Air Quality Technical Report for the Crystal Creek Aggregates Expansion

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1.0 INTRODUCTION

This document presents results of an air quality analysis associated with the proposed project for Crystal Creek Aggregates near Redding, California. The project applicant proposes an overall project area of approximately 179.97 acres. The existing mining area or quarry is approximately 57.31 acres, and the plant area is approximately 53.38 acres, which total 110.69 acres. The project Use Permit Area is proposed to be expanded by an additional 69.28 acres. The total aggregate amount to be processed for sale yearly is proposed to increase from 250,000 to 500,000 tons.

The estimated amount proposed to be mined will increase from 15.92 million tons to 25.4 million tons over three phases. Extraction for Phases 1, 2, and 3 will be 4.84, 5.42, and 2.15 million cubic yards per phase, respectively. The estimated life of the mining operation will increase from the currently approved end of the Year 2072 by 27 years to the end of the Year 2101. Three phases: Phase 1 – 30 years, Phase 2 – 35 years, and Phase 3 – 14 years. Therefore, the existing condition involves 250,000 tons of aggregate processing per year through 2072, while the proposed project involves 500,000 tons of aggregate processing per year through 2101.

This document provides an overview of the existing air quality conditions at the project site and an analysis of potential air quality impacts that would result from implementation of the proposed project. Issues related to greenhouse gas (GHG) emissions, health impacts, and odor impacts are also included.

2.0 PROJECT OVERVIEW

Operations at the site would include the aggregate processing facility supporting onsite equipment such as loaders and excavators. Based on knowledge of the existing operations, there are 110 trucks round trips (55 trucks going in and out) under the existing condition with 250,000 tons of yearly aggregate sale. In doubling the sale of aggregate from 250,000 tons to 500,000 tons in the proposed conditions, the number of daily trips could also double to 220 trucks round trips. However, the average is more likely to be 184 trucks round trips which is based on previous operations. In capturing a conservative approach, the traffic analysis did evaluate the maximum daily truck trips of 220 round trips.[1] The offsite haul truck one-way trip distance was assumed to be 20 miles.

The project will increase truck traffic from 45 to 92 average trips per day with an increase in the annual trips based on the increase in aggregate production levels (the maximum daily trips of 220 remains the

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[1] GHD, Crystal Creek Aggregates Expansion, Final Draft Traffic Impact Analysis Report, July 7, 2022

same). The project will increase total trips from 134 to 222 per day with the increase in aggregate production levels.[2]

This existing light duty vehicle trips include all employee trips (two trips per employee – coming in and going out), all deliveries done with light duty trucks (less than three axles), and any customers/consultants. The current number of employees at the site is eight full time and one part time employees. Assuming two trips per employee, the light duty daily trips for employees is 18 round trips. An additional six trips are added to light vehicle trips to account for any other trips made by for deliveries and clients. In the proposed conditions, the number of full-time employees will increase from eight to nine full-time and the number of part-time employees remains at one. The proposed daily light duty trips would therefore add two additional trips from existing conditions.[3] The employee one-way trip distance was assumed to be 15 miles.

Yearly blasting would increase from 12 to 24 times per year; between 9:30 AM to 3:30 PM, Monday through Friday. Importation of material from backhaul of 50,000 cubic yards (100,000 tons) of topsoil/year remains the same. PG&E provides electrical power for all facilities; therefore, no diesel generators are required.

There is enough overburden from mining operations that is being stockpiled that will work for topsoil reclamation, under the existing condition and proposed project. That overburden haul distance is one mile on-site. Importation of material from backhaul of 50,000 cubic yards (100,000 tons) of topsoil per year would remain the same. The onsite haul truck one-way trip distance was assumed to be one mile.

Normal mining and processing activities occur up to 6 days per week, Monday through Saturday. Current hours of operation are from 6:00 a.m. to 5:00 p.m. during pacific standard time. During daylight savings time, hours are from 6:00 a.m. to 6:00 p.m., Monday through Friday and 6:00 a.m. to 5:00 p.m. on Saturdays. Hourly production rates will not change from the existing schedule represented by 300 Days per year, five days per week. However, the project site would effectively increase the hours per day from five hours (for existing condition) to ten hours (for proposed project) to increase the annual production rates.

