fifth pathway is specified for certain residential projects outside a city's sphere of influence.

As presented in Section 7 of this Air Quality Study, the emissions increase from the South Quarry Project is estimated to remain less than the County screening threshold of 3,000 MT/year CO_2e and, therefore, could be considered less than significant under the County's GHG Emission Reduction Plan. However, the GHG Emissions Reduction Plan is not the most appropriate significance threshold for the South Quarry Project. In 2015, the California Supreme Court provided additional direction regarding CEQA GHG analysis in its decision in *Center for Biological Diversity v. California Department of Fish and Wildlife*, 62 Cal.4th 204. The court confirmed that lead agencies have wide latitude in selecting a significance threshold for GHGs and climate change. The court approved, in concept, using efficiency or performance thresholds keyed to the goals in the AB 32 Scoping Plan, which is designed to cut approximately 29% from business as usual (BAU) emission levels projected for 2020. However, the court found fault in the lead agency using the Scoping Plan's overall 29% reduction from the BAU goal as a significance threshold for a project-level EIR. The court suggested that the lead agency needed evidence that the 29% reduction level was the appropriate amount of reduction for the type of project at issue, as opposed to an aggregate, statewide objective across all types of activities, both existing and proposed. The screening tables in the County's GHG Emissions Reduction Plan identify with particularity measures determined to be appropriate and generally feasible for the activities on the screening list, but they do not provide any evidence of the appropriate or feasible GHG controls for a mining project. Therefore, while the GHG Emissions Reduction Plan meets the California Supreme Court's test for most residential, commercial, and mixed-use projects, in addition to some industrial projects, the GHG Emissions Reduction Plan is not the best template for determining CEQA significance for the South Quarry Project.

The County's GHG Emissions Reduction Plan was designed to capture 90% of the GHG emissions, but the analysis used in program design did not include industrial processes such as mining operations (Development Review Processes, March 2015, page 14). Similarly, industrial processes, such as mining, were not contemplated in the development of the screening tables (*Id.*, at page 36). As a result, while the screening tables contain a long menu of emission reduction measures for residential and commercial developments, few, if any, measures are relevant to a mining project. To the extent the screening tables address industrial activities, they are premised on a model that consists of a stationary source with emitting equipment at a fixed location to which employees and materials arrive by vehicle. The South Quarry Project shares few attributes with this model, and so the mitigation measures on the screening tables generally are not relevant to the South Quarry Project. Accordingly, the GHG Emissions Reduction Plan and Development Review Process state that more unusual types of industrial projects cannot use the screening tables. However, the 100-point equivalency pathway is also not workable for a mining project such as the South Quarry Project. The 100-point benchmark used in the GHG Emissions Reduction Plan is based on achieving an emission reduction of 0.691 MT CO_2e per point per 1,000 square feet of gross commercial or industrial building area (*Id*). There is no way to translate this into an equivalent level of emissions reduction for a mine that includes no buildings.

The California Supreme Court's opinion in *Center for Biological Diversity v. California Department of Fish and Wildlife* also confirmed that a quantitative threshold may be used to determine whether a project has significant GHG emissions. The prior version of this Air Quality Study applied a quantitative GHG emissions threshold adopted by the SCAQMD and applicable to industrial projects. The SCAQMD industrial CEQA significance threshold was adopted in December 2008 following nearly a year of study, analysis, and public input. Tier 3 of the SCAQMD's standard establishes a numeric threshold of 10,000 MT/year CO_2e for industrial sources. The SCAQMD threshold was designed to ensure that projects representing at least 90% of GHG emissions would be considered potentially significant and require further analysis in a CEQA document, while allowing projects aggregating to approximately 10% of GHG emissions to proceed without detailed analysis. (Unlike the County's GHG Emissions Reduction Plan, the SCAQMD 90% capture thresholds were developed using a substantial database of industrial projects.) The staff report presented to the SCAQMD Governing Board, in conjunction with adoption of the standard, explained:

> [T]he policy objective of staff's recommended interim GHG significance threshold proposal is to achieve an emission capture rate of 90 percent of all new or modified stationary source projects. A GHG significance threshold based on a 90 percent emission capture rate may be more appropriate to address the long-term adverse impacts associated with global climate change because most projects will be required to implement GHG reduction measures. Further, a 90 percent emission capture rate sets the emission threshold low enough to capture a substantial fraction of future stationary source projects that will be constructed to accommodate future statewide population and economic growth, while setting the emission threshold high enough to exclude small projects that will in aggregate contribute a relatively small fraction of the cumulative statewide GHG emissions. This assertion is based on the fact that staff estimates that these GHG emissions would account for slightly less than one percent of future 2050 statewide GHG emissions target (85 $MMTCO_2eq$/yr). In addition, these small projects may be subject to future applicable GHG control regulations that would further reduce their overall future contribution to the statewide GHG inventory…. Staff does not believe a zero threshold…would be feasible to implement. A 90 percent emissions capture rate will assure that all feasible GHG reduction measures will be implemented for a

> large majority of emissions from new or modified GHG stationary sources, while avoiding overwhelming the [lead agency's] capabilities to process environmental documents.

The current version of the MDAQMD's CEQA and Federal Conformity Guidelines establishes a CEQA significance threshold of 100,000 MT/year CO_2e (MDAQMD CEQA Guidelines, August 2016, p. 9). This is 10 times more GHG emissions than the SCAQMD threshold used in the initial version of the Air Quality Report for the South Quarry Project and in the Notice of Preparation released to the public in 2012. While the County may reasonably opt to shift to the current MDAQMD CEQA significance threshold of 100,000 tons per year (tpy) CO_2e, for consistency with the Notice of Preparation, this Air Quality Study will continue to apply the lower threshold of 10,000 MT/year CO_2e. It should be noted that the SCAQMD CEQA significance threshold is the lowest numeric threshold adopted by any air district in the region. In 2011, the Antelope Valley Air Quality Management District (AVAQMD) adopted a numeric CEQA significance threshold of 100,000 MT/year CO_2e. The Eastern Kern Air Pollution Control District (EKAPCD) has adopted a numeric CEQA significance threshold of 25,000 MT/year CO_2e. The Great Basin Unified Air Pollution Control District (GBUAPCD) has applied a numeric CEQA significance threshold of 25,000 MT/year CO_2e in at least one EIR (see Draft Environmental Impact Report/Environmental Assessment for the Keeler Dunes Dust Control Project, dated March 21, 2014). By comparison, the SCAQMD CEQA significance threshold is the lowest numeric significance threshold in the region.

4.0 PROJECT DESCRIPTION AND ASSUMPTIONS

Limestone has been mined from the East Pit at the Cushenbury Quarry since the 1950s or earlier. In 2004, the County certified an EIR and approved a project to shift limestone production to the West Pit, which is now under development. Based on further geologic study subsequent to the approval of the West Pit project, MCC is proposing that the new South Quarry produce high-grade limestone that will be blended with the low and medium-grade limestone produced in the East and West Pits. The Project, for purposes of this Air Quality Study, is the shifting of a portion of the production from the East and West Pits to the South Quarry. The Project does not involve an increase in overall mine throughput (sum of throughputs from the West Pit and South Quarry). Because the impacts of construction and operation of the West Pit were fully analyzed in the EIR certified in 2004 (2004 EIR), such that the combined operation of the East and West Pits was fully disclosed and that the certified CEQA document was not challenged, this study compares the impacts of the Project to the impacts previously evaluated for the combined East and West Pits in the 2004 EIR, except as otherwise indicated.

For each of the construction and operational phases, the Project emissions consist of the difference between the baseline and post-Project emissions. In evaluating changes to haul truck and water truck emissions, we have considered the effects of the CARB off-road diesel regulation that requires various fleet changes over a 15-year period. Note that the CARB off-road diesel rule includes a number of complex compliance details, exemptions, and scheduling issues that are not described in detail here. The baseline emissions were based on an approximate off-road diesel rule compliance plan and a preliminary review of the existing fleet (the actual fleet changes planned for off-road diesel rule compliance in the baseline may be different from those shown in this Air Quality Study). We have evaluated the impact of the CARB off-road diesel rule by calculating a baseline that includes the effect of the rule but not the effect of MCC's additional commitment to accelerated turnover of its fleet, and then compared the post-Project emissions to the baseline. We have evaluated post-Project scenarios with and without mitigation.

For the construction phase, the baseline consists of operation in the East and West Pits, and the post-Project consists of the ongoing operation in the East and West Pits, which are unchanged, plus the construction associated with the South Quarry. The Project emissions (difference between baseline and post-Project emissions) for the construction phase consist of the construction emissions associated with the South Quarry. For the operational phase, the baseline consists of operation in the East and West Pits, and the post-Project consists of the ongoing, but reduced, operation in the East and West Pits, plus the operation associated with the South Quarry. For both the Project construction and operational phases, the worst-case year was chosen for the Project emissions (year with largest difference between post-Project and baseline).

The Project will consist of a construction phase, followed by an operational phase, as follows:

- Construction phase: 2017 and 2018; and
- Operational phase: Transition years 2019, 2020, 2021, and full operation in 2022 and beyond.

The years listed above for construction and operation are estimates only, and the actual year of commencement will depend on when the EIR/Environmental Impact Statement (EIS) and the Project are approved. The assumptions used for each of the construction and operational phases are discussed below.

4.1 Construction Phase Assumptions

During the construction phase, the haul road to the South Quarry will be built. A temporary construction road will also be built in order to aid in the construction of the haul road. Note that the construction phase will produce some rock that is cut in the process of road building but is not needed for road fill elsewhere along the route. Excess limestone that meets quality specifications will be hauled to the crushers and used in cement production. Construction activities include the following:

- Mass site grading to create a uniform haul road surface (option identified in CalEEMod);
- Moving of rock from the cut sections to fill sections (included in mass site grading operation identified in CalEEMod); and
- There will be hauling of cut rock that cannot be used in fill activities to limestone crushers or waste piles. However, because the total mined quantity will remain the same and because this average haul distance is less than the maximum permitted haul distance for the West Pit, there is no emission increase associated with this activity.

Based on the above description of construction activities, we have identified the following sources and pollutants to be included in the construction emission calculations:

- Fugitive PM_{10} and $PM_{2.5}$ emissions from solid material handling; and
- Diesel PM_{10} and $PM_{2.5}$, NO_x, VOCs, CO, SO_x, and CO_2 emissions from mobile sources used in mass site grading, as described in CalEEMod.

Table 4-1 presents the Project assumptions for the construction phase.

Table 4-1: Project Assumptions for Construction

	Parameter[1]	Value
Construction Activity Assumptions (Main Haul Road)	Construction phase duration	2 years
	Annual construction time (days/yr)	250
	Daily construction time (hrs/day)	10
	Haul road length (miles)	1.82
	Total active disturbed area (acres)	22.2
	Cut amount (yd^3/yr)	225,000
	Fill amount (yd^3/yr)	0
	Total amount of cut/fill (yd^3/yr)	225,000
	Amount of cut/fill (yd^3/day)	900
Construction Activity Assumptions (Temporary Construction Road)	Temporary construction road length (miles)	0.14
	Total active disturbed area, temporary construction road (acres)	0.7
	Cut amount (yd^3/yr)	2,625
	Fill amount (yd^3/yr)	0
	Total amount of cut/fill (yd^3/yr)	2,625
	Amount of cut/fill (yd^3/day)	11
Emission Control Assumptions	Material moisture content	1%, which accounts for watering
	Watering application frequency	2 times a day

Notes:

1. Parameters supplied by Lilburn haul road map, dated September 2010.

4.2 Operational Phase Assumptions

The operational phase will begin when the South Quarry is accessed for the production of limestone. We have defined baseline mining activities from the 2004 EIR and then described the operational change due to the shift to the South Quarry. The main assumptions for the operational phase are listed in Table 4-2. The operational Project scenario, as described in Section 4.2 (including Table 4-2) is the Project scenario with mitigation. In other words, it is the Project scenario that includes all design features currently incorporated into the Project. Section 4.3 (including Table 4-5) describes the operational scenario without mitigation, which is included for completeness and as a reference.

Table 4-4 describes the permit condition language for the operational Project scenario that incorporates all of the design features included in the Project (i.e., mitigation measures included). These Project design features are reflected in the preliminary list of assumptions in Table 4-2, which is the operational scenario with mitigation (the Project with all of the design features already incorporated). The mitigation measures consist of the following:

- Accelerated fleet replacement that goes beyond the CARB off-road diesel rule; and
- Prescribed dust mitigation, including the frequency of water application on days where water is used in lieu of chemical dust suppressants. This condition has the same language as the watering permit condition in the EIR for the West Pit and extends the watering permit condition language from the West Pit to the South Quarry.

Table 4-2: Preliminary List of Assumptions, Long Term Operational Phase, 2022 and Later

<table>
<tr><th>Parameter</th><th colspan="2">Value</th></tr>
<tr><td>Maximum Mine Throughput (West Pit and South Quarry), Limestone Ore</td><td colspan="2">2,600,000 tons/yr</td></tr>
<tr><td>Maximum Mine Throughput (West Pit and South Quarry), Waste Rock</td><td colspan="2">300,000 tons/yr</td></tr>
<tr><td>Maximum Throughput from South Quarry, Limestone</td><td colspan="2">1,300,000 tons/yr</td></tr>
<tr><td>Maximum Throughput from South Quarry, Waste Rock</td><td colspan="2">150,000 tons/yr</td></tr>
<tr><td>Maximum Haul Road Length, South Quarry[1]</td><td colspan="2">4.0 miles</td></tr>
<tr><td>Watering Frequency on All Roads, Same as Baseline</td><td colspan="2">Every 1.25 hours</td></tr>
<tr><td rowspan="2">Fleet Description, Including Accelerated Fleet Turnover</td><th>2022 Baseline[2,3]</th><th>2022 Post-Project</th></tr>
<tr><td>2 – 777B
1 – 777D
1 – 777G</td><td>0 – 777B
1 – 777D
8 – 777G</td></tr>
</table>

Notes:

1. This distance includes the haul road from the crusher to the new haul road, the new haul road (1.82 miles), and the road traveled within the South Quarry itself.
2. The entries indicate the numbers on each model of haul truck in each year. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the CARB off-road diesel rule.
3. Baseline calculation reflects the implementation of off-road diesel emission reductions to the extent required by the ARB rules in 2022.

Because the composition of the haul truck fleet is changing over the period 2019 through 2022, we have prepared emission calculations for each of these years. We are calling the period 2019 through 2021 the transition period, because the haul truck fleet will be transitioning from its current composition to its final composition. In the years 2022 and beyond, eight of the nine MCC haul trucks will meet Tier 4 standards (777G) and one of the haul trucks will meet Tier 2 standards (777D). As additional trucks are added, they will meet Tier 4 standards. Therefore, the worst-case scenario for the years 2022 and beyond is the case where there are eight of nine trucks that meet Tier 4.

During the period 2019 through 2021 (transition period), the haul distance will be 2.5 miles (2019), 2.7 miles (2020), and 2.9 miles (2021), as shown in Table 4-3. The haul distance during the transition period is shorter than the worst-case distance for later years (4.0 miles).

During the transitional years (2019-2021), 33% of the total throughput will come from the South Quarry. In 2022, this percentage will increase to 50%. It is assumed that the cycle time is proportional to the haul road length, presuming that loading and unloading takes 12 minutes. For the year 2022 (which is post-transition), we have performed the emission calculations assuming the worst-case haul distance for any year 2022 or later (4.0 miles, which is the longest haul distance for the South Quarry). Therefore, the 2022 calculations are intended to represent worst-case conditions in any year 2022 or later.

Table 4-3 is a list of the operational changes due to the Project. In evaluating changes to haul truck and water truck emissions, we have considered the effects of the CARB off-road diesel regulation that requires various fleet changes over a 15-year period. Note that the CARB off-road diesel rule includes a number of complex compliance details, exemptions, and scheduling issues that are not described in detail here. The baseline emissions were based on an approximate off-road diesel rule compliance plan and a preliminary review of the existing fleet (the actual fleet changes planned for off-road diesel rule compliance in the baseline may be different from those shown in Table 4-3). We have evaluated the impact of the CARB off-road diesel rule by calculating a baseline that includes the effect of the rule but not the effect of MCC's additional commitment to accelerated turnover of its fleet, and then compared the post-Project emissions to the baseline.

Please see Table 4-4 for the proposed permit condition language for both the truck fleet and road watering provisions included in the Project design features.

Table 4-3: Operational Features of South Quarry Project

Item	West Pit EIR	South Quarry Post-Project (Transition Period, 2019-2021)	South Quarry Post-Project (2022 and Later)[1]	Comments
Annual mined quantity	2.9 million tons per year (MMtpy) total (2.6 million tons/yr limestone ore) (0.3 million tons/yr waste rock)	2.9 MMtpy total (2.6 million tons/yr limestone ore) (0.3 million tons/yr waste rock) West Pit – 1,742,000 tons/yr limestone ore, 201,000 tons/yr waste rock South Quarry – 858,000 tons/yr limestone ore, 99,000 tons/yr waste rock	2.9 MMtpy total (2.6 MMtpy limestone ore) (0.3 MMtpy waste rock) West Pit – 1,300,000 tons/yr limestone ore, 150,000 tons/yr waste rock South Quarry – 1,300,000 tons/yr limestone ore, 150,000 tons/yr waste rock	The proposed Project will not result in an increase in the quantity of rock mined at any time. During the transition period, 33% of the rock will be mined in the South Quarry. 50% will be mined in the South Quarry in 2022.
Active disturbed mine area[2]	6 acres	6 acres	6 acres	The Project will not result in an increase in active disturbed mine area at any time.
Unpaved road length[3]	1.7 miles to West Pit	1.7 miles to West Pit. The South Quarry haul road will be 2.5 miles (2019), 2.7 miles (2020), and 2.9 miles (2021).	1.7 miles to West Pit, with an additional 4.0 miles to the South Quarry.	The worst-case scenario for PM_{10} will occur in 2022 when the maximum South Quarry haul road length will be 4.0 miles. During the transition period, the haul road length will increase gradually from 2019 to 2021. The West Pit haul road length will be unchanged.
Vehicle miles traveled – limestone ore (roundtrip)	3.4 miles from mine to crusher	3.4 miles from West Pit to crusher. The South Quarry round trip haul road distance to the crusher will be 5.0 miles (2019), 5.4 miles (2020), and 5.8 miles (2021).	3.4 miles from West Pit to crusher. 8.0 miles from the South Quarry to the crusher.	Haul trucks will transport limestone ore from the West Pit and South Quarry to the same crusher.

Item	West Pit EIR	South Quarry Post-Project (Transition Period, 2019-2021)	South Quarry Post-Project (2022 and Later)[1]	Comments
Vehicle miles traveled – waste rock (roundtrip)	Not specified	3.4 miles for both the West Pit and South Quarry.	3.4 miles for both the West Pit and South Quarry.	The waste rock haul distance is the same for the transition period and for 2022 and later.
Vehicle roundtrips per day – limestone ore (250 days/yr)	134 trips	126 trips for West Pit and South Quarry haul trucks carrying limestone ore.	117 trips for West Pit and South Quarry haul trucks carrying limestone ore.	Post-Project (2022 and later), the haul truck fleet will be a mix of 777B, 777D, and 777G haul trucks, which have a capacity of 77 to 105 tons/load. During the transition period, the truck capacity will vary according to the truck fleet.
Vehicle roundtrips per day – waste rock (250 days/yr)	Not specified	15 trips for West Pit and South Quarry haul trucks carrying waste rock.	13 trips for haul roads traveling to/from West Pit and South Quarry carrying waste rock.	
Haul truck operating hours – limestone ore (per week)	240 operating hours per week (2004 EIR reports total operating hours)	266 to 280 operating hours per week for West Pit and South Quarry haul trucks carrying limestone ore.	343 operating hours per week for West Pit and South Quarry haul trucks carrying limestone ore.	Operating hours will be the highest in 2022 when the South Quarry haul road will be at its maximum distance.
Haul truck operating hours – waste rock (per week)		24 operating hours per week for West Pit and South Quarry haul trucks carrying waste rock.	22 operating hours per week for West Pit and South Quarry haul trucks carrying waste rock.	Operating hours will decrease in 2022 due to the shift to higher capacity haul trucks.
Water truck operating hours (per year)	2,500 hours for the water truck fleet	3,604 to 4,919 hours	6,524 hours	The watering frequency for the South Quarry haul roads will be the same as the West Pit. Water truck operating hours are a function of haul truck operating hours and the distance of haul road requiring watering.

Notes:

1. 2022 was determined to be the worst-case year for PM_{10}. 2019 was determined to be the worst-case year for NO_x.

2. Active disturbed mine area reflects the total acreage of all quarries.

3. The maximum distance over the life of the South Quarry is 4.0 miles. This distance includes the haul road from the crusher to the new haul road, the new haul road (1.82 miles), and the road traveled within the South Quarry itself.

Table 4-4: Permit Condition Language

Within three years after the commencement of mining in the South Quarry, or whenever the total quarry haul truck operating HP-hrs/year reach 6 million per year (based on a load factor of XX), whichever is later, the applicant shall: (1) Add to its fleet no fewer than five quarry haul trucks meeting Tier 4 standards; and (2) Retire all remaining Tier 0 quarry haul trucks. "Tier 0" and "Tier 4" refer to those terms as defined by the CARB off-road diesel rule, CCR Title 13 Sections 2449-2449.3. For the purposes of this condition, "mining" shall not include the construction of the South Quarry Road.
Every day of active mining, the Project proponent shall apply water or chemical dust suppressants to unpaved roads and disturbed mine areas that are in active use on that day. For days when water is used rather than chemical dust suppressants, water shall be applied no less than once every 1.25 hours at a rate of no less than 0.11 gallons per square yard. Alternatively, to control dust emissions from unpaved roads and disturbed mine areas in active use, the Project proponent shall apply chemical dust suppressants in accordance with manufacturer specifications.

4.3 Operational Scenario Without Mitigation

MCC plans to include mitigation in the South Quarry Project, as indicated in the permit conditions provided above. However, for completeness, MCC is providing emission calculations for the scenario without mitigation, which involves showing results for a different Project fleet without the extra 777G haul truck additions. The scenario with mitigation involves additional haul truck retirements and replacements with Tier 4 (777G) haul trucks relative to the scenario without mitigation. The assumptions used for the fleet without mitigation are shown in Table 4-5.

Table 4-5: Preliminary List of Assumptions, Long Term Operational Phase, 2022 and Later (Without Mitigation)

<table>
<tr><th>Parameter</th><th colspan="2">Value</th></tr>
<tr><td>Maximum Mine Throughput (West Pit and South Quarry), Limestone Ore</td><td colspan="2">2,600,000 tons/yr</td></tr>
<tr><td>Maximum Mine Throughput (West Pit and South Quarry), Waste Rock</td><td colspan="2">300,000 tons/yr</td></tr>
<tr><td>Maximum Throughput from South Quarry, Limestone</td><td colspan="2">1,300,000 tons/yr</td></tr>
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<tr><td>Maximum Haul Road Length, South Quarry[1]</td><td colspan="2">4.0 miles</td></tr>
<tr><td>Watering Frequency on All Roads, Same as Baseline</td><td colspan="2">Every 1.25 hours</td></tr>
<tr><td rowspan="2">Fleet Turnover per Off-Road Diesel Rule Only</td><th>2022 Baseline[2,3]</th><th>2022 Post-Project</th></tr>
<tr><td>2 – 777B
1 – 777D
1 – 777G</td><td>2 – 777B
1 – 777D
5 – 777G</td></tr>
</table>

Notes:

1. This distance includes the haul road from the crusher to the new haul road, the new haul road (1.82 miles), and the road traveled within the South Quarry itself.

2. The entries indicate the numbers on each model of haul truck in each year. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the CARB off-road diesel rule.

3. Baseline calculation reflects the implementation of off-road diesel emission reductions to the extent required by the ARB rules in 2022.

5.0 EMISSION CALCULATIONS

5.1 Construction Emissions

For each of the construction and operational phases, the Project emissions consist of the difference between the baseline and post-Project emissions. For the construction phase, the baseline consists of operation in the East and West Pits (as shown in the baseline discussion in Section 5.2), and the post-Project consists of the ongoing operation in the East and West Pits, which are unchanged, plus the construction associated with the South Quarry. The Project emissions (difference between baseline and post-Project emissions) for the construction phase consist of the construction emissions associated with the South Quarry, as shown in Tables 5-1 and 5-2.

At the request of the MDAQMD, we are using CalEEMod to estimate emissions for grading operations during road construction. The CalEEMod input and output are shown in Appendix B. For truck exhaust, CalEEMod uses CARB's OFFROAD2011 emissions model and an assumed fleet composition for an average fleet during the entire construction duration (2017-2018). The throughput assumptions used were obtained from information provided by MCC for the construction phase duration, haul road length, and cut and fill quantity.

The following procedures were used for calculating construction emissions using CalEEMod:

- We selected a two-year construction duration (2017-2018). (The actual year of the commencement of construction will depend on the date of Project approval.)
- We selected land use type industrial, general heavy industry, and construction activity grading.
- We provided the Project total acreage, the total cubic yards cut and fill quantity, mean vehicle speed, and material silt content.
- We used the default site grading equipment, causing CalEEMod to use default fleet parameters to evaluate off-road diesel emissions.
- We removed default off-site construction activities, such as off-site hauling of cut material.
- We chose a moisture content of 1% to account for watering activities for both material handling and wind erosion.

Tables 5-1 and 5-2 present the Project construction emissions summary for PM_{10} and $PM_{2.5}$ for fugitive dust and for truck exhaust, including the comparison to the MDAQMD CEQA emissions significance thresholds. Tables 5-1 and 5-2 show that the Project construction emissions increases for fugitive PM_{10} and $PM_{2.5}$ and truck exhaust are below the MDAQMD CEQA emissions significance thresholds, and hence the Project's air quality impact for the construction phase is not significant and no mitigation is needed.

Table 5-1: Construction Emissions Summary for PM_{10} and $PM_{2.5}$ for 2017 (Worst-Case Year)

Activity/Sources	Uncontrolled PM_{10} Emissions (tons/yr)	PM_{10} Control Efficiency	Controlled PM_{10} Emissions (tons/yr)	Controlled $PM_{2.5}$ Emissions (tons/yr)[2]
Fugitive Emissions	29.93	61%	11.75	5.11
Off-Road Vehicle Exhaust[1]	0.41	N/A	0.41	0.38
Total	**30.3426**	**-**	**12.16**	**5.49**
		Significance Threshold	**15**	**12**
		Above Significance Threshold	**NO**	**NO**

Notes:

1. Calculations assumed the construction off-road vehicle fleet determined for the specified design acreage of total active disturbed area for a general heavy industry application, including controls.
2. Weighted control efficiency of fugitive emission terms is provided in Table A-2-1.
3. Per CalEEMod, the $PM_{2.5}/PM_{10}$ ratio used for fugitive dust and diesel exhaust is 0.44 and 0.92, respectively.

Table 5-2: Construction Emissions Summary for Truck Exhaust for 2017 (Worst-Case Year)

Pollutant Name	Project Emissions (tons/yr)	Significance Thresholds (tons/yr)	Above Significance Thresholds (Yes/No)
Nitrous Oxides (NO_x)	8.70	25	NO
Volatile Organic Compounds (VOCs)	0.76	25	NO
Carbon Monoxide (CO)	5.85	100	NO
Particulate Matter (PM_{10})[1]	0.41	See PM Table	See PM Table
Particulate Matter ($PM_{2.5}$)[1,2]	0.38	See PM Table	See PM Table
Sulfur Oxides (SO_x)	0.01	25	NO

Notes:

1. There is no significance threshold specific to diesel PM. Diesel PM is included in the overall Project PM_{10} to determine if PM_{10} exceeds the threshold levels. See Table A-2-3 for threshold comparison.
2. Per CalEEMod, the $PM_{2.5}/PM_{10}$ ratio used for fugitive dust and diesel exhaust is 0.44 and 0.92, respectively.

5.2 Operational Emissions

We have performed baseline and operational emissions calculations for several years, as shown in Appendix A (with supporting information in Appendices B, C, D, and E), and selected the worst-case year for presentation in the summary tables in this section. For the calculations of the Project emissions increase, we have used a baseline (specific to each year) that is based on required fleet changes for compliance with future deadlines in CARB's off-road diesel rule, as shown in Appendix A. The use of this baseline assures that MCC is taking credit only for those reductions that go beyond the regulatory requirements, and the use of this baseline results in a larger Project emissions increase than would otherwise have been calculated (meaning that this is a conservative assumption). Tables 5-3 and 5-4 present the baseline emissions summaries for PM_{10} and $PM_{2.5}$ and for fugitive dust and truck exhaust. As shown in Table 5-5, emissions are calculated based on $PM_{2.5}/PM_{10}$ ratios obtained from United States Environmental Protection Agency (USEPA) guidance (AP 42 for fugitive emissions and USEPA NONROAD model for off-road diesel exhaust).

Table 5-3: Comparison of West Pit Approved Emissions to Baseline for South Quarry Project, $PM_{2.5}$ and PM_{10} Emissions

#	Activity/Sources	Unit of Emission Factor	Unit of Throughput[4]	West Pit EIR Approved Emissions			
				PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]
1	Blasthole drilling	lb/ton	ton/year	0.0008	2,900,000	1.2	0.1
2	Blasting	lb/ton	ton/year	0.08	2,900,000	116.0	6.7
3	Bulldozing, scraping, and grading of materials	lb/hr	hr/year	11.8	2,500	14.7	0.8
4	Material handling, limestone ore and waste rock[2]	lb/ton	ton/year	0.014	2,900,000	20.3	5.7
5	Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6
6	Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2
7	Wind erosion from unpaved roads	tons/acre-yr	acre	0.27	13.39	3.6	0.5
8	Dust entrainment from unpaved roads[1]	lb/VMT	VMT	0.85	115,955	49.3	4.9
	Subtotal (Fugitive Emissions)					**210.7**	**19.6**
10	Other truck exhaust	g/hp-hr	hp-hr/year	Variable	3,236,250	0.9	0.9
11	Haul truck exhaust[1]	g/hp-hr	hp-hr/year	See Table A-6-1	6,580,650	3.3	3.2
12	Water truck exhaust[1]	g/hp-hr	hp-hr/year	See Table A-7-1	904,875	0.7	0.7
	Total (All Sources):					**215.6**	**24.3**

#	Activity/Sources	Unit of Emission Factor	Unit of Throughput[4]	2022 Baseline, South Quarry Project			
				PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]
1	Blasthole drilling	lb/ton	ton/year	0.0008	2,900,000	1.2	0.1
2	Blasting	lb/ton	ton/year	0.08	2,900,000	116.0	6.7
3	Bulldozing, scraping, and grading of materials	lb/hr	hr/year	11.8	2,500	14.7	0.8
4	Material handling, limestone ore and waste rock[2]	lb/ton	ton/year	0.014	2,900,000	20.3	5.7
5	Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6
6	Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2
7	Wind erosion from unpaved roads	tons/acre-yr	acre	0.16	13.39	2.1	0.3
8a	Dust entrainment from unpaved roads – haul trucks[1]	lb/VMT	VMT	0.55	108,352	29.8	3.0
8b	Dust entrainment from unpaved roads – water trucks[1]	lb/VMT	VMT	0.11	6,800	0.4	0.0
9	Material handling, seasonal stockpile	lb/ton	tons/year	0.0022	0	0.0	0.0
	Subtotal (Fugitive Emissions)					**190.1**	**17.4**
10	Other truck exhaust	g/hp-hr	hp-hr/year	Variable	3,236,250	0.9	0.9
11	Haul truck exhaust[1]	g/hp-hr	hp-hr/year	See Table A-6-1	3,988,392	1.4	1.4
12	Water truck exhaust[1]	g/hp-hr	hp-hr/year	See Table A-7-1	603,250	0.1	0.1
	Total (All Sources):					**192.5**	**19.7**

Notes:

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.

2. Assume two transfer points for material handling. Each transfer point has an emission factor of 0.007 lb/ton.

3. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.

4. Dust entrainment throughputs are based on vehicle miles traveled (VMT).

5. This table compares approved West Pit emissions from the 2004 certified EIR (post-Project with mitigation) to the 2022 baseline for the South Quarry Project that will be used in the document, prepared using updated approaches.

Table 5-4: Comparison of West Pit Approved Emissions to Baseline for South Quarry Project, Truck Exhaust

Pollutant Name	West Pit EIR Approved Emissions			
	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)[1]	Total Emissions (tons/yr)
Nitrous Oxides (NO_x)	24.3	63.6	13.6	101.5
Volatile Organic Compounds (VOCs)	1.8	6.3	1.4	9.5
Carbon Monoxide (CO)	4.7	21.2	5.2	31.1
Particulate Matter (PM_{10})	0.9	3.3	0.7	4.9
Particulate Matter ($PM_{2.5}$)[2]	0.9	3.1	0.7	4.6
Sulfur Oxides (SO_x)	0.5	1.0	0.2	1.7

Pollutant Name	2019 Baseline, South Quarry Project				2022 Baseline, South Quarry Project[1,5]			
	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)[3]	Water Truck Emissions (tons/yr)[4]	Total Emissions (tons/yr)	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)[3]	Water Truck Emissions (tons/yr)[4]	Total Emissions (tons/yr)
Nitrous Oxides (NO_x)	24.3	39.4	2.9	66.7	24.3	36.2	2.9	63.5
Volatile Organic Compounds (VOCs)	1.8	2.6	0.1	4.5	1.8	2.3	0.1	4.3
Carbon Monoxide (CO)	4.7	17.4	0.7	22.8	4.7	16.4	0.7	21.8
Particulate Matter (PM_{10})	0.9	1.6	0.1	2.6	0.9	1.4	0.1	2.4
Particulate Matter ($PM_{2.5}$)[2]	0.9	1.6	0.1	2.5	0.9	1.4	0.1	2.3
Sulfur Oxides (SO_x)	0.5	0.03	0.004	0.5	0.5	0.03	0.004	0.5

Notes:

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.

2. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.

3. For haul trucks in 2019 and 2022, refer to Table 6-3B.

4. For water trucks in the 2019 and 2022 baselines, see Table 7-3.

5. This table compares approved West Pit emissions from the 2004 certified EIR (post-Project with mitigation) to the 2022 baseline for the South Quarry Project that will be used in the document, prepared using updated approaches.

Table 5-5: Mining Operations and Fugitive Emission Factors ($PM_{2.5}$ and PM_{10} Ratios Used)

Operation	$PM_{2.5}/PM_{10}$ Ratio	Notes
Blasthole Drilling	0.058	AP 42, Section 11.9, Western Surface Coal Mining, page 11.9-5.
Blasting	0.058	AP 42, Section 11.9, Western Surface Coal Mining, page 11.9-5.
Bulldozing, Scraping, and Grading of Materials	0.052	AP 42, Section 11.9, Western Surface Coal Mining, page 11.9-5.
Material Handling, Limestone Ore and Waste Rock	0.28	AP 42, Section 11.19.2, Crushed Stone Processing and Pulverized Mineral Processing, page 11.19.2-8.
Wind Erosion from Stockpiles	0.15	AP 42, Section 13.2.5, Industrial Wind Erosion, page 13.2.5-3.
Wind Erosion from Active Disturbed Mine Areas	0.15	AP 42, Section 13.2.5, Industrial Wind Erosion, page 13.2.5-3.
Wind Erosion from Unpaved Roads	0.15	AP 42, Section 13.2.5, Industrial Wind Erosion, page 13.2.5-3.
Dust Entrainment from Unpaved Roads	0.10	AP 42, Section 13.2.2, Unpaved Roads, page 13.2.2-5.
Off-Road Diesel Exhaust	0.97	USEPA NONROAD Model, Exhaust Crankcase Emission Factors for NONROAD Engine Modeling – Compression Ignition, page 1.

The Project results in no changes to the following activities, and, therefore, these will not be considered further:

- Blasting and blasthole drilling: These operations relate to the initial blasting to release the rock prior to bulldozing, scraping, and grading. Because the mine throughput is unchanged, the number of blastholes drilled and total quantity blasted is unchanged.
- Bulldozing, scraping, and grading of materials: These operations are needed to collect the material prior to loading the haul trucks. Because the mine throughput is unchanged, this operation is unchanged.
- Material handling for limestone ore and waste rock: This is the operation to load the material into the haul trucks and unload it into either the crusher or the waste pile. Because the mine throughput is unchanged, this operation is unchanged, except that for ten months of the year there will be accumulation of extra limestone (to cover the two winter months) in a limestone pile prior to being processed in the crusher, resulting in two extra material handling steps for this portion of the limestone (unloading to limestone pile and reloading into the haul trucks). The material handling for the seasonal stockpile is accounted for in the Project emission calculations. All other material handling is unchanged.
- Wind erosion from limestone and waste rock stockpiles: These are the emissions that occur due to wind erosion for stockpiles that are disturbed at any given time as part of the mining operation. Because the mine throughput is unchanged, this operation is unchanged.

- Wind erosion from active disturbed mine areas: These are the emissions that occur due to wind erosion for the active disturbed mine areas (where material is being removed at any given time) as part of the mining operation. Because the mine throughput is unchanged, this operation is unchanged.

The Project results in increases in the following emission terms:

- Dust entrainment from unpaved roads;
- Wind erosion from unpaved roads;
- Material handling emissions due to seasonal stockpiling;
- Haul truck exhaust emissions; and
- Water truck exhaust emissions.

The uncontrolled emission factors for fugitive dust are based on the USEPA's AP 42 because this is a combined EIR/EIS document, and it is intended to meet federal requirements as well as MDAQMD requirements. The control efficiency due to watering is based on MDAQMD formulas, because water control efficiency calculations are not available as part of AP 42. We have assumed that the baseline watering frequency (watering every 1.25 hours) used in the 2004 EIR will be extended to all haul roads. For haul truck and water truck exhaust, we are using emission factors from CARB's OFFROAD2011 emissions model for off-road construction vehicles based on the projected fleet composition in each year. Adjusted full life emission factors account for deterioration and California fuel adjustment. Throughputs for all emission terms are calculated from haul truck VMT per year (dust entrainment) and operating hours per year (haul truck exhaust), based on annual mine throughput, haul road length, fleet composition, haul truck capacity, and cycle time per load. Water truck operating hours are based on watering all haul road areas in use at a frequency of once every 1.25 hours during the periods that haul trucks are operating in the West Pit and South Quarry (determined from the haul truck operating hours).

Since the off-road diesel rule will ultimately require that the entire plant and mine fleet be turned over by approximately 2028, the off-road diesel emissions at a given maximum production rate are expected to decline over time through approximately 2028 and to remain level after that. However, we are presenting worst-case emissions accounting for planned changes from 2019-2022, but not for changes after 2022 (which will further reduce emissions).

Depending on the parameter value selected, the wind erosion emissions can be as shown or as low as near-zero. While we are currently presenting the conservative (high) value for wind erosion emissions, we may refine this value later if the wind erosion contribution becomes important to the determination of whether the Project emissions increase exceeds the MDAQMD CEQA emissions significance thresholds.

After comparing the 2022 emissions increase to the emissions increase in each year of the transition period (when some haul trucks had not yet been replaced with Tier 4 haul trucks but the haul distance was shorter), it became clear that 2022 was the overall worst-case year for PM_{10} and $PM_{2.5}$ emissions. For NO_x and VOCs, 2019 was the overall worst-case year. Worst-case CO and SO_x emissions occurred in 2022. Because SO_x emissions are relatively small, we have not focused on those emissions in the following discussion. We have presented data for the following worst-case years, corresponding to the summary in Table 5-6:

- PM_{10} and $PM_{2.5}$ in 2022 (see Table 5-7);
- NO_x and VOC in 2019 (see Table 5-8A); and
- CO and SO_x in 2022 (see Table 5-8B).

Table 5-6: Worst-Case Year Emissions Summary

Pollutant Name	Worst-Case Year
Particulate Matter (PM_{10})	2022
Particulate Matter ($PM_{2.5}$)	2022
Nitrous Oxides (NO_x)	2019
Volatile Organic Compounds (VOCs)	2019
Carbon Monoxide (CO)	2022
Sulfur Oxides (SO_x)	2022

Tables 5-7, 5-8A, and 5-8B present the Project operational emissions summary for PM_{10} and $PM_{2.5}$ for fugitive dust and truck exhaust for the worst-case year, including the comparison to the MDAQMD CEQA emissions significance thresholds. Controlled emission factors for wind erosion and dust entrainment from unpaved roads for 2022 post-Project emissions are weighted averages of the West Pit and South Quarry. Tables 5-7, 5-8A, and 5-8B show that the Project emissions increases for PM_{10} and $PM_{2.5}$, and for truck exhaust, NO_x and VOCs, are below the MDAQMD CEQA emissions significance thresholds. Hence the Project's air quality impact for the operational phase is not significant and no further mitigation is needed.

Table 5-7: Project Emissions Summary for PM_{10} and $PM_{2.5}$ for 2022 (Worst-Case Year)

Activity/Source	Unit of Emission Factor	Unit of Throughput	2022 Baseline			
			Controlled Emission Factor	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]
Blasthole drilling	lb/ton	ton/year	0.0008	2,900,000	1.2	0.07
Blasting	lb/ton	ton/year	0.080	2,900,000	116.0	6.7
Bulldozing, scraping, and grading of materials	lb/hr	hr/year	11.77	2,500	14.7	0.8
Material handling, limestone ore and waste rock	lb/ton	ton/year	0.014	2,900,000	20.3	5.7
Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6
Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2
Wind erosion from unpaved roads[2]	tons/acre-yr	acre	0.16	13.39	2.08	0.31
Dust entrainment from unpaved roads – haul trucks[2]	lb/VMT	VMT	0.55	108,352	29.8	3.0
Dust entrainment from unpaved roads – water trucks[2]	lb/VMT	VMT	0.11	6,800	0.37	0.04
Material handling, seasonal stockpile	lb/ton	tons/year	0.0022	0	0.0	0.0
				Subtotal (Fugitive Emissions):	**190.1**	**17.4**
Other truck exhaust	g/HP-hr	HP-hr/year	Variable	3,236,250	0.9	0.9
Haul truck exhaust[1]	g/HP-hr	HP-hr/year	See Table A-6-1	3,988,392	1.4	1.4
Water truck exhaust	g/HP-hr	HP-hr/year	See Table A-7-1	603,250	0.08	0.08
				Total (All Sources):	**192.5**	**19.7**

Activity/Source	Unit of Emission Factor	Unit of Throughput	2022 Post-Project				Project PM_{10} Emissions Increase (tons/yr)	Project $PM_{2.5}$ Emissions Increase (tons/yr)
			Controlled Emission Factor	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]		
Blasthole drilling	lb/ton	ton/year	0.00080	2,900,000	1.2	0.07	0.0	0.0
Blasting	lb/ton	ton/year	0.080	2,900,000	116.0	6.7	0.0	0.0
Bulldozing, scraping, and grading of materials	lb/hr	hr/year	11.77	2,500	14.7	0.8	0.0	0.0
Material handling, limestone ore and waste rock	lb/ton	ton/year	0.014	2,900,000	20.3	5.7	0.0	0.0
Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6	0.0	0.0
Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2	0.0	0.0
Wind erosion from unpaved roads[2,5]	tons/acre-yr	acre	0.11	37.64	4.01	0.60	1.9	0.29
Dust entrainment from unpaved roads – haul trucks[2,4]	lb/VMT	VMT	0.55	151,904	41.7	4.2	12.0	1.20
Dust entrainment from unpaved roads – water trucks[2,4]	lb/VMT	VMT	0.11	24,800	1.36	0.14	0.99	0.10
Material Handling, seasonal stockpile[6]	lb/ton	tons/year	0.0022	216,667	0.2	0.1	0.24	0.1
				Subtotal (Fugitive Emissions):	**205.2**	**19.1**	**15.1**	**1.7**
Other truck exhaust	g/HP-hr	HP-hr/year	Variable	3,236,250	0.9	0.9	0.00	0.0
Haul truck exhaust[1,7]	g/HP-hr	HP-hr/year	See Table A-6-1	6,300,258	0.4	0.4	-1.02	-0.99
Water truck exhaust[8]	g/HP-hr	HP-hr/year	See Table A-7-1	2,014,000	0.19	0.19	0.11	0.11
				Total (All Sources):	**206.7**	**20.5**	**14.2**	**0.78**
						Significance Threshold:	**15**	**12**
						Above Significance Threshold:	**NO**	**NO**

Notes:

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. Controlled emission factor calculations for dust entrainment (A-3-1) and wind erosion (A-4-1A and A-4-2) for 2022 are weighted averages of the West Pit and South Quarry.
3. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.
4. See Table A-3-3 for dust entrainment summary.
5. See Table A-4-2 for wind erosion summary.
6. See Table A-5-2 for seasonal stockpile and material handling summary.
7. See Table A-6-3 for haul truck exhaust summary.
8. See Table A-7-3 for water truck exhaust summary.

Table 5-8A: Project Emissions Summary for Truck Exhaust for 2019 (Worst-Case Year for NO_x and VOCs)

Pollutant Name	2019 Baseline[1]				2019 Post-Project			
	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)	Total Emissions (tons/yr)	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)	Total Emissions (tons/yr)
Nitrous Oxides (NO_x)	24.3	39.4	2.9	66.7	24.3	36.2	6.2	66.8
Volatile Organic Compounds (VOCs)	1.8	2.6	0.1	4.5	1.8	2.3	0.3	4.3
Particulate Matter (PM_{10})[2]	0.9	1.6	0.1	2.6	0.9	1.3	0.1	2.4
Particulate Matter ($PM_{2.5}$)[2, 3]	0.9	1.6	0.1	2.5	0.9	1.3	0.1	2.3

Pollutant Name	Project Emissions Change (tons/yr)	Significance Thresholds (tons/yr)	Above Significance Thresholds
Nitrous Oxides (NO_x)	0.1	25	NO
Volatile Organic Compounds (VOCs)	-0.2	25	NO
Particulate Matter (PM_{10})[2]	-0.2	N/A	N/A
Particulate Matter ($PM_{2.5}$)[2,3]	-0.2	N/A	N/A

Notes:

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.

2. There are no significance thresholds specific to diesel $PM_{2.5}$ and PM_{10}. Diesel $PM_{2.5}$ and PM_{10} are included in the overall Project PM_{10} to determine if PM_{10} exceeds the threshold levels (Table 5-7).

3. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.

Table 5-8B: Project Emissions Summary for Truck Exhaust for 2022 (Worst-Case Year for CO and SO_x)

Pollutant Name	2022 Baseline[1]				2022 Post-Project			
	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)	Total Emissions (tons/yr)	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)	Total Emissions (tons/yr)
Carbon Monoxide (CO)	4.7	16.4	0.7	21.8	4.7	20.5	3.8	29.0
Sulfur Oxides (SO_x)	0.5	0.03	0.004	0.5	0.5	0.04	0.013	0.5

Pollutant Name	Project Emissions Change (tons/yr)	Significance Thresholds (tons/yr)	Above Significance Thresholds (Yes/No)
Carbon Monoxide (CO)	7.2	100	NO
Sulfur Oxides (SO_x)	0.02	25	NO

Notes:

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.

5.3 Operational Scenario Without Mitigation

MCC plans to include mitigation in the South Quarry Project, as indicated in the permit conditions provided above in Section 4.2 (permit conditions specifying watering frequency and fleet turnover schedule). However, for completeness, MCC is providing emission calculations for the scenario without mitigation, which involves showing results for a different Project fleet without the extra 777G haul truck additions. The mitigation involves additional haul truck retirements and replacements with Tier 4 (777G) haul trucks. The fleet without mitigation results in higher Project emissions for haul truck dust entrainment and haul truck exhaust, but does not affect water truck dust entrainment, material handling seasonal stockpile, and water truck exhaust. The assumptions used for the fleet without mitigation are shown in Table 4-5. The emission calculation results for haul truck dust entrainment and haul truck exhaust are shown in Tables 5-9, 5-10A, and 5-10B. The emission calculation results without mitigation are higher than the emission calculation results with mitigation. Hence, there is a benefit for the mitigation measures applied, as shown in the tables.

Table 5-9: Project Emissions Summary for PM_{10} and $PM_{2.5}$ for 2022 (Worst-Case Year) (Without Mitigation)

Activity/Source	Unit of Emission Factor	Unit of Throughput	2022 Baseline			
			Controlled Emission Factor[9]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]
Blasthole drilling	lb/ton	ton/year	0.0008	2,900,000	1.2	0.07
Blasting	lb/ton	ton/year	0.080	2,900,000	116.0	6.7
Bulldozing, scraping, and grading of materials	lb/hr	hr/year	11.77	2,500	14.7	0.8
Material handling, limestone ore and waste rock	lb/ton	ton/year	0.014	2,900,000	20.3	5.7
Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6
Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2
Wind erosion from unpaved roads[2]	tons/acre-yr	acre	0.16	13.39	2.08	0.31
Dust entrainment from unpaved roads – haul trucks[2]	lb/VMT	VMT	0.55	108,352	29.8	3.0
Dust entrainment from unpaved roads – water trucks[2]	lb/VMT	VMT	0.11	6,800	0.37	0.04
Material handling, seasonal stockpile	lb/ton	tons/year	0.0022	0	0.0	0.0
Subtotal (Fugitive Emissions):					**190.1**	**17.4**
Other truck exhaust	g/HP-hr	HP-hr/year	Variable	3,236,250	0.9	0.9
Haul truck exhaust[1]	g/HP-hr	HP-hr/year	See Table A-6-1	3,988,392	1.4	1.4
Water truck exhaust	g/HP-hr	HP-hr/year	See Table A-7-1	603,250	0.08	0.08
Total (All Sources):					**192.5**	**19.7**

Activity/Source	Unit of Emission Factor	Unit of Throughput	2022 Post-Project				Project PM_{10} Emissions Increase (tons/yr)	Project $PM_{2.5}$ Emissions Increase (tons/yr)
			Controlled Emission Factor[9]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]		
Blasthole drilling	lb/ton	ton/year	0.00080	2,900,000	1.2	0.07	0.0	0.0
Blasting	lb/ton	ton/year	0.080	2,900,000	116.0	6.7	0.0	0.0
Bulldozing, scraping, and grading of materials	lb/hr	hr/year	11.77	2,500	14.7	0.8	0.0	0.0
Material handling, limestone ore and waste rock	lb/ton	ton/year	0.014	2,900,000	20.3	5.7	0.0	0.0
Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6	0.0	0.0
Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2	0.0	0.0
Wind erosion from unpaved roads[2,5]	tons/acre-yr	acre	0.11	37.64	4.01	0.60	1.9	0.29
Dust entrainment from unpaved roads – haul trucks[2,4]	lb/VMT	VMT	0.55	162,913	44.7	4.5	15.0	1.50
Dust entrainment from unpaved roads – water trucks[2,4]	lb/VMT	VMT	0.11	24,800	1.36	0.14	0.99	0.10
Material handling, seasonal stockpile[6]	lb/ton	tons/year	0.0022	216,667	0.2	0.1	0.24	0.1
Subtotal (Fugitive Emissions):					**208.2**	**19.4**	**18.1**	**2.0**
Other truck exhaust	g/HP-hr	HP-hr/year	Variable	3,236,250	0.9	0.9	0.00	0.0
Haul truck exhaust[1,7]	g/HP-hr	HP-hr/year	See Table A-6-1	4,930,228	1.4	1.3	-0.09	-0.09
Water truck exhaust[8]	g/HP-hr	HP-hr/year	See Table A-7-1	2,014,000	0.19	0.19	0.11	0.11
Total (All Sources):					**210.6**	**21.7**	**18.2**	**1.98**
Significance Threshold:							**15**	**12**
Above Significance Threshold:							**YES**	**NO**

Notes:

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.

2. Controlled emission factor calculations for dust entrainment (A-3-1) and wind erosion (A-4-1A and A-4-2) for 2022 are weighted averages of the West Pit and South Quarry.

3. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.

4. See Table A-14-2 for dust entrainment summary.

5. See Table A-4-2 for wind erosion summary.

6. See Table A-5-2 for seasonal stockpile and material handling summary.

7. See Table A-15-2 for haul truck exhaust summary.

8. See Table A-7-3 for water truck exhaust summary.

9. Table 5-9 presents the emissions calculated for the scenario without mitigation. The scenario without mitigation **only** affects the emissions calculated for the "emissions terms that changed" where the mitigation was applied, such as dust entrainment and wind erosion for unpaved roads. For the "emissions terms that are unchanged," we are presenting the same emissions for pre-Project and post-Project scenarios. Therefore, for these terms, there is no difference between the scenarios with and without mitigation. In general, where there are different terms, some of which do and do not have controls, for the column "Controlled Emission Factor," the entry in the column for the units without controls will just be equal to the uncontrolled emission factor (i.e., the controlled emission factor is equal to uncontrolled emission factor, where no controls are present).

Table 5-10A: Project Emissions Summary for Truck Exhaust for 2019 (Worst-Case Year for NO_x, and VOCs) (Without Mitigation)

Pollutant Name	2019 Baseline[1]				2019 Post-Project			
	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)	Total Emissions (tons/yr)	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)	Total Emissions (tons/yr)
Nitrous Oxides (NO_x)	24.3	39.4	2.9	66.7	24.3	43.5	6.2	74.0
Volatile Organic Compounds (VOCs)	1.8	2.6	0.1	4.5	1.8	2.8	0.3	4.8
Particulate Matter (PM_{10})[2]	0.9	1.6	0.1	2.6	0.9	1.7	0.1	2.7
Particulate Matter ($PM_{2.5}$)[2, 3]	0.9	1.6	0.1	2.5	0.9	1.7	0.1	2.7

Pollutant Name	Project Emissions Change (tons/yr)	Significance Thresholds (tons/yr)	Above Significance Thresholds
Nitrous Oxides (NO_x)	7.3	25	NO
Volatile Organic Compounds (VOCs)	0.4	25	NO
Particulate Matter (PM_{10})[2]	0.2	N/A	N/A
Particulate Matter ($PM_{2.5}$)[2,3]	0.2	N/A	N/A

Notes:

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. There are no significance thresholds specific to diesel $PM_{2.5}$ and PM_{10}. Diesel $PM_{2.5}$ and PM_{10} are included in the overall Project PM_{10} to determine if PM_{10} exceeds the threshold levels (Table 5-9).
3. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.

Table 5-10B: Project Emissions Summary for Truck Exhaust for 2022 (Worst-Case Year for CO and SO_x) (Without Mitigation)

Pollutant Name	2022 Baseline[1]				2022 Post-Project			
	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)	Total Emissions (tons/yr)	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)	Total Emissions (tons/yr)
Carbon Monoxide (CO)	4.7	16.4	0.7	21.8	4.7	24.1	3.8	32.7
Sulfur Oxides (SO_x)	0.5	0.03	0.004	0.5	0.5	0.04	0.013	0.5

Pollutant Name	Project Emissions Change (tons/yr)	Significance Thresholds (tons/yr)	Above Significance Thresholds (Yes/No)
Carbon Monoxide (CO)	10.8	100	NO
Sulfur Oxides (SO_x)	0.03	25	NO

Notes:

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.

6.0 HEALTH RISK ASSESSMENT

An HRA was performed separately for the construction and operational phases. For the purposes of the HRA, Sources A through F were defined as shown in the following tables. Table 6-1 provides source descriptions and associated Project PM_{10} emissions (emission increases due to the Project). Table 6-2 presents a source parameter summary.

Table 6-1: Operational and Construction Phase HRA Source Description and Emissions

Source	Phase	Source Description	Baseline PM_{10} Emissions (ton/yr)	Post-Project PM_{10} Emissions (ton/yr)	PM_{10} Emissions Increase (ton/yr)	PM_{10} Emissions Increase (lb/yr)	PM_{10} Emissions Increase (lb/hr)
A	Operational	Haul Truck Exhaust	1.62	1.35	-0.27	-546	-0.22
		Water Truck Exhaust	0.08	0.14	0.06	128	0.05
		Total:	1.70	1.49	-0.21	-417	-0.17
B	Operational	Wind Erosion from Unpaved Roads	2.08	4.01	1.93	3,852	1.54
C	Operational	Dust Entrainment from Haul Trucks	29.76	41.72	11.96	23,926	9.57
		Dust Entrainment from Water Trucks	0.37	1.36	0.99	1,978	0.79
		Total:	30.14	43.09	12.95	25,904	10.36
D	Operational	Seasonal Stockpile – Material Handling	0.00	0.24	0.24	482	0.19
E	Construction	Off-Road Vehicle Exhaust	0.00	0.41	0.41	829	0.33
F	Construction	Fugitive Emissions	0.00	11.75	11.75	23,498	9.40

Notes:

1. To be conservative, worst-case year for truck exhaust (2019) was used (worst-case year results in a decrease of emissions).
2. PM_{10} emissions in lb/hr are calculated by dividing by 2,500 hrs/year.

Table 6-2: Operational and Construction Phase HRA Source Type and Location

Source	Phase	Source Description	Source Type	Source Hours per Day	Source Dimensions	Source Location
A	Operational	Haul Truck Exhaust Water Truck Exhaust	Line Source	10	15.24m by 542m	Phase IA to near SQ end of haul road
B	Operational	Wind Erosion from Unpaved Roads	Line Source	24	15.24m by 542m	Same as Source A, except 24 hrs
C	Operational	Dust Entrainment from Haul Trucks Dust Entrainment from Water Trucks	Line Source	10	15.24m by 542m	Same as Source A
D	Operational	Seasonal Stockpile – Material Handling	Area Source	10	30m by 30m	Near Crusher
E	Construction	Off-Road Vehicle Exhaust	Line Source	10	15.24m by 902m	Along haul road from SQ to Crusher, but straight line
F	Construction	Fugitive Emissions	Line Source	10	15.24m by 902m	Same as Source E

6.1 HRA for Construction Phase

Emission calculations for TACs and health risk calculations for the construction phase are presented in Appendix A, and supporting information is presented in Appendices C, D, and E. TAC emission estimates are based on diesel PM_{10} (Source E) and fugitive dust (Source F) calculations described above and metal concentrations in fugitive dust obtained from laboratory analyses of road dust samples. HRA calculations use the Atmospheric Dispersion Modeling System (AERMOD), as described in Appendices C and D, and the Hotspots Analysis and Reporting Program, version 2 (HARP2) health risk calculations [derived from the Office of Environmental Health Hazard Assessment (OEHHA) guidance], as described in Appendix E. Tables 6-3A and 6-3B present construction TAC emissions by source for 2017 (Year 1, which has an older fleet and hence higher vehicle exhaust diesel PM_{10} emissions), and Table 6-4 presents a construction cancer, chronic, and acute risk summary by receptor.

Table 6-4 shows that the calculated health risks for the construction emissions are below the health risk significance thresholds applied to this Project. The cancer risk threshold is 10 in a million and the cancer risk values calculated for the construction phase are 0.056, 0.0043, and 0.025 in a million, depending on the receptor. The chronic hazard index threshold is 1.0, and the chronic hazard index values for the construction phase at all receptors are below 0.001. The acute hazard index threshold is 1.0, and the acute hazard index values for the construction phase at all receptors are below 0.01.

Table 6-3A: Project Emissions Summary for Diesel PM_{10} (Source E) – Construction Phase

Source E	Units	Increase[1]
Diesel Construction Vehicles	tons/yr	0.41
	lb/yr	829
	(lb/hr)[2]	0.33

Notes:

1. Construction occurs over two years.
2. Divide yearly emissions by 2,500 hours/yr (10 hours/day, 250 days/yr).

Table 6-3B: Annual Average and Maximum Hourly Fugitive TAC Emissions from Source F – Construction Phase

Metal	Lab Results[1]	Source F[2]	
	Unpaved Road Dust (mg/kg)	Ann. Avg. (lb/yr)	Max. Hr. (lb/hr)[3]
Antimony	0.50	1.17E-02	4.70E-06
Arsenic	7.50	1.76E-01	7.05E-05
Beryllium	0.15	3.52E-03	1.41E-06
Cadmium	1.05	2.47E-02	9.87E-06
Chromium VI	0.10	2.35E-03	9.40E-07
Copper	12.00	2.82E-01	1.13E-04
Chromium, total	0.10	2.35E-03	9.40E-07
Diesel Exhaust PM	-	-	-
Lead	76.00	1.79E+00	7.14E-04
Mercury	0.01	2.35E-04	9.40E-08
Nickel	7.60	1.79E-01	7.14E-05
Selenium	0.50	1.17E-02	4.70E-06
Vanadium	22.00	5.17E-01	2.07E-04
Zinc	76.50	1.80E+00	7.19E-04
Crystalline silica	1020.00	2.40E+01	9.59E-03

Notes:

1. Obtained from the Comprehensive Emission Inventory Report (CEIR) for MCC's Cushenbury Plant for 2014, Table 5.
2. Source F: Fugitive emissions from construction activities (10-hour source).
3. Assumed 2,500 hours/yr in determining maximum hourly emission rates.

Table 6-4: Total Cancer, Chronic, and Acute Risk by Receptor – Comparison with Health Risk Significance Thresholds (Construction Phase)

	Cancer Risk			Chronic Hazard Index			Acute Hazard Index		
	MEIR	MEIW	Sensitive	MEIR	MEIW	Sensitive	MEIR	MEIW	Sensitive
Calculated Total	5.55E-08	4.25E-09	2.45E-08	1.34E-04	4.26E-05	5.89E-05	3.13E-03	1.48E-03	6.89E-04
Risk Threshold	1.00E-05	1.00E-05	1.00E-05	1	1	1	1	1	1
Exceeds Threshold (Yes/No):	NO	NO	NO	NO	NO	NO	NO	NO	NO

Acronyms

Maximally Exposed Individual Resident (MEIR)

Maximally Exposed Individual Worker (MEIW)

6.2 HRA for Operational Phase

Emission calculations for TACs and health risk calculations for the operational phase are presented in Appendix A, and supporting information is presented in Appendices C, D, and E. TAC emission estimates are based on diesel PM_{10} (Source A) and fugitive dust (Sources B, C, and D) calculations described above and metal concentrations in fugitive dust obtained from laboratory analyses of road dust samples taken from MCC's existing quarry roads. HRA calculations use AERMOD modeling, as described in Appendices C and D, and spreadsheet-based health risk calculations (derived from OEHHA guidance), as described in Appendix E. Tables 6-5A and 6-5B present Project operational TAC emissions based on diesel PM_{10} (Source A), fugitive emissions from wind erosion (Source B), fugitive emissions from dust entrainment (Source C), and fugitive emissions from material handling of the seasonal stockpile (Source D) by source. Table 6-6 presents the Project operational cancer, chronic, and acute risk summary by receptor. The receptors are shown in Figure 1-1.

Table 6-6 shows that the calculated health risks for the Project operational emissions are below the health risk significance thresholds applicable to this Project. The cancer risk threshold is 10 in a million and the cancer risk values calculated for the operational phase are -0.0054, -0.0013, and -0.0078 in a million, depending on the receptor. The chronic hazard index threshold is 1.0, and the chronic hazard index values for the operational phase at all receptors are below 0.01. The acute hazard index threshold is 1.0, and the acute hazard index values for the operational phase at all receptors are below 0.01.

Table 6-5A: Project Emissions Summary for Diesel PM_{10} (Source A) – Operational Phase

Source A	Units	Change[1]
Haul Trucks and Water Trucks	tons/yr	-0.21
	lb/yr	-417
	(lb/hr)[2]	-0.17

Notes:

1. To be conservative, worst-case year for diesel PM_{10} was used (2019 is the worst-case year, because it has the smallest emissions decrease of all years).

2. Divide yearly emissions by 2,500 hours/yr (10 hours/day, 250 days/yr).

Table 6-5B: Annual Average And Maximum Hourly Fugitive TAC Emissions By Source (B, C, D) – Operational Phase

Metal	Lab Results[1] Unpaved Road Dust (mg/kg)	Source B[2,4]		Source C[3,4]		Lab Results[1] Low-Grade Limestone Process Material (mg/kg)	Source D[5,4]	
		Ann. Avg. (lb/yr)	Max. Hr. (lb/hr)[7]	Ann. Avg. (lb/yr)	Max. Hr. (lb/hr)[7]		Ann. Avg. (lb/yr)	Max. Hr. (lb/hr)[7]
Antimony	0.50	1.93E-03	7.70E-07	1.30E-02	5.18E-06	0.25	1.21E-04	4.85E-08
Arsenic	7.50	2.89E-02	1.16E-05	1.94E-01	7.77E-05	5.98	2.88E-03	1.15E-06
Beryllium	0.15	5.78E-04	2.31E-07	3.89E-03	1.55E-06	0.24	1.18E-04	4.71E-08
Cadmium	1.05	4.04E-03	1.62E-06	2.72E-02	1.09E-05	1.16	5.60E-04	2.24E-07
Chromium VI	0.10	3.85E-04	1.54E-07	2.59E-03	1.04E-06	8.42	4.06E-03	1.62E-06
Copper	12.00	4.62E-02	1.85E-05	3.11E-01	1.24E-04	7.08	3.42E-03	1.37E-06
Chromium, total	0.10	3.85E-04	1.54E-07	2.59E-03	1.04E-06	0.10	4.82E-05	1.93E-08
Diesel Exhaust PM	-	-	-	-	-	-	-	-
Lead	76.00	2.93E-01	1.17E-04	1.97E+00	7.87E-04	120.00	5.79E-02	2.31E-05
Mercury	0.01	3.85E-05	1.54E-08	2.59E-04	1.04E-07	0.02	7.72E-06	3.09E-09
Nickel	7.60	2.93E-02	1.17E-05	1.97E-01	7.87E-05	9.85	4.75E-03	1.90E-06
Selenium	0.50	1.93E-03	7.70E-07	1.30E-02	5.18E-06	0.68	3.28E-04	1.31E-07
Vanadium	22.00	8.48E-02	3.39E-05	5.70E-01	2.28E-04	15.02	7.24E-03	2.90E-06
Zinc	76.50	2.95E-01	1.18E-04	1.98E+00	7.93E-04	73.00	3.52E-02	1.41E-05
Crystalline silica	1020.00	3.93E+00	1.57E-03	2.64E+01	1.06E-02	61000.00	2.94E+01	1.18E-02

Notes:

1. Obtained from the CEIR for MCC's Cushenbury Plant for 2014, Table 5.
2. Source B: Wind erosion from unpaved roads (24-hour source).
3. Source C: Dust entrainment from unpaved roads (10-hour sources).

4. Source D: Material handling from the seasonal stockpiles (10-hour sources).
5. To be conservative, worst-case year for fugitive PM_{10} (2020) was used.
6. PM_{10} emissions shown in tons/yr.
7. Max hourly emissions calculated from 2,500 hours/yr.

Table 6-6: Total Cancer, Chronic, and Acute Risk by Receptor and Comparison with Health Risk Significance Thresholds – Operational Phase

	Cancer Risk			Chronic Hazard Index			Acute Hazard Index		
	MEIR	MEIW	Sensitive	MEIR	MEIW	Sensitive	MEIR	MEIW	Sensitive
Calculated Total	-5.37E-09	-1.27E-09	-7.79E-09	3.87E-04	1.55E-04	1.09E-04	2.72E-03	3.78E-03	1.26E-03
Risk Threshold	1.00E-05	1.00E-05	1.00E-05	1	1	1	1	1	1
Exceeds Threshold (Yes/No):	NO	NO	NO	NO	NO	NO	NO	NO	NO

Notes:
1. To be conservative, worst-case year for fugitive PM_{10} (2022) and diesel PM_{10} (2019) was used.

7.0 GHG APPROACH AND RESULTS

The State of California has determined that global climate change is a threat to the environment and that human activity generating GHG influences global climate change. Global climate change refers to changes in average climatic conditions on earth as a whole, including temperature, wind patterns, precipitation, and storms. The six major GHG identified by the Kyoto Protocol are carbon dioxide (CO_2), methane, nitrous oxide, sulfur hexafluoride, haloalkanes, and perflurocarbons. CO_2 is the only GHG with the potential to be generated in meaningful quantities by the Project.

Under California's AB 32, a series of GHG rules have been promulgated for industrial sources, including rules pertaining to GHG reporting and GHG reduction over the next few years. The various AB 32 rules applying to industrial sources affect both stationary sources and mobile sources, and include the following:

- AB 32 mandatory reporting, which requires annual reporting of GHG emissions;
- AB 32 cap-and-trade facility requirements, which require facilities to purchase emission credits for GHG emissions beyond a diminishing allocation of credits;
- AB 32 cap-and-trade fuel requirements (applied to transportation fuel suppliers), where fuel suppliers purchase credits from the same credit market (costs are likely passed on to fuel purchasers);
- SB 375, which regulates government planning efforts and promotes infill projects and other strategies to reduce vehicle use; and
- Other AB 32 Scoping Plan measures for smaller sources that are not subject to cap-and-trade, including agricultural and other sources.

For the MCC South Quarry Project, there are no stationary sources in the new quarry that are subject to the AB 32 cap-and-trade facility regulations on a facility basis. However, the GHG from the fuels used in mobile sources have been accounted for in the AB 32 cap-and-trade program. Hence, the main effect of the AB 32 rule suite on the South Quarry Project is that fuel purchases for existing sources and for Project increases will be accounted for in the cap-and-trade program and that GHG from fuel usage will be subject to a collective declining cap. The fuel suppliers, not the customers, are responsible for regulatory compliance, but the fuel suppliers may pass these costs to the customers. SB 375 aims to reduce emissions from automobiles and light-duty trucks through land use and transportation planning, but does not apply to the South Quarry Project because the Project does not increase the use of automobiles or light-duty trucks. Based on a detailed review of the updated AB 32 Scoping Plan (dated May 2014), there are no new AB 32 Scoping Plan measures that have the potential to apply to the Project directly.

As discussed in Section 3.0 of this Air Quality Study, the Project will have a significant impact on climate change if it will generate more than 10,000 MT/year of GHG emissions (CO_2e).

7.1 GHG Emissions from Construction Phase

The Project construction GHG emissions, which occur over only a short period of time, will be amortized over a 30-year period and added to the operational emissions via the following equations:

Amortized construction emissions (MT/yr) = total construction emissions (MT)/30 years

Total annual emissions (MT/yr) = operational emissions (MT/yr) + amortized construction emissions (MT/yr)

The total annual emissions are compared to the significance threshold for industrial projects, 10,000 MT CO_2e/yr, to determine Project significance.

7.2 GHG Emissions from Operational Phase

The only GHGs emitted by the Project will come from the trucks to be used in the construction and operational phases. Table 7-1 presents GHG emission calculations for the truck activity during the construction and operational phases. Truck activity due to construction was based on results from the CalEEMod model. For the construction phase, the baseline consists of operation in the East and West Pits, and the post-Project consists of the ongoing operation in the East and West Pits, which are unchanged, plus the construction associated with the South Quarry. The Project emissions (difference between baseline and post-Project emissions) for the construction phase consist of the construction emissions associated with the South Quarry.

For the operational phase, calculations for baseline and post-Project emissions for each of the years 2019 through 2022 (using the Project design features previously outlined) are shown, with 2022 being the worst-case year. Comparing the sum of the amortized construction GHG emissions and the operational GHG emissions to the significance threshold of 10,000 MT CO_2e/yr for industrial projects shows that for the worst-case year (2022), the sum is below the significance threshold.

Table 7-1: Project GHG Emissions Increase – Construction and Operational Phases

Parameter	2017	2018	2019	2020	2021	2022
	Construction Post-Project					
Off-road diesel vehicles for construction Y1-Y2 (HP-hr/yr)	1,429,600	1,429,600	-	-	-	-
GHG emissions for construction Y1-Y2 (MT/yr)	721	709	-	-	-	-
	Amortized Construction Project GHG Increase					
GHG emissions, amortized based on total for 2 years (MT/yr)	47.7	47.7	47.7	47.7	47.7	47.7
			Operational Baseline[1]			
Haul and water truck usage (HP-hr/yr)	-	-	4,656,161	4,656,161	4,591,642	4,591,642
Other trucks (HP-hr/yr)	-	-	3,236,250	3,236,250	3,236,250	3,236,250
Total HP-hr/yr	-	-	7,892,411	7,892,411	7,827,892	7,827,892
Total GHG emissions (MT/yr)	-	-	4,969	4,969	4,928	4,928
			Operational Post-Project			
Haul and water truck usage, operational (HP-hr/yr)	-	-	6,351,007	6,440,553	6,528,270	8,314,258
Other trucks, operational (HP-hr/yr)	-	-	3,236,250	3,236,250	3,236,250	3,236,250
Off-road diesel vehicles, operational (HP-hr/yr)	-	-	9,587,257	9,676,803	9,764,520	11,550,508
GHG emissions (MT/yr)	-	-	6,036	6,092	6,148	7,272
			Operational Project GHG Increase			
GHG emissions (MT/yr)	-	-	1,067	1,123	1,219	2,344
	Amortized Construction and Operational Project GHG Increase					
GHG emissions (MT/yr)	47.7	47.7	1,115	1,171	1,267	2,391
Significance Threshold (MT/yr)	10,000	10,000	10,000	10,000	10,000	10,000
Above Significance Threshold	NO	NO	NO	NO	NO	NO

Conversion Factors and Assumptions

HP-hr = 2,545 British thermal units (Btu)

Combustion efficiency = 30%

CO_2 emission factor = 73.96 kg CO_2/MMBtu[3]

CH_4 emission factor = 3.0E-03 kg CO_2/MMBtu[3]

N_2O emission factor = 6.0E-04 kg CO_2/MMBtu[3]

CO_2 Global Warming Potential (GWP) = 1

CH_4 GWP = 25

N_2O GWP = 298

Notes:

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.

2. Emission Factors and GWP values are from Title 40, Chapter I, Subchapter C, Part 98, Tables A-1, C-1, and C-2 for distillate fuel #2.

7.3 Operational Scenario Without Mitigation

MCC plans to include mitigation in the South Quarry Project, as indicated in the permit conditions provided above. However, for completeness, MCC is providing GHG emission calculations for the scenario without mitigation, which involves showing results for a different Project fleet without the extra 777G haul truck additions. The mitigation involves additional haul truck retirements and replacements with Tier 4 (777G) haul trucks. The newer trucks achieve higher energy efficiency because they carry more material per trip and use less fuel relative to the amount of material carried.

The assumptions used for the fleet without mitigation are shown in Table 4-5. The GHG emission calculation results for haul truck dust entrainment and haul truck exhaust are presented in Table A-17-1 in Appendix A and are summarized in Table 7-2. The GHG emission calculation results without mitigation are higher than the GHG emission calculation results with mitigation. Hence, there is a benefit for the mitigation measures applied, as shown in the tables below.

Table 7-2: Project GHG Emissions Increase – Construction and Operational Phases (Without Mitigation)

Parameter	2017	2018	2019	2020	2021	2022
	Construction Post-Project					
Off-road diesel vehicles for Construction Y1-Y2 (HP-hr/yr)	1,429,600	1,429,600	-	-	-	-
GHG emissions for Construction Y1-Y2 (MT/yr)	721	709	-	-	-	-
	Amortized Construction Project GHG Increase					
GHG emissions, amortized based on total for 2 years (MT/yr)	47.7	47.7	47.7	47.7	47.7	47.7
			Operational Baseline[1]			
Haul and water truck usage (HP-hr/yr)	-	-	4,656,161	4,656,161	4,591,642	4,591,642
Other trucks (HP-hr/yr)	-	-	3,236,250	3,236,250	3,236,250	3,236,250
Total HP-hr/yr	-	-	7,892,411	7,892,411	7,827,892	7,827,892
Total GHG emissions (MT/yr)	-	-	4,969	4,969	4,928	4,928
			Operational Post-Project			
Haul and water truck usage, operational (HP-hr/yr)	-	-	6,426,188	6,582,172	6,643,260	8,523,175
Other trucks, operational (HP-hr/yr)	-	-	3,236,250	3,236,250	3,236,250	3,236,250
Off-road diesel vehicles, operational (HP-hr/yr)	-	-	9,662,438	9,818,422	9,879,510	11,759,425
GHG emissions (MT/yr)	-	-	6,083	6,181	6,220	7,404
			Operational Project GHG Increase			
GHG emissions (MT/yr)	-	-	1,114	1,213	1,292	2,475
	Amortized Construction and Operational Project GHG Increase					
GHG emissions (MT/yr)	47.7	47.7	1,162	1,260	1,339	2,523
Significance Threshold (MT/yr)	10,000	10,000	10,000	10,000	10,000	10,000
Above Significance Threshold	NO	NO	NO	NO	NO	NO

Conversion Factors and Assumptions

HP-hr = 2,545 Btu

Combustion efficiency = 30%

CO_2 emission factor = 73.96 kg CO_2/MMBtu[3]

CH_4 emission factor = 3.0E-03 kg CO_2/MMBtu[3]

N_2O emission factor = 6.0E-04 kg CO_2/MMBtu[3]

CO_2 GWP = 1

CH_4 GWP = 25

N_2O GWP = 298

Notes:

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.

2. Emission factors and GWP values are from Title 40, Chapter I, Subchapter C, Part 98, Tables A-1, C-1, and C-2 for distillate fuel #2.

8.0 CLASS I AREA ANALYSIS

As discussed in Section 2.0, this Project is not subject to either PSD or a conformity analysis. This section discusses the Class I area analysis, which is a CEQA/NEPA requirement.

For both the construction and operational phases, the emission increase associated with the mine expansion is less than 25 tpy of NO_x, less than 15 tpy of PM_{10}, and less than 2 tpy of $PM_{2.5}$, and the Project will be below the MDAQMD and CEQA significance thresholds. The SO_2 increase associated with the Project is less than 0.05 tpy and is considered negligible.