No additional structures or operations are proposed. The locations of the existing scales and office, rock crushing, screen and washing operational, primary and secondary entrances/exits, diesel fuel storage tanks, waste oil tank, two motor oil and one lubricating oil tank, and five settling and two recycle ponds will remain. The existing Concrete Recycle Area location and operation is proposed to be removed as a Project component. The aggregated material stockpiles will remain in their current general location,

[2] GHD, Crystal Creek Aggregates Expansion, Final Draft Traffic Impact Analysis Report, July 7, 2022
[3] GHD, Crystal Creek Aggregates Expansion, Final Draft Traffic Impact Analysis Report, July 7, 2022

expanding as part of the proposed project (from 9.61 to 15.84 acres). The topsoil and overburden stockpile areas will remain the same at 2.90 acres.

Figure 1 shows the project site location and **Figure 2** shows the project site layout.

Figure 1
Project Site Location

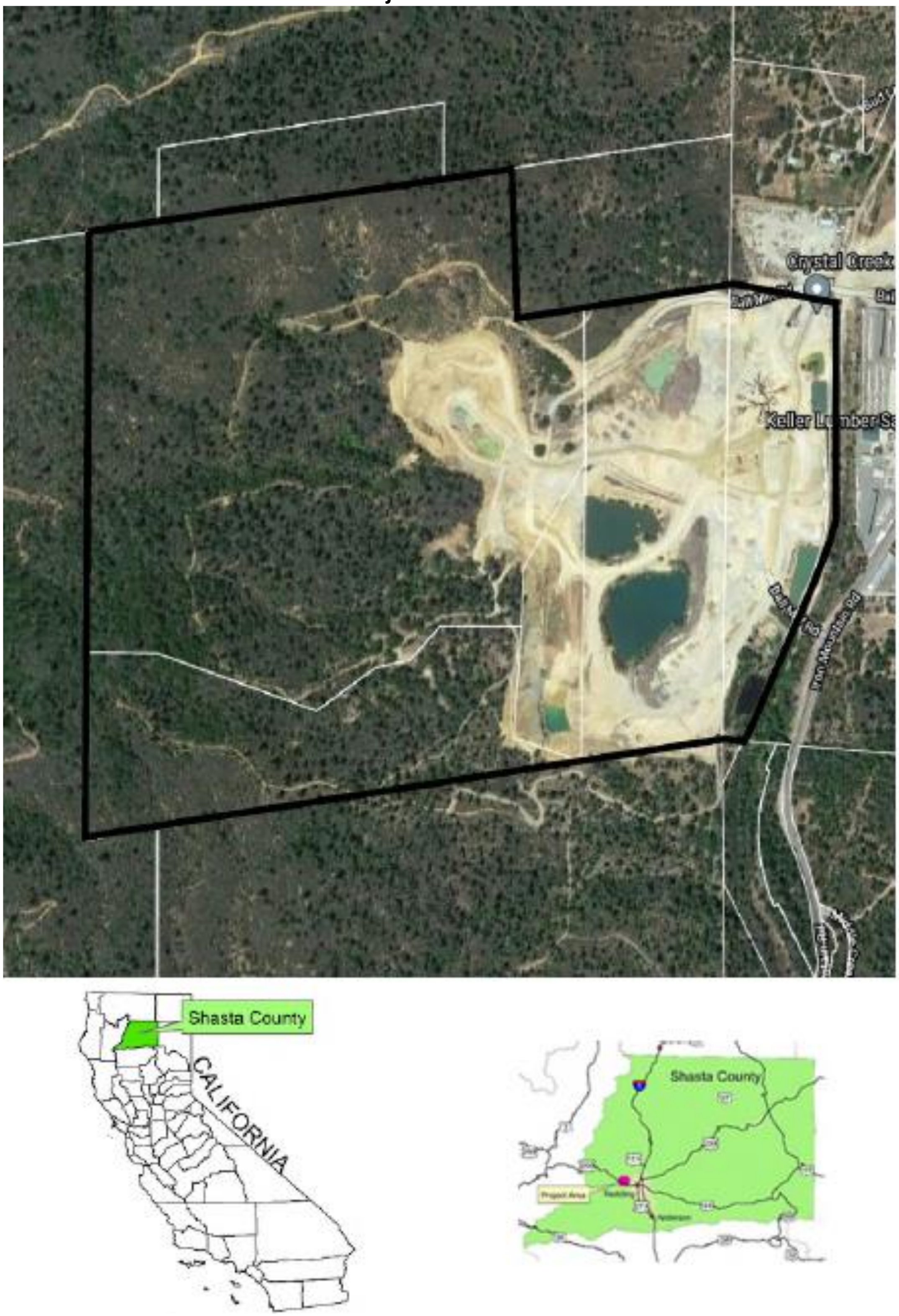

Figure 2
Project Site Layout

3.0 ANALYSIS METHODOLGY

The proposed project could affect air quality during project operations (including truck trips, rock processing plant, and other processing equipment such as crushers and material movement (i.e., dozers, vehicular traffic on unpaved surfaces, and material/soil disturbance). This air quality analysis is consistent with the methods described in the Shasta County Air Quality Management District (SCAQMD) *Protocol for Review, Land Use Permitting Activities, Procedures for Implementing the California Environmental Quality Act*[4] and *Environmental Review Guidelines, Procedures for Implementing the California Environmental Quality Act*.[5]

The air quality analysis includes a review of criteria pollutant[6] emissions such as carbon monoxide (CO)[7], nitrogen oxides (NO_x), sulfur dioxide (SO_2), volatile organic compounds (VOC) as reactive organic gases (ROG)[8], particulate matter less than 10 micrometers (coarse or PM_{10}), particulate matter less than 2.5 micrometers (fine or $PM_{2.5}$).[9]

Regulatory models used to estimate air quality impacts include:

- California Air Resources Board's (CARB) EMFAC[10] emissions inventory model. EMFAC is the latest emission inventory model that calculates emission inventories and emission rates for motor vehicles operating on roads in California. This model reflects CARB's current understanding of how vehicles travel and how much they emit. EMFAC can be used to show how California motor vehicle emissions have changed over time and are projected to change in the future.

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[4] Shasta County Air Quality Management District, *Protocol for Review, Land Use Permitting Activities, Procedures for Implementing the California Environmental Quality Act*, November 2003, https://www.shastacounty.gov/sites/default/files/fileattachments/air_quality/page/2415/scaqmd-ceqa-land-use-protocol.pdf

[5] Shasta County Air Quality Management District, *Environmental Review Guidelines, Procedures for Implementing the California Environmental Quality Act*, November 2003, https://www.shastacounty.gov/sites/default/files/fileattachments/air_quality/page/2415/scaqmd-ceqa-guidelines.pdf

[6] Criteria air pollutants refer to those air pollutants for which the USEPA and CARB has established National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS) under the Federal Clean Air Act (CAA).

[7] CO is a non–reactive pollutant that is a product of incomplete combustion of organic material, and is mostly associated with motor vehicle traffic, and in wintertime, with wood–burning stoves and fireplaces.

[8] VOC means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions and thus, a precursor of ozone formation. ROG are any reactive compounds of carbon, excluding methane, CO, CO_2 carbonic acid, metallic carbides or carbonates, ammonium carbonate, and other exempt compounds. The terms VOC and ROG are often used interchangeably.

[9] PM_{10} and $PM_{2.5}$ consists of airborne particles that measure 10 microns or less in diameter and 2.5 microns or less in diameter, respectively. PM_{10} and $PM_{2.5}$ represent fractions of particulate matter that can be inhaled into the air passages and the lungs, causing adverse health effects.