For all of the discussion in Section 8.0, we are using the project emissions increase of 0.1 tons/year for NO_x emissions and 15 tons/year for PM_{10} emissions (rounded up from 14.2 tons/year, for simplicity).

8.1 Federal Land Manager (FLM) Requirements for Class I Areas

Class I areas are designated in 40 CFR Part 81 and are defined as areas of special national or regional value from a natural, scenic, recreational, or historic perspective. Mandatory federal Class I areas include the following areas in existence on August 7, 1977:

- International parks;
- National wilderness areas that exceed 5,000 acres in size;
- National memorial parks that exceed 5,000 acres in size; and
- National parks that exceed 6,000 acres in size.

These areas are administered by the National Park Service (NPS), the USFS, or the United States Fish and Wildlife Service (USFWS). These FLMs are also responsible for evaluating a project's air quality impacts in the Class I areas and may make recommendations to the permitting agency to approve or deny permit applications. The FLMs are also responsible for preparing NEPA documents for sources located on federal lands. The FLM is typically consulted prior to the preparation of the NEPA document, which allows the FLM to assess the need for a Class I area impact analysis and provides the source the opportunity to provide their own analysis and data to support the NEPA process.

The FLM has authority under the CAA to require impact analyses if any source is thought to impact the air quality related values (AQRVs) in a Class I area. Class I area impact analyses were historically performed for proposed projects located within 100 kilometers (km) of a Class I area, although this has been extended to 300 km for some large projects.

The nearest Class I area to the Project is the San Gorgonio Wilderness located approximately 21 km to the south of the Project in the San Bernardino National Forest. Other Class I areas located within 100 km of the facility are presented in Figure 1-5. All are under USFS management, except for Joshua Tree National Park, which is located 48 km from the site and is under the management of the NPS. Therefore, the only Class I areas that are located within 50 km of the source are the San Gorgonio Wilderness and Joshua Tree National Park.

The Class I area analysis typically consists of:

- An analysis of impacts on other AQRVs, such as impacts to flora and fauna, water, and cultural resources (AQRV impact analysis), which includes:

- A Visibility Impairment Analysis (VIA);
- An ozone impact analysis; and
- An Acid Deposition Analysis (ADA).

8.2 AQRV Impact Analysis

The FLM Air Quality Related Values Work Group (FLAG) has published two FLM guidance documents, both titled Phase I Report. The first was published in December 2000 and an updated document was published in November 2010. These documents provide procedures the FLM should use for determining AQRVs in Class I areas and the procedures the applicant should use to evaluate impacts on AQRVs. To the extent practical, procedures described in the 2010 FLAG Phase I Report have been employed to demonstrate the likelihood that the Project will not result in adverse impacts to the region's Class I areas.

Prior to the establishment of FLAG and its predecessor, the Interagency Workgroup on Air Quality Modeling (IWAQM), the various FLMs had little coordination on how to implement the requirements for Class I areas. The IWAQM and FLAG reports have allowed the FLMs to act on Class I area analyses using a consistent framework. The first Phase I Report was prepared in 2000. In 2008, FLAG released a draft update to the 2000 report. The update was prepared after FLAG recognized the need to update information in the 2000 report based on new scientific data. In addition, an initial screening test was added to determine if a source would need to perform further analysis. After publishing a federal register notice requesting comments on the revised document, a draft document was finalized and published in November 2010, which is referred to hereinafter as the 2010 FLAG Phase I Report.

The 2010 FLAG Phase I Report instructs the FLMs to review each application on a case-by-case basis and take into account the following factors:

- Current conditions of sensitive AQRVs within the Class I area;
- Magnitude of emissions from the project;
- Distance of the project from the Class I area;
- Potential for source growth in the region surrounding the Class I area;
- Existing/prevailing meteorological conditions in the region; and
- Cumulative effects to AQRVs of the project with other regional sources.

The 2010 FLAG Phase I Report identifies three major AQRVs the FLM should focus on, specifically visibility impacts, ozone impacts, and deposition of nitrogen and sulfur compounds. The AQRVs are set by the FLM and are specific to each Class I Area. Wilderness area (acid deposition impact) AQRVs can be found through the USFS Website at http://www.fs.fed.us/air/index.htm. Each major AQRV for the San Gorgonio Wilderness is presented in Appendix F. For the AQRV impact analysis, we are using the total Project emissions increase, including both mining fugitive source and mobile source Project emissions increases (as described in the previous sections).

8.2.1 Analysis for Class I Areas Located 50 km or More from the Site

For Class I areas located 50 km or more from the site, the 2010 FLAG Phase I Report provides a general screening method that was not available in the 2000 FLAG Phase I Report. If the total emissions of certain pollutants (tpy) divided by the distance to the Class I area in km is less than 10, no further analysis is necessary. The general screening method is applied to each area of concern: visibility impairment, ozone impacts, and acid deposition.

For MCC, the general screening method is quantified as follows:

$$(15 \text{ tpy of } PM_{10} + 0.1 \text{ tpy of } NO_x)/50 \text{ km} = 0.3 << 10$$

Based on this result, the FLMs will not be expected to require a more detailed analysis of visibility and haze impacts in Class I areas located beyond 50 km of the Project. This approach will also eliminate the requirements for ozone impacts and acid deposition impacts analysis for Class I areas beyond 50 km.

8.2.2 Analysis for Class I Areas Located Within 50 km of the Site

The following sections specifically address visibility, ozone, and acid deposition impacts for Class I areas located within 50 km of the site. The following sections present results for the San Gorgonio Wilderness, which is the closest Class I area to the site. Assuming that results for San Gorgonio Wilderness show that the specified screening criteria are not exceeded, an analysis for Joshua Tree National Park is not needed because it is further away.

For sources located within 50 km of a Class I area, the general screening method described above (for Class I areas located beyond 50 km of the Project) does not apply and the FLM is to be consulted as to the availability of any initial screening methods for each analysis. If no initial screening methods are available, the next level of screening analysis (referred to as Level 1 Screening) will likely be required by the FLMs.

8.2.2.1 Visual Impacts Analysis

For the Class I areas less than 50 km from MCC (San Gorgonio Wilderness and a small corner of Joshua Tree National Park), the plume visibility impacts are evaluated using a tiered approach.

For the VIA, the 2010 FLAG Phase I Report calls for VISCREEN modeling as the correct screening approach (page 20). Note that the VIA screening method discussed in this section is distinct from the general screening method discussed in Section 8.2.1. The VISCREEN model uses worst-case meteorology to estimate plume visibility. The two parameters output by VISCREEN are delta E, a plume perceptibility parameter based on color differences and brightness, and the plume contrast, a spectral criterion defined for a green wavelength of 0.55 microns.

VIA Summary

The VISCREEN model was run for the Project using PM_{10} and NO_x emission rates of 15 and 25 tons/yr, both of which were conservatively set at threshold levels for the purpose of the VIA screening analysis. The nearest Class I area is the San Gorgonio Wilderness, with the closest boundary located 21 km south of the Project. The most distant boundary in the San Gorgonio Wilderness is 42 km south of the Project.

A Level 2 VIA screening analysis was performed in accordance with the 2010 FLAG Phase I Report and USEPA guidance for VISCREEN (1992). Both meteorology and complex terrain were considered for the analysis, as follows:

- Wind direction: The boundaries of the San Gorgonio Wilderness lie within a southerly sector ranging from 153° to 204° of the Project. Since wind direction is measured at angles from which the wind is blowing, this sector corresponds to wind directions ranging from 333° to 24°. To further account for a plume angle of 11.25°, wind directions ranging from 322° to 35° were considered in the Level 2 VIA screening analysis.
- Stability class and wind speed: The VISCREEN guidance prescribes a procedure by which local hourly meteorological data is evaluated in order to identify the joint frequency of the occurrence of stability class, wind speed, and relevant wind directions. The meteorological data set used for AERMOD modeling was used in this analysis. Additionally, complex terrain was considered in selecting the stability class. A stability class of E and a wind speed of 2.0 meters per second (m/s) were selected based on this analysis, which is described below in greater detail.
- Background visual range: A background visual range of 257 km was obtained from the USFS website regarding AQRVs, and is identified as the average annual natural visibility in the wilderness area (USFS 2016).
- Other parameters: Neither the 2010 FLAG Phase I Report nor the MDAQMD have provided modeling guidelines or recommended parameters for the other VISCREEN inputs. Nearby air quality management districts do provide modeling guidelines and it is common to use other jurisdiction's guidelines if appropriate for the situation. For this analysis, we used the guidance in SCAQMD Rule 1303, Appendix B, Modeling Analysis for Visibility, which recommends that primary NO_2, soot, and sulfate (SO_4) emissions be set to 0 tpy, which is also the model default. The USEPA defaults for particle characteristics and background ozone were also used.

The threshold visibility values to which VISCREEN results should be compared are stated in the 2010 FLAG Phase I Report (page 21), and are the same as those listed in the USEPA guidance for VISCREEN, dated June 1992. These threshold values are 2.0 for the total color contrast (delta E) and 0.05 for contrast. The VISCREEN model output file is provided in Appendix G.

The VISCREEN modeling results are presented in Table 8-1 and show that the results inside the Class I area ("Plume") are below the threshold values ("Standard") for both delta E and contrast. A negative value for plume contrast is a valid result and indicates that the plume appears darker than the sky. The conservative nature of the VISCREEN model will ensure the proposed changes at MCC will not negatively impact visibility at nearby Class I areas.

Table 8-1: Maximum Visual Impacts Inside the Class I Area

					Delta E		Contrast	
Background	**Theta**	**Azimuth**	**Distance**	**Alpha**	**Standard**	**Plume**	**Standard**	**Plume**
SKY	10	158	42	10	2	0.428	0.05	0.009
SKY	140	158	42	10	2	0.091	0.05	-0.003
TERRAIN	10	158	42	10	2	1.206	0.05	0.009
TERRAIN	140	158	42	10	2	0.085	0.05	0.001

<u>Stability Class and Wind Speed Analysis for Use as Inputs to the VIA for Level 2 VISCREEN Modeling</u>

The Level 2 VIA screening analysis consists of identifying the joint frequency distribution of wind direction, wind speed, and atmospheric stability as measured at or near the location of the emission source. As described previously, a sequential hourly 5-year meteorological data set was prepared for the purpose of performing an ambient air quality analysis of Project emissions using the AERMOD dispersion model. This 5-year data set was used for identifying the stability class and wind speed to be used in the VISCREEN analysis.

The first step in the analysis is to stratify the data set into four equal length time periods of the day, specifically with a duration of 6 hours each. The second step is to rank dispersion conditions by the calculated product of $\sigma_y \times \sigma_z \times u$, where u is the measured wind speed and σ_y and σ_z are the Pasquill-Gifford horizontal and vertical diffusion coefficients for the calculated stability class and downwind distance along the stable plume trajectory. Table 8-2 summarizes the results of these first two steps of the analysis.

Table 8-2: Worst-Case Meteorological Conditions for Plume Visual Impact Calculations

Dispersion Condition		Transport Time (Hours)	Frequency (f) and Cumulative Frequency (cf) of the Occurrence of Hourly Dispersion Conditions Associated with Class I Area Transport Wind Direction by Time of Day (Percent)							
Stability Class, Wind Speed (m/s)	$\sigma_y \times \sigma_z \times u$ (m^3/s)		Hours 1-6		Hours 7-12		Hours 13-18		Hours 19-24	
			f	cf	f	cf	f	cf	f	cf
F, 1	3.13E+04	5.7	0.34	0.34	0.06	0.06	0.22	0.22	0.52	0.52
F, 2	6.26E+04	2.9	0.31	0.65	0.04	0.10	0.12	0.34	0.66	1.18
F, 3	9.39E+04	1.9	0.02	0.67	0.02	0.12	0.05	0.38	–	–
E, 1	8.53E+04	5.7	0.00	0.67	0.00	0.12	0.00	0.38	–	–
E, 2	1.71E+05	2.9	0.04	0.70	0.03	0.15	0.04	0.42	–	–
D, 1	2.09E+05	5.7	0.00	0.70	0.03	0.17	0.03	0.45	–	–
E, 3	2.56E+05	1.9	0.16	0.87	0.05	0.22	0.15	0.59	–	–
E, 4	3.41E+05	1.4	0.04	0.90	0.00	0.22	0.04	0.63	–	–
E, 5	4.27E+05	1.1	0.00	0.90	0.00	0.22	0.00	0.63	–	–
D, 2	4.19E+05	2.9	0.00	0.90	0.02	0.24	0.09	0.72	–	–
D, 3	6.28E+05	1.9	0.03	0.93	0.04	0.27	0.19	0.91	–	–
D, 4	8.38E+05	1.4	0.06	0.99	0.05	0.32	0.27	1.19	–	–
D, 5	1.05E+06	1.1	0.06	1.06	0.12	0.44	–	–	–	–
D, 6	1.26E+06	1.0	–	–	0.17	0.61	–	–	–	–
D, 7	1.47E+06	0.8	–	–	0.16	0.78	–	–	–	–
C, 1	1.51E+06	5.7	–	–	0.01	0.79	–	–	–	–
D, 8	1.68E+06	0.7	–	–	0.05	0.84	–	–	–	–
D, 9	1.88E+06	0.6	–	–	0.06	0.90	–	–	–	–
D, 10	2.09E+06	0.6	–	–	0.05	0.96	–	–	–	–
D, 11	2.30E+06	0.5	–	–	0.02	0.98	–	–	–	–
D, 12	2.51E+06	0.5	–	–	0.01	0.99	–	–	–	–
C, 2	3.02E+06	2.9	–	–	0.04	1.02	–	–		

The next step is to select the worst-case 1st percentile meteorological condition as being indicative of worst-day plume visual impacts. In this case, the combination of F stability class and a wind speed of 2 m/s is selected based on the results for the meteorological hours from 19:00 to 24:00. While this time period is generally associated with nighttime hours, the USEPA VISCREEN guidance explicitly states that nighttime dispersion conditions must be considered because maximum plume visual impacts are often observed in the morning after a period of nighttime transport. However, the selection of meteorological conditions from this time period is conservative because the Project will not be operating beyond sunset. Nevertheless, for the purposes of the Level 2 VIA screening analysis of the Project, the combination of F stability class and a wind speed of 2 m/s was selected for further analysis.

The last step in the process is to evaluate complex terrain. The Project, at about 6,000 feet in elevation, is separated from the San Gorgonio Wilderness by a high ridge that exceeds 8,000 feet in elevation, the Big Bear Lake valley, and Sugarloaf Mountain (9,950 feet). The San Gorgonio Wilderness has terrain with elevations greater than 10,000 feet. The USEPA's VISCREEN guidance states that the selected stability class should be shifted to one category less stable if an observer in the Class I area is at least 500 meters above the emissions release height or if elevated terrain separates an observer in the Class I area from the emission source. In the case of an observer in the San Gorgonio Wilderness, both criteria are satisfied. Therefore, the combination of E stability class and a wind speed of 2 m/s was selected for input to VISCREEN.

8.2.2.2 Ozone Impact Analysis

The 2010 FLAG Phase I Report has identified ozone as an ambient air quality pollutant of concern. AQRVs have been established in Class I areas to determine if the ozone impacts are damaging to the flora of the area. The AQRV values for the San Gorgonio Wilderness are listed in Appendix F, which shows that the lowest AQRV for ozone is 45 parts per billion (ppb).

There are no recommended or approved models available for calculating ozone impacts from an individual project. As noted in the 2010 FLAG Phase I Report, ozone impacts are directly related to NO_x concentrations. Therefore, we used calculated NO_x concentration increases and then applied a reference that relates NO_x concentration increases to ozone concentration increases. This approach is used because, in this instance, there is no standard approach provided by the 2010 FLAG Phase I Report. The NO_x concentration used is based on AERMOD modeling for annual average concentrations at the Class I area, as discussed above. The threshold values applied for comparing with the model results are the ozone AQRVs published for the San Gorgonio Wilderness.

The USEPA-approved AERMOD dispersion model was used to estimate the annual NO_x concentration of the emissions from the Project at the northern edge of the San Gorgonio Wilderness boundary. The model was run with 5 years of meteorological data per USEPA modeling guidance in 40 CFR 51 Appendix W, which the 2010 FLAG Phase I Report references. Only the haul road emissions source was considered in this analysis, as that is the source that comprises the haul trucks and water trucks being evaluated. These trucks were assumed by AERMOD to operate for 10 hours each weekday from 7:00 am to 5:00 pm. Since the trucks operate on a schedule of 2,500 hours per year (10 hours each weekday, 50 weeks per year), the modeled NO_2 emission rate is calculated by dividing 0.1 tpy by 2,500 operating hours. The resulting modeled emission rate is 0.13 lb/hr [0.017 grams per second (g/s)]. The model output file and input parameters for the worst-case year are provided in Appendices C and D.

AERMOD predicted a 5-year maximum annual X/Q of 0.00148 microgram per cubic meter ($\mu g/m^3$)/(g/s), as shown in Appendices C and D. Multiplying this value by the modeled emission rate of 0.017 g/s results in a maximum predicted annual NO_2 concentration of 0. $\mu g/m^3$. The USEPA national default ratio of NO_2 to NO_x is 0.75 per 40 CFR 51 Appendix W. However, we have conservatively assumed that all NO_x is NO_2. Assuming all the NO_x as NO_2, this will translate to 0.00000195 parts per billion (ppb) of NO_2.

Using the ozone isopleths in the Seinfeld 1986 reference (see Appendix H), the worst-case ratio of the ozone increase to the NO_2 increase is less than 10. Therefore, as shown in Table 8-3, based on a NO_x concentration of 0.000013 ppb, the maximum ozone increase is 0.00013 ppb. This is much less than the lowest AQRV for ozone in Appendix F, which is 45 ppb.

Table 8-3: Evaluation of Ozone Impacts Using Relationship between NO_x Concentration Increases and Ozone Concentration Increases

Item	Units	Value	Reference
Maximum annual NO_x concentration at northern edge of the San Gorgonio Wilderness boundary	$\mu g/m^3$	0.000025	AERMOD modeling
Maximum NO_2 concentration in ppb	ppb	0.000013	Conversion of $\mu g/m^3$ to ppb
Ratio of ozone increase to NO_2 concentration increase	Ratio	<10	Seinfeld 1986
Maximum ozone increase	ppb	0.00013	Calculated from above ratio
AQRV for ozone impacts	ppb	45	Appendix F
Is increase above AQRV?	Yes/No	No	–

For comparison, please note that the NO_x emissions from this Project were less than 0.1% of the total NO_x emissions in the MDAQMD territory in 2007.

8.2.2.3 Acid Deposition Analysis

Emissions of NO_x and SO_x may be converted into nitrates, sulfates, and sulfites in the atmosphere. These compounds, in turn, may then be deposited into water bodies and vegetative surfaces where the acidic nature of the compounds may damage the flora or fauna.

The FLM may request a nitrogen and sulfur deposition analysis. As mentioned, it is in the FLM's authority to request deposition impacts for sources if they suspect a detrimental impact on Class I areas. AQRVs for nitrogen and sulfur deposition have been established through the FLAG Phase I process. The AQRV values for the San Gorgonio Wilderness are listed in Appendix F, which shows that the lowest AQRV for acid deposition is 3.0 kilogram per hectare per year (kg/ha/year).

The following ADA screening method can be used to perform an ADA for Class I areas less than 50 km from the site. An USFS ADA screening methodology for calculating acid neutralizing capacity (ANC) change to high elevation lakes includes a calculation to determine the deposition rates of nitrogen and sulfur from ambient NO_x and SO_x concentrations. Dispersion modeling without the complex nitrogen and sulfur chemical mechanisms can then be used to determine the concentrations of NO_x and SO_x at the location of interest. If the ADA screening method estimates deposition rates above the AQRV values, more refined modeling may be required by the FLM.

The ADA screening methodology provided by the USFS was used to estimate the nitrogen deposition rates. This methodology was applied based on predicted NO_2 concentrations at the boundary of the San Gorgonio Wilderness. SO_x emissions from the Project are insignificant and will not impact the acid deposition rates.

The 2010 FLAG Phase I Report specifies the MAGIC-WAND deposition model and also mentions the USFS Rocky Mountain Region's recommendation to use either CALPUFF or AERMOD modeling for nitrogen deposition (page 65). The 2010 FLAG Phase I Report also indicates that the Rocky Mountain Region recommends the USFS publication, "Screening Methodology for Calculating ANC Change to High Elevation Lakes," for ADA screening (page 65). The parameter values used are those found in the nitrogen deposition rate equation in the USFS publication (which calculates nitrogen deposition rate from NO_x concentration and other parameters). The NO_x concentration used is based on AERMOD modeling for annual average concentrations at the Class I area. The threshold values applied for comparing with the model results are the acid deposition AQRVs published for the San Gorgonio Wilderness.

The NO_2 deposition can be estimated from the NO_2 concentration according to the equation found in the USFS publication, "Screening Methodology for Calculating ANC Change to High Elevation Lakes":

$$Dn = \begin{matrix}\text{pollutant}\\\text{concentration}\end{matrix}\left(\mu g/m^3\right) * \begin{matrix}\text{deposition}\\\text{velocity}\end{matrix}\left(0.05\, m/s \text{ for } HNO_3\right) * \begin{matrix}\text{molecular weight}\\\text{ratio } NO_2 \text{ to N}\end{matrix}\left(\frac{14}{46}\right) * \begin{matrix}\text{total deposition to}\\\text{dry deposition ratio}\end{matrix}\left(2.0\right) * \left(\frac{315.4\,kg/ha/yr}{m/s \times \mu g/m^3}\right)$$

The annual NO_x concentration at the Northern edge of the San Gorgonio Wilderness boundary was estimated, as described above, under ozone impact analysis. The estimated deposition according to the above equation is 0.00014 kg/ha/year. As shown in Table 8-4, the estimated deposition is considerably less than the lowest listed AQRV threshold for the San Gorgonio Wilderness, as detailed in Appendix F.

Table 8-4: Evaluation of Acid Deposition Based on USFS ADA Screening Methodology

Item	Units	Value	Reference
Maximum annual NO_x concentration at northern edge of the San Gorgonio Wilderness boundary	$\mu g/m^3$	0.000015	AERMOD modeling
Deposition rate	kg/ha/year	0.00014	Calculated from above equation from USFS publication
AQRV for acid deposition	kg/ha/year	0.005	Appendix F
Is increase above AQRV?	Yes/No	No	–

9.0 CONCLUSIONS ABOUT SIGNIFICANCE FINDINGS AND CLASS I AREA ANALYSIS

Table 9-1 presents a summary of the Project construction and operational emission and health risk impacts and the comparison of this information to the significance thresholds for criteria pollutants and health risk.

The emission and health risk calculations for the construction and operational phases demonstrate that the construction and operational worst-case emissions and health risks from the Project, including Project design features and proposed mitigation measures, are below the criteria pollutant emissions and health risk significance thresholds.

The GHG emission calculations for the construction and operational phases demonstrated that the sum of the amortized construction GHG emissions and the operational GHG emissions from the Project are below the relevant significance threshold. As such, no mitigation is required. However, the truck fleet changes identified as mitigation for the PM_{10} and $PM_{2.5}$ emissions will also reduce GHG emissions.

In conclusion, as presented in previous sections (5.0, 6.0, and 7.0), we have reached the conclusion that the Project air quality and GHG emissions for each of the construction and operational phases are less than significant with mitigation.

For Class I areas that are more than 50 km away from MCC, impact analyses are not required by the FLM because the initial screening method in the 2010 FLAG Phase I Report shows that the change in emission levels is below the level required to trigger analysis requirements.

For Class I areas within 50 km of the site, the screening air quality analysis performed for this study shows that the Project is not expected to impair visibility, cause adverse ozone impacts, or result in acid deposition impacts.

Table 9-1: Project Summary of Construction and Operational Emissions and Health Risk Impacts

Pollutant	Baseline Emissions (tons/yr)[1]	Post-Project Emissions (tons/yr)	Project Emissions Increase (tons/yr)	Significance Threshold	Exceeds Threshold (Yes/No)
Construction Phase (Worst-Case Year)					
Particulate Matter (PM_{10})	198	210.2	12.2	15	NO
Particulate Matter ($PM_{2.5}$)	20.8	26.3	5.5	10	NO
Nitrous Oxides (NO_x)	68.8	77.5	8.7	25	NO
Volatile Organic Compounds (VOCs)	5.3	6	0.8	25	NO
Carbon Monoxide (CO)	25.2	31	5.9	100	NO
Sulfur Oxides (SO_x)	0.51	0.52	0.01	25	NO
			Project Health Risk[2]	**Significance Threshold**	**Exceeds Threshold (Yes/No)**
Cancer Risk			5.55E-08	1.00E-05	NO
Chronic Hazard Index			1.34E-04	1	NO
Acute Hazard Index			3.13E-03	1	NO
Operational Phase (Worst-Case Year)[3]					
Particulate Matter (PM_{10})	192.5	206.7	14.2	15	NO
Particulate Matter ($PM_{2.5}$)	19.7	20.5	0.8	12	NO
Nitrous Oxides (NO_x)	63.5	55.7	0.1	25	NO
Volatile Organic Compounds (VOCs)	4.3	3.3	-0.2	25	NO
Carbon Monoxide (CO)	21.8	29.0	7.2	100	NO
Sulfur Oxides (SO_x)	0.5	0.5	0.02	25	NO
			Project Health Risk[2]	**Significance Threshold**	**Exceeds Threshold (Yes/No)**
Cancer Risk			-1.27E-09	1.00E-05	NO
Chronic Hazard Index			3.87E-04	1	NO
Acute Hazard Index			3.78E-03	1	NO
Amortized Construction and Operational Phase (GHG)					
GHG (CO_2)[4]	4,928	7,272	2,344	10,000	NO

Notes:

1. The emissions for the 2017 baseline are shown for construction phase (Year 1).
2. Highest risk was observed at the MEIW for operational cancer and acute risks and at the MEIR for operational chronic risk and all construction risks. The risks reported in this table are the maximum risks for each phase.
3. Worst-case year for PM_{10}, $PM_{2.5}$, CO, and SO_x was 2022. Worst-case year for NO_x and VOC was 2019.
4. Units for CO_2 emissions and thresholds are expressed in MT/yr. Baseline for amortized construction and operational phase GHG is 2022.

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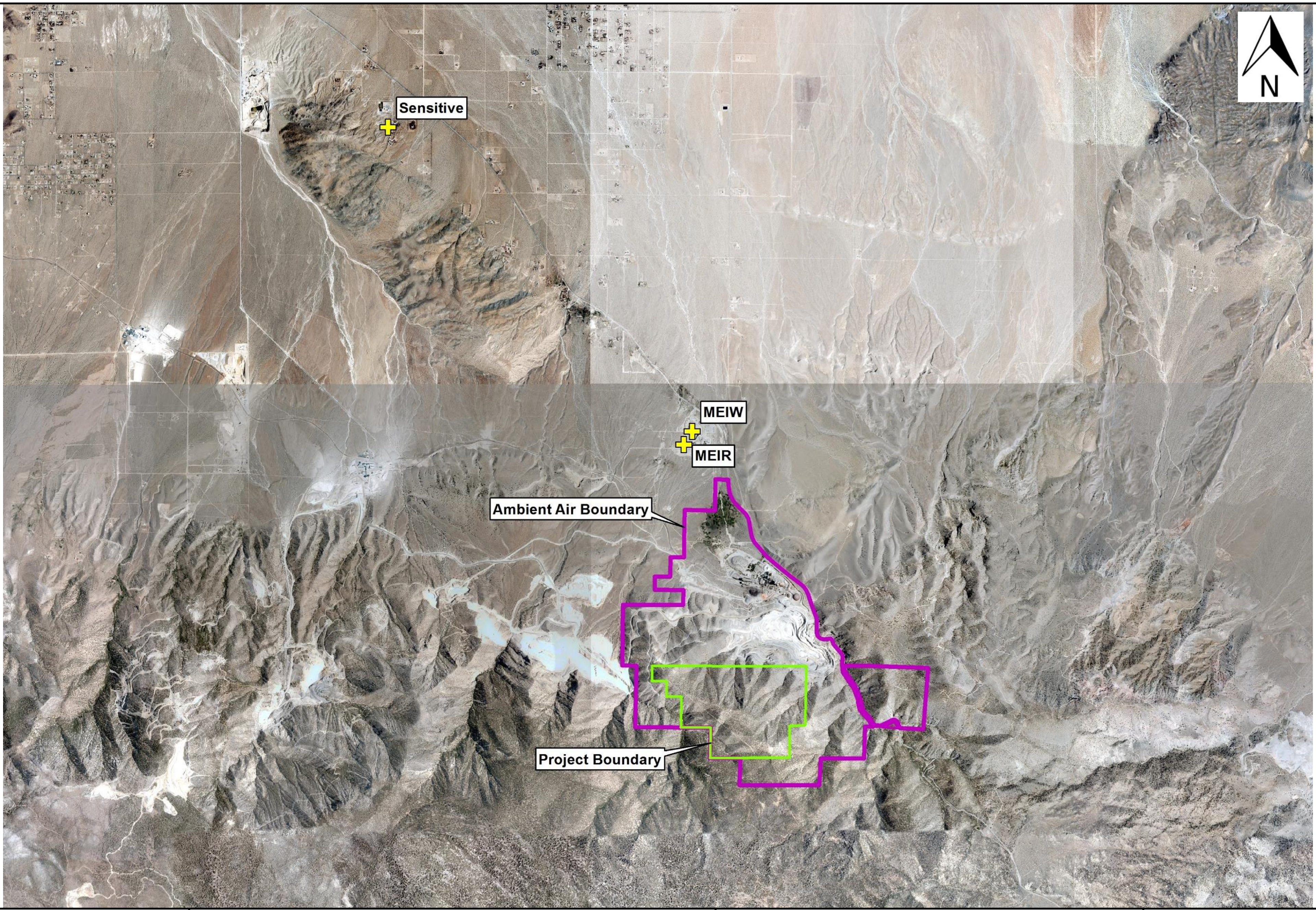
FIGURES



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TITLE

Receptor Locations Used in Air Dispersion Modeling

FACILITY ADDRESS

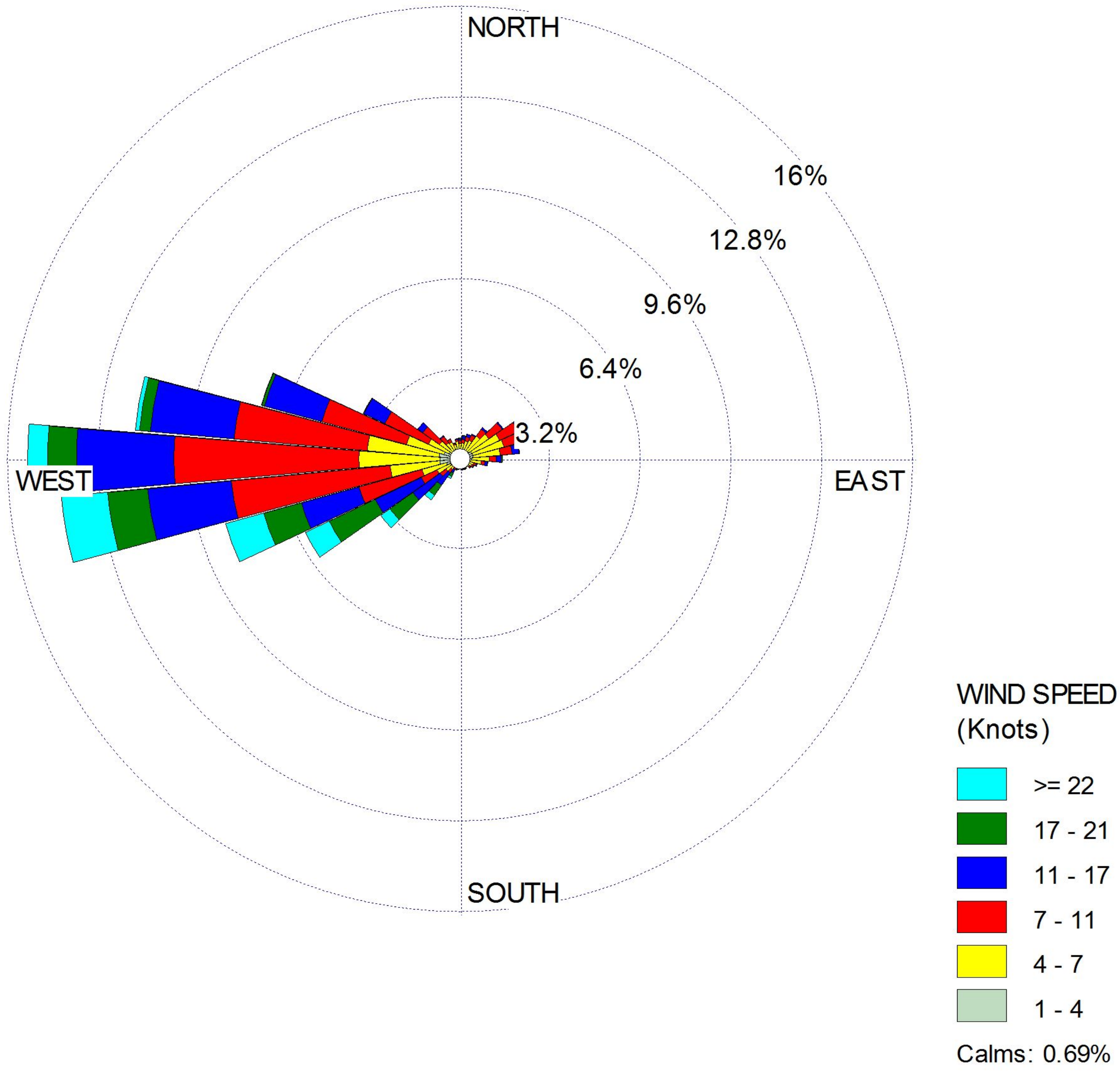
Mitsubishi Cement Corporation
Lucerne Valley, California

FIGURE #

1-1

REVISION DATE

June 2, 2016



DISPLAY
Wind Speed
Direction (Blowing From)

DATA PERIOD
2010 - 2014
Jan 1 - Dec 31
0:00 - 23:00

TOTAL COUNT
43,648 Hours

CALM WINDS
0.69%

AVG. WIND SPEED
9.92 Knots

Yorke ENGINEERING, LLC
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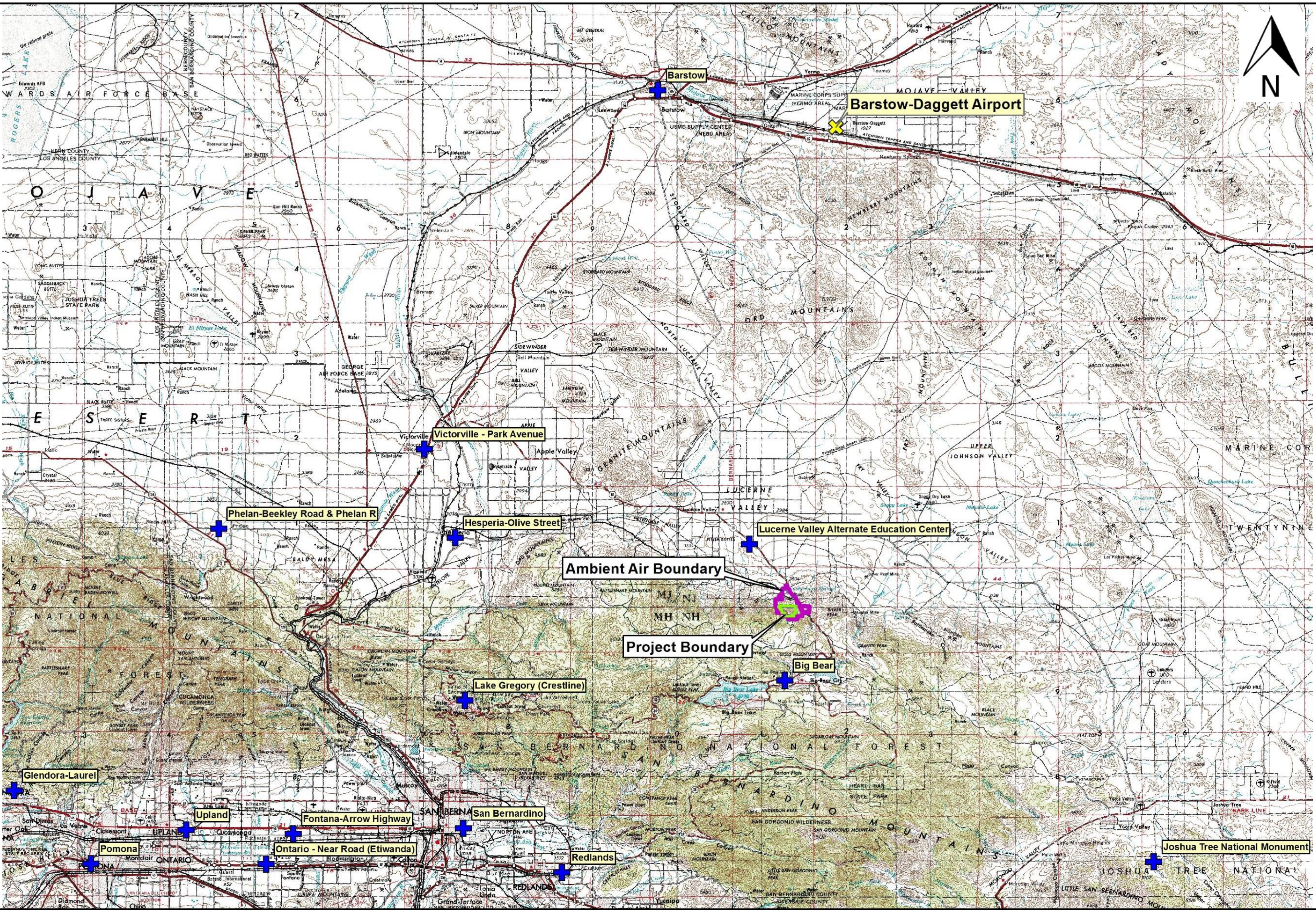
TITLE
Wind Rose, Daggett, CA, 2010 - 2014

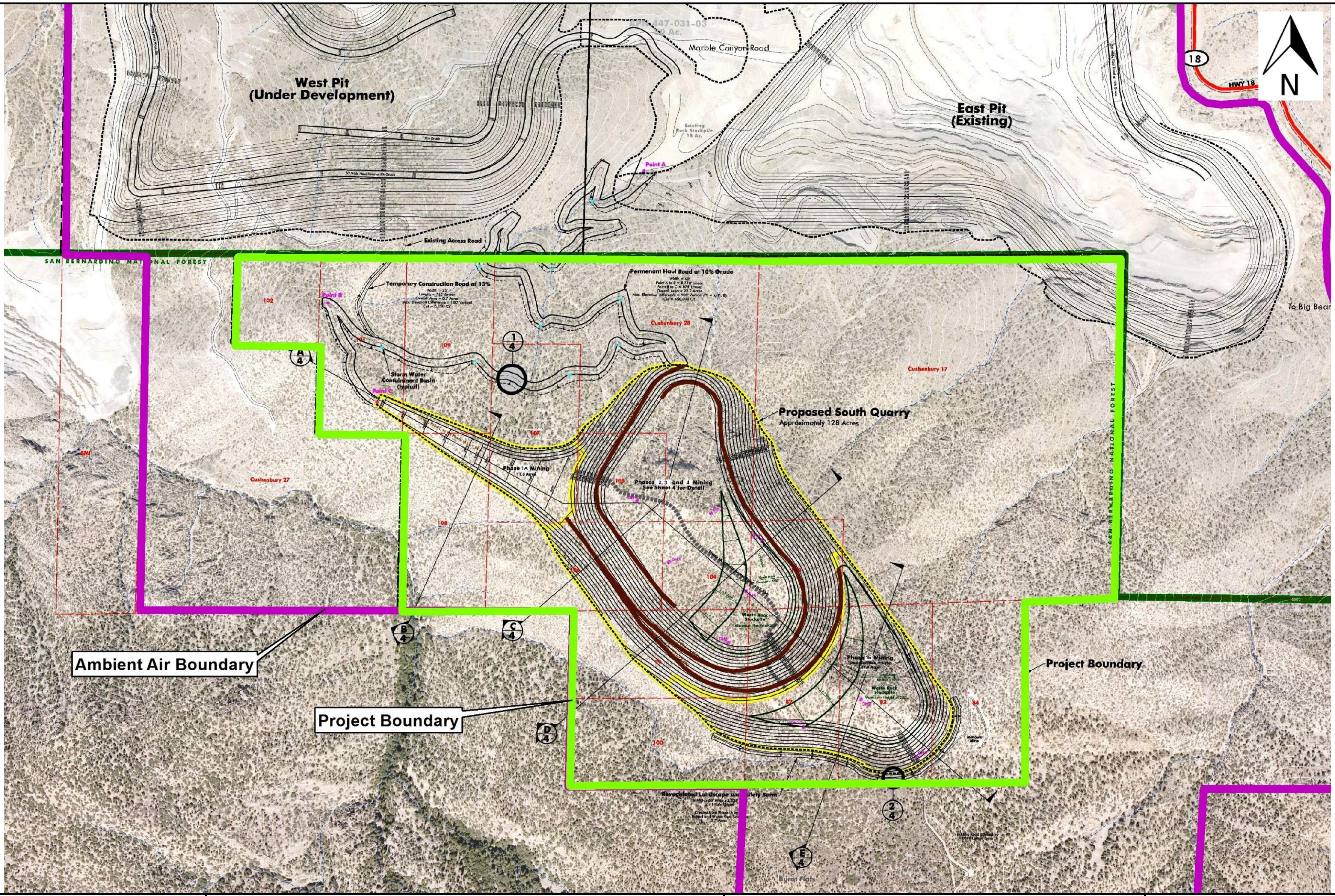
FACILITY ADDRESS
Mitsubishi Cement Corporation
Lucerne Valley, California

FIGURE #
1-2

REVISION DATE
June 2, 2016



Yorke ENGINEERING, LLC www.YorkeEngr.com	TITLE Ambient Air Quality Monitoring Stations Near the Project Site	FACILITY ADDRESS Mitsubishi Cement Corporation Lucerne Valley, California	FIGURE # 1-3 REVISION DATE June 15, 2016



TITLE	FACILITY ADDRESS	FIGURE #
Existing and Planned Operations	Mitsubishi Cement Corporation Lucerne Valley, California	1-4
		REVISION DATE June 2, 2016

Yorke ENGINEERING, LLC
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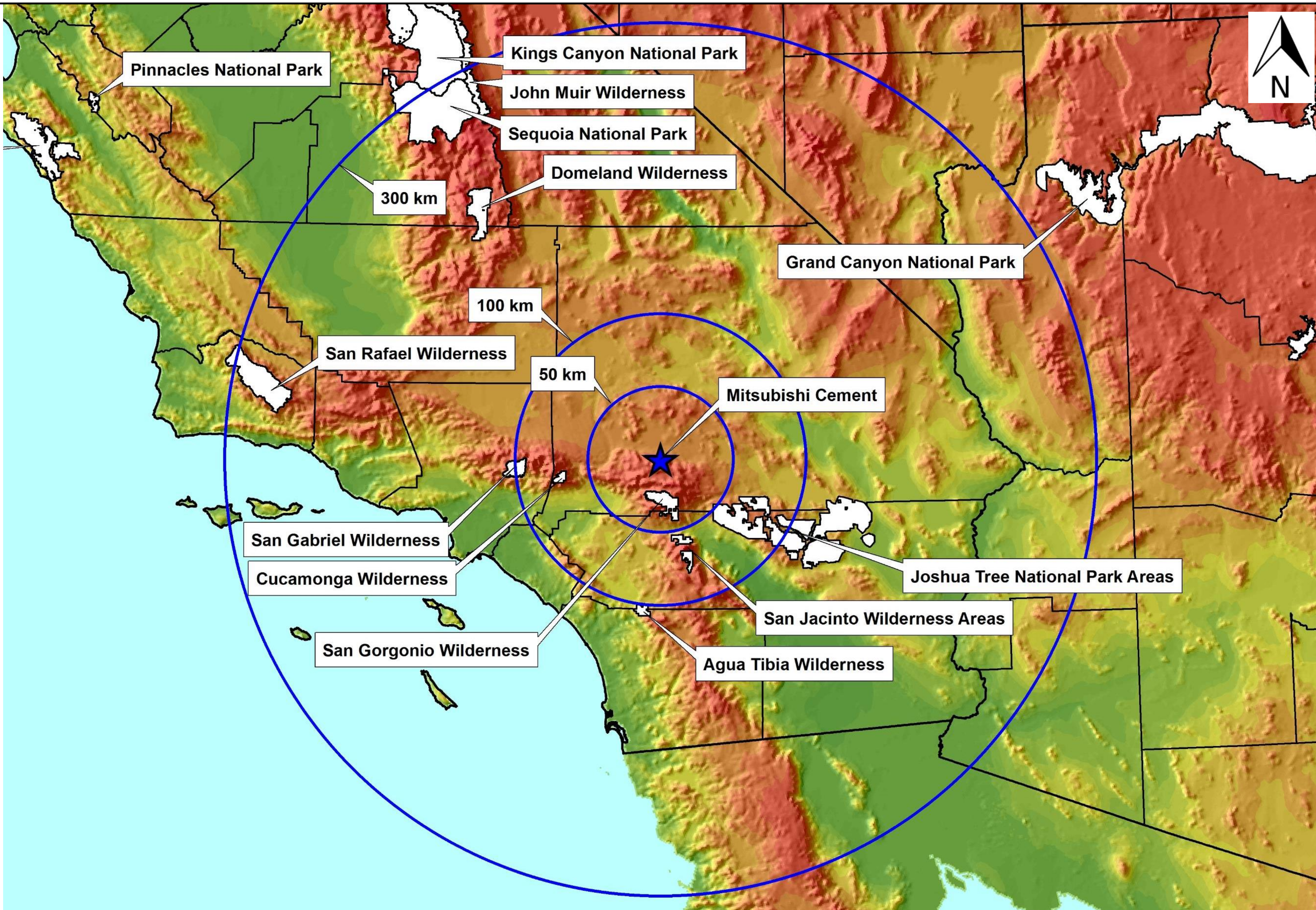

Yorke ENGINEERING, LLC www.YorkeEngr.com	TITLE Class I Areas Within 50 km, 100 km, and 300 km of Mitsubishi Cement	FACILITY ADDRESS Mitsubishi Cement Corporation Lucerne Valley, California	FIGURE # 1-5 REVISION DATE June 2, 2016

APPENDIX A – DETAILED CALCULATIONS FOR PROJECT EMISSIONS AND HEALTH RISKS

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Appendix A – Detailed Calculations for Project Emissions and Health Risks

Yorke Engineering, LLC has prepared criteria pollutant emission calculations, toxic air contaminant (TAC) emission calculations, and health risk assessment (HRA) calculations on behalf of Mitsubishi Cement Corporation (MCC) for the MCC proposed South Quarry Project (the Project), and compared the Project emissions increase and Project health risk increase to the Mojave Desert Air Quality Management District (MDAQMD) California Environmental Quality Act (CEQA) emissions and health risk significance thresholds.

Greenhouse gas (GHG) emissions from the construction and operational phases of the Project were calculated and the resulting total (based on the sum of one-thirtieth of the construction emissions and operational emissions) was compared to the South Coast Air Quality Management District (SCAQMD) GHG significance threshold for industrial projects, 10,000 metric tonnes (MT) of carbon dioxide equivalent per year (CO_2e/yr), to determine Project significance. Neither the County of San Bernardino nor the MDAQMD has adopted discrete significance thresholds for evaluating the global climate change impacts of this Project, or any project. However, in the meantime, and as approved by the County of San Bernardino (telephone conversation between Doug Feremenga, San Bernardino County, to Jocelyn Thompson, Alston & Bird, December 3, 2009), this analysis utilizes the GHG significance threshold for industrial projects adopted by the SCAQMD.

The detailed emission calculations are described in this appendix for the construction and operational phases of the Project. In each case, baseline emissions are presented, followed by post-Project emissions. Calculations are provided for the haul road construction (at the start of the Project) and the operational changes. The Project emissions and health risk for each Project phase are compared to the significance thresholds. The appendix includes the following sections:

- Project description and assumptions for construction and operational phases (A.1);
- Criteria pollutant emission calculations for construction phase (A.2);
- Criteria pollutant emission calculations for operational phase (A.3);
- TAC emission calculations and HRA for construction emissions (A.4);
- TAC emission calculations and HRA for operational emissions (A.5);
- GHG emission calculations for construction and operational phases (A.6); and
- Project scenario without mitigation (A.7).

For each of the construction and operational phases, the assumptions and Project design features are described. As shown in this report, for both the construction and operational emissions, for the Project with mitigation, the Project criteria pollutant emissions increase and health risk are below the corresponding MDAQMD CEQA emissions and health risk significance thresholds. For the post-Project with mitigation, total GHG emissions (based on the sum of one-thirtieth of the construction emissions and operational emissions) due to the Project are below the corresponding SCAQMD emissions threshold. Based on the permit conditions, MCC is committing to accelerated fleet turnover, the current watering frequency and associated control efficiency assumed for the West Pit are extended to the South Quarry, and the option of using chemical dust suppressants, in lieu of watering at this frequency, is included.

A.1 PROJECT DESCRIPTION AND ASSUMPTIONS

This section discusses Tables A-1-1 through A-1-2:

- A-1 series of tables: Project assumptions.

Limestone has been mined from the East Pit at the Cushenbury Quarry since the 1950s or earlier. In 2004, San Bernardino County certified an Environmental Impact Report (EIR) and approved a project that will shift limestone production to the West Pit, which is now under development. Based on further geologic study subsequent to the approval of the West Pit, MCC is proposing the new South Quarry to produce high-grade limestone that will be blended with the low and medium-grade limestone produced in the East and West Pits. The Project, for the purposes of this air quality study, is the shifting of a portion of the production from the West Pit to the South Quarry. The Project does not involve an increase in overall mine throughput (sum of throughputs from the West Pit and South Quarry). Because the impacts of construction and operation of the West Pit were fully analyzed in the EIR certified in 2004 (2004 EIR), this study compares the impacts of the Project to the impacts previously evaluated for the West Pit in the 2004 EIR, except as otherwise indicated.

This section analyzes the criteria pollutants and TACs emitted during Project construction. Based on instructions received from the MDAQMD, construction emissions are being calculated using CalEEMod. During the construction phase, the haul road will be built, including the following activities:

- Mass site grading to create a uniform haul road surface (option identified in CalEEMod);
- Moving of rock from the cut sections to fill sections (included in mass site grading operation identified in CalEEMod); and
- There will be hauling of cut rock that cannot be used in fill activities to limestone crushers or waste piles. However, because the total mined quantity will remain the same, and because the average haul distance is less than the maximum permitted haul distance for the West Pit, there is no emission increase associated with this activity.

Based on the above description of activities, we have identified the following emissions terms to be included in the construction emission calculations:

- Fugitive particulate matter less than 10 and 2.5 microns in size (PM_{10} and $PM_{2.5}$) emissions from solid material handling; and
- Diesel PM_{10} and $PM_{2.5}$, oxides of nitrogen (NO_x), volatile organic compound (VOCs), carbon monoxide (CO), oxides of sulfur (SO_x), and carbon dioxide (CO_2) emissions from mobile sources used in mass site grading, as described in CalEEMod.

Table A-1-1 presents the Project assumptions for the construction phase.

The operational phase will begin when the South Quarry is accessed for the production of limestone. We have defined baseline mining activities from the 2004 EIR and then described the operational change due to the shift to the South Quarry. The main assumptions (Project design features) for the operational phase are listed in Table A-1-2. The CEQA significance findings for the Project in Section 9.0 are based on these Project design features.

A.2 CONSTRUCTION PHASE EMISSIONS

This section discusses Table A-2-1 through A-2-4:

- A-2 series of tables: Construction emissions.

For the construction phase, the baseline and post-Project emissions were evaluated. The baseline emissions for the construction phase are the same as for the operational phase, as described below.

The construction post-Project emission calculations are based on CalEEMod, which include fugitive dust and truck exhaust emissions associated with mass site grading. Table A-2-1 presents the emission factor approaches used in CalEEMod. The methodology and results of the CalEEMod calculations, and comparison with MDAQMD emissions significance thresholds, are presented in Tables A-2-2, A-2-3, and A-2-4. The following procedures were used for calculating construction emissions using CalEEMod:

- We selected a 2-year construction duration (2017-2018). (The actual year for commencement of construction will depend on the date of Project approval.)
- We selected land use type industrial, general heavy industry, and construction activity grading.
- We provided the Project total acreage, the total cubic yards cut and fill quantity, mean vehicle speed, and material silt content.
- We used the default site grading equipment, causing CalEEMod to use default fleet parameters to evaluate off-road diesel emissions. The fleet is also used within CalEEMod to calculate default total disturbed acres.
- We removed default off-site construction activities, such as off-site hauling of cut material.
- We chose a moisture content of 1% to account for watering activities, for both material handling and wind erosion.

Table A-2-2 shows the parameters used for the CalEEMod simulation.

Tables A-2-3 and A-2-4 demonstrate that the worst-case Project construction emissions are below the MDAQMD CEQA emissions significance thresholds.

A.3 OPERATIONAL PHASE EMISSIONS

This section discusses Tables A-2-5 through A-8-8:

- A-2 series of tables: Operational Project assumptions;
- A-3 series of tables: Dust entrainment;
- A-4 series of tables: Wind erosion;
- A-5 series of tables: Seasonal stockpile material handling;
- A-6 series of tables: Haul truck emissions;
- A-7 series of tables: Water truck emissions; and

- A-8 series of tables: Emissions summaries.

In the following sections, we will describe the general features of the operational emission calculations, including baseline and post-Project emissions.

The baseline emissions for the Project are taken from the 2004 West Pit certified EIR and consist of the worst-case emissions associated with the West Pit (post-Project, after mitigation). Table A-2-5 presents a baseline emissions summary for PM_{10} and $PM_{2.5}$ for the West Pit EIR and 2022 (worst-case year for PM_{10} and $PM_{2.5}$) and Table A-2-6 presents a baseline emissions summary for truck exhaust for the West Pit EIR, 2019 (worst-case year for NO_x and VOCs), and 2022 (worst-case year for CO and SO_x).

For the baseline, the following approach will be used, with different approaches for the terms that are unchanging and for the terms that are changing. The Project results in no changes to the following terms, and therefore, these will not be considered further:

- Blasting and blasthole drilling: These operations relate to the initial blasting to release the rock prior to bulldozing, scraping, and grading. Because the mine throughput is unchanged, the number of blastholes drilled and number of blasting events is unchanged.
- Bulldozing, scraping, and grading of materials: These operations are needed to collect the material prior to loading on the haul trucks. Because the mine throughput is unchanged, this operation is unchanged.
- Material handling, for limestone ore and waste rock: This is the operation to load the material into the haul trucks and unload it into either the crusher or the waste pile. Because the mine throughput is unchanged, this operation is unchanged, except that, for 10 months of the year, there will be accumulation of extra limestone (to cover the two winter months) in a limestone pile prior to processing in the crusher, resulting in two extra material handling steps for this portion of the limestone (unloading to limestone pile and reloading into haul trucks). The material handling for the seasonal stockpile is accounted for in the Project emission calculations. All other material handling is unchanged.
- Wind erosion from limestone ore and waste rock stockpiles: These are the emissions that occur due to wind erosion for stockpiles that are disturbed at any given time as part of the mining operation. Because the mine throughput is unchanged, this operation is unchanged.
- Wind erosion from active disturbed mine areas: These are the emissions that occur due to wind erosion for the active disturbed mine areas (where material is being removed at any given time) as part of the mining operation. Because the mine throughput is unchanged, this operation is unchanged.

For emission terms that will not be modified in this Project, we are continuing to rely on MDAQMD emission factors used in the 2004 EIR, because there is no need to re-analyze these terms, as these emissions will not be changing, and hence their contribution to the Project emissions increase is zero.

For the Table A-2-5 and Table A-2-6 calculations, we have used the throughput assumptions from the 2004 EIR, but have used Environmental Protection Agency (EPA) AP-42 emission factors for all emission terms that will be modified in this Project, including:

- Dust entrainment, unpaved roads;

- Wind erosion, unpaved roads;
- Material handling due to seasonal stockpiling; and
- Haul truck exhaust and water truck exhaust.

We will then summarize the overall Project emissions for the years 2019-2022 and show the selection of the worst-case year for comparison to the MDAQMD CEQA emissions significance thresholds.

We have selected EPA AP-42 emission factors for the operational phase emission terms that will be modified because this is a combined EIR/Environmental Impact Statement (EIS) document and is intended to meet federal requirements, as well as MDAQMD requirements. For calculating control efficiencies due to watering, we are using a practical approach developed by the MDAQMD relating to the watering frequency and watering rate, because there is no detailed approach available in EPA documents.

In evaluating changes to haul truck and water truck emissions, we have considered the effects of the California Air Resources Board (CARB) off-road diesel regulation, which requires various fleet changes. The baseline emissions were based on an approximate off-road diesel rule compliance plan and a preliminary review of the existing fleet (the actual fleet changes planned for off-road diesel rule compliance in the baseline may be different from those shown).

We have evaluated the impact of the CARB off-road diesel rule by calculating a baseline that includes the effect of the rule, but not the effect of MCC's additional commitment to accelerated turnover of its fleet, and then compared the post-Project emissions to the baseline.

Table A-2-7 presents the 2004 West Pit certified EIR mining operations emission factors and explains the origin of the fugitive emission factors used. Table A-2-8 describes the $PM_{2.5}/PM_{10}$ ratios used to calculate $PM_{2.5}$ emissions. All ratios were obtained from EPA guidance. Table A-2-9 describes the operational changes due to the Project. Table A-2-10 provides additional Project assumptions for the operational phase by year and shows how the fleet changes during the years 2019 through 2022. Table A-2-11 presents the explanation of the off-road diesel compliance plan for the calculated baseline calculations for 2019 through 2022.

Because the off-road diesel rule will ultimately require that the entire plant and mine fleet be turned over by approximately 2028, the off-road diesel emissions at a given maximum production rate are expected to decline over time through approximately 2028 and to remain level after that. However, we are presenting worst-case emissions accounting for planned changes during calendar years 2019-2022, but not for changes after 2022 (which will further reduce emissions).

Because the composition of the haul truck fleet is changing over the period 2019 through 2022, we have prepared emission calculations for each of these years. We are calling the period 2019 through 2021 the transition period, because the haul truck fleet will be transitioning from its current composition to its final composition. In the years 2022 and beyond, eight of the nine MCC haul trucks will meet Tier 4 standards (777G) and the ninth truck will meet Tier 2 standards (777D). As additional trucks are added, they will meet Tier 4 standards. Therefore the worst-case for the years 2022 and beyond is the case where there are eight of the nine trucks that meet Tier 4.

During the period 2019 through 2021 (transition period), the haul distance will be 2.5 miles (2019), 2.7 miles (2020), and 2.9 miles (2021) as shown in Table A-2-10. The haul distance during the transition period is shorter than the worst-case distance for later years (4.0 miles). For the year

2022 (which is post-transition), we have performed the emission calculations assuming the worst-case haul distance for any year 2022 or later (4.0 miles, which is the longest haul distance for the South Quarry). Therefore, the 2022 calculations are intended to represent worst-case conditions in any year 2022 or later.

After comparing the 2022 emissions increase to the emissions increase in each year of the transition period (when some haul trucks had not yet been replaced with Tier 4 haul trucks, but the haul distance was shorter), it became clear that 2022 was the overall worst-case year for PM_{10} and $PM_{2.5}$ emissions. For NO_x and VOCs, 2019 was the overall worst-case year. Worst-case CO and SO_x emissions occurred in 2022. Because SO_x emissions are relatively small, we have not focused on those emissions in the following discussion.

There will be no change in the maximum mine throughput due to the Project, but a portion of the production will be shifted from the West Pit to the South Quarry. During the transitional years (2019-2021), 33% of the total throughput will come from the South Quarry. In 2022, this percentage will increase to 50%. Cycle time is proportional to the haul road length assuming that loading and unloading takes 12 minutes.

Note that operational emission calculations are shown for the years 2019 through 2022, because MCC is requesting permit processing by the end of 2016, if possible, but the schedule will be adjusted correspondingly, if there are delays in accessing the South Quarry.

The following sections discuss the details for each emissions term:

<u>Dust entrainment, unpaved roads emissions</u>:

- The dust entrainment emissions are based on the calculated haul truck vehicle miles traveled (VMT) per year, AP-42 uncontrolled emission factors for dust entrainment, and MDAQMD control efficiency due to watering (because control efficiency calculations are not available in AP-42), as shown in Table A-3-1.
- For each year's baseline and post-Project emissions (see Tables A-3-2A through A-3-2H), we calculated the haul truck VMT for each truck in the fleet, per the fleet specified for the baseline and post-Project in that year. The haul truck VMT/year are based on total mine throughput (assuming that 33% of the total throughput will come from the South Quarry in 2019-2021 and will increase to 50% in 2022), haul truck capacity, and haul road length.
- Haul truck VMT in the West Pit decreases over time because the replacement trucks have a higher hauling capacity.
- Haul truck VMT in the South Quarry is a function of the haul road length and the hauling capacity of the replacement trucks. The maximum haul truck VMT occurs in 2022 VMT primarily due to the longer haul road length.
- Calculations assumed that there is a shifting of operating hours to newer trucks up to an operating hour limit.
- Table A-3-2I presents dust entrainment emissions from water trucks.
- Table A-3-3 presents the dust entrainment summary for years 2019 through 2022 and shows that 2022 is the worst-case year for dust entrainment PM emissions.

Wind erosion, unpaved roads emissions:

- The wind erosion emission calculations use AP-42 uncontrolled emission factors (which are a function of historical meteorological data for wind speed) and MDAQMD control efficiency due to watering (because control efficiency calculations are not available in AP-42), as shown in Tables A-4-1A and A-4-1B.
- Wind erosion emissions are a function of haul road length. The baseline and post-Project emissions are shown in Table A-4-2, for the transition period (2019-2021) and for 2022 (where the haul road is longer).
- Table A-4-2 presents the wind erosion summary for years 2019 through 2022 and shows that 2022 is the worst-case year for wind erosion PM emissions.

Material handling emissions due to seasonal stockpiling:

- There are additional material handling emissions due to stockpiling for winter months, which requires one extra loading and one extra unloading step for the stockpiled material. Seasonal stockpiling is required for the South Quarry, because it is not possible to access the South Quarry in the two winter months.
- The material handling emission calculations use AP-42 uncontrolled emission factors and control efficiency due to watering, as shown in Table A-5-1.
- The baseline for material handling emissions from seasonal stockpiling is zero.
- The stockpile throughput corresponds to the operation levels in the South Quarry for the years 2019-2022.
- Table A-5-2 presents the material handling emission summary for years 2019 through 2022.

Haul truck exhaust emissions:

- The emissions are based on the calculated haul truck operating hours and emission factors for the specific fleet trucks based on their model type, model year, horsepower, and mobile source emission factor calculation procedures from CARB, as shown in Table A-6-1 per the OFFROAD2011 regulations. Adjusted full life emission factors account for average engine deterioration and California fuel adjustment.
- For each year's baseline and post-Project emissions (see Tables A-6-2A through A-6-2H), we calculated the haul truck operating hours for each truck in the fleet, per the fleet specified for the baseline and post-Project in that year. The haul truck operating hours are based on total mine throughput (assuming that 33% of the total throughput will come from the South Quarry in 2019-2021 and will increase to 50% in 2022), haul truck capacity, and estimated cycle time for the West Pit and South Quarry (which is related to the haul road length).
- Calculations assumed that there is a shifting of operating hours to newer trucks up to an operating hour limit.
- Table A-6-3 presents the haul truck exhaust summary for years 2019 through 2022 and shows that 2019 is the worst-case year for haul truck PM_{10}, $PM_{2.5}$, NO_x, and VOCs. Worst-case haul truck CO and SO_x emissions occurs in 2022.

Water truck exhaust emissions:

- The emissions are based on the calculated water truck operating hours and emission factors for the specific fleet trucks based on their model type, model year, horsepower, and mobile source emission factor calculation procedures from CARB, as shown in Table A-7-1 per the OFFROAD2011 regulations. Adjusted full life emission factors account for engine deterioration and California fuel adjustment.
- The water truck baseline is the same for all years. Each year's post-Project emissions are shown in Tables A-7-2A and A-7-2B. Water truck operating hours for 2019-2022 are calculated based on the operating hours of the haul truck fleet and the amount of haul road that requires watering.
- Table A-7-3 presents the water truck exhaust summary for years 2019 through 2022 and shows that 2022 is the worst-case year for water truck exhaust.

Overall Project emissions summary:

Table A-8-1 presents the Project emissions summary for PM_{10} and $PM_{2.5}$ by year and demonstrates that 2022 is the worst-case year for PM_{10} and $PM_{2.5}$ emissions. Table A-8-2 presents the Project emissions summary for truck exhaust by year (2019-2022) and demonstrates that 2019 was the worst-case year for truck exhaust NO_x, and VOCs and 2022 was the worst-case year for truck exhaust CO and SO_x.

Tables A-8-3 through A-8-5 present the baseline and post-Project emissions for trucks, PM_{10}, and other pollutants for all years.

The worst-case Project emissions summary for 2022 is shown in Table A-8-6 (worst-case year for PM_{10} and $PM_{2.5}$). Tables A-8-7A and A-8-7B show the worst-case year for truck exhaust NO_x and VOCs and for CO and SO_x, respectively, where the Project emissions increase is compared with the MDAQMD CEQA emissions significance thresholds for each pollutant. Tables A-8-6, A-8-7A, and A-8-7B demonstrate that all Project operational emissions increases are below the MDAQMD CEQA emissions significance thresholds.

Table A-8-8 presents the overall emissions summary for PM_{10} and $PM_{2.5}$ for all years.

A.4 HEALTH RISK ASSESSMENT FOR CONSTRUCTION PHASE

This section discusses Tables A-9-1 through A-10-3:

- A-9 series of tables: Operational and construction phase HRA descriptions; and
- A-10 series of tables: HRA results, construction phase.

An HRA was performed to evaluate health risk impacts associated with the construction emissions increases, for comparison with the MDAQMD project health risk significance thresholds. The following procedures were used to perform the HRA, as discussed further in Appendices C and E:

- TAC emission calculations were performed for diesel PM_{10} (calculated as part of the criteria pollutant emission calculations described in previous sections) and for metal emissions associated with PM_{10} emissions from fugitive dust, using metal concentrations in fugitive dust. The diesel PM_{10} and fugitive PM_{10} values were obtained from the construction emission calculations by CalEEMod and the metal concentrations were obtained from laboratory analysis of road dust samples.

- AERMOD modeling was performed to determine annual average and maximum hourly dispersion coefficients for the two emission sources [diesel mobile (E) and fugitive dust (F)] at the three receptors [Maximum Exposed Individual Residence (MEIR), Maximum Exposed Individual Worker (MEIW), and nearest sensitive receptor] using source, receptor, meteorological, and topographical data from the plant location, as described in Appendix C.
- Health risk calculations were performed using the Hotspots Analysis and Reporting Program, version 2 (HARP2) software, which is based on the Office of Environmental Health Hazard Assessment (OEHHA) Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, February 2015, as described in Appendix E. All applicable exposure pathways were included, and default parameter values were used for all calculations, as described in Appendix E.

Tables A-9-1 and A-9-2 present the HRA source description, emissions, source type, and location.

The results of the HRA calculations for the construction emissions are shown in the following tables:

- Table A-10-1A: Project emissions summary for diesel PM_{10} (Source E), construction phase;
- Table A-10-1B: Annual average and maximum hourly fugitive TAC emissions by source (F), construction phase;
- Table A-10-2A: Cancer risk by receptor (MEIR, MEIW, sensitive) and source (E, F) construction phase;
- Table A-10-2B: Chronic non-cancer hazard index by receptor (MEIR, MEIW, sensitive) and source (E, F), construction phase;
- Table A-10-2C: Acute non-cancer hazard index by receptor (MEIR, MEIW, sensitive) and source (E, F), construction phase; and
- Table A-10-3: Total cancer, chronic, and acute risk by receptor comparison with MDAQMD project health risk significance thresholds, construction phase.

Table A-10-3 shows that the calculated health risks for the Project construction emissions are below the MDAQMD CEQA project health risk significance thresholds. The cancer risk threshold is 10 in a million and the cancer risk values calculated for the construction phase are between 0.017, 0.0013, and 0.0073 in a million, depending on the receptor. The chronic hazard index threshold is 1.0, and the chronic hazard index values for the construction phase at all receptors are below 0.001. The acute hazard index threshold is 1.0, and the acute hazard index values for the construction phase at all receptors are below 0.01.

A.5 HEALTH RISK ASSESSMENT FOR OPERATIONAL PHASE

This section discusses Table A-11-1 through A-11-3:

- A-11 series of tables: HRA results, operational phase.

An HRA was performed to evaluate health risk impacts associated with the Project operational emissions increases, for comparison with the MDAQMD project health risk significance thresholds. The following procedures were used to perform the HRA, as discussed further in Appendices C and E:

- TAC emission calculations were performed for diesel PM_{10} (calculated as part of the criteria pollutant emission calculations described in previous sections) and for metal emissions associated with PM_{10} emissions from unpaved road wind erosion and dust entrainment, using metal concentrations in fugitive dust. The diesel PM_{10} and fugitive PM_{10} values were obtained from the operational emission calculations described above and the metal concentrations were obtained from laboratory analysis of road dust samples. The worst-case year for fugitive dust was 2020, but the worst-case year for diesel PM_{10} was 2017. Therefore, to be conservative, we used the 2020 fugitive dust and the 2017 diesel PM_{10} value.
- AERMOD modeling was performed to determine annual average and maximum hourly dispersion coefficients for the four emission sources [diesel mobile (A), wind erosion (B), dust entrainment (C), and seasonal stockpile (D)] at the three receptors (MEIR, MEIW, and nearest sensitive receptor) using source, receptor, meteorological, and topographical data from the plant location, as described in Appendix C.
- Health risk calculations were performed using the HARP2 software, which is based on the OEHHA Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, February 2015, as described in Appendix E. All applicable exposure pathways were included, and default parameter values were used for all calculations, as described in Appendix E.

The results of the HRA calculations for the operational emissions are shown in the following tables:

- Table A-11-1A: Project emissions summary for diesel PM_{10} (Source A), operational phase;
- Table A-11-1B: Annual average and maximum hourly fugitive TAC emissions by source (B, C, D), operational phase;
- Table A-11-2A: Cancer risk by receptor (MEIR, MEIW, sensitive) and source (A, B, C, D), operational phase;
- Table A-11-2B: Chronic non-cancer hazard index by receptor (MEIR, MEIW, sensitive) and source (A, B, C, D), operational phase;
- Table A-11-2C: Acute non-cancer hazard index by receptor (MEIR, MEIW, sensitive) and source (A, B, C, D), operational phase; and
- Table A-11-3: Total cancer, chronic, and acute risk by receptor and comparison with MDAQMD project health risk significance thresholds, operational phase.

Table A-11-3 shows that the calculated health risks for the Project operational emissions are below the MDAQMD CEQA project health risk significance thresholds. The cancer risk threshold is 10 in a million and the cancer risk values calculated for the operational phase are between 0.0019, -0.00021, and -0.0016 in a million, depending on the receptor. The chronic hazard index threshold is 1.0, and the chronic hazard index values for the operational phase at all receptors are below 0.01. The acute hazard index threshold is 1.0, and the acute hazard index values for the operational phase at all receptors are below 0.01.

A.6 GREENHOUSE GAS EMISSION CALCULATIONS FOR CONSTRUCTION AND OPERATIONAL PHASES

This section discusses Table A-12-1:

- A-12 series of tables: Project GHG emissions.

Under the SCAQMD's guidance, construction GHG emissions must be included in the significance determination. The Project construction GHG emissions, which occur over only a short period of time, will be amortized over a 30-year period and added to the operational emissions via the following equations:

Amortized construction emissions (MT/yr) = total construction emissions (MT) /30 (years)

Total annual emissions (MT/yr) = operational emissions (MT/yr) + amortized construction emissions (MT/yr)

The total annual emissions are compared to the SCAQMD GHG significance threshold for industrial projects, 10,000 MT CO_2e/yr, to determine Project significance.

Table A-12-1 presents GHG emission calculations for the truck activity during the construction phase (amortized over 30 years) and haul and water truck operations during the operational phase, using the truck operating hours, horsepower, load factor, an assumption of 30% efficiency for calculating fuel usage, and a GHG emission factor of 73.1 kilograms (kg) CO_2 per million British thermal units (MMBtu) (CARB, Instructional Guidance for Mandatory GHG Emissions Reporting, December 2008). For the construction phase, the baseline consists of operation in the East and West Pits, and the post-Project consists of the ongoing operation in the East and West Pits, which are unchanged, plus the construction associated with the South Quarry. The Project emissions (difference between baseline and post-Project) for the construction phase consist of the construction emissions associated with the South Quarry. For the operational phase, calculations for the baseline and post-Project emissions for each of the years 2019 through 2022 (using the Project design features outlined above) show that 2022 is the worst-case year. As shown in Table A-12-1, the sum of the Project amortized construction and operational GHG emissions for the worst-case year (2022) are below the SCAQMD CEQA GHG significance threshold of 10,000 MT CO_2e/yr for industrial projects.

A.7 PROJECT SCENARIO WITHOUT MITIGATION

This section discusses Tables A-13-1 through A-17-1, all for operational phase without mitigation:

- A-13 series of tables: Project assumptions for operational phase;
- A-14 series of tables: Dust entrainment;
- A-15 series of tables: Haul truck emissions;
- A-16 series of tables: Emissions summaries; and
- A-17 series of tables: Project GHG emissions.

MCC plans to include mitigation in the South Quarry Project, as indicated in the permit conditions provided above. However, for completeness, MCC is providing emission calculations for the scenario without mitigation, which involves showing results for a different Project fleet without the extra 777G haul truck additions. The mitigation involves additional haul truck retirements and replacements with Tier 4 (777G) haul trucks. The fleet without mitigation results in higher Project emissions for haul truck dust entrainment and haul truck exhaust, but does not affect water truck dust entrainment, material handling seasonal stockpile, and water truck exhaust. The assumptions used for the fleet without mitigation are shown in Table A-13-1. The emission calculation results for haul truck dust entrainment and haul truck exhaust are shown in Tables A-14-1A through A-15-2. The emission calculation results without mitigation are considerably higher than the emission calculation results with mitigation, and hence, there is a considerable benefit for the mitigation measures applied, as shown in the tables.

The GHG emission calculation results for haul truck dust entrainment and haul truck exhaust are shown in Table A-17-1. The GHG emission calculation results without mitigation are higher than the GHG emission calculation results with mitigation, and hence, there is a benefit for the mitigation measures applied, as shown in the tables.

TABLES

Unchanged and Updated Emission Terms

The purpose of the emission calculations in the AQ study is to evaluate the Project emission increase associated with the South Quarry Project. In addition, for completeness, the report shows the total post-Project mine emissions, including certain West Pit EIR emission terms that are unchanged due to the Project.

In evaluating the Project emission increase, we have determined that certain emission terms will be unchanged in the post-Project scenario relative to the baseline, as shown in the following table, and we are setting the unchanged emission terms equal to the West Pit EIR values shown (where these values are listed as post-Project, after mitigation values for the Project proposal at that time).

For the other emission terms that are expected to change, we have undertaken a detailed analysis of both baseline and post-Project values, including, in some cases, reducing the baseline emissions below the West Pit EIR post-Project, after mitigation values (which makes the calculations more conservative). This is because we are simultaneously updating the approach for these emission terms (for both the baseline and post-Project) to use the approaches that are current as of the 2016 EIR publication date. In addition, for the emission terms that are changing, we are using different baseline values by year, to take into account the equipment improvements that have been made since 2004 or that would be made in future years as part of a business-as-usual scenario.

#	Emission Term	Status	Baseline Value Used
Unchanged emission terms:			
1	Blasthole drilling	Unchanged	Use West Pit EIR value
2	Blasting	Unchanged	Use West Pit EIR value
3	Bulldozing and grading	Unchanged	Use West Pit EIR value
4	Material handling, ore and waste	Unchanged	Use West Pit EIR value
5	Wind erosion, stockpiles	Unchanged	Use West Pit EIR value
6	Wind erosion, disturbed mine area	Unchanged	Use West Pit EIR value
10	Truck exhaust, other trucks	Unchanged	Use West Pit EIR value
Changing emission terms:			
7	Wind erosion, unpaved roads	Changing	Use updated approach
8	Dust entrainment, unpaved roads	Changing	Use updated approach
9	Material handling, seasonal stockpile	Changing	Use updated approach
11	Truck exhaust, haul trucks	Changing	Use updated approach
12	Truck exhaust, water trucks	Changing	Use updated approach

Relationship of Baseline Selected to Off-Road Diesel Rule Compliance

The MCC fleet changes planned for the years 2018 through 2022 go beyond the Off-Road Diesel rule requirements, as shown in Table A-2-11 and explained here:

• MCC has met all Off-Road Diesel rule requirements through 2018, based on early retrofits and retirements as shown in Table A-2-11. For the baseline without the Project, MCC already has plans for Off-Road Diesel compliance through 2022 that involve only two 777B retirements.
• For the mine fleet in the post-Project scenario, MCC plans to retire 777B haul trucks in 2019, 2020, 2021, and 2022 (for a total of four 777B retirements), as 777G trucks are phased in. The 777B retirements and 777G truck purchases for the mine fleet go beyond the Off-Road Diesel rule requirements, and are intended for CEQA mitigation for the mine expansion.

Therefore, the mine fleet changes made for CEQA mitigation are shown in the post-Project scenario, but not in the baseline scenario.

Whereas the baseline fleet scenario involves only one 777G truck purchase between now and 2022, the post-Project scenario involves four 777G purchases by 2019 and four more by 2022.

Control Efficiency Due to Watering Used for Wind Erosion and Dust Entrainment

The control efficiency due to watering used for wind erosion, dust entrainment, and material handling, seasonal stockpile (changing emission terms) is based on the AP-42 Section 13.2.4 approach relating emissions to moisture content (see equation for loading). However, to relate the control efficiency to watering frequency, we are using the MDAQMD watering calculation approach as shown in Table A-3-1 of this AQ study (which is the same approach as in the West Pit certified EIR).

Based on the target moisture content, the control efficiency will be 87%, which corresponds to a watering frequency of once every 1.25 hours, based on the average traffic rate assumed, as calculated from the MDAQMD watering equation in Table A-3-1 of this AQ study.

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Comparison of Table Numbers of With and Without Mitigation Tables

With Mitigation Table Number	Without Mitigation Table Number	Table Description
2-10	13-1	Project Assumptions
3-2e	14-1a	2019 Dust Entrainment
3-2f	14-1b	2020 Dust Entrainment
3-2g	14-1c	2021 Dust Entrainment
3-2h	14-1d	2022 Dust Entrainment
3-3	14-2	2019-22 Dust Entrainment Summary
6-2e	15-1a	2019 Haul Truck Emissions
6-2f	15-1b	2020 Haul Truck Emissions
6-2g	15-1c	2021 Haul Truck Emissions
6-2h	15-1d	2022 Haul Truck Emissions
6-3	15-2	2019-22 Haul Truck Summary
8-1	16-1	2019-22 Project Emissions
8-2	16-2	2019-22 Truck Exh Emissions
8-3	16-3	2019-22 Truck Exh Emissions
8-4	16-4	2019-22 Project Emissions
8-5	16-5	2019-22 Alll Poll Emissions
8-6	16-6	2022 Worst Case PM Emissions
8-7a	16-7a	2019 Worst Case Truck Exh
8-7b	16-7b	2022 Worst Case Truck Exh
8-8	16-8	2019-22 Project PM Emissions
12-1	17-1	GHG Summary

Table A-1-1: Project Assumptions for Construction

	Parameter[1]	Value
Construction Activity Assumptions (Main Haul Road)	Construction phase duration	2 years
	Annual construction time (days/yr)	250
	Daily construction time (hrs/day)	10
	Haul road length (miles)	1.82
	Total active disturbed area (acres)	22.2
	Cut amount (yd3/yr)	225,000
	Fill amount (yd^3/yr)	0
	Total amount of cut/fill (yd^3/yr)	225,000
	Amount of cut/fill (yd^3/day)	900
Construction Activity Assumptions (Temporary Construction Road)	Temporary construction road length (miles)	0.14
	Total active disturbed area, temporary construction road (acres)	0.7
	Cut amount (yd^3/yr)	2,625
	Fill amount (yd^3/yr)	0
	Total amount of cut/fill (yd^3/yr)	2,625
	Amount of cut/fill (yd^3/day)	11
Emission Control Assumptions	Material moisture content	1% which accounts for watering
Emission Control Assumptions	Watering application frequency	2 times a day

Notes

1. Parameters supplied by Lilburn haul road map, dated September 2010.

Table A-1-2: Preliminary List of Project Design Features, Long-Term Operational Phase, 2022 and Later

Parameter	Value	
Maximum mine throughput (West Pit and South Quarry), limestone ore	2,600,000 tons/yr	
Maximum mine throughput (West Pit and South Quarry), waste rock	300,000 tons/yr	
Estimated throughput from South Quarry, limestone ore	1,300,000 tons/yr	
Estimated throughput from South Quarry, waste rock	150,000 tons/yr	
Maximum haul road length, South Quarry[1]	4.0 miles	
Watering frequency on all haul roads same as baseline	Every 1.25 hours	
Accelerated fleet replacement, 3 additional 777G trucks purchased (Note that the 2022 baseline is explained further detail below)	**2022 Baseline[1]**	**2022 Post-Project**
	2 - 777B	0 - 777B
	1 - 777D	1 - 777D
	1 - 777G	8 - 777G

<u>Notes</u>

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.

Table A-2-1: Construction Emission Factors from CalEEMod (v. 2013.2.2)

Operation	Unit	Uncontrolled PM_{10} Emission Factor[1]	Controlled PM_{10} Emission Factor[1,2]	Notes
Grading Equipment Passes	lb/VMT	3.06	3.06	EF is a function of mean vehicle speed. The value chosen was 10 mph. This is a conservative value relative to the speed in CEIR Table B-5d, Grading, which has 5 mph. No controls applied.
Bulldozing	lb/hr	27.65	10.48	EF is a function of material moisture and silt content. Uncontrolled conditions assume a moisture of 0.5%. Controlled conditions assume watering for a moisture of 1%. Silt content value of 5.8% was chosen (AP-42 section 12.2.2 table 12.2.2-1 value for haul road to/from pit for taconite mining/processing). Assumed moistures are from CEIR Table B-5a, Mine Handling. Assumed silt is from CEIR Table B-5c, Bulldozing.
Truck Loading	lb/ton	0.0095	0.0036	EF is a function of material moisture and average wind speed. Uncontrolled conditions assume a moisture of 0.5%. Controlled conditions assume watering for a moisture of 1%. Assumed moistures are from CEIR Table B-5a, Mine Handling. Average wind speed of 2.6 m/s was chosen based on the CalEEMod value for MDAQMD.
Off-road Mobile Vehicles	g/HP-hr	Vehicle dependent, ARB OFFROAD2011 (including controls)	N/A	The CalEEMod default off-road truck fleet for grading 22.9 acres consists of 2 excavators, 1 grader, 1 rubber tired dozer, 2 scrapers, and 2 tractor/loader/backhoes. Emission factors for these units are based on ARB's OFFROAD2011 emissions model, using an average fleet for 2017-2018 (including controls), which are the planned years for road construction.

Notes
1. Emission factors calculated from equations provided in Appendix A of the CalEEMod manual.
2. Control efficiencies were applied corresponding roughly to the affects of watering to the extent available in the software.
Actual control efficiencies due to watering are higher than shown, so controlled emission factors are conservative values.

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Table A-2-2: CalEEMod (v. 2013.2.2) Assumptions Summary

#	Parameter	Option Selected	Comments	How Parameter Affects Results
1	Land use type	Industrial	Other options are commercial, educational, parking,	Affects defaults.
2	Land use subtype	General heavy industry	Other options are general light industry, industrial park, manufacturing, and warehouse.	Affects defaults.
3	Project acreage[1]	22.9 acres	Project area for haul road and temporary haul road.	Affects grading equipment passes by affecting the fleet size and "Total Acres Disturbed". Larger project -> larger fleet -> more area disturbed -> more emissions. Affects exhaust emissions. More acres -> larger fleet -> more emissions.
Construction Data				
4	Phase name/type	Grading 2017 and Grading 2018	This activity corresponds most closely to road construction. Other options are demolition, site preparation, building construction, architectural coatings, and paving.	Affects types of emissions sources. Grading has emissions from grading equipment passes (~3% of PM10 emissions for this project), bulldozing (~90% of emissions), truck loading (~3% of emissions), vehicle exhaust (~4% of emissions), and off-site hauling emissions (0% of emissions).
5	Start and end dates	1/1/17 - 12/15/17 and 1/1/18 - 12/14/18	These dates are chosen to correspond to 250 days/yr at 5 days/wk.	Affects off-road vehicle emission factors. Later years have more efficient models and lower EFs.
6	Yearly construction days[1]	250 days/yr	Used to convert annual cut and fill data to daily quantities.	Affects grading equipment passes by affecting "Total Acres Disturbed". More days -> more acres -> more emissions. Affects bulldozing emissions by affecting total hours/yr. More days -> more hours -> more emissions.
7	Off-road equipment	Defaults, see table below	CalEEMod creates a default fleet based on site acreage.	Affects grading equipment passes emissions by affecting "Total Acres Disturbed". Bigger fleet -> more acres disturbed -> more emissions. Affects exhaust emissions depending on the fleet size and composition.
8	Material imported[1,2]	170,719 tons	Total cut of 225,000 yd^3/yr for the haul road for the	Affects truck loading emissions. More material -> more emissions.
9	Material exported[1,2]	170,719 tons	Total cut of 225,000 yd^3/yr for the haul road for the	Affects truck loading emissions. More material -> more emissions.
10	Mean vehicle speed	10 mph	Value of 5 is assumed in CEIR Table B-5d, Grading. 10 mph is a conservative estimate relative to this.	Affects grading equipment passes emissions. Faster vehicles -> more emissions.
11	Material moisture content, bulldozing	0.01	Value reflecting routine watering of construction area. Unmitigated moisture is assumed to be 0.5%.	Affects bulldozing emissions. More moisture -> fewer emissions.
12	Material moisture content, truck loading	0.01	Value reflecting routine watering of construction area. Unmitigated moisture is assumed to be 0.5%.	Affects truck loading emissions. More moisture -> fewer emissions.
13	Average wind speed	2.6 m/s	Default value specified by CalEEMod for MDAQMD.	Affects truck loading emissions. More wind speed -> more emissions.
14	Material silt content	0.058	Value for taconite and processing, haul road, AP-42	Affects bulldozing emissions. Higher silt content -> more emissions.
15	Trips and VMT parameters	0 trips, 0 miles	Materials are retained onsite.	Affects off-site emissions. More VMT -> more emissions.
16	Other construction parameters	Defaults	Use defaults for fields for demolition, on-road fugitive dust, and architectural coatings.	Will not affect emissions. Since only grading has been chosen as a construction activity, the defaults will not produce emissions.
Operational and Vegetation Data				
17	Operation and vegetation parameters	Defaults	Use default values for operational data.	Operational emissions will not be taken from CalEEMod.
Mass Site Grading Mitigation				
18	Watering of grading site	-	Applied a moisture content of 1% to account for routine watering of construction area. Assume 0.5%	Affects grading equipment passes and bulldozing emissions. More mitigation -> fewer emissions.
19	Off-road equipment mitigation	None	For the typical fleet for that compliance year,	Affects exhaust emissions. More mitigation -> fewer emissions.

CalEEMod Default Off-Road Equipment Units Based off of Construction Acreage

#	Equipment	Hrs/day	HP	Load Factor
2	Excavator	8	162	0.38
1	Grader	8	174	0.41
1	Rubber Tired Dozer	8	255	0.4
2	Scraper	8	361	0.48
2	Tractor/loader/backhoe	8	97	0.37

Notes
1. Parameters obtained from Lilburn haul road map, dated September 2010.
2. Density of cut/fill material provided from industry correspondence.

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Table A-2-3: Construction Emissions Summary for $PM_{2.5}$ and PM_{10} for 2017 (Worst-Case Year)

Activity/Sources	Uncontrolled PM_{10} Emissions (tons/yr)	PM_{10} Control Efficiency[2]	Controlled PM_{10} Emissions (tons/yr)	Controlled $PM_{2.5}$ Emissions (tons/yr)[3]
Fugitive Emissions	29.93	61%	11.75	5.11
Off-road vehicle exhaust[1]	0.41	N/A	0.41	0.38
Total	**30.34**	**-**	**12.16**	**5.49**
		Significance Threshold	**15**	**12**
		Above Significance Threshold	**NO**	**NO**
	Above Significance Threshold			**NO**

Notes

1. Calculations assumed the construction off-road vehicle fleet determined for the specified design acreage of total active disturbed area for a general heavy industry application, including controls.
2. Weighted control efficiency of fugitive emission terms in Table A-2-1.
3. Per CalEEMod, the $PM_{2.5}/PM_{10}$ ratio used for fugitive dust and diesel exhaust is 0.44 and 0.92, respectively.

Table A-2-4: Construction Emissions Summary for Truck Exhaust for 2017 (Worst-Case Year)

Pollutant Name	Project Emissions (tons/yr)	Significance Thresholds (tons/yr)	Above Significance Thresholds (yes/no)
Nitrous Oxides (NOx)	8.70	25	NO
Volatile Organic Compounds (VOC)	0.76	25	NO
Carbon Monoxide (CO)	5.85	100	NO
Particulate Matter (PM_{10})[1]	0.41	See PM table	See PM table
Particulate Matter ($PM_{2.5}$)[1,2]	0.38	See PM table	See PM table
Sulfur Oxides (SOx)	0.01	25	NO

Notes

1. There is no significance threshold specific to diesel PM. Diesel PM is included in the overall Project PM_{10} to determine if PM_{10} exceeds the threshold levels. See Table A-2-3 for threshold comparison.

2. Per CalEEMod, the $PM_{2.5}/PM_{10}$ ratio used for fugitive dust and diesel exhaust is 0.44 and 0.92, respectively.

Table A-2-5: Comparison of West Pit Approved Emissions to Baseline for South Quarry Project, $PM_{2.5}$ and PM_{10} Emissions

#	Activity/Sources	Unit of Emission Factor	Unit of Throughput[4]	West Pit EIR Approved Emissions			
				PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]
1	Blasthole drilling	lb/ton	ton/year	0.0008	2,900,000	1.2	0.1
2	Blasting	lb/ton	ton/year	0.08	2,900,000	116.0	6.7
3	Bulldozing, scraping and grading of materials	lb/hr	hr/year	11.8	2,500	14.7	0.8
4	Material Handling, limestone ore and waste rock[2]	lb/ton	ton/year	0.014	2,900,000	20.3	5.7
5	Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6
6	Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2
7	Wind erosion from unpaved roads	tons/acre-yr	acre	0.27	13.39	3.6	0.5
8	Dust entrainment from unpaved roads[1]	lb/VMT	VMT	0.85	115,955	49.3	4.9
					Subtotal (fugitive emissions)	**210.7**	**19.6**
10	Other truck exhaust	g/hp-hr	hp-hr/year	Variable	3,236,250	0.9	0.9
11	Haul truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-6-1	6,580,650	3.3	3.2
12	Water truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-7-1	904,875	0.7	0.7
					Total (all sources):	**215.6**	**24.3**

#	Activity/Sources	Unit of Emission Factor	Unit of Throughput[4]	2022 Baseline, South Quarry Project[5]			
				PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]
1	Blasthole drilling	lb/ton	ton/year	0.0008	2,900,000	1.2	0.1
2	Blasting	lb/ton	ton/year	0.08	2,900,000	116.0	6.7
3	Bulldozing, scraping and grading of materials	lb/hr	hr/year	11.8	2,500	14.7	0.8
4	Material Handling, limestone ore and waste rock[2]	lb/ton	ton/year	0.014	2,900,000	20.3	5.7
5	Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6
6	Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2
7	Wind erosion from unpaved roads	tons/acre-yr	acre	0.16	13.39	2.1	0.3
8a	Dust entrainment from unpaved roads - haul trucks[1]	lb/VMT	VMT	0.55	108,352	29.8	3.0
8b	Dust entrainment from unpaved roads - water trucks[1]	lb/VMT	VMT	0.11	6,800	0.4	0.0
9	Material Handling, seasonal stockpile	lb/ton	tons/year	0.0022	0	0.0	0.0
					Subtotal (fugitive emissions)	**190.1**	**17.4**
10	Other truck exhaust	g/hp-hr	hp-hr/year	Variable	3,236,250	0.9	0.9
11	Haul truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-6-1	3,988,392	1.4	1.4
12	Water truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-7-1	603,250	0.1	0.1
					Total (all sources):	**192.5**	**19.7**

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. Assume two transfer points for material handling. Each transfer point has an emission factor of 0.007 lb/ton.
3. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.
4. Dust Entrainment Throughputs are based on vehicle miles traveled (VMT).
5. This table compares approved West Pit emissions from the 2004 Certified EIR (post-project with mitigation) to the 2022 baseline for the South Quarry project, that will be used in the document, prepared using updated approaches.

Table A-2-6: Comparison of West Pit Approved Emissions to Baseline for South Quarry Project, Truck Exhaust

Pollutant Name	West Pit EIR Approved Emissions			
	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)[1]	Total Emissions (tons/yr)
Nitrous Oxides (NOx)	24.3	63.6	13.6	101.5
Volatile Organic Compounds (VOC)	1.8	6.3	1.4	9.5
Carbon Monoxide (CO)	4.7	21.2	5.2	31.1
Particulate Matter (PM_{10})	0.9	3.3	0.7	4.9
Particulate Matter ($PM_{2.5}$)[2]	0.9	3.1	0.7	4.6
Sulfur Oxides (SOx)	0.5	1.0	0.2	1.7

Pollutant Name	2019 Baseline, South Quarry Project[1,5]				2022 Baseline, South Quarry Project[1,5]			
	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)[3]	Water Truck Emissions (tons/yr)[4]	Total Emissions (tons/yr)	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)[3]	Water Truck Emissions (tons/yr)[4]	Total Emissions (tons/yr)
Nitrous Oxides (NOx)	24.3	39.4	2.9	66.7	24.3	36.2	2.9	63.5
Volatile Organic Compounds (VOC)	1.8	2.6	0.1	4.5	1.8	2.3	0.1	4.3
Carbon Monoxide (CO)	4.7	17.4	0.7	22.8	4.7	16.4	0.7	21.8
Particulate Matter (PM_{10})	0.9	1.6	0.1	2.6	0.9	1.4	0.1	2.4
Particulate Matter ($PM_{2.5}$)[2]	0.9	1.6	0.1	2.5	0.9	1.4	0.1	2.3
Sulfur Oxides (SOx)	0.5	0.03	0.004	0.5	0.5	0.03	0.004	0.5

Notes
1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.
3. For Haul Trucks 2019 and 2022, refer to Table 6-3B.
4. For Water Trucks in the 2019 and 2022 Baselines, see Table 7-3.
5. This table compares approved West Pit emissions from the 2004 Certified EIR (post-project with mitigation) to the 2019 and 2022 baseline for the South Quarry project, that will be used in the document, prepared using updated approaches.

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Table A-2-7: Mining Operations and Fugitive Emission Factors Used in West Pit Certified EIR

Operation	Unit	Uncontrolled PM_{10} Emission Factor	Control Efficiency (%)	Controlled PM_{10} Emission Factor	Notes
Blasthole drilling	lb/ton	0.0008	0%	0.0008	MDAQMD Emissions Inventory Guidance Page 4, Intermediate Complexity
Blasting	lb/ton	0.08	0%	0.08	MDAQMD EIG, Page 6, Least Complexity
Bulldozing, Scraping and Grading of Materials	lb/hr	47.06	75%	11.8	MDAQMD EIG, Page 10, Table 2, Moisture content 2%, Silt content 25%, 75% control efficiency for wind screens.
Material handling, limestone ore and waste rock	lb/ton	0.014	50%	0.007	MDAQMD EIG, Page 12, Least Complex; assuming mean wind speed 7.7 mph, moisture content 0.5%, 50% control efficiency for mine trucks and two material handling points.
Material handling, waste rock	lb/ton	0.014	50%	0.007	
Material handling, usable material	lb/ton	0.014	50%	0.007	
Wind Erosion from stockpiles	tons/acre-yr	0.202	0%	0.202	MDAQMD EIG, Page 18, Table 3, Silt content 0.5%, 40% wind > 12 mph, (double the EF for 20% wind > 12 mph)
Wind erosion from active disturbed mine areas	tons/acre-yr	2.09	87%	0.27	Equation is from MDAQMD Emissions Inventory Guidance; April 2000; Page 28; "Wind Erosion from Unpaved Operational Areas and Roads; Intermediate Complexity".
Wind erosion from unpaved roads	tons/acre-yr	2.09	87%	0.27	Equation is from MDAQMD Emissions Inventory Guidance; April 2000; Page 28; "Wind Erosion from Unpaved Operational Areas and Roads; Intermediate Complexity".
Dust entrainment from unpaved roads	lb/vmt	6.48	87%	0.85	MDAQMD Emission Inventory Guidance; April 2000l Page 25; "Dust Entrainment from Unpaved Roads; Most Complex". Surface silt content of 5.8% and moisture content of 0.2%.

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Table A-2-8: Mining Operations and Fugitive Emission Factors PM_{10} and $PM_{2.5}$ Ratios Used

Operation	$PM_{2.5}/PM_{10}$ Ratio	Notes
Blasthole drilling	0.058	AP-42, Section 11.9, Western Surface Coal Mining, page 11.9-5.
Blasting	0.058	AP-42, Section 11.9, Western Surface Coal Mining, page 11.9-5.
Bulldozing, Scraping and Grading of Materials	0.052	AP-42, Section 11.9, Western Surface Coal Mining, page 11.9-5.
Material handling, limestone ore and waste rock	0.28	AP-42, Section 11.19.2, Crushed Stone Processing and Pulverized Mineral Processing, page 11.19.2-8.
Wind Erosion from stockpiles	0.15	AP-42, Section 13.2.5, Industrial Wind Erosion, page 13.2.5-3.
Wind erosion from active disturbed mine areas	0.15	AP-42, Section 13.2.5, Industrial Wind Erosion, page 13.2.5-3.
Wind erosion from unpaved roads	0.15	AP-42, Section 13.2.5, Industrial Wind Erosion, page 13.2.5-3.
Dust entrainment from unpaved roads	0.10	AP-42, Section 13.2.2, Unpaved Roads, page 13.2.2-5.
Off-road diesel exhaust	0.97	EPA NONROAD Model, Exhaust Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, page 1.

Table A-2-9: Operational Features of South Quarry Project

Item	West Pit EIR	South Quarry Post-Project (Transition Period, 2019-2021)	South Quarry Post-Project (2022 and later)[1]	Comments
Annual mined quantity	2.9 million tons per year total (2.6 million tons/yr limestone ore) (0.3 million tons/yr waste rock)	2.9 million tons per year total (2.6 million tons/yr limestone ore) (0.3 million tons/yr waste rock) West Pit - 1,742,000 tons/yr limestone ore, 201,000 tons/yr waste rock South Quarry - 858,000 tons/yr limestone ore, 99,000 tons/yr waste rock	2.9 million tons per year total (2.6 million tons/yr limestone ore) (0.3 million tons/yr waste rock) West Pit - 1,300,000 tons/yr limestone ore, 150,000 tons/yr waste rock South Quarry - 1,300,000 tons/yr limestone ore, 150,000 tons/yr waste rock	Proposed project will not result in increase in quantity of rock mined at any time during the expansion. During the transition period, 33% of the rock will be mined in the South Quarry. 50% will be mined in the South Quarry in 2022.
Active disturbed mine area[2]	6 acres	6 acres	6 acres	The mine expansion will not result in an increase in active disturbed mine area at any time during the expansion.
Unpaved road length[3]	1.7 miles to West Pit.	1.7 miles to West Pit. The South Quarry haul road will be 2.5 miles (2019), 2.7 miles (2020), and 2.9 miles (2021).	1.7 miles to West Pit with an additional 4.0 miles to the South Quarry.	Worst case scenario for PM10 will occur in 2022 when the maximum South Quarry haul road length will be 4.0 miles. During the transition period, the haul road length will increase gradually from 2019 to 2021. The West Pit haul road length will be unchanged.
Vehicle miles traveled - limestone ore (round trip)	3.4 miles from mine to crusher.	3.4 miles from West Pit to crusher. The South Quarry round trip haul road distance to the crusher will be 5.0 miles (2019), 5.4 miles (2020), and 5.8 miles (2021).	3.4 miles from West Pit to crusher. 8.0 miles from the South Quarry to the crusher.	Haul trucks will transport limestone ore from the West Pit and South Quarry to the same crusher.
Vehicle miles traveled - waste rock (round trip)	Not specified	3.4 miles for both the West Pit and South Quarry.	3.4 miles for both the West Pit and South Quarry.	The waste rock haul distance is the same for the transition period and for 2022 and later.
Vehicle round trips per day - limestone ore (250 days/yr)	134 trips	126 trips for West Pit and South Quarry haul trucks carrying limestone ore.	117 trips for West Pit and South Quarry haul trucks carrying limestone ore.	After expansion, the haul truck fleet will be a mix of 777B, 777D, and 777G haul trucks which have a capacity of 77 to 105 tons/load. During the transition period, the truck capacity will vary according to the truck fleet.
Vehicle round trips per day - waste rock (250 days/yr)	Not specified	15 trips for West Pit and South Quarry haul trucks carrying waste rock.	13 trips for haul roads traveling to/from West Pit and South Quarry carrying waste rock.	
Haul truck operating hours - limestone ore (per week)	240 operating hours per week (2004 EIR reports total operating hours)	266 to 280 operating hours per week for West Pit and South Quarry haul trucks carrying limestone ore.	343 operating hours per week for West Pit and South Quarry haul trucks carrying limestone ore.	Operating hours will be the highest in 2022 when the South Quarry haul road will be at its maximum distance.
Haul truck operating hours - waste rock (per week)		24 operating hours per week for West Pit and South Quarry haul trucks carrying waste rock.	22 operating hours per week for West Pit and South Quarry haul trucks carrying waste rock.	Operating hours will decrease for 2022 due to the shift to higher capacity haul trucks.
Water truck operating hours (per year)	2,500 hours for the water truck fleet.	3,604 to 4,919 hours	6,524 hours	The watering frequency for the South Quarry haul roads will be the same as the West Pit. Water truck operating hours are a function of haul truck operating hours and the distance of haul road requiring watering.

Notes
1. 2022 was determined to be the worst case year for PM10. 2019 was determined to be the worst case year for NOx.
2. Active disturbed mine area reflects the total acreage of all quarries.
3. The maximum distance over the life of the South Quarry is 4.0 miles. This distance includes the haul road from the crusher to the new haul road, the new haul road (1.82 miles), and the road traveled within the South Quarry itself.

Table A-2-10: Project Assumptions for Operational Phase

		Baseline			
West Pit	**West Pit EIR**	**2019**	**2020**	**2021**	**2022**
Throughput, limestone ore(tons/yr)	2,600,000	2,600,000	2,600,000	2,600,000	2,600,000
Throughput, waste rock (tons/yr)	300,000	300,000	300,000	300,000	300,000
Haul road length, limestone ore (mi)	1.7	1.7	1.7	1.7	1.7
Haul road length, waste rock (mi)	1.7	1.7	1.7	1.7	1.7
Cycle time, limestone ore (hrs)	0.35	0.35	0.35	0.35	0.35
Cycle time, waste rock (hrs)	0.35	0.35	0.35	0.35	0.35
Fleet composition[2]	4 - 777B 1 - 777D 0 - 777G	3 - 777B 1 - 777D 1 - 777G	3 - 777B 1 - 777D 1 - 777G	2 - 777B 1 - 777D 1 - 777G	2 - 777B 1 - 777D 1 - 777G

		Post-Project			
West Pit		**2019**	**2020**	**2021**	**2022**
Throughput, limestone ore (tons/yr)	-	1,742,000	1,742,000	1,742,000	1,300,000
Throughput, waste rock (tons/yr)	-	201,000	201,000	201,000	150,000
Haul road length, limestone ore (mi)	-	1.7	1.7	1.7	1.7
Haul road length, waste rock (mi)	-	1.7	1.7	1.7	1.7
Cycle time, limestone ore (hrs)	-	0.35	0.35	0.35	0.35
Cycle time, waste rock (hrs)	-	0.35	0.35	0.35	0.35
Fleet composition[2]	-	3 - 777B 1 - 777D 1 - 777G	2 - 777B 1 - 777D 2 - 777G	1 - 777B 1 - 777D 3 - 777G	0 - 777B 1 - 777D 3 - 777G
South Quarry		**2019**	**2020**	**2021**	**2022**
Throughput, limestone ore (tons/yr)	-	858,000	858,000	858,000	1,300,000
Throughput, waste rock (tons/yr)	-	99,000	99,000	99,000	150,000
Haul road length, limestone ore (mi)	-	2.5	2.7	2.9	4.0
Haul road length, waste rock (mi)	-	1.7	1.7	1.7	1.7
Cycle time, limestone ore (hrs)	-	0.63	0.66	0.69	0.88
Cycle time, waste rock (hrs)	-	0.35	0.35	0.35	0.35
Fleet composition[2,3]	-	3 - 777B 1 - 777D 4 - 777G	2 - 777B 1 - 777D 5 - 777G	1 - 777B 1 - 777D 6 - 777G	0 - 777B 1 - 777D 8 - 777G

Fraction of rock coming from South Quarry:	0.33	(for transitional years 2019-2021)
Fraction of rock coming from South Quarry:	0.50	(for 2022)

Haul Truck Capacity[2]		
777B	77	tons
777D	105	tons
777G	105	tons

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.

Table A-2-11: Evaluation of Haul Truck Baseline Under CARB's Off-Road Diesel Rule

● MCC has met all Off-Road Diesel requirements through 2018, based on early retrofits and retirements as shown in the table below. For the baseline without the project, MCC already has plans for Off-Road Diesel compliance through 2022 that involve only two 777B retirements.

● For the mine fleet in the post-project scenario, MCC plans to retire 777B haul trucks in 2019, 2020, 2021, and 2022 (for a total of four retirements), as 777G trucks are phased in. The 777B retirements and 777G truck purchases for the mine fleet go beyond the Off-Road Diesel rule requirements, and are intended for CEQA mitigation for the mine expansion.

Year	Plant fleet changes for ORD rule compliance	Mine fleet changes for ORD rule compliance	Mine fleet changes in Proposed Project (in addition to those for ORD rule compliance)	777G Units Purchased for Mitigation (Cumulative) (in addition to 1 for baseline)
Prior to 2017				2
2017	No further changes needed--already in compliance	None needed	None planned	2
2018	No further changes needed--already in compliance	None needed	None planned	3
2019	Additional retirements	First 777B retirement (counted towards 2019)	None planned	4
2020	Additional retirements	None needed	Third 777B retirement (not needed for ORD rule compliance)	5
2021	Additional retirements	Second 777B retirement (counted towards 2021)	None planned	6
2022	Additional retirements	None needed	Fourth 777B retirement (not needed for ORD rule compliance)	7
Total retirements		Total two retirements (and one 777G purchase)	Total four retirements (and seven 777G purchases)	

Table A-3-1: Dust Entrainment Emission Factor

Development of PM_{10} Emission Factor[1]

$$E_f = 1.5 * \left(\frac{s}{12}\right)^{0.9} * \left(\frac{W}{3}\right)^{0.45}$$

Equation element	Symbol	Value used	Assumption
Unpaved surface silt content (%)	s	5.8	AP 42; Table 13.2.2-1; Taconite mining and processing; haul road
Average vehicle weight (tons)	W	127.5	average weight for plant vehicles
PM_{10} emission factor (lbs/VMT)	E_f	4.21	

Control Efficiency for Watering Application, per AP-42[2]

$$C_f = 100 * \left[1 - \left(\frac{1}{\left(\frac{M}{0.7}\right)^{1.4}}\right)\right]$$

$$E_{fc} = E_f * \frac{C_f}{100}$$

Equation element	Symbol	Value used	Notes
Controlled moisture content[3]	M	3.00	Controlled moisture for plant
Control efficiency of watering application (%)	C_f	87	
Controlled PM_{10} emission factor (lbs/VMT) - after watering	E_{fc}	0.55	

Control Efficiency for Watering Application

Equation for Control Efficiency for Watering as per MDAQMD Emissions Inventory Guidance[3]

$$C_f = 100 - \left(0.0012 \times \frac{A \times D \times T}{I}\right)$$

Equation element	Symbol	West Pit EIR	2019-2022 Baseline	2019-2022 Post-Project	Notes
Average annual pan evaporation (inches)	A	66	66	66	Value for MCC
Average hourly traffic rate in (vehicles / hour)	D	15	15	15	
Time between water application (hours)	T	1.25	1.25	1.25	Watering frequency remains constant.
Water application intensity (gal/square yard)	I	0.11	0.11	0.11	Conservative default value from MDAQMD.
Control efficiency of watering application (%)	C_f	87	87	87	

Notes:
1. Equation is from AP-42, Section 13.2.2, Unpaved Roads, equation 1a and Table 13.2.2-2.
2. Higher control efficiency due to more frequent watering
3. Control efficiency is also calculated using the MDAQMD method to show how the controlled moisture (M) and time between water application (T) are related.

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Table A-3-2A: Dust Entrainment Emissions Summary for 2019 Baseline

Truck[2]	Avg. Truck Weight (tons)	Tons/load	West Pit Hours/yr		South Quarry Hours/yr		West Pit Tons/yr[4]		South Quarry Tons/yr[4]		West Pit Trips/yr		South Quarry Trips/yr		West Pit VMT/yr[5]		South Quarry VMT/yr[5]	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Material	Waste	Material	Waste	Material	Waste	Material	Waste	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	2063	238	0	0	453,968	52,381	0	0	5,896	680	0	0	20,045	2,313	0	0
777B	113.5	77	2063	238	0	0	453,968	52,381	0	0	5,896	680	0	0	20,045	2,313	0	0
777B	113.5	77	2063	238	0	0	453,968	52,381	0	0	5,896	680	0	0	20,045	2,313	0	0
777D	127.5	105	2063	238	0	0	619,048	71,429	0	0	5,896	680	0	0	20,045	2,313	0	0
777G	127.5	105	2063	238	0	0	619,048	71,429	0	0	5,896	680	0	0	20,045	2,313	0	0
		Subtotal:	10,317	1,190	0	0	2,600,000	300,000	0	0	29,478	3,401	0	0	100,227	11,565	0	0
		Total:	11,508		0		2,900,000		0		32,880		0		111,791		0	

Section	# of trucks	Avg. Truck Weight (tons)[3]	Uncontrolled Ef (lb/VMT)[7]	Control Efficiency (%)[7]	Controlled Ef (lb/VMT)[7]	PM_{10} (tons/yr)
West Pit	5	127.5	4.21	87.0	0.55	30.7
South Quarry	0	0	4.21	87.0	0.55	0.0
					Total:	30.7

Equations

$$\frac{VMT}{yr} = \frac{Throughput(ton/yr)}{Capacity\ (ton/load)} * \frac{VMT}{trip}$$

$$Emisions\left(\frac{ton}{yr}\right) = \frac{VMT}{yr} * Controlled\ EF\left(\frac{lb}{VMT}\right) * \frac{1\text{ ton}}{2000\text{ lb}}$$

Assumptions[6]	
West Pit, limestone ore road length (mi)	1.7
West Pit, waste rock road length (mi)	1.7
South Quarry, limestone ore (mi)	0
South Quarry, waste rock (mi)	0
West Pit cycle time, limestone ore (hr)	0.35
West Pit cycle time, waste rock (hr)	0.35
South Quarry cycle time, limestone ore (hr)	0
South Quarry cycle time, waste rock (hr)	0
Capacity, 777B (ton/load)	77
Capacity, 777D (ton/load)	105
Capacity, 777G (ton/load)	105
Empty weight, haul truck (tons)	75

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. The entries indicate the model number of each haul truck in each year. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
3. As a conservative estimate for the emission factor, assume the heaviest average fleet truck weight (2022 post-project) for calculations.
4. Ton per year and fraction of rock hauled are from haul truck calculations (Tables A-6-2A through A-6-2D).
5. Trip is defined as 2*road length (there and back).
6. Refer to Table A-2-10B for truck inventory and mileage assumptions.
7. Refer to Table A-3-1 for uncontrolled EF, control efficiency, and controlled EF.

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Table A-3-2B: Dust Entrainment Emissions Summary for 2020 Baseline

Truck[2]	Avg. Truck Weight (tons)	Tons/load	West Pit Hours/yr		South Quarry Hours/yr		West Pit Tons/yr[4]		South Quarry Tons/yr[4]		West Pit Trips/yr		South Quarry Trips/yr		West Pit VMT/yr[5]		South Quarry VMT/yr[5]	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Material	Waste	Material	Waste	Material	Waste	Material	Waste	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	2063	238	0	0	453,968	52,381	0	0	5,896	680	0	0	20,045	2,313	0	0
777B	113.5	77	2063	238	0	0	453,968	52,381	0	0	5,896	680	0	0	20,045	2,313	0	0
777B	113.5	77	2063	238	0	0	453,968	52,381	0	0	5,896	680	0	0	20,045	2,313	0	0
777D	127.5	105	2063	238	0	0	619,048	71,429	0	0	5,896	680	0	0	20,045	2,313	0	0
777G	127.5	105	2063	238	0	0	619,048	71,429	0	0	5,896	680	0	0	20,045	2,313	0	0
		Subtotal:	10,317	1,190	0	0	2,600,000	300,000	0	0	29,478	3,401	0	0	100,227	11,565	0	0
		Total:	11,508		0		2,900,000		0		32,880		0		111,791		0	

Section	# of trucks	Avg. Truck Weight (tons)[3]	Uncontrolled Ef (lb/VMT)[7]	Control Efficiency (%)[7]	Controlled Ef (lb/VMT)[7]	PM_{10} (tons/yr)
West Pit	5	127.5	4.21	87.0	0.55	30.7
South Quarry	0	0	4.21	87.0	0.55	0.0
					Total:	30.7

Equations

$$\frac{VMT}{yr} = \frac{Throughput(ton/yr)}{Capacity\ (ton/load)} * \frac{VMT}{trip}$$

$$Emisions\left(\frac{ton}{yr}\right) = \frac{VMT}{yr} * Controlled\ EF\left(\frac{lb}{VMT}\right) * \frac{1\ \text{ton}}{2000\ \text{lb}}$$

Assumptions[6]	
West Pit, limestone ore road length (mi)	1.7
West Pit, waste rock road length (mi)	1.7
South Quarry, limestone ore (mi)	0
South Quarry, waste rock (mi)	0
West Pit cycle time, limestone ore (hr)	0.35
West Pit cycle time, waste rock (hr)	0.35
South Quarry cycle time, limestone ore (hr)	0
South Quarry cycle time, waste rock (hr)	0
Capacity, 777B (ton/load)	77
Capacity, 777D (ton/load)	105
Capacity, 777G (ton/load)	105
Empty weight, haul truck (tons)	75

Notes
1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. The entries indicate the model number of each haul truck in each year. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
3. As a conservative estimate for the emission factor, assume the heaviest average fleet truck weight (2022 post-project) for calculations.
4. Ton per year and fraction of rock hauled are from haul truck calculations (Tables A-6-2A through A-6-2D).
5. Trip is defined as 2*road length (there and back).
6. Refer to Table A-2-10B for truck inventory and mileage assumptions.
7. Refer to Table A-3-1 for uncontrolled EF, control efficiency, and controlled EF.

Table A-3-2C: Dust Entrainment Emissions Summary for 2021 Baseline

Truck[2]	Avg. Truck Weight (tons)	Tons/load	West Pit Hours/yr		South Quarry Hours/yr		West Pit Tons/yr[4]		South Quarry Tons/yr[4]		West Pit Trips/yr		South Quarry Trips/yr		West Pit VMT/yr[5]		South Quarry VMT/yr[5]	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Material	Waste	Material	Waste	Material	Waste	Material	Waste	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	2500	288	0	0	550,000	63,462	0	0	7,143	824	0	0	24,286	2,802	0	0
777B	113.5	77	2500	288	0	0	550,000	63,462	0	0	7,143	824	0	0	24,286	2,802	0	0
777D	127.5	105	2500	288	0	0	750,000	86,538	0	0	7,143	824	0	0	24,286	2,802	0	0
777G	112.5	105	2500	288	0	0	750,000	86,538	0	0	7,143	824	0	0	24,286	2,802	0	0
		Subtotal:	10,000	1,154	0	0	2,600,000	300,000	0	0	28,571	3,297	0	0	97,143	11,209	0	0
		Total:	11,154		0		2,900,000		0		31,868		0		108,352		0	

Section	# of trucks	Avg. Truck Weight (tons)[3]	Uncontrolled Ef (lb/VMT)[7]	Control Efficiency (%)[7]	Controlled Ef (lb/VMT)[7]	PM_{10} (tons/yr)
West Pit	4	127.5	4.21	87.0	0.55	29.8
South Quarry	0	0	4.21	87.0	0.55	0.0
					Total:	29.8

Equations

$$\frac{VMT}{yr} = \frac{Throughput(ton/yr)}{Capacity\ (ton/load)} * \frac{VMT}{trip}$$

$$Emisions\left(\frac{ton}{yr}\right) = \frac{VMT}{yr} * Controlled\ EF\left(\frac{lb}{VMT}\right) * \frac{1\ \text{ton}}{2000\ \text{lb}}$$

Assumptions[6]	
West Pit, limestone ore road length (mi)	1.7
West Pit, waste rock road length (mi)	1.7
South Quarry, limestone ore (mi)	0
South Quarry, waste rock (mi)	0
West Pit cycle time, limestone ore (hr)	0.35
West Pit cycle time, waste rock (hr)	0.35
South Quarry cycle time, limestone ore (hr)	0
South Quarry cycle time, waste rock (hr)	0
Capacity, 777B (ton/load)	77
Capacity, 777D (ton/load)	105
Capacity, 777G (ton/load)	105
Empty weight, haul truck (tons)	75

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. The entries indicate the model number of each haul truck in each year. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
3. As a conservative estimate for the emission factor, assume the heaviest average fleet truck weight (2022 post-project) for calculations.
4. Ton per year and fraction of rock hauled are from haul truck calculations (Tables A-6-2A through A-6-2D).
5. Trip is defined as 2*road length (there and back).
6. Refer to Table A-2-10B for truck inventory and mileage assumptions.
7. Refer to Table A-3-1 for uncontrolled EF, control efficiency, and controlled EF.

Table A-3-2D: Dust Entrainment Emissions Summary for 2022 Baseline

Truck[2]	Avg. Truck Weight (tons)	Tons/load	West Pit Hours/yr		South Quarry Hours/yr		West Pit Tons/yr[4]		South Quarry Tons/yr[4]		West Pit Trips/yr		South Quarry Trips/yr		West Pit VMT/yr[5]		South Quarry VMT/yr[5]	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Material	Waste	Material	Waste	Material	Waste	Material	Waste	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	2500	288	0	0	550,000	63,462	0	0	7,143	824	0	0	24,286	2,802	0	0
777B	113.5	77	2500	288	0	0	550,000	63,462	0	0	7,143	824	0	0	24,286	2,802	0	0
777D	127.5	105	2500	288	0	0	750,000	86,538	0	0	7,143	824	0	0	24,286	2,802	0	0
777G	127.5	105	2500	288	0	0	750,000	86,538	0	0	7,143	824	0	0	24,286	2,802	0	0
		Subtotal:	10,000	1,154	0	0	2,600,000	300,000	0	0	28,571	3,297	0	0	97,143	11,209	0	0
		Total:	11,154		0		2,900,000		0		31,868		0		108,352		0	

Section	# of trucks	Avg. Truck Weight (tons)[3]	Uncontrolled Ef (lb/VMT)[7]	Control Efficiency (%)[7]	Controlled Ef (lb/VMT)[7]	PM_{10} (tons/yr)
West Pit	4	127.5	4.21	87.0	0.55	29.8
South Quarry	0	0	4.21	87.0	0.55	0.0
					Total:	29.8

Equations

$$\frac{VMT}{yr} = \frac{Throughput(ton/yr)}{Capacity\ (ton/load)} * \frac{VMT}{trip}$$

$$Emissions\left(\frac{ton}{yr}\right) = \frac{VMT}{yr} * Controlled\ EF\left(\frac{lb}{VMT}\right) * \frac{1\ \text{ton}}{2000\ \text{lb}}$$

Assumptions[6]	
West Pit, limestone ore road length (mi)	1.7
West Pit, waste rock road length (mi)	1.7
South Quarry, limestone ore (mi)	0
South Quarry, waste rock (mi)	0
West Pit cycle time, limestone ore (hr)	0.35
West Pit cycle time, waste rock (hr)	0.35
South Quarry cycle time, limestone ore (hr)	0
South Quarry cycle time, waste rock (hr)	0
Capacity, 777B (ton/load)	77
Capacity, 777D (ton/load)	105
Capacity, 777G (ton/load)	105
Empty weight, haul truck (tons)	75

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. The entries indicate the model number of each haul truck in each year. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
3. As a conservative estimate for the emission factor, assume the heaviest average fleet truck weight (2022 post-project) for calculations.
4. Ton per year and fraction of rock hauled are from haul truck calculations (Tables A-6-2A through A-6-2D).
5. Trip is defined as 2*road length (there and back).
6. Refer to Table A-2-10B for truck inventory and mileage assumptions.
7. Refer to Table A-3-1 for uncontrolled EF, control efficiency, and controlled EF.

Table A-3-2E: Dust Entrainment Emissions Summary for 2019 Post-Project

Truck[2]	Avg. Truck Weight (tons)	Tons/load	West Pit Hours/yr		South Quarry Hours/yr		West Pit Tons/yr[4]		South Quarry Tons/yr[4]		West Pit Trips/yr		South Quarry Trips/yr		West Pit VMT/yr[5]		South Quarry VMT/yr[5]	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Material	Waste	Material	Waste	Material	Waste	Material	Waste	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	1383	160	266	17	304,159	35,095	32,771	3,781	3,950	456	426	49	13,430	1,550	2,128	167
777B	113.5	77	1383	160	266	17	304,159	35,095	32,771	3,781	3,950	456	426	49	13,430	1,550	2,128	167
777B	113.5	77	1383	160	266	17	304,159	35,095	32,771	3,781	3,950	456	426	49	13,430	1,550	2,128	167
777D	127.5	105	1383	160	266	17	414,762	47,857	44,688	5,156	3,950	456	426	49	13,430	1,550	2,128	167
777G	127.5	105	1383	160	266	17	414,762	47,857	44,688	5,156	3,950	456	426	49	13,430	1,550	2,128	167
777Gd	127.5	105	0	0	1330	86	0	0	223,438	25,781	0	0	2,128	246	0	0	10,640	835
777Gd	127.5	105	0	0	1330	86	0	0	223,438	25,781	0	0	2,128	246	0	0	10,640	835
777Gd	127.5	105	0	0	1330	86	0	0	223,438	25,781	0	0	2,128	246	0	0	10,640	835
		Subtotal:	6,913	798	5,320	344	1,742,000	201,000	858,000	99,000	19,751	2,279	8,512	982	67,152	7,748	42,560	3,339
		Total:	7,710		5,664		1,943,000		957,000		22,029		9,494		74,900		45,899	

Section	# of trucks	Avg. Truck Weight (tons)[3]	Uncontrolled Ef (lb/VMT)[7]	Control Efficiency (%)[7]	Controlled Ef (lb/VMT)[7]	PM_{10} (tons/yr)
West Pit	5	127.5	4.21	87.0	0.55	20.6
South Quarry	8	127.5	4.21	87.0	0.55	12.6
					Total:	33.2

Equations

$$\frac{VMT}{yr} = \frac{Throughput(ton/yr)}{Capacity\ (ton/load)} * \frac{VMT}{trip}$$

$$Emissions\left(\frac{ton}{yr}\right) = \frac{VMT}{yr} * Controlled\ EF\left(\frac{lb}{VMT}\right) * \frac{1\ \text{ton}}{2000\ \text{lb}}$$

Assumptions[6]	
West Pit, limestone ore (mi)	1.7
West Pit, waste rock (mi)	1.7
South Quarry, limestone ore (mi)	2.5
South Quarry, waste rock (mi)	1.7
West Pit cycle time, limestone ore (hr)	0.35
West Pit cycle time, waste rock (hr)	0.35
South Quarry cycle time, limestone ore (h	0.63
South Quarry cycle time, waste rock (hr)	0.35
Capacity, 777B (ton/load)	77
Capacity, 777D (ton/load)	105
Capacity, 777G (ton/load)	105
Empty weight, haul truck (tons)	75

Notes
1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. The entries indicate the model number of each haul truck in each year. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
3. As a conservative estimate for the emission factor, assume the heaviest average fleet truck weight (2022 post-project) for calculations.
4. Ton per year and fraction of rock hauled are from haul truck calculations (Tables A-6-2E through A-6-2H).
5. Trip is defined as 2*road length (there and back).
6. Refer to Table A-2-10 for truck inventory and mileage assumptions.
7. Refer to Table A-3-1 for uncontrolled EF, control efficiency, and controlled EF.

Table A-3-2F: Dust Entrainment Emissions Summary for 2020 Post-Project

Truck[2]	Avg. Truck Weight (tons)	Tons/load	West Pit Hours/yr		South Quarry Hours/yr		West Pit Tons/yr[4]		South Quarry Tons/yr[4]		West Pit Trips/yr		South Quarry Trips/yr		West Pit VMT/yr[5]		South Quarry VMT/yr[5]	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Material	Waste	Material	Waste	Material	Waste	Material	Waste	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	1300	150	277	17	286,000	33,000	32,322	3,729	3,714	429	420	48	12,629	1,457	2,267	165
777B	113.5	77	1300	150	277	17	286,000	33,000	32,322	3,729	3,714	429	420	48	12,629	1,457	2,267	165
777D	127.5	105	1300	150	277	17	390,000	45,000	44,075	5,086	3,714	429	420	48	12,629	1,457	2,267	165
777G	127.5	105	1300	150	277	17	390,000	45,000	44,075	5,086	3,714	429	420	48	12,629	1,457	2,267	165
777G	127.5	105	1300	150	277	17	390,000	45,000	44,075	5,086	3,714	429	420	48	12,629	1,457	2,267	165
777Gd	127.5	105	0	0	1383	85	0	0	220,377	25,428	0	0	2,099	242	0	0	11,334	823
777Gd	127.5	105	0	0	1383	85	0	0	220,377	25,428	0	0	2,099	242	0	0	11,334	823
777Gd	127.5	105	0	0	1383	85	0	0	220,377	25,428	0	0	2,099	242	0	0	11,334	823
		Subtotal:	6,500	750	5,533	339	1,742,000	201,000	858,000	99,000	18,571	2,143	8,395	969	63,143	7,286	45,335	3,294
		Total:	7,250		5,872		1,943,000		957,000		20,714		9,364		70,429		48,628	

Section	# of trucks	Avg. Truck Weight (tons)[3]	Uncontrolled Ef (lb/VMT)[7]	Control Efficiency (%)[7]	Controlled Ef (lb/VMT)[7]	PM_{10} (tons/yr)
West Pit	5	127.5	4.21	87.0	0.55	19.3
South Quarry	8	127.5	4.21	87.0	0.55	13.4
					Total:	32.7

Equations

$$\frac{VMT}{yr} = \frac{Throughput(ton/yr)}{Capacity\ (ton/load)} * \frac{VMT}{trip}$$

$$Emisions\left(\frac{ton}{yr}\right) = \frac{VMT}{yr} * Controlled\ EF\left(\frac{lb}{VMT}\right) * \frac{1\text{ ton}}{2000\text{ lb}}$$

Assumptions[6]	
West Pit, limestone ore (mi)	1.7
West Pit, waste rock (mi)	1.7
South Quarry, limestone ore (mi)	2.7
South Quarry, waste rock (mi)	1.7
West Pit cycle time, limestone ore (hr)	0.35
West Pit cycle time, waste rock (hr)	0.35
South Quarry cycle time, limestone ore (hr)	0.66
South Quarry cycle time, waste rock (hr)	0.35
Capacity, 777B (ton/load)	77
Capacity, 777D (ton/load)	105
Capacity, 777G (ton/load)	105
Empty weight, haul truck (tons)	75

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. The entries indicate the model number of each haul truck in each year. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
3. As a conservative estimate for the emission factor, assume the heaviest average fleet truck weight (2022 post-project) for calculations.
4. Ton per year and fraction of rock hauled are from haul truck calculations (Tables A-6-2E through A-6-2H).
5. Trip is defined as 2*road length (there and back).
6. Refer to Table A-2-10 for truck inventory and mileage assumptions.
7. Refer to Table A-3-1 for uncontrolled EF, control efficiency, and controlled EF.

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Table A-3-2G: Dust Entrainment Emissions Summary for 2021 Post-Project

Truck[2]	Avg. Truck Weight (tons)	Tons/load	West Pit Hours/yr		South Quarry Hours/yr		West Pit Tons/yr[4]		South Quarry Tons/yr[4]		West Pit Trips/yr		South Quarry Trips/yr		West Pit VMT/yr[5]		South Quarry VMT/yr[5]	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Material	Waste	Material	Waste	Material	Waste	Material	Waste	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	1227	142	286	17	269,887	31,141	31,885	3,679	3,505	404	414	48	11,917	1,375	2,402	162
777D	127.5	105	1227	142	286	17	368,028	42,465	43,480	5,017	3,505	404	414	48	11,917	1,375	2,402	162
777G	127.5	105	1227	142	286	17	368,028	42,465	43,480	5,017	3,505	404	414	48	11,917	1,375	2,402	162
777G	127.5	105	1227	142	286	17	368,028	42,465	43,480	5,017	3,505	404	414	48	11,917	1,375	2,402	162
777G	127.5	105	1227	142	286	17	368,028	42,465	43,480	5,017	3,505	404	414	48	11,917	1,375	2,402	162
777Gd	127.5	105	0	0	1429	84	0	0	217,399	25,084	0	0	2,070	239	0	0	12,009	812
777Gd	127.5	105	0	0	1429	84	0	0	217,399	25,084	0	0	2,070	239	0	0	12,009	812
777Gd	127.5	105	0	0	1429	84	0	0	217,399	25,084	0	0	2,070	239	0	0	12,009	812
		Subtotal:	6,134	708	5,714	334	1,742,000	201,000	858,000	99,000	17,525	2,022	8,282	956	59,586	6,875	48,035	3,249
		Total:	6,842		6,049		1,943,000		957,000		19,547		9,237		66,461		51,284	

Section	# of trucks	Avg. Truck Weight (tons)[3]	Uncontrolled Ef (lb/VMT)[7]	Control Efficiency (%)[7]	Controlled Ef (lb/VMT)[7]	PM_{10} (tons/yr)
West Pit	5	127.5	4.21	87.0	0.55	18.3
South Quarry	8	127.5	4.21	87.0	0.55	14.1
					Total:	32.3

Equations

$$\frac{VMT}{yr} = \frac{Throughput\,(ton/yr)}{Capacity\,(ton/load)} * \frac{VMT}{trip}$$

$$Emissions\left(\frac{ton}{yr}\right) = \frac{VMT}{yr} * Controlled\ EF\left(\frac{lb}{VMT}\right) * \frac{1\ ton}{2000\ lb}$$

Assumptions[6]	
West Pit, limestone ore (mi)	1.7
West Pit, waste rock (mi)	1.7
South Quarry, limestone ore (mi)	2.9
South Quarry, waste rock (mi)	1.7
West Pit cycle time, limestone ore (hr)	0.35
West Pit cycle time, waste rock (hr)	0.35
South Quarry cycle time, limestone ore (hr)	0.69
South Quarry cycle time, waste rock (hr)	0.35
Capacity, 777B (ton/load)	77
Capacity, 777D (ton/load)	105
Capacity, 777G (ton/load)	105
Empty weight, haul truck (tons)	75

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. The entries indicate the model number of each haul truck in each year. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
3. As a conservative estimate for the emission factor, assume the heaviest average fleet truck weight (2022 post-project) for calculations.
4. Ton per year and fraction of rock hauled are from haul truck calculations (Tables A-6-2E through A-6-2H).
5. Trip is defined as 2*road length (there and back).
6. Refer to Table A-2-10 for truck inventory and mileage assumptions.
7. Refer to Table A-3-1 for uncontrolled EF, control efficiency, and controlled EF.

Table A-3-2H: Dust Entrainment Emissions Summary for 2022 Post-Project

Truck[2]	Avg. Truck Weight (tons)	Tons/load	West Pit Hours/yr		South Quarry Hours/yr		West Pit Tons/yr[4]		South Quarry Tons/yr[4]		West Pit Trips/yr		South Quarry Trips/yr		West Pit VMT/yr[5]		South Quarry VMT/yr[5]	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Material	Waste	Material	Waste	Material	Waste	Material	Waste	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777D	127.5	105	1083	125	376	17	325,000	37,500	44,828	5,172	3,095	357	427	49	10,524	1,214	3,415	167
777G	127.5	105	1083	125	376	17	325,000	37,500	44,828	5,172	3,095	357	427	49	10,524	1,214	3,415	167
777G	127.5	105	1083	125	376	17	325,000	37,500	44,828	5,172	3,095	357	427	49	10,524	1,214	3,415	167
777G	127.5	105	1083	125	376	17	325,000	37,500	44,828	5,172	3,095	357	427	49	10,524	1,214	3,415	167
777Gd	127.5	105	0	0	1878	86	0	0	224,138	32,328	0	0	2,135	308	0	0	17,077	1,047
777Gd	127.5	105	0	0	1878	86	0	0	224,138	32,328	0	0	2,135	308	0	0	17,077	1,047
777Gd	127.5	105	0	0	1878	86	0	0	224,138	32,328	0	0	2,135	308	0	0	17,077	1,047
777Gd	127.5	105	0	0	1878	86	0	0	224,138	32,328	0	0	2,135	308	0	0	17,077	1,047
777Gd	127.5	105	0	0	1878	86	0	0	224,138	32,328	0	0	2,135	308	0	0	17,077	1,047
		Subtotal:	4,333	500	10,895	500	1,300,000	150,000	1,300,000	150,000	12,381	1,429	12,381	1,736	42,095	4,857	99,048	5,904
		Total:	4,833		11,395		1,450,000		1,450,000		13,810		14,117		46,952		104,952	

Section	# of trucks	Avg. Truck Weight (tons)[3]	Uncontrolled Ef (lb/VMT)[7]	Control Efficiency (%)[7]	Controlled Ef (lb/VMT)[7]	PM_{10} (tons/yr)
West Pit	4	127.5	4.21	87.0	0.55	12.9
South Quarry	9	127.5	4.21	87.0	0.55	28.8
					Total:	41.7

Equations

$$\frac{VMT}{yr} = \frac{Throughput\,(ton/yr)}{Capacity\,(ton/load)} * \frac{VMT}{trip}$$

$$Emisions\left(\frac{ton}{yr}\right) = \frac{VMT}{yr} * Controlled\ EF\left(\frac{lb}{VMT}\right) * \frac{1\ \text{ton}}{2000\ \text{lb}}$$

Assumptions[6]	
West Pit, limestone ore (mi)	1.7
West Pit, waste rock (mi)	1.7
South Quarry, limestone ore (mi)	4.0
South Quarry, waste rock (mi)	1.7
West Pit cycle time, limestone ore (hr)	0.35
West Pit cycle time, waste rock (hr)	0.35
South Quarry cycle time, limestone ore (hr)	0.88
South Quarry cycle time, waste rock (hr)	0.35
Capacity, 777B (ton/load)	77
Capacity, 777D (ton/load)	105
Capacity, 777G (ton/load)	105
Empty weight, haul truck (tons)	75

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. The entries indicate the model number of each haul truck in each year. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
3. As a conservative estimate for the emission factor, assume the heaviest average fleet truck weight (2022 post-project) for calculations.
4. Ton per year and fraction of rock hauled are from haul truck calculations (Tables A-6-2E through A-6-2H).
5. Trip is defined as 2*road length (there and back).
6. Refer to Table A-2-10 for truck inventory and mileage assumptions.
7. Refer to Table A-3-1 for uncontrolled EF, control efficiency, and controlled EF.

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Table A-3-2I: Water Truck Dust Entrainment Calculations

Year	Total trips/yr[1]	West Pit Total VMT/yr[2,5]	South Quarry Total VMT/yr[2,5]	Emission Factor (lb/VMT)	Controlled Emission Factor (lb/VMT)	West Pit Emissions (tons/yr)	South Quarry Emissions (tons/yr)	Total Emissions (tons/yr)
West Pit EIR	2000	6800	0	4.21	0.11	0.37	0.00	0.37
2019 Post-Project	2000	6800	11250	4.21	0.11	0.37	0.62	0.99
2020 Post-Project	2000	6800	12150	4.21	0.11	0.37	0.67	1.04
2021 Post-Project	2000	6800	13050	4.21	0.11	0.37	0.72	1.09
2022 Post-Project	2000	6800	18000	4.21	0.11	0.37	0.99	1.36

Equations

$$\frac{VMT}{yr} = \frac{trips}{yr} * road\ length\ RT\left(\frac{VMT}{trip}\right)$$

$$Emisions\left(\frac{ton}{yr}\right) = \frac{VMT}{yr} * Controlled\ EF\left(\frac{lb}{VMT}\right) * \frac{1\text{ ton}}{2000\text{ lb}}$$

$$Controlled\ EF\left(\frac{lb}{VMT}\right) = Uncontrolled\ EF\left(\frac{lb}{VMT}\right) * (1 - Watering\ Efficiency_1) * (1 - Watering\ Efficiency_2)$$

Assumptions	
West Pit (mi)	1.7
2019 South Quarry (mi)	2.5
2020 South Quarry (mi)	2.7
2021 South Quarry (mi)	2.9
2022 South Quarry (mi)	4.0
Watering frequency (operating trip/hr)	0.80
Operating hours/day	10
Operating days/yr	250
Watering Efficiency[3]	87%
Additional Water Truck Efficiency[3]	80%

Notes
1. Total trips/year are based on maximum operating schedule.
2. Assuming South Quarry uses 250 additional truck trips per year.
3. Watering efficiency is from Table A-3-1. Water trucks have an extra 80% efficiency due to immediate watering.
4. See Table A-10B for mileage assumptions.
5. Trip is defined as 2*road length (there and back).

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Table A-3-3: Dust Entrainment Emissions Summary (2019-2022)

Parameter	2019	2020	2021	2022	Notes
South Quarry haul road length (mi)	2.5	2.7	2.9	4.0	
South Quarry haul road length (ft)	13,200	14,256	15,312	21,120	
Dust entrainment, baseline[1,2,3]					
Haul Trucks					
West Pit miles traveled: Haul Trucks (VMT/yr)	111,791	111,791	108,352	108,352	Calculated according to baseline haul truck fleet
West Pit uncontrolled emission factor (lb/VMT)	4.21	4.21	4.21	4.21	
Control efficiency (%)	87.0	87.0	87.0	87.0	
West Pit controlled emission factor (lb/VMT)	0.55	0.55	0.55	0.55	
West Pit Haul Truck emissions (tons/yr)	**30.71**	**30.71**	**29.76**	**29.76**	
Water Trucks					
West Pit miles traveled (VMT/yr)	6,800	6,800	6,800	6,800	Calculated according to water truck fleet
West Pit uncontrolled emission factor (lb/VMT)	4.21	4.21	4.21	4.21	
Control efficiency (%)	0.97	0.97	0.97	0.97	
West Pit controlled emission factor (lb/VMT)	0.11	0.11	0.11	0.11	
West Pit emissions (tons/yr)	**0.37**	**0.37**	**0.37**	**0.37**	
Dust entrainment - Post-Project[2,3]					
Haul Trucks					
West Pit miles traveled (VMT/yr), calculated	74,900	70,429	66,461	46,952	Calculated according to haul truck fleet
West Pit uncontrolled emission factor (lb/VMT)	4.21	4.21	4.21	4.21	
Control efficiency (%)	87.0	87.0	87.0	87.0	
West Pit controlled emission factor (lb/VMT)	0.55	0.55	0.55	0.55	
West Pit Haul Truck emissions (tons/yr)	**20.57**	**19.35**	**18.26**	**12.90**	
South Quarry miles traveled (VMT/yr)	45,899	48,628	51,284	104,952	Throughput includes waste rock transport
South Quarry uncontrolled emission factor (lb/VMT)	4.21	4.21	4.21	4.21	Same as the unmitigated uncontrolled emission factor for the west pit
Control efficiency (%)	87.0	87.0	87.0	87.0	
South Quarry controlled emission factor (lb/VMT)	0.55	0.55	0.55	0.55	
South Quarry Haul Truck emissions (tons/yr)	**12.61**	**13.36**	**14.09**	**28.83**	
Water Trucks					
West Pit miles traveled (VMT/yr), calculated	6,800	6,800	6,800	6,800	Calculated according to water truck fleet
West Pit uncontrolled emission factor (lb/VMT)	4.21	4.21	4.21	4.21	
Control efficiency (%)	0.97	0.97	0.97	0.97	
West Pit controlled emission factor (lb/VMT)	0.11	0.11	0.11	0.11	
West Pit Water Truck emissions (tons/yr)	**0.37**	**0.37**	**0.37**	**0.37**	
South Quarry miles traveled (VMT/yr)	11,250	12,150	13,050	18,000	
South Quarry uncontrolled emission factor (lb/VMT)	4.21	4.21	4.21	4.21	
Control efficiency (%)	0.97	0.97	0.97	0.97	
South Quarry controlled emission factor (lb/VMT)	0.11	0.11	0.11	0.11	
South Quarry Water Truck emissions (tons/yr)	**0.62**	**0.67**	**0.72**	**0.99**	
Summary					
Total post-project Haul Truck miles traveled (VMT/yr)	120,799	119,057	117,745	151,904	
Total post-project Haul Truck emissions (tons/yr)	**33.18**	**32.70**	**32.34**	**41.72**	
Haul Truck Increase relative to baseline (VMT/yr)	9,008	7,265	9,393	43,552	
Haul Truck Increase relative to baseline (tons/yr)	**2.47**	**2.00**	**2.58**	**11.96**	
Total post-project Water Truck miles traveled (VMT/yr)	18,050	18,950	19,850	24,800	
Total post-project Water Truck emissions (tons/yr)	**0.99**	**1.04**	**1.09**	**1.36**	
Water Truck Increase relative to baseline (VMT/yr)	11,250	12,150	13,050	18,000	
Water Truck Increase relative to baseline (tons/yr)	**0.62**	**0.67**	**0.72**	**0.99**	

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. 2019-2022 Haul Truck Baseline references A-3-2A through A-3-2D respectively, and the 2019-2022 Haul Truck Post-Project references A-3-2E through A-3-2H respectively.
3. 2019 and 2022 Water Truck Baseline and Post-Project reference A-3-2I.

Table A-4-1A: Wind Erosion from Unpaved Roads Emission Factor Calculations

Equations for Emission Factor, per EPA AP-42[1]

Correct wind speed data to reference height of 10 m[2]:

$$u_{10}^{+} = u_z^{+} * \frac{\ln \frac{10}{0.005}}{\ln \frac{z}{0.005}}$$

Equation element	Symbol	Value	Notes
"Fastest mile" of wind speed per disturbance at height z (m/s)	u^{+}_{z}	daily data	Wind gust data from 2014 obtained from NCDC for Daggett-Barstow Airport.
Height at which meteorological data was taken (m)	z	10	
"Fastest mile" of wind speed per disturbance at 10m (m/s)	u^{+}_{10}	calculated	Step 1; calculated for each day[4]

Calculate u* for the unpaved road:

$$u^{*} = 0.053 u_{10}^{+}$$

Equation element	Symbol	Value	Notes
Friction velocity per disturbance (m/s)	u*	calculated	Step 2; calculated for each day[4]

Calculate the emission factor for each disturbance:

$$P_i = 58(u^{*} - u_t^{*})^2 + 25(u^{*} - u_t^{*})$$

Equation element	Symbol	Value	Notes
Number of disturbances per year	N	365	number of days in 2014
Threshold friction velocity (m/s)	u^{*}_{t}	0.62	EPA AP-42, Table 13.2.5-2. Value for uncrusted coal pile.
Erosion potential per disturbance (g/m^2)	P_i	calculated	Step 3; calculated for each day[4]

Sum the erosion potential disturbances:

$$E_f = k * \sum_{i-1}^{N} P_i$$

Equation element	Symbol	Value	Notes
Particle size multiplier for PM_{10} (-)	*k*	0.5	EPA AP-42, Chapter 13.2.5-3
PM_{10} emission factor (tons/acre-yr)	E_f	1.19	Calculated emission factor

Control Efficiency for Watering Application, per AP-42[5]

$$C_f = 100 * \left[1 - \left(\frac{1}{\left(\frac{M}{0.7}\right)^{1.4}}\right)\right]$$

$$E_{fc} = E_f * \frac{C_f}{100}$$

Equation element	Symbol	Value used	Notes
Controlled moisture content	M	3.00	Controlled moisture for plant
Control efficiency of watering application (%)	C_f	87	
PM_{10} Controlled emission factor (tons/acre-yr)	E_{fc}	0.16	Calculated emission factor

Conversion Factors:
907,184.74 grams per ton
4,049 m^2 per acre
43,560 ft^2 per acre

Notes

1. Section 13.2.5 Industrial Wind Erosion from EPA AP-42.
2. Equation is from MDAQMD and AVAPCD Emissions Inventory Guidance for Mineral Handling and Processing Industries, April 2000: Page 26, "Control Techniques".
3. Meteorological data used is 2014 data from Daggett airport station (NOAA NCDC website).
4. See Table A-4-1B for daily calculations.
5. Higher control efficiency due to more frequent watering.
6. The initial calculations are performed assuming that a disturbance occurs on all 365 days, and then an adjustment factor is applied to calculate the value for just 250 days disturbance, as shown in Table A-4-2.