[10] California Air Resources Board, EMFAC2021 User's Guide, January 15, 2021, https://ww2.arb.ca.gov/sites/default/files/2021-01/EMFAC202x_Users_Guide_01112021_final.pdf

- CARB OFFROAD[11] emissions inventory model. OFFROAD is the latest emission inventory model that calculates emission inventories and emission rates for off-road equipment such as dozers operating in California. This model reflects CARB's current understanding of how equipment operates and how much they emit. OFFROAD can be used to show how California off-road equipment emissions have changed over time and are projected to change in the future.
- United States Environmental Protection Agency (USEPA) AP-42, Compilation of Air Pollutant Emission Factors, has been published since 1972 as the primary compilation of USEPA's emission factor information. It contains emission factors and process information for more than 200 air pollution source categories. A source category is a specific industry sector or group of similar emitting sources. The emission factors have been developed and compiled from source test data, material balance studies, and engineering estimates.[12]

4.0 EXISTING CONDITIONS

The proposed project is located in unincorporated portion of Shasta County at the northern area of the Northern Sacramento Valley Air Basin (NSVAB). The NSVAB consists of a total of seven counties: Sutter, Yuba, Colusa, Butte, Glenn, Tehama, and Shasta. The NSVAB is bounded on the north and west by the Coastal Mountain Range and on the east by the southern portion of the Cascade Mountain Range and the northern portion of the Sierra Nevada range. These mountain ranges reach heights in excess of 6,000 feet above mean sea level, with individual peaks rising much higher. The mountains form a substantial physical barrier to locally created pollution as well as pollution transported northward on prevailing winds from the Sacramento metropolitan area.

The environmental conditions of Shasta County are conducive to potentially adverse air quality conditions. The basin area traps pollutants between two mountain ranges to the east and the west. This problem is exacerbated by a temperature inversion layer that traps air at lower levels below an overlying layer of warmer air. Prevailing winds in the area are from the south and southwest. Sea breezes flow over the San Francisco Bay Area and into the Sacramento Valley, transporting pollutants from the large urban areas. Growth and urbanization in Shasta County have also contributed to an increase in emissions.

Local air districts are primarily responsible for controlling emissions from stationary and area-wide sources (with the exception of consumer products) through rules and permitting programs. For the project site, the SCAQMD is the agency primarily responsible for ensuring that federal and state ambient air quality

[11] California Air Resources Board, OFFROAD2021 Documentation, https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-road-documentation-0

[12] US Environmental Protection Agency, AP 42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I, https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors

standards are not exceeded and that air quality conditions are maintained. Responsibilities of SCAQMD include, but are not limited to, preparing plans for the attainment of ambient air quality standards, adopting and enforcing rules and regulations concerning sources of air pollution, issuing permits for stationary sources of air pollution, inspecting stationary sources of air pollution and responding to citizen complaints, monitoring ambient air quality and meteorological conditions, and implementing programs and regulations required by the federal CAA and the CCAA.

Local Air Quality

Ambient air quality in Shasta County, and thus at the project site, can be inferred from ambient air quality measurements conducted at air quality monitoring stations. Existing levels of ambient air quality and historical trends and projections in the region are documented by measurements made by the SCAQMD, which is the air pollution regulatory agency for the portion of the NSVAB in Shasta County. These measurements are affected by pollutants generated by the urbanized land uses in Shasta County as well as by land uses in the entire NSVAB and beyond.

CARB maintains a network of monitoring stations within the NSVAB that monitor air quality and compliance with applicable ambient standards. The monitoring station closest to the project site is in Redding. Ozone, PM_{10}, and $PM_{2.5}$ are the primary pollutants affecting the NSVAB. **Table 1** summarizes the most recent three years of data (2019 – 2021) from the air monitoring station. Ozone data is measured at 13791 Lake Boulevard in Shasta Lake, 2220 North Street in Anderson, and at the Health Department in Redding. PM_{10} is measured at 4066 La Mesa Avenue in Shasta Lake, North Street in Anderson, and at the Health Department in Redding. $PM_{2.5}$ is measured at the Health Department in Redding.