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Table A-4-1B: Wind Erosion from Unpaved Roads Emission Factor Raw Data

Date	N	u^{+z} (m/s)[1,3]	u^{+10} (m/s)	u* (m/s)	Preci[4]	P_i (g/m^2)
1/1/2014	1	6.26	6.26	0.33	No	0.00
1/2/2014	2	7.15	7.15	0.38	No	0.00
1/3/2014	3	7.15	7.15	0.38	No	0.00
1/4/2014	4	6.26	6.26	0.33	No	0.00
1/5/2014	5	4.02	4.02	0.21	No	0.00
1/6/2014	6	4.47	4.47	0.24	No	0.00
1/7/2014	7	6.26	6.26	0.33	No	0.00
1/8/2014	8	6.26	6.26	0.33	No	0.00
1/9/2014	9	10.28	10.28	0.54	No	0.00
1/10/2014	10	9.39	9.39	0.50	No	0.00
1/11/2014	11	15.65	15.65	0.83	No	7.77
1/12/2014	12	14.31	14.31	0.76	No	4.56
1/13/2014	13	6.26	6.26	0.33	No	0.00
1/14/2014	14	8.05	8.05	0.43	No	0.00
1/15/2014	15	7.15	7.15	0.38	No	0.00
1/16/2014	16	6.71	6.71	0.36	No	0.00
1/17/2014	17	5.81	5.81	0.31	No	0.00
1/18/2014	18	7.15	7.15	0.38	No	0.00
1/19/2014	19	6.71	6.71	0.36	No	0.00
1/20/2014	20	5.36	5.36	0.28	No	0.00
1/21/2014	21	5.81	5.81	0.31	No	0.00
1/22/2014	22	7.15	7.15	0.38	No	0.00
1/23/2014	23	8.94	8.94	0.47	No	0.00
1/24/2014	24	4.47	4.47	0.24	No	0.00
1/25/2014	25	5.36	5.36	0.28	No	0.00
1/26/2014	26	7.15	7.15	0.38	No	0.00
1/27/2014	27	7.60	7.60	0.40	No	0.00
1/28/2014	28	8.05	8.05	0.43	No	0.00
1/29/2014	29	8.94	8.94	0.47	No	0.00
1/30/2014	30	16.99	16.99	0.90	No	11.57
1/31/2014	31	16.09	16.09	0.85	No	8.97
2/1/2014	32	8.94	8.94	0.47	Yes	0.00
2/2/2014	33	9.39	9.39	0.50	No	0.00
2/3/2014	34	9.83	9.83	0.52	No	0.00
2/4/2014	35	7.15	7.15	0.38	No	0.00
2/5/2014	36	8.94	8.94	0.47	No	0.00
2/6/2014	37	13.41	13.41	0.71	Yes	0.00
2/7/2014	38	14.75	14.75	0.78	No	5.57
2/8/2014	39	16.54	16.54	0.88	No	10.24

Table A-4-1B: Wind Erosion from Unpaved Roads Emission Factor Raw Data

Date	N	u^{+z} (m/s)[1,3]	u^{+10} (m/s)	u* (m/s)	Preci[4]	P_i (g/m^2)
2/9/2014	40	15.65	15.65	0.83	No	7.77
2/10/2014	41	14.31	14.31	0.76	No	4.56
2/11/2014	42	7.15	7.15	0.38	No	0.00
2/12/2014	43	7.60	7.60	0.40	No	0.00
2/13/2014	44	13.86	13.86	0.73	No	3.62
2/14/2014	45	11.18	11.18	0.59	No	0.00
2/15/2014	46	10.73	10.73	0.57	No	0.00
2/16/2014	47	12.52	12.52	0.66	No	1.19
2/17/2014	48	10.28	10.28	0.54	No	0.00
2/18/2014	49	7.60	7.60	0.40	No	0.00
2/19/2014	50	16.54	16.54	0.88	No	10.24
2/20/2014	51	6.71	6.71	0.36	No	0.00
2/21/2014	52	4.47	4.47	0.24	No	0.00
2/22/2014	53	6.71	6.71	0.36	No	0.00
2/23/2014	54	5.36	5.36	0.28	No	0.00
2/24/2014	55	6.71	6.71	0.36	No	0.00
2/25/2014	56	6.26	6.26	0.33	No	0.00
2/26/2014	57	9.39	9.39	0.50	No	0.00
2/27/2014	58	16.09	16.09	0.85	No	8.97
2/28/2014	59	16.09	16.09	0.85	Yes	0.00
3/1/2014	60	6.26	6.26	0.33	Yes	0.00
3/2/2014	61	6.26	6.26	0.33	No	0.00
3/3/2014	62	6.26	6.26	0.33	No	0.00
3/4/2014	63	9.83	9.83	0.52	No	0.00
3/5/2014	64	5.81	5.81	0.31	No	0.00
3/6/2014	65	16.99	16.99	0.90	No	11.57
3/7/2014	66	14.75	14.75	0.78	No	5.57
3/8/2014	67	5.36	5.36	0.28	No	0.00
3/9/2014	68	7.60	7.60	0.40	No	0.00
3/10/2014	69	13.86	13.86	0.73	No	3.62
3/11/2014	70	8.94	8.94	0.47	No	0.00
3/12/2014	71	6.71	6.71	0.36	No	0.00
3/13/2014	72	7.15	7.15	0.38	No	0.00
3/14/2014	73	8.94	8.94	0.47	No	0.00
3/15/2014	74	8.94	8.94	0.47	No	0.00
3/16/2014	75	9.83	9.83	0.52	No	0.00
3/17/2014	76	18.33	18.33	0.97	No	15.95
3/18/2014	77	8.05	8.05	0.43	No	0.00
3/19/2014	78	6.26	6.26	0.33	No	0.00

Table A-4-1B: Wind Erosion from Unpaved Roads Emission Factor Raw Data

Date	N	u^{+z} (m/s)[1,3]	u^{+10} (m/s)	u* (m/s)	Preci[4]	P_i (g/m^2)
3/20/2014	79	7.15	7.15	0.38	No	0.00
3/21/2014	80	12.96	12.96	0.69	No	1.94
3/22/2014	81	13.86	13.86	0.73	No	3.62
3/23/2014	82	6.71	6.71	0.36	No	0.00
3/24/2014	83	6.71	6.71	0.36	No	0.00
3/25/2014	84	13.41	13.41	0.71	No	2.75
3/26/2014	85	19.67	19.67	1.04	No	20.92
3/27/2014	86	16.54	16.54	0.88	No	10.24
3/28/2014	87	9.83	9.83	0.52	No	0.00
3/29/2014	88	12.96	12.96	0.69	No	1.94
3/30/2014	89	19.22	19.22	1.02	Yes	0.00
3/31/2014	90	16.54	16.54	0.88	No	10.24
4/1/2014	91	13.41	13.41	0.71	Yes	0.00
4/2/2014	92	16.54	16.54	0.88	Yes	0.00
4/3/2014	93	9.39	9.39	0.50	No	0.00
4/4/2014	94	12.96	12.96	0.69	No	1.94
4/5/2014	95	10.73	10.73	0.57	No	0.00
4/6/2014	96	7.60	7.60	0.40	No	0.00
4/7/2014	97	6.71	6.71	0.36	No	0.00
4/8/2014	98	6.71	6.71	0.36	No	0.00
4/9/2014	99	10.28	10.28	0.54	No	0.00
4/10/2014	100	10.73	10.73	0.57	No	0.00
4/11/2014	101	12.52	12.52	0.66	No	1.19
4/12/2014	102	14.31	14.31	0.76	No	4.56
4/13/2014	103	12.52	12.52	0.66	No	1.19
4/14/2014	104	7.15	7.15	0.38	No	0.00
4/15/2014	105	12.96	12.96	0.69	No	1.94
4/16/2014	106	8.94	8.94	0.47	No	0.00
4/17/2014	107	10.73	10.73	0.57	No	0.00
4/18/2014	108	10.73	10.73	0.57	No	0.00
4/19/2014	109	12.96	12.96	0.69	No	1.94
4/20/2014	110	10.28	10.28	0.54	No	0.00
4/21/2014	111	10.73	10.73	0.57	No	0.00
4/22/2014	112	19.22	19.22	1.02	No	19.19
4/23/2014	113	11.62	11.62	0.62	No	0.00
4/24/2014	114	10.28	10.28	0.54	No	0.00
4/25/2014	115	16.09	16.09	0.85	Yes	0.00
4/26/2014	116	18.33	18.33	0.97	Yes	0.00
4/27/2014	117	16.99	16.99	0.90	No	11.57

Table A-4-1B: Wind Erosion from Unpaved Roads Emission Factor Raw Data

Date	N	u^{+z} (m/s)[1,3]	u^{+10} (m/s)	u^* (m/s)	Preci[4]	P_i (g/m^2)
4/28/2014	118	12.52	12.52	0.66	No	1.19
4/29/2014	119	9.83	9.83	0.52	No	0.00
4/30/2014	120	8.94	8.94	0.47	No	0.00
5/1/2014	121	7.60	7.60	0.40	No	0.00
5/2/2014	122	10.28	10.28	0.54	No	0.00
5/3/2014	123	12.52	12.52	0.66	No	1.19
5/4/2014	124	11.18	11.18	0.59	No	0.00
5/5/2014	125	14.31	14.31	0.76	No	4.56
5/6/2014	126	16.54	16.54	0.88	No	10.24
5/7/2014	127	13.41	13.41	0.71	No	2.75
5/8/2014	128	13.86	13.86	0.73	No	3.62
5/9/2014	129	17.43	17.43	0.92	No	12.96
5/10/2014	130	22.80	22.80	1.21	No	34.79
5/11/2014	131	12.96	12.96	0.69	No	1.94
5/12/2014	132	8.05	8.05	0.43	No	0.00
5/13/2014	133	9.83	9.83	0.52	No	0.00
5/14/2014	134	9.39	9.39	0.50	No	0.00
5/15/2014	135	7.15	7.15	0.38	No	0.00
5/16/2014	136	14.75	14.75	0.78	No	5.57
5/17/2014	137	14.75	14.75	0.78	No	5.57
5/18/2014	138	17.43	17.43	0.92	No	12.96
5/19/2014	139	16.09	16.09	0.85	No	8.97
5/20/2014	140	13.41	13.41	0.71	No	2.75
5/21/2014	141	12.52	12.52	0.66	Yes	0.00
5/22/2014	142	13.41	13.41	0.71	Yes	0.00
5/23/2014	143	9.83	9.83	0.52	No	0.00
5/24/2014	144	11.18	11.18	0.59	No	0.00
5/25/2014	145	9.83	9.83	0.52	No	0.00
5/26/2014	146	12.52	12.52	0.66	No	1.19
5/27/2014	147	12.96	12.96	0.69	No	1.94
5/28/2014	148	13.41	13.41	0.71	No	2.75
5/29/2014	149	11.18	11.18	0.59	No	0.00
5/30/2014	150	11.62	11.18	0.62	No	0.00
5/31/2014	151	13.86	13.86	0.73	No	3.62
6/1/2014	152	9.39	9.39	0.50	No	0.00
6/2/2014	153	14.75	14.75	0.78	No	5.57
6/3/2014	154	9.83	9.83	0.52	No	0.00
6/4/2014	155	10.28	10.28	0.54	No	0.00
6/5/2014	156	10.73	10.73	0.57	No	0.00

Table A-4-1B: Wind Erosion from Unpaved Roads Emission Factor Raw Data

Date	N	u^{+z} (m/s)[1,3]	u^{+10} (m/s)	u* (m/s)	Preci[4]	P_i (g/m^2)
6/6/2014	157	12.52	12.52	0.66	No	1.19
6/7/2014	158	11.62	11.62	0.62	No	0.00
6/8/2014	159	9.83	9.83	0.52	No	0.00
6/9/2014	160	11.62	11.62	0.62	No	0.00
6/10/2014	161	11.62	11.62	0.62	No	0.00
6/11/2014	162	12.52	12.52	0.66	No	1.19
6/12/2014	163	12.52	12.52	0.66	No	1.19
6/13/2014	164	17.43	17.43	0.92	No	12.96
6/14/2014	165	16.54	16.54	0.88	No	10.24
6/15/2014	166	15.65	15.65	0.83	No	7.77
6/16/2014	167	16.09	16.09	0.85	No	8.97
6/17/2014	168	15.65	15.65	0.83	No	7.77
6/18/2014	169	10.28	10.28	0.54	No	0.00
6/19/2014	170	7.60	7.60	0.40	No	0.00
6/20/2014	171	11.62	11.62	0.62	No	0.00
6/21/2014	172	12.96	12.96	0.69	No	1.94
6/22/2014	173	12.52	12.52	0.66	No	1.19
6/23/2014	174	10.73	10.73	0.57	No	0.00
6/24/2014	175	14.75	14.75	0.78	No	5.57
6/25/2014	176	16.09	16.09	0.85	No	8.97
6/26/2014	177	19.67	19.67	1.04	No	20.92
6/27/2014	178	16.09	16.09	0.85	No	8.97
6/28/2014	179	12.52	12.52	0.66	No	1.19
6/29/2014	180	10.73	10.73	0.57	No	0.00
6/30/2014	181	8.05	8.05	0.43	No	0.00
7/1/2014	182	9.83	9.83	0.52	No	0.00
7/2/2014	183	10.73	10.73	0.57	No	0.00
7/3/2014	184	10.73	10.73	0.57	No	0.00
7/4/2014	185	12.96	12.96	0.69	No	1.94
7/5/2014	186	15.65	15.65	0.83	Yes	0.00
7/6/2014	187	11.18	11.18	0.59	No	0.00
7/7/2014	188	11.18	11.18	0.59	No	0.00
7/8/2014	189	11.62	11.62	0.62	No	0.00
7/9/2014	190	13.86	13.86	0.73	No	3.62
7/10/2014	191	11.18	11.18	0.59	No	0.00
7/11/2014	192	10.73	10.73	0.57	No	0.00
7/12/2014	193	8.05	8.05	0.43	No	0.00
7/13/2014	194	9.83	9.83	0.52	No	0.00
7/14/2014	195	9.39	9.39	0.50	Yes	0.00

Table A-4-1B: Wind Erosion from Unpaved Roads Emission Factor Raw Data

Date	N	u^{+z}	u^{+10}	u*	Preci[4]	P_i
		(m/s)[1,3]	(m/s)	(m/s)		(g/m^2)
7/15/2014	196	9.83	9.83	0.52	No	0.00
7/16/2014	197	11.18	11.18	0.59	No	0.00
7/17/2014	198	10.28	10.28	0.54	No	0.00
7/18/2014	199	8.94	8.94	0.47	No	0.00
7/19/2014	200	9.83	9.83	0.52	Yes	0.00
7/20/2014	201	11.62	11.62	0.62	No	0.00
7/21/2014	202	10.28	10.28	0.54	No	0.00
7/22/2014	203	10.28	10.28	0.54	No	0.00
7/23/2014	204	9.39	9.39	0.50	No	0.00
7/24/2014	205	9.83	9.83	0.52	No	0.00
7/25/2014	206	11.18	11.18	0.59	No	0.00
7/26/2014	207	11.62	11.62	0.62	No	0.00
7/27/2014	208	13.86	13.86	0.73	Yes	0.00
7/28/2014	209	9.39	9.39	0.50	Yes	0.00
7/29/2014	210	10.28	10.28	0.54	No	0.00
7/30/2014	211	11.62	11.62	0.62	No	0.00
7/31/2014	212	9.39	9.39	0.50	No	0.00
8/1/2014	213	16.99	16.99	0.90	Yes	0.00
8/2/2014	214	12.96	12.96	0.69	Yes	0.00
8/3/2014	215	8.05	8.05	0.43	Yes	0.00
8/4/2014	216	7.15	7.15	0.38	No	0.00
8/5/2014	217	9.83	9.83	0.52	No	0.00
8/6/2014	218	10.28	10.28	0.54	No	0.00
8/7/2014	219	7.15	7.15	0.38	No	0.00
8/8/2014	220	8.94	8.94	0.47	No	0.00
8/9/2014	221	8.94	8.94	0.47	No	0.00
8/10/2014	222	8.05	8.05	0.43	No	0.00
8/11/2014	223	8.05	8.05	0.43	No	0.00
8/12/2014	224	11.62	11.62	0.62	Yes	0.00
8/13/2014	225	9.83	9.83	0.52	No	0.00
8/14/2014	226	10.73	10.73	0.57	No	0.00
8/15/2014	227	9.83	9.83	0.52	No	0.00
8/16/2014	228	8.05	8.05	0.43	No	0.00
8/17/2014	229	10.28	10.28	0.54	No	0.00
8/18/2014	230	16.09	16.09	0.85	Yes	0.00
8/19/2014	231	11.62	11.62	0.62	No	0.00
8/20/2014	232	11.62	11.62	0.62	No	0.00
8/21/2014	233	16.54	16.54	0.88	Yes	0.00
8/22/2014	234	11.62	11.62	0.62	No	0.00

Table A-4-1B: Wind Erosion from Unpaved Roads Emission Factor Raw Data

Date	N	u^{+z} (m/s)[1,3]	u^{+10} (m/s)	u* (m/s)	Preci[4]	P_i (g/m^2)
8/23/2014	235	11.18	11.18	0.59	No	0.00
8/24/2014	236	10.28	10.28	0.54	No	0.00
8/25/2014	237	11.62	11.62	0.62	No	0.00
8/26/2014	238	8.94	8.94	0.47	No	0.00
8/27/2014	239	9.39	9.39	0.50	No	0.00
8/28/2014	240	8.94	8.94	0.47	No	0.00
8/29/2014	241	8.05	8.05	0.43	No	0.00
8/30/2014	242	12.96	12.96	0.69	No	1.94
8/31/2014	243	13.86	13.86	0.73	No	3.62
9/1/2014	244	8.05	8.05	0.43	No	0.00
9/2/2014	245	9.39	9.39	0.50	No	0.00
9/3/2014	246	9.83	9.83	0.52	No	0.00
9/4/2014	247	7.15	7.15	0.38	No	0.00
9/5/2014	248	9.39	9.39	0.50	No	0.00
9/6/2014	249	6.71	6.71	0.36	No	0.00
9/7/2014	250	12.96	12.96	0.69	Yes	0.00
9/8/2014	251	9.39	9.39	0.50	Yes	0.00
9/9/2014	252	11.62	11.62	0.62	No	0.00
9/10/2014	253	6.71	6.71	0.36	No	0.00
9/11/2014	254	7.15	7.15	0.38	No	0.00
9/12/2014	255	7.15	7.15	0.38	No	0.00
9/13/2014	256	6.26	6.26	0.33	No	0.00
9/14/2014	257	7.60	7.60	0.40	No	0.00
9/15/2014	258	7.15	7.15	0.38	No	0.00
9/16/2014	259	11.18	11.18	0.59	No	0.00
9/17/2014	260	8.94	8.94	0.47	No	0.00
9/18/2014	261	12.52	12.52	0.66	No	1.19
9/19/2014	262	9.39	9.39	0.50	No	0.00
9/20/2014	263	9.83	9.83	0.52	No	0.00
9/21/2014	264	7.60	7.60	0.40	No	0.00
9/22/2014	265	7.15	7.15	0.38	No	0.00
9/23/2014	266	5.81	5.81	0.31	No	0.00
9/24/2014	267	6.71	6.71	0.36	No	0.00
9/25/2014	268	13.41	13.41	0.71	No	2.75
9/26/2014	269	13.86	13.86	0.73	No	3.62
9/27/2014	270	16.99	16.99	0.90	No	11.57
9/28/2014	271	11.62	11.62	0.62	No	0.00
9/29/2014	272	7.60	7.60	0.40	No	0.00
9/30/2014	273	7.15	7.15	0.38	No	0.00

Table A-4-1B: Wind Erosion from Unpaved Roads Emission Factor Raw Data

Date	N	u^{+z} (m/s)[1,3]	u^{+10} (m/s)	u* (m/s)	Preci[4]	P_i (g/m^2)
10/1/2014	274	7.15	7.15	0.38	No	0.00
10/2/2014	275	5.81	5.81	0.31	No	0.00
10/3/2014	276	6.26	6.26	0.33	No	0.00
10/4/2014	277	6.71	6.71	0.36	No	0.00
10/5/2014	278	6.71	6.71	0.36	No	0.00
10/6/2014	279	5.81	5.81	0.31	No	0.00
10/7/2014	280	11.18	11.18	0.59	No	0.00
10/8/2014	281	6.26	6.26	0.33	No	0.00
10/9/2014	282	9.83	9.83	0.52	No	0.00
10/10/2014	283	9.83	9.83	0.52	No	0.00
10/11/2014	284	7.15	7.15	0.38	No	0.00
10/12/2014	285	10.28	10.28	0.54	No	0.00
10/13/2014	286	6.26	6.26	0.33	No	0.00
10/14/2014	287	8.94	8.94	0.47	No	0.00
10/15/2014	288	10.28	10.28	0.54	No	0.00
10/16/2014	289	6.71	6.71	0.36	No	0.00
10/17/2014	290	9.39	9.39	0.50	No	0.00
10/18/2014	291	8.05	8.05	0.43	No	0.00
10/19/2014	292	8.05	8.05	0.43	No	0.00
10/20/2014	293	8.94	8.94	0.47	No	0.00
10/21/2014	294	10.73	10.73	0.57	No	0.00
10/22/2014	295	7.15	7.15	0.38	No	0.00
10/23/2014	296	5.81	5.81	0.31	No	0.00
10/24/2014	297	9.39	9.39	0.50	No	0.00
10/25/2014	298	11.62	11.62	0.62	No	0.00
10/26/2014	299	11.62	11.62	0.62	No	0.00
10/27/2014	300	6.71	6.71	0.36	No	0.00
10/28/2014	301	5.36	5.36	0.28	No	0.00
10/29/2014	302	6.26	6.26	0.33	No	0.00
10/30/2014	303	8.05	8.05	0.43	No	0.00
10/31/2014	304	12.52	12.52	0.66	No	1.19
11/1/2014	305	10.73	10.73	0.57	Yes	0.00
11/2/2014	306	8.94	8.94	0.47	No	0.00
11/3/2014	307	7.15	7.15	0.38	No	0.00
11/4/2014	308	6.26	6.26	0.33	No	0.00
11/5/2014	309	6.26	6.26	0.33	No	0.00
11/6/2014	310	6.26	6.26	0.33	No	0.00
11/7/2014	311	6.71	6.71	0.36	No	0.00
11/8/2014	312	6.26	6.26	0.33	No	0.00

Table A-4-1B: Wind Erosion from Unpaved Roads Emission Factor Raw Data

Date	N	u^{+z} (m/s)[1,3]	u^{+10} (m/s)	u* (m/s)	Preci[4]	P_i (g/m^2)
11/9/2014	313	5.81	5.81	0.31	No	0.00
11/10/2014	314	9.83	9.83	0.52	No	0.00
11/11/2014	315	8.94	8.94	0.47	No	0.00
11/12/2014	316	8.94	8.94	0.47	No	0.00
11/13/2014	317	14.75	14.75	0.78	No	5.57
11/14/2014	318	14.31	14.31	0.76	No	4.56
11/15/2014	319	17.88	17.88	0.95	No	14.42
11/16/2014	320	8.05	8.05	0.43	No	0.00
11/17/2014	321	3.58	3.58	0.19	No	0.00
11/18/2014	322	6.26	6.26	0.33	No	0.00
11/19/2014	323	4.47	4.47	0.24	Yes	0.00
11/20/2014	324	10.28	10.28	0.54	No	0.00
11/21/2014	325	9.39	9.39	0.50	No	0.00
11/22/2014	326	19.22	19.22	1.02	No	19.19
11/23/2014	327	8.94	8.94	0.47	No	0.00
11/24/2014	328	6.26	6.26	0.33	No	0.00
11/25/2014	329	5.81	5.81	0.31	No	0.00
11/26/2014	330	6.26	6.26	0.33	No	0.00
11/27/2014	331	4.47	4.47	0.24	No	0.00
11/28/2014	332	5.36	5.36	0.28	No	0.00
11/29/2014	333	9.39	9.39	0.50	No	0.00
11/30/2014	334	11.62	11.62	0.62	No	0.00
12/1/2014	335	5.36	5.36	0.28	No	0.00
12/2/2014	336	6.26	6.26	0.33	Yes	0.00
12/3/2014	337	6.71	6.71	0.36	Yes	0.00
12/4/2014	338	6.71	6.71	0.36	Yes	0.00
12/5/2014	339	4.47	4.47	0.24	No	0.00
12/6/2014	340	5.36	5.36	0.28	No	0.00
12/7/2014	341	6.26	6.26	0.33	No	0.00
12/8/2014	342	6.71	6.71	0.36	No	0.00
12/9/2014	343	7.60	7.60	0.40	No	0.00
12/10/2014	344	7.60	7.60	0.40	No	0.00
12/11/2014	345	8.05	8.05	0.43	No	0.00
12/12/2014	346	14.75	14.75	0.78	Yes	0.00
12/13/2014	347	9.39	9.39	0.50	No	0.00
12/14/2014	348	6.71	6.71	0.36	No	0.00
12/15/2014	349	5.81	5.81	0.31	No	0.00
12/16/2014	350	3.58	3.58	0.19	Yes	0.00
12/17/2014	351	5.36	5.36	0.28	Yes	0.00

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Table A-4-1B: Wind Erosion from Unpaved Roads Emission Factor Raw Data

Date	N	u^{+z} (m/s)[1,3]	u^{+10} (m/s)	u* (m/s)	Preci[4]	P_i (g/m^2)
12/18/2014	352	4.02	4.02	0.21	No	0.00
12/19/2014	353	5.81	5.81	0.31	No	0.00
12/20/2014	354	3.58	3.58	0.19	No	0.00
12/21/2014	355	7.15	7.15	0.38	No	0.00
12/22/2014	356	9.39	9.39	0.50	No	0.00
12/23/2014	357	8.94	8.94	0.47	No	0.00
12/24/2014	358	14.75	14.75	0.78	No	5.57
12/25/2014	359	16.99	16.99	0.90	No	11.57
12/26/2014	360	9.39	9.39	0.50	No	0.00
12/27/2014	361	5.36	5.36	0.28	No	0.00
12/28/2014	362	5.81	5.81	0.31	No	0.00
12/29/2014	363	10.28	10.28	0.54	No	0.00
12/30/2014	364	10.73	10.73	0.57	No	0.00
12/31/2014	365	12.52	12.52	0.66	No	1.19

ΣP_i:	534.60	g/m2/yr
Ef (TSP)=	2.39	ton/acre-yr
E_f=	1.19	ton/acre-yr

Data and Parameters[2]	
z (m) =	10
k (PM_{10}) =	0.5
threshold friction velocity (u^*_t) =	0.62

Notes

1. Meteorological data for 2014 from Daggett airport station (NOAA NCDC website).
2. u^*_t obtained from EPA AP-42, Table 13.2.5-2.
3. Maximum 2 minute wind speed used.
4. There is no wind erosion during days with precipitation.
5. Above calculations are for equations in Table A-4-1A.

Table A-4-2: Wind Erosion Emissions Summary by Year (2019-2022)

Parameter	South Quarry Baseline for all years	Post-Project							
		2019		2020		2021		2022	
		West Pit	South Quarry	West Pit	South Quarry	West Pit	South Quarry	West Pit	South Quarry
Road Length (mi)	1.7	1.7	2.5	1.7	2.7	1.7	2.9	1.7	4.0
Road Length (ft)	8,976	8,976	13,200	8,976	14,256	8,976	15,312	8,976	21,120
Road area (acre)	13.39	13.39	15.15	13.39	16.36	13.39	17.58	13.39	24.24
Uncontrolled Ef before adjustment (tons/acre-yr)[1]	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19
Controlled Ef before adjustment (tons/acre-yr)	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Controlled Ef after adjustment (tons/acre-yr)[3]	0.16	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Controlled PM_{10} emissions (tons/yr)	2.08	1.43	1.61	1.43	1.74	1.43	1.87	1.43	2.58
Total project PM_{10} emissions (tons/yr)	2.083	3.04		3.17		3.30		4.01	
Increase in PM_{10} emissions (tons/yr)	-	**0.96**		**1.09**		**1.22**		**1.93**	

Assumptions	
West Pit width (ft)	65
South quarry width (ft)	50
Operating schedule (250 days/year)	0.685
Unit Conversion (ft/mi)	5,280
Unit Conversion (ft^2/acre)	43,560

Notes
1. See Emission Factor calculations in Tables A-4-1A and A-4-1B.
2. Control efficiency is estimated to be 87%.
3. Post-project emissions are based on an "adjustment" of a 250 days/year operation schedule.

Table A-5-1: Mine Handling Emission Factor

Development of PM_{10} Emission Factor[1]

$$E_{uc} = k(0.0032) * \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Equation element	Symbol	Value used	Notes
Mean wind speed (mph)	U	7.7	Conservative Estimate: MDAQMD Emission Inventory Guidance pg 13
Moisture, uncontrolled (%)	M	0.7	Table 13.2.4-1, crushed limestone
Particle size multiplier for PM_{10} (-)	k	0.35	EPA AP-42, Chapter 13.2.4-4
Mean wind speed	mph	7.70	
PM_{10} emission factor, uncontrolled (lb/ton)	E_f	0.0085	Per transfer point

Control Efficiency for Watering Application[2]

$$C_f = 100 * \left[1 - \left(\frac{1}{\left(\frac{M}{0.7}\right)^{1.4}}\right)\right]$$

$$E_{fc} = E_f * \frac{C_f}{100}$$

Equation element	Symbol	Value used	Notes
Controlled moisture content	M	3.00	
Control efficiency of watering application (%)	C_f	87	
Controlled PM10 emission factor (lbs/ton) - after watering	E_{fc}	0.0011	

Notes

1. Equation is from AP-42, Section 13.2.4, Aggregate Handling and Storage Piles, Equation 1.
2. Control efficiency based on AP-42 material handling formula for moisture content adjustment, assuming uncontrolled moisture of 0.7% and specified controlled moisture content.

Table A-5-2: Seasonal Stockpile Material Handling Emissions by Year (2019-2022)

Parameter	South Quarry Baseline (all years)	Post-Project			
		2019	2020	2021	2022
Material handled (tons/yr)[1]	0	143,000	143,000	143,000	216,667
Uncontrolled E_f (lb/ton)[2,3]	0.0171	0.0171	0.0171	0.0171	0.0171
Control efficiency (%)	87%	87%	87%	87%	87%
Controlled E_f (lb/ton)	0.0022	0.0022	0.0022	0.0022	0.0022
Controlled PM_{10} emissions (tons/yr)	0	0.16	0.16	0.16	0.24

Notes
1. Material is removed from the Seasonal stockpile only 2 months out of the year and is based on the South Quarry throughput; see
2. See Table A-5-1 for E_f calculations.
3. 2 transfer points are applied to the uncontrolled emission factor.
4. The other material handling emissions from adding to the pile are reflected in other calculation terms (see West Pit EIR in Table A-2-5)

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Table A-6-1: Haul Truck Emission Factors Calculations

Equipment Manufacturer	Equipment Model	Equipment Category	Engine Manufacturer	Engine Model	bhp[3]	Tier[3]	Engine Year	Annual Hours	Cumulative Hours[1]	Load Factor[6]	Initial Emission Factors[4] (g/bhp-hr)				Deterioration Rate Factors[4,5] (g/bhp-hr)/hr			
											NOx	ROG	CO	PM_{10}	NOx	ROG	CO	PM_{10}
CAT	777B	Off-Highway Trucks	CAT	3508	870	0	1988	2500	6312.5	0.38	11.00	0.84	4.10	0.53	1.83E-04	2.93E-05	8.12E-05	2.81E-05
CAT	777D	Off-Highway Trucks	CAT	3508	1000	2	2003	2500	6312.5	0.38	8.17	0.68	2.70	0.38	1.36E-04	2.37E-05	5.35E-05	2.02E-06
CAT	777G[2]	Off-Highway Trucks	CAT	C32	1024	4	2014	2500	6312.5	0.38	2.61	0.14	2.61	0.030	4.34E-05	4.95E-06	5.17E-05	1.59E-06

Equipment Manufacturer	Equipment Model	Equipment Category	Engine Manufacturer	Engine Model	bhp[3]	Tier[3]	Engine Year	Annual Hours	Cumulative Hours[1]	Load Factor[6]	CA Fuel Correction Factors[8]				Adjusted Emission Factors[9]				
											NOx	ROG	CO	PM_{10}	NOx	ROG	CO	PM_{10}	SOx
CAT	777B	Off-Highway Trucks	CAT	3508	870	0	1988	2500	6312.5	0.38	0.93	0.72	1.00	0.72	11.30	0.74	4.61	0.51	0.0059
CAT	777D	Off-Highway Trucks	CAT	3508	1000	2	2003	2500	6312.5	0.38	0.95	0.72	1.00	0.80	8.56	0.60	3.04	0.31	0.0059
CAT	777G[2]	Off-Highway Trucks	CAT	C32	1024	4	2014	2500	6312.5	0.38	0.95	0.72	1.00	0.852	2.73	0.12	2.94	0.034	0.0059

Equations

$$Adjusted\ EF = \left(Initial\ EF + (Det\ Rate\ Factor * Cumulative\ Hrs\ )\right) * CFC\ Factor$$

$$SOx\ EF\ \left(\frac{g}{HP-hr}\right) = \frac{15\ ppm}{1{,}000{,}000} * \frac{1\ lb}{19{,}500\ BTU} * \frac{64\ lb\ SOx}{32\ lb\ S} * 2{,}545\,\frac{BTU}{hp-hr} * \left(\frac{1}{30\%}\right) * 454\,\frac{g}{lb}$$

Data and Parameters

CEQA Project date:	2016
Useful life[7] (HHDD):	12625 hrs
kW to bhp:	1.341

Notes

1. Cumulative hours are half of the useful life to assume an "average" deterioration factor.
2. 777G trucks have Executive Orders stating their emission factors (STD rates are used).
3. HP and Tier are based on current trucks' specifications.
4. Emission factors and deterioration rate factors for 777B and 777D trucks are from In-Use Off-Road Equipment 2011 Inventory Model Appendix D.
5. Deterioration Factor Table (see reference material) is used only for 777G because the emission factors are from Executive Orders and the deterioration rate factors are not given. This table is from In-Use Off-Road Equipment 2011 Inventory Model Appendix D.
6. Load factors are from CARB's In-Use Off-Road Equipment 2011 Inventory Model Appendix D.
7. Useful life is assumed for a heavy-heavy duty diesel truck (HHDD) in In-Use Off-Road Equipment 2011 Inventory Model Appendix D.
8. California Fuel Correction Factor is from In-Use Off-Road Equipment 2011 Inventory Model Appendix D.
9. SOx emission factors based on fuel sulfur content of 15 ppm (weight fraction) and a fuel higher heating value (HHV) of 19,500 BTU/lb.

Table A-6-2A: Haul Truck Emissions Calculations for 2019 Baseline

Truck[1,2]	Avg. Truck Weight (tons)	Capacity (Tons/load)	West Pit Hours/yr		South Quarry Hours/yr		West Pit HP-hr/yr		South Quarry HP-hr/yr	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	2063	238	0	0	682,190	78,714	0	0
777B	113.5	77	2063	238	0	0	682,190	78,714	0	0
777B	113.5	77	2063	238	0	0	682,190	78,714	0	0
777D	127.5	105	2063	238	0	0	784,127	90,476	0	0
777G	127.5	105	2063	238	0	0	802,946	92,648	0	0
		Subtotal:	10,317	1,190	0	0	3,633,644	419,267	0	0
		Total:	11,508		0		4,052,911		0	

Truck[1,2]	Total HP-hr/yr	Emission Factor (g/HP-hr)[3]					Emissions (tons/yr)				
		NOx	VOC	CO	PM_{10}	SOx	NOx	VOC	CO	PM_{10}	SOx
777B	760,905	11.30	0.74	4.61	0.51	0.0059	9.48	0.62	3.87	0.43	0.0050
777B	760,905	11.30	0.74	4.61	0.51	0.0059	9.48	0.62	3.87	0.43	0.0050
777B	760,905	11.30	0.74	4.61	0.51	0.0059	9.48	0.62	3.87	0.43	0.0050
777D	874,603	8.56	0.60	3.04	0.31	0.0059	8.25	0.58	2.93	0.30	0.0057
777G	895,594	2.73	0.12	2.94	0.034	0.0059	2.70	0.12	2.90	0.034	0.0059
Total:	4,052,911					**Total:**	39.39	2.56	17.43	1.62	0.026

Equations

$$\frac{Hrs}{yr} = \frac{fraction\ of\ rock\ hauled * Throughput\ (tpy)}{Capacity\ (\frac{tons}{load})} * cycle\ time\ (\frac{hrs}{trip})$$

$$fraction\ of\ rock\ hauled = \frac{fraction\ of\ trips * truck\ capacity}{\sum fraction\ of\ trips * truck\ capacity}$$

$$Emissions\ \left(\frac{tons}{yr}\right) = Usage\ \left(\frac{HP-hr}{yr}\right) * EF\ \left(\frac{g}{HP-hr}\right) * \frac{1\ ton}{907184.74\ g}$$

$$Usage\ \left(\frac{HP-hr}{yr}\right) = Operating\ hours\ \left(\frac{hr}{yr}\right) * HP * Load\ Factor$$

Assumptions	West Pit	South Quarry
Throughput, Limestone Ore[4] (tpy)	2,600,000	0
Throughput, Waste Rock[4] (tpy)	300,000	0
Limestone Ore road length (mi)	1.7	0
Waste Rock road length (mi)	1.7	0
Cycle time, Limestone Ore (hr)	0.35	0
Cycle time, Waste Rock (hr)	0.35	0
Fraction of haul truck trips, 777B	0.60	0.60
Fraction of haul truck trips, 777D	0.20	0.20
Fraction of haul truck trips, 777G	0.20	0.20
Fraction of rock hauled, 777B	0.52	0.52
Fraction of rock hauled, 777D	0.24	0.24
Fraction of rock hauled, 777G	0.24	0.24
Capacity, 777B (tons/load)	77	77
Capacity, 777D (tons/load)	105	105
Capacity, 777G (tons/load)	105	105
HP, 777B	870	870
HP, 777D	1000	1000
HP, 777G	1024	1024
Load factor (same for all 777 units)	0.38	0.38
Empty weight, haul truck (tons)	75	75

Notes
1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
3. See Table A-6-1 for Emission Factors.
4. See Table A-2-10B for Throughputs.

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Table A-6-2B: Haul Truck Emissions Calculations for 2020 Baseline

Truck[1,2]	Avg. Truck Weight (tons)	Capacity (Tons/load)	West Pit Hours/yr		South Quarry Hours/yr		West Pit HP-hr/yr		South Quarry HP-hr/yr	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	2063	238	0	0	682,190	78,714	0	0
777B	113.5	77	2063	238	0	0	682,190	78,714	0	0
777B	113.5	77	2063	238	0	0	682,190	78,714	0	0
777D	127.5	105	2063	238	0	0	784,127	90,476	0	0
777G	127.5	105	2063	238	0	0	802,946	92,648	0	0
		Subtotal:	10,317	1,190	0	0	3,633,644	419,267	0	0
		Total:	11,508		0		4,052,911		0	

Truck[1,2]	Total HP-hr/yr	Emission Factor (g/HP-hr)[3]					Emissions (tons/yr)				
		NOx	VOC	CO	PM_{10}	SOx	NOx	VOC	CO	PM_{10}	SOx
777B	760,905	11.30	0.74	4.61	0.51	0.0059	9.48	0.62	3.87	0.43	0.005
777B	760,905	11.30	0.74	4.61	0.51	0.0059	9.48	0.62	3.87	0.43	0.005
777B	760,905	11.30	0.74	4.61	0.51	0.0059	9.48	0.62	3.87	0.43	0.005
777D	874,603	8.56	0.60	3.04	0.31	0.0059	8.25	0.58	2.93	0.30	0.006
777G	895,594	2.73	0.12	2.94	0.03	0.0059	2.70	0.12	2.90	0.034	0.006
Total:	4,052,911					Total:	39.39	2.56	17.43	1.62	0.026

Equations

$$\frac{Hrs}{yr} = \frac{fraction\ of\ rock\ hauled * Throughput\ (tpy)}{Capacity\ (\frac{tons}{load})} * cycle\ time\ (\frac{hr}{trip})$$

$$fraction\ of\ rock\ hauled = \frac{fraction\ of\ trips * truck\ capacity}{\sum fraction\ of\ trips * truck\ capacity}$$

$$Emissions\ \left(\frac{tons}{yr}\right) = Usage\ \left(\frac{HP-hr}{yr}\right) * EF\ \left(\frac{g}{HP-hr}\right) * \frac{1\ ton}{907184.74\ g}$$

$$Usage\ \left(\frac{HP-hr}{yr}\right) = Operating\ hours\ \left(\frac{hr}{yr}\right) * HP * Load\ Factor$$

Assumptions	West Pit	South Quarry
Throughput, Limestone Ore[4] (tpy)	2,600,000	0
Throughput, Waste Rock[4] (tpy)	300,000	0
Limestone Ore road length (mi)	1.7	0
Waste Rock road length (mi)	1.7	0
Cycle time, Limestone Ore (hr)	0.35	0
Cycle time, Waste Rock (hr)	0.35	0
Fraction of haul truck trips, 777B	0.60	0.60
Fraction of haul truck trips, 777D	0.20	0.20
Fraction of haul truck trips, 777G	0.20	0.20
Fraction of rock hauled, 777B	0.52	0.52
Fraction of rock hauled, 777D	0.24	0.24
Fraction of rock hauled, 777G	0.24	0.24
Capacity, 777B (tons/load)	77	77
Capacity, 777D (tons/load)	105	105
Capacity, 777G (tons/load)	105	105
HP, 777B	870	870
HP, 777D	1000	1000
HP, 777G	1024	1024
Load factor (same for all 777 units)	0.38	0.38
Empty weight, haul truck (tons)	75	75

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
3. See Table A-6-1 for Emission Factors.
4. See Table A-2-10B for Throughputs.

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Table A-6-2C: Haul Truck Emissions Calculations for 2021 Baseline

Truck[1,2]	Avg. Truck Weight (tons)	Capacity (Tons/load)	West Pit Hours/yr		South Quarry Hours/yr		West Pit HP-hr/yr		South Quarry HP-hr/yr	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	2500	288	0	0	826,500	95,365	0	0
777B	113.5	77	2500	288	0	0	826,500	95,365	0	0
777D	127.5	105	2500	288	0	0	950,000	109,615	0	0
777G	127.5	105	2500	288	0	0	972,800	112,246	0	0
		Subtotal:	10,000	1,154	0	0	3,575,800	412,592	0	0
		Total:	11,154		0		3,988,392		0	

Truck[1,2]	Total HP-hr/yr	Emission Factor (g/HP-hr)[3] NOx	VOC	CO	PM_{10}	SOx	Emissions (tons/yr) NOx	VOC	CO	PM_{10}	SOx
777B	921,865	11.30	0.74	4.61	0.51	0.0059	11.49	0.75	4.69	0.52	0.0060
777B	921,865	11.30	0.74	4.61	0.51	0.0059	11.49	0.75	4.69	0.52	0.0060
777D	1,059,615	8.56	0.60	3.04	0.31	0.0059	10.00	0.70	3.55	0.37	0.0069
777G	1,085,046	2.73	0.12	2.94	0.034	0.0059	3.27	0.15	3.51	0.041	0.0071
Total:	3,988,392					**Total:**	36.24	2.35	16.43	1.44	0.026

Equations

$$\frac{Hrs}{yr} = \frac{fraction\ of\ rock\ hauled * Throughput\ (tpy)}{Capacity\ (\frac{tons}{load})} * cycle\ time\ (\frac{hr}{trip})$$

$$fraction\ of\ rock\ hauled = \frac{fraction\ of\ trips * truck\ capacity}{\sum fraction\ of\ trips * truck\ capacity}$$

$$Emissions\ \left(\frac{tons}{yr}\right) = Usage\ \left(\frac{HP-hr}{yr}\right) * EF\ \left(\frac{g}{HP-hr}\right) * \frac{1\ ton}{907184.74\ g}$$

$$Usage\ \left(\frac{HP-hr}{yr}\right) = Operating\ hours\ \left(\frac{hr}{yr}\right) * HP * Load\ Factor$$

Assumptions	West Pit	South Quarry
Throughput, Limestone Ore[4] (tpy)	2,600,000	0
Throughput, Waste Rock[4] (tpy)	300,000	0
Limestone Ore road length (mi)	1.7	0
Waste Rock road length (mi)	1.7	0
Cycle time, Limestone Ore (hr)	0.35	0
Cycle time, Waste Rock (hr)	0.35	0
Fraction of haul truck trips, 777B	0.50	0.50
Fraction of haul truck trips, 777D	0.25	0.25
Fraction of haul truck trips, 777G	0.25	0.25
Fraction of rock hauled, 777B	0.42	0.42
Fraction of rock hauled, 777D	0.29	0.29
Fraction of rock hauled, 777G	0.29	0.29
Capacity, 777B (tons/load)	77	77
Capacity, 777D (tons/load)	105	105
Capacity, 777G (tons/load)	105	105
HP, 777B	870	870
HP, 777D	1000	1000
HP, 777G	1024	1024
Load factor (same for all 777 units)	0.38	0.38
Empty weight, haul truck (tons)	75	75

Notes
1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
3. See Table A-6-1 for Emission Factors.
4. See Table A-2-10B for Throughputs.

Table A-6-2D: Haul Truck Emissions Calculations for 2022 Baseline

Truck[1,2]	Avg. Truck Weight (tons)	Capacity (Tons/load)	West Pit Hours/yr		South Quarry Hours/yr		West Pit HP-hr/yr		South Quarry HP-hr/yr	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	2500	288	0	0	826,500	95,365	0	0
777B	113.5	77	2500	288	0	0	826,500	95,365	0	0
777D	127.5	105	2500	288	0	0	950,000	109,615	0	0
777G	127.5	105	2500	288	0	0	972,800	112,246	0	0
		Subtotal:	10,000	1,154	0	0	3,575,800	412,592	0	0
		Total:	11,154		0		3,988,392		0	

Truck[1,2]	Total HP-hr/yr	Emission Factor (g/HP-hr)[3]					Emissions (tons/yr)				
		NOx	VOC	CO	PM_{10}	SOx	NOx	VOC	CO	PM_{10}	SOx
777B	921,865	11.30	0.74	4.61	0.51	0.0059	11.49	0.75	4.69	0.52	0.0060
777B	921,865	11.30	0.74	4.61	0.51	0.0059	11.49	0.75	4.69	0.52	0.0060
777D	1,059,615	8.56	0.60	3.04	0.31	0.0059	10.00	0.70	3.55	0.37	0.0069
777G	1,085,046	2.73	0.12	2.94	0.034	0.0059	3.27	0.15	3.51	0.041	0.0071
Total:	3,988,392					**Total:**	36.24	2.35	16.43	1.44	0.026

Equations

$$\frac{Hrs}{yr} = \frac{fraction\ of\ rock\ hauled * Throughput\ (tpy)}{Capacity\ (\frac{tons}{load})} * cycle\ time\ (\frac{hr}{trip})$$

$$fraction\ of\ rock\ hauled = \frac{fraction\ of\ trips * truck\ capacity}{\sum fraction\ of\ trips * truck\ capacity}$$

$$Emissions\ \left(\frac{tons}{yr}\right) = Usage\ \left(\frac{HP-hr}{yr}\right) * EF\ \left(\frac{g}{HP-hr}\right) * \frac{1\ ton}{907184.74\ g}$$

$$Usage\ \left(\frac{HP-hr}{yr}\right) = Operating\ hours\ \left(\frac{hr}{yr}\right) * HP * Load\ Factor$$

Assumptions	West Pit	South Quarry
Throughput, Limestone Ore[4] (tpy)	2,600,000	0
Throughput, Waste Rock[4] (tpy)	300,000	0
Limestone Ore road length (mi)	1.7	0
Waste Rock road length (mi)	1.7	0
Cycle time, Limestone Ore (hr)	0.35	0
Cycle time, Waste Rock (hr)	0.35	0
Fraction of haul truck trips, 777B	0.50	0.50
Fraction of haul truck trips, 777D	0.25	0.25
Fraction of haul truck trips, 777G	0.25	0.25
Fraction of rock hauled, 777B	0.42	0.42
Fraction of rock hauled, 777D	0.29	0.29
Fraction of rock hauled, 777G	0.29	0.29
Capacity, 777B (tons/load)	77	77
Capacity, 777D (tons/load)	105	105
Capacity, 777G (tons/load)	105	105
HP, 777B	870	870
HP, 777D	1000	1000
HP, 777G	1024	1024
Load factor (same for all 777 units)	0.38	0.38
Empty weight, haul truck (tons)	75	75

Notes
1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
3. See Table A-6-1 for Emission Factors.
4. See Table A-2-10B for Throughputs.

Table A-6-2E: Haul Truck Emissions Calculations for 2019 Post-Project

Truck[1,2]	Avg. Truck Weight (tons)	Capacity (Tons/load)	West Pit Hours/yr		South Quarry Hours/yr		West Pit HP-hr/yr		South Quarry HP-hr/yr	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	1383	160	266	17	457,068	52,739	87,939	5,682
777B	113.5	77	1383	160	266	17	457,068	52,739	87,939	5,682
777B	113.5	77	1383	160	266	17	457,068	52,739	87,939	5,682
777D	127.5	105	1383	160	266	17	525,365	60,619	101,079	6,531
777G	127.5	105	1383	160	266	17	537,974	62,074	103,505	6,688
777Gd	127.5	105	0	0	1330	86	0	0	517,524	33,440
777Gd	127.5	105	0	0	1330	86	0	0	517,524	33,440
777Gd	127.5	105	0	0	1330	86	0	0	517,524	33,440
		Subtotal:	6,913	798	5,320	344	2,434,542	280,909	2,020,971	130,586
		Total:	7,710		5,664		2,715,450		2,151,557	

Truck[1,2]	Total HP-hr/yr	Emission Factor (g/HP-hr)[3]					Emissions (tons/yr)				
		NOx	VOC	CO	PM_{10}	SOx	NOx	VOC	CO	PM_{10}	SOx
777B	603,427	11.30	0.74	4.61	0.51	0.0059	7.52	0.49	3.07	0.34	0.0039
777B	603,427	11.30	0.74	4.61	0.51	0.0059	7.52	0.49	3.07	0.34	0.0039
777B	603,427	11.30	0.74	4.61	0.51	0.0059	7.52	0.49	3.07	0.34	0.0039
777D	693,594	8.56	0.60	3.04	0.31	0.0059	6.54	0.46	2.32	0.24	0.0045
777G	710,241	2.73	0.12	2.94	0.034	0.0059	2.14	0.10	2.30	0.027	0.0046
777Gd	550,964	2.73	0.12	2.94	0.034	0.0059	1.66	0.08	1.78	0.021	0.0036
777Gd	550,964	2.73	0.12	2.94	0.034	0.0059	1.66	0.08	1.78	0.021	0.0036
777Gd	550,964	2.73	0.12	2.94	0.034	0.0059	1.66	0.08	1.78	0.021	0.0036
Total:	4,867,007					**Total:**	36.22	2.25	19.18	1.35	0.032

Equations

$$\frac{Hrs}{yr} = \frac{fraction\ of\ rock\ hauled * Throughput\ (tpy)}{Capacity\ (\frac{tons}{load})} * cycle\ time\ (\frac{hr}{trip})$$

$$fraction\ of\ rock\ hauled = \frac{fraction\ of\ trips * truck\ capacity}{\sum fraction\ of\ trips * truck\ capacity}$$

$$Emissions\ \left(\frac{tons}{yr}\right) = Usage\ \left(\frac{HP-hr}{yr}\right) * EF\left(\frac{g}{HP-hr}\right) * \frac{1\ ton}{907184.74\ g}$$

$$Usage\ \left(\frac{HP-hr}{yr}\right) = Operating\ hours\ \left(\frac{hr}{yr}\right) * HP * Load\ Factor$$

Assumptions	West Pit	South Quarry
Throughput, Limestone Ore[4] (tpy)	1,742,000	858,000
Throughput, Waste Rock[4] (tpy)	201,000	99,000
Limestone Ore road length (mi)	1.7	2.5
Waste Rock road length (mi)	1.7	1.7
Cycle time, Limestone Ore (hr)	0.35	0.63
Cycle time, Waste Rock (hr)	0.35	0.35
Fraction of haul truck trips, 777B	0.60	0.15
Fraction of haul truck trips, 777D	0.20	0.05
Fraction of haul truck trips, 777G	0.20	0.05
Fraction of haul truck trips, 777Gd	0.00	0.75
Fraction of rock hauled, 777B	0.52	0.11
Fraction of rock hauled, 777D	0.24	0.05
Fraction of rock hauled, 777G	0.24	0.05
Fraction of rock hauled, 777Gd	0.00	0.78
Capacity, 777B (tons/load)	77	77
Capacity, 777D (tons/load)	105	105
Capacity, 777G (tons/load)	105	105
Capacity, 777Gd (tons/load)	105	105
HP, 777B	870	870
HP, 777D	1000	1000
HP, 777G	1024	1024
Load factor (same for all 777 units)	0.38	0.38
Empty weight, haul truck (tons)	75	75

Notes
1. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
2. 777Gd represents 777G Trucks that are dedicated to the South Quarry; they have 5 times more trips to the South Quarry than the other trucks.
3. See Table A-6-1 for Emission Factors.
4. See Table A-2-10 for Throughputs.

Table A-6-2F: Haul Truck Emissions Calculations for 2020 Post-Project

Truck[1,2]	Avg. Truck Weight (tons)	Capacity (Tons/load)	West Pit Hours/yr		South Quarry Hours/yr		West Pit HP-hr/yr		South Quarry HP-hr/yr	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	1300	150	277	17	429,780	49,590	91,452	5,604
777B	113.5	77	1300	150	277	17	429,780	49,590	91,452	5,604
777D	127.5	105	1300	150	277	17	494,000	57,000	105,118	6,442
777G	127.5	105	1300	150	277	17	505,856	58,368	107,640	6,596
777G	127.5	105	1300	150	277	17	505,856	58,368	107,640	6,596
777Gd	127.5	105	0	0	1383	85	0	0	538,202	32,982
777Gd	127.5	105	0	0	1383	85	0	0	538,202	32,982
777Gd	127.5	105	0	0	1383	85	0	0	538,202	32,982
		Subtotal:	6,500	750	5,533	339	2,365,272	272,916	2,117,909	129,789
		Total:	7,250		5,872		2,638,188		2,247,698	

Truck[1,2]	Total HP-hr/yr	Emission Factor (g/HP-hr)[3] NOx	VOC	CO	PM_{10}	SOx	Emissions (tons/yr) NOx	VOC	CO	PM_{10}	SOx
777B	576,427	11.30	0.74	4.61	0.51	0.0059	7.18	0.47	2.93	0.32	0.0038
777B	576,427	11.30	0.74	4.61	0.51	0.0059	7.18	0.47	2.93	0.32	0.0038
777D	662,559	8.56	0.60	3.04	0.31	0.0059	6.25	0.44	2.22	0.23	0.0043
777G	678,461	2.73	0.12	2.94	0.034	0.0059	2.04	0.09	2.20	0.026	0.0044
777G	678,461	2.73	0.12	2.94	0.034	0.0059	2.04	0.09	2.20	0.026	0.0044
777Gd	571,184	2.73	0.12	2.94	0.034	0.0059	1.72	0.08	1.85	0.021	0.0037
777Gd	571,184	2.73	0.12	2.94	0.034	0.0059	1.72	0.08	1.85	0.021	0.0037
777Gd	571,184	2.73	0.12	2.94	0.034	0.0059	1.72	0.08	1.85	0.021	0.0037
Total:	4,885,886					**Total:**	29.87	1.80	18.02	0.99	0.032

Equations

$$\frac{Hrs}{yr} = \frac{fraction\ of\ rock\ hauled * Throughput\ (tpy)}{Capacity\ (\frac{tons}{load})} * cycle\ time\ (\frac{hr}{trip})$$

$$fraction\ of\ rock\ hauled = \frac{fraction\ of\ trips * truck\ capacity}{\sum fraction\ of\ trips * truck\ capacity}$$

$$Emissions\ \left(\frac{tons}{yr}\right) = Usage\ \left(\frac{HP-hr}{yr}\right) * EF\ \left(\frac{g}{HP-hr}\right) * \frac{1\ ton}{907184.74\ g}$$

$$Usage\ \left(\frac{HP-hr}{yr}\right) = Operating\ hours\ \left(\frac{hr}{yr}\right) * HP * Load\ Factor$$

Assumptions	West Pit	South Quarry
Throughput, Limestone Ore[4] (tpy)	1,742,000	858,000
Throughput, Waste Rock[4] (tpy)	201,000	99,000
Limestone Ore road length (mi)	1.7	2.7
Waste Rock road length (mi)	1.7	1.7
Cycle time, Limestone Ore (hr)	0.35	0.66
Cycle time, Waste Rock (hr)	0.35	0.35
Fraction of haul truck trips, 777B	0.40	0.10
Fraction of haul truck trips, 777D	0.20	0.05
Fraction of haul truck trips, 777G	0.40	0.10
Fraction of haul truck trips, 777Gd	0.00	0.75
Fraction of rock hauled, 777B	0.33	0.08
Fraction of rock hauled, 777D	0.22	0.05
Fraction of rock hauled, 777G	0.45	0.10
Fraction of rock hauled, 777Gd	0.00	0.77
Capacity, 777B (tons/load)	77	77
Capacity, 777D (tons/load)	105	105
Capacity, 777G (tons/load)	105	105
Capacity, 777Gd (tons/load)	105	105
HP, 777B	870	870
HP, 777D	1000	1000
HP, 777G	1024	1024
Load factor (same for all 777 units)	0.38	0.38
Empty weight, haul truck (tons)	75	75

Notes
1. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
2. 777Gd represents 777G Trucks that are dedicated to the South Quarry; they have 5 times more trips to the South Quarry than the other trucks.
3. See Table A-6-1 for Emission Factors.
4. See Table A-2-10 for Throughputs.

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Table A-6-2G: Haul Truck Emissions Calculations for 2021 Post-Project

Truck[1,2]	Avg. Truck Weight (tons)	Capacity (Tons/load)	West Pit Hours/yr		South Quarry Hours/yr		West Pit HP-hr/yr		South Quarry HP-hr/yr	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	1227	142	286	17	405,567	46,796	94,460	5,529
777D	127.5	105	1227	142	286	17	466,169	53,789	108,575	6,355
777G	127.5	105	1227	142	286	17	477,357	55,080	111,181	6,507
777G	127.5	105	1227	142	286	17	477,357	55,080	111,181	6,507
777G	127.5	105	1227	142	286	17	477,357	55,080	111,181	6,507
777Gd	127.5	105	0	0	1429	84	0	0	555,904	32,536
777Gd	127.5	105	0	0	1429	84	0	0	555,904	32,536
777Gd	127.5	105	0	0	1429	84	0	0	555,904	32,536
		Subtotal:	6,134	708	5,714	334	2,303,807	265,824	2,204,292	129,014
		Total:	6,842		6,049		2,569,631		2,333,305	

Truck[1,2]	Total HP-hr/yr	Emission Factor (g/HP-hr)[3]					Emissions (tons/yr)				
		NOx	VOC	CO	PM_{10}	SOx	NOx	VOC	CO	PM_{10}	SOx
777B	552,352	11.30	0.74	4.61	0.51	0.0059	6.88	0.45	2.81	0.31	0.0036
777D	634,888	8.56	0.60	3.04	0.31	0.0059	5.99	0.42	2.13	0.22	0.0042
777G	650,125	2.73	0.12	2.94	0.034	0.0059	1.96	0.09	2.10	0.024	0.0042
777G	650,125	2.73	0.12	2.94	0.034	0.0059	1.96	0.09	2.10	0.024	0.0042
777G	650,125	2.73	0.12	2.94	0.034	0.0059	1.96	0.09	2.10	0.024	0.0042
777Gd	588,441	2.73	0.12	2.94	0.034	0.0059	1.77	0.08	1.90	0.022	0.0038
777Gd	588,441	2.73	0.12	2.94	0.034	0.0059	1.77	0.08	1.90	0.022	0.0038
777Gd	588,441	2.73	0.12	2.94	0.034	0.0059	1.77	0.08	1.90	0.022	0.0038
Total:	4,902,937					**Total:**	24.07	1.38	16.96	0.67	0.032

Equations

$$\frac{Hrs}{yr} = \frac{fraction\ of\ rock\ hauled * Throughput\ (tpy)}{Capacity\ (\frac{tons}{load})} * cycle\ time\ (\frac{hr}{trip})$$

$$fraction\ of\ rock\ hauled = \frac{fraction\ of\ trips * truck\ capacity}{\sum fraction\ of\ trips * truck\ capacity}$$

$$Emissions\ \left(\frac{tons}{yr}\right) = Usage\ \left(\frac{HP-hr}{yr}\right) * EF\left(\frac{g}{HP-hr}\right) * \frac{1\ ton}{907184.74\ g}$$

$$Usage\ \left(\frac{HP-hr}{yr}\right) = Operating\ hours\ \left(\frac{hr}{yr}\right) * HP * Load\ Factor$$

Assumptions	West Pit	South Quarry
Throughput, Limestone Ore[4] (tpy)	1,742,000	858,000
Throughput, Waste Rock[4] (tpy)	201,000	99,000
Limestone Ore road length (mi)	1.7	2.9
Waste Rock road length (mi)	1.7	1.7
Cycle time, Limestone Ore (hr)	0.35	0.69
Cycle time, Waste Rock (hr)	0.35	0.35
Fraction of haul truck trips, 777B	0.20	0.05
Fraction of haul truck trips, 777D	0.20	0.05
Fraction of haul truck trips, 777G	0.60	0.15
Fraction of haul truck trips, 777Gd	0.00	0.75
Fraction of rock hauled, 777B	0.15	0.04
Fraction of rock hauled, 777D	0.21	0.05
Fraction of rock hauled, 777G	0.63	0.15
Fraction of rock hauled, 777Gd	0.00	0.76
Capacity, 777B (tons/load)	77	77
Capacity, 777D (tons/load)	105	105
Capacity, 777G (tons/load)	105	105
Capacity, 777Gd (tons/load)	105	105
HP, 777B	870	870
HP, 777D	1000	1000
HP, 777G	1024	1024
Load factor (same for all 777 units)	0.38	0.38
Empty weight, haul truck (tons)	75	75

Notes
1. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
2. 777Gd represents 777G Trucks that are dedicated to the South Quarry; they have 5 times more trips to the South Quarry than the other trucks.
3. See Table A-6-1 for Emission Factors.
4. See Table A-2-10 for Throughputs.

Table A-6-2H: Haul Truck Emissions Calculations for 2022 Post-Project

Truck[1,2]	Avg. Truck Weight (tons)	Capacity (Tons/load)	West Pit Hours/yr		South Quarry Hours/yr		West Pit HP-hr/yr		South Quarry HP-hr/yr	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777D	127.5	105	1083	125	376	17	411,667	47,500	142,765	6,552
777G	127.5	105	1083	125	376	17	421,547	48,640	146,192	6,709
777G	127.5	105	1083	125	376	17	421,547	48,640	146,192	6,709
777G	127.5	105	1083	125	376	17	421,547	48,640	146,192	6,709
777Gd	127.5	105	0	0	1878	86	0	0	730,958	33,545
777Gd	127.5	105	0	0	1878	86	0	0	730,958	33,545
777Gd	127.5	105	0	0	1878	86	0	0	730,958	33,545
777Gd	127.5	105	0	0	1878	86	0	0	730,958	33,545
777Gd	127.5	105	0	0	1878	86	0	0	730,958	33,545
		Subtotal:	4,333	500	10,895	500	1,676,307	193,420	4,236,129	194,403
		Total:	4,833		11,395		1,869,727		4,430,531	

Truck[1,2]	Total HP-hr/yr	Emission Factor (g/HP-hr)[3] NOx	VOC	CO	PM_{10}	SOx	Emissions (tons/yr) NOx	VOC	CO	PM_{10}	SOx
777D	608,484	8.56	0.60	3.04	0.31	0.0059	5.74	0.40	2.04	0.21	0.0040
777G	623,087	2.73	0.12	2.94	0.034	0.0059	1.88	0.09	2.02	0.023	0.0041
777G	623,087	2.73	0.12	2.94	0.034	0.0059	1.88	0.09	2.02	0.023	0.0041
777G	623,087	2.73	0.12	2.94	0.034	0.0059	1.88	0.09	2.02	0.023	0.0041
777Gd	764,503	2.73	0.12	2.94	0.034	0.0059	2.30	0.11	2.47	0.029	0.0050
777Gd	764,503	2.73	0.12	2.94	0.034	0.0059	2.30	0.11	2.47	0.029	0.0050
777Gd	764,503	2.73	0.12	2.94	0.034	0.0059	2.30	0.11	2.47	0.029	0.0050
777Gd	764,503	2.73	0.12	2.94	0.034	0.0059	2.30	0.11	2.47	0.029	0.0050
777Gd	764,503	2.73	0.12	2.94	0.034	0.0059	2.30	0.11	2.47	0.029	0.0050
Total:	6,300,258					**Total:**	22.89	1.18	20.46	0.42	0.041

Equations

$$\frac{Hrs}{yr} = \frac{fraction\ of\ rock\ hauled * Throughput\ (tpy)}{Capacity\ (\frac{tons}{load})} * cycle\ time\ (\frac{hr}{trip})$$

$$fraction\ of\ rock\ hauled = \frac{fraction\ of\ trips * truck\ capacity}{\sum fraction\ of\ trips * truck\ capacity}$$

$$Emissions\ \left(\frac{tons}{yr}\right) = Usage\ \left(\frac{HP-hr}{yr}\right) * EF\ \left(\frac{g}{HP-hr}\right) * \frac{1\ ton}{907184.74\ g}$$

$$Usage\ \left(\frac{HP-hr}{yr}\right) = Operating\ hours\ \left(\frac{hr}{yr}\right) * HP * Load\ Factor$$

Assumptions	West Pit	South Quarry
Throughput, Limestone Ore[4] (tpy)	1,300,000	1,300,000
Throughput, Waste Rock[4] (tpy)	150,000	150,000
Limestone Ore road length (mi)	1.7	4.0
Waste Rock road length (mi)	1.7	1.7
Cycle time, Limestone Ore (hr)	0.35	0.88
Cycle time, Waste Rock (hr)	0.35	0.35
Fraction of haul truck trips, 777B	0.00	0.00
Fraction of haul truck trips, 777D	0.25	0.03
Fraction of haul truck trips, 777G	0.75	0.10
Fraction of haul truck trips, 777Gd	0.00	0.86
Fraction of rock hauled, 777B	0.00	0.00
Fraction of rock hauled, 777D	0.25	0.03
Fraction of rock hauled, 777G	0.75	0.10
Fraction of rock hauled, 777Gd	0.00	0.86
Capacity, 777B (tons/load)	77	77
Capacity, 777D (tons/load)	105	105
Capacity, 777G (tons/load)	105	105
Capacity, 777Gd (tons/load)	105	105
HP, 777B	870	870
HP, 777D	1000	1000
HP, 777G	1024	1024
Load factor (same for all 777 units)	0.38	0.38
Empty weight, haul truck (tons)	75	75

Notes
1. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
2. 777Gd represents 777G Trucks that are dedicated to the South Quarry; they have 5 times more trips to the South Quarry than the other trucks.
3. See Table A-6-1 for Emission Factors.
4. See Table A-2-10 for Throughputs.

Table A-6-3: Haul Truck Emissions Summary by Year (2019-2022)

Project Year	2019	2020	2021	2022
Baseline[1]				
Truck Usage (HP-hr/yr)	4,052,911	4,052,911	3,988,392	3,988,392
NOx Emissions (tons/yr)	39.39	39.39	36.24	36.24
VOC Emissions (tons/yr)	2.56	2.56	2.35	2.35
CO Emissions (tons/yr)	17.43	17.43	16.43	16.43
PM_{10} Emissions (tons/yr)	1.62	1.62	1.44	1.44
SOx Emissions (tons/yr)	0.026	0.026	0.026	0.026
Post-Project				
Truck Usage (HP-hr/yr)	4,867,007	4,885,886	4,902,937	6,300,258
NOx Emissions (tons/yr)	36.22	29.87	24.07	22.89
VOC Emissions (tons/yr)	2.25	1.80	1.38	1.18
CO Emissions (tons/yr)	19.18	18.02	16.96	20.46
PM_{10} Emissions (tons/yr)	1.35	0.99	0.67	0.42
SOx Emissions (tons/yr)	0.032	0.032	0.032	0.041
Project Change				
Truck Usage (HP-hr/yr)	814,096	832,975	914,544	2,311,866
NOx Emissions (tons/yr)	-3.17	-9.52	-12.17	-13.35
VOC Emissions (tons/yr)	-0.30	-0.76	-0.97	-1.16
CO Emissions (tons/yr)	1.74	0.58	0.53	4.03
PM_{10} Emissions (tons/yr)	-0.27	-0.63	-0.77	-1.02
SOx Emissions (tons/yr)	0.0053	0.0054	0.0060	0.015

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.

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Table A-7-1: Water Truck Emission Factors

Equipment Manufacturer	Equipment Model	Equipment Category	Engine Manufacturer	Engine Model	bhp[3]	Tier[3]	Engine Year	Annual Hours	Cumulative Hours [1]	Load Factor	Initial Emission Factors[4] (g/bhp-hr)				Deterioration Rate Factors[4] (g/bhp-hr)/hr			
											NOx	ROG	CO	PM_{10}	NOx	ROG	CO	PM_{10}
Euclid[2]	R-50	Off-Highway Trucks	Cummins	VT-1710-635	635	2	2005	2500	6312.5	0.38	4.29	0.12	0.92	0.11	5.81E-05	2.36E-05	1.82E-05	5.79E-06
CAT	773E	Off-Highway Trucks	CAT	3412E	710	2	2005	2500	6312.5	0.38	4.29	0.12	0.92	0.11	5.81E-05	2.36E-05	1.82E-05	5.79E-06
CAT[9,10]	773G	Off-Highway Trucks	CAT	C27 ACERT	775	4	2016	2500	6312.5	0.38	2.61	0.14	2.61	0.03	4.34E-05	4.95E-06	5.17E-05	1.59E-06

Equipment Manufacturer	Equipment Model	Equipment Category	Engine Manufacturer	Engine Model	bhp[3]	Tier[3]	Engine Year	Annual Hours	Cumulative Hours [1]	Load Factor	CA Fuel Correction Factors[7]				Adjusted Emission Factors[8]				
											NOx	ROG	CO	PM_{10}	NOx	ROG	CO	PM_{10}	SOx
Euclid[2]	R-50	Off-Highway Trucks	Cummins	VT-1710-635	635	2	2005	2500	6312.5	0.38	0.95	0.72	1.00	0.80	4.41	0.19	1.04	0.12	0.0059
CAT	773E	Off-Highway Trucks	CAT	3412E	710	2	2005	2500	6312.5	0.38	0.95	0.72	1.00	0.80	4.41	0.19	1.04	0.12	0.0059
CAT[9,10]	773G	Off-Highway Trucks	CAT	C27 ACERT	775	4	2016	2500	6312.5	0.38	0.95	0.72	1.00	0.852	2.73	0.12	2.94	0.03	0.0059

Equations

$$Adjusted\ EF = (Initial\ EF + (Det\ Rate\ Factor * Cumulative\ Hrs)) * CFC\ Factor$$

$$SOx\ EF\ \left(\frac{g}{HP-hr}\right) = \frac{15\ ppm}{1{,}000{,}000} * \frac{1\ lb}{19{,}500\ BTU} * \frac{64\ lb\ SOx}{32\ lb\ S} * 2{,}545\frac{BTU}{hp-hr} * \left(\frac{1}{30\%}\right) * 454\frac{g}{lb}$$

Data and Parameters

CEQA Project date:	2016
Useful life[6] (HHDD):	12625 hrs

Notes

1. Cumulative hours are half of the useful life to assume an "average" deterioration rate factor.
2. Euclid R-50 was Repowered to Tier 2; Engine Year was updated to reflect this.
3. HP and Tier are based on current trucks' specifications.
4. Emission factors and deterioration rate factors for 777B and 777D trucks are from In-Use Off-Road Equipment 2011 Inventory Model Appendix D.
5. Load factors are from CARB's In-Use Off-Road Equipment 2011 Inventory Model Appendix D.
6. Useful life is assumed for a heavy-heavy duty diesel truck (HHDD) in In-Use Off-Road Equipment 2011 Inventory Model Appendix D.
7. California Fuel Correction Factor is from In-Use Off-Road Equipment 2011 Inventory Model Appendix D.
8. SOx emission factors based on fuel sulfur content of 15 ppm (weight fraction) and a fuel higher heating value (HHV) of 19,500 BTU/lb.
9. 773G Truck is a proposed truck and has not been bought yet.
10. 773G truck has Executive Order stating its emission factors (STD rates are used).

Table A-7-2A: Water Truck Usage Calculations

Parameter	Baseline	West Pit and South Quarry Post-Project[1,2,3,4]			
		2019	2020	2021	2022
Total haul road length, West Pit and South Quarry (m	1.7	4.2	4.4	4.6	5.7
Water truck annual operating hours[4]					
Annual operating hours, Euclid R-50[2]	2,500	1,842	1,930	2,018	2,500
Annual operating hours, CAT 773E[2]	0	1,842	1,930	2,018	2,500
Annual operating hours, CAT 773G[2]	0	1,842	1,930	2,018	2,500
Total annual operating Hours	2,500	5,526	5,789	6,053	7,500
Water Truck Usage					
Water truck usage, Euclid R-50 (HP-hr/yr)	603,250	444,500	465,667	486,833	603,250
Water truck usage, CAT 773E (HP-hr/yr)	0	497,000	520,667	544,333	674,500
Water truck usage, CAT 773G (HP-hr/yr)	0	542,500	568,333	594,167	736,250
Total usage (HP-hr/yr)	603,250	1,484,000	1,554,667	1,625,333	2,014,000

Equations

$$\text{Usage}\left(\frac{HP-hr}{yr}\right) = Operating\ hours\left(\frac{hr}{yr}\right) * HP * Load\ Factor$$

Data and Parameters	
Euclid R-50 horsepower (HP):	635
CAT 773E (HP):	710
CAT 773G (HP):	775
Load factor:	0.38

Notes
1. Watering frequency of 1.25 applies to all scenarios.
2. Assume total operating hours are evenly distributed between the water truck models.
3. Water truck operating hours based on haul truck operating hours per truck, multiplied by two (for two water trucks)
4. Water truck operating hours for the transitional period (2019-2021) proportional to the total haul road length.

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Table A-7-2B: Water Truck Emissions Calculations

Baseline

Truck Type	Total Usage (HP-hr/yr)	Emission Factor (g/HP-hr)[1,2,3]					Emissions (tons/yr)				
		NOx	VOC	CO	PM_{10}	SOx	NOx	VOC	CO	PM_{10}	SOx
Euclid R-50	603,250	4.41	0.19	1.04	0.12	0.0059	2.94	0.129	0.69	0.078	0.0039
CAT 773E	0	4.41	0.19	1.04	0.12	0.0059	0.00	0.00	0.00	0.00	0.00
CAT 773G	0	2.73	0.12	2.94	0.03	0.0059	0.00	0.00	0.00	0.00	0.00
Total:	603,250					**Total:**	2.94	0.129	0.69	0.078	0.0039

2019 Post-Project

Truck Type	Total Usage (HP-hr/yr)	Emission Factor (g/HP-hr)[1,2,3]					Emissions (tons/yr)				
		NOx	VOC	CO	PM_{10}	SOx	NOx	VOC	CO	PM_{10}	SOx
Euclid R-50	444,500	4.41	0.19	1.04	0.12	0.0059	2.16	0.095	0.51	0.057	0.0029
CAT 773E	497,000	4.41	0.19	1.04	0.12	0.0059	2.42	0.106	0.57	0.064	0.0032
CAT 773G	542,500	2.73	0.12	2.94	0.03	0.0059	1.63	0.075	1.76	0.020	0.0035
Total:	1,484,000					**Total:**	6.22	0.276	2.83	0.142	0.0097

2020 Post-Project

Truck Type	Total Usage (HP-hr/yr)	Emission Factor (g/HP-hr)[1,2,3]					Emissions (tons/yr)				
		NOx	VOC	CO	PM_{10}	SOx	NOx	VOC	CO	PM_{10}	SOx
Euclid R-50	465,667	4.41	0.19	1.04	0.12	0.0059	2.27	0.099	0.53	0.060	0.0030
CAT 773E	520,667	4.41	0.19	1.04	0.12	0.0059	2.53	0.111	0.59	0.067	0.0034
CAT 773G	568,333	2.73	0.12	2.94	0.03	0.0059	1.71	0.078	1.84	0.021	0.0037
Total:	1,554,667					**Total:**	6.51	0.289	2.96	0.149	0.0102

2021 Post-Project

Truck Type	Total Usage (HP-hr/yr)	Emission Factor (g/HP-hr)[1,2,3]					Emissions (tons/yr)				
		NOx	VOC	CO	PM_{10}	SOx	NOx	VOC	CO	PM_{10}	SOx
Euclid R-50	486,833	4.41	0.19	1.04	0.12	0.0059	2.37	0.104	0.56	0.063	0.0032
CAT 773E	544,333	4.41	0.19	1.04	0.12	0.0059	2.65	0.116	0.62	0.070	0.0036
CAT 773G	594,167	2.73	0.12	2.94	0.03	0.0059	1.79	0.082	1.92	0.022	0.0039
Total:	1,625,333					**Total:**	6.81	0.302	3.10	0.156	0.0106

2022 Post-Project

Truck Type	Total Usage (HP-hr/yr)	Emission Factor (g/HP-hr)[1,2,3]					Emissions (tons/yr)				
		NOx	VOC	CO	PM_{10}	SOx	NOx	VOC	CO	PM_{10}	SOx
Euclid R-50	603,250	4.41	0.19	1.04	0.12	0.0059	2.94	0.13	0.69	0.08	0.0039
CAT 773E	674,500	4.41	0.19	1.04	0.12	0.0059	3.28	0.14	0.77	0.09	0.0044
CAT 773G	736,250	2.73	0.12	2.94	0.03	0.0059	2.22	0.10	2.38	0.03	0.0048
Total:	2,014,000					**Total:**	8.44	0.374	3.84	0.193	0.0132

Equations

$$Usage\left(\frac{HP-hr}{yr}\right) = Operating\ Hours\left(\frac{hr}{yr}\right) * HP * Load\ Factor$$

$$Emissions\left(\frac{tons}{yr}\right) = Usage\left(\frac{HP-hr}{yr}\right) * EF\left(\frac{g}{HP-hr}\right) * \frac{1\ ton}{907184.74\ g}$$

Notes

1. Euclid R-50 was repowered to comply with Tier 2 emission standards.
2. See Table A-7-1 for Emission Factors and A-7-2A for total usage.

Table A-7-3: Water Truck Emissions Summary by Year (2019-2022)

	Baseline			
Truck Usage (HP-hr/yr)	603,250			
NOx Emissions (tons/yr)	2.94			
VOC Emissions (tons/yr)	0.13			
CO Emissions (tons/yr)	0.69			
PM_{10} Emissions (tons/yr)	0.08			
SOx Emissions (tons/yr)	0.0039			
Post-Project	**2019**	**2020**	**2021**	**2022**
Truck Usage (HP-hr/yr)	1,484,000	1,554,667	1,625,333	2,014,000
NOx Emissions (tons/yr)	6.22	6.51	6.81	8.44
VOC Emissions (tons/yr)	0.28	0.29	0.30	0.37
CO Emissions (tons/yr)	2.83	2.96	3.10	3.84
PM_{10} Emissions (tons/yr)	0.14	0.15	0.16	0.19
SOx Emissions (tons/yr)	0.0097	0.0102	0.0106	0.013
Project Emissions Change	**2019**	**2020**	**2021**	**2022**
Truck Usage (HP-hr/yr)	880,750	951,417	1,022,083	1,410,750
NOx Emissions (tons/yr)	3.28	3.58	3.87	5.50
VOC Emissions (tons/yr)	0.15	0.16	0.17	0.25
CO Emissions (tons/yr)	2.14	2.28	2.41	3.15
PM_{10} Emissions (tons/yr)	0.06	0.07	0.08	0.11
SOx Emissions (tons/yr)	0.0058	0.0062	0.0067	0.0092

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.

Table A-8-1: Project Emissions Summary for $PM_{2.5}$ and PM_{10} by Year (2019-2022)

Emissions Source	2019	2020	2021	2022
PM_{10} (tons/yr)				
Dust entrainment from haul trucks[1]	2.47	2.00	2.58	11.96
Dust entrainment from water trucks[1]	0.62	0.67	0.72	0.99
Wind erosion from unpaved roads[2]	0.96	1.09	1.22	1.93
Seasonal stockpile- material handling[3]	0.16	0.16	0.16	0.24
Haul truck exhaust[4]	-0.27	-0.63	-0.77	-1.02
Water truck exhaust[5]	0.06	0.07	0.08	0.11
Total emissions increase due to project	4.0	3.4	4.0	14.2
Above PM_{10} threshold (15 tons/yr):	NO	NO	NO	NO
$PM_{2.5}$ (tons/yr)[6]				
Dust entrainment from haul trucks	0.25	0.20	0.26	1.20
Dust entrainment from water trucks	0.06	0.07	0.07	0.10
Wind erosion from unpaved roads	0.14	0.16	0.18	0.29
Seasonal stockpile material handling	0.04	0.04	0.04	0.07
Haul truck exhaust	-0.26	-0.61	-0.75	-0.99
Water truck exhaust	0.06	0.07	0.08	0.11
Total emissions change due to project	0.30	-0.06	-0.12	0.78
Above $PM_{2.5}$ threshold (12 tons/yr):	NO	NO	NO	NO

Notes
1. See Table A-3-3 for dust entrainment summary.
2. See Table A-4-2 for wind erosion summary.
3. See Table A-5-2 for seasonal stockpile- material handling summary.
4. See Table A-6-3 for haul truck exhaust summary.
5. See Table A-7-3 for water truck exhaust summary.
6. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.

Table A-8-2: Project Emissions Summary for Truck Exhaust (2019-2022)

Project Year	2019	2020	2021	2022
Project Emissions Change, Haul Trucks[2]				
Truck Usage (HP-hr/yr)	814,096	832,975	914,544	2,311,866
NOx Emissions (tons/yr)	-3.17	-9.52	-12.17	-13.35
VOC Emissions (tons/yr)	-0.30	-0.76	-0.97	-1.16
CO Emissions (tons/yr)	1.74	0.58	0.53	4.03
PM_{10} Emissions (tons/yr)	-0.27	-0.63	-0.77	-1.02
$PM_{2.5}$ Emissions (tons/yr)[1]	-0.26	-0.61	-0.75	-0.99
SOx Emissions (tons/yr)	0.0053	0.0054	0.0060	0.015
Project Emissions Change, Water Trucks[3]				
Truck Usage (HP-hr/yr)	880,750	951,417	1,022,083	1,410,750
NOx Emissions (tons/yr)	3.28	3.58	3.87	5.50
VOC Emissions (tons/yr)	0.147	0.160	0.173	0.25
CO Emissions (tons/yr)	2.14	2.28	2.41	3.15
PM_{10} Emissions (tons/yr)	0.06	0.07	0.08	0.11
$PM_{2.5}$ Emissions (tons/yr)[1]	0.06	0.07	0.08	0.11
SOx Emissions (tons/yr)	0.0058	0.0062	0.0067	0.0092
Total Emissions Change, Haul and Water Trucks				
Truck Usage (HP-hr/yr)	1,694,846	1,784,392	1,936,628	3,722,616
NOx Emissions (tons/yr)	0.1	-5.9	-8.30	-7.85
VOC Emissions (tons/yr)	-0.15	-0.60	-0.80	-0.92
CO Emissions (tons/yr)	3.88	2.86	2.94	7.18
PM_{10} Emissions (tons/yr)	-0.21	-0.56	-0.70	-0.90
$PM_{2.5}$ Emissions (tons/yr)[1]	-0.20	-0.54	-0.67	-0.88
SOx Emissions (tons/yr)	0.0111	0.012	0.013	0.024

Notes

1. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.
2. See Table A-6-3 for haul truck exhaust summary.
3. See Table A-7-3 for water truck exhaust summary.

Table A-8-3: Comparison of South Quarry Project Baseline to South Quarry Post-Project, Truck Emissions, All Years

	Baseline				Post-Project			
	2019	2020	2021	2022	2019	2020	2021	2022
Other Trucks								
Nitrous Oxides (NOx)	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3
Volatile Organic Compounds (VOC)	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Carbon Monoxide (CO)	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Particulate Matter (PM_{10})	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Particulate Matter ($PM_{2.5}$)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Sulfur Oxides (SOx)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Haul Trucks								
Nitrous Oxides (NOx)	39.4	39.4	36.2	36.2	36.2	29.9	24.1	22.9
Volatile Organic Compounds (VOC)	2.6	2.6	2.3	2.3	2.3	1.8	1.4	1.2
Carbon Monoxide (CO)	17.4	17.4	16.4	16.4	19.2	18.0	17.0	20.5
Particulate Matter (PM_{10})	1.6	1.6	1.4	1.4	1.3	1.0	0.7	0.4
Particulate Matter ($PM_{2.5}$)	1.6	1.6	1.4	1.4	1.3	1.0	0.6	0.4
Sulfur Oxides (SOx)	0.026	0.026	0.026	0.026	0.032	0.032	0.032	0.041
Water Trucks								
Nitrous Oxides (NOx)	2.9	2.9	2.9	2.9	6.2	6.5	6.8	8.4
Volatile Organic Compounds (VOC)	0.1	0.1	0.1	0.1	0.3	0.3	0.3	0.4
Carbon Monoxide (CO)	0.7	0.7	0.7	0.7	2.8	3.0	3.1	3.8
Particulate Matter (PM_{10})	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Particulate Matter ($PM_{2.5}$)	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Sulfur Oxides (SOx)	0.004	0.004	0.004	0.004	0.010	0.010	0.011	0.013
Total Trucks								
Nitrous Oxides (NOx)	66.7	66.7	63.5	63.5	66.8	60.7	55.2	55.7
Volatile Organic Compounds (VOC)	4.5	4.5	4.3	4.3	4.3	3.9	3.5	3.3
Carbon Monoxide (CO)	22.8	22.8	21.8	21.8	26.7	25.7	24.8	29.0
Particulate Matter (PM_{10})	2.6	2.6	2.4	2.4	2.4	2.0	1.7	1.5
Particulate Matter ($PM_{2.5}$)	2.5	2.5	2.3	2.3	2.3	2.0	1.7	1.5
Sulfur Oxides (SOx)	0.504	0.504	0.504	0.504	0.516	0.516	0.517	0.528

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Table A-8-4: Comparison of PM_{10} Emissions for South Quarry Baseline and Post-Project, All Years

Emissions Source	2019	2020	2021	2022
PM_{10} South Quarry Baseline Emissions (tons/yr)				
Dust entrainment from haul trucks[1]	30.71	30.71	29.76	29.76
Dust entrainment from water trucks[1]	0.37	0.37	0.37	0.37
Wind erosion from unpaved roads[2]	2.08	2.08	2.08	2.08
Seasonal stockpile- material handling[3]	0.00	0.00	0.00	0.00
Haul truck exhaust[4]	1.62	1.62	1.44	1.44
Water truck exhaust[5]	0.08	0.08	0.08	0.08
Total emissions	34.9	34.9	33.7	33.7
PM_{10} South Quarry Post-Project Emissions (tons/yr)				
Dust entrainment from haul trucks[1]	33.18	32.70	32.34	41.72
Dust entrainment from water trucks[1]	0.99	1.04	1.09	1.36
Wind erosion from unpaved roads[2]	3.04	3.17	3.30	4.01
Seasonal stockpile- material handling[3]	0.16	0.16	0.16	0.24
Haul truck exhaust[4]	1.35	0.99	0.67	0.42
Water truck exhaust[5]	0.14	0.15	0.16	0.19
Total emission	38.9	38.2	37.7	48.0
PM_{10} South Quarry Emissions Increase (tons/yr)				
Dust entrainment from haul trucks[1]	2.47	2.00	2.58	11.96
Dust entrainment from water trucks[1]	0.62	0.67	0.72	0.99
Wind erosion from unpaved roads[2]	0.96	1.09	1.22	1.93
Seasonal stockpile- material handling[3]	0.16	0.16	0.16	0.24
Haul truck exhaust[4]	-0.27	-0.63	-0.77	-1.02
Water truck exhaust[5]	0.06	0.07	0.08	0.11
Total emissions increase due to project	4.0	3.4	4.0	14.2

Notes
1. See Table A-3-3 for dust entrainment summary.
2. See Table A-4-2 for wind erosion summary.
3. See Table A-5-2 for seasonal stockpile- material handling summary.
4. See Table A-6-3 for haul truck exhaust summary.
5. See Table A-7-3 for water truck exhaust summary.
6. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.

Table A-8-5: Overall Comparison of South Quarry Project Baseline to South Quarry Post-Project, All Years

	2019	2020	2021	2022
Baseline				
Nitrous Oxides (NOx)	66.7	66.7	63.5	63.5
Volatile Organic Compounds (VOC)	4.5	4.5	4.3	4.3
Carbon Monoxide (CO)	22.8	22.8	21.8	21.8
Particulate Matter (PM_{10})	193.6	193.6	192.5	192.5
Particulate Matter ($PM_{2.5}$)	20.0	20.0	19.7	19.7
Sulfur Oxides (SOx)	0.5	0.5	0.5	0.5
Post-Project				
Nitrous Oxides (NOx)	66.8	60.7	55.2	55.7
Volatile Organic Compounds (VOC)	4.3	3.9	3.5	3.3
Carbon Monoxide (CO)	26.7	25.7	24.8	29.0
Particulate Matter (PM_{10})	197.6	196.9	196.4	206.7
Particulate Matter ($PM_{2.5}$)	20.3	19.9	19.6	20.5
Sulfur Oxides (SOx)	0.5	0.5	0.5	0.5
Change in emissions				
Nitrous Oxides (NOx)	0.1	-5.9	-8.3	-7.8
Volatile Organic Compounds (VOC)	-0.2	-0.6	-0.8	-0.9
Carbon Monoxide (CO)	3.9	2.9	2.9	7.2
Particulate Matter (PM_{10})	4.0	3.4	4.0	14.2
Particulate Matter ($PM_{2.5}$)	0.3	-0.1	-0.1	0.8
Sulfur Oxides (SOx)	0.01	0.01	0.01	0.02

Table A-8-6: Project Emissions Summary for PM_{10} and $PM_{2.5}$ for 2022 (Worst-Case Year)

Activity/Source	Unit of Emission Factor	Unit of Throughput	2022 Baseline Controlled Emission Factor	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]
Blasthole drilling	lb/ton	ton/year	0.0008	2,900,000	1.2	0.07
Blasting	lb/ton	ton/year	0.080	2,900,000	116.0	6.7
Bulldozing, scraping and grading of materials	lb/hr	hr/year	11.77	2,500	14.7	0.8
Material Handling, limestone ore and waste rock	lb/ton	ton/year	0.014	2,900,000	20.3	5.7
Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6
Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2
Wind erosion from unpaved roads[2]	tons/acre-yr	acre	0.16	13.39	2.08	0.31
Dust entrainment from unpaved roads - haul trucks[2]	lb/VMT	VMT	0.55	108,352	29.8	3.0
Dust entrainment from unpaved roads - water trucks[2]	lb/VMT	VMT	0.11	6,800	0.37	0.04
Material Handling, seasonal stockpile	lb/ton	tons/year	0.0022	0	0.0	0.0
				Subtotal (fugitive emissions):	**190.1**	**17.4**
Other truck exhaust	g/HP-hr	HP-hr/year	Variable	3,236,250	0.9	0.9
Haul truck exhaust[1]	g/HP-hr	HP-hr/year	See table A-6-1	3,988,392	1.4	1.4
Water truck exhaust	g/HP-hr	HP-hr/year	See table A-7-1	603,250	0.08	0.08
				Total (all sources):	**192.5**	**19.7**

Activity/Source	Unit of Emission Factor	Unit of Throughput	2022 Post-Project Controlled Emission Factor	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]	Project PM_{10} Emissions Increase (tons/yr)	Project $PM_{2.5}$ Emissions Increase (tons/yr)
Blasthole drilling	lb/ton	ton/year	0.00080	2,900,000	1.2	0.07	0.0	0.0
Blasting	lb/ton	ton/year	0.080	2,900,000	116.0	6.7	0.0	0.0
Bulldozing, scraping and grading of materials	lb/hr	hr/year	11.77	2,500	14.7	0.8	0.0	0.0
Material Handling, limestone ore and waste rock	lb/ton	ton/year	0.014	2,900,000	20.3	5.7	0.0	0.0
Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6	0.0	0.0
Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2	0.0	0.0
Wind erosion from unpaved roads[2,5]	tons/acre-yr	acre	0.11	37.64	4.01	0.60	1.9	0.29
Dust entrainment from unpaved roads - haul trucks[2,4]	lb/VMT	VMT	0.55	151,904	41.7	4.2	12.0	1.20
Dust entrainment from unpaved roads - water trucks[2,4]	lb/VMT	VMT	0.11	24,800	1.36	0.14	0.99	0.10
Material Handling, seasonal stockpile[6]	lb/ton	tons/year	0.0022	216,667	0.2	0.1	0.24	0.1
				Subtotal (fugitive emissions):	**205.2**	**19.1**	**15.1**	**1.7**
Other truck exhaust	g/HP-hr	HP-hr/year	Variable	3,236,250	0.9	0.9	0.00	0.0
Haul truck exhaust[1,7]	g/HP-hr	HP-hr/year	See table A-6-1	6,300,258	0.4	0.4	-1.02	-0.99
Water truck exhaust[8]	g/HP-hr	HP-hr/year	See table A-7-1	2,014,000	0.19	0.19	0.11	0.11
				Total (all sources):	**206.7**	**20.5**	**14.2**	**0.78**
						Significance Threshold:	**15**	**12**
						Above Significance Threshold:	**NO**	**NO**

Notes
1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. Controlled EF calculations for dust entrainment (A-3-1) and wind erosion (A-4-1A and A-4-2) for 2022 are weighted averages of the West Pit and South Quarry.
3. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.
4. See Table A-3-3 for dust entrainment summary.
5. See Table A-4-2 for wind erosion summary.
6. See Table A-5-2 for seasonal stockpile- material handling summary.
7. See Table A-6-3 for haul truck exhaust summary.
8. See Table A-7-3 for water truck exhaust summary.

Table A-8-7A: Project Emissions Summary for Truck Exhaust for 2019 (Worst-Case Year for NOx, VOC, PM_{10}, and $PM_{2.5}$)

Pollutant Name	2019 Baseline[1]				2019 Post-Project			
	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)	Total Emissions (tons/yr)	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)	Total Emissions (tons/yr)
Nitrous Oxides (NOx)	24.3	39.4	2.9	66.7	24.3	36.2	6.2	66.8
Volatile Organic Compounds (VOC)	1.8	2.6	0.1	4.5	1.8	2.3	0.3	4.3
Particulate Matter (PM_{10})[2]	0.9	1.6	0.1	2.6	0.9	1.3	0.1	2.4
Particulate Matter ($PM_{2.5}$)[2, 3]	0.9	1.6	0.1	2.5	0.9	1.3	0.1	2.3

Pollutant Name	Project Emissions Change (tons/yr)	Significance Thresholds (tons/yr)	Above Significance Thresholds
Nitrous Oxides (NOx)	0.1	25	NO
Volatile Organic Compounds (VOC)	-0.2	25	NO
Particulate Matter (PM_{10})[2]	-0.2	n/a	n/a
Particulate Matter ($PM_{2.5}$)[2, 3]	-0.2	n/a	n/a

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.

2. There are no significance thresholds specific to diesel $PM_{2.5}$ and PM_{10}. Diesel $PM_{2.5}$ and PM_{10} are included in the overall project PM_{10} to determine if PM_{10} exceeds the threshold levels. (Table A-8-3)

3. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.

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Table A-8-7B: Project Emissions Summary for Truck Exhaust for 2022 (Worst-Case Year for CO and SOx)

Pollutant Name	2022 Baseline[1]				2022 Post-Project			
	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)	Total Emissions (tons/yr)	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)	Total Emissions (tons/yr)
Carbon Monoxide (CO)	4.7	16.4	0.7	21.8	4.7	20.5	3.8	29.0
Sulfur Oxides (SOx)	0.5	0.03	0.004	0.5	0.5	0.04	0.013	0.5

Pollutant Name	Project Emissions Change (tons/yr)	Significance Thresholds (tons/yr)	Above Significance Thresholds (yes/no)
Carbon Monoxide (CO)	7.2	100	NO
Sulfur Oxides (SOx)	0.02	25	NO

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.

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Table A-8-8: Project Emissions Summary, $PM_{2.5}$ and PM_{10} Emissions, All Years

#	Activity/Sources	Unit of Emission Factor	Unit of Throughput[4]	2019 Baseline, South Quarry Project				2019 Post-Project, South Quarry Project			
				PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]	PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]
1	Blasthole drilling	lb/ton	ton/year	0.0008	2,900,000	1.2	0.1	0.0008	2,900,000	1.2	0.1
2	Blasting	lb/ton	ton/year	0.08	2,900,000	116.0	6.7	0.08	2,900,000	116.0	6.7
3	Bulldozing, scraping and grading of materials	lb/hr	hr/year	11.8	2,500	14.7	0.8	11.8	2,500	14.7	0.8
4	Material Handling, limestone ore and waste rock[2]	lb/ton	ton/year	0.014	2,900,000	20.3	5.7	0.014	2,900,000	20.3	5.7
5	Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6	0.20	20	4.0	0.6
6	Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2	0.27	6	1.6	0.2
7	Wind erosion from unpaved roads	tons/acre-yr	acre	0.16	13.39	2.1	0.3	0.11	28.55	3.0	0.5
8a	Dust entrainment from unpaved roads - haul trucks[1]	lb/VMT	VMT	0.55	111,791	30.7	3.1	0.55	120,799	33.2	3.3
8b	Dust entrainment from unpaved roads - water trucks[1]	lb/VMT	VMT	0.11	6,800	0.4	0.0	0.11	18,050	1.0	0.1
9	Material Handling, seasonal stockpile	lb/ton	tons/year	0.0022	0	0.0	0.0	0.0022	143,000	0.2	0.0
	Subtotal (fugitive emissions)					**191.0**	**17.5**			**195.2**	**18.0**
10	Other truck exhaust	g/hp-hr	hp-hr/year	Variable	3,236,250	0.9	0.9	Variable	3,236,250	0.9	0.9
11	Haul truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-6-1	4,052,911	1.6	1.6	See table A-6-1	4,867,007	1.3	1.3
12	Water truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-7-1	603,250	0.1	0.1	See table A-7-1	1,484,000	0.1	0.1
	Total (all sources):					**193.6**	**20.0**			**197.6**	**20.3**

#	Activity/Sources	Unit of Emission Factor	Unit of Throughput[4]	2020 Baseline, South Quarry Project				2020 Post-Project, South Quarry Project			
				PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]	PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]
1	Blasthole drilling	lb/ton	ton/year	0.0008	2,900,000	1.2	0.1	0.0008	2,900,000	1.2	0.1
2	Blasting	lb/ton	ton/year	0.08	2,900,000	116.0	6.7	0.08	2,900,000	116.0	6.7
3	Bulldozing, scraping and grading of materials	lb/hr	hr/year	11.8	2,500	14.7	0.8	11.8	2,500	14.7	0.8
4	Material Handling, limestone ore and waste rock[2]	lb/ton	ton/year	0.014	2,900,000	20.3	5.7	0.014	2,900,000	20.3	5.7
5	Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6	0.20	20	4.0	0.6
6	Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2	0.27	6	1.6	0.2
7	Wind erosion from unpaved roads	tons/acre-yr	acre	0.16	13.39	2.1	0.3	0.11	29.76	3.2	0.5
8a	Dust entrainment from unpaved roads - haul trucks[1]	lb/VMT	VMT	0.55	111,791	30.7	3.1	0.55	119,057	32.7	3.3
8b	Dust entrainment from unpaved roads - water trucks[1]	lb/VMT	VMT	0.11	6,800	0.4	0.0	0.11	18,950	1.0	0.1
9	Material Handling, seasonal stockpile	lb/ton	tons/year	0.0022	0	0.0	0.0	0.0022	143,000	0.2	0.0
	Subtotal (fugitive emissions)					**191.0**	**17.5**			**194.9**	**18.0**
10	Other truck exhaust	g/hp-hr	hp-hr/year	Variable	3,236,250	0.9	0.9	Variable	3,236,250	0.9	0.9
11	Haul truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-6-1	4,052,911	1.6	1.6	See table A-6-1	4,885,886	1.0	1.0
12	Water truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-7-1	603,250	0.1	0.1	See table A-7-1	1,554,667	0.1	0.1
	Total (all sources):					**193.6**	**20.0**			**196.9**	**19.9**

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Table A-8-8: Project Emissions Summary, $PM_{2.5}$ and PM_{10} Emissions, All Years

#	Activity/Sources	Unit of Emission Factor	Unit of Throughput[4]	2021 Baseline, South Quarry Project				2021 Post-Project, South Quarry Project			
				PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]	PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]
1	Blasthole drilling	lb/ton	ton/year	0.0008	2,900,000	1.2	0.1	0.0008	2,900,000	1.2	0.1
2	Blasting	lb/ton	ton/year	0.08	2,900,000	116.0	6.7	0.08	2,900,000	116.0	6.7
3	Bulldozing, scraping and grading of materials	lb/hr	hr/year	11.8	2,500	14.7	0.8	11.8	2,500	14.7	0.8
4	Material Handling, limestone ore and waste rock[2]	lb/ton	ton/year	0.014	2,900,000	20.3	5.7	0.014	2,900,000	20.3	5.7
5	Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6	0.20	20	4.0	0.6
6	Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2	0.27	6	1.6	0.2
7	Wind erosion from unpaved roads	tons/acre-yr	acre	0.16	13.39	2.1	0.3	0.11	30.97	3.3	0.5
8a	Dust entrainment from unpaved roads - haul trucks[1]	lb/VMT	VMT	0.55	108,352	29.8	3.0	0.55	117,745	32.3	3.2
8b	Dust entrainment from unpaved roads - water trucks[1]	lb/VMT	VMT	0.11	6,800	0.4	0.0	0.11	19,850	1.1	0.1
9	Material Handling, seasonal stockpile	lb/ton	tons/year	0.0022	0	0.0	0.0	0.0022	143,000	0.2	0.0
					Subtotal (fugitive emissions)	**190.1**	**17.4**			**194.7**	**18.0**
10	Other truck exhaust	g/hp-hr	hp-hr/year	Variable	3,236,250	0.9	0.9	Variable	3,236,250	0.9	0.9
11	Haul truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-6-1	3,988,392	1.4	1.4	See table A-6-1	4,902,937	0.7	0.6
12	Water truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-7-1	603,250	0.1	0.1	See table A-7-1	1,625,333	0.2	0.2
					Total (all sources):	**192.5**	**19.7**			**196.4**	**19.6**

#	Activity/Sources	Unit of Emission Factor	Unit of Throughput[4]	2022 Baseline, South Quarry Project				2022 Post-Project, South Quarry Project			
				PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]	PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]
1	Blasthole drilling	lb/ton	ton/year	0.0008	2,900,000	1.2	0.1	0.0008	2,900,000	1.2	0.1
2	Blasting	lb/ton	ton/year	0.08	2,900,000	116.0	6.7	0.08	2,900,000	116.0	6.7
3	Bulldozing, scraping and grading of materials	lb/hr	hr/year	11.8	2,500	14.7	0.8	11.8	2,500	14.7	0.8
4	Material Handling, limestone ore and waste rock[2]	lb/ton	ton/year	0.014	2,900,000	20.3	5.7	0.014	2,900,000	20.3	5.7
5	Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6	0.20	20	4.0	0.6
6	Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2	0.27	6	1.6	0.2
7	Wind erosion from unpaved roads	tons/acre-yr	acre	0.16	13.39	2.1	0.3	0.11	37.64	4.0	0.6
8a	Dust entrainment from unpaved roads - haul trucks[1]	lb/VMT	VMT	0.55	108,352	29.8	3.0	0.55	151,904	41.7	4.2
8b	Dust entrainment from unpaved roads - water trucks[1]	lb/VMT	VMT	0.11	6,800	0.4	0.0	0.11	24,800	1.4	0.1
9	Material Handling, seasonal stockpile	lb/ton	tons/year	0.0022	0	0.0	0.0	0.0022	216,667	0.2	0.1
					Subtotal (fugitive emissions)	**190.1**	**17.4**			**205.2**	**19.1**
10	Other truck exhaust	g/hp-hr	hp-hr/year	Variable	3,236,250	0.9	0.9	Variable	3,236,250	0.9	0.9
11	Haul truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-6-1	3,988,392	1.4	1.4	See table A-6-1	6,300,258	0.4	0.4
12	Water truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-7-1	603,250	0.1	0.1	See table A-7-1	2,014,000	0.2	0.2
					Total (all sources):	**192.5**	**19.7**			**206.7**	**20.5**

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. Assume two transfer points for material handling. Each transfer point has an emission factor of 0.007 lb/ton.
3. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.
4. Dust Entrainment Throughputs are based on vehicle miles traveled (VMT).

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Table A-9-1: Operational and Construction Phase HRA Source Description and Emissions

Source	Phase	Source Description	PM_{10} Emissions Increase (ton/yr)	PM_{10} Emissions Increase (lb/yr)	PM_{10} Emissions Increase (lb/hr)
A	Operational	Haul Truck Exhaust	-0.27	-546	-0.22
		Water Truck Exhaust	0.06	128	0.05
		Total:	-0.21	-417	-0.17
B	Operational	Wind Erosion from Unpaved Roads	1.93	3,852	1.54
C	Operational	Dust Entrainment from Haul Trucks	11.96	23,926	9.57
		Dust Entrainment from Water Trucks	0.99	1,978	0.79
		Total:	12.95	25,904	10.36
D	Operational	Seasonal Stockpile - Material Handling	0.24	482	0.19
E	Construction	Off-Road Vehicle Exhaust	0.41	829	0.33
F	Construction	Fugitive Emissions	11.75	23,498	9.40

Notes
1. To be conservative, worst case year for Truck Exhaust (2019) was used (worst case results in a decrease of emissions).

Table A-9-2: Operational and Construction Phase HRA Source Type and Location

Source	Phase	Source Description	Source Type	Source Hours per Day	Source Dimensions	Source Location
A	Operational	Haul Truck Exhaust Water Truck Exhaust	Line Source	10	15.24m by 542m	Extending from Seasonal Stockpile in Phase 1A Mining to the road beyond Point C in Figure 3.
B	Operational	Wind Erosion from Unpaved Roads	Line Source	24	15.24m by 542m	Extending from Seasonal Stockpile in Phase 1A Mining to the road beyond Point C in Figure 3.
C	Operational	Dust Entrainment from Haul Trucks Dust Entrainment from Water Trucks	Line Source	10	15.24m by 542m	Extending from Seasonal Stockpile in Phase 1A Mining to the road beyond Point C in Figure 3.
D	Operational	Seasonal Stockpile - Material Handling	Area Source	10	30m by 30m	Phase 1A Mining Area.
E	Construction	Off-Road Vehicle Exhaust	Line Source	10	15.24m by 902m	Extending from Point C in Figure 3 to the Existing Rock Stockpile at the west end of the East Pit.
F	Construction	Fugitive Emissions	Line Source	10	15.24m by 902m	Extending from Point C in Figure 3 to the Existing Rock Stockpile at the west end of the East Pit.

Table A-10-1A: Project Emissions Summary for Diesel PM_{10} (Source E) - Construction Phase

Source E	Units	Increase[1]
Diesel Construction Vehicles	tons/yr	0.41
	lb/yr	829
	(lb/hr)[2]	0.33

<u>Notes</u>

1. Construction occurs over two years.
2. Divide yearly emissions by 2,500 hours/yr (10 hours/day, 250 days/yr).

Table A-10-1B: Annual Average and Maximum Hourly Fugitive TAC Emissions by Source (F) - Construction Phase

Metal	Lab Results[1] Unpaved Road Dust (mg/kg)	Source F[2]	
		Ann. Avg. (lb/yr)	Max. Hr. (lb/hr)[3]
Antimony	0.50	1.17E-02	4.70E-06
Arsenic	7.50	1.76E-01	7.05E-05
Beryllium	0.15	3.52E-03	1.41E-06
Cadmium	1.05	2.47E-02	9.87E-06
Chromium VI	0.10	2.35E-03	9.40E-07
Copper	12.00	2.82E-01	1.13E-04
Chromium, total	0.10	2.35E-03	9.40E-07
Diesel Exhaust PM	-	-	-
Lead	76.00	1.79E+00	7.14E-04
Mercury	0.01	2.35E-04	9.40E-08
Nickel	7.60	1.79E-01	7.14E-05
Selenium	0.50	1.17E-02	4.70E-06
Vanadium	22.00	5.17E-01	2.07E-04
Zinc	76.50	1.80E+00	7.19E-04
Crystalline silica	1020.00	2.40E+01	9.59E-03

Notes
1. Obtained from Comprehensive Emission Inventory Report (CEIR) for Mitsubishi Cement Corporation's Cushenbury Plant for 2014, Table 5.
2. Source F: Fugitive emissions from construction activities (10 hour source).
3. Assumed 2,500 hours/yr in determining maximum hourly emission rates.
4. PM_{10} Emissions shown in tons/yr.

Table A-10-2A: Cancer Risk by Receptor (MEIR, MEIW, Sensitive) and Source (E,F) - Construction Phase

Source	MEIR		MEIW		Sensitive	
	E	F	E	F	E	F
Antimony	0	0	0	0	0	0
Arsenic	0	1.49E-09	0	4.39E-11	0	6.57E-10
Beryllium	0	1.74E-12	0	1.36E-13	0	7.69E-13
Cadmium	0	2.18E-11	0	1.70E-12	0	9.63E-12
Chromium VI	0	1.24E-10	0	5.63E-12	0	5.45E-11
Copper	0	0	0	0	0	0
Chromium, total	0	0	0	0	0	0
Diesel Exhaust PM	5.38E-08	0	4.19E-09	0	2.37E-08	0
Lead	0	6.26E-11	0	2.01E-12	0	2.76E-11
Mercury	0	0	0	0	0	0
Nickel	0	9.60E-12	0	7.49E-13	0	4.23E-12
Selenium	0	0	0	0	0	0
Vanadium	0	0	0	0	0	0
Zinc	0	0	0	0	0	0
Crystalline silica	0	0	0	0	0	0
Total:	5.38E-08	1.71E-09	4.19E-09	5.41E-11	2.37E-08	7.54E-10

Notes

1. Source E: Diesel construction vehicles (10 hour source).
2. Source F: Fugitive emissions from construction activities (10 hour source).

Table A-10-2B: Chronic Non-Cancer Hazard Index by Receptor (MEIR, MEIW, Sensitive) and Source (E,F) - Construction Phase

Source	MEIR		MEIW		Sensitive	
	E	F	E	F	E	F
Antimony	0	0	0	0	0	0
Arsenic	0	1.13E-04	0	2.72E-05	0	4.97E-05
Beryllium	0	5.51E-08	0	4.11E-08	0	2.43E-08
Cadmium	0	2.67E-07	0	1.21E-07	0	1.18E-07
Chromium VI	0	3.14E-09	0	9.60E-10	0	1.38E-09
Copper	0	0	0	0	0	0
Chromium, total	0	0	0	0	0	0
Diesel Exhaust PM	1.82E-05	0	1.35E-05	0	8.01E-06	0
Lead	0	0	0	0	0	0
Mercury	0	3.31E-09	0	1.35E-09	0	1.46E-09
Nickel	0	1.40E-06	0	1.04E-06	0	6.18E-07
Selenium	0	1.25E-08	0	1.13E-09	0	5.53E-09
Vanadium	0	0	0	0	0	0
Zinc	0	0	0	0	0	0
Crystalline silica	0	8.76E-07	0	6.53E-07	0	3.86E-07
Total:	1.82E-05	1.15E-04	1.35E-05	2.91E-05	8.01E-06	5.09E-05

Notes

1. Source E: Diesel construction vehicles (10 hour source).
2. Source F: Fugitive emissions from construction activities (10 hour source).

Table A-10-2C: Acute Non-Cancer Hazard Index by Receptor (MEIR, MEIW, Sensitive) and Source (E,F) - Construction Phase

Source	MEIR		MEIW		Sensitive	
	E	F	E	F	E	F
Antimony	0	0	0	0	0	0
Arsenic	0	1.54E-03	0	7.25E-04	0	3.39E-04
Beryllium	0	0	0	0	0	0
Cadmium	0	0	0	0	0	0
Chromium VI	0	0	0	0	0	0
Copper	0	4.93E-06	0	2.32E-06	0	1.09E-06
Chromium, total	0	0	0	0	0	0
Diesel Exhaust PM	0	0	0	0	0	0
Lead	0	0	0	0	0	0
Mercury	0	6.83E-07	0	3.22E-07	0	1.51E-07
Nickel	0	1.56E-03	0	7.34E-04	0	3.43E-04
Selenium	0	0	0	0	0	0
Vanadium	0	3.01E-05	0	1.42E-05	0	6.63E-06
Zinc	0	0	0	0	0	0
Crystalline silica	0	0	0	0	0	0
Total:	0	3.13E-03	0	1.48E-03	0	6.89E-04

Notes
1. Source E: Diesel construction vehicles (10 hour source).
2. Source F: Fugitive emissions from construction activities (10 hour source).

Table A-10-3: Total Cancer, Chronic, and Acute Risk by Receptor Comparison with Health Risk Significance Thresholds - Construction Phase

	Cancer Risk			Chronic Hazard Index			Acute Hazard Index		
	MEIR	MEIW	Sensitive	MEIR	MEIW	Sensitive	MEIR	MEIW	Sensitive
Calculated Total	5.55E-08	4.25E-09	2.45E-08	1.34E-04	4.26E-05	5.89E-05	3.13E-03	1.48E-03	6.89E-04
Risk Threshold	1.00E-05	1.00E-05	1.00E-05	1	1	1	1	1	1
Exceeds Threshold (yes/no):	NO	NO	NO	NO	NO	NO	NO	NO	NO

Table A-11-1A: Project Emissions Summary for Diesel PM_{10} (Source A) - Operational Phase

Source A	Units	Change[1]
Haul Trucks and Water Trucks	tons/yr	-0.21
	lb/yr	-417
	(lb/hr)[2]	-0.17

Notes

1. To be conservative, worst case year for diesel PM_{10} was used (2019 is worst-case year, because it has the smallest decrease of all years).
2. Divide yearly emissions by 2,500 hours/yr (10 hours/day, 250 days/yr).

Table A-11-1B: Annual Average and Maximum Hourly Fugitive TAC Emissions by Source (B, C, D) - Operational Phase

Metal	Lab Results[1] Unpaved Road Dust (mg/kg)	Source B[2, 4]		Source C[3, 4]		Lab Results[1] Low Grade Limestone Process Material (mg/kg)	Source D[5, 4]	
		Ann. Avg. (lb/yr)	Max. Hr. (lb/hr)[7]	Ann. Avg. (lb/yr)	Max. Hr. (lb/hr)[7]		Ann. Avg. (lb/yr)	Max. Hr. (lb/hr)[7]
Antimony	0.50	1.93E-03	7.70E-07	1.30E-02	5.18E-06	0.25	1.21E-04	4.85E-08
Arsenic	7.50	2.89E-02	1.16E-05	1.94E-01	7.77E-05	5.98	2.88E-03	1.15E-06
Beryllium	0.15	5.78E-04	2.31E-07	3.89E-03	1.55E-06	0.24	1.18E-04	4.71E-08
Cadmium	1.05	4.04E-03	1.62E-06	2.72E-02	1.09E-05	1.16	5.60E-04	2.24E-07
Chromium VI	0.10	3.85E-04	1.54E-07	2.59E-03	1.04E-06	8.42	4.06E-03	1.62E-06
Copper	12.00	4.62E-02	1.85E-05	3.11E-01	1.24E-04	7.08	3.42E-03	1.37E-06
Chromium, total	0.10	3.85E-04	1.54E-07	2.59E-03	1.04E-06	0.10	4.82E-05	1.93E-08
Diesel Exhaust PM	-	-	-	-	-	-	-	-
Lead	76.00	2.93E-01	1.17E-04	1.97E+00	7.87E-04	120.00	5.79E-02	2.31E-05
Mercury	0.01	3.85E-05	1.54E-08	2.59E-04	1.04E-07	0.02	7.72E-06	3.09E-09
Nickel	7.60	2.93E-02	1.17E-05	1.97E-01	7.87E-05	9.85	4.75E-03	1.90E-06
Selenium	0.50	1.93E-03	7.70E-07	1.30E-02	5.18E-06	0.68	3.28E-04	1.31E-07
Vanadium	22.00	8.48E-02	3.39E-05	5.70E-01	2.28E-04	15.02	7.24E-03	2.90E-06
Zinc	76.50	2.95E-01	1.18E-04	1.98E+00	7.93E-04	73.00	3.52E-02	1.41E-05
Crystalline silica	1020.00	3.93E+00	1.57E-03	2.64E+01	1.06E-02	61000.00	2.94E+01	1.18E-02

Notes

1. Obtained from Comprehensive Emission Inventory Report (CEIR) for Mitsubishi Cement Corporation's Cushenbury Plant for 2014, Table 5.
2. Source B: Wind erosion from unpaved roads (24 hour source).
3. Source C: Dust entrainment from unpaved roads (10 hour sources).
4. Source D: Material handling from the seasonal stockpiles (10 hour sources).
5. To be conservative, worst case year for fugitive PM_{10} (2022) was used.
6. PM_{10} emissions shown in tons/yr.
7. Max hourly emissions calculated from 2,500 hours/yr.

Table A-11-2A: Cancer Risk by Receptor (MEIR, MEIW, Sensitive) and Source (A, B, C, D) - Operational Phase

Source	MEIR				MEIW				Sensitive			
	A	B	C	D	A	B	C	D	A	B	C	D
Antimony	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	0	4.31E-09	6.79E-10	9.45E-12	0	1.97E-10	3.58E-11	2.45E-13	0	8.24E-10	5.76E-10	7.88E-12
Beryllium	0	5.03E-12	7.96E-13	2.26E-14	0	6.11E-13	1.11E-13	1.56E-15	0	9.64E-13	6.75E-13	1.89E-14
Cadmium	0	6.28E-11	9.94E-12	1.92E-13	0	7.63E-12	1.39E-12	1.32E-14	0	1.20E-11	8.43E-12	1.60E-13
Chromium VI	0	3.56E-10	5.64E-11	8.27E-11	0	2.53E-11	4.60E-12	3.32E-12	0	6.82E-11	4.78E-11	6.90E-11
Copper	0	0	0	0	0	0	0	0	0	0	0	0
Chromium, total	0	0	0	0	0	0	0	0	0	0	0	0
Diesel Exhaust PM	-1.12E-08	0	0	0	-1.56E-09	0	0	0	-9.47E-09	0	0	0
Lead	0	1.80E-10	2.85E-11	7.84E-13	0	9.02E-12	1.64E-12	2.22E-14	0	3.45E-11	2.41E-11	6.54E-13
Mercury	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	0	2.76E-11	4.37E-12	9.86E-14	0	3.36E-12	6.11E-13	6.79E-15	0	5.29E-12	3.70E-12	8.23E-14
Selenium	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	0	0	0	0	0	0	0	0	0	0	0	0
Crystalline silica	0	0	0	0	0	0	0	0	0	0	0	0
Total:	-1.12E-08	4.94E-09	7.79E-10	9.33E-11	-1.56E-09	2.43E-10	4.42E-11	3.61E-12	-9.47E-09	9.46E-10	6.61E-10	7.78E-11

Notes

1. Source A: Haul and water trucks (10 hour source).
2. Source B: Wind erosion from unpaved roads (24 hour source).
3. Source C: Dust entrainment from unpaved roads (10 hour sources).
4. Source D: Material handling from the seasonal stockpiles (10 hour sources).
5. To be conservative, worst case year for fugitive PM_{10} (2022) and diesel PM_{10} (2019) was used.

Table A-11-2B: Chronic Non-Cancer Hazard Index by Receptor (MEIR, MEIW, Sensitive) and Source (A, B, C, D) - Operational Phase

Source	MEIR				MEIW				Sensitive			
	A	B	C	D	A	B	C	D	A	B	C	D
Antimony	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	0	3.26E-04	5.14E-05	7.15E-07	0	1.22E-04	2.22E-05	1.52E-07	0	6.24E-05	4.36E-05	5.96E-07
Beryllium	0	1.59E-07	2.52E-08	7.15E-10	0	1.85E-07	3.37E-08	4.70E-10	0	3.05E-08	2.13E-08	5.96E-10
Cadmium	0	7.69E-07	1.22E-07	2.35E-09	0	5.43E-07	9.89E-08	9.38E-10	0	1.47E-07	1.03E-07	1.96E-09
Chromium VI	0	9.04E-09	1.43E-09	2.10E-09	0	4.31E-09	7.84E-10	5.66E-10	0	1.73E-09	1.21E-09	1.75E-09
Copper	0	0	0	0	0	0	0	0	0	0	0	0
Chromium, total	0	0	0	0	0	0	0	0	0	0	0	0
Diesel Exhaust PM	0	0	0	0	0	0	0	0	0	0	0	0
Lead	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	0	9.53E-09	1.51E-09	4.21E-11	0	6.05E-09	1.10E-09	1.51E-11	0	1.82E-09	1.28E-09	3.51E-11
Nickel	0	4.03E-06	6.38E-07	1.44E-08	0	4.68E-06	8.52E-07	9.47E-09	0	7.72E-07	5.40E-07	1.20E-08
Selenium	0	3.64E-08	5.76E-09	1.36E-10	0	5.12E-09	9.33E-10	1.09E-11	0	6.96E-09	4.88E-09	1.13E-10
Vanadium	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	0	0	0	0	0	0	0	0	0	0	0	0
Crystalline silica	0	2.53E-06	3.99E-07	4.16E-07	0	2.93E-06	5.33E-07	2.73E-07	0	4.83E-07	3.38E-07	3.47E-07
Total:	0.00E+00	3.33E-04	5.26E-05	1.15E-06	0.00E+00	1.31E-04	2.37E-05	4.37E-07	0.00E+00	6.38E-05	4.46E-05	9.59E-07

Notes

1. Source A: Haul and water trucks (10 hour source).
2. Source B: Wind erosion from unpaved roads (24 hour source).
3. Source C: Dust entrainment from unpaved roads (10 hour sources).
4. Source D: Material handling from the seasonal stockpiles (10 hour sources).
5. To be conservative, worst case year for fugitive PM_{10} (2022) and diesel PM_{10} (2019) was used.

Table A-11-2C: Acute Non-Cancer Hazard Index by Receptor (MEIR, MEIW, Sensitive) and Source (A, B, C, D) - Operational Phase

Source	MEIR				MEIW				Sensitive			
	A	B	C	D	A	B	C	D	A	B	C	D
Antimony	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic	0	6.90E-04	6.22E-04	1.89E-05	0	8.46E-04	1.00E-03	8.61E-06	0	1.77E-04	4.26E-04	1.20E-05
Beryllium	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	0	0	0	0	0	0	0	0	0	0	0	0
Chromium VI	0	0	0	0	0	0	0	0	0	0	0	0
Copper	0	2.20E-06	1.99E-06	4.50E-08	0	2.70E-06	3.20E-06	2.05E-08	0	5.64E-07	1.36E-06	2.85E-08
Chromium, total	0	0	0	0	0	0	0	0	0	0	0	0
Diesel Exhaust PM	0	0	0	0	0	0	0	0	0	0	0	0
Lead	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	0	3.05E-07	2.78E-07	1.69E-08	0	3.74E-07	4.47E-07	7.72E-09	0	7.82E-08	1.90E-07	1.07E-08
Nickel	0	6.96E-04	6.30E-04	3.12E-05	0	8.53E-04	1.02E-03	1.42E-05	0	1.78E-04	4.31E-04	1.98E-05
Selenium	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium	0	1.34E-05	1.22E-05	3.18E-07	0	1.65E-05	1.96E-05	1.45E-07	0	3.44E-06	8.33E-06	2.01E-07
Zinc	0	0	0	0	0	0	0	0	0	0	0	0
Crystalline silica	0	0	0	0	0	0	0	0	0	0	0	0
Total:	0	1.40E-03	1.27E-03	5.05E-05	0	1.72E-03	2.04E-03	2.30E-05	0	3.59E-04	8.67E-04	3.20E-05

Notes

1. Source A: Haul and water trucks (10 hour source).
2. Source B: Wind erosion from unpaved roads (24 hour source).
3. Source C: Dust entrainment from unpaved roads (10 hour sources).
4. Source D: Material handling from the seasonal stockpiles (10 hour sources).
5. To be conservative, worst case year for fugitive PM_{10} (2022) and diesel PM_{10} (2019) was used.

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Table A-11-3: Total Cancer, Chronic, and Acute Risk by Receptor and Comparison with Health Risk Significance Thresholds - Operational Phase

	Cancer Risk			Chronic Hazard Index			Acute Hazard Index		
	MEIR	**MEIW**	**Sensitive**	**MEIR**	**MEIW**	**Sensitive**	**MEIR**	**MEIW**	**Sensitive**
Calculated Total	-5.37E-09	-1.27E-09	-7.79E-09	3.87E-04	1.55E-04	1.09E-04	2.72E-03	3.78E-03	1.26E-03
Risk Threshold	1.00E-05	1.00E-05	1.00E-05	1	1	1	1	1	1
Exceeds Threshold (yes/no):	NO	NO	NO	NO	NO	NO	NO	NO	NO

1. To be conservative, worst case year for fugitive PM_{10} (2022) and diesel PM_{10} (2019) was used.

Table A-12-1: Project Greenhouse Gas (GHG) Emissions Increase - Construction and Operational Phases

Parameter	2017	2018	2019	2020	2021	2022
	Construction Post-Project					
Off-road diesel vehicles for Constr Y1-Y2 (HP-hr/yr)	1,429,600	1,429,600	-	-	-	-
GHG emissions for Constr Y1-Y2 (MT/yr)	721	709	-	-	-	-
	Amortized Construction Project GHG Increase					
GHG emissions, amortized based on total for 2 years (MT/yr)	47.7	47.7	47.7	47.7	47.7	47.7
			Operational Baseline[1]			
Haul and water truck usage (HP-hr/yr)	-	-	4,656,161	4,656,161	4,591,642	4,591,642
Other trucks (HP-hr/yr)	-	-	3,236,250	3,236,250	3,236,250	3,236,250
Total HP-hr/yr	-	-	7,892,411	7,892,411	7,827,892	7,827,892
Total GHG emissions (MT/yr)	-	-	4,969	4,969	4,928	4,928
			Operational Post-Project			
Haul and water truck usage, operational (HP-hr/yr)	-	-	6,351,007	6,440,553	6,528,270	8,314,258
Other trucks, operational (HP-hr/yr)	-	-	3,236,250	3,236,250	3,236,250	3,236,250
Off-road diesel vehicles, operational (HP-hr/yr)	-	-	9,587,257	9,676,803	9,764,520	11,550,508
GHG emissions (MT/yr)	-	-	6,036	6,092	6,148	7,272
			Operational Project GHG Increase			
GHG emissions (MT/yr)	-	-	1,067	1,123	1,219	2,344
	Amortized Construction and Operational Project GHG Increase					
GHG emissions (MT/yr)	47.7	47.7	1,115	1,171	1,267	2,391
Significance Threshold (MT/yr)	10,000	10,000	10,000	10,000	10,000	10,000
Above Significance Threshold	NO	NO	NO	NO	NO	NO

Conversion Factors and Assumptions		
HP-hr =	2,545	BTU
Combustion efficiency =	30	%
CO_2 emission factor =	73.96	kg CO_2/MMBTU[2]
CH_4 emission factor =	3.0E-03	kg CO_2/MMBTU[2]
N_2O emission factor =	6.0E-04	kg CO_2/MMBTU[2]
CO_2 GWP =	1	
CH_4 GWP =	25	
N_2O GWP =	298	

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. Emission Factors and GWP values are from Title 40, Chapter I, Subchapter C, Part 98, Tables A-1, C-1, and C-2 for distillate fuel #2.

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Table A-13-1: Project Assumptions for Operational Phase (Without Mitigation)

West Pit	West Pit EIR	Baseline 2019	Baseline 2020	Baseline 2021	Baseline 2022
Throughput, limestone ore(tons/yr)	2,600,000	2,600,000	2,600,000	2,600,000	2,600,000
Throughput, waste rock (tons/yr)	300,000	300,000	300,000	300,000	300,000
Haul road length, limestone ore (mi)	1.7	1.7	1.7	1.7	1.7
Haul road length, waste rock (mi)	1.7	1.7	1.7	1.7	1.7
Cycle time, limestone ore (hrs)	0.35	0.35	0.35	0.35	0.35
Cycle time, waste rock (hrs)	0.35	0.35	0.35	0.35	0.35
Fleet composition[2]	4 - 777B 1 - 777D 0 - 777G	3 - 777B 1 - 777D 1 - 777G	3 - 777B 1 - 777D 1 - 777G	2 - 777B 1 - 777D 1 - 777G	2 - 777B 1 - 777D 1 - 777G

West Pit		Post-Project 2019	Post-Project 2020	Post-Project 2021	Post-Project 2022
Throughput, limestone ore (tons/yr)	-	1,742,000	1,742,000	1,742,000	1,300,000
Throughput, waste rock (tons/yr)	-	201,000	201,000	201,000	150,000
Haul road length, limestone ore (mi)	-	1.7	1.7	1.7	1.7
Haul road length, waste rock (mi)	-	1.7	1.7	1.7	1.7
Cycle time, limestone ore (hrs)	-	0.35	0.35	0.35	0.35
Cycle time, waste rock (hrs)	-	0.35	0.35	0.35	0.35
Fleet composition[2]	-	3 - 777B 1 - 777D 1 - 777G	3 - 777B 1 - 777D 1 - 777G	2 - 777B 1 - 777D 2 - 777G	2 - 777B 1 - 777D 1 - 777G
South Quarry		**2019**	**2020**	**2021**	**2022**
Throughput, limestone ore (tons/yr)	-	858,000	858,000	858,000	1,300,000
Throughput, waste rock (tons/yr)	-	99,000	99,000	99,000	150,000
Haul road length, limestone ore (mi)	-	2.5	2.7	2.9	4.0
Haul road length, waste rock (mi)	-	1.7	1.7	1.7	1.7
Cycle time, limestone ore (hrs)	-	0.63	0.66	0.69	0.88
Cycle time, waste rock (hrs)	-	0.35	0.35	0.35	0.35
Fleet composition[2,3]	-	3 - 777B 1 - 777D 2 - 777G	3 - 777B 1 - 777D 3 - 777G	2 - 777B 1 - 777D 4 - 777G	2 - 777B 1 - 777D 5 - 777G

Fraction of rock coming from South Quarry:	0.33	(for transitional years 2019-2021)
Fraction of rock coming from South Quarry:	0.50	(for 2022)

Haul Truck Capacity[2]		
777B	77	tons
777D	105	tons
777G	105	tons

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.

Table A-14-1A: Dust Entrainment Emissions Summary for 2019 Post-Project (Without Mitigation)

Truck[2]	Avg. Truck Weight (tons)	Tons/load	West Pit Hours/yr		South Quarry Hours/yr		West Pit Tons/yr[4]		South Quarry Tons/yr[4]		West Pit Trips/yr		South Quarry Trips/yr		West Pit VMT/yr[5]		South Quarry VMT/yr[5]	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Material	Waste	Material	Waste	Material	Waste	Material	Waste	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	1383	160	824	53	304,159	35,095	101,484	11,710	3,950	456	1,318	152	13,430	1,550	6,590	517
777B	113.5	77	1383	160	824	53	304,159	35,095	101,484	11,710	3,950	456	1,318	152	13,430	1,550	6,590	517
777B	113.5	77	1383	160	824	53	304,159	35,095	101,484	11,710	3,950	456	1,318	152	13,430	1,550	6,590	517
777D	127.5	105	1383	160	824	53	414,762	47,857	138,387	15,968	3,950	456	1,318	152	13,430	1,550	6,590	517
777G	127.5	105	1383	160	824	53	414,762	47,857	138,387	15,968	3,950	456	1,318	152	13,430	1,550	6,590	517
777Gd	127.5	105	0	0	1647	106	0	0	276,774	31,935	0	0	2,636	304	0	0	13,180	1,034
		Subtotal:	6,913	798	5,766	373	1,742,000	201,000	858,000	99,000	19,751	2,279	9,226	1,065	67,152	7,748	46,129	3,619
		Total:	7,710		6,139		1,943,000		957,000		22,029		10,290		74,900		49,748	

Section	# of trucks	Avg. Truck Weight (tons)[3]	Uncontrolled Ef (lb/VMT)[7]	Control Efficiency (%)[7]	Controlled Ef (lb/VMT)[7]	PM_{10} (tons/yr)
West Pit	5	120.5	4.21	87.0	0.55	20.6
South Quarry	6	127.5	4.21	87.0	0.55	13.7
					Total:	34.2

Equations

$$\frac{VMT}{yr} = \frac{Throughput(ton/yr)}{Capacity\ (ton/load)} * \frac{VMT}{trip}$$

$$Emisions\left(\frac{ton}{yr}\right) = \frac{VMT}{yr} * Controlled\ EF\left(\frac{lb}{VMT}\right) * \frac{1\ \text{ton}}{2000\ \text{lb}}$$

Assumptions[6]	
West Pit, limestone ore (mi)	1.7
West Pit, waste rock (mi)	1.7
South Quarry, limestone ore (mi)	2.5
South Quarry, waste rock (mi)	1.7
West Pit cycle time, limestone ore (hr)	0.35
West Pit cycle time, waste rock (hr)	0.35
South Quarry cycle time, limestone ore (h	0.63
South Quarry cycle time, waste rock (hr)	0.35
Capacity, 777B (ton/load)	77
Capacity, 777D (ton/load)	105
Capacity, 777G (ton/load)	105
Empty weight, haul truck (tons)	75

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. The entries indicate the model number of each haul truck in each year. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
3. As a conservative estimate for the emission factor, assume the heaviest average fleet truck weight (2022 post-project) for calculations.
4. Ton per year and fraction of rock hauled are from haul truck calculations (Tables A-15-1A through A-15-1D).
5. Trip is defined as 2*road length (there and back).
6. Refer to Table A-13-1 for truck inventory and mileage assumptions.
7. Refer to Table A-3-1 for uncontrolled EF, control efficiency, and controlled EF.

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Table A-14-1B: Dust Entrainment Emissions Summary for 2020 Post-Project (Without Mitigation)

Truck[2]	Avg. Truck Weight (tons)	Tons/load	West Pit Hours/yr		South Quarry Hours/yr		West Pit Tons/yr[4]		South Quarry Tons/yr[4]		West Pit Trips/yr		South Quarry Trips/yr		West Pit VMT/yr[5]		South Quarry VMT/yr[5]	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Material	Waste	Material	Waste	Material	Waste	Material	Waste	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	1383	160	657	40	304,159	35,095	76,732	8,854	3,950	456	997	115	13,430	1,550	5,381	391
777B	113.5	77	1383	160	657	40	304,159	35,095	76,732	8,854	3,950	456	997	115	13,430	1,550	5,381	391
777B	113.5	77	1383	160	657	40	304,159	35,095	76,732	8,854	3,950	456	997	115	13,430	1,550	5,381	391
777D	127.5	105	1383	160	657	40	414,762	47,857	104,634	12,073	3,950	456	997	115	13,430	1,550	5,381	391
777G	127.5	105	1383	160	657	40	414,762	47,857	104,634	12,073	3,950	456	997	115	13,430	1,550	5,381	391
777Gd	127.5	105	0	0	1313	80	0	0	209,268	24,146	0	0	1,993	230	0	0	10,762	782
777Gd	127.5	105	0	0	1313	80	0	0	209,268	24,146	0	0	1,993	230	0	0	10,762	782
		Subtotal:	6,913	798	5,910	362	1,742,000	201,000	858,000	99,000	19,751	2,279	8,969	1,035	67,152	7,748	48,431	3,518
		Total:	7,710		6,273		1,943,000		957,000		22,029		10,003		74,900		51,949	

Section	# of trucks	Avg. Truck Weight (tons)[3]	Uncontrolled Ef (lb/VMT)[7]	Control Efficiency (%)[7]	Controlled Ef (lb/VMT)[7]	PM_{10} (tons/yr)
West Pit	5	120.5	4.21	87.0	0.55	20.6
South Quarry	7	127.5	4.21	87.0	0.55	14.3
					Total:	34.8

Equations

$$\frac{VMT}{yr} = \frac{Throughput(ton/yr)}{Capacity\ (ton/load)} * \frac{VMT}{trip}$$

$$Emisions\left(\frac{ton}{yr}\right) = \frac{VMT}{yr} * Controlled\ EF\left(\frac{lb}{VMT}\right) * \frac{1\ \text{ton}}{2000\ \text{lb}}$$

Assumptions[6]	
West Pit, limestone ore (mi)	1.7
West Pit, waste rock (mi)	1.7
South Quarry, limestone ore (mi)	2.7
South Quarry, waste rock (mi)	1.7
West Pit cycle time, limestone ore (hr)	0.35
West Pit cycle time, waste rock (hr)	0.35
South Quarry cycle time, limestone ore (hr)	0.66
South Quarry cycle time, waste rock (hr)	0.35
Capacity, 777B (ton/load)	77
Capacity, 777D (ton/load)	105
Capacity, 777G (ton/load)	105
Empty weight, haul truck (tons)	75

Notes
1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. The entries indicate the model number of each haul truck in each year. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
3. As a conservative estimate for the emission factor, assume the heaviest average fleet truck weight (2022 post-project) for calculations.
4. Ton per year and fraction of rock hauled are from haul truck calculations (Tables A-15-1A through A-15-1D).
5. Trip is defined as 2*road length (there and back).
6. Refer to Table A-13-1 for truck inventory and mileage assumptions.
7. Refer to Table A-3-1 for uncontrolled EF, control efficiency, and controlled EF.

Table A-14-1C: Dust Entrainment Emissions Summary for 2021 Post-Project (Without Mitigation)

Truck[2]	Avg. Truck Weight (tons)	Tons/load	West Pit Hours/yr		South Quarry Hours/yr		West Pit Tons/yr[4]		South Quarry Tons/yr[4]		West Pit Trips/yr		South Quarry Trips/yr		West Pit VMT/yr[5]		South Quarry VMT/yr[5]	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Material	Waste	Material	Waste	Material	Waste	Material	Waste	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	1300	150	666	39	286,000	33,000	74,315	8,575	3,714	429	965	111	12,629	1,457	5,598	379
777B	113.5	77	1300	150	666	39	286,000	33,000	74,315	8,575	3,714	429	965	111	12,629	1,457	5,598	379
777D	127.5	105	1300	150	666	39	390,000	45,000	101,339	11,693	3,714	429	965	111	12,629	1,457	5,598	379
777G	127.5	105	1300	150	666	39	390,000	45,000	101,339	11,693	3,714	429	965	111	12,629	1,457	5,598	379
777G	127.5	105	1300	150	666	39	390,000	45,000	101,339	11,693	3,714	429	965	111	12,629	1,457	5,598	379
777Gd	127.5	105	0	0	1332	78	0	0	202,677	23,386	0	0	1,930	223	0	0	11,196	757
777Gd	127.5	105	0	0	1332	78	0	0	202,677	23,386	0	0	1,930	223	0	0	11,196	757
		Subtotal:	6,500	750	5,993	351	1,742,000	201,000	858,000	99,000	18,571	2,143	8,686	1,002	63,143	7,286	50,380	3,408
		Total:	7,250		6,344		1,943,000		957,000		20,714		9,688		70,429		53,787	

Section	# of trucks	Avg. Truck Weight (tons)[3]	Uncontrolled Ef (lb/VMT)[7]	Control Efficiency (%)[7]	Controlled Ef (lb/VMT)[7]	PM_{10} (tons/yr)
West Pit	5	120.5	4.21	87.0	0.55	19.3
South Quarry	7	127.5	4.21	87.0	0.55	14.8
					Total:	34.1

Equations

$$\frac{VMT}{yr} = \frac{Throughput\,(ton/yr)}{Capacity\ (ton/load)} * \frac{VMT}{trip}$$

$$Emisions\left(\frac{ton}{yr}\right) = \frac{VMT}{yr} * Controlled\ EF\left(\frac{lb}{VMT}\right) * \frac{1\text{ ton}}{2000\text{ lb}}$$

Assumptions[6]	
West Pit, limestone ore (mi)	1.7
West Pit, waste rock (mi)	1.7
South Quarry, limestone ore (mi)	2.9
South Quarry, waste rock (mi)	1.7
West Pit cycle time, limestone ore (hr)	0.35
West Pit cycle time, waste rock (hr)	0.35
South Quarry cycle time, limestone ore (hr)	0.69
South Quarry cycle time, waste rock (hr)	0.35
Capacity, 777B (ton/load)	77
Capacity, 777D (ton/load)	105
Capacity, 777G (ton/load)	105
Empty weight, haul truck (tons)	75

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. The entries indicate the model number of each haul truck in each year. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
3. As a conservative estimate for the emission factor, assume the heaviest average fleet truck weight (2022 post-project) for calculations.
4. Ton per year and fraction of rock hauled are from haul truck calculations (Tables A-15-1A through A-15-1D).
5. Trip is defined as 2*road length (there and back).
6. Refer to Table A-13-1 for truck inventory and mileage assumptions.
7. Refer to Table A-3-1 for uncontrolled EF, control efficiency, and controlled EF.

Table A-14-1D: Dust Entrainment Emissions Summary for 2022 Post-Project (Without Mitigation)

Truck[2]	Avg. Truck Weight (tons)	Tons/load	West Pit Hours/yr		South Quarry Hours/yr		West Pit Tons/yr[4]		South Quarry Tons/yr[4]		West Pit Trips/yr		South Quarry Trips/yr		West Pit VMT/yr[5]		South Quarry VMT/yr[5]	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Material	Waste	Material	Waste	Material	Waste	Material	Waste	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	1250	144	950	44	275,000	31,731	83,140	9,593	3,571	412	1,080	125	12,143	1,401	8,638	424
777B	113.5	77	1250	144	950	44	275,000	31,731	83,140	9,593	3,571	412	1,080	125	12,143	1,401	8,638	424
777D	127.5	105	1250	144	950	44	375,000	43,269	113,372	13,081	3,571	412	1,080	125	12,143	1,401	8,638	424
777G	127.5	105	1250	144	950	44	375,000	43,269	113,372	13,081	3,571	412	1,080	125	12,143	1,401	8,638	424
777Gd	127.5	105	0	0	1900	87	0	0	226,744	26,163	0	0	2,159	249	0	0	17,276	847
777Gd	127.5	105	0	0	1900	87	0	0	226,744	26,163	0	0	2,159	249	0	0	17,276	847
777Gd	127.5	105	0	0	1900	87	0	0	226,744	26,163	0	0	2,159	249	0	0	17,276	847
777Gd	127.5	105	0	0	1900	87	0	0	226,744	26,163	0	0	2,159	249	0	0	17,276	847
		Subtotal:	5,000	577	11,402	523	1,300,000	150,000	1,300,000	150,000	14,286	1,648	12,957	1,495	48,571	5,604	103,654	5,083
		Total:	5,577		11,925		1,450,000		1,450,000		15,934		14,452		54,176		108,738	

Section	# of trucks	Avg. Truck Weight (tons)[3]	Uncontrolled Ef (lb/VMT)[7]	Control Efficiency (%)[7]	Controlled Ef (lb/VMT)[7]	PM_{10} (tons/yr)
West Pit	4	120.5	4.21	87.0	0.55	14.9
South Quarry	8	127.5	4.21	87.0	0.55	29.9
					Total:	44.7

Equations

$$\frac{VMT}{yr} = \frac{Throughput\,(ton/yr)}{Capacity\,(ton/load)} * \frac{VMT}{trip}$$

$$Emisions\left(\frac{ton}{yr}\right) = \frac{VMT}{yr} * Controlled\ EF\left(\frac{lb}{VMT}\right) * \frac{1\text{ ton}}{2000\text{ lb}}$$

Assumptions[6]	
West Pit, limestone ore (mi)	1.7
West Pit, waste rock (mi)	1.7
South Quarry, limestone ore (mi)	4.0
South Quarry, waste rock (mi)	1.7
West Pit cycle time, limestone ore (hr)	0.35
West Pit cycle time, waste rock (hr)	0.35
South Quarry cycle time, limestone ore (hr)	0.88
South Quarry cycle time, waste rock (hr)	0.35
Capacity, 777B (ton/load)	77
Capacity, 777D (ton/load)	105
Capacity, 777G (ton/load)	105
Empty weight, haul truck (tons)	75

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. The entries indicate the model number of each haul truck in each year. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
3. As a conservative estimate for the emission factor, assume the heaviest average fleet truck weight (2022 post-project) for calculations.
4. Ton per year and fraction of rock hauled are from haul truck calculations (Tables A-15-1A through A-15-1D).
5. Trip is defined as 2*road length (there and back).
6. Refer to Table A-13-1 for truck inventory and mileage assumptions.
7. Refer to Table A-3-1 for uncontrolled EF, control efficiency, and controlled EF.

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Table A-14-2: Dust Entrainment Emissions Summary (2019-2022) (Without Mitigation)

Parameter	2019	2020	2021	2022	Notes
South Quarry haul road length (mi)	2.5	2.7	2.9	4.0	
South Quarry haul road length (ft)	13,200	14,256	15,312	21,120	
Dust entrainment, baseline[1,2,3]					
Haul Trucks					
West Pit miles traveled: Haul Trucks (VMT/yr)	111,791	111,791	108,352	108,352	Calculated according to baseline haul truck fleet
West Pit uncontrolled emission factor (lb/VMT)	4.21	4.21	4.21	4.21	
Control efficiency (%)	87.0	87.0	87.0	87.0	
West Pit controlled emission factor (lb/VMT)	0.55	0.55	0.55	0.55	
West Pit Haul Truck emissions (tons/yr)	**30.71**	**30.71**	**29.76**	**29.76**	
Water Trucks					
West Pit miles traveled (VMT/yr)	6,800	6,800	6,800	6,800	Calculated according to water truck fleet
West Pit uncontrolled emission factor (lb/VMT)	4.21	4.21	4.21	4.21	
Control efficiency (%)	0.97	0.97	0.97	0.97	
West Pit controlled emission factor (lb/VMT)	0.11	0.11	0.11	0.11	
West Pit emissions (tons/yr)	**0.37**	**0.37**	**0.37**	**0.37**	
Dust entrainment - Post-Project[2,3]					
Haul Trucks					
West Pit miles traveled (VMT/yr), calculated	74,900	74,900	70,429	54,176	Calculated according to haul truck fleet
West Pit uncontrolled emission factor (lb/VMT)	4.21	4.21	4.21	4.21	
Control efficiency (%)	87.0	87.0	87.0	87.0	
West Pit controlled emission factor (lb/VMT)	0.55	0.55	0.55	0.55	
West Pit Haul Truck emissions (tons/yr)	**20.57**	**20.57**	**19.35**	**14.88**	
South Quarry miles traveled (VMT/yr)	49,748	51,949	53,787	108,738	Throughput includes waste rock transport
South Quarry uncontrolled emission factor (lb/VMT)	4.21	4.21	4.21	4.21	Same as the unmitigated uncontrolled emission factor for the west pit
Control efficiency (%)	87.0	87.0	87.0	87.0	
South Quarry controlled emission factor (lb/VMT)	0.55	0.55	0.55	0.55	
South Quarry Haul Truck emissions (tons/yr)	**13.66**	**14.27**	**14.77**	**29.87**	
Water Trucks					
West Pit miles traveled (VMT/yr), calculated	6,800	6,800	6,800	6,800	Calculated according to water truck fleet
West Pit uncontrolled emission factor (lb/VMT)	4.21	4.21	4.21	4.21	
Control efficiency (%)	0.97	0.97	0.97	0.97	
West Pit controlled emission factor (lb/VMT)	0.11	0.11	0.11	0.11	
West Pit Water Truck emissions (tons/yr)	**0.37**	**0.37**	**0.37**	**0.37**	
South Quarry miles traveled (VMT/yr)	11,250	12,150	13,050	18,000	
South Quarry uncontrolled emission factor (lb/VMT)	4.21	4.21	4.21	4.21	
Control efficiency (%)	0.97	0.97	0.97	0.97	
South Quarry controlled emission factor (lb/VMT)	0.11	0.11	0.11	0.11	
South Quarry Water Truck emissions (tons/yr)	**0.62**	**0.67**	**0.72**	**0.99**	
Summary					
Total post-project Haul Truck miles traveled (VMT/yr)	124,649	126,849	124,216	162,913	
Total post-project Haul Truck emissions (tons/yr)	**34.24**	**34.84**	**34.12**	**44.75**	
Haul Truck Increase relative to baseline (VMT/yr)	12,857	15,058	15,864	54,562	
Haul Truck Increase relative to baseline (tons/yr)	**3.53**	**4.14**	**4.36**	**14.99**	
Total post-project Water Truck miles traveled (VMT/yr)	18,050	18,950	19,850	24,800	
Total post-project Water Truck emissions (tons/yr)	**0.99**	**1.04**	**1.09**	**1.36**	
Water Truck Increase relative to baseline (VMT/yr)	11,250	12,150	13,050	18,000	
Water Truck Increase relative to baseline (tons/yr)	**0.62**	**0.67**	**0.72**	**0.99**	

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. 2019-2022 Haul Truck Baseline references A-3-2A through A-3-2D respectively, and the 2019-2022 Haul Truck Post-Project references A-14-1A through A-14-1D respectively.
3. 2019 and 2022 Water Truck Baseline and Post-Project reference A-3-2I.

Table A-15-1A: Haul Truck Emissions Calculations for 2019 Post-Project (Without Mitigation)

Truck[1,2]	Avg. Truck Weight (tons)	Capacity (Tons/load)	West Pit Hours/yr		South Quarry Hours/yr		West Pit HP-hr/yr		South Quarry HP-hr/yr	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	1383	160	824	53	457,068	52,739	272,326	17,596
777B	113.5	77	1383	160	824	53	457,068	52,739	272,326	17,596
777B	113.5	77	1383	160	824	53	457,068	52,739	272,326	17,596
777D	127.5	105	1383	160	824	53	525,365	60,619	313,018	20,226
777G	127.5	105	1383	160	824	53	537,974	62,074	320,531	20,711
777Gd	127.5	105	0	0	1647	106	0	0	641,062	41,422
		Subtotal:	6,913	798	5,766	373	2,434,542	280,909	2,091,589	135,149
		Total:	7,710		6,139		2,715,450		2,226,738	

Truck[1,2]	Total HP-hr/yr	Emission Factor (g/HP-hr)[3]					Emissions (tons/yr)				
		NOx	VOC	CO	PM_{10}	SOx	NOx	VOC	CO	PM_{10}	SOx
777B	799,729	11.30	0.74	4.61	0.51	0.0059	9.97	0.65	4.07	0.45	0.0052
777B	799,729	11.30	0.74	4.61	0.51	0.0059	9.97	0.65	4.07	0.45	0.0052
777B	799,729	11.30	0.74	4.61	0.51	0.0059	9.97	0.65	4.07	0.45	0.0052
777D	919,228	8.56	0.60	3.04	0.31	0.0059	8.67	0.61	3.08	0.32	0.0060
777G	941,290	2.73	0.12	2.94	0.034	0.0059	2.84	0.13	3.05	0.035	0.0062
777Gd	682,484	2.73	0.12	2.94	0.034	0.0059	2.06	0.09	2.21	0.026	0.0045
Total:	4,942,188					**Total:**	43.46	2.78	20.53	1.73	0.032

Equations

$$\frac{Hrs}{yr} = \frac{fraction\ of\ rock\ hauled * Throughput\ (tpy)}{Capacity\ (\frac{tons}{load})} * cycle\ time\ (\frac{hr}{trip})$$

$$fraction\ of\ rock\ hauled = \frac{fraction\ of\ trips * truck\ capacity}{\sum fraction\ of\ trips * truck\ capacity}$$

$$Emissions\ \left(\frac{tons}{yr}\right) = Usage\ \left(\frac{HP-hr}{yr}\right) * EF\ \left(\frac{g}{HP-hr}\right) * \frac{1\ ton}{907184.74\ g}$$

$$Usage\ \left(\frac{HP-hr}{yr}\right) = Operating\ hours\ \left(\frac{hr}{yr}\right) * HP * Load\ Factor$$

Assumptions	West Pit	South Quarry
Throughput, Limestone Ore[4] (tpy)	1,742,000	858,000
Throughput, Waste Rock[4] (tpy)	201,000	99,000
Limestone Ore road length (mi)	1.7	2.5
Waste Rock road length (mi)	1.7	1.7
Cycle time, Limestone Ore (hr)	0.35	0.63
Cycle time, Waste Rock (hr)	0.35	0.35
Fraction of haul truck trips, 777B	0.60	0.43
Fraction of haul truck trips, 777D	0.20	0.14
Fraction of haul truck trips, 777G	0.20	0.14
Fraction of haul truck trips, 777Gd	0.00	0.29
Fraction of rock hauled, 777B	0.52	0.35
Fraction of rock hauled, 777D	0.24	0.16
Fraction of rock hauled, 777G	0.24	0.16
Fraction of rock hauled, 777Gd	0.00	0.32
Capacity, 777B (tons/load)	77	77
Capacity, 777D (tons/load)	105	105
Capacity, 777G (tons/load)	105	105
Capacity, 777Gd (tons/load)	105	105
HP, 777B	870	870
HP, 777D	1000	1000
HP, 777G	1024	1024
Load factor (same for all 777 units)	0.38	0.38
Empty weight, haul truck (tons)	75	75

Notes
1. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
2. 777Gd represents 777G Trucks that are dedicated to the South Quarry; they have 5 times more trips to the South Quarry than the other trucks.
3. See Table A-6-1 for Emission Factors.
4. See Table A-13-1 for Throughputs.

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Table A-15-1B: Haul Truck Emissions Calculations for 2020 Post-Project (Without Mitigation)

Truck[1,2]	Avg. Truck Weight (tons)	Capacity (Tons/load)	West Pit Hours/yr		South Quarry Hours/yr		West Pit HP-hr/yr		South Quarry HP-hr/yr	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	1383	160	657	40	457,068	52,739	217,106	13,305
777B	113.5	77	1383	160	657	40	457,068	52,739	217,106	13,305
777B	113.5	77	1383	160	657	40	457,068	52,739	217,106	13,305
777D	127.5	105	1383	160	657	40	525,365	60,619	249,547	15,293
777G	127.5	105	1383	160	657	40	537,974	62,074	255,537	15,660
777Gd	127.5	105	0	0	1313	80	0	0	511,073	31,319
777Gd	127.5	105	0	0	1313	80	0	0	511,073	31,319
		Subtotal:	6,913	798	5,910	362	2,434,542	280,909	2,178,549	133,505
		Total:	7,710		6,273		2,715,450		2,312,054	

Truck[1,2]	Total HP-hr/yr	Emission Factor (g/HP-hr)[3] NOx	VOC	CO	PM_{10}	SOx	Emissions (tons/yr) NOx	VOC	CO	PM_{10}	SOx
777B	740,217	11.30	0.74	4.61	0.51	0.0059	9.22	0.60	3.76	0.42	0.0048
777B	740,217	11.30	0.74	4.61	0.51	0.0059	9.22	0.60	3.76	0.42	0.0048
777B	740,217	11.30	0.74	4.61	0.51	0.0059	9.22	0.60	3.76	0.42	0.0048
777D	850,824	8.56	0.60	3.04	0.31	0.0059	8.03	0.56	2.85	0.29	0.0056
777G	871,244	2.73	0.12	2.94	0.034	0.0059	2.63	0.12	2.82	0.033	0.0057
777Gd	542,393	2.73	0.12	2.94	0.034	0.0059	1.63	0.07	1.76	0.020	0.0035
777Gd	542,393	2.73	0.12	2.94	0.034	0.0059	1.63	0.07	1.76	0.020	0.0035
Total:	5,027,505					**Total:**	41.59	2.64	20.47	1.62	0.033

Equations

$$\frac{Hrs}{yr} = \frac{fraction\ of\ rock\ hauled * Throughput\ (tpy)}{Capacity\ (\frac{tons}{load})} * cycle\ time\ (\frac{hr}{trip})$$

$$fraction\ of\ rock\ hauled = \frac{fraction\ of\ trips * truck\ capacity}{\sum fraction\ of\ trips * truck\ capacity}$$

$$Emissions\ \left(\frac{tons}{yr}\right) = Usage\ \left(\frac{HP-hr}{yr}\right) * EF\left(\frac{g}{HP-hr}\right) * \frac{1\ ton}{907184.74\ g}$$

$$Usage\ \left(\frac{HP-hr}{yr}\right) = Operating\ hours\ \left(\frac{hr}{yr}\right) * HP * Load\ Factor$$

Assumptions	West Pit	South Quarry
Throughput, Limestone Ore[4] (tpy)	1,742,000	858,000
Throughput, Waste Rock[4] (tpy)	201,000	99,000
Limestone Ore road length (mi)	1.7	2.7
Waste Rock road length (mi)	1.7	1.7
Cycle time, Limestone Ore (hr)	0.35	0.66
Cycle time, Waste Rock (hr)	0.35	0.35
Fraction of haul truck trips, 777B	0.60	0.33
Fraction of haul truck trips, 777D	0.20	0.11
Fraction of haul truck trips, 777G	0.20	0.11
Fraction of haul truck trips, 777Gd	0.00	0.44
Fraction of rock hauled, 777B	0.52	0.27
Fraction of rock hauled, 777D	0.24	0.12
Fraction of rock hauled, 777G	0.24	0.12
Fraction of rock hauled, 777Gd	0.00	0.49
Capacity, 777B (tons/load)	77	77
Capacity, 777D (tons/load)	105	105
Capacity, 777G (tons/load)	105	105
Capacity, 777Gd (tons/load)	105	105
HP, 777B	870	870
HP, 777D	1000	1000
HP, 777G	1024	1024
Load factor (same for all 777 units)	0.38	0.38
Empty weight, haul truck (tons)	75	75

Notes
1. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
2. 777Gd represents 777G Trucks that are dedicated to the South Quarry; they have 5 times more trips to the South Quarry than the other trucks.
3. See Table A-6-1 for Emission Factors.
4. See Table A-13-1 for Throughputs.

Table A-15-1C: Haul Truck Emissions Calculations for 2021 Post-Project (Without Mitigation)

Truck[1,2]	Avg. Truck Weight (tons)	Capacity (Tons/load)	West Pit Hours/yr		South Quarry Hours/yr		West Pit HP-hr/yr		South Quarry HP-hr/yr	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	1300	150	666	39	429,780	49,590	220,160	12,886
777B	113.5	77	1300	150	666	39	429,780	49,590	220,160	12,886
777D	127.5	105	1300	150	666	39	494,000	57,000	253,057	14,811
777G	127.5	105	1300	150	666	39	505,856	58,368	259,130	15,166
777G	127.5	105	1300	150	666	39	505,856	58,368	259,130	15,166
777Gd	127.5	105	0	0	1332	78	0	0	518,261	30,333
777Gd	127.5	105	0	0	1332	78	0	0	518,261	30,333
		Subtotal:	6,500	750	5,993	351	2,365,272	272,916	2,248,158	131,581
		Total:	7,250		6,344		2,638,188		2,379,739	

Truck[1,2]	Total HP-hr/yr	Emission Factor (g/HP-hr)[3]					Emissions (tons/yr)				
		NOx	VOC	CO	PM_{10}	SOx	NOx	VOC	CO	PM_{10}	SOx
777B	712,415	11.30	0.74	4.61	0.51	0.0059	8.88	0.58	3.62	0.40	0.0047
777B	712,415	11.30	0.74	4.61	0.51	0.0059	8.88	0.58	3.62	0.40	0.0047
777D	818,868	8.56	0.60	3.04	0.31	0.0059	7.73	0.54	2.74	0.28	0.0054
777G	838,521	2.73	0.12	2.94	0.034	0.0059	2.53	0.12	2.71	0.032	0.0055
777G	838,521	2.73	0.12	2.94	0.034	0.0059	2.53	0.12	2.71	0.032	0.0055
777Gd	548,594	2.73	0.12	2.94	0.034	0.0059	1.65	0.08	1.78	0.021	0.0036
777Gd	548,594	2.73	0.12	2.94	0.034	0.0059	1.65	0.08	1.78	0.021	0.0036
Total:	5,017,927					**Total:**	33.84	2.08	18.97	1.19	0.033

Equations

$$\frac{Hrs}{yr} = \frac{fraction\ of\ rock\ hauled * Throughput\ (tpy)}{Capacity\ (\frac{tons}{load})} * cycle\ time\ (\frac{hr}{trip})$$

$$fraction\ of\ rock\ hauled = \frac{fraction\ of\ trips * truck\ capacity}{\sum fraction\ of\ trips * truck\ capacity}$$

$$Emissions\ \left(\frac{tons}{yr}\right) = Usage\ \left(\frac{HP-hr}{yr}\right) * EF\ \left(\frac{g}{HP-hr}\right) * \frac{1\ ton}{907184.74\ g}$$

$$Usage\ \left(\frac{HP-hr}{yr}\right) = Operating\ hours\ \left(\frac{hr}{yr}\right) * HP * Load\ Factor$$

Assumptions	West Pit	South Quarry
Throughput, Limestone Ore[4] (tpy)	1,742,000	858,000
Throughput, Waste Rock[4] (tpy)	201,000	99,000
Limestone Ore road length (mi)	1.7	2.9
Waste Rock road length (mi)	1.7	1.7
Cycle time, Limestone Ore (hr)	0.35	0.69
Cycle time, Waste Rock (hr)	0.35	0.35
Fraction of haul truck trips, 777B	0.40	0.22
Fraction of haul truck trips, 777D	0.20	0.11
Fraction of haul truck trips, 777G	0.40	0.22
Fraction of haul truck trips, 777Gd	0.00	0.44
Fraction of rock hauled, 777B	0.33	0.17
Fraction of rock hauled, 777D	0.22	0.12
Fraction of rock hauled, 777G	0.45	0.24
Fraction of rock hauled, 777Gd	0.00	0.47
Capacity, 777B (tons/load)	77	77
Capacity, 777D (tons/load)	105	105
Capacity, 777G (tons/load)	105	105
Capacity, 777Gd (tons/load)	105	105
HP, 777B	870	870
HP, 777D	1000	1000
HP, 777G	1024	1024
Load factor (same for all 777 units)	0.38	0.38
Empty weight, haul truck (tons)	75	75

Notes
1. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
2. 777Gd represents 777G Trucks that are dedicated to the South Quarry; they have 5 times more trips to the South Quarry than the other trucks.
3. See Table A-6-1 for Emission Factors.
4. See Table A-13-1 for Throughputs.

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Table A-15-1D: Haul Truck Emissions Calculations for 2022 Post-Project (Without Mitigation)

Truck[1,2]	Avg. Truck Weight (tons)	Capacity (Tons/load)	West Pit Hours/yr		South Quarry Hours/yr		West Pit HP-hr/yr		South Quarry HP-hr/yr	
			Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock	Limestone Ore	Waste Rock
777B	113.5	77	1250	144	950	44	413,250	47,683	314,125	14,416
777B	113.5	77	1250	144	950	44	413,250	47,683	314,125	14,416
777D	127.5	105	1250	144	950	44	475,000	54,808	361,063	16,570
777G	127.5	105	1250	144	950	44	486,400	56,123	369,729	16,967
777Gd	127.5	105	0	0	1900	87	0	0	739,457	33,935
777Gd	127.5	105	0	0	1900	87	0	0	739,457	33,935
777Gd	127.5	105	0	0	1900	87	0	0	739,457	33,935
777Gd	127.5	105	0	0	1900	87	0	0	739,457	33,935
		Subtotal:	5,000	577	11,402	523	1,787,900	206,296	4,316,871	198,108
		Total:	5,577		11,925		1,994,196		4,514,979	

Truck[1,2]	Total HP-hr/yr	Emission Factor (g/HP-hr)[3]					Emissions (tons/yr)				
		NOx	VOC	CO	PM_{10}	SOx	NOx	VOC	CO	PM_{10}	SOx
777B	789,473	11.30	0.74	4.61	0.509	0.0059	9.84	0.64	4.01	0.44	0.0052
777B	789,473	11.30	0.74	4.61	0.509	0.0059	9.84	0.64	4.01	0.443	0.0052
777D	907,441	8.56	0.60	3.04	0.314	0.0059	8.56	0.60	3.04	0.314	0.0059
777G	929,219	2.73	0.12	2.94	0.034	0.0059	2.80	0.13	3.01	0.035	0.0061
777Gd	773,392	2.73	0.12	2.94	0.034	0.0059	2.33	0.11	2.50	0.029	0.0051
777Gd	773,392	2.73	0.12	2.94	0.034	0.0059	2.33	0.11	2.50	0.029	0.0051
777Gd	773,392	2.73	0.12	2.94	0.034	0.0059	2.33	0.11	2.50	0.029	0.0051
777Gd	773,392	2.73	0.12	2.94	0.034	0.0059	2.33	0.11	2.50	0.029	0.0051
Total:	4,930,228					**Total:**	40.36	2.43	24.09	1.35	0.043

Equations

$$\frac{Hrs}{yr} = \frac{fraction\ of\ rock\ hauled * Throughput\ (tpy)}{Capacity\ (\frac{tons}{load})} * cycle\ time\ (\frac{hr}{trip})$$

$$fraction\ of\ rock\ hauled = \frac{fraction\ of\ trips * truck\ capacity}{\sum fraction\ of\ trips * truck\ capacity}$$

$$Emissions\ \left(\frac{tons}{yr}\right) = Usage\ \left(\frac{HP-hr}{yr}\right) * EF\ \left(\frac{g}{HP-hr}\right) * \frac{1\ ton}{907184.74\ g}$$

$$Usage\ \left(\frac{HP-hr}{yr}\right) = Operating\ hours\ \left(\frac{hr}{yr}\right) * HP * Load\ Factor$$

Assumptions	West Pit	South Quarry
Throughput, Limestone Ore[4] (tpy)	1,300,000	1,300,000
Throughput, Waste Rock[4] (tpy)	150,000	150,000
Limestone Ore road length (mi)	1.7	4.0
Waste Rock road length (mi)	1.7	1.7
Cycle time, Limestone Ore (hr)	0.35	0.88
Cycle time, Waste Rock (hr)	0.35	0.35
Fraction of haul truck trips, 777B	0.50	0.17
Fraction of haul truck trips, 777D	0.25	0.08
Fraction of haul truck trips, 777G	0.25	0.08
Fraction of haul truck trips, 777Gd	0.00	0.67
Fraction of rock hauled, 777B	0.42	0.13
Fraction of rock hauled, 777D	0.29	0.09
Fraction of rock hauled, 777G	0.29	0.09
Fraction of rock hauled, 777Gd	0.00	0.70
Capacity, 777B (tons/load)	77	77
Capacity, 777D (tons/load)	105	105
Capacity, 777G (tons/load)	105	105
Capacity, 777Gd (tons/load)	105	105
HP, 777B	870	870
HP, 777D	1000	1000
HP, 777G	1024	1024
Load factor (same for all 777 units)	0.38	0.38
Empty weight, haul truck (tons)	75	75

Notes

1. 777B, 777D, and 777G are Caterpillar haul truck models meeting Tier 0, Tier 2, and Tier 4 standards, respectively, under the ARB off-road diesel rule.
2. 777Gd represents 777G Trucks that are dedicated to the South Quarry; they have 5 times more trips to the South Quarry than the other trucks.
3. See Table A-6-1 for Emission Factors.
4. See Table A-13-1 for Throughputs.

Table A-15-2: Haul Truck Emissions Summary by Year (2019-2022) (Without Mitigation)

Project Year	2019	2020	2021	2022
Baseline[1]				
Truck Usage (HP-hr/yr)	4,052,911	4,052,911	3,988,392	3,988,392
NOx Emissions (tons/yr)	39.39	39.39	36.24	36.24
VOC Emissions (tons/yr)	2.56	2.56	2.35	2.35
CO Emissions (tons/yr)	17.43	17.43	16.43	16.43
PM_{10} Emissions (tons/yr)	1.62	1.62	1.44	1.44
SOx Emissions (tons/yr)	0.026	0.026	0.026	0.026
Post-Project				
Truck Usage (HP-hr/yr)	4,942,188	5,027,505	5,017,927	6,509,175
NOx Emissions (tons/yr)	43.46	41.59	33.84	40.36
VOC Emissions (tons/yr)	2.78	2.64	2.08	2.43
CO Emissions (tons/yr)	20.53	20.47	18.97	24.09
PM_{10} Emissions (tons/yr)	1.73	1.62	1.19	1.35
SOx Emissions (tons/yr)	0.032	0.033	0.033	0.043
Project Change				
Truck Usage (HP-hr/yr)	889,277	974,594	1,029,534	2,520,783
NOx Emissions (tons/yr)	4.07	2.20	-2.40	4.12
VOC Emissions (tons/yr)	0.22	0.08	-0.27	0.09
CO Emissions (tons/yr)	3.10	3.04	2.53	7.65
PM_{10} Emissions (tons/yr)	0.11	0.00	-0.26	-0.09
SOx Emissions (tons/yr)	0.0058	0.0064	0.0067	0.016

Notes
1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.

Table A-16-1: Project Emissions Summary for $PM_{2.5}$ and PM_{10} by Year (2019-2022) (Without Mitigation)

Emissions Source	2019	2020	2021	2022
PM_{10} (tons/yr)				
Dust entrainment from haul trucks[1]	3.53	4.14	4.36	14.99
Dust entrainment from water trucks[1]	0.62	0.67	0.72	0.99
Wind erosion from unpaved roads[2]	0.96	1.09	1.22	1.93
Seasonal stockpile- material handling[3]	0.16	0.16	0.16	0.24
Haul truck exhaust[4]	0.11	0.00	-0.26	-0.09
Water truck exhaust[5]	0.06	0.07	0.08	0.11
Total emissions increase due to project	5.4	6.1	6.3	18.2
Above PM_{10} threshold (15 tons/yr):	NO	NO	NO	YES
$PM_{2.5}$ (tons/yr)[6]				
Dust entrainment from haul trucks	0.35	0.41	0.44	1.50
Dust entrainment from water trucks	0.06	0.07	0.07	0.10
Wind erosion from unpaved roads	0.14	0.16	0.18	0.29
Seasonal stockpile material handling	0.04	0.04	0.04	0.07
Haul truck exhaust	0.11	0.00	-0.25	-0.09
Water truck exhaust	0.06	0.07	0.08	0.11
Total emissions change due to project	0.77	0.75	0.56	1.98
Above $PM_{2.5}$ threshold (12 tons/yr):	NO	NO	NO	NO

Notes
1. See Table A-14-2 for dust entrainment summary.
2. See Table A-4-2 for wind erosion summary.
3. See Table A-5-2 for seasonal stockpile- material handling summary.
4. See Table A-15-2 for haul truck exhaust summary.
5. See Table A-7-3 for water truck exhaust summary.
6. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.

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Table A-16-2: Project Emissions Summary for Truck Exhaust (2019-2022) (Without Mitigation)

Project Year	2019	2020	2021	2022
Project Emissions Change, Haul Trucks[2]				
Truck Usage (HP-hr/yr)	889,277	974,594	1,029,534	2,520,783
NOx Emissions (tons/yr)	4.07	2.20	-2.40	4.12
VOC Emissions (tons/yr)	0.22	0.08	-0.27	0.09
CO Emissions (tons/yr)	3.10	3.04	2.53	7.65
PM_{10} Emissions (tons/yr)	0.11	0.00	-0.26	-0.09
$PM_{2.5}$ Emissions (tons/yr)[1]	0.11	0.00	-0.25	-0.09
SOx Emissions (tons/yr)	0.0058	0.0064	0.0067	0.016
Project Emissions Change, Water Trucks[3]				
Truck Usage (HP-hr/yr)	880,750	951,417	1,022,083	1,410,750
NOx Emissions (tons/yr)	3.28	3.58	3.87	5.50
VOC Emissions (tons/yr)	0.147	0.160	0.173	0.25
CO Emissions (tons/yr)	2.14	2.28	2.41	3.15
PM_{10} Emissions (tons/yr)	0.06	0.07	0.08	0.11
$PM_{2.5}$ Emissions (tons/yr)[1]	0.06	0.07	0.08	0.11
SOx Emissions (tons/yr)	0.0058	0.0062	0.0067	0.0092
Total Emissions Change, Haul and Water Trucks				
Truck Usage (HP-hr/yr)	1,770,027	1,926,010	2,051,618	3,931,533
NOx Emissions (tons/yr)	7.3	5.8	1.47	9.62
VOC Emissions (tons/yr)	0.37	0.24	-0.09	0.33
CO Emissions (tons/yr)	5.24	5.31	4.94	10.81
PM_{10} Emissions (tons/yr)	0.17	0.07	-0.18	0.02
$PM_{2.5}$ Emissions (tons/yr)[1]	0.17	0.07	-0.17	0.02
SOx Emissions (tons/yr)	0.0116	0.013	0.013	0.026

Notes
1. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.
2. See Table A-15-2 for haul truck exhaust summary.
3. See Table A-7-3 for water truck exhaust summary.

Table A-16-3: Comparison of South Quarry Project Baseline to South Quarry Post-Project, Truck Emissions, All Years (Without Mitigation)

	Baseline				Post-Project			
	2019	2020	2021	2022	2019	2020	2021	2022
Other Trucks								
Nitrous Oxides (NOx)	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3
Volatile Organic Compounds (VOC)	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Carbon Monoxide (CO)	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Particulate Matter (PM_{10})	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Particulate Matter ($PM_{2.5}$)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Sulfur Oxides (SOx)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Haul Trucks								
Nitrous Oxides (NOx)	39.4	39.4	36.2	36.2	43.5	41.6	33.8	40.4
Volatile Organic Compounds (VOC)	2.6	2.6	2.3	2.3	2.8	2.6	2.1	2.4
Carbon Monoxide (CO)	17.4	17.4	16.4	16.4	20.5	20.5	19.0	24.1
Particulate Matter (PM_{10})	1.6	1.6	1.4	1.4	1.7	1.6	1.2	1.4
Particulate Matter ($PM_{2.5}$)	1.6	1.6	1.4	1.4	1.7	1.6	1.2	1.3
Sulfur Oxides (SOx)	0.026	0.026	0.026	0.026	0.032	0.033	0.033	0.043
Water Trucks								
Nitrous Oxides (NOx)	2.9	2.9	2.9	2.9	6.2	6.5	6.8	8.4
Volatile Organic Compounds (VOC)	0.1	0.1	0.1	0.1	0.3	0.3	0.3	0.4
Carbon Monoxide (CO)	0.7	0.7	0.7	0.7	2.8	3.0	3.1	3.8
Particulate Matter (PM_{10})	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Particulate Matter ($PM_{2.5}$)	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Sulfur Oxides (SOx)	0.004	0.004	0.004	0.004	0.010	0.010	0.011	0.013
Total Trucks								
Nitrous Oxides (NOx)	66.7	66.7	63.5	63.5	74.0	72.5	65.0	73.1
Volatile Organic Compounds (VOC)	4.5	4.5	4.3	4.3	4.8	4.7	4.2	4.6
Carbon Monoxide (CO)	22.8	22.8	21.8	21.8	28.1	28.2	26.8	32.7
Particulate Matter (PM_{10})	2.6	2.6	2.4	2.4	2.7	2.6	2.2	2.4
Particulate Matter ($PM_{2.5}$)	2.5	2.5	2.3	2.3	2.7	2.6	2.2	2.4
Sulfur Oxides (SOx)	0.504	0.504	0.504	0.504	0.516	0.517	0.517	0.530

Table A-16-4: Comparison of PM_{10} Emissions for South Quarry Baseline and Post-Project, All Years (Without Mitigation)

Emissions Source	2019	2020	2021	2022
PM_{10} South Quarry Baseline Emissions (tons/yr)				
Dust entrainment from haul trucks[1]	30.71	30.71	29.76	29.76
Dust entrainment from water trucks[1]	0.37	0.37	0.37	0.37
Wind erosion from unpaved roads[2]	2.08	2.08	2.08	2.08
Seasonal stockpile- material handling[3]	0.00	0.00	0.00	0.00
Haul truck exhaust[4]	1.62	1.62	1.44	1.44
Water truck exhaust[5]	0.08	0.08	0.08	0.08
Total emissions	34.9	34.9	33.7	33.7
PM_{10} South Quarry Post-Project Emissions (tons/yr)				
Dust entrainment from haul trucks[1]	34.24	34.84	34.12	44.75
Dust entrainment from water trucks[1]	0.99	1.04	1.09	1.36
Wind erosion from unpaved roads[2]	3.04	3.17	3.30	4.01
Seasonal stockpile- material handling[3]	0.16	0.16	0.16	0.24
Haul truck exhaust[4]	1.73	1.62	1.19	1.35
Water truck exhaust[5]	0.14	0.15	0.16	0.19
Total emission	40.3	41.0	40.0	51.9
PM_{10} South Quarry Project Emissions Increase (tons/yr)				
Dust entrainment from haul trucks[1]	3.53	4.14	4.36	14.99
Dust entrainment from water trucks[1]	0.62	0.67	0.72	0.99
Wind erosion from unpaved roads[2]	0.96	1.09	1.22	1.93
Seasonal stockpile- material handling[3]	0.16	0.16	0.16	0.24
Haul truck exhaust[4]	0.11	0.00	-0.26	-0.09
Water truck exhaust[5]	0.06	0.07	0.08	0.11
Total emissions increase due to project	5.4	6.1	6.3	18.2

Notes

1. See Table A-14-2 for dust entrainment summary.
2. See Table A-4-2 for wind erosion summary.
3. See Table A-5-2 for seasonal stockpile- material handling summary.
4. See Table A-15-2 for haul truck exhaust summary.
5. See Table A-7-3 for water truck exhaust summary.
6. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.

Table A-16-5: Overall Comparison of South Quarry Project Baseline to South Quarry Post-Project, All Years (Without Mitigation)

	2019	2020	2021	2022
Baseline				
Nitrous Oxides (NOx)	66.7	66.7	63.5	63.5
Volatile Organic Compounds (VOC)	4.5	4.5	4.3	4.3
Carbon Monoxide (CO)	22.8	22.8	21.8	21.8
Particulate Matter (PM_{10})	193.6	193.6	192.5	192.5
Particulate Matter ($PM_{2.5}$)	20.0	20.0	19.7	19.7
Sulfur Oxides (SOx)	0.5	0.5	0.5	0.5
Post-Project				
Nitrous Oxides (NOx)	74.0	72.5	65.0	73.1
Volatile Organic Compounds (VOC)	4.8	4.7	4.2	4.6
Carbon Monoxide (CO)	28.1	28.2	26.8	32.7
Particulate Matter (PM_{10})	199.0	199.7	198.7	210.6
Particulate Matter ($PM_{2.5}$)	20.8	20.8	20.3	21.7
Sulfur Oxides (SOx)	0.5	0.5	0.5	0.5
Change in emissions				
Nitrous Oxides (NOx)	7.3	5.8	1.5	9.6
Volatile Organic Compounds (VOC)	0.4	0.2	-0.1	0.3
Carbon Monoxide (CO)	5.2	5.3	4.9	10.8
Particulate Matter (PM_{10})	5.4	6.1	6.3	18.2
Particulate Matter ($PM_{2.5}$)	0.8	0.8	0.6	2.0
Sulfur Oxides (SOx)	0.01	0.01	0.01	0.03

Table A-16-6: Project Emissions Summary for PM_{10} and $PM_{2.5}$ for 2022 (Worst-Case Year) (Without Mitigation)

Activity/Source	Unit of Emission Factor	Unit of Throughput	2022 Baseline			
			Controlled Emission Factor	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]
Blasthole drilling	lb/ton	ton/year	0.0008	2,900,000	1.2	0.07
Blasting	lb/ton	ton/year	0.080	2,900,000	116.0	6.7
Bulldozing, scraping and grading of materials	lb/hr	hr/year	11.77	2,500	14.7	0.8
Material Handling, limestone ore and waste rock	lb/ton	ton/year	0.014	2,900,000	20.3	5.7
Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6
Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2
Wind erosion from unpaved roads[2]	tons/acre-yr	acre	0.16	13.39	2.08	0.31
Dust entrainment from unpaved roads - haul trucks[2]	lb/VMT	VMT	0.55	108,352	29.8	3.0
Dust entrainment from unpaved roads - water trucks[2]	lb/VMT	VMT	0.11	6,800	0.37	0.04
Material Handling, seasonal stockpile	lb/ton	tons/year	0.0022	0	0.0	0.0
				Subtotal (fugitive emissions):	**190.1**	**17.4**
Other truck exhaust	g/HP-hr	HP-hr/year	Variable	3,236,250	0.9	0.9
Haul truck exhaust[1]	g/HP-hr	HP-hr/year	See table A-6-1	3,988,392	1.4	1.4
Water truck exhaust	g/HP-hr	HP-hr/year	See table A-7-1	603,250	0.08	0.08
				Total (all sources):	**192.5**	**19.7**

Activity/Source	Unit of Emission Factor	Unit of Throughput	2022 Post-Project				Project PM_{10} Emissions Increase (tons/yr)	Project $PM_{2.5}$ Emissions Increase (tons/yr)
			Controlled Emission Factor	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]		
Blasthole drilling	lb/ton	ton/year	0.00080	2,900,000	1.2	0.07	0.0	0.0
Blasting	lb/ton	ton/year	0.080	2,900,000	116.0	6.7	0.0	0.0
Bulldozing, scraping and grading of materials	lb/hr	hr/year	11.77	2,500	14.7	0.8	0.0	0.0
Material Handling, limestone ore and waste rock	lb/ton	ton/year	0.014	2,900,000	20.3	5.7	0.0	0.0
Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6	0.0	0.0
Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2	0.0	0.0
Wind erosion from unpaved roads[2,5]	tons/acre-yr	acre	0.11	37.64	4.01	0.60	1.9	0.29
Dust entrainment from unpaved roads - haul trucks[2,4]	lb/VMT	VMT	0.55	162,913	44.7	4.5	15.0	1.50
Dust entrainment from unpaved roads - water trucks[2,4]	lb/VMT	VMT	0.11	24,800	1.36	0.14	0.99	0.10
Material Handling, seasonal stockpile[6]	lb/ton	tons/year	0.0022	216,667	0.2	0.1	0.24	0.1
				Subtotal (fugitive emissions):	**208.2**	**19.4**	**18.1**	**2.0**
Other truck exhaust	g/HP-hr	HP-hr/year	Variable	3,236,250	0.9	0.9	0.00	0.0
Haul truck exhaust[1,7]	g/HP-hr	HP-hr/year	See table A-6-1	4,930,228	1.4	1.3	-0.09	-0.09
Water truck exhaust[8]	g/HP-hr	HP-hr/year	See table A-7-1	2,014,000	0.19	0.19	0.11	0.11
				Total (all sources):	**210.6**	**21.7**	**18.2**	**1.98**
						Significance Threshold:	**15**	**12**
						Above Significance Threshold:	**YES**	**NO**

Notes

1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. Controlled EF calculations for dust entrainment (A-3-1) and wind erosion (A-4-1A and A-4-2) for 2022 are weighted averages of the West Pit and South Quarry.
3. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.
4. See Table A-14-2 for dust entrainment summary.
5. See Table A-4-2 for wind erosion summary.
6. See Table A-5-2 for seasonal stockpile- material handling summary.
7. See Table A-15-2 for haul truck exhaust summary.
8. See Table A-7-3 for water truck exhaust summary.

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Table A-16-7A: Project Emissions Summary for Truck Exhaust for 2019 (Worst-Case Year for VOC, PM_{10}, and $PM_{2.5}$) (Without Mitigation)

Pollutant Name	2019 Baseline[1]				2019 Post-Project			
	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)	Total Emissions (tons/yr)	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)	Total Emissions (tons/yr)
Volatile Organic Compounds (VOC)	1.8	2.6	0.1	4.5	1.8	2.8	0.3	4.8
Particulate Matter (PM_{10})[2]	0.9	1.6	0.1	2.6	0.9	1.7	0.1	2.7
Particulate Matter ($PM_{2.5}$)[2, 3]	0.9	1.6	0.1	2.5	0.9	1.7	0.1	2.7

Pollutant Name	Project Emissions Change (tons/yr)	Significance Thresholds (tons/yr)	Above Significance Thresholds
Volatile Organic Compounds (VOC)	0.4	25	NO
Particulate Matter (PM_{10})[2]	0.2	n/a	n/a
Particulate Matter ($PM_{2.5}$)[2, 3]	0.2	n/a	n/a

Notes
1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.

2. There are no significance thresholds specific to diesel $PM_{2.5}$ and PM_{10}. Diesel $PM_{2.5}$ and PM_{10} are included in the overall project PM_{10} to determine if PM_{10} exceeds the threshold levels. (Table A-16-6)
3. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.

Table A-16-7B: Project Emissions Summary for Truck Exhaust for 2022 (Worst-Case Year for NOx, CO, and SOx) (Without Mitigation)

Pollutant Name	2022 Baseline[1]				2022 Post-Project			
	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)	Total Emissions (tons/yr)	Other Truck Emissions (tons/yr)	Haul Truck Emissions (tons/yr)	Water Truck Emissions (tons/yr)	Total Emissions (tons/yr)
Nitrous Oxides (NOx)	24.3	36.2	2.9	63.5	24.3	40.4	8.4	73.1
Carbon Monoxide (CO)	4.7	16.4	0.7	21.8	4.7	24.1	3.8	32.7
Sulfur Oxides (SOx)	0.5	0.03	0.004	0.5	0.5	0.04	0.013	0.5

Pollutant Name	Project Emissions Change (tons/yr)	Significance Thresholds (tons/yr)	Above Significance Thresholds (yes/no)
Nitrous Oxides (NOx)	9.6	25	NO
Carbon Monoxide (CO)	10.8	100	NO
Sulfur Oxides (SOx)	0.03	25	NO

Notes
1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.

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Table A-16-8: Project Emissions Summary, $PM_{2.5}$ and PM_{10} Emissions, All Years (Without Mitigation)

#	Activity/Sources	Unit of Emission Factor	Unit of Throughput[4]	2019 Baseline, South Quarry Project				2019 Post-Project, South Quarry Project			
				PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]	PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]
1	Blasthole drilling	lb/ton	ton/year	0.0008	2,900,000	1.2	0.1	0.0008	2,900,000	1.2	0.1
2	Blasting	lb/ton	ton/year	0.08	2,900,000	116.0	6.7	0.08	2,900,000	116.0	6.7
3	Bulldozing, scraping and grading of materials	lb/hr	hr/year	11.8	2,500	14.7	0.8	11.8	2,500	14.7	0.8
4	Material Handling, limestone ore and waste rock[2]	lb/ton	ton/year	0.014	2,900,000	20.3	5.7	0.014	2,900,000	20.3	5.7
5	Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6	0.20	20	4.0	0.6
6	Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2	0.27	6	1.6	0.2
7	Wind erosion from unpaved roads	tons/acre-yr	acre	0.16	13.39	2.1	0.3	0.11	28.55	3.0	0.5
8a	Dust entrainment from unpaved roads - haul trucks[1]	lb/VMT	VMT	0.55	111,791	30.7	3.1	0.55	124,649	34.2	3.4
8b	Dust entrainment from unpaved roads - water trucks[1]	lb/VMT	VMT	0.11	6,800	0.4	0.0	0.11	18,050	1.0	0.1
9	Material Handling, seasonal stockpile	lb/ton	tons/year	0.0022	0	0.0	0.0	0.0022	143,000	0.2	0.0
	Subtotal (fugitive emissions)					**191.0**	**17.5**			**196.3**	**18.1**
10	Other truck exhaust	g/hp-hr	hp-hr/year	Variable	3,236,250	0.9	0.9	Variable	3,236,250	0.9	0.9
11	Haul truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-6-1	4,052,911	1.6	1.6	See table A-6-1	4,942,188	1.7	1.7
12	Water truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-7-1	603,250	0.1	0.1	See table A-7-1	1,484,000	0.1	0.1
	Total (all sources):					**193.6**	**20.0**			**199.0**	**20.8**

#	Activity/Sources	Unit of Emission Factor	Unit of Throughput[4]	2020 Baseline, South Quarry Project				2020 Post-Project, South Quarry Project			
				PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]	PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]
1	Blasthole drilling	lb/ton	ton/year	0.0008	2,900,000	1.2	0.1	0.0008	2,900,000	1.2	0.1
2	Blasting	lb/ton	ton/year	0.08	2,900,000	116.0	6.7	0.08	2,900,000	116.0	6.7
3	Bulldozing, scraping and grading of materials	lb/hr	hr/year	11.8	2,500	14.7	0.8	11.8	2,500	14.7	0.8
4	Material Handling, limestone ore and waste rock[2]	lb/ton	ton/year	0.014	2,900,000	20.3	5.7	0.014	2,900,000	20.3	5.7
5	Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6	0.20	20	4.0	0.6
6	Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2	0.27	6	1.6	0.2
7	Wind erosion from unpaved roads	tons/acre-yr	acre	0.16	13.39	2.1	0.3	0.11	29.76	3.2	0.5
8a	Dust entrainment from unpaved roads - haul trucks[1]	lb/VMT	VMT	0.55	111,791	30.7	3.1	0.55	126,849	34.8	3.5
8b	Dust entrainment from unpaved roads - water trucks[1]	lb/VMT	VMT	0.11	6,800	0.4	0.0	0.11	18,950	1.0	0.1
9	Material Handling, seasonal stockpile	lb/ton	tons/year	0.0022	0	0.0	0.0	0.0022	143,000	0.2	0.0
	Subtotal (fugitive emissions)					**191.0**	**17.5**			**197.0**	**18.2**
10	Other truck exhaust	g/hp-hr	hp-hr/year	Variable	3,236,250	0.9	0.9	Variable	3,236,250	0.9	0.9
11	Haul truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-6-1	4,052,911	1.6	1.6	See table A-6-1	5,027,505	1.6	1.6
12	Water truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-7-1	603,250	0.1	0.1	See table A-7-1	1,554,667	0.1	0.1
	Total (all sources):					**193.6**	**20.0**			**199.7**	**20.8**

Table A-16-8: Project Emissions Summary, $PM_{2.5}$ and PM_{10} Emissions, All Years (Without Mitigation)

#	Activity/Sources	Unit of Emission Factor	Unit of Throughput[4]	2021 Baseline, South Quarry Project				2021 Post-Project, South Quarry Project			
				PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]	PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]
1	Blasthole drilling	lb/ton	ton/year	0.0008	2,900,000	1.2	0.1	0.0008	2,900,000	1.2	0.1
2	Blasting	lb/ton	ton/year	0.08	2,900,000	116.0	6.7	0.08	2,900,000	116.0	6.7
3	Bulldozing, scraping and grading of materials	lb/hr	hr/year	11.8	2,500	14.7	0.8	11.8	2,500	14.7	0.8
4	Material Handling, limestone ore and waste rock[2]	lb/ton	ton/year	0.014	2,900,000	20.3	5.7	0.014	2,900,000	20.3	5.7
5	Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6	0.20	20	4.0	0.6
6	Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2	0.27	6	1.6	0.2
7	Wind erosion from unpaved roads	tons/acre-yr	acre	0.16	13.39	2.1	0.3	0.11	30.97	3.3	0.5
8a	Dust entrainment from unpaved roads - haul trucks[1]	lb/VMT	VMT	0.55	108,352	29.8	3.0	0.55	124,216	34.1	3.4
8b	Dust entrainment from unpaved roads - water trucks[1]	lb/VMT	VMT	0.11	6,800	0.4	0.0	0.11	19,850	1.1	0.1
9	Material Handling, seasonal stockpile	lb/ton	tons/year	0.0022	0	0.0	0.0	0.0022	143,000	0.2	0.0
	Subtotal (fugitive emissions)					**190.1**	**17.4**			**196.5**	**18.2**
10	Other truck exhaust	g/hp-hr	hp-hr/year	Variable	3,236,250	0.9	0.9	Variable	3,236,250	0.9	0.9
11	Haul truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-6-1	3,988,392	1.4	1.4	See table A-6-1	5,017,927	1.2	1.2
12	Water truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-7-1	603,250	0.1	0.1	See table A-7-1	1,625,333	0.2	0.2
	Total (all sources):					**192.5**	**19.7**			**198.7**	**20.3**

#	Activity/Sources	Unit of Emission Factor	Unit of Throughput[4]	2022 Baseline, South Quarry Project				2022 Post-Project, South Quarry Project			
				PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]	PM_{10} Controlled Emission Factor[1]	Throughput	PM_{10} Emissions (tons/year)	$PM_{2.5}$ Emissions (tons/year)[3]
1	Blasthole drilling	lb/ton	ton/year	0.0008	2,900,000	1.2	0.1	0.0008	2,900,000	1.2	0.1
2	Blasting	lb/ton	ton/year	0.08	2,900,000	116.0	6.7	0.08	2,900,000	116.0	6.7
3	Bulldozing, scraping and grading of materials	lb/hr	hr/year	11.8	2,500	14.7	0.8	11.8	2,500	14.7	0.8
4	Material Handling, limestone ore and waste rock[2]	lb/ton	ton/year	0.014	2,900,000	20.3	5.7	0.014	2,900,000	20.3	5.7
5	Wind erosion from stockpiles	tons/acre-yr	acre	0.20	20	4.0	0.6	0.20	20	4.0	0.6
6	Wind erosion from active disturbed mine area	tons/acre-yr	acre	0.27	6	1.6	0.2	0.27	6	1.6	0.2
7	Wind erosion from unpaved roads	tons/acre-yr	acre	0.16	13.39	2.1	0.3	0.11	37.64	4.0	0.6
8a	Dust entrainment from unpaved roads - haul trucks[1]	lb/VMT	VMT	0.55	108,352	29.8	3.0	0.55	162,913	44.7	4.5
8b	Dust entrainment from unpaved roads - water trucks[1]	lb/VMT	VMT	0.11	6,800	0.4	0.0	0.11	24,800	1.4	0.1
9	Material Handling, seasonal stockpile	lb/ton	tons/year	0.0022	0	0.0	0.0	0.0022	216,667	0.2	0.1
	Subtotal (fugitive emissions)					**190.1**	**17.4**			**208.2**	**19.4**
10	Other truck exhaust	g/hp-hr	hp-hr/year	Variable	3,236,250	0.9	0.9	Variable	3,236,250	0.9	0.9
11	Haul truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-6-1	3,988,392	1.4	1.4	See table A-6-1	6,509,175	1.4	1.3
12	Water truck exhaust[1]	g/hp-hr	hp-hr/year	See table A-7-1	603,250	0.1	0.1	See table A-7-1	2,014,000	0.2	0.2
	Total (all sources):					**192.5**	**19.7**			**210.6**	**21.7**

Notes
1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of Appendix A.
2. Assume two transfer points for material handling. Each transfer point has an emission factor of 0.007 lb/ton.
3. $PM_{2.5}$ emissions calculated based on ratios shown in Table A-2-8.
4. Dust Entrainment Throughputs are based on vehicle miles traveled (VMT).

Table A-17-1: Project Greenhouse Gas (GHG) Emissions Increase - Construction and Operational Phases (Without Mitigation)

Parameter	2017	2018	2019	2020	2021	2022
	Construction Post-Project					
Off-road diesel vehicles for Constr Y1-Y2 (HP-hr/yr)	1,429,600	1,429,600	-	-	-	-
GHG emissions for Constr Y1-Y2 (MT/yr)	721	709	-	-	-	-
	Amortized Construction Project GHG Increase					
GHG emissions, amortized based on total for 2 years (MT/yr)	47.7	47.7	47.7	47.7	47.7	47.7
			Operational Baseline[1]			
Haul and water truck usage (HP-hr/yr)	-	-	4,656,161	4,656,161	4,591,642	4,591,642
Other trucks (HP-hr/yr)	-	-	3,236,250	3,236,250	3,236,250	3,236,250
Total HP-hr/yr	-	-	7,892,411	7,892,411	7,827,892	7,827,892
Total GHG emissions (MT/yr)	-	-	4,969	4,969	4,928	4,928
			Operational Post-Project			
Haul and water truck usage, operational (HP-hr/yr)	-	-	6,426,188	6,582,172	6,643,260	8,523,175
Other trucks, operational (HP-hr/yr)	-	-	3,236,250	3,236,250	3,236,250	3,236,250
Off-road diesel vehicles, operational (HP-hr/yr)	-	-	9,662,438	9,818,422	9,879,510	11,759,425
GHG emissions (MT/yr)	-	-	6,083	6,181	6,220	7,404
			Operational Project GHG Increase			
GHG emissions (MT/yr)	-	-	1,114	1,213	1,292	2,475
	Amortized Construction and Operational Project GHG Increase					
GHG emissions (MT/yr)	47.7	47.7	1,162	1,260	1,339	2,523
Significance Threshold (MT/yr)	10,000	10,000	10,000	10,000	10,000	10,000
Above Significance Threshold	NO	NO	NO	NO	NO	NO

Conversion Factors and Assumptions		
HP-hr =	2,545	BTU
Combustion efficiency =	30	%
CO_2 emission factor =	73.96	kg CO_2/MMBTU[2]
CH_4 emission factor =	3.0E-03	kg CO_2/MMBTU[2]
N_2O emission factor =	6.0E-04	kg CO_2/MMBTU[2]
CO_2 GWP =	1	
CH_4 GWP =	25	
N_2O GWP =	298	

Notes
1. For a discussion of baseline approaches used for unchanged and changing emission terms and other baseline issues, please see the general note on baseline issues at the start of
2. Emission Factors and GWP values are from Title 40, Chapter I, Subchapter C, Part 98, Tables A-1, C-1, and C-2 for distillate fuel #2.

APPENDIX B – CALEEMOD RUN FOR CONSTRUCTION EMISSION CALCULATIONS

MCC ME 2yr

Mojave Desert AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Heavy Industry	997.52	1000sqft	22.90	997,520.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.6	**Precipitation Freq (Days)**	30
Climate Zone	10			**Operational Year**	2014
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	630.89	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Phase - Two years to construct haul road at 250 days per year

Trips and VMT - Everything remains onsite.

Grading - Speed is from the yearly emissions inventory. Moisture assumed from watering activities. Silt default for taconite and processing haul road, AP-42.

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	35.00	250.00
tblConstructionPhase	NumDays	35.00	250.00
tblConstructionPhase	PhaseEndDate	11/30/2018	12/14/2018
tblConstructionPhase	PhaseStartDate	12/16/2017	1/1/2018
tblGrading	MaterialExported	0.00	170,719.00
tblGrading	MaterialExported	0.00	170,719.00
tblGrading	MaterialImported	0.00	170,719.00
tblGrading	MaterialImported	0.00	170,719.00
tblGrading	MaterialMoistureContentBulldozing	7.90	1.00
tblGrading	MaterialMoistureContentBulldozing	7.90	1.00
tblGrading	MaterialMoistureContentTruckLoading	12.00	1.00
tblGrading	MaterialMoistureContentTruckLoading	12.00	1.00
tblGrading	MaterialSiltContent	6.90	5.80
tblGrading	MaterialSiltContent	6.90	5.80
tblGrading	MeanVehicleSpeed	7.10	10.00
tblGrading	MeanVehicleSpeed	7.10	10.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblTripsAndVMT	HaulingTripLength	20.00	0.00
tblTripsAndVMT	HaulingTripLength	20.00	0.00
tblTripsAndVMT	HaulingTripNumber	33,760.00	0.00
tblTripsAndVMT	HaulingTripNumber	33,760.00	0.00
tblTripsAndVMT	VendorTripLength	6.60	0.00
tblTripsAndVMT	VendorTripLength	6.60	0.00
tblTripsAndVMT	WorkerTripLength	16.80	0.00
tblTripsAndVMT	WorkerTripLength	16.80	0.00
tblTripsAndVMT	WorkerTripNumber	20.00	0.00
tblTripsAndVMT	WorkerTripNumber	20.00	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.7624	8.6990	5.8506	7.7100e-003	11.7489	0.4147	12.1635	5.1112	0.3815	5.4927	0.0000	715.9240	715.9240	0.2194	0.0000	720.5305
2018	0.6612	7.4417	5.2884	7.7100e-003	11.7489	0.3485	12.0974	5.1112	0.3206	5.4318	0.0000	704.5201	704.5201	0.2193	0.0000	709.1260
Total	**1.4236**	**16.1407**	**11.1390**	**0.0154**	**23.4978**	**0.7632**	**24.2609**	**10.2223**	**0.7021**	**10.9244**	**0.0000**	**1,420.4441**	**1,420.4441**	**0.4387**	**0.0000**	**1,429.6565**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.7624	8.6990	5.8506	7.7100e-003	11.7489	0.4147	12.1635	5.1112	0.3815	5.4927	0.0000	715.9232	715.9232	0.2194	0.0000	720.5297
2018	0.6612	7.4417	5.2883	7.7100e-003	11.7489	0.3485	12.0974	5.1112	0.3206	5.4318	0.0000	704.5193	704.5193	0.2193	0.0000	709.1252
Total	**1.4236**	**16.1407**	**11.1390**	**0.0154**	**23.4978**	**0.7632**	**24.2609**	**10.2223**	**0.7021**	**10.9244**	**0.0000**	**1,420.4425**	**1,420.4425**	**0.4387**	**0.0000**	**1,429.6548**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	5.0527	9.0000e-005	9.5800e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.0178	0.0178	5.0000e-005	0.0000	0.0189
Energy	0.1791	1.6278	1.3674	9.7700e-003		0.1237	0.1237		0.1237	0.1237	0.0000	4,932.0867	4,932.0867	0.1792	0.0625	4,955.2380
Mobile	1.8140	7.0516	25.3040	0.0342	2.1987	0.1218	2.3205	0.5880	0.1119	0.6998	0.0000	2,889.0624	2,889.0624	0.1277	0.0000	2,891.7448
Waste						0.0000	0.0000		0.0000	0.0000	251.0836	0.0000	251.0836	14.8386	0.0000	562.6945
Water						0.0000	0.0000		0.0000	0.0000	73.1830	859.5420	932.7250	7.5561	0.1857	1,148.9571
Total	**7.0457**	**8.6795**	**26.6809**	**0.0440**	**2.1987**	**0.2455**	**2.4442**	**0.5880**	**0.2356**	**0.8236**	**324.2666**	**8,680.7088**	**9,004.9754**	**22.7017**	**0.2482**	**9,558.6534**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	5.0527	9.0000e-005	9.5800e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.0178	0.0178	5.0000e-005	0.0000	0.0189
Energy	0.1791	1.6278	1.3674	9.7700e-003		0.1237	0.1237		0.1237	0.1237	0.0000	4,932.086 7	4,932.086 7	0.1792	0.0625	4,955.238 0
Mobile	1.8140	7.0516	25.3040	0.0342	2.1987	0.1218	2.3205	0.5880	0.1119	0.6998	0.0000	2,889.062 4	2,889.062 4	0.1277	0.0000	2,891.744 8
Waste						0.0000	0.0000		0.0000	0.0000	251.0836	0.0000	251.0836	14.8386	0.0000	562.6945
Water						0.0000	0.0000		0.0000	0.0000	73.1830	859.5420	932.7250	7.5547	0.1854	1,148.840 4
Total	**7.0457**	**8.6795**	**26.6809**	**0.0440**	**2.1987**	**0.2455**	**2.4442**	**0.5880**	**0.2356**	**0.8236**	**324.2666**	**8,680.708 8**	**9,004.975 4**	**22.7004**	**0.2479**	**9,558.536 6**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.12	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading 2017	Grading	1/1/2017	12/15/2017	5	250	
2	Grading 2018	Grading	1/1/2018	12/14/2018	5	250	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Grading 2017	Excavators	2	8.00	162	0.38
Grading 2017	Graders	1	8.00	174	0.41
Grading 2017	Rubber Tired Dozers	1	8.00	255	0.40
Grading 2017	Scrapers	2	8.00	361	0.48
Grading 2017	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Grading 2018	Excavators	2	8.00	162	0.38
Grading 2018	Graders	1	8.00	174	0.41
Grading 2018	Rubber Tired Dozers	1	8.00	255	0.40
Grading 2018	Scrapers	2	8.00	361	0.48
Grading 2018	Tractors/Loaders/Backhoes	2	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Grading 2017	8	0.00	0.00	0.00	0.00	0.00	0.00	LD_Mix	HDT_Mix	HHDT
Grading 2018	8	0.00	0.00	0.00	0.00	0.00	0.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Grading 2017 - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					11.7489	0.0000	11.7489	5.1112	0.0000	5.1112	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.7624	8.6990	5.8506	7.7100e-003		0.4147	0.4147		0.3815	0.3815	0.0000	715.9240	715.9240	0.2194	0.0000	720.5305
Total	**0.7624**	**8.6990**	**5.8506**	**7.7100e-003**	**11.7489**	**0.4147**	**12.1635**	**5.1112**	**0.3815**	**5.4927**	**0.0000**	**715.9240**	**715.9240**	**0.2194**	**0.0000**	**720.5305**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.2 Grading 2017 - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					11.7489	0.0000	11.7489	5.1112	0.0000	5.1112	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.7624	8.6990	5.8506	7.7100e-003		0.4147	0.4147		0.3815	0.3815	0.0000	715.9232	715.9232	0.2194	0.0000	720.5297
Total	**0.7624**	**8.6990**	**5.8506**	**7.7100e-003**	**11.7489**	**0.4147**	**12.1635**	**5.1112**	**0.3815**	**5.4927**	**0.0000**	**715.9232**	**715.9232**	**0.2194**	**0.0000**	**720.5297**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Grading 2018 - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					11.7489	0.0000	11.7489	5.1112	0.0000	5.1112	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.6612	7.4417	5.2884	7.7100e-003		0.3485	0.3485		0.3206	0.3206	0.0000	704.5201	704.5201	0.2193	0.0000	709.1260
Total	**0.6612**	**7.4417**	**5.2884**	**7.7100e-003**	**11.7489**	**0.3485**	**12.0974**	**5.1112**	**0.3206**	**5.4318**	**0.0000**	**704.5201**	**704.5201**	**0.2193**	**0.0000**	**709.1260**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.3 Grading 2018 - 2018

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					11.7489	0.0000	11.7489	5.1112	0.0000	5.1112	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.6612	7.4417	5.2883	7.7100e-003		0.3485	0.3485		0.3206	0.3206	0.0000	704.5193	704.5193	0.2193	0.0000	709.1252
Total	**0.6612**	**7.4417**	**5.2883**	**7.7100e-003**	**11.7489**	**0.3485**	**12.0974**	**5.1112**	**0.3206**	**5.4318**	**0.0000**	**704.5193**	**704.5193**	**0.2193**	**0.0000**	**709.1252**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.8140	7.0516	25.3040	0.0342	2.1987	0.1218	2.3205	0.5880	0.1119	0.6998	0.0000	2,889.0624	2,889.0624	0.1277	0.0000	2,891.7448
Unmitigated	1.8140	7.0516	25.3040	0.0342	2.1987	0.1218	2.3205	0.5880	0.1119	0.6998	0.0000	2,889.0624	2,889.0624	0.1277	0.0000	2,891.7448

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Heavy Industry	1,496.28	1,496.28	1496.28	5,780,827	5,780,827
Total	1,496.28	1,496.28	1,496.28	5,780,827	5,780,827

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Heavy Industry	14.70	6.60	6.60	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.452183	0.068092	0.173893	0.157333	0.043180	0.007461	0.007893	0.075795	0.001067	0.001391	0.007963	0.000556	0.003193

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	3,160.011 2	3,160.011 2	0.1453	0.0301	3,172.377 9
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	3,160.011 2	3,160.011 2	0.1453	0.0301	3,172.377 9
NaturalGas Mitigated	0.1791	1.6278	1.3674	9.7700e-003		0.1237	0.1237		0.1237	0.1237	0.0000	1,772.075 5	1,772.075 5	0.0340	0.0325	1,782.860 1
NaturalGas Unmitigated	0.1791	1.6278	1.3674	9.7700e-003		0.1237	0.1237		0.1237	0.1237	0.0000	1,772.075 5	1,772.075 5	0.0340	0.0325	1,782.860 1

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Heavy Industry	3.32074e+007	0.1791	1.6278	1.3674	9.7700e-003		0.1237	0.1237		0.1237	0.1237	0.0000	1,772.075 5	1,772.075 5	0.0340	0.0325	1,782.860 1
Total		**0.1791**	**1.6278**	**1.3674**	**9.7700e-003**		**0.1237**	**0.1237**		**0.1237**	**0.1237**	**0.0000**	**1,772.075 5**	**1,772.075 5**	**0.0340**	**0.0325**	**1,782.860 1**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Heavy Industry	3.32074e+007	0.1791	1.6278	1.3674	9.7700e-003		0.1237	0.1237		0.1237	0.1237	0.0000	1,772.0755	1,772.0755	0.0340	0.0325	1,782.8601
Total		**0.1791**	**1.6278**	**1.3674**	**9.7700e-003**		**0.1237**	**0.1237**		**0.1237**	**0.1237**	**0.0000**	**1,772.0755**	**1,772.0755**	**0.0340**	**0.0325**	**1,782.8601**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Heavy Industry	1.10425e+007	3,160.0112	0.1453	0.0301	3,172.3779
Total		**3,160.0112**	**0.1453**	**0.0301**	**3,172.3779**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Heavy Industry	1.10425e+007	3,160.0112	0.1453	0.0301	3,172.3779
Total		**3,160.0112**	**0.1453**	**0.0301**	**3,172.3779**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	5.0527	9.0000e-005	9.5800e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.0178	0.0178	5.0000e-005	0.0000	0.0189
Unmitigated	5.0527	9.0000e-005	9.5800e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.0178	0.0178	5.0000e-005	0.0000	0.0189

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.1559					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.8958					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	9.7000e-004	9.0000e-005	9.5800e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.0178	0.0178	5.0000e-005	0.0000	0.0189
Total	**5.0527**	**9.0000e-005**	**9.5800e-003**	**0.0000**		**3.0000e-005**	**3.0000e-005**		**3.0000e-005**	**3.0000e-005**	**0.0000**	**0.0178**	**0.0178**	**5.0000e-005**	**0.0000**	**0.0189**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Consumer Products	3.8958					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	9.7000e-004	9.0000e-005	9.5800e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.0178	0.0178	5.0000e-005	0.0000	0.0189
Architectural Coating	1.1559					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**5.0527**	**9.0000e-005**	**9.5800e-003**	**0.0000**		**3.0000e-005**	**3.0000e-005**		**3.0000e-005**	**3.0000e-005**	**0.0000**	**0.0178**	**0.0178**	**5.0000e-005**	**0.0000**	**0.0189**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	932.7250	7.5547	0.1854	1,148.840 4
Unmitigated	932.7250	7.5561	0.1857	1,148.957 1

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Heavy Industry	230.677 / 0	932.7250	7.5561	0.1857	1,148.957 1
Total		**932.7250**	**7.5561**	**0.1857**	**1,148.957 1**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Heavy Industry	230.677 / 0	932.7250	7.5547	0.1854	1,148.8404
Total		**932.7250**	**7.5547**	**0.1854**	**1,148.8404**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	251.0836	14.8386	0.0000	562.6945
Unmitigated	251.0836	14.8386	0.0000	562.6945

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Heavy Industry	1236.92	251.0836	14.8386	0.0000	562.6945
Total		**251.0836**	**14.8386**	**0.0000**	**562.6945**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Heavy Industry	1236.92	251.0836	14.8386	0.0000	562.6945
Total		**251.0836**	**14.8386**	**0.0000**	**562.6945**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

APPENDIX C – SUMMARY OF AERMOD MODELING/CLASS I AREA CALCULATIONS

DISPERSION MODELING ANALYSIS

Mitsubishi Cement Corporation
South Quarry Mine Expansion

Prepared for:

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31726 Rancho Viejo Road, Suite 218
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Prepared by:

Amec Foster Wheeler Earth & Environmental
511 Congress Street Portland, Maine 04101

October 2016

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LIST OF FIGURES

1.0 INTRODUCTION

The purpose of this report is to document the protocol followed for performing dispersion modeling of Mitsubishi Cement Corporation's (MCC) South Quarry Mine Expansion located near Lucerne Valley, California. The modeling is performed in support of an air quality study of the project.

Section 2 describes the site location and emissions source configuration. Section 3 describes the modeling protocol followed for this analysis, including the approach to the dispersion modeling, highlighting the selected model, identified receptors, and meteorological data used. Section 4 provides the dispersion modeling results.

2.0 FACILITY DESCRIPTION

2.1 Site Location

MCC owns and operates a Portland cement production facility and associated quarries near Lucerne Valley, California. The facility is located on Route 18 approximately 9 miles southeast of Lucerne Valley. The location of the facility is presented in Figure 1-1. The project boundary presented in Figure 1-1 represents the project site. The ambient air boundary presented in Figure 1-1 is based on property controlled by MCC. The San Bernardino National Forest abuts the southern project boundary.

Terrain in the vicinity of the facility includes flat desert to the north and mountains to the west, south, and east. The highest terrain feature within 10 miles is Sugarloaf Mountain with an elevation of 9,952 feet above mean sea level (AMSL). The elevation at the plant site is approximately 4,300 feet AMSL. The elevation at the proposed South Quarry site is approximately 6,000 feet AMSL.

2.2 Emissions Sources

This dispersion modeling analysis was performed for sources associated with MCC's mine expansion project at the proposed South Quarry site. The emission sources evaluated in the modeling include:

Operational phase:

- Haul truck exhaust and water truck exhaust
- Wind erosion from unpaved roads
- Dust entrainment from unpaved roads
- Seasonal stockpile material handling

Construction phase:

- Off-road vehicle exhaust
- Fugitive emissions

The locations of the modeled sources were identified from site plans provided by MCC. For practical dispersion modeling purposes, the six sources identified above can be consolidated into three distinct sources: the seasonal stockpile, the haul road, and the construction road.

The modeled release parameters were primarily developed from guidance published by the National Stone, Sand & Gravel Association (NSSGA, 2007) for dispersion modeling of fugitive dust sources using the U.S. Environmental Protection Agency's (USEPA) preferred dispersion model, AERMOD. An exception is that the NSSGA guidance was published prior to the inclusion of line source types in AERMOD. Nevertheless, the source parameters for area sources and line sources are identical with the exception of the geographic location inputs. Thus, the source parameters developed for the line sources followed guidance established for area sources.

Tables 2-1 and 2-2 present the modeled inputs of the three sources. Table 2-1 presents the geographic inputs. For line source types, both begin and end coordinates are provided. An angle input is not required for the line sources because coordinates for both ends of the line are specified. Table 2-2 presents the modeled release parameters.

For the line sources, the release height is defined as the height of the trucks traveling down the roads. The initial sigma-z is likewise based on the height of the haul trucks, divided by a factor of 2.15.

Emissions for each of the sources are modeled as 1.0 g/s, allowing for direct computation by AERMOD of normalized predicted concentrations commonly referred to as X/Q (i.e., predicted concentration divided by modeled emission rate).

Table 2-1. Modeled Source Geographic Inputs

Source (Type)		UTM Easting (meters)	UTM Northing (meters)	Base Elev. (m)	Length (m)	Width (m)	Angle (°N)
Seasonal Stockpile (Area)		512,699.8	3,799,785.6	1,838.2	30.0	30.0	0.0
Haul Road (Line)	Begin	512,238.8	3,800,093.2	1,831.6	542	15.24	--
	End	512,702.1	3,799,811.7				
Construction Road (Line)	Begin	513,055.6	3,800,570.2	1,404.2	902	15.24	--
	End	512,289.2	3,800,094.5				

Table 2-2. Modeled Release Parameters

Source (Type)	Release Height (m)	Initial Sigma-z (m)
Seasonal Stockpile (Area)	0.00	0.00
Haul Road (Line)	4.47	2.08
Construction Road (Line)	4.47	2.08

Some of the sources emit only during periods of quarry operation, specifically:

Operational phase:

- Haul truck exhaust and water truck exhaust
- Dust entrainment from unpaved roads
- Seasonal stockpile material handling

Construction phase:

- Off-road vehicle exhaust
- Fugitive emissions

These sources were assumed to operate for 10 hours each weekday from 7:00am to 5:00pm.

Wind erosion emissions were assumed to potentially occur 24 hours per day, 7 days per week. While the wind erosion emissions calculations are based on wind gust and precipitation data, for the purposes of dispersion modeling the wind erosion emissions were conservatively assumed to occur during all meteorological conditions. Wind erosion emissions were calculated for the entire year (based on 24 hours per day and 7 days per week), and then an average annual emissions value in lb/hour was used in calculating ground level concentrations for the modeling during all the hours of the year.

3.0 MODELING PROTOCOL

This section addresses model selection, receptor grid design, meteorological data, and source data.

3.1 Model Selection

The most recent version of AERMOD as of the date of report issuance (version 15181; USEPA, 2015) was selected to predict ambient concentrations in simple, complex, and intermediate terrain. AERMOD also addresses cavity impacts. AERMOD is the recommended sequential model in USEPA's *Guideline on Air Quality Models* (40 CFR 51 Appendix W). The regulatory default option was used. This option commands AERMOD to:

a. use the elevated terrain algorithms requiring input of terrain height data for receptors and emission sources,

b. use stack tip downwash (building downwash automatically overrides),

c. use the calms processing routines,

d. use buoyancy-induced dispersion, and

e. use the missing meteorological data processing routines.

3.2 Land Use

Dispersion coefficients for air quality modeling were selected based on the land use classification technique suggested by Auer (Auer, 1978), which is the preferred method of the USEPA. The classification determination involves assessing land use by Auer's categories within a 3-kilometer radius of the proposed site. Urban dispersion coefficients should be selected if greater than 50 percent of the area consists of urban land use types; otherwise, rural coefficients apply.

Land use categories for areas within the 3-kilometer radius of the Project were identified from USGS maps and observation. The area within 3-kilometers of the Project is rural. Therefore, rural dispersion coefficients were selected for the air quality modeling.

3.3 Receptors

Three receptors were placed in accordance with AB 2588 requirements (OEHHA, 2015), specifically at locations for:

- The Maximum Exposed Individual Resident (MEIR, approximately 2 miles away from facility);
- The Maximum Exposed Individual Worker (MEIW, approximately 2 miles away from facility); and
- Sensitive Locations (i.e., schools, hospitals, etc.)—The only sensitive receptor identified within six miles of the site is the alternative education school at the location shown, and it is approximately 5 miles away from facility.

These receptors were identified by thorough evaluation of Geographic Information Systems (GIS) data and confirmation on the ground. Figure 1-1 presents the AB 2588 receptors on a map of the area.

Receptor elevations were assigned by using USEPA's AERMAP software tool (version 11103; USEPA, 2011), which is designed to extract elevations from USGS Digital Elevation Model (DEM) files and USGS National Elevation Dataset (NED) files. AERMAP is the terrain preprocessor for AERMOD and uses the following procedure to assign elevations to a receptor:

- For each receptor, the program searches through the USGS input files to determine the two profiles (longitudes or eastings) that straddle this receptor.
- For each of these two profiles, the program then searches through the nodes in the USGS input files to determine which two rows (latitudes or northings) straddle the receptor.
- The program then calculates the coordinates of these four points and reads the elevations for these four points.
- A 2-dimensional distance-weighted interpolation is used to determine the elevation at the receptor location based on the elevations at the four nodes determined above.

NED data with a resolution of 1/3 arc-second (roughly 10 meters) were used as inputs to AERMAP. The NED data were obtained from the USGS Seamless Data Server and covers a domain ranging from 33.875°N to 34.875°N in latitude and from 116.375°W to 117.375°W in longitude.

This domain is sufficient to properly account for terrain that would factor into the critical hill height calculations. Receptor elevations generated by AERMAP were then visually confirmed with the actual USGS 7.5-minute topographic maps to ensure accurate representation of terrain features.

3.4 Meteorological Data

The meteorological data used in the analysis consisted of five years (2010 to 2014) of hourly National Weather Service (NWS) surface observations from the Barstow-Daggett Airport located near Daggett, California, in conjunction with upper air data collected by the NWS in Las Vegas, Nevada.

MCC is located approximately 35 miles south of the Barstow-Daggett Airport. The Barstow-Daggett Airport location was selected over an alternative surface data set available at Victorville, 29 miles west-northwest of MCC. Barstow-Daggett Airport was selected because it was more topographically similar to the MCC site. The airport has wind-blocking topography located to the south, with open desert located to the north. Victorville has no such topography and is located in a suburban area. Given the distances from MCC to the sites (35 mi to Barstow-Daggett, 29 mi to Victorville), there is no strong apparent advantage to the sites based on distance alone. Given the rural location of the Barstow-Daggett Airport and the similar topography, it was selected as most representative of MCC meteorology. Figure 1-3 shows the locations and topography of the two surface observation sites relative to MCC.

The profile base elevation of the Barstow-Daggett Airport monitoring site is 1,924 feet (586.4 meters). A windrose showing the frequency distribution of the winds for the five year period is presented in Figure 1-2.

USEPA's AERMET tool (version 14134; EPA, 2015b) was used to process meteorological data for use with AERMOD. AERMET merges National Weather Service (NWS) surface observations with NWS upper air observations and performs calculations of meteorological parameters required by AERMOD. Surface observations from on-site instruments can optionally be included if available. In addition to the meteorological observations, AERMET further requires the inclusion of the characteristics of land use surfaces that were calculated using USEPA's AERSURFACE tool.

3.4.1 Surface Observations

USEPA recommends that AERMOD be run with a minimum of 5 years of NWS data or 1 year of on-site meteorological data. On-site data are not available; therefore, the meteorological data used in the sequential modeling consists of NES surface observations measured at the Barstow-Daggett Airport. Integrated Surface Hourly Data (ISHD) files for the site were downloaded from the National Climatic Data Center (NCDC) and input directly to AERMET. Additionally, Barstow-Daggett Airport is an Automated Surface Observing Station (ASOS) with one minute wind data. These wind data were downloaded from the NCDC and processed using the USEPA's AERMINUTE tool. The file generated by the AERMINUTE program was input directly to AERMET.

3.4.2 Upper Air Observations

Concurrent upper air radiosonde data in Forecast Systems Laboratory (FSL) format were obtained from the National Oceanic and Atmospheric Administration (NOAA) for the Las Vegas NWS site (WBAN 03120) located approximately 245 kilometers northeast of the project location. An analysis of the Las Vegas NWS radiosonde data showed many missing daily soundings in 2010. Two other nearby upper air stations were identified, Desert Rock NWS site (WBAN 03160) located approximately 265 kilometers north-northeast of the project location and Miramar Air Force Base site (WBAN 03190) located approximately 162 kilometers south-southeast of the project location. Data from these stations were substituted for the missing 2010 Las Vegas upper air data. Although the Miramar upper air station was closer to the project location, preference was given to the data from the Desert Rock site over the Miramar site due to the Miramar site's location near the ocean.

3.4.3 AERSURFACE

USEPA's AERSURFACE tool was used to calculate the surface roughness length, albedo and Bowen ratio inputs required by AERMET. EPA developed AERSURFACE to identify these parameters within a defined radius from a specified point. In this case, the UTM coordinates of the NWS surface station at Barstow-Daggett Airport were input to AERSURFACE along with a 1-kilometer radius per EPA guidance. National Land Cover Data (NLCD) were obtained from the USGS for the area, and input directly to AERSURFACE. Seasonal categories were assigned as follows:

- Late autumn after frost and harvest, or winter with no snow: December, January, February;
- Winter with continuous snow on the ground: none;
- Transitional spring (partial green coverage, short annuals): March, April, May;
- Midsummer with lush vegetation: June, July, August; and
- Autumn with un-harvested cropland: September, October, November.

Surface moisture characteristics were based on the annual precipitation measured at the Barstow-Daggett NWS site during each of the five years (2010-2014) and compared with the 30-year average value from 1971 to 2000. Table 3-1 provides a summary of the precipitation analysis. Average moisture conditions were identified for year 2013, dry moisture conditions were identified for years 2011, 2012, and 2014, and wet moisture conditions were identified for year 2010.

Table 3-1. Precipitation Rates (inches)

30-Year Average	2010	2011	2012	2013	2014
4.17	7.68	1.19	1.29	4.55	2.04

AERSURFACE was commanded to generate a file of surface parameters for twelve compass sectors of 30° each, as well as by month, which were input directly to AERMET.

3.4.4 **Processed Data Completeness**

Table 3-2 provides the data completeness for the processed meteorological parameters used in the modeling. The table demonstrates five continuous years of record where USEPA's data completeness guideline (USEPA, 2000) for raw data of 90% exists from 2010 through 2014. Because the data completeness meets USEPA criteria, the processed meteorological data set was used in the modeling analysis.

Table 3-2. Processed Meteorological Data Completeness

Year	Wind Speed	Wind Direction	Temperature	Cloud Height	Pressure	AERMET Output
2010	99.88%	97.01%	96.41%	99.68%	99.87%	95.65%
2011	99.86%	96.82%	97.54%	100.0%	99.97%	96.68%
2012	99.95%	96.42%	99.25%	99.97%	99.99%	98.83%
2013	99.95%	97.15%	96.27%	99.98%	99.87%	98.53%
2014	99.55%	96.32%	93.30%	9991%	99.99%	99.01%

3.4.5 **AERMOD Implementation**

Single 5-year surface and profile meteorological files were prepared and input to AERMOD. AERMOD was set to calculate the 1-hour maximum and period average X/Q values over the entire 5-year period of meteorological data.

4.0 DISPERSION MODELING RESULTS

Maximum predicted 1-hour average and period average X/Q values for the MEIR, MEIW, and Sensitive receptors are presented in Table 4-1. AERMOD PLOTFILE outputs were generated and provided electronically for use as inputs to the Hotspots Analysis and Reporting Program Version 2 (HARP 2).

As was stated previously, 5 years of sequential hourly meteorological data were input to AERMOD. The maximum predicted 1-hour average X/Q value represents the highest predicted 1-hour value over the entire 5-year period. In contrast, the period average predicted X/Q value represents the average 1-hour value over the entire 5-year period.

Table 4-1. Predicted Maximum X/Q Values at Selected Receptor Locations

Source	Receptor	Maximum 1-Hour Average Predicted X/Q ($\mu g \cdot m^{-3}$ / $g \cdot s^{-1}$)	Period Average Predicted X/Q ($\mu g \cdot m^{-3}$ / $g \cdot s^{-1}$)
Seasonal	MEIR	26.1	0.00295
Stockpile	MEIW	11.9	0.00194
	Sensitive	16.5	0.00246
Haul	MEIR	12.7	0.00315
Road	MEIW	20.5	0.00421
(workday)	Sensitive	8.70	0.00267
Haul	MEIR	94.5	0.134
Road	MEIW	116	0.156
(wind erosion)	Sensitive	24.2	0.0257
Construction	MEIR	34.6	0.00762
Road	MEIW	16.3	0.00568
	Sensitive	7.62	0.00336

5.0 CLASS I AREA ANALYSIS

Due to the increased haul truck and water truck usage associated with the South Quarry project, AERMOD was used to calculate the maximum annual NO_X concentration increase at the closest Class I Area to the project, the San Gorgonio Wilderness located in the San Bernardino National Forest.

The AERMOD analysis was performed in a manner consistent with the protocol described previously in Sections 2 and 3, with the following exceptions:

- Only the haul road emissions source was considered in this analysis as that is the source which comprises the haul trucks and water trucks. These trucks were assumed to operate for 10 hours each weekday from 7:00am to 5:00pm. When considering the total number of operating hours per year, this averages 2,607 hours per year (e.g., 10 hours per day × 365 days per year × 5 work days per week / 7 total days per week).
- 26 receptors were placed along the northern boundary of the San Gorgonio Wilderness Area for the Class I Area analysis. The nearest Class I area boundary is expected to be the worst case condition for all Class I areas because the modeled sources have low release heights and no plume rise. AERMAP was used as previously described to calculate the AERMOD terrain parameters.
- Individual years of meteorological data were input to AERMOD, such that predicted annual average results are calculated. The maximum 1-year average result is presented, not the 5-year period average.

For the Class I analysis, the maximum predicted annual average X/Q value was 0.00148 $\mu g \cdot m^{-3} / g \cdot s^{-1}$, which occurred with the 2010 meteorological data. This result is provided for the purpose of assessing air quality related values (AQRV) in the wilderness area, specifically ozone air quality and nitrogen deposition.

6.0 REFERENCES

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USEPA, 2015a. *User's Guide for the AMS/EPA Regulatory Model - AERMOD*. EPA-454/B-03-001, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, June 2015.

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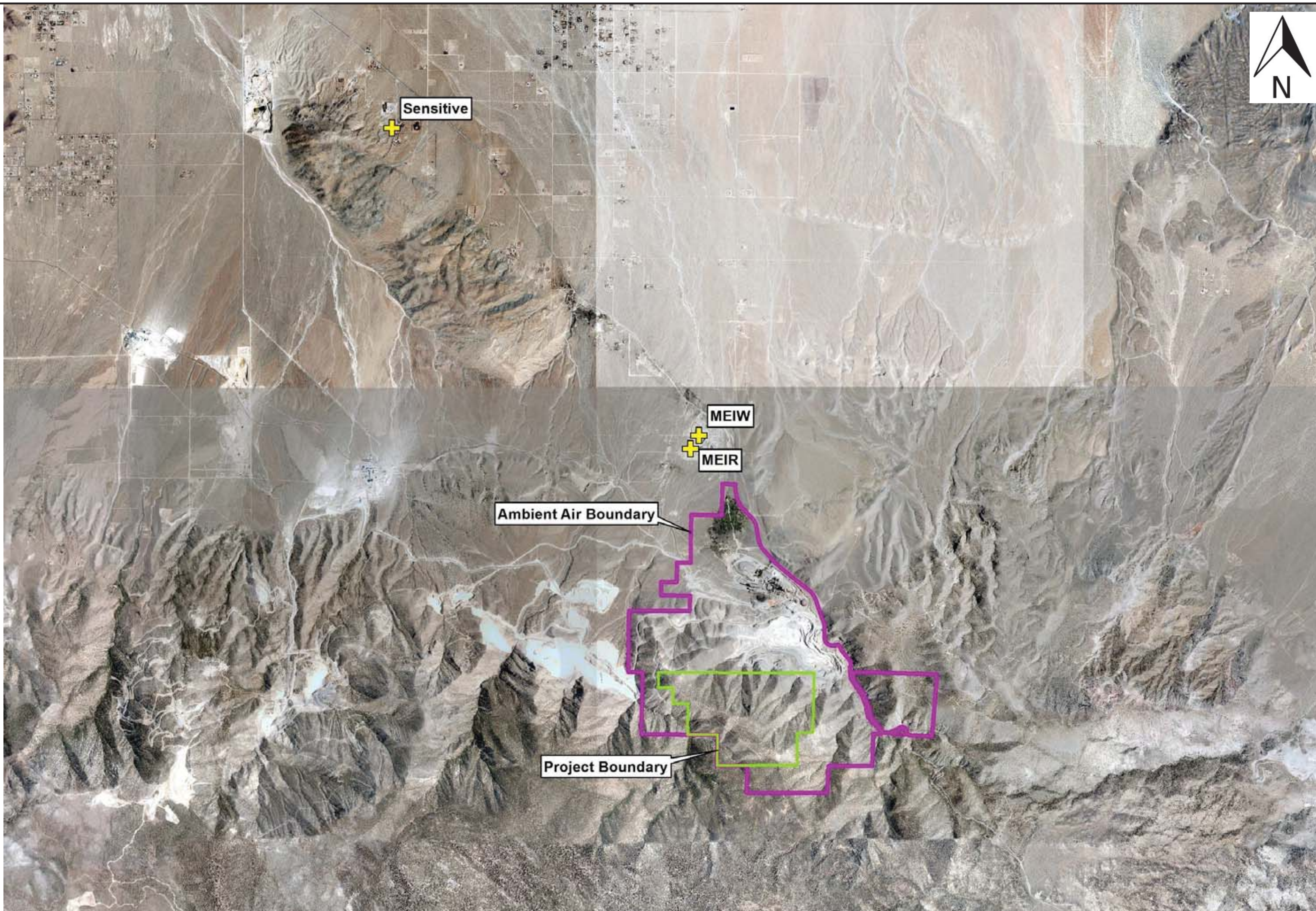
USEPA, 2013. *AERSURFACE User's Guide*. EPA-454/B-08-001. Research Triangle Park, North Carolina, North Carolina, January 2013.

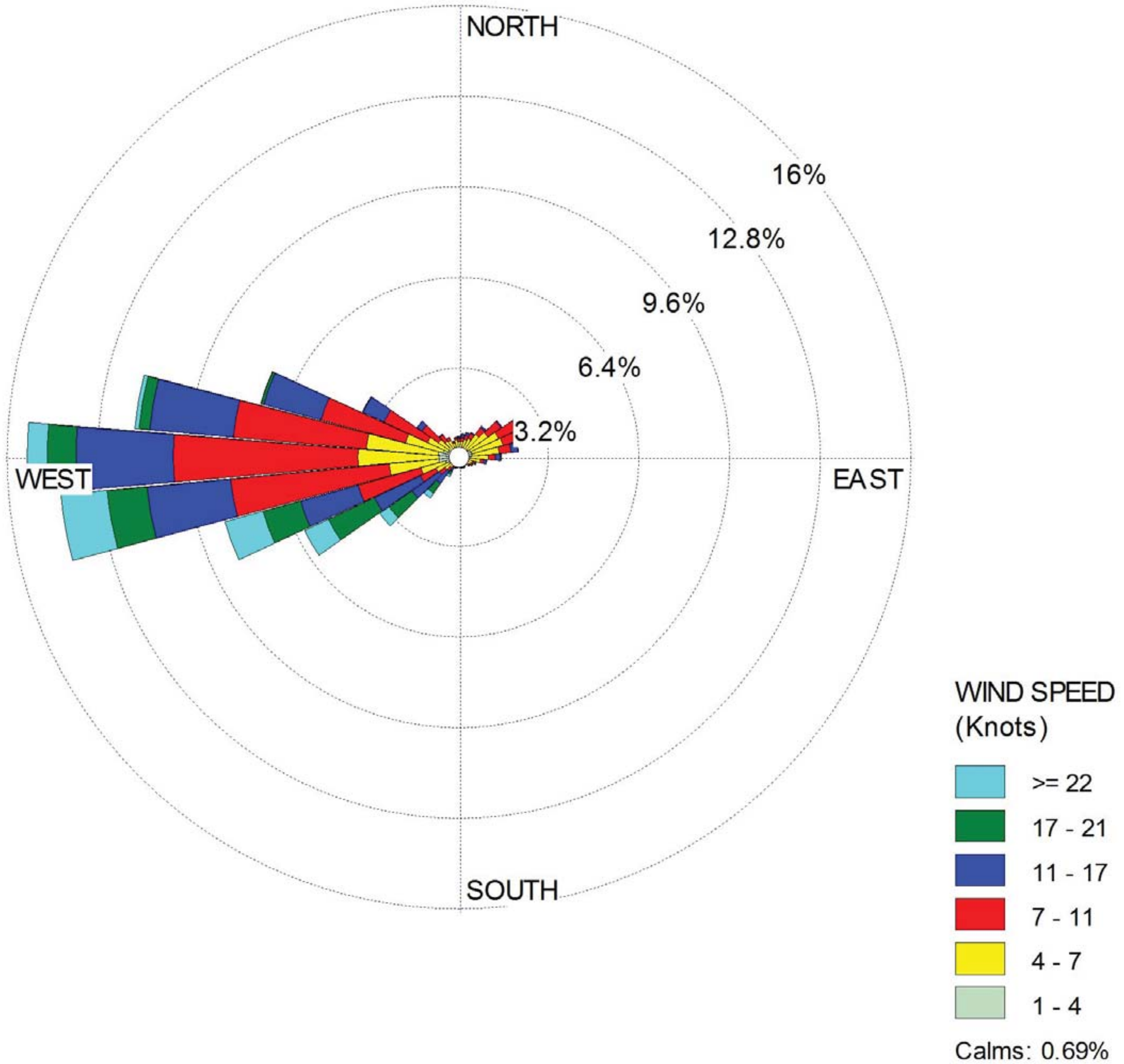
USEPA, 2011. *User's Guide for the AERMOD Terrain Preprocessor (AERMAP)*. EPA-454/B-03-003, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, April 2011.

FIGURES



Yorke ENGINEERING, LLC
www.YorkeEngr.com

TITLE	FACILITY ADDRESS	FIGURE #
Receptor Locations Used in Air Dispersion Modeling	Mitsubishi Cement Corporation Lucerne Valley, California	1-1
		REVISION DATE June 2, 2016



DISPLAY

Wind Speed Direction (Blowing From)

DATA PERIOD

2010 - 2014
Jan 1 - Dec 31
0:00 - 23:00

TOTAL COUNT

43,648 Hours

CALM WINDS

0.69%

AVG. WIND SPEED

9.92 Knots

Yorke ENGINEERING, LLC
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TITLE

Wind Rose, Daggett, CA, 2010 - 2014

FACILITY ADDRESS

Mitsubishi Cement Corporation
Lucerne Valley, California

FIGURE #

1-2

REVISION DATE

June 2, 2016

Yorke ENGINEERING, LLC www.YorkeEngr.com	TITLE Ambient Air Quality Monitoring Stations Near the Project Site	FACILITY ADDRESS Mitsubishi Cement Corporation Lucerne Valley, California	FIGURE # 1-3 REVISION DATE June 15, 2016

APPENDIX D – AERMOD MODELING FILES

AERMOD Period Modeling Files for HRA Analysis

AERMOD Period Output File - HRA Analysis

```
                                                MCC-PhaseI-20161006-PERIOD_5yrs_UNITEMIS.LST
NO ECHO


 ***********************************
 *** SETUP Finishes Successfully ***
 ***********************************

↑ *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                        ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                        ***        07:09:49
                                                                                                                       PAGE   1
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL

                                          ***     MODEL SETUP OPTIONS SUMMARY       ***
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 **Model Is Setup For Calculation of Average CONCentration Values.

   --  DEPOSITION LOGIC  --
 **NO GAS DEPOSITION Data Provided.
 **NO PARTICLE DEPOSITION Data Provided.
 **Model Uses NO DRY DEPLETION.  DRYDPLT  =  F
 **Model Uses NO WET DEPLETION.  WETDPLT  =  F

 **Model Uses RURAL Dispersion Only.

 **Model Allows User-Specified Options:
         1. Stack-tip Downwash.
         2. Model Accounts for ELEVated Terrain Effects.
         3. Use Calms Processing Routine.
         4. Use Missing Data Processing Routine.
         5. No Exponential Decay.

 **Other Options Specified:
         CCVR_Sub - Meteorological data includes CCVR substitutions
         TEMP_Sub - Meteorological data includes TEMP substitutions

 **Model Assumes No FLAGPOLE Receptor Heights.

 **The User Specified a Pollutant Type of:  UNITEMIS

 **Model Calculates PERIOD Averages Only

 **This Run Includes:      4 Source(s);       4 Source Group(s); and       3 Receptor(s)

                with:      0 POINT(s), including
                           0 POINTCAP(s) and      0 POINTHOR(s)
                 and:      0 VOLUME source(s)
                 and:      1 AREA type source(s)
                 and:      3 LINE source(s)
                 and:      0 OPENPIT source(s)


 **Model Set To Continue RUNning After the Setup Testing.

 **The AERMET Input Meteorological Data Version Date:  14134

 **Output Options Selected:
          Model Outputs Tables of PERIOD Averages by Receptor
          Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)
          Model Outputs Separate Summary File of High Ranked Values (SUMMFILE Keyword)

 **NOTE:  The Following Flags May Appear Following CONC Values:  c for Calm Hours
                                                                 m for Missing Hours
                                                                 b for Both Calm and Missing Hours

 **Misc. Inputs:  Base Elev. for Pot. Temp. Profile (m MSL) =   586.44 ;  Decay Coef. =    0.000     ;  Rot. Angle =     0.0
                  Emission Units = GRAMS/SEC                             ;  Emission Rate Unit Factor =   0.10000E+07
                  Output Units   = MICROGRAMS/M**3

 **Approximate Storage Requirements of Model =      3.5 MB of RAM.

 **File for Summary of Results:   C:\MitsubishiCement\AERMOD\MCC-PhaseI-20161006-PERIOD_5yrs_UNITEMIS.SUM
↑ *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                        ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                        ***        07:09:49
                                                                                                                       PAGE   2
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL


                                                *** AREA SOURCE DATA ***
```

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC /METER**2)	COORD (SW CORNER) X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	X-DIM OF AREA (METERS)	Y-DIM OF AREA (METERS)	ORIENT. OF AREA (DEG.)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
SQMINE10	0	0.11111E-02	512699.8	3799785.6	1838.2	0.00	30.00	30.00	0.00	0.00	NO	HRDOW

```
↑ *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                        ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                        ***        07:09:49
                                                                                                                       PAGE   3
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL


                                                *** LINE SOURCE DATA ***

                                                                  Page 1
```

```
                                                          MCC-PhaseI-20161006-PERIOD_5yrs_UNITEMIS.LST

              NUMBER EMISSION RATE     FIRST COORD         SECOND COORD      BASE    RELEASE    WIDTH    INIT.   URBAN  EMISSION RATE
   SOURCE      PART.  (GRAMS/SEC       X        Y          X        Y       ELEV.   HEIGHT    OF LINE    SZ     SOURCE SCALAR VARY
     ID        CATS.   /METER**2)   (METERS) (METERS)   (METERS) (METERS) (METERS) (METERS)  (METERS) (METERS)           BY
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 SQROAD10         0  0.12104E-03  512238.8 3800093.2  512702.1 3799811.6  1831.6     4.47     15.24     2.08     NO    HRDOW
 SQROAD24         0  0.12104E-03  512238.8 3800093.2  512702.1 3799811.6  1831.6     4.47     15.24     2.08     NO
 SQCNST10         0  0.72745E-04  513055.6 3800570.2  512289.2 3800094.5  1404.2     4.47     15.24     2.08     NO    HRDOW
  *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                                ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                               ***       07:09:49
                                                                                                                             PAGE   4
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL


                                         *** SOURCE IDs DEFINING SOURCE GROUPS ***

 SRCGROUP ID                                           SOURCE IDs
 -----------                                           ----------


  SQROAD10   SQROAD10    ,

  SQROAD24   SQROAD24    ,

  SQMINE10   SQMINE10    ,

  SQCNST10   SQCNST10    ,
  *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                                ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                               ***       07:09:49
                                                                                                                             PAGE   5
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL

                     * SOURCE EMISSION RATE SCALARS WHICH VARY DIURNALLY AND BY DAY OF WEEK (HRDOW) *

 SOURCE ID = SQROAD10     ; SOURCE TYPE = LINE     :
  HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
                                              DAY OF WEEK = WEEKDAY
    1  .0000E+00    2  .0000E+00    3  .0000E+00    4  .0000E+00    5  .0000E+00    6  .0000E+00    7  .0000E+00    8  .3369E+01
    9  .3369E+01   10  .3369E+01   11  .3369E+01   12  .3369E+01   13  .3369E+01   14  .3369E+01   15  .3369E+01   16  .3369E+01
   17  .3369E+01   18  .0000E+00   19  .0000E+00   20  .0000E+00   21  .0000E+00   22  .0000E+00   23  .0000E+00   24  .0000E+00
                                              DAY OF WEEK = SATURDAY
    1  .0000E+00    2  .0000E+00    3  .0000E+00    4  .0000E+00    5  .0000E+00    6  .0000E+00    7  .0000E+00    8  .0000E+00
    9  .0000E+00   10  .0000E+00   11  .0000E+00   12  .0000E+00   13  .0000E+00   14  .0000E+00   15  .0000E+00   16  .0000E+00
   17  .0000E+00   18  .0000E+00   19  .0000E+00   20  .0000E+00   21  .0000E+00   22  .0000E+00   23  .0000E+00   24  .0000E+00
                                              DAY OF WEEK = SUNDAY
    1  .0000E+00    2  .0000E+00    3  .0000E+00    4  .0000E+00    5  .0000E+00    6  .0000E+00    7  .0000E+00    8  .0000E+00
    9  .0000E+00   10  .0000E+00   11  .0000E+00   12  .0000E+00   13  .0000E+00   14  .0000E+00   15  .0000E+00   16  .0000E+00
   17  .0000E+00   18  .0000E+00   19  .0000E+00   20  .0000E+00   21  .0000E+00   22  .0000E+00   23  .0000E+00   24  .0000E+00
  *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                                ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                               ***       07:09:49
                                                                                                                             PAGE   6
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL

                     * SOURCE EMISSION RATE SCALARS WHICH VARY DIURNALLY AND BY DAY OF WEEK (HRDOW) *

 SOURCE ID = SQMINE10     ; SOURCE TYPE = AREA     :
  HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
                                              DAY OF WEEK = WEEKDAY
    1  .0000E+00    2  .0000E+00    3  .0000E+00    4  .0000E+00    5  .0000E+00    6  .0000E+00    7  .0000E+00    8  .3369E+01
    9  .3369E+01   10  .3369E+01   11  .3369E+01   12  .3369E+01   13  .3369E+01   14  .3369E+01   15  .3369E+01   16  .3369E+01
   17  .3369E+01   18  .0000E+00   19  .0000E+00   20  .0000E+00   21  .0000E+00   22  .0000E+00   23  .0000E+00   24  .0000E+00
                                              DAY OF WEEK = SATURDAY
    1  .0000E+00    2  .0000E+00    3  .0000E+00    4  .0000E+00    5  .0000E+00    6  .0000E+00    7  .0000E+00    8  .0000E+00
    9  .0000E+00   10  .0000E+00   11  .0000E+00   12  .0000E+00   13  .0000E+00   14  .0000E+00   15  .0000E+00   16  .0000E+00
   17  .0000E+00   18  .0000E+00   19  .0000E+00   20  .0000E+00   21  .0000E+00   22  .0000E+00   23  .0000E+00   24  .0000E+00
                                              DAY OF WEEK = SUNDAY
    1  .0000E+00    2  .0000E+00    3  .0000E+00    4  .0000E+00    5  .0000E+00    6  .0000E+00    7  .0000E+00    8  .0000E+00
    9  .0000E+00   10  .0000E+00   11  .0000E+00   12  .0000E+00   13  .0000E+00   14  .0000E+00   15  .0000E+00   16  .0000E+00
   17  .0000E+00   18  .0000E+00   19  .0000E+00   20  .0000E+00   21  .0000E+00   22  .0000E+00   23  .0000E+00   24  .0000E+00
  *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                                ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                               ***       07:09:49
                                                                                                                             PAGE   7
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL

                     * SOURCE EMISSION RATE SCALARS WHICH VARY DIURNALLY AND BY DAY OF WEEK (HRDOW) *

 SOURCE ID = SQCNST10     ; SOURCE TYPE = LINE     :
  HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
                                              DAY OF WEEK = WEEKDAY
    1  .0000E+00    2  .0000E+00    3  .0000E+00    4  .0000E+00    5  .0000E+00    6  .0000E+00    7  .0000E+00    8  .3369E+01
    9  .3369E+01   10  .3369E+01   11  .3369E+01   12  .3369E+01   13  .3369E+01   14  .3369E+01   15  .3369E+01   16  .3369E+01
   17  .3369E+01   18  .0000E+00   19  .0000E+00   20  .0000E+00   21  .0000E+00   22  .0000E+00   23  .0000E+00   24  .0000E+00
                                              DAY OF WEEK = SATURDAY
    1  .0000E+00    2  .0000E+00    3  .0000E+00    4  .0000E+00    5  .0000E+00    6  .0000E+00    7  .0000E+00    8  .0000E+00
    9  .0000E+00   10  .0000E+00   11  .0000E+00   12  .0000E+00   13  .0000E+00   14  .0000E+00   15  .0000E+00   16  .0000E+00
   17  .0000E+00   18  .0000E+00   19  .0000E+00   20  .0000E+00   21  .0000E+00   22  .0000E+00   23  .0000E+00   24  .0000E+00
                                              DAY OF WEEK = SUNDAY
    1  .0000E+00    2  .0000E+00    3  .0000E+00    4  .0000E+00    5  .0000E+00    6  .0000E+00    7  .0000E+00    8  .0000E+00
    9  .0000E+00   10  .0000E+00   11  .0000E+00   12  .0000E+00   13  .0000E+00   14  .0000E+00   15  .0000E+00   16  .0000E+00
   17  .0000E+00   18  .0000E+00   19  .0000E+00   20  .0000E+00   21  .0000E+00   22  .0000E+00   23  .0000E+00   24  .0000E+00
  *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                                ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                               ***       07:09:49
                                                                                                                             PAGE   8
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL
```

MCC-PhaseI-20161006-PERIOD_5yrs_UNITEMIS.LST

```
                    *** DISCRETE CARTESIAN RECEPTORS ***
                  (X-COORD, Y-COORD, ZELEV, ZHILL, ZFLAG)
                                (METERS)

    ( 512416.0, 3803250.0,    1205.7,    2554.2,       0.0);        ( 512761.0, 3803044.0,    1205.1,    2554.2,       0.0);
    ( 508576.0, 3807607.0,     983.8,    2554.2,       0.0);
```



```
                    *** METEOROLOGICAL DAYS SELECTED FOR PROCESSING ***
                                       (1=YES; 0=NO)

          1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
          1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
          1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
          1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
          1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
          1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
          1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
          1 1 1 1 1 1 1 1 1 1  1 1 1 1 1

     NOTE:  METEOROLOGICAL DATA ACTUALLY PROCESSED WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.


               *** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
                                       (METERS/SEC)

                          1.54,   3.09,   5.14,   8.23,  10.80,
```



```
                      *** UP TO THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

   Surface file:   C:\MitsubishiCement\AERMET\MCC5YR.sfc                                       Met Version:  14134
   Profile file:   C:\MitsubishiCement\AERMET\MCC5YR.PFL
   Surface format: FREE
   Profile format: FREE
   Surface station no.:    23161                Upper air station no.:     3190
                Name: DAGGETT,CA                                Name: UNKNOWN
                Year:   2010                                    Year:   2010
```

First 24 hours of scalar data

YR	MO	DY	JDY	HR	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS	WD	HT	REF TA	HT
10	01	01	1	01	-999.0	-9.000	-9.000	-9.000	-999.	-999.	-99999.0	0.10	1.56	1.00	0.00	0.	10.0	273.8	2.0
10	01	01	1	02	-6.0	0.081	-9.000	-9.000	-999.	56.	7.7	0.13	1.56	1.00	1.76	248.	10.0	273.8	2.0
10	01	01	1	03	-3.2	0.059	-9.000	-9.000	-999.	35.	5.6	0.13	1.56	1.00	1.28	226.	10.0	274.2	2.0
10	01	01	1	04	-6.5	0.085	-9.000	-9.000	-999.	59.	8.0	0.13	1.56	1.00	1.84	259.	10.0	273.8	2.0
10	01	01	1	05	-16.8	0.152	-9.000	-9.000	-999.	142.	17.7	0.07	1.56	1.00	2.93	275.	10.0	272.5	2.0
10	01	01	1	06	-11.3	0.108	-9.000	-9.000	-999.	86.	9.6	0.07	1.56	1.00	2.66	274.	10.0	273.1	2.0
10	01	01	1	07	-12.0	0.112	-9.000	-9.000	-999.	89.	9.9	0.07	1.56	1.00	2.74	274.	10.0	273.1	2.0
10	01	01	1	08	-13.3	0.157	-9.000	-9.000	-999.	149.	24.7	0.13	1.56	0.56	2.49	257.	10.0	276.4	2.0
10	01	01	1	09	25.6	0.332	0.347	0.008	56.	460.	-122.8	0.07	1.56	0.35	3.88	280.	10.0	278.8	2.0
10	01	01	1	10	80.4	0.298	0.702	0.008	147.	391.	-28.2	0.07	1.56	0.28	3.18	282.	10.0	281.4	2.0
10	01	01	1	11	118.2	0.182	1.090	0.008	375.	194.	-4.4	0.07	1.56	0.25	1.55	291.	10.0	283.8	2.0
10	01	01	1	12	136.0	0.210	1.281	0.008	529.	230.	-5.8	0.07	1.56	0.24	1.86	275.	10.0	285.4	2.0
10	01	01	1	13	133.5	0.139	1.362	0.008	646.	126.	-1.7	0.08	1.56	0.25	0.99	344.	10.0	287.0	2.0
10	01	01	1	14	110.0	0.176	1.331	0.007	730.	177.	-4.2	0.07	1.56	0.26	1.50	63.	10.0	287.5	2.0
10	01	01	1	15	67.0	0.134	1.154	0.007	782.	118.	-3.1	0.08	1.56	0.29	1.06	331.	10.0	287.5	2.0
10	01	01	1	16	9.2	0.083	0.597	0.007	789.	58.	-5.4	0.07	1.56	0.39	0.74	60.	10.0	287.5	2.0
10	01	01	1	17	-2.2	0.049	-9.000	-9.000	-999.	26.	4.5	0.07	1.56	0.69	1.20	296.	10.0	285.4	2.0
10	01	01	1	18	-4.8	0.072	-9.000	-9.000	-999.	46.	6.5	0.07	1.56	1.00	1.76	294.	10.0	284.2	2.0
10	01	01	1	19	-4.3	0.068	-9.000	-9.000	-999.	42.	6.1	0.07	1.56	1.00	1.67	75.	10.0	282.0	2.0
10	01	01	1	20	-10.2	0.107	-9.000	-9.000	-999.	85.	10.4	0.14	1.56	1.00	2.30	157.	10.0	280.9	2.0
10	01	01	1	21	-9.7	0.104	-9.000	-9.000	-999.	81.	10.0	0.13	1.56	1.00	2.25	213.	10.0	278.8	2.0
10	01	01	1	22	-27.3	0.254	-9.000	-9.000	-999.	307.	50.9	0.13	1.56	1.00	3.37	260.	10.0	279.2	2.0
10	01	01	1	23	-13.8	0.128	-9.000	-9.000	-999.	120.	13.0	0.13	1.56	1.00	2.62	236.	10.0	278.8	2.0
10	01	01	1	24	-26.0	0.240	-9.000	-9.000	-999.	282.	45.2	0.07	1.56	1.00	3.61	273.	10.0	277.0	2.0

First hour of profile data

YR	MO	DY	HR	HEIGHT	F	WDIR	WSPD	AMB_TMP	sigmaA	sigmaW	sigmaV
10	01	01	01	10.0	1	-999.	-99.00	273.8	99.0	-99.00	-99.00

F indicates top of profile (=1) or below (=0)


```
          *** THE PERIOD ( 43824 HRS) AVERAGE CONCENTRATION   VALUES FOR SOURCE GROUP: SQROAD10 ***
                         INCLUDING SOURCE(S):     SQROAD10    ,

                             *** DISCRETE CARTESIAN RECEPTOR POINTS ***

                          ** CONC OF UNITEMIS IN MICROGRAMS/M**3                          **
```

X-COORD (M)	Y-COORD (M)	CONC	X-COORD (M)	Y-COORD (M)	CONC
512416.00	3803250.00	0.00315	512761.00	3803044.00	0.00421
508576.00	3807607.00	0.00267			

```
                                                    MCC-PhaseI-20161006-PERIOD_5yrs_UNITEMIS.LST
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                       ***        07:09:49
                                                                                                                     PAGE  12
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL

                              *** THE PERIOD ( 43824 HRS) AVERAGE CONCENTRATION   VALUES FOR SOURCE GROUP: SQROAD24 ***
                                  INCLUDING SOURCE(S):     SQROAD24    ,

                                             *** DISCRETE CARTESIAN RECEPTOR POINTS ***

                                        ** CONC OF UNITEMIS IN MICROGRAMS/M**3                          **

      X-COORD (M)  Y-COORD (M)        CONC                    X-COORD (M)  Y-COORD (M)        CONC
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
        512416.00   3803250.00       0.13402                    512761.00   3803044.00       0.15553
        508576.00   3807607.00       0.02566
↑ *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                        ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                       ***        07:09:49
                                                                                                                     PAGE  13
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL

                              *** THE PERIOD ( 43824 HRS) AVERAGE CONCENTRATION   VALUES FOR SOURCE GROUP: SQMINE10 ***
                                  INCLUDING SOURCE(S):     SQMINE10    ,

                                             *** DISCRETE CARTESIAN RECEPTOR POINTS ***

                                        ** CONC OF UNITEMIS IN MICROGRAMS/M**3                          **

      X-COORD (M)  Y-COORD (M)        CONC                    X-COORD (M)  Y-COORD (M)        CONC
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
        512416.00   3803250.00       0.00295                    512761.00   3803044.00       0.00194
        508576.00   3807607.00       0.00246
↑ *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                        ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                       ***        07:09:49
                                                                                                                     PAGE  14
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL

                              *** THE PERIOD ( 43824 HRS) AVERAGE CONCENTRATION   VALUES FOR SOURCE GROUP: SQCNST10 ***
                                  INCLUDING SOURCE(S):     SQCNST10    ,

                                             *** DISCRETE CARTESIAN RECEPTOR POINTS ***

                                        ** CONC OF UNITEMIS IN MICROGRAMS/M**3                          **

      X-COORD (M)  Y-COORD (M)        CONC                    X-COORD (M)  Y-COORD (M)        CONC
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
        512416.00   3803250.00       0.00762                    512761.00   3803044.00       0.00568
        508576.00   3807607.00       0.00336
↑ *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                        ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                       ***        07:09:49
                                                                                                                     PAGE  15
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL

                                        *** THE SUMMARY OF MAXIMUM PERIOD ( 43824 HRS) RESULTS ***

                                    ** CONC OF UNITEMIS IN MICROGRAMS/M**3                          **

                                                                                                 NETWORK
GROUP ID                      AVERAGE CONC              RECEPTOR  (XR, YR, ZELEV, ZHILL, ZFLAG)  OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

SQROAD10  1ST HIGHEST VALUE IS       0.00421 AT (  512761.00,  3803044.00,  1205.06,  2554.16,     0.00)  DC
          2ND HIGHEST VALUE IS       0.00315 AT (  512416.00,  3803250.00,  1205.66,  2554.16,     0.00)  DC
          3RD HIGHEST VALUE IS       0.00267 AT (  508576.00,  3807607.00,   983.84,  2554.16,     0.00)  DC
          4TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
          5TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
          6TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
          7TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
          8TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
          9TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
         10TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)

SQROAD24  1ST HIGHEST VALUE IS       0.15553 AT (  512761.00,  3803044.00,  1205.06,  2554.16,     0.00)  DC
          2ND HIGHEST VALUE IS       0.13402 AT (  512416.00,  3803250.00,  1205.66,  2554.16,     0.00)  DC
          3RD HIGHEST VALUE IS       0.02566 AT (  508576.00,  3807607.00,   983.84,  2554.16,     0.00)  DC
          4TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
          5TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
          6TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
          7TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
          8TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
          9TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
         10TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)

SQMINE10  1ST HIGHEST VALUE IS       0.00295 AT (  512416.00,  3803250.00,  1205.66,  2554.16,     0.00)  DC
          2ND HIGHEST VALUE IS       0.00246 AT (  508576.00,  3807607.00,   983.84,  2554.16,     0.00)  DC
          3RD HIGHEST VALUE IS       0.00194 AT (  512761.00,  3803044.00,  1205.06,  2554.16,     0.00)  DC
          4TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
          5TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
          6TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
          7TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
          8TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
          9TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
         10TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)

SQCNST10  1ST HIGHEST VALUE IS       0.00762 AT (  512416.00,  3803250.00,  1205.66,  2554.16,     0.00)  DC
          2ND HIGHEST VALUE IS       0.00568 AT (  512761.00,  3803044.00,  1205.06,  2554.16,     0.00)  DC
          3RD HIGHEST VALUE IS       0.00336 AT (  508576.00,  3807607.00,   983.84,  2554.16,     0.00)  DC
          4TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,     0.00)
```

```
                                                   MCC-PhaseI-20161006-PERIOD_5yrs_UNITEMIS.LST
         5TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,    0.00)
         6TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,    0.00)
         7TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,    0.00)
         8TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,    0.00)
         9TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,    0.00)
        10TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,     0.00,     0.00,    0.00)


 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
 *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                        ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                       ***        07:09:49
                                                                                                                       PAGE  16
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL

 *** Message Summary : AERMOD Model Execution ***

  --------- Summary of Total Messages --------

 A Total of           0 Fatal Error Message(s)
 A Total of          24 Warning Message(s)
 A Total of        1219 Informational Message(s)

 A Total of       43824 Hours Were Processed

 A Total of         293 Calm Hours Identified

 A Total of         926 Missing Hours Identified (  2.11 Percent)


    ******** FATAL ERROR MESSAGES ********
               ***  NONE  ***


    ********   WARNING MESSAGES   ********
 MX W441   12175        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052307
 MX W441   12176        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052308
 MX W441   12177        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052309
 MX W441   12178        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052310
 MX W441   12179        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052311
 MX W441   12180        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052312
 MX W441   12181        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052313
 MX W441   12182        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052314
 MX W441   12183        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052315
 MX W441   12184        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052316
 MX W441   12185        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052317
 MX W441   12186        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052318
 MX W441   14167        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081407
 MX W441   14168        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081408
 MX W441   14169        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081409
 MX W441   14170        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081410
 MX W441   14171        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081411
 MX W441   14172        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081412
 MX W441   14173        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081413
 MX W441   14174        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081414
 MX W441   14175        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081415
 MX W441   14176        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081416
 MX W441   14177        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081417
 MX W441   14178        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081418

    ************************************
    *** AERMOD Finishes Successfully ***
    ************************************
```

AERMOD 1-Hour Modeling Files for HRA Analysis

```
NO ECHO

 ***********************************
 *** SETUP Finishes Successfully ***
 ***********************************

 *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                        ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                       ***        07:09:47
                                                                                                                      PAGE   1
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL

                                         ***     MODEL SETUP OPTIONS SUMMARY       ***
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 **Model Is Setup For Calculation of Average CONCentration Values.

   --  DEPOSITION LOGIC  --
 **NO GAS DEPOSITION Data Provided.
 **NO PARTICLE DEPOSITION Data Provided.
 **Model Uses NO DRY DEPLETION.  DRYDPLT  =  F
 **Model Uses NO WET DEPLETION.  WETDPLT  =  F

 **Model Uses RURAL Dispersion Only.

 **Model Allows User-Specified Options:
         1. Stack-tip Downwash.
         2. Model Accounts for ELEVated Terrain Effects.
         3. Use Calms Processing Routine.
         4. Use Missing Data Processing Routine.
         5. No Exponential Decay.

 **Other Options Specified:
         CCVR_Sub - Meteorological data includes CCVR substitutions
         TEMP_Sub - Meteorological data includes TEMP substitutions

 **Model Assumes No FLAGPOLE Receptor Heights.

 **The User Specified a Pollutant Type of:  UNITEMIS

 **Model Calculates  1 Short Term Average(s) of:   1-HR

 **This Run Includes:      4 Source(s);       4 Source Group(s); and       3 Receptor(s)

                with:      0 POINT(s), including
                           0 POINTCAP(s) and      0 POINTHOR(s)
                 and:      0 VOLUME source(s)
                 and:      1 AREA type source(s)
                 and:      3 LINE source(s)
                 and:      0 OPENPIT source(s)


 **Model Set To Continue RUNning After the Setup Testing.

 **The AERMET Input Meteorological Data Version Date:  14134

 **Output Options Selected:
          Model Outputs Tables of Highest Short Term Values by Receptor (RECTABLE Keyword)
          Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)
          Model Outputs Separate Summary File of High Ranked Values (SUMMFILE Keyword)

 **NOTE:  The Following Flags May Appear Following CONC Values:  c for Calm Hours
                                                                 m for Missing Hours
                                                                 b for Both Calm and Missing Hours

 **Misc. Inputs:  Base Elev. for Pot. Temp. Profile (m MSL) =   586.44 ;  Decay Coef. =    0.000     ;  Rot. Angle =     0.0
                  Emission Units = GRAMS/SEC                               ;  Emission Rate Unit Factor =   0.10000E+07
                  Output Units   = MICROGRAMS/M**3

 **Approximate Storage Requirements of Model =      3.5 MB of RAM.

 **File for Summary of Results:   C:\MitsubishiCement\AERMOD\MCC-PhaseI-20161006-01HOUR_5yrs_UNITEMIS.SUM
 *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                        ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                       ***        07:09:47
                                                                                                                      PAGE   2
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL


                                                 *** AREA SOURCE DATA ***

               NUMBER EMISSION RATE  COORD (SW CORNER)  BASE     RELEASE  X-DIM     Y-DIM    ORIENT.    INIT.  URBAN  EMISSION RATE
   SOURCE       PART.  (GRAMS/SEC       X        Y       ELEV.    HEIGHT  OF AREA   OF AREA   OF AREA     SZ    SOURCE  SCALAR VARY
     ID         CATS.   /METER**2)   (METERS) (METERS) (METERS) (METERS) (METERS)  (METERS)   (DEG.)  (METERS)            BY
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 SQMINE10         0  0.11111E-02  512699.8 3799785.6  1838.2     0.00     30.00     30.00      0.00     0.00     NO    HRDOW
 *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                        ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                       ***        07:09:47
                                                                                                                      PAGE   3
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL


                                                 *** LINE SOURCE DATA ***
```

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC /METER**2)	FIRST COORD X (METERS)	FIRST COORD Y (METERS)	SECOND COORD X (METERS)	SECOND COORD Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	WIDTH OF LINE (METERS)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
SQROAD10	0	0.12104E-03	512238.8	3800093.2	512702.1	3799811.6	1831.6	4.47	15.24	2.08	NO	HRDOW
SQROAD24	0	0.12104E-03	512238.8	3800093.2	512702.1	3799811.6	1831.6	4.47	15.24	2.08	NO	
SQCNST10	0	0.72745E-04	513055.6	3800570.2	512289.2	3800094.5	1404.2	4.47	15.24	2.08	NO	HRDOW

*** AERMOD - VERSION 15181 *** *** Mitsubishi Cement; Lucerne Valley California *** 10/06/16
*** AERMET - VERSION 14134 *** *** Phase I Mine Expansion Modeling; October 2016 *** 07:09:47
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**MODELOPTs: NonDFAULT CONC ELEV NODRYDPLT NOWETDPLT BETA RURAL

*** SOURCE IDs DEFINING SOURCE GROUPS ***

SRCGROUP ID	SOURCE IDs
SQROAD10	SQROAD10 ,
SQROAD24	SQROAD24 ,
SQMINE10	SQMINE10 ,
SQCNST10	SQCNST10 ,

*** AERMOD - VERSION 15181 *** *** Mitsubishi Cement; Lucerne Valley California *** 10/06/16
*** AERMET - VERSION 14134 *** *** Phase I Mine Expansion Modeling; October 2016 *** 07:09:47
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**MODELOPTs: NonDFAULT CONC ELEV NODRYDPLT NOWETDPLT BETA RURAL

* SOURCE EMISSION RATE SCALARS WHICH VARY DIURNALLY AND BY DAY OF WEEK (HRDOW) *

SOURCE ID = SQROAD10 ; SOURCE TYPE = LINE :

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR
DAY OF WEEK = WEEKDAY															
1	.0000E+00	2	.0000E+00	3	.0000E+00	4	.0000E+00	5	.0000E+00	6	.0000E+00	7	.0000E+00	8	.1000E+01
9	.1000E+01	10	.1000E+01	11	.1000E+01	12	.1000E+01	13	.1000E+01	14	.1000E+01	15	.1000E+01	16	.1000E+01
17	.1000E+01	18	.0000E+00	19	.0000E+00	20	.0000E+00	21	.0000E+00	22	.0000E+00	23	.0000E+00	24	.0000E+00
DAY OF WEEK = SATURDAY															
1	.0000E+00	2	.0000E+00	3	.0000E+00	4	.0000E+00	5	.0000E+00	6	.0000E+00	7	.0000E+00	8	.0000E+00
9	.0000E+00	10	.0000E+00	11	.0000E+00	12	.0000E+00	13	.0000E+00	14	.0000E+00	15	.0000E+00	16	.0000E+00
17	.0000E+00	18	.0000E+00	19	.0000E+00	20	.0000E+00	21	.0000E+00	22	.0000E+00	23	.0000E+00	24	.0000E+00
DAY OF WEEK = SUNDAY															
1	.0000E+00	2	.0000E+00	3	.0000E+00	4	.0000E+00	5	.0000E+00	6	.0000E+00	7	.0000E+00	8	.0000E+00
9	.0000E+00	10	.0000E+00	11	.0000E+00	12	.0000E+00	13	.0000E+00	14	.0000E+00	15	.0000E+00	16	.0000E+00
17	.0000E+00	18	.0000E+00	19	.0000E+00	20	.0000E+00	21	.0000E+00	22	.0000E+00	23	.0000E+00	24	.0000E+00

*** AERMOD - VERSION 15181 *** *** Mitsubishi Cement; Lucerne Valley California *** 10/06/16
*** AERMET - VERSION 14134 *** *** Phase I Mine Expansion Modeling; October 2016 *** 07:09:47
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**MODELOPTs: NonDFAULT CONC ELEV NODRYDPLT NOWETDPLT BETA RURAL

* SOURCE EMISSION RATE SCALARS WHICH VARY DIURNALLY AND BY DAY OF WEEK (HRDOW) *

SOURCE ID = SQMINE10 ; SOURCE TYPE = AREA :

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR
DAY OF WEEK = WEEKDAY															
1	.0000E+00	2	.0000E+00	3	.0000E+00	4	.0000E+00	5	.0000E+00	6	.0000E+00	7	.0000E+00	8	.1000E+01
9	.1000E+01	10	.1000E+01	11	.1000E+01	12	.1000E+01	13	.1000E+01	14	.1000E+01	15	.1000E+01	16	.1000E+01
17	.1000E+01	18	.0000E+00	19	.0000E+00	20	.0000E+00	21	.0000E+00	22	.0000E+00	23	.0000E+00	24	.0000E+00
DAY OF WEEK = SATURDAY															
1	.0000E+00	2	.0000E+00	3	.0000E+00	4	.0000E+00	5	.0000E+00	6	.0000E+00	7	.0000E+00	8	.0000E+00
9	.0000E+00	10	.0000E+00	11	.0000E+00	12	.0000E+00	13	.0000E+00	14	.0000E+00	15	.0000E+00	16	.0000E+00
17	.0000E+00	18	.0000E+00	19	.0000E+00	20	.0000E+00	21	.0000E+00	22	.0000E+00	23	.0000E+00	24	.0000E+00
DAY OF WEEK = SUNDAY															
1	.0000E+00	2	.0000E+00	3	.0000E+00	4	.0000E+00	5	.0000E+00	6	.0000E+00	7	.0000E+00	8	.0000E+00
9	.0000E+00	10	.0000E+00	11	.0000E+00	12	.0000E+00	13	.0000E+00	14	.0000E+00	15	.0000E+00	16	.0000E+00
17	.0000E+00	18	.0000E+00	19	.0000E+00	20	.0000E+00	21	.0000E+00	22	.0000E+00	23	.0000E+00	24	.0000E+00

*** AERMOD - VERSION 15181 *** *** Mitsubishi Cement; Lucerne Valley California *** 10/06/16
*** AERMET - VERSION 14134 *** *** Phase I Mine Expansion Modeling; October 2016 *** 07:09:47
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**MODELOPTs: NonDFAULT CONC ELEV NODRYDPLT NOWETDPLT BETA RURAL

* SOURCE EMISSION RATE SCALARS WHICH VARY DIURNALLY AND BY DAY OF WEEK (HRDOW) *

SOURCE ID = SQCNST10 ; SOURCE TYPE = LINE :

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR
DAY OF WEEK = WEEKDAY															
1	.0000E+00	2	.0000E+00	3	.0000E+00	4	.0000E+00	5	.0000E+00	6	.0000E+00	7	.0000E+00	8	.1000E+01
9	.1000E+01	10	.1000E+01	11	.1000E+01	12	.1000E+01	13	.1000E+01	14	.1000E+01	15	.1000E+01	16	.1000E+01
17	.1000E+01	18	.0000E+00	19	.0000E+00	20	.0000E+00	21	.0000E+00	22	.0000E+00	23	.0000E+00	24	.0000E+00
DAY OF WEEK = SATURDAY															
1	.0000E+00	2	.0000E+00	3	.0000E+00	4	.0000E+00	5	.0000E+00	6	.0000E+00	7	.0000E+00	8	.0000E+00
9	.0000E+00	10	.0000E+00	11	.0000E+00	12	.0000E+00	13	.0000E+00	14	.0000E+00	15	.0000E+00	16	.0000E+00
17	.0000E+00	18	.0000E+00	19	.0000E+00	20	.0000E+00	21	.0000E+00	22	.0000E+00	23	.0000E+00	24	.0000E+00
DAY OF WEEK = SUNDAY															
1	.0000E+00	2	.0000E+00	3	.0000E+00	4	.0000E+00	5	.0000E+00	6	.0000E+00	7	.0000E+00	8	.0000E+00
9	.0000E+00	10	.0000E+00	11	.0000E+00	12	.0000E+00	13	.0000E+00	14	.0000E+00	15	.0000E+00	16	.0000E+00
17	.0000E+00	18	.0000E+00	19	.0000E+00	20	.0000E+00	21	.0000E+00	22	.0000E+00	23	.0000E+00	24	.0000E+00

*** AERMOD - VERSION 15181 *** *** Mitsubishi Cement; Lucerne Valley California *** 10/06/16
*** AERMET - VERSION 14134 *** *** Phase I Mine Expansion Modeling; October 2016 *** 07:09:47
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**MODELOPTs: NonDFAULT CONC ELEV NODRYDPLT NOWETDPLT BETA RURAL

*** DISCRETE CARTESIAN RECEPTORS ***
(X-COORD, Y-COORD, ZELEV, ZHILL, ZFLAG)
(METERS)

(512416.0, 3803250.0, 1205.7, 2554.2, 0.0); (512761.0, 3803044.0, 1205.1, 2554.2, 0.0);
(508576.0, 3807607.0, 983.8, 2554.2, 0.0);

*** AERMOD - VERSION 15181 *** *** Mitsubishi Cement; Lucerne Valley California *** 10/06/16
*** AERMET - VERSION 14134 *** *** Phase I Mine Expansion Modeling; October 2016 *** 07:09:47
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**MODELOPTs: NonDFAULT CONC ELEV NODRYDPLT NOWETDPLT BETA RURAL

*** METEOROLOGICAL DAYS SELECTED FOR PROCESSING ***
(1=YES; 0=NO)

```
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1
```

NOTE: METEOROLOGICAL DATA ACTUALLY PROCESSED WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.

*** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

*** AERMOD - VERSION 15181 *** *** Mitsubishi Cement; Lucerne Valley California *** 10/06/16
*** AERMET - VERSION 14134 *** *** Phase I Mine Expansion Modeling; October 2016 *** 07:09:47
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**MODELOPTs: NonDFAULT CONC ELEV NODRYDPLT NOWETDPLT BETA RURAL

*** UP TO THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

Surface file: C:\MitsubishiCement\AERMET\MCC5YR.sfc Met Version: 14134
Profile file: C:\MitsubishiCement\AERMET\MCC5YR.PFL
Surface format: FREE
Profile format: FREE
Surface station no.: 23161 Upper air station no.: 3190
Name: DAGGETT,CA Name: UNKNOWN
Year: 2010 Year: 2010

First 24 hours of scalar data

YR MO DY JDY HR	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS	WD	HT	REF TA	HT
10 01 01 1 01	-999.0	-9.000	-9.000	-9.000	-999.	-999.	-99999.0	0.10	1.56	1.00	0.00	0.	10.0	273.8	2.0
10 01 01 1 02	-6.0	0.081	-9.000	-9.000	-999.	56.	7.7	0.13	1.56	1.00	1.76	248.	10.0	273.8	2.0
10 01 01 1 03	-3.2	0.059	-9.000	-9.000	-999.	35.	5.6	0.13	1.56	1.00	1.28	226.	10.0	274.2	2.0
10 01 01 1 04	-6.5	0.085	-9.000	-9.000	-999.	59.	8.0	0.13	1.56	1.00	1.84	259.	10.0	273.8	2.0
10 01 01 1 05	-16.8	0.152	-9.000	-9.000	-999.	142.	17.7	0.07	1.56	1.00	2.93	275.	10.0	272.5	2.0
10 01 01 1 06	-11.3	0.108	-9.000	-9.000	-999.	86.	9.6	0.07	1.56	1.00	2.66	274.	10.0	273.1	2.0
10 01 01 1 07	-12.0	0.112	-9.000	-9.000	-999.	89.	9.9	0.07	1.56	1.00	2.74	274.	10.0	273.1	2.0
10 01 01 1 08	-13.3	0.157	-9.000	-9.000	-999.	149.	24.7	0.13	1.56	0.56	2.49	257.	10.0	276.4	2.0
10 01 01 1 09	25.6	0.332	0.347	0.008	56.	460.	-122.8	0.07	1.56	0.35	3.88	280.	10.0	278.8	2.0
10 01 01 1 10	80.4	0.298	0.702	0.008	147.	391.	-28.2	0.07	1.56	0.28	3.18	282.	10.0	281.4	2.0
10 01 01 1 11	118.2	0.182	1.090	0.008	375.	194.	-4.4	0.07	1.56	0.25	1.55	291.	10.0	283.8	2.0
10 01 01 1 12	136.0	0.210	1.281	0.008	529.	230.	-5.8	0.07	1.56	0.24	1.86	275.	10.0	285.4	2.0
10 01 01 1 13	133.5	0.139	1.362	0.008	646.	126.	-1.7	0.08	1.56	0.25	0.99	344.	10.0	287.0	2.0
10 01 01 1 14	110.0	0.176	1.331	0.007	730.	177.	-4.2	0.07	1.56	0.26	1.50	63.	10.0	287.5	2.0
10 01 01 1 15	67.0	0.134	1.154	0.007	782.	118.	-3.1	0.08	1.56	0.29	1.06	331.	10.0	287.5	2.0
10 01 01 1 16	9.2	0.083	0.597	0.007	789.	58.	-5.4	0.07	1.56	0.39	0.74	60.	10.0	287.5	2.0
10 01 01 1 17	-2.2	0.049	-9.000	-9.000	-999.	26.	4.5	0.07	1.56	0.69	1.20	296.	10.0	285.4	2.0
10 01 01 1 18	-4.8	0.072	-9.000	-9.000	-999.	46.	6.5	0.07	1.56	1.00	1.76	294.	10.0	284.2	2.0
10 01 01 1 19	-4.3	0.068	-9.000	-9.000	-999.	42.	6.1	0.07	1.56	1.00	1.67	75.	10.0	282.0	2.0
10 01 01 1 20	-10.2	0.107	-9.000	-9.000	-999.	85.	10.4	0.14	1.56	1.00	2.30	157.	10.0	280.9	2.0
10 01 01 1 21	-9.7	0.104	-9.000	-9.000	-999.	81.	10.0	0.13	1.56	1.00	2.25	213.	10.0	278.8	2.0
10 01 01 1 22	-27.3	0.254	-9.000	-9.000	-999.	307.	50.9	0.13	1.56	1.00	3.37	260.	10.0	279.2	2.0
10 01 01 1 23	-13.8	0.128	-9.000	-9.000	-999.	120.	13.0	0.13	1.56	1.00	2.62	236.	10.0	278.8	2.0
10 01 01 1 24	-26.0	0.240	-9.000	-9.000	-999.	282.	45.2	0.07	1.56	1.00	3.61	273.	10.0	277.0	2.0

First hour of profile data

YR MO DY HR	HEIGHT	F	WDIR	WSPD	AMB_TMP	sigmaA	sigmaW	sigmaV
10 01 01 01	10.0	1	-999.	-99.00	273.8	99.0	-99.00	-99.00

F indicates top of profile (=1) or below (=0)

*** AERMOD - VERSION 15181 *** *** Mitsubishi Cement; Lucerne Valley California *** 10/06/16
*** AERMET - VERSION 14134 *** *** Phase I Mine Expansion Modeling; October 2016 *** 07:09:47
PAGE 11

**MODELOPTs: NonDFAULT CONC ELEV NODRYDPLT NOWETDPLT BETA RURAL

*** THE 1ST HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: SQROAD10 ***
INCLUDING SOURCE(S): SQROAD10 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF UNITEMIS IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
512416.00	3803250.00	12.70962	(14111917)	512761.00	3803044.00	20.47634	(10122208)
508576.00	3807607.00	8.70301	(13112808)				

*** AERMOD - VERSION 15181 *** *** Mitsubishi Cement; Lucerne Valley California *** 10/06/16

```
                                        MCC-PhaseI-20161006-01HOUR_5yrs_UNITEMIS.LST
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                         ***        07:09:47
                                                                                                                        PAGE  12
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL

                             *** THE   1ST HIGHEST  1-HR AVERAGE CONCENTRATION   VALUES FOR SOURCE GROUP:  SQROAD24 ***
                                 INCLUDING SOURCE(S):     SQROAD24    ,

                                            *** DISCRETE CARTESIAN RECEPTOR POINTS ***

                                       ** CONC OF UNITEMIS IN MICROGRAMS/M**3                          **

      X-COORD (M)  Y-COORD (M)        CONC     (YYMMDDHH)             X-COORD (M)  Y-COORD (M)        CONC     (YYMMDDHH)
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

        512416.00   3803250.00       94.45413  (13020219)              512761.00   3803044.00      115.72419  (12112723)
        508576.00   3807607.00       24.18648  (13102222)
 *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                          ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                         ***        07:09:47
                                                                                                                        PAGE  13
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL

                             *** THE   1ST HIGHEST  1-HR AVERAGE CONCENTRATION   VALUES FOR SOURCE GROUP:  SQMINE10 ***
                                 INCLUDING SOURCE(S):     SQMINE10    ,

                                            *** DISCRETE CARTESIAN RECEPTOR POINTS ***

                                       ** CONC OF UNITEMIS IN MICROGRAMS/M**3                          **

      X-COORD (M)  Y-COORD (M)        CONC     (YYMMDDHH)             X-COORD (M)  Y-COORD (M)        CONC     (YYMMDDHH)
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

        512416.00   3803250.00       26.09553  (14111917)              512761.00   3803044.00       11.88991  (13112217)
        508576.00   3807607.00       16.53676  (11012017)
 *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                          ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                         ***        07:09:47
                                                                                                                        PAGE  14
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL

                             *** THE   1ST HIGHEST  1-HR AVERAGE CONCENTRATION   VALUES FOR SOURCE GROUP:  SQCNST10 ***
                                 INCLUDING SOURCE(S):     SQCNST10    ,

                                            *** DISCRETE CARTESIAN RECEPTOR POINTS ***

                                       ** CONC OF UNITEMIS IN MICROGRAMS/M**3                          **

      X-COORD (M)  Y-COORD (M)        CONC     (YYMMDDHH)             X-COORD (M)  Y-COORD (M)        CONC     (YYMMDDHH)
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

        512416.00   3803250.00       34.60399  (14111917)              512761.00   3803044.00       16.31710  (14111917)
        508576.00   3807607.00        7.62434  (12120717)
 *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                          ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                         ***        07:09:47
                                                                                                                        PAGE  15
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL

                                               *** THE SUMMARY OF HIGHEST  1-HR RESULTS ***

                                   ** CONC OF UNITEMIS IN MICROGRAMS/M**3                          **

                                                     DATE                                                                 NETWORK
GROUP ID                                  AVERAGE CONC     (YYMMDDHH)          RECEPTOR  (XR, YR, ZELEV, ZHILL, ZFLAG)    OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

SQROAD10 HIGH   1ST HIGH VALUE IS      20.47634  ON 10122208: AT (  512761.00,  3803044.00,  1205.06,  2554.16,    0.00)  DC

SQROAD24 HIGH   1ST HIGH VALUE IS     115.72419  ON 12112723: AT (  512761.00,  3803044.00,  1205.06,  2554.16,    0.00)  DC

SQMINE10 HIGH   1ST HIGH VALUE IS      26.09553  ON 14111917: AT (  512416.00,  3803250.00,  1205.66,  2554.16,    0.00)  DC

SQCNST10 HIGH   1ST HIGH VALUE IS      34.60399  ON 14111917: AT (  512416.00,  3803250.00,  1205.66,  2554.16,    0.00)  DC

 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
 *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                          ***        10/06/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; October 2016                         ***        07:09:47
                                                                                                                        PAGE  16
 **MODELOPTs:   NonDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT BETA      RURAL

 *** Message Summary : AERMOD Model Execution ***

  --------- Summary of Total Messages --------

 A Total of           0 Fatal Error Message(s)
 A Total of          24 Warning Message(s)
 A Total of        1219 Informational Message(s)

 A Total of       43824 Hours Were Processed

 A Total of         293 Calm Hours Identified

 A Total of         926 Missing Hours Identified (  2.11 Percent)

    ******** FATAL ERROR MESSAGES ********
               ***  NONE  ***
```

```
   ********   WARNING MESSAGES   ********
MX W441   12175        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052307
MX W441   12176        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052308
MX W441   12177        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052309
MX W441   12178        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052310
MX W441   12179        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052311
MX W441   12180        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052312
MX W441   12181        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052313
MX W441   12182        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052314
MX W441   12183        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052315
MX W441   12184        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052316
MX W441   12185        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052317
MX W441   12186        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11052318
MX W441   14167        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081407
MX W441   14168        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081408
MX W441   14169        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081409
MX W441   14170        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081410
MX W441   14171        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081411
MX W441   14172        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081412
MX W441   14173        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081413
MX W441   14174        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081414
MX W441   14175        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081415
MX W441   14176        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081416
MX W441   14177        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081417
MX W441   14178        METQA: Vert Pot Temp Grad abv ZI set to min .005, KURDAT=     11081418

   ************************************
   *** AERMOD Finishes Successfully ***
   ************************************
```

AERMOD Modeling Files for Class I Area Analysis

AERMOD Output File - Class I Area Analysis

```
                                            MCC-MineExpansion-SanGorgonioWilderness-20160526_2014_UNITEMIS
**BEE-Line Software: BEEST for Windows (Version 10.14) data input file
**  Model: AERMOD.EXE     Input File Creation Date: 6/1/2016  Time: 8:18:02 PM
NO ECHO




 **********************************
 *** SETUP Finishes Successfully ***
 **********************************

 *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                        ***        06/01/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; May 2016; San Gorgonio Wilderness R ***        20:22:40
                                                                                                                       PAGE   1
 **MODELOPTs:   RegDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT RURAL

                                           ***     MODEL SETUP OPTIONS SUMMARY       ***
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 **Model Is Setup For Calculation of Average CONCentration Values.

   --  DEPOSITION LOGIC  --
 **NO GAS DEPOSITION Data Provided.
 **NO PARTICLE DEPOSITION Data Provided.
 **Model Uses NO DRY DEPLETION.  DRYDPLT  =  F
 **Model Uses NO WET DEPLETION.  WETDPLT  =  F

 **Model Uses RURAL Dispersion Only.

 **Model Uses Regulatory DEFAULT Options:
         1. Stack-tip Downwash.
         2. Model Accounts for ELEVated Terrain Effects.
         3. Use Calms Processing Routine.
         4. Use Missing Data Processing Routine.
         5. No Exponential Decay.

 **Other Options Specified:
         CCVR_Sub - Meteorological data includes CCVR substitutions
         TEMP_Sub - Meteorological data includes TEMP substitutions

 **Model Assumes No FLAGPOLE Receptor Heights.

 **The User Specified a Pollutant Type of:  UNITEMIS

 **Model Calculates ANNUAL Averages Only

 **This Run Includes:      1 Source(s);       1 Source Group(s); and      26 Receptor(s)

                with:      0 POINT(s), including
                           0 POINTCAP(s) and      0 POINTHOR(s)
                 and:      0 VOLUME source(s)
                 and:      0 AREA type source(s)
                 and:      1 LINE source(s)
                 and:      0 OPENPIT source(s)


 **Model Set To Continue RUNning After the Setup Testing.

 **The AERMET Input Meteorological Data Version Date:  14134

 **Output Options Selected:
          Model Outputs Tables of ANNUAL Averages by Receptor
          Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)
          Model Outputs Separate Summary File of High Ranked Values (SUMMFILE Keyword)

 **NOTE:  The Following Flags May Appear Following CONC Values:  c for Calm Hours
                                                                 m for Missing Hours
                                                                 b for Both Calm and Missing Hours

 **Misc. Inputs:  Base Elev. for Pot. Temp. Profile (m MSL) =   586.44 ;  Decay Coef. =    0.000     ;  Rot. Angle =     0.0
                  Emission Units = GRAMS/SEC                               ;  Emission Rate Unit Factor =   0.10000E+07
                  Output Units   = MICROGRAMS/M**3

 **Approximate Storage Requirements of Model =      3.5 MB of RAM.

 **File for Summary of Results:   C:\MitsubishiCement\AERMOD\MCC-MineExpansion-SanGorgonioWilderness-20160526_2014_UNITEMIS.SUM
 *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                        ***        06/01/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; May 2016; San Gorgonio Wilderness R ***        20:22:40
                                                                                                                       PAGE   2
 **MODELOPTs:   RegDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT RURAL


                                                 *** LINE SOURCE DATA ***

               NUMBER EMISSION RATE     FIRST COORD         SECOND COORD      BASE    RELEASE    WIDTH    INIT.   URBAN  EMISSION RATE
   SOURCE       PART.  (GRAMS/SEC        X       Y           X       Y      ELEV.   HEIGHT    OF LINE    SZ     SOURCE SCALAR VARY
     ID         CATS.   /METER**2)   (METERS) (METERS)   (METERS) (METERS) (METERS) (METERS)  (METERS) (METERS)               BY
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 SQROAD10         0   0.12104E-03  512238.8 3800093.2  512702.1 3799811.6  1831.6     4.47     15.24     2.08     NO    HRDOW
 *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                        ***        06/01/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; May 2016; San Gorgonio Wilderness R ***        20:22:40
                                                                                                                       PAGE   3
 **MODELOPTs:   RegDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT RURAL
```

```
                                      MCC-MineExpansion-SanGorgonioWilderness-20160526_2014_UNITEMIS

                                     *** SOURCE IDs DEFINING SOURCE GROUPS ***

 SRCGROUP ID                                             SOURCE IDs
 -----------                                             ----------

  SQROAD10   SQROAD10    ,
 *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                            ***        06/01/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; May 2016; San Gorgonio Wilderness R ***        20:22:40
                                                                                                                         PAGE   4
 **MODELOPTs:   RegDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT RURAL

                 * SOURCE EMISSION RATE SCALARS WHICH VARY DIURNALLY AND BY DAY OF WEEK (HRDOW) *

 SOURCE ID = SQROAD10     ; SOURCE TYPE = LINE      :
  HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR   HOUR   SCALAR
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
                                              DAY OF WEEK = WEEKDAY
    1  .0000E+00    2  .0000E+00    3  .0000E+00    4  .0000E+00    5  .0000E+00    6  .0000E+00    7  .0000E+00    8  .1000E+01
    9  .1000E+01   10  .1000E+01   11  .1000E+01   12  .1000E+01   13  .1000E+01   14  .1000E+01   15  .1000E+01   16  .1000E+01
   17  .1000E+01   18  .0000E+00   19  .0000E+00   20  .0000E+00   21  .0000E+00   22  .0000E+00   23  .0000E+00   24  .0000E+00
                                              DAY OF WEEK = SATURDAY
    1  .0000E+00    2  .0000E+00    3  .0000E+00    4  .0000E+00    5  .0000E+00    6  .0000E+00    7  .0000E+00    8  .0000E+00
    9  .0000E+00   10  .0000E+00   11  .0000E+00   12  .0000E+00   13  .0000E+00   14  .0000E+00   15  .0000E+00   16  .0000E+00
   17  .0000E+00   18  .0000E+00   19  .0000E+00   20  .0000E+00   21  .0000E+00   22  .0000E+00   23  .0000E+00   24  .0000E+00
                                              DAY OF WEEK = SUNDAY
    1  .0000E+00    2  .0000E+00    3  .0000E+00    4  .0000E+00    5  .0000E+00    6  .0000E+00    7  .0000E+00    8  .0000E+00
    9  .0000E+00   10  .0000E+00   11  .0000E+00   12  .0000E+00   13  .0000E+00   14  .0000E+00   15  .0000E+00   16  .0000E+00
   17  .0000E+00   18  .0000E+00   19  .0000E+00   20  .0000E+00   21  .0000E+00   22  .0000E+00   23  .0000E+00   24  .0000E+00
 *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                            ***        06/01/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; May 2016; San Gorgonio Wilderness R ***        20:22:40
                                                                                                                         PAGE   5
 **MODELOPTs:   RegDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT RURAL

                                           *** DISCRETE CARTESIAN RECEPTORS ***
                                         (X-COORD, Y-COORD, ZELEV, ZHILL, ZFLAG)
                                                        (METERS)

     ( 502119.9, 3777524.2,     1945.0,     3505.1,       0.0);        ( 503387.5, 3778923.3,     1969.1,     3505.1,       0.0);
     ( 505433.8, 3779587.0,     1875.2,     3505.1,       0.0);        ( 506595.3, 3779199.8,     1968.5,     3505.1,       0.0);
     ( 508143.8, 3779752.9,     2000.4,     3505.1,       0.0);        ( 509747.7, 3779587.0,     2125.7,     3505.1,       0.0);
     ( 511517.5, 3779421.1,     2199.2,     3505.1,       0.0);        ( 512734.2, 3779199.8,     2251.4,     3505.1,       0.0);
     ( 513785.0, 3779421.1,     2236.0,     3505.1,       0.0);        ( 514946.5, 3779974.1,     2073.6,     3505.1,       0.0);
     ( 516163.2, 3779974.1,     2102.0,     3505.1,       0.0);        ( 517103.4, 3779310.5,     2133.2,     3505.1,       0.0);
     ( 518320.1, 3778868.0,     2225.5,     3505.1,       0.0);        ( 519924.0, 3777651.3,     2370.7,     3505.1,       0.0);
     ( 521970.3, 3775660.3,     2494.1,     3505.1,       0.0);        ( 524569.7, 3775770.9,     2247.9,     3505.1,       0.0);
     ( 525841.8, 3777430.1,     2216.5,     3505.1,       0.0);        ( 527445.6, 3778923.3,     2525.4,     2761.2,       0.0);
     ( 530487.5, 3778978.6,     2346.2,     2761.2,       0.0);        ( 532755.0, 3779033.9,     2129.0,     2761.2,       0.0);
     ( 535465.0, 3778923.3,     1626.7,     2775.5,       0.0);        ( 536903.0, 3778591.5,     1449.9,     2785.5,       0.0);
     ( 538451.5, 3778536.2,     1618.8,     2761.2,       0.0);        ( 540110.7, 3776987.6,     1262.6,     2775.5,       0.0);
     ( 541825.2, 3776987.6,     1376.2,     2465.2,       0.0);        ( 543318.5, 3776932.3,     1319.7,     2465.2,       0.0);
 *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                            ***        06/01/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; May 2016; San Gorgonio Wilderness R ***        20:22:40
                                                                                                                         PAGE   6
 **MODELOPTs:   RegDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT RURAL

                                         *** METEOROLOGICAL DAYS SELECTED FOR PROCESSING ***
                                                           (1=YES; 0=NO)

            1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1  1 1 1 1 1

                NOTE:  METEOROLOGICAL DATA ACTUALLY PROCESSED WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.


                                  *** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
                                                          (METERS/SEC)

                                                   1.54,   3.09,   5.14,   8.23,  10.80,
 *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                            ***        06/01/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; May 2016; San Gorgonio Wilderness R ***        20:22:40
                                                                                                                         PAGE   7
 **MODELOPTs:   RegDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT RURAL

                                    *** UP TO THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

   Surface file:   C:\MitsubishiCement\AERMET\MCC2014.SFC                                            Met Version:  14134
   Profile file:   C:\MitsubishiCement\AERMET\MCC2014.PFL
   Surface format: FREE
   Profile format: FREE
   Surface station no.:     23161               Upper air station no.:      3120
                  Name: DAGGETT,CA                                Name: UNKNOWN
                  Year:   2014                                    Year:   2014

 First 24 hours of scalar data
 YR MO DY JDY HR     H0     U*     W*  DT/DZ ZICNV ZIMCH  M-O LEN    Z0  BOWEN ALBEDO  REF WS   WD     HT  REF TA     HT
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 14 01 01   1 01  -39.5  0.367 -9.000 -9.000 -999.  534.    106.6  0.07   1.56   1.00    4.94  274.    10.0  278.8    2.0
 14 01 01   1 02  -41.6  0.386 -9.000 -9.000 -999.  575.    117.4  0.13   1.56   1.00    4.59  268.    10.0  278.1    2.0
 14 01 01   1 03  -34.7  0.321 -9.000 -9.000 -999.  440.     81.2  0.07   1.56   1.00    4.44  272.    10.0  277.5    2.0
```

```
                                                     MCC-MineExpansion-SanGorgonioWilderness-20160526_2014_UNITEMIS
 14 01 01   1 04  -39.6  0.365 -9.000 -9.000 -999.  529.    104.4  0.13   1.56   1.00    4.39  265.   10.0  276.4    2.0
 14 01 01   1 05  -37.6  0.346 -9.000 -9.000 -999.  489.     93.6  0.07   1.56   1.00    4.71  271.   10.0  275.9    2.0
 14 01 01   1 06  -45.8  0.421 -9.000 -9.000 -999.  656.    139.0  0.13   1.56   1.00    4.94  265.   10.0  276.4    2.0
 14 01 01   1 07  -44.6  0.409 -9.000 -9.000 -999.  628.    130.5  0.13   1.56   1.00    4.82  262.   10.0  275.4    2.0
 14 01 01   1 08  -25.5  0.302 -9.000 -9.000 -999.  406.     92.3  0.07   1.56   0.56    4.12  276.   10.0  277.0    2.0
 14 01 01   1 09   26.1  0.407  0.317  0.009   41.  624.   -220.7  0.07   1.56   0.35    4.85  270.   10.0  280.9    2.0
 14 01 01   1 10   81.3  0.466  0.862  0.009  268.  764.   -106.4  0.07   1.56   0.28    5.41  272.   10.0  284.2    2.0
 14 01 01   1 11  119.4  0.340  1.169  0.011  456.  488.    -28.1  0.07   1.56   0.25    3.63  281.   10.0  287.0    2.0
 14 01 01   1 12  137.2  0.212  1.297  0.010  542.  246.     -5.9  0.07   1.56   0.24    1.89  292.   10.0  288.1    2.0
 14 01 01   1 13  135.0  0.158  1.366  0.009  643.  152.     -2.5  0.08   1.56   0.25    1.21  340.   10.0  290.4    2.0
 14 01 01   1 14  111.9  0.152  1.365  0.009  774.  142.     -2.7  0.07   1.56   0.26    1.20   80.   10.0  291.4    2.0
 14 01 01   1 15   69.5  0.165  1.174  0.008  793.  161.     -5.5  0.12   1.56   0.29    1.26  112.   10.0  292.5    2.0
 14 01 01   1 16   11.6  0.155  0.648  0.008  796.  146.    -27.0  0.12   1.56   0.39    1.45  100.   10.0  292.5    2.0
 14 01 01   1 17   -7.6  0.094 -9.000 -9.000 -999.   69.      9.2  0.12   1.56   0.69    2.06  117.   10.0  289.9    2.0
 14 01 01   1 18   -6.7  0.084 -9.000 -9.000 -999.   59.      7.6  0.07   1.56   1.00    2.08   62.   10.0  285.4    2.0
 14 01 01   1 19   -2.0  0.047 -9.000 -9.000 -999.   25.      4.6  0.14   1.56   1.00    1.01  148.   10.0  284.9    2.0
 14 01 01   1 20   -5.6  0.080 -9.000 -9.000 -999.   54.      7.7  0.14   1.56   1.00    1.72  197.   10.0  282.5    2.0
 14 01 01   1 21   -2.6  0.054 -9.000 -9.000 -999.   30.      5.2  0.14   1.56   1.00    1.16  201.   10.0  279.9    2.0
 14 01 01   1 22   -9.3  0.099 -9.000 -9.000 -999.   75.      8.9  0.07   1.56   1.00    2.44  281.   10.0  279.9    2.0
 14 01 01   1 23  -17.7  0.163 -9.000 -9.000 -999.  158.     21.0  0.07   1.56   1.00    2.98  275.   10.0  277.5    2.0
 14 01 01   1 24  -10.1  0.106 -9.000 -9.000 -999.   84.     10.1  0.13   1.56   1.00    2.30  254.   10.0  277.5    2.0


 First hour of profile data
 YR MO DY HR HEIGHT F  WDIR    WSPD AMB_TMP sigmaA  sigmaW  sigmaV
 14 01 01 01   10.0 1  274.    4.94   278.8   99.0  -99.00  -99.00

 F indicates top of profile (=1) or below (=0)
^ *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                         ***        06/01/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; May 2016; San Gorgonio Wilderness R ***        20:22:40
                                                                                                                       PAGE   8
 **MODELOPTs:   RegDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT RURAL

                  *** THE ANNUAL AVERAGE CONCENTRATION    VALUES AVERAGED OVER   1 YEARS FOR SOURCE GROUP: SQROAD10 ***
                                 INCLUDING SOURCE(S):     SQROAD10    ,

                                                    *** DISCRETE CARTESIAN RECEPTOR POINTS ***

                                               ** CONC OF UNITEMIS IN MICROGRAMS/M**3                          **

       X-COORD (M)   Y-COORD (M)        CONC                         X-COORD (M)   Y-COORD (M)        CONC
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
         502119.89    3777524.22       0.00041                         503387.51    3778923.32       0.00045
         505433.84    3779586.99       0.00112                         506595.26    3779199.85       0.00054
         508143.83    3779752.91       0.00036                         509747.71    3779586.99       0.00034
         511517.50    3779421.07       0.00037                         512734.23    3779199.85       0.00040
         513785.04    3779421.07       0.00046                         514946.47    3779974.13       0.00062
         516163.20    3779974.13       0.00067                         517103.41    3779310.46       0.00058
         518320.14    3778868.01       0.00047                         519924.01    3777651.28       0.00034
         521970.33    3775660.26       0.00024                         524569.72    3775770.87       0.00024
         525841.76    3777430.06       0.00024                         527445.63    3778923.32       0.00040
         530487.46    3778978.62       0.00044                         532755.01    3779033.93       0.00032
         535465.00    3778923.32       0.00076                         536902.96    3778591.48       0.00050
         538451.53    3778536.18       0.00036                         540110.71    3776987.61       0.00031
         541825.19    3776987.61       0.00029                         543318.46    3776932.30       0.00031
^ *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                         ***        06/01/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; May 2016; San Gorgonio Wilderness R ***        20:22:40
                                                                                                                       PAGE   9
 **MODELOPTs:   RegDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT RURAL

                                            *** THE SUMMARY OF MAXIMUM ANNUAL RESULTS AVERAGED OVER   1 YEARS ***


                                             ** CONC OF UNITEMIS IN MICROGRAMS/M**3                          **

                                                                                                             NETWORK
GROUP ID                      AVERAGE CONC              RECEPTOR  (XR, YR, ZELEV, ZHILL, ZFLAG)  OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


SQROAD10  1ST HIGHEST VALUE IS       0.00112 AT (  505433.84,  3779586.99,  1875.21,  3505.05,    0.00)  DC
          2ND HIGHEST VALUE IS       0.00076 AT (  535465.00,  3778923.32,  1626.66,  2775.52,    0.00)  DC
          3RD HIGHEST VALUE IS       0.00067 AT (  516163.20,  3779974.13,  2101.98,  3505.05,    0.00)  DC
          4TH HIGHEST VALUE IS       0.00062 AT (  514946.47,  3779974.13,  2073.56,  3505.05,    0.00)  DC
          5TH HIGHEST VALUE IS       0.00058 AT (  517103.41,  3779310.46,  2133.17,  3505.05,    0.00)  DC
          6TH HIGHEST VALUE IS       0.00054 AT (  506595.26,  3779199.85,  1968.52,  3505.05,    0.00)  DC
          7TH HIGHEST VALUE IS       0.00050 AT (  536902.96,  3778591.48,  1449.86,  2785.48,    0.00)  DC
          8TH HIGHEST VALUE IS       0.00047 AT (  518320.14,  3778868.01,  2225.51,  3505.05,    0.00)  DC
          9TH HIGHEST VALUE IS       0.00046 AT (  513785.04,  3779421.07,  2236.01,  3505.05,    0.00)  DC
         10TH HIGHEST VALUE IS       0.00045 AT (  503387.51,  3778923.32,  1969.12,  3505.05,    0.00)  DC


 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
^ *** AERMOD - VERSION  15181 ***   *** Mitsubishi Cement; Lucerne Valley California                         ***        06/01/16
 *** AERMET - VERSION  14134 ***   *** Phase I Mine Expansion Modeling; May 2016; San Gorgonio Wilderness R ***        20:22:40
                                                                                                                       PAGE  10
 **MODELOPTs:   RegDFAULT CONC      ELEV      NODRYDPLT NOWETDPLT RURAL

 *** Message Summary : AERMOD Model Execution ***

  --------- Summary of Total Messages --------

 A Total of           0 Fatal Error Message(s)
 A Total of           0 Warning Message(s)
 A Total of         108 Informational Message(s)
```

```
                                           MCC-MineExpansion-SanGorgonioWilderness-20160526_2014_UNITEMIS
A Total of         8760 Hours Were Processed

A Total of           32 Calm Hours Identified

A Total of           76 Missing Hours Identified (  0.87 Percent)

   ******** FATAL ERROR MESSAGES ********
              ***  NONE  ***

   ********   WARNING MESSAGES   ********
              ***  NONE  ***

   ************************************
   *** AERMOD Finishes Successfully ***
   ************************************
```

APPENDIX E – HARP MODELING FILES

HRA Parameters - Cancer Analysis

P#	HRA Parameter - Cancer	Default Value in HARP Software	Value Selected for MCC	Explanation for Selection
	Residential Receptor:			
R1	Exposure duration (residential)	30 years	Same as default	Recommended by CAPCOA
R2	Inhalation rate basis	Standard (24-hour)	Same as default	Recommended by CAPCOA
R3A	Inhalation rate values selected	95^{th} percentile	$95^{th}/80^{th}$ percentile (RMP)	Recommended by CAPCOA
R3B	Non-inhalation exposure approach	OEHHA Derived	Same as default	Recommended by CAPCOA
R4	Non-inhalation pathways included	Not specified	Includes Dermal, Soil Ingestion, and Produce Ingestion, and also Mother's Milk (where applicable)	All relevant non-inhalation pathways included, as recommended by OEHHA
R5	Deposition rate	0.05 (uncontrolled)	0.02 (controlled)	Recommended by OEHHA (not addressed by CAPCOA)
R6	Fraction at home (FAH)	FAH only applied for ages > 16 years old.	FAH applied to all ages	No schools within zone of impact for one in a million cancer risk
R7	Climate	Mixed	Same as default	The area around the plant has a mixed climate
	Worker Receptor:			
W1	Exposure duration (worker)	25 years	Same as default	Recommended by CAPCOA
W2	Inhalation rate basis	8-hour breathing rates, moderate intensity	Same as default	Recommended by CAPCOA
W3A	Inhalation rate values selected	95^{th} percentile	Same as default	Recommended by CAPCOA
W3B	Non-inhalation exposure approach	OEHHA Derived	Same as default	Recommended by CAPCOA
W4	Non-inhalation pathways included	Includes Dermal, Soil Ingestion	Same as default	All relevant non-inhalation pathways included
W5	Deposition rate	0.05 (uncontrolled)	0.02 (controlled)	Recommended by OEHHA
W6	Worker adjustment factor (WAF)	WAF = 1.0	Same as default (implicit)	Recommended by OEHHA
W7	Climate	Mixed	Same as default	The area around the plant has a mixed climate.

The OEHHA derived method for non-inhalation exposure refers to using 50^{th} percentile values for non-dominant pathways.

Note: For sensitive receptors (the nearest sensitive receptor in this case is an elementary school), the same HRA parameters as for residential receptors will be used. There is no special age sensitivity factor applied to sensitive receptors.

HRA Parameters - Non-cancer Chronic Analysis

P#	HRA Parameter: Non-cancer Chronic Analysis	Default Value in HARP Software	Value Selected for MCC	Explanation for Selection
	Residential Receptor:			
R1	Exposure duration (residential)	N/A (70 years)	Same as default	Automatic default in HARP
R2	Inhalation rate basis	Standard (24-hour)	Same as default	Recommended by CAPCOA
R3A	Inhalation rate values selected	95^{th} percentile	Same as default	Recommended by CAPCOA
R3B	Non-inhalation exposure approach	OEHHA Derived	Same as default	Recommended by CAPCOA
R4	Non-inhalation pathways included	Includes Dermal, Soil Ingestion, and Mother's Milk (where applicable)	Includes Dermal, Soil Ingestion, and Produce Ingestion, and also Mother's Milk (where applicable)	All relevant non-inhalation pathways included, as recommended by OEHHA
R5	Deposition rate	0.05 (uncontrolled)	0.02 (controlled)	Recommended by OEHHA (not addressed by CAPCOA)
R6	Fraction at home (FAH)	N/A	N/A	FAH not included in chronic calculations
R7	Climate	Mixed	Same as default	The area around the plant has a mixed climate
	Worker Receptor:			
W1	Exposure duration (worker)	N/A (25 years)	Same as default	Automatic default in HARP
W2	Inhalation rate basis	8-hour breathing rates, moderate intensity	Same as default	Recommended by CAPCOA
W3A	Inhalation rate values selected	95^{th} percentile	Same as default	Recommended by CAPCOA
W3B	Non-inhalation exposure approach	OEHHA Derived	Same as default	Recommended by CAPCOA
W4	Non-inhalation pathways included	Includes Dermal, Soil Ingestion	Same as default	All relevant non-inhalation pathways included
W5	Deposition rate	0.05 (uncontrolled)	0.02 (controlled)	Recommended by OEHHA
W6	Worker adjustment factor (WAF)	WAF = 1.0	Same as default (running 24/7)	Recommended by OEHHA
W7	Climate	Mixed	Same as default	The area around the plant has a mixed climate.

The OEHHA derived method for non-inhalation exposure refers to using 50^{th} percentile values for non-dominant pathways.

Note: For sensitive receptors (the nearest sensitive receptor in this case is an elementary school), the same HRA parameters as for residential receptors will be used. There is no special age sensitivity factor applied to sensitive receptors.

HRA Parameters - Non-cancer Acute Analysis

P#	HRA Parameter: Non-cancer Acute Analysis	Default Value in HARP Software	Value Selected for MCC	Explanation for Selection
R1	Exposure duration	30 years	Same as default	Recommended by CAPCOA
R2	Inhalation rate basis	Standard (24-hour)	Same as default	Recommended by CAPCOA
R4	**Non-inhalation pathways included**	**None**	**Same as default**	Only inhalation pathway included, as recommended by OEHHA
R5	Deposition rate	N/A	N/A	Only inhalation included
R6	Fraction at home (FAH)	N/A	N/A	Acute is based on max hour
R7	Climate	N/A	N/A	Only inhalation included

List of Individual HARP2 Runs and Descriptions

	Cancer Residential Run	Non-cancer Chronic Residential Run
Sources:	A, B, C, D, E, F	A, B, C, D, E, F
Receptors:	MEIR, MEIS	MEIR, MEIS
Parameters	Residential Parameters, Cancer Analysis	Residential Parameters, Non-Cancer Chronic Analysis

	Cancer Worker Run	Non-cancer Chronic Worker Run
Sources:	A, B, C, D, E, F	A, B, C, D, E, F
Receptors:	MEIW	MEIW
Parameters	Worker Parameters, Cancer Analysis	Worker Parameters, Non-Cancer Chronic Analysis

	Acute Run
Sources:	A, B, C, D, E, F
Receptors:	MEIR, MEIW, MEIS
Parameters	Acute Analysis Parameters

Notes:

Source	Phase	Source Description	Source Type	Source Hours per Day	Source Dimensions	Source Location
A	Operational	Haul Truck Exhaust Water Truck Exhaust	Line Source	10	15.24m by 542m	Extending from Seasonal Stockpile in Phase 1A Mining to the road beyond Point C in Figure 3.
B	Operational	Wind Erosion from Unpaved Roads	Line Source	24	15.24m by 542m	Extending from Seasonal Stockpile in Phase 1A Mining to the road beyond Point C in Figure 3.
C	Operational	Dust Entrainment from Haul Trucks Dust Entrainment from Water Trucks	Line Source	10	15.24m by 542m	Extending from Seasonal Stockpile in Phase 1A Mining to the road beyond Point C in Figure 3.
D	Operational	Seasonal Stockpile - Material Handling	Area Source	10	30m by 30m	Phase 1A Mining Area.
E	Construction	Off-Road Vehicle Exhaust	Line Source	10	15.24m by 902m	Extending from Point C in Figure 3 to the Existing Rock Stockpile at the west end of the
F	Construction	Fugitive Emissions	Line Source	10	15.24m by 902m	Extending from Point C in Figure 3 to the Existing Rock Stockpile at the west end of the

Cancer Residential Run, All Sources

HARP2 Emissions Input File

B	0	0	7440360	Antimony	1	0.00193	7.70E-07	1
B	0	0	7440382	Arsenic	1	0.0289	1.16E-05	1
B	0	0	7440417	Beryllium	1	0.000578	2.31E-07	1
B	0	0	7440439	Cadmium	1	0.00404	1.62E-06	1
B	0	0	18540299	Cr(VI)	1	0.000385	1.54E-07	1
B	0	0	7440508	Copper	1	0.0462	1.85E-05	1
B	0	0	7440473	Chromium	1	0.000385	1.54E-07	1
B	0	0	7439921	Lead	1	0.293	0.000117	1
B	0	0	7439976	Mercury	1	3.85E-05	1.54E-08	1
B	0	0	7440020	Nickel	1	0.0293	1.17E-05	1
B	0	0	7782492	Selenium	1	0.00193	7.70E-07	1
B	0	0	7440622	Vanadium	1	0.0848	3.39E-05	1
B	0	0	7440666	Zinc	1	0.295	0.000118	1
B	0	0	1175	Silica, Cryst	1	3.93	0.00157	1
C	0	0	7440360	Antimony	1	0.013	5.18E-06	1
C	0	0	7440382	Arsenic	1	0.194	7.77E-05	1
C	0	0	7440417	Beryllium	1	0.00389	1.55E-06	1
C	0	0	7440439	Cadmium	1	0.0272	1.09E-05	1
C	0	0	18540299	Cr(VI)	1	0.00259	1.04E-06	1
C	0	0	7440508	Copper	1	0.311	0.000124	1
C	0	0	7440473	Chromium	1	0.00259	1.04E-06	1
C	0	0	7439921	Lead	1	1.97	0.000787	1
C	0	0	7439976	Mercury	1	0.000259	1.04E-07	1
C	0	0	7440020	Nickel	1	0.197	7.87E-05	1
C	0	0	7782492	Selenium	1	0.013	5.18E-06	1
C	0	0	7440622	Vanadium	1	0.57	0.000228	1
C	0	0	7440666	Zinc	1	1.98	0.000793	1
C	0	0	1175	Silica, Cryst	1	26.4	0.0106	1
D	0	0	7440360	Antimony	1	0.000121	4.85E-08	1
D	0	0	7440382	Arsenic	1	0.00288	1.15E-06	1
D	0	0	7440417	Beryllium	1	0.000118	4.71E-08	1
D	0	0	7440439	Cadmium	1	0.00056	2.24E-07	1
D	0	0	18540299	Cr(VI)	1	0.00406	1.62E-06	1
D	0	0	7440508	Copper	1	0.00342	1.37E-06	1
D	0	0	7440473	Chromium	1	4.82E-05	1.93E-08	1
D	0	0	7439921	Lead	1	0.0579	2.31E-05	1
D	0	0	7439976	Mercury	1	7.72E-06	3.09E-09	1
D	0	0	7440020	Nickel	1	0.00475	1.90E-06	1
D	0	0	7782492	Selenium	1	0.000328	1.31E-07	1
D	0	0	7440622	Vanadium	1	0.00724	2.90E-06	1
D	0	0	7440666	Zinc	1	0.0352	1.41E-05	1
D	0	0	1175	Silica, Cryst	1	29.4	0.0118	1
A	0	0	9901	DieselExhP	1	-417	-0.167	1
E	0	0	9901	DieselExhP	1	829	0.332	1
F	0	0	7440360	Antimony	1	0.0117	4.70E-06	1
F	0	0	7440382	Arsenic	1	0.176	7.05E-05	1
F	0	0	7440417	Beryllium	1	0.00352	1.41E-06	1
F	0	0	7440439	Cadmium	1	0.0247	9.87E-06	1
F	0	0	18540299	Cr(VI)	1	0.00235	9.40E-07	1
F	0	0	7440508	Copper	1	0.282	0.000113	1
F	0	0	7439921	Lead	1	1.79	0.000714	1
F	0	0	7439976	Mercury	1	0.000235	9.40E-08	1
F	0	0	7440020	Nickel	1	0.179	7.14E-05	1
F	0	0	7782492	Selenium	1	0.0117	4.70E-06	1
F	0	0	7440622	Vanadium	1	0.517	0.000207	1
F	0	0	7440666	Zinc	1	1.8	0.000719	1
F	0	0	1175	Silica, Cryst	1	23.96778	0.009587	1
F	0	0	7440473	Chromium	1	0.00235	9.40E-07	1

HARP2 Plotfile Input File

A	C:\HARP2\MCC AQS 10-7-2016\plt\MCC-PhaseI-20161006-PERIOD-SQROAD10.PLT	C:\HARP2\MCC AQS 10-7-2016\plt\MCC-PhaseI-20161006-01HOUR-SQROAD10.PLT
B	C:\HARP2\MCC AQS 10-7-2016\plt\MCC-PhaseI-20161006-PERIOD-SQROAD24.PLT	C:\HARP2\MCC AQS 10-7-2016\plt\MCC-PhaseI-20161006-01HOUR-SQROAD24.PLT
C	C:\HARP2\MCC AQS 10-7-2016\plt\MCC-PhaseI-20161006-PERIOD-SQROAD10.PLT	C:\HARP2\MCC AQS 10-7-2016\plt\MCC-PhaseI-20161006-01HOUR-SQROAD10.PLT
D	C:\HARP2\MCC AQS 10-7-2016\plt\MCC-PhaseI-20161006-PERIOD-SQMINE10.PLT	C:\HARP2\MCC AQS 10-7-2016\plt\MCC-PhaseI-20161006-01HOUR-SQMINE10.PLT
E	C:\HARP2\MCC AQS 10-7-2016\plt\MCC-PhaseI-20161006-PERIOD-SQCNST10.PLT	C:\HARP2\MCC AQS 10-7-2016\plt\MCC-PhaseI-20161006-01HOUR-SQCNST10.PLT
F	C:\HARP2\MCC AQS 10-7-2016\plt\MCC-PhaseI-20161006-PERIOD-SQCNST10.PLT	C:\HARP2\MCC AQS 10-7-2016\plt\MCC-PhaseI-20161006-01HOUR-SQCNST10.PLT

Cancer Residential Run, Source B

HARP2 Residential Cancer Analysis Input File, Source B


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<?xml version="1.0" encoding="UTF-8"?>
<!--HARP RISK INPUT FILE-->
<!--Created 2016/10/07 08:11:29-->
<HRA>
  <HRAVERSION>16217</HRAVERSION>
  <Title>Resident</Title>
  <AERMODMode>Y</AERMODMode><!--Read AERMOD plot file (Y) or read CSV file (N)-->
  <GLCList>C:\HARP2\MCC AQS 10-7-2016\hra\B.ResidentGLCList.csv</GLCList>
  <PollutantList>C:\HARP2\MCC AQS 10-7-2016\hra\B.ResidentPolDB.csv</PollutantList>
  <PathwayRecConc>C:\HARP2\MCC AQS 10-7-2016\hra\B.ResidentPathwayRec.csv</PathwayRecConc>
  <Output>C:\HARP2\MCC AQS 10-7-2016\hra</Output>
  <PollutantNum>15</PollutantNum>
  <Append>Y</Append>
  <ReceptorIndex>NA</ReceptorIndex>
  <SourceName>B</SourceName>
  <RiskScenario>
        <ReceptorType>Resident</ReceptorType><!--Residential, Population, School, or Worker-->
        <UDEDOn>N</UDEDOn><!--Y or N-->
        <ExposureDuration>30</ExposureDuration><!--years-->
        <Scenario>Cancer</Scenario><!--Cancer, NCChronic, NCChronic8HR, NCAcute, All-->
        <StartAge>-0.25</StartAge><!--years-->
        <WorkerExposureFrequency>250</WorkerExposureFrequency><!--days/year-->
        <WorkerNote>NA</WorkerNote>
        <Tier2On>N</Tier2On>
        <IntakeRatePercentile>Derived</IntakeRatePercentile><!--HighEnd, Mean, Derived-->
  </RiskScenario>
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  <Type>4</Type>
  <PathwaysEnabled><!--Y or N-->
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        <Soil>Y</Soil>
        <Dermal>Y</Dermal>
        <MothersMilk>Y</MothersMilk>
        <Water>N</Water>
        <Fish>N</Fish>
        <HomegrownCrop>Y</HomegrownCrop>
        <Beef>N</Beef>
        <Dairy>N</Dairy>
        <Pig>N</Pig>
        <Chicken>N</Chicken>
        <Egg>N</Egg>
  </PathwaysEnabled>
  <Inhalation>
        <FAH3rdTrito16>Y</FAH3rdTrito16><!--Y or N-->
        <FAH16to70>Y</FAH16to70><!--Y or N-->
        <DBRType>RMP</DBRType><!--LongTerm24HR, RMP, SedentaryPassive8HR, Light8HR, or Moderate8HR-->
        <GLCAdjustmentFactor>1</GLCAdjustmentFactor>
        <UseAdj>N</UseAdj><!--Y or N-->
        <USEPOSTFILE8REL>N</USEPOSTFILE8REL><!--Y or N-->
        <USEPOSTFILECAN>N</USEPOSTFILECAN><!--Y or N-->
  </Inhalation>
  <Deposition>0.02</Deposition>
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  <DermalClimate>Mixed</DermalClimate><!--Cold, Mixed, or Warm-->
  <HumanWater>
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        <WaterVolume>0</WaterVolume><!--kg-->
        <VolumeChangesPerYear>0</VolumeChangesPerYear>
        <FractionFromContamSource>0</FractionFromContamSource>
        <RecPhysicallyActiveLivesWorkHotClimates>N</RecPhysicallyActiveLivesWorkHotClimates><!--Y or N-->
  </HumanWater>
  <Homegrown>
        <HouseholdType>HouseholdsthatGarden</HouseholdType><!--HouseholdsthatGarden, HouseholdsthatFarm, or 
UserDefined-->
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        <Exposed>0.137</Exposed>
        <Protected>0.137</Protected>
        <Root>0.137</Root>
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HARP2 Residential Cancer Analysis Input File, Source B


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        <FractionFromContamSource>0</FractionFromContamSource>
  </Fish>
  <AnimalFractions>
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        <HouseholdTypePCE>RaiseHunt</HouseholdTypePCE><!--RaiseHunt, Farm, or UserDefined-->
        <Beef>0.485</Beef>
        <Pork>0.242</Pork>
        <Poultry>0.156</Poultry>
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        <FractionFromContamSourceDairy>0</FractionFromContamSourceDairy>
  </BeefDairyWater>
  <BeefFractionFromGrazing>0.5</BeefFractionFromGrazing>
  <DairyFractionFromGrazing>0.5</DairyFractionFromGrazing>
  <PigChickenEggsWater>
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        <FractionFromContamSourcePig>0</FractionFromContamSourcePig>
        <FractionFromContamSourceChicken>0</FractionFromContamSourceChicken>
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  </PigChickenEggsWater>
  <Pig>
        <FractionEatenOffGround>0</FractionEatenOffGround>
        <FractionFeedOnsiteContaminated>0.1</FractionFeedOnsiteContaminated>
        <Leafy>0.25</Leafy>
        <Exposed>0.25</Exposed>
        <Protected>0.25</Protected>
        <Root>0.25</Root>
  </Pig>
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        <Root>0.25</Root>
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  <Egg>
        <FractionEatenOffGround>0.05</FractionEatenOffGround>
        <FractionFeedOnsiteContaminated>0</FractionFeedOnsiteContaminated>
        <Leafy>0.25</Leafy>
        <Exposed>0.25</Exposed>
        <Protected>0.25</Protected>
        <Root>0.25</Root>
  </Egg>
</Pathways>
<Tier2>
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        <EF>350</EF>
        <Inhalation>
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                <HighEnd>361,1090,631,572,261,233</HighEnd>
                <FAHOn>N</FAHOn><!--Y or N-->
                <FAH>0.85,0.85,0.72,0.72,0.73,0.73</FAH>
        </Inhalation>
        <Soil>
                <IROn>N</IROn><!--Y or N-->
                <Mean>0.7,20,5,3,0.7,0.6</Mean>
                <HighEnd>3,40,20,10,3,3</HighEnd>
                <TfOn>N</TfOn><!--Y or N-->
                <Tf>25550</Tf>
        </Soil>
        <Dermal>
                <TfOn>N</TfOn><!--Y or N-->
                <Mean>1100,2200,6600,5700,1100,1100</Mean>
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			<HighEnd>2400,2900,8700,8100,2400,2400</HighEnd>
		</Dermal>
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			<Mean>101</Mean>
			<HighEnd>139</HighEnd>
		</MothersMilk>
		<Water>
			<TfOn>N</TfOn><!--Y or N-->
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			<HighEnd>47,196,66,61,47,45</HighEnd>
		</Water>
		<Fish>
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			<Mean>0.38,0.18,0.36,0.36,0.38,0.36</Mean>
			<HighEnd>1.22,0.58,1.16,1.16,1.22,1.16</HighEnd>
		</Fish>
		<CropIROn>N</CropIROn><!--Y or N-->
		<BDIROn>N</BDIROn><!--Y or N-->
		<PCEIROn>N</PCEIROn><!--Y or N-->
		<Leafy>
			<Mean>0.9,3.8,2.5,0.9,0.9,1.1</Mean>
			<HighEnd>3.2,10.8,7.9,3.2,3.2,3.4</HighEnd>
		</Leafy>
		<Exposed>
			<Mean>1.9,11.7,7.4,1.9,1.9,1.8</Mean>
			<HighEnd>5.9,30.2,21.7,5.9,5.9,5.6</HighEnd>
		</Exposed>
		<Protected>
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			<HighEnd>5.8,17.5,13.3,5.8,5.8,5.2</HighEnd>
		</Protected>
		<Root>
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			<HighEnd>4.6,15.3,10.8,4.6,4.6,4.2</HighEnd>
		</Root>
		<Beef>
			<Mean>2,3.9,3.5,2,2,1.7</Mean>
			<HighEnd>4.8,11.3,8.6,4.8,4.8,4.4</HighEnd>
		</Beef>
		<Dairy>
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			<HighEnd>15.9,116,61.4,15.9,15.9,13.2</HighEnd>
		</Dairy>
		<Pig>
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			<HighEnd>4.7,11.4,9,4.7,4.7,3.8</HighEnd>
		</Pig>
		<Chicken>
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			<HighEnd>2.9,10.5,7.8,2.9,2.9,2.8</HighEnd>
		</Chicken>
		<Egg>
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			<HighEnd>4.2,15,9.4,4.2,4.2,3.4</HighEnd>
		</Egg>
		<WhatWasChanged>NA</WhatWasChanged>
	</Tier2>
</HRA>
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HARP2 Residential Cancer Analysis Results, Source B

*HARP - HRACalc v16088 10/7/2016 8:11:29 AM - Cancer Risk

REC	GRP	NETID	X	Y	CONC	POLID	POLABBREV	RISK_SUM	SCENARIO	DETAILS	INH_RISK	SOIL_RISK	DERMAL_RISK	MMILK_RISK	WATER_RISK	FISH_RISK	CROP_RISK	BEEF_RISK	DAIRY_RISK	PIG_RISK	CHICKEN_RISK	EGG_RISK	1ST_DRIVER	2ND_DRIVER
1	ALL		512416	3803250	3.72E-09	7440360	Antimony	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
1	ALL		512416	3803250	5.57E-08	7440382	Arsenic	4.31E-09	30YrCancerRMP	*	2.52E-10	2.41E-09	9.80E-11	0.00E+00	0.00E+00	0.00E+00	1.55E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	SOIL	CROP
1	ALL		512416	3803250	1.11E-09	7440417	Beryllium	5.03E-12	30YrCancerRMP	*	5.03E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION	
1	ALL		512416	3803250	7.79E-09	7440439	Cadmium	6.28E-11	30YrCancerRMP	*	6.28E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION	
1	ALL		512416	3803250	7.42E-10	18540299	Cr(VI)	3.56E-10	30YrCancerRMP	*	2.04E-10	4.52E-12	1.45E-13	0.00E+00	0.00E+00	0.00E+00	1.48E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION	CROP
1	ALL		512416	3803250	8.91E-08	7440508	Copper	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
1	ALL		512416	3803250	7.42E-10	7440473	Chromium	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
1	ALL		512416	3803250	5.65E-07	7439921	Lead	1.80E-10	30YrCancerRMP	*	8.93E-12	1.38E-10	2.81E-12	2.51E-12	0.00E+00	0.00E+00	2.78E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	SOIL	CROP
1	ALL		512416	3803250	7.42E-11	7439976	Mercury	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
1	ALL		512416	3803250	5.65E-08	7440020	Nickel	2.76E-11	30YrCancerRMP	*	2.76E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION	
1	ALL		512416	3803250	3.72E-09	7782492	Selenium	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
1	ALL		512416	3803250	1.63E-07	7440622	Vanadium	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
1	ALL		512416	3803250	5.69E-07	7440666	Zinc	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
1	ALL		512416	3803250	7.58E-06	1175	Silica, Cryst	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
1	ALL		512416	3803250	0	9901	DieselExhPl	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
2	ALL		512761	3803044	4.32E-09	7440360	Antimony	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
2	ALL		512761	3803044	6.47E-08	7440382	Arsenic	5.00E-09	30YrCancerRMP	*	2.92E-10	2.79E-09	1.14E-10	0.00E+00	0.00E+00	0.00E+00	1.80E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	SOIL	CROP
2	ALL		512761	3803044	1.29E-09	7440417	Beryllium	5.84E-12	30YrCancerRMP	*	5.84E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION	
2	ALL		512761	3803044	9.04E-09	7440439	Cadmium	7.29E-11	30YrCancerRMP	*	7.29E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION	
2	ALL		512761	3803044	8.61E-10	18540299	Cr(VI)	4.14E-10	30YrCancerRMP	*	2.36E-10	5.25E-12	1.68E-13	0.00E+00	0.00E+00	0.00E+00	1.72E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION	CROP
2	ALL		512761	3803044	1.03E-07	7440508	Copper	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
2	ALL		512761	3803044	8.61E-10	7440473	Chromium	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
2	ALL		512761	3803044	6.55E-07	7439921	Lead	2.09E-10	30YrCancerRMP	*	1.04E-11	1.60E-10	3.27E-12	2.91E-12	0.00E+00	0.00E+00	3.22E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	SOIL	CROP
2	ALL		512761	3803044	8.61E-11	7439976	Mercury	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
2	ALL		512761	3803044	6.55E-08	7440020	Nickel	3.21E-11	30YrCancerRMP	*	3.21E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION	
2	ALL		512761	3803044	4.32E-09	7782492	Selenium	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
2	ALL		512761	3803044	1.90E-07	7440622	Vanadium	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
2	ALL		512761	3803044	6.60E-07	7440666	Zinc	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
2	ALL		512761	3803044	8.79E-06	1175	Silica, Cryst	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
2	ALL		512761	3803044	0	9901	DieselExhPl	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
3	ALL		508576	3807607	7.12E-10	7440360	Antimony	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
3	ALL		508576	3807607	1.07E-08	7440382	Arsenic	8.24E-10	30YrCancerRMP	*	4.82E-11	4.61E-10	1.88E-11	0.00E+00	0.00E+00	0.00E+00	2.97E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	SOIL	CROP
3	ALL		508576	3807607	2.13E-10	7440417	Beryllium	9.64E-13	30YrCancerRMP	*	9.64E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION	
3	ALL		508576	3807607	1.49E-09	7440439	Cadmium	1.20E-11	30YrCancerRMP	*	1.20E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION	
3	ALL		508576	3807607	1.42E-10	18540299	Cr(VI)	6.82E-11	30YrCancerRMP	*	3.90E-11	8.66E-13	2.78E-14	0.00E+00	0.00E+00	0.00E+00	2.84E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION	CROP
3	ALL		508576	3807607	1.71E-08	7440508	Copper	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
3	ALL		508576	3807607	1.42E-10	7440473	Chromium	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
3	ALL		508576	3807607	1.08E-07	7439921	Lead	3.45E-11	30YrCancerRMP	*	1.71E-12	2.65E-11	5.39E-13	4.80E-13	0.00E+00	0.00E+00	5.31E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	SOIL	CROP
3	ALL		508576	3807607	1.42E-11	7439976	Mercury	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
3	ALL		508576	3807607	1.08E-08	7440020	Nickel	5.29E-12	30YrCancerRMP	*	5.29E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION	
3	ALL		508576	3807607	7.12E-10	7782492	Selenium	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
3	ALL		508576	3807607	3.13E-08	7440622	Vanadium	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
3	ALL		508576	3807607	1.09E-07	7440666	Zinc	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
3	ALL		508576	3807607	1.45E-06	1175	Silica, Cryst	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
3	ALL		508576	3807607	0	9901	DieselExhPl	0.00E+00	30YrCancerRMP	*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		

Legend:

REC: Receptor Number
GRP: Primary pollutant group description
NETID: Secondary pollutant group description
X and Y: East and North UTM coordinates, respectively
CONC: GLC Concentration for each pollutant
POLID: Pollutant identification number
POLABBREV: Pollutant name abbreviation
RISK_SUM: Sum total of individual cancer risks
SCENARIO: Exposure scenario, including duration and exposure method
DETAILS: N/A (Table break)
INH_RISK: Cancer Risk from Inhalation Pathway
SOIL_RISK: Cancer Risk from Soil Ingestion Pathway
DERMAL_RISK: Cancer Risk from Dermal Exposure Pathway
MMILK_RISK: Cancer Risk from Mother's Milk Pathway
WATER_RISK: Cancer Risk from Drinking Water Pathway
FISH_RISK: Cancer Risk from Fish Ingenstion Pathway
CROP_RISK: Cancer Risk from Homegrown Produce Pathway
BEEF_RISK: Cancer Risk from Beef Consumption Pathway
DAIRY_RISK: Cancer Risk from Dairy Consumption Pathway
PIG_RISK: Cancer Risk from Pig Consumption Pathway
CHICKEN_RISK: Cancer Risk from Chicken Consumption Pathway
EGG_RISK: Cancer Risk from Egg Consumption Pathway
1ST_DRIVER: Primary risk-contributing pathway
2ND_DRIVER: Secondary risk-contributing pathway

APPENDIX F – AQRVS FOR SAN GORGONIO WILDERNESS AREA

AIR | ABOUT US | CONTACT US | FAQ'S | NEWSROOM

US FOREST SERVICE
100 Years of Caring for the land and serving people

Search

- Forest Service Home
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- International
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- Pubs, Regs & Manuals
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- Research & Development
- Safety & Occupational Health
- State & Private Forestry

- Air Resource Management Home
- Program Spotlight
- Wilderness Air Quality
- Who We Are
- Our Partners
- Monitoring and Data
- Air Pollution
- Law and Policy
- Manager's Portal

USDA Forest Service
1400 Independence Avenue SW
Washington, D.C.
20250-0003
(202) 205-8333

E-GOV
USA.gov Government Made Easy

San Gorgonio Wilderness

Home > PSD Limits > Map, List > San Gorgonio Wilderness

General Information

State(s): California

County(s): Riverside, San Bernardino

Forest Service Administrative Unit(s): Pacific Southwest Region (Region 5) -- San Bernardino National Forest

Size: 94664 acres

Elevation Range: 3,116 - 10,911 feet

Image(s): http://www.wilderness.net/images/

Detailed wilderness information: http://www.wilderness.net

GIS Map/Official Boundary: http://www.wilderness.net/NWPS/

Webcam(s): San Gorgonio (Gallery)

Data:

- Wet Deposition (NADP)
    - Chuchupate Ranger Station
    - Joshua Tree National Park-Black Rock
    - Palomar Mountain
    - Tanbark Flat
- Dry Deposition (CASTNET)
    - Converse Station
    - Joshua Tree NM
- Visibility (IMPROVE) - San Gorgonio Wilderness, Visibility Summary

Contacts

Documents

Resource Concern Thresholds

AQRV Type: VISIBILITY		
Sensitive Receptor	**Sensitive Receptor Indicator**	**Thresholds**
Natural Visibilty		For sources generally further than 50 km from a Class I area, the visibility threshold for concern is not exceeded if the 98th %ile change in light extinction is <5% for each year modeled, when compared to the annual average natural condition value for that Class I area.

Plume Blight	Absolute Contrast	Higher level near-field screening and refined analysis: no further analysis will likely be requested if a new or modified source can show that impacts from a new or modified source will stay with the threshold of DeltaE <1.0 and |C| <0.02 modeled against natural conditions.
Plume Blight	Absolute Contrast	For near field sources (within 50 km of a Class I area), no additional analysis will be requested If screening analysis of a new or modified source can demonstrate that its emissions will not cause a plume with hourly estimates of DeltaE (color difference index) greater than or equal to 2.0 or the absolute value of the contrast greater than or equal to 0.05 when modeled against natural conditions.
Plume Blight	Color Difference Index	Plume blight near-field refined analysis: no further analysis will likely be requested if a new or modified source can show that impacts from a new or modified source will stay with the threshold of DeltaE <1.0 and |C| <0.02 when modeled against natural conditions.
Plume Blight	Color Difference Index	For near field sources (within 50 km of a Class I area), no additional analysis will be requested If screening analysis of a new or modified source can demonstrate that its emissions will not cause a plume with hourly estimates of DeltaE (color difference index) greater than or equal to 2.0 or the absolute value of the contrast greater than or equal to 0.05 when modeled against natural conditions.

AQRV Type: WATER

Sensitive Receptor	Sensitive Receptor Indicator	Thresholds
Lakes with Low Anc	Acid Neutralizing Capacity	For lakes with low acid neutralizing capacity, a reduction of ANC to near 0 ueq/l during and immediately following hydrologic events results in the condition class "Severe".
Lakes with Low Anc	Acid Neutralizing Capacity	For lakes with low acid neutralizing capacity, a long-term reduction of ANC of 5-10 ueq/l results in the condition class "Significant".
Lakes with Low Anc	Acid Neutralizing Capacity	For lakes with low acid neutralizing capacity, a long-term reduction of ANC of less than 10 ueq/l results in the condition class "No Change".
Perennial Streams	Acid Neutralizing Capacity	For perennial streams with low acid neutralizing capacity, a long-term reduction of ANC of 5-10 ueq/l results in the condition class "Significant".
Perennial Streams	Acid Neutralizing Capacity	For perennial streams with low acid neutralizing capacity, a long-term reduction of ANC of less than 10 ueq/l results in the condition class "No Change".
Perennial Streams	Acid Neutralizing Capacity	For perennial streams with low acid neutralizing capacity, a reduction of ANC to near 0 ueq/l during and immediately following hydrologic events results in the condition class "Severe".

Pollutant Exposure Concern Thresholds

Pollutant Exposures	Level Name	Thresholds
N	EXCEEDANCE	The Deposition Analysis Threshold for nitrogen deposition is 0.005 kg/ha/yr. Below this, estimated impacts from a source greater than 50km from a FLM Class I Area are considered negligible.
Q	QOverD	For new or modified sources locating greater than 50 km from a Class I area, its impacts will be considered negligible with respect to Class I AQRVs if its total SO2, NOx, PM25, PM10, and H2SO4 annual emissions in tons/yr, based on 24-hr maximum allowable emissions, divided by the distance (km) from the Class I area (Q/D) is 10 or less. For sources operating less than a year, the emissions must be adjusted to reflect what the emissions would be if the source operated year-round.
S	EXCEEDANCE	The Deposition Analysis Threshold for sulfur deposition is 0.005 kg/ha/yr. Below this, estimated impacts from a source

		greater than 50km from a FLM Class I Area are considered negligible.

Natural Background Visibility

Site Specific Rayleigh scattering coefficient: 10	**Clearest 20% Natural**	**Clearest 20% 2000-2004 Baseline**	**Haziest 20% Natural**	**Haziest 20% 2000-2004 Baseline**	**Average Annual Natural**	**Annual Average 2000-2004 Baseline**
Standard Visual Range (km)	346	228	188	43	257	92
Haze Index (dv)	1.23	5.4	7.3	22.17	4.2	14.44
For more information on these numbers, click here.						

APPENDIX G – VISCREEN OUTPUT

Visual Effects Screening Analysis for
Source: MCC
Class I Area: San Gorgonio

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	15.00	TON/YR
NOx (as NO2)	0.10	TON/YR
Primary NO2	0.00	TON/YR
Soot	0.00	TON/YR
Primary SO4	0.00	TON/YR

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	6
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	0.04 ppm
Background Visual Range:	257.00 km
Source-Observer Distance:	20.60 km
Min. Source-Class I Distance:	20.60 km
Max. Source-Class I Distance:	42.00 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	5
Wind Speed:	2.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	158.	42.0	10.	2.00	0.429	0.05	0.009
SKY	140.	158.	42.0	10.	2.00	0.065	0.05	-0.002
TERRAIN	10.	158.	42.0	10.	2.00	1.237	0.05	0.009
TERRAIN	140.	158.	42.0	10.	2.00	0.073	0.05	0.001

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	1.	1.0	168.	2.00	2.579*	0.05	0.058*
SKY	140.	1.	1.0	168.	2.00	0.394	0.05	-0.013
TERRAIN	10.	1.	1.0	168.	2.00	7.218*	0.05	0.054*
TERRAIN	140.	1.	1.0	168.	2.00	0.440	0.05	0.006

APPENDIX H – SEINFELD 1986 REFERENCE

Atmospheric Chemistry and Physics of Air Pollution

JOHN H. SEINFELD
California Institute of Technology
Pasadena, California

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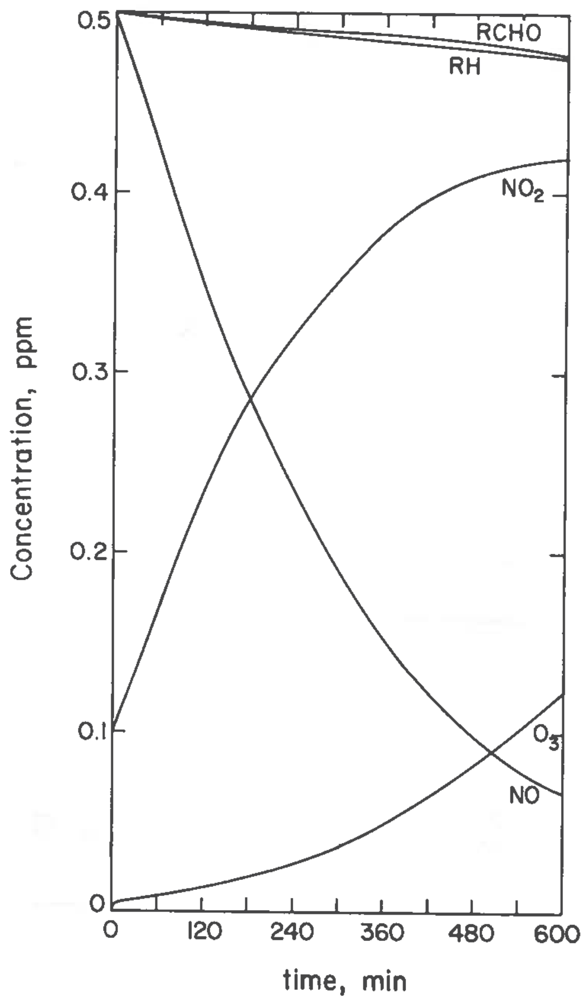

Figure 4.18. Concentrations predicted by a generalized reaction mechanism for photochemical smog. The initial conditions are those of case 2 in Section 4.5.2.

tion is reached at about 120 min with subsequent decay due to formation of nitric acid and PAN. The O_3 concentration reaches 0.8 ppm at the end of 600 min. Although the mechanism in Table 4.6 is oversimplified in its representation of photochemical smog chemistry, the qualitative behavior shown in Figures 4.17 to 4.19 is that which is observed in laboratory simulations, atmospheric data, and in computer simulations with more detailed mechanisms.

4.5.3. The Ozone Isopleth Plot

The chemical features of ozone formation in the photochemical smog system can be represented compactly by plotting isopleths of maximum ozone concentration achieved over a fixed time of irradiation in the plane of initial NO_x concentration $[NO_x]_0 = [NO]_0 + [NO_2]_0$, and initial reactive organic con-

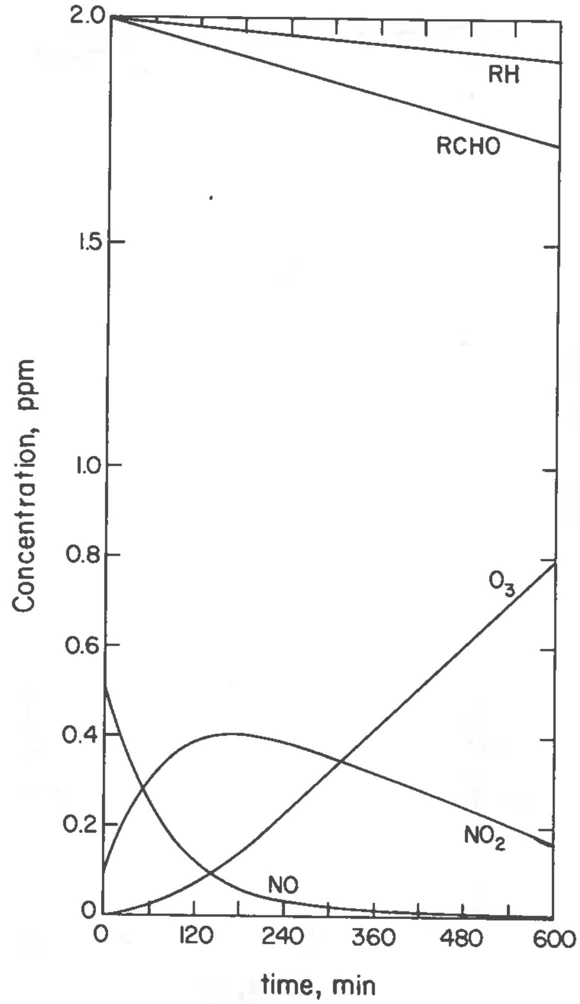

Figure 4.19. Concentrations predicted by a generalized reaction mechanism for photochemical smog. The initial conditions are those of case 3 in Section 4.5.2.

centration, expressed in units of parts-per-million of carbon. Figure 4.20 shows such an ozone isopleth plot. Each point on each curve represents a separate experiment or simulation using a kinetic mechanism. We see that if we fix the initial organic concentration at 1.0 ppmC and reduce $[NO_x]_0$, starting at $[NO_x]_0 = 0.4$, the maximum ozone actually increases, goes through a maximum and then finally decreases as $[NO_x]_0$ gets quite low. This behavior can be explained as follows.

At low $[\text{Organic}]_0/[NO_x]_0$ ratios, the order of 1–2, the conversion of NO to NO_2, and the subsequent build-up of O_3, is limited by the limited availability of organics. Thus, sufficient organics are not present to generate enough radicals to effectively convert NO to NO_2. At very high $[\text{Organic}]_0/[NO_x]_0$ ratios, on the other hand, the order of 20 or more, O_3 cannot accumulate because either it is consumed by reacting with alkenes, or the NO_2 is removed by reacting with the excess of free radicals present, or radical-radical termina-

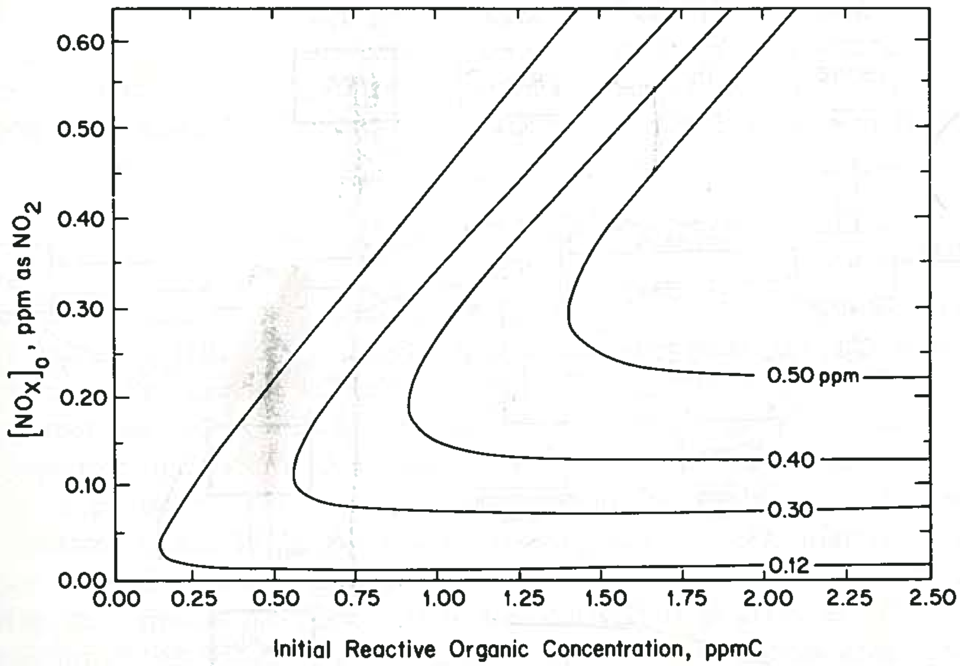

Figure 4.20. Ozone isopleth plot. The maximum O_3 concentration achieved during a fixed time of irradiation of a mixture whose initial concentrations are $[NO_x]_0 = [NO]_0 + [NO_2]_0$ and $[Organic]_0$, where the latter is measured in parts-per-million of carbon (ppmC). Although the general features of this plot are duplicated in virtually all photochemical smog systems, the actual location of the O_3 isopleths depends on the specific conditions of the irradiation, such as the particular components of the organic mixture, the light intensity, and so forth.

tion reactions become important. Therefore, at the two extremes of low and high $[Organic]_0/[NO_x]_0$ ratios little O_3 can form, and as one decreases $[NO_x]_0$ at constant $[Organic]_0$, an ozone maximum is found. For example, from Figure 4.20 we see that at $[Organic]_0 = 1.0$ ppmC, the maximum O_3 achieved is about 0.42 ppm at $[NO_x]_0 \cong 0.2$ ppm, that is, a ratio of 5.

4.5.4. Summary of Atmospheric NO_x Chemistry

Much of this chapter has been devoted to the atmospheric chemistry of the nitrogen oxides. The prominent species in the chemistry of both the natural and the polluted atmosphere are NO, NO_2, and HNO_3. Figure 4.21 shows an expanded schematic of the atmospheric chemistry of the oxides of nitrogen. The top of the figure indicates four of the organic nitrogen compounds that can form in the presence of organic free radicals. NO_3 may be formed by the reaction of NO_2 with O or O_3, the latter being the more important pathway. The NO_3 may react with NO or photolyze to regenerate NO_2 or react with an additional NO_2 to generate N_2O_5. Although N_2O_5 may thermally decompose, it is believed that some fraction of it reacts heterogeneously with H_2O, forming

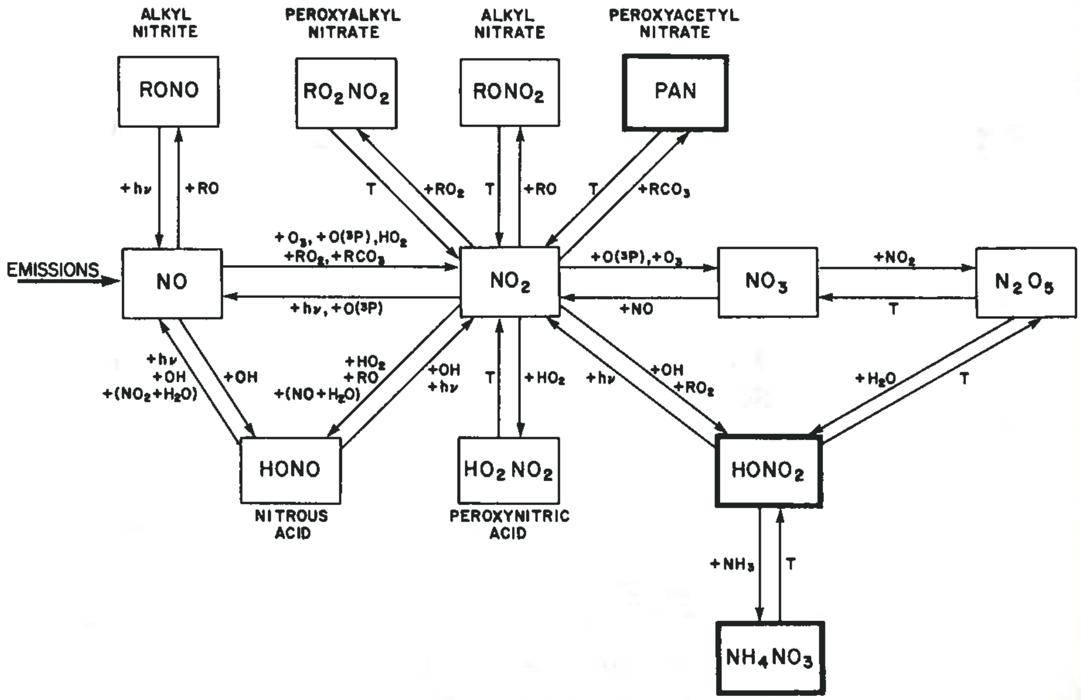

Figure 4.21. Atmospheric nitrogen chemistry (McRae and Russell, 1984).

nitric acid. During daylight hours, the dominant loss process for NO_3 is photolysis (Table 4.1). Under nighttime conditions, the path from NO_2 to NO_3 to N_2O_5 to HNO_3 is predicted to be dominant (Russell et al., 1985; Stockwell and Calvert, 1983).

4.6. CHEMISTRY OF SULFUR DIOXIDE

From a thermodynamic point of view, sulfur dioxide has a strong tendency to react with oxygen in air,

$$2SO_2 + O_2 \xrightarrow{1} 2SO_3$$

The equilibrium concentration ratio of $[SO_3]/[SO_2]$ is about 8×10^{11} in air at 1 atm. and 25°C. However, the rate of reaction 1 is so slow under catalyst-free conditions in the gas phase that it can be totally neglected as a source of SO_3. If formed, SO_3 reacts so rapidly with water vapor to form sulfuric acid,

$$SO_3 + H_2O \xrightarrow{2} H_2SO_4(aq)$$

that any process in which SO_3 is formed in a moist atmosphere can be considered equivalent to the formation of H_2SO_4.

APPENDIX I – RESUMES

ANNE T. MCQUEEN, PH.D., P.E., C.P.P.

Principal Engineer

YORKE ENGINEERING, LLC
www.YorkeEngr.com

AREAS OF EXPERTISE

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- GHG Reporting
- Air Pollution Control
- Regulatory Development Support and Advocacy
- Litigation Support

EXPERIENCE

- Yorke Engineering, LLC Principal Engineer, 2015-Present
- Amec Foster Wheeler, Senior Engineer, 2008-2015
- Geomatrix Consultants, Inc. Senior Engineer, 2004-2008
- Other Positions at ENVIRON, Radian, and Sierra Environmental Engineering 1989-2004

PROFESSIONAL CERTIFICATIONS

- Registered Professional Engineer (Chemical), CA, No. 4749
- Certified Permitting Professional, SCAQMD
- Certified Air Permitting Professional, SJVAPCD
- CARB Certified Lead Verifier, Stationary Combustion, Oil & Gas, and Process

EDUCATION

- Ph.D., Chemical Engineering, California Institute of Technology, Pasadena, 1989
- B.Eng., Chemical Engineering, McGill University, Montreal, Canada, 1983

OVERVIEW

Dr. McQueen is a chemical engineer in the air quality and regulatory compliance practice. She has more than 25 years of experience in the fields of engineering and project management. Dr. McQueen has managed projects for a wide variety of industrial and legal clients working in different industries, including power generation, oil & gas, cement and aggregate, mining, and coating, food, and other manufacturing industries. She is an air quality (AQ) and greenhouse gas (GHG) compliance specialist, who is unique in that she also knows air pollution control technology and monitoring and source testing very well, having also worked in those industries. Dr. McQueen has expertise in the following areas:

- AQ permitting for New Source Review (NSR), Prevention of Significant Deterioration (PSD), and Title V;
- Compliance support;
- Compliance auditing;
- California Environmental Quality Act (CEQA) AQ and GHG analyses;
- GHG reporting and pre-verification, GHG technology implementation, and other GHG projects;
- Air pollution control equipment selection and troubleshooting;
- Monitoring and source test oversight;
- Research and development (R&D) technology demonstration;
- Regulatory development support and advocacy; and
- Litigation support.

Dr. McQueen has in-depth experience with all of the following environmental regulations: NSR, PSD, Title V, CEQA and the National Environmental Policy Act (NEPA), National Emission Standards for Hazardous Air Pollutants (NESHAPs) and New Source Performance Standards (NSPS), AB 32 Cap-and-Trade, AB 32 mandatory reporting, AB 32 energy audit rule, AB 2588, Proposition 65, Toxics Release Inventory (TRI), and South Coast Air Quality Management District (SCAQMD) Regional Clean Air Incentives Market (RECLAIM). Dr. McQueen has been extensively involved in regulatory development, including assisting industry organizations with advocacy during the rule drafting process. She has also done litigation support for clients at agency hearings and in connection with citizen complaints.

FIELDS OF EXPERIENCE

CEQA Air Quality and Greenhouse Gas Analyses

CEQA AQ and GHG Study, New Operation in Central California

For a new operation including solid material processing, Dr. McQueen recently served as project manager for an AQ and GHG study and oversaw all project tasks, including equipment and data review, emission calculations, mitigation measure inclusion, dispersion modeling, performing a health risk assessment, and report preparation. She assisted in defining the project so that it was clear and accurate, and also successfully identified mitigation measures to keep the project below air quality significance thresholds. Since AQ impacts were found not to be significant and because the analysis was transparent and defensible, the operation is likely to be approved relatively quickly by the Lead Agency.

CEQA Construction Mitigation Measure Evaluation

Dr. McQueen is currently working on a CEQA emissions evaluation for a large construction project that involves seeking Lead Agency approval for changes to an agreed upon grading design and berm layout (which requires updating due to newly available improvements in design). She has overseen the work to help the operator correctly define the scope of the construction activities and evaluate mitigation measures relating to fleet selection and fugitive dust control. Although the project is still at the early stages, this project is representative of tasks carried out by Dr. McQueen that assist the applicant move through the CEQA process quickly and effectively by being able to anticipate and meet agency requirements.

CEQA Analysis and Representation, Mining Facility

For a mine expansion project, Dr. McQueen prepared a CEQA AQ analysis and developed mitigation measures that were technically feasible and cost-effective. She also responded to public comments and attended public meetings and agency hearings. Partly as a result of her work, AQ issues were successfully addressed, and concerns were minimized at the time of the agency hearing.

CEQA and NEPA Air Quality and GHG Analyses, Industrial Facility

Dr. McQueen prepared AQ and GHG analyses for a significant modification to an industrial facility that was subject to CEQA and NEPA, involving stationary and mobile source impacts. Her work included selecting appropriate significance thresholds (where these were not specified), defining project impacts, explaining consequences of ongoing regulatory changes, identifying appropriate mitigation measures, and documenting all aspects of the analysis in a format designed to be acceptable to Lead Agencies and to the public. The proposed project now includes creative AQ mitigation measures that minimize project cost.

Air Pollution Control Equipment Selection and Troubleshooting

Refinery Heater NO_x Control Study

In response to new regulatory requirements, Dr. McQueen performed a study of refinery heater NO_x control options based on segmenting the heaters into categories and finding the best options for each category. The heater categories varied in terms of design and operating features affecting NO_x control feasibility and cost-effectiveness. She developed the approach for the heater segmentation, researched the control options, and completed the study for the operators to use in planning compliance strategies. Since the control option selection was made more rational and only feasible and cost-effective control options were accepted, the overall project cost was reduced in both the short-term and long-term.

Engineering Design for SCR and SNCR NO_x Control Systems

For multiple projects on various combustor types, Dr. McQueen assisted with selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR) system process and mechanical design. She also visited client facilities and helped make presentations for training on technology features and selection of the correct system.

RECLAIM NO_x Control Plan for DOD Facility

Dr. McQueen prepared a RECLAIM NO_x control plan for an island Department of Defense (DOD) facility and adopted a systematic approach that involved ranking and prioritizing emission reduction options based on costs in dollars per ton NO_x removed. (RECLAIM is a market-based NO_x control regulation in the SCAQMD.) She included creative options, such as energy conservation measures, which were found to have no net cost, and innovative measures, such as renewable energy. The result was that the plan had an overall compliance cost that was a factor of 2-3 less than the cost that was originally projected.

Innovative Ship Auxiliary Engine Diesel Emission Controls

When a port facility was required to implement NO_x emission controls on ship auxiliary engines, Dr. McQueen oversaw a turnkey project design and procurement for a technology that had never been done before in the U.S. This project was important because the auxiliary engine NO_x control technology originally suggested involved an emission control technology that would have greatly increased power and fuel consumption and generated hazardous waste. The alternative that she proposed had significantly lower power and fuel consumption, did not generate hazardous waste, and saved the client over $2 million in capital cost (saving of about 40%).

Air Quality Permitting

NSR Permit, New Manufacturing Facility

Dr. McQueen prepared an NSR AQ permit application for a new manufacturing facility, supplying all of the company's production for several U.S. states. She supervised all aspects of the permit application, including control equipment evaluation, Best Available Control Technology (BACT) documentation, emission factor development, criteria pollutant and toxic air contaminant (TAC) emission estimates, source characteristics and ground-level impacts, and other documentation.

SCAQMD Permit Application and Control Equipment Specification, Recycling Facility

Dr. McQueen prepared an SCAQMD permit application for a new production line at a recycling facility, including specifying control equipment for particulate matter (PM), volatile organic compounds (VOCs), and acid gas. She worked with the vendor to adapt their control equipment to the unique features of this recycling production line and meet the warranty requirements necessary to obtain exemption from offsets. She also supervised AQ impact modeling, including multiple iterations for production parameters to minimize stack height requirements.

Initial Title V Application, Large Combustion Facility

For a large combustion facility with over 70 permit units, Dr. McQueen prepared their initial Title V permit application, including identifying potentially applicable requirements, assessing applicability, verifying compliance, and preparing application forms and supporting documents. She organized regulatory applicability information in a comprehensive, tabular format, which could be understood at a glance. Because of her careful approach and user-friendly formats, the permit application was accepted by the air district and suitable permit language was issued to the facility.

Air Quality Compliance

AB 2588 Compliance, Manufacturing Facility, Southern California

Dr. McQueen provided oversight of AB 2588 test programs for a manufacturing facility. Prior to her involvement, the facility was concerned about the potential for high cancer risk estimates associated with erroneous and non-detect values. Dr. McQueen recommended modifications to the source test and analytical program and performed a careful review of the test data. As a result of improvements in data quality and corrections to errors in reporting that were directly related to her oversight, the health risk associated with the site declined by a factor of 100. The client's public image was improved, and their potential liability was greatly reduced.

Emission Reduction Credit Generation

For a manufacturer that was shutting down its SCAQMD operations, Dr. McQueen prepared an Emission Reduction Credit (ERC) application, including BACT demonstration for the specific equipment category that was shut down, which SCAQMD staff was not familiar with. She met with SCAQMD staff to explain the basis for the calculations and justify the ERC quantity generated. She successfully convinced SCAQMD staff to double the number of PM_{10} ERCs generated for the project, and the client sold the ERCs for over $2 million.

Compliance Auditing

Multi-Media Compliance Audit for Construction Materials Company, Nationwide

For a construction materials company with multiple facilities in California and other states, Dr. McQueen performed a large multi-media compliance audit addressing AQ, water, waste, Surface Mining and Restoration Act (SMARA), and other environmental issues. She evaluated the operations at each facility, inspected the sites, and reviewed historical records. She then documented her findings, including researching regulatory interpretations for issues where requirements were not clear. Her work helped the facilities decide how to change practices where necessary and prioritize ongoing environmental projects.

Air Quality Compliance Audit, Large Industrial Facility

Dr. McQueen conducted a detailed AQ compliance audit for a large Title V facility with more than 100 air permits, including NSR, PSD, and AB 2588, as well as Title V permit requirements. She developed feasibility and budgetary cost estimates for potential control equipment retrofits to address regulatory requirements for several dozen different equipment types. In spite of the large facility size, the compliance audit was completed quickly and effectively, within the budget and time allocated.

GHG Reporting and Pre-Verification

Federal and AB 32 MR Compliance Implementation and Pre-Verification

In preparation for GHG report submittal under federal and AB 32 mandatory reporting (MR), Dr. McQueen helped facilities implement compliance and assemble documentation, including tasks relating to fuel meter, product measurement, continuous emissions monitoring system (CEMS), and data acquisition system (DAS) compliance. She also provided pre-verification services, including doing a practice audit and assembling the binder given to the verifier. Because of her technical support, the facility was able to be ready sooner, facilitate responses to verifier questions and concerns, and overall have fewer problems with verification.

Alternative Monitoring Plan Submittal to EPA

For a company with multiple stacks on a single dust collector, Dr. McQueen prepared an alternative monitoring plan (AMP) for Environmental Protection Agency (EPA) approval, including assembling all the documentation necessary to demonstrate compliance of the alternative proposal with the original rule requirements through creative approaches. She fleshed out the arguments (as needed per AMP requirements) to make the AMP submittal complete and convincing. Due to the quality of her work, the AMP was approved promptly by the EPA, allowing the GHG report to be accepted by the California Air Resources Board (CARB) in a timely manner.

CEMS and DAS Implementation for GHG Reporting

Because of new CEMS missing data requirements under state GHG reporting regulations, Dr. McQueen was engaged to help the client implement the CEMS and DAS requirements that were needed to comply. She selected a DAS contractor with broad experience in GHG CEMS across the U.S. and worked with the DAS contractor to develop a hybrid system that complied with both federal and state GHG requirements, which was the first of its kind for the contractor. Her DAS specifications were implemented successfully, and the DAS was accepted by the regulatory agency.

Monitoring and Source Test Oversight

Source Test Program Oversight for TAC Source Testing

Dr. McQueen participated in several large source test programs, including operating sampling trains and documenting results. The program scope included PM, acid gas, dioxin/furan, and other TAC source testing. She supported the project team and helped projects be completed successfully and on time.

NESHAP Monitoring and Source Test Program Implementation

As part of a Portland Cement NESHAP compliance implementation, Dr. McQueen supervised the selection, installation, testing, and full-scale operation of a new hydrogen chloride (HCl) Fourier transform infrared spectroscopy (FTIR) monitoring system that was the first of its kind in the U.S. She specified performance criteria for the instrument initial testing, interpreted the results, and continued to monitor performance over time. Dr. McQueen's suggestions caused the instrument to meet higher standards, and, as a result, the instrument is likely to be a good predictor of HCl source test results at the time of compliance testing.

R&D Technology Demonstration

Technology Feasibility Study for Cement Kiln Facility

Dr. McQueen managed the design, startup, and testing of the biosolids injection (BSI) technology for cement kiln NO_x control. The full-scale demonstration test results showed that substantial NO_x reduction could be achieved without adversely affecting cement kiln operations with net revenue generation. The results were presented to the Portland Cement Association General Technical Committee meeting in Seattle, Washington, in September 1994. A U.S. patent was issued on the process, with Dr. McQueen as a co-inventor. The technology has now been installed permanently.

CO_2 Capture Technology Pilot Test

For a consortium of California cement companies, Dr. McQueen performed R&D on CO_2 capture, alternative fuels, and other GHG reduction technologies. She supervised a CO_2 capture pilot test at a California cement plant, which was the first pilot test of its kind in California. Dr. McQueen helped select the technology, organize the pilot test, and document the results, and her work helped keep the project on track.

Pilot Project for New Control Technology

Dr. McQueen supervised the design, construction, startup, testing, and reporting phases of a $1 million pilot project to demonstrate a new technology for the suppression of polychlorinated dibenzodioxin (PCDD)/polychlorinated dibenzofuran (PCDF) emissions from municipal solid waste incinerators. The pilot-scale testing successfully demonstrated that ammonia injection suppressed PCDD/PCDF formation at temperatures below 800°. Construction and startup supervision was necessary to ensure that the design principles from the bench-scale test were carried through to the finished pilot plant. A total of 50 PCDD/PCDF samples were collected, and a detailed data analysis was performed.

Regulatory Development Support and Advocacy

GHG Cap-and-Trade Rule Development Support and Advocacy for Industry Group

Dr. McQueen provided extensive technical support to an industry group commenting on the AB 32 Cap-and-Trade rules during the rule development process, including researching GHG performance benchmarks, assessing practical consequences of rule language, and supporting efforts by economists and others. She helped the industry demonstrate the need for free allocation to compensate for leakage potential. Her work allowed facilities to begin anticipating potential impacts of various regulatory features and to plan their comments accordingly.

AB 32 Energy Audit Reports

For an industry association that wished to standardize energy audit report responses and share basic information on energy efficiency technologies, Dr. McQueen prepared a comprehensive technology review report that addressed the options under consideration and presented a careful evaluation of technical feasibility with detailed justification. She also explained how the specific plant design for California plants affected energy efficiency technology application and provided credible evidence for why certain technologies could not be applied. Based on this common document developed by Dr. McQueen, which was accepted by the regulatory agency, the effort required from each individual facility was greatly reduced.

GHG Mandatory Reporting Rule Change

For a sector that uses solid biofuels, Dr. McQueen prepared documentation to support a GHG mandatory reporting rule change affecting how to take credit for biofuels use. She researched the practical aspects of performing the test, interviewed labs, and designed an alternative to the baseline procedure. Her work helped secure the rule change, thereby avoiding onerous new test requirements and simplifying the reporting requirements.

Litigation Support

Litigation Support for SCAQMD Hearing on VOC Source Test

Dr. McQueen represented a food industry client at an SCAQMD variance hearing relating to a VOC source test and provided testimony on plant operations, VOC-emitting process and control equipment, source test uncertainties, and other topics. In large part due to her testimony, the interim variance was granted. She then developed and implemented a plan that included control technology troubleshooting, diagnostic VOC source testing, and background agency data collection and analysis to solve the compliance problem and meet the concerns of the Hearing Board. The client successfully completed the program of activities and avoided the regular variance hearing.

Hexavalent Chromium and Crystalline Silica Technical Support

In connection with potential litigation, Dr. McQueen provided technical support for studies performed in preparation for response to public concerns about hexavalent chromium and crystalline silica. Services supplied included monitoring program oversight, health risk assessment, public communication documents, agency publication review, industrial hygiene and groundwater monitoring program review, and numerous other tasks. Dr. McQueen employed specific expertise in material sampling and laboratory methods, health risk assessment protocols, ambient monitoring programs, industrial hygiene monitoring, and groundwater sampling, in addition to knowledge of many other procedures and technologies, to assist the client with this complex issue.

SELECTED PUBLICATIONS AND PRESENTATIONS

"Upcoming HRA Procedure Changes Under Draft New OEHHA Guidance and Potential Consequences," California Desert Air Working Group, October 2014.

"How to Streamline Air Quality Permit Applications and Avoid Common Pitfalls," CalCIMA Education Conference, November 12, 2013.

"AB32 Cap and Trade from Industry Perspective," LACBA Luncheon Symposium, October 23, 2012.

"GHG Reduction Options for Mining Operations in California," CalCIMA Education Conference, September 2010.

"Strategies for CEQA Greenhouse Gas Analyses," CLE International Conference, January 2008.

"Greenhouse Gas Recovery from Portland Cement Operations," IEEE-IAS Cement Industry Committee Conference, Phoenix, Arizona, April 2006.

"Strategies to Minimize CEQA Requirements for Mining Projects," with Jocelyn Thompson of Weston Benshoof, California Mining Association 2004 Annual Meeting, Napa, California, May 2004.

"A Comparison of Recent Air Toxics Emissions Data from Combustion Sources in California," AWMA 93rd Annual Meeting & Exhibition, Salt Lake City, Utah, June 18-22, 2000.

"A Novel Cost-Effective Approach to Preparing a NO_x RECLAIM Compliance Plan for a Facility in Southern California," AWMA 90th Annual Meeting & Exhibition, Toronto, June 8-13, 1997.

"Method and System for Controlling Pollutant Emissions in Combustion Operations," U.S. Patent #5,586,510, 1996.

"Development of a Novel, Cost Effective NO_x Control Technology for Cement Kilns," PCA General Technical Committee Meeting, Seattle, Washington, September 1994.

"Suppression of PDCC/PCDF Formation in MSW Incinerator Flue Gas at Temperatures Below 800°F by Ammonia Injection," EPRI Conference on Air Toxics, Washington, DC, November 4-6, 1991.

JOHN A. FURLONG

Senior Environmental Scientist

AREAS OF EXPERTISE

- Air Dispersion Modeling
- Air Quality Permitting
- Regulatory Analysis and Compliance Assistance
- Emission Inventories/Annual Emissions Reports
- Air Quality Audits
- Health Risk Assessment
- CEMS Engineering
- Emissions Source Testing
- Project Management

EXPERIENCE

- Yorke Engineering, LLC Senior Environmental Scientist, 2013-Present
- SCEC Corp., Senior Project Manager, 1997-2012
- Carnot Technical Services Project Manager, 1990-1997
- Sierra Environmental Engineering, Project Technician, 1989-1990
- Endo Engineering, Assistant Project Manager, 1989

EDUCATION

- B.A., Political Science, Humboldt State University, 1989

OVERVIEW

Mr. Furlong is an experienced air quality professional with over 23 years of experience in the air quality engineering business. Mr. Furlong's experience covers many areas, such as air quality permitting, regulatory compliance support, Annual Emissions Report (AER) preparation, air quality modeling and health risk assessments (HRAs), air quality audits, Continuous Emissions Monitoring System (CEMS) engineering, emissions source testing, and general project management. In addition, Mr. Furlong also possesses extensive experience with projects related to South Coast Air Quality Management District (SCAQMD) regulations, including the complex Regional Clean Air Incentives Market (RECLAIM) program, New Source Review (NSR) permitting, Best Available Control Technology (BACT) determinations, and Title V compliance. Mr. Furlong has also completed air quality engineering projects in many other California air districts, as well as Arizona, Nevada, Hawaii, and the Pacific Rim Commonwealth Islands.

Mr. Furlong has extensive experience in many industry sectors, including light and heavy industrial manufacturing, power generation, utilities, wastewater treatment, hospital/heath care, and food manufacturing. Equipment-specific expertise includes boilers and heaters, internal combustion (IC) engines, gas turbines, process and storage tanks, aggregate processing systems, rendering equipment, and deep fat fryers. Mr. Furlong also has experience working with air pollution control equipment, such as baghouses, electrostatic precipitators, catalyst systems, scrubbers, oxidizers, flares, incinerators, etc.

Mr. Furlong's project-specific experience ranges from small emergency generator permits to entire wastewater treatment plants and peaker power plants. Mr. Furlong's clients have included some of America's largest corporations, cities and county agencies, medium-sized regional corporations, and small independent businesses.

FIELDS OF EXPERIENCE

Air Dispersion Modeling

Mr. Furlong has experience in performing air dispersion modeling using various agency-approved computer programs, such as Industrial Source Complex Short Term 3 (ISCST3), SCREEN, TSCREEN, Building Profile Input Program (BPIP), Hotspot Analysis and Reporting Program (HARP), ACE2588, and AERMOD. Projects typically included modeling of criteria pollutants and toxic air contaminants for equipment such as IC engines, boilers and heaters, air pollution control equipment, process tanks, power generation equipment, and cooling towers. Projects have involved various types of sources and facilities, including landfills, schools, chemical plants, refineries, hospitals, wastewater treatment plants, and power plants.

Air Quality Permitting

Mr. Furlong has permitted a wide variety of equipment for various types of facilities within California and outside of California. These sources have included IC engines, boilers, turbines, manufacturing process lines, wastewater treatment equipment, storage tanks, fuel dispensing systems, rendering processes, and various air pollution control systems. These permits have required BACT analyses, air dispersion modeling, HRAs, and regulatory compliance analyses.

Regulatory Analysis and Compliance Assistance

Mr. Furlong has prepared numerous regulatory analyses and compliance determinations as part of local and federal permitting requirements, agency audits, and also for project planning purposes. These regulations include NSR, BACT, Title V, and various source-specific regulations. Mr. Furlong has had many projects reviewing regulations and their applicability to various projects or equipment. Mr. Furlong has worked on many projects under the jurisdiction of the local regulatory agency, the U.S. Environmental Protection Agency (EPA), the SCAQMD, as well as other outside agencies such as the Bay Area Air Quality Management District (BAAQMD) and the California Energy Commission (CEC).

Air Quality Audits

Mr. Furlong has provided air quality audit support for a variety of facilities. This included examining permits, reports, and records for accuracy and completeness. Mr. Furlong has also provided support during agency audits. This typically included on-site support during the audit process, along with interfacing with the agency auditor on behalf of the facility.

Health Risk Assessments

Mr. Furlong has prepared many HRAs as part of local and federal permitting requirements, as well as for the California AB 2588 reporting program. Preparation of the HRAs involved the use of the latest agency risk assessment guidelines and approved agency computer models. Mr. Furlong is up-to-date on all recent regulatory changes related to air modeling and approved air modeling programs.

CEMS Engineering

Mr. Furlong has experience in the field of CEMS engineering. His experience includes the preparation of CEMS applications and Quality Assurance/Quality Control (QA/QC) Plans, evaluation of equipment, and CEMS certification criteria. Most of these projects have been in the SCAQMD region and were necessary for Rule 218 and RECLAIM compliance.

Emissions Source Testing

Mr. Furlong also has experience in the field of emissions source testing. Mr. Furlong has worked as a field technician and project manager on a wide range of testing projects, such as compliance demonstrations, Relative Accuracy Test Audits (RATAs), CEMS certifications, and performance evaluations. Mr. Furlong's expertise includes knowledge of testing equipment and methods, site-specific considerations related to testing and testing locations, as well as management and review of testing programs.

Jeffrey Harrington

Senior Project Manager

Professional summary

Mr. Harrington is a senior project manager with 28 years of experience in air emissions permitting, air quality dispersion modeling, air quality monitoring, air emissions inventories, model development, and applied statistics. He has produced PSD and Title V operating permit applications; managed and performed air quality dispersion modeling for permitting, air toxics evaluations, risk assessment, and feasibility studies; prepared air emission inventories for permit applications and dispersion and photochemical modeling demonstrations; prepared air emissions control analyses (RACT, BACT, LAER); managed and designed ambient monitoring and fugitive emissions monitoring programs; performed advanced statistical analyses of air quality, groundwater, surface water, and sediment monitoring data; and developed custom software packages for clients to meet environmental record keeping requirements. Mr. Harrington regularly applies deterministic, numerical, and stochastic (probability) models in his work. He is particularly experienced with air quality dispersion models, Monte Carlo simulation models, and data mining techniques, such as Classification and Regression Tree (CART). He has performed work in 35 states in many industry sectors: electric power generation; semiconductor and electronics; chemical manufacturing; textiles and leather; petroleum and natural gas distribution; aerospace; automobile parts; transportation; foundries and other metallurgical industry; aggregate and mining; pulp and paper and other forest products; sugar; and pharmaceutical and other health care products. In addition to permitting-related projects, Mr. Harrington has considerable experience with mercury air emissions and the fate and transport of atmospheric mercury, worked closely with the development of Maine's Volatile Organic Compound (VOC) reduction strategy under the Clean Air Act (CAA) requirements for ozone nonattainment areas, and managed the air quality tasks of a petition that successfully delisted a glycol ether (EGBE) from the CAA's hazardous air pollutant (HAP) list. He has also served as a testifying expert witness in courtroom, legislative, regulatory agency, and planning board settings and has prepared technical documentation in support of testifying expert witnesses.

Employment history

Amec Foster Wheeler, Environment & Infrastructure, Inc., Senior Project Engineer, Portland, ME, 2005 to present
Earth Tech, Senior Project Engineer, South Portland, ME, 1994 to 2005
Systems Applications International, Senior Engineer, Morrisville, NC, 1992 to 1994
ABB Environmental Services, Inc., Portland, ME, 1988 to 1991
Carnegie Mellon University, Research Assistant, Pittsburgh, PA , 1986 to 1987

Representative Amec Foster Wheeler projects

Freeport McMoRan Miami Inc., Air Permitting, Miami, Arizona

Managed the preparation of a comprehensive emissions inventory for FMMI's primary copper smelter, a PSD major source facility. Compiled future potential and baseline actual emissions inventories of the smelting operations and related activities such as material transport and rock crushing and screening. The inventory was used for the permitting of a major capital project at the facility, including dispersion modeling and netting analysis. Also assisted with the dispersion modeling effort to demonstrate compliance with NAAQS, including the 1-hour SO_2 standard. Providing ongoing support for SO_2 nonattainment area SIP activities.

Paulini Loam, LLC, Litigation Support, Framingham, Massachusetts.

Provided expert witness services for a proposed ready mix concrete facility that had been denied a building permit. Performed dispersion modeling using AERMOD, prepared an expert report, and testified before the Massachusetts Land Court. Process and fugitive dust sources evaluated included material handling operations, truck travel on paved and unpaved roads, and point source emissions from the enclosed ready mix operation.

Years with Amec Foster Wheeler: 11

Years of experience: 28

Education

Master of Science, Civil Engineering, Carnegie Mellon University, 1988

Bachelor of Science, Chemical Engineering, Stanford University, 1984

Memberships/affiliations

Member, Air and Waste Management Association

Continued...

Project Robin, Faraday & Future Co., Clark County, Nevada.
Managed the preparation of an air quality impact analysis in support of an air permit application for a new automobile manufacturing complex proposed for Clark County, Nevada. Performed AERMOD dispersion modeling which required assessment of $PM_{2.5}$, PM_{10}, and NO_2 NAAQS and Class II Area PSD increments. The evaluation included 38 emissions sources.

Highlands Ethanol LLC, PSD Permit Application, Highlands County, Florida.
Managed the preparation of a major source (PSD) air permit application for a proposed commercial 36 million gallon per year cellulosic ethanol production facility in Florida. The application required preparation of a comprehensive inventory of potential and actual emissions from the proposed ethanol production activities and the associated biomass boilers. EPA's TANKS model was used to calculate emissions from a variety of storage tanks and EPA's WATER9 model was used to calculate emissions from the wastewater treatment operations. A comprehensive regulatory analysis was performed to identify applicable federal and state regulations. A BACT analysis was prepared to identify appropriate control technologies, and dispersion modeling was performed with AERMOD. In addition to the air permitting, also directed the acquisition of the industrial wastewater, environmental resource, water use, and FAA permits as well as the preparation of technical reports that were requested to meet county requirements. Also was responsible for preparing the air quality sections of an EA, which is being prepared to meet the NEPA requirements of DOE's loan guarantee program under the 2005 Energy Policy Act. Mr. Harrington presented the facility site plan and the resulting permitting implications in front of a public meeting of the Planning and Zoning Board of Highlands County, Florida.

Taunton Municipal Light & Power, Dispersion Modeling, Taunton, Massachusetts.
Managed the preparation of an air quality impact analysis in support of an air permit application for modifications at TMLP's Cleary Flood Generating Station. Performed AERMOD dispersion modeling which required assessment of the NO_2 and SO_2 NAAQS that were promulgated in 2010. Included in the evaluation were the station's oil-fired boilers and diesel startup engine.

Veterans Affairs Medical Centers, Air Permitting of Combined Heat and Power (CHP) Projects, Cheyenne, Wyoming and Salt Lake City, Utah.
Managed the preparation of air permit applications for CHP projects located at VAMC hospitals located in Cheyenne and Salt Lake City. The projects consisted of 0.9 MW and 2.7 MW gas-fired reciprocating engines, respectively. Both projects required preparation of emission inventories for proposed and existing equipment, regulatory analysis, and dispersion modeling of criteria pollutants and air toxics. The Salt Lake City application also required preparation of a BACT analysis. Both projects were required to meet NSPS emissions standards at 40 CFR 60 Subpart JJJJ. AERMOD was used for dispersion modeling, with 5-year sequential meteorological data sets provided by the respective regulatory agencies. The Salt Lake City submittal required a strategy to address the area's nonattainment status.

Evergreen Development, Hot Mix Asphalt Plant, Uxbridge, Massachusetts.
Managed the preparation of an air quality impact analysis in support of an air permit application for a new greenfield hot mix asphalt plant. Performed AERMOD dispersion modeling which required assessment of the NO_2 and SO_2 NAAQS that were promulgated in 2010. Process and fugitive dust sources evaluated included material handling operations, truck travel on paved and unpaved roads, and point source emissions.

AES Sparrows Point LNG Project, EIS Support, Sparrows Point, Maryland.
Part of the AMEC technical team that provided AES Sparrows Point LNG, LLC and Mid-Atlantic Express LLC with third-party services regarding the Sparrows Point Project. As an objective third-party reviewer, AMEC's services were performed under the direction of FERC, with AES as the project proponent funding the analysis. AMEC prepared National Environmental Policy Act (NEPA) compliant documents (the Draft Environmental Impact Statement [DEIS] and the Final EIS) for LNG facilities and related pipelines and a non-jurisdictional power plant. Specific responsibilities included the review and assessment of the Resource Reports related to Air and Noise Resources and preparation of those particular sections of the EIS in accordance with the 2002 FERC Guidance Manual for Environmental Report Preparation.

IN Madison LLC, Dispersion Modeling and Control Technology Assessment, Madison, Maine.
Managed the preparation of an air quality impact analysis and BACT analysis in support of a major source air permit application for a new 135 MMBtu/hr wood-fired boiler to be located at Madison Paper Industries. Also performed the AERMOD dispersion modeling which required assessment of the NO_2 and SO_2 NAAQS that were promulgated in 2010, as well as the Class I impact analysis and additional impacts analysis required for PSD applications.

H-POWER, Cooling Tower Modeling, Honolulu, Hawaii.
Performed air quality dispersion modeling of the cooling tower expansion associated with the addition of a third combustion unit at this Municipal Waste Combustor. The modeling was an update of the modeling previously performed for a PSD permit application and FEIS for the addition of the third unit.

Continued...

Confidential Client, Permit Assistance.
Performed air dispersion modeling for an existing pulp and paper mill. The mill was seeking to identify alternative emission limits for its recovery boiler and power boiler. The AERMOD dispersion model was used to assist with the establishment of the alternative emission limits. The mill is located within 10 kilometers of a Class I area, which required strategies to be developed to maintain minor modification status with respect to that Class I area. Sources modeled include the recovery boiler, smelt tank vent, power boiler, lime kiln, and a VOC incinerator located at the mill, as well as emission sources at a nearby forest products manufacturer.

First Quality Tissue, PSD Permit Application, Lock Haven, Pennsylvania.
Managed the preparation of a major source (PSD) air permit application for a proposed 120 MW coal and wood-fired circulating fluidized bed (CFB) cogeneration facility to be located at a paper mill. The application required preparation of a comprehensive inventory of potential and actual emissions from the proposed CFB, associated fuel handling operations, and existing papermaking operations. A comprehensive regulatory analysis was performed to identify applicable federal and state regulations. A LAER analysis was prepared for VOC and NO_X due to the proposed facility's location in the Northeast Ozone Transport Region, and a BACT analysis was prepared to identify appropriate control technologies, and dispersion modeling was performed with AERMOD. The modeling protocol included an analysis supporting the use of nearby meteorological data as on-site data for modeling purposes. The NNSR evaluation included an alternatives analysis and addressed the acquisition of NO_X offsets.

Huber Engineered Woods, Permit Assistance, Easton, Maine.
Performed air dispersion modeling for a PSD permit application for an expansion and MACT compliance project at this oriented strandboard (OSB) manufacturing facility which included a new 152 MMBtu/hr wood-fired furnace. The AERMOD dispersion model was used and included 31 interactive sources. The effort was complicated by predicted exceedances of air quality standards from other sources in the area. The project required evaluations of numerous possible facility configurations to identify which ones would produce insignificant impacts. The evaluations explored revisions to the emissions inventory as well as locations of proposed buildings and stacks. Also prepared the additional impacts analysis required for the PSD application, prepared a BACT analysis for an interim permit amendment, and participated in negotiations with the DEP.

Sydney Tar Ponds Agency, Sydney, Nova Scotia.
Technical lead on the ambient air quality analysis of proposed remediation projects at a former coke ovens and steel mill site. The analysis supported a human health risk assessment, evaluated predicted concentrations against ambient air quality standards and occupational exposure limits, and provided an inventory of greenhouse gases and ozone precursors. Emissions evaluated were fugitive VOC and PM from excavation, stabilization, landfarming, and capping activities, as well as diesel exhaust emissions from the equipment used to support the activities. The ISCST3 and AERMOD dispersion models were used to predict ambient air concentrations of 25 constituents emitted from the activities. Over 350 scenarios were considered, based on two different prospective project schedules, 10 project years, and multiple combinations of activities within each project year. The project included a field experiment that measured ambient air concentrations around a trial excavation of sediments that contained naphthalene and BTEX. The field experiment was used in the ambient air quality analysis to estimate emissions from excavation and stabilization of pond sediments. Also reviewed emissions calculations and AERMOD dispersion modeling performed for a proposed incinerator that is being considered for the thermal destruction of PCBs contained in some of the pond sediment areas. The results of this analysis were presented in testimony at a public hearing held by the regulatory authority responsible for approving the remediation projects.

Bridgestone Firestone Inc., Air Toxics Analysis, Graniteville, South Carolina.
Performed three tiered air toxics modeling per SCDHEC's Standard No. 8. In anticipation of significant future growth, Bridgestone Firestone requested preapproval of new emission sources from South Carolina Department of Health & Environmental Control (SCDHEC) through the South Carolina Environmental Innovations Program. To obtain the preapproval, Bridgestone Firestone was required to evaluate the potential impacts of increased air toxics and criteria pollutant emissions from the proposed tire manufacturing plant expansion. The tiered modeling included a detailed ISCST3 dispersion modeling analysis of the emissions from the proposed expansion of the tire manufacturing facility to demonstrate compliance with ambient air quality standards, PSD increments, and South Carolina's air toxics rules. The modeling analysis included 272 stack emission sources and considered a total of 49 toxic air pollutants. The analysis demonstrated that the proposed plant expansion would comply with the SCDHEC's Air Toxics Standard No.8.

Robins AFB, Air Compliance Assistance, Robins AFB, GA.
Prepared two phases of an air toxics compliance demonstration for the largest manufacturing complex in Georgia. Assisted with the preparation of a comprehensive emission inventory of air toxics and performed ISCST3 dispersion modeling analyses for aircraft and support vehicle surface coating and depainting operations as well as chromium anodizing and pickling operations. The analysis addressed more than 50 significant emission points and more than 100 buildings (downwash). A de minimus emissions approach developed for the first phase of the effort was used to address more than

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2000 additional emission sources at the base. The second phase of the analysis specifically addressed air toxics that are not listed as Federal Hazardous Air Pollutants (HAPs). The first phase of the analysis specifically addressed 35 HAPs emitted from the various operations. Also assessed the impact of revised chromium PELs on the analyses previously performed for the chromium anodizing and pickling operations.

Presentations

"Experiences with Operating a 40 CFR 75 Subpart E Alternative Monitoring System" (with J. Nelson). Electric Utility Environmental Conference, Phoenix, Arizona, February 3, 2009.

"Strategic Siting and Permitting Considerations for Cellulosic Ethanol Production Plants" (with D. Agneta). Electric Utility Environmental Conference, Tucson, Arizona, January 29, 2008.

"Highway Modelling in the City of Calgary" (with R. Rudolph and Y. Wong). Emerging Issues in Air Quality Modelling for Canada, A&WMA Specialty Conference, Calgary, Alberta, October 5, 2006.

"Visualizing NSR Reforms" (with J.L. Hanisch). EnviroExpo 2003, Boston, Massachusetts, May 6, 2003.
"Estimating Fugitive Gaseous Emissions from Naturally Ventilated Structures" (with D.R. Tonini). EnviroExpo 2002, Boston, Massachusetts, May 7, 2002.

"Evaluation of Methods and Protocols for Operation of a CERMS at a Municipal Waste Combustor" (with M. Arienti). In Proceedings of The 10th Annual North American Waste to Energy Conference (NAWTEC10), Philadelphia, Pennsylvania, May 6-8, 2002.

"Ambient and Fugitive Emissions Measurements of Total Gaseous Mercury at a Chlor-Alkali Plant" (with D.R. Tonini, M.J. Mains, S.J. Wallace, and D.W. Dixon). A&WMA New England Section Conference on Mercury, Worcester, Massachusetts, October 23, 2001.

Ambient and Fugitive Emissions Measurements of Total Gaseous Mercury at a Chlor-Alkali Plant" (with D.R. Tonini, M.J. Mains, S.J. Wallace, and D.W. Dixon). In Proceedings of The A&WMA Specialty Conference on Mercury Emissions: Fate, Effects, and Control, Arlington Heights, Illinois, August 20-23, 2001.

"Retrospective Air Quality Analyses for PM, SO2, and NOx: Benefits of the Clean Air Act" (with J.E. Langstaff and K.A. McAuliffe). In Proceedings of the 86th Annual Meeting & Exhibition of the AWMA, Denver, Colorado, Number 93-TP-56.01, June 13-18, 1993.

"A Model for Estimating the Fate and Treatability of Organic and Inorganic Pollutants Discharged to Publicly Owned Treatment Works" (with T.L. Arnold and N. Walter). In Proceedings of National Research and Development Conference on the Control of Hazardous Materials, Anaheim, California, pp. 230-234, February 20-22, 1991.

"Comparisons of Predicted and Measured Dry Deposition Velocities of Trace Metals onto Natural Surfaces" (with C.I. Davidson). In Proceedings of the Sixth International Conference on Heavy Metals in the Environment, New Orleans, Louisiana, September 15-18, 1987.

Publications

"A Practical Guide to NSR Reform," with John Hanisch, EM, September 2004, 18-25.

"Uncertainty and Variation in Indirect Exposure Assessments: An Analysis of Exposure to Tetrachlorodibenzo-p-Dioxin from a Beef Consumption Pathway," with others, Risk Analysis, 16(2):263-277, 1996.

"FATE: A computerized model for estimating the fate and treatability of hazardous pollutants in publicly owned treatment works," with others, Water Environment & Technology, March 1993.

"Guidance for Conducting Ambient Air Monitoring for Lead Around Point Sources," Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC EPA-454/R-92-009.

"Seasonal variations in sulfate, nitrate, and chloride in the Greenland Ice Sheet: Relation to atmospheric concentrations," with others, Atmos. Environ. 23(11):2483-2493, 1989.

"Radioactive cesium from the Chernobyl accident in the Greenland Ice Sheet," with others, Science, 237:633-634, August 7, 1987.