Table 1
Air Quality Data Summary (2019 – 2021)

Pollutant	Monitoring Data by Year			
	Standard[s]	***2019***	***2020***	***2021***
Ozone				
Highest 1 Hour Average (ppm)	0.09	0.072	0.077	0.089
Highest 8 Hour Average (ppm)	0.070	0.070	0.070	0.068
Particulate Matter (PM_{10})				
Highest 24-Hour Average (mg/m^3)	50	28.1	**94.4**	**126**
Annual Average (mg/m^3)	20	11.9	19.3	**21.0**
Particulate Matter ($PM_{2.5}$)				
Highest 24-Hour Average (mg/m^3)	35	24.1	**68.3**	**165**
Annual Average (mg/m^3)	12	10.1	10.9	9.5

*Notes: Values in **bold** are in excess of at least one applicable standard. Generally, State and national standards are not to be exceeded more than once per year. ppm = parts per million; mg/m^3 = micrograms per cubic meter.*
PM_{10} is not measured every day of the year. Number of estimated days over the standard is based on 365 days per year.
Source: California Air Resources Board, Air Quality Data Statistics, https://www.arb.ca.gov/adam/index.html

At the Redding air monitoring station, the one-hour and eight-hour ozone standards were not exceeded. The 24-hour PM_{10} standard was exceeded in 2020 and 2021 and the annual PM_{10} standard was exceeded in 2021. The 24-hour $PM_{2.5}$ standard was exceeded in 2020 and 2021. PM_{10} and $PM_{2.5}$ concentrations in 2020 and 2021 may have been adversely affected by wildfires.

5.0 IMPACT ANALYSIS

The air quality analysis includes a review of pollutant emissions such as CO, NO_x, SO_2, VOC as ROG, PM_{10}, and $PM_{2.5}$.

Threshold of Significance

The significance of potential impacts was determined based on State CEQA Guidelines, Appendix G, and the SCAQMD's *Protocol for Review, Land Use Permitting Activities, Procedures for Implementing the California Environmental Quality Act* and *Environmental Review Guidelines, Procedures for Implementing the California Environmental Quality Act*. Using Appendix G evaluation thresholds, the proposed project would be considered to have significant air quality impacts if it were to:

A. Conflict with or obstruct implementation of the applicable air quality plan;

B. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard;

C. Expose sensitive receptors to substantial pollutant concentrations; or

D. Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.

The thresholds of significance applied to assess project-level air quality impacts are:

- Daily emissions of 25 pounds per day of ROG and NO_x and 80 pounds per day of PM_{10} (Level A)
- Daily emissions of greater than 137 pounds per day of ROG, NO_x, and PM_{10} (Level B)
- Exposure of persons by siting a new source or a new sensitive receptor to substantial levels of TAC resulting in (a) a cancer risk level greater than 10 in one million and (b) a noncancerous risk (chronic or acute) hazard index greater than 1.0. For this threshold, sensitive receptors include residential uses, schools, parks, daycare centers, nursing homes, and medical centers
- Frequently and for a substantial duration, create or expose sensitive receptors to substantial objectionable odors affecting a substantial number of people

These thresholds are consistent with New Source Review Rule 2:1 adopted by the SCAQMD Board in 1993 as required by the California CAA. If the project's indirect and area wide emissions are greater than the

Level A thresholds but less than Level B thresholds, appropriate Level A mitigation is required to be implemented by the project applicant. If the project's indirect and area wide emissions are above the Level B threshold of 137 pounds per day after applying all feasible mitigation measures, the project would be considered to have a significant impact from an air quality perspective.

The SCAQMD and the Shasta County General Plan recommend that projects apply Standard Mitigation Measures (SMM) and appropriate Best Available Mitigation Measures (BAMM) when a project exceeds Level A thresholds and that projects apply SMM, BAMM, and special BAMM when a project exceeds Level B thresholds. Projects that cannot mitigate emissions to levels below the Level B thresholds are considered significant.

The supporting information, methodology, assumptions, and results used in the air quality analysis are provided in **Attachment A: Air Emission Calculations**.

Daily Air Emission Estimates

Table 2 presents the maximum daily emissions associated with the existing condition while **Table 3** presents the maximum daily emissions associated with the proposed project. **Table 4** presents the maximum daily emissions related to the project (proposed project minus existing condition). The significance thresholds are compared to the project-related emissions (**Table 4**) accordingly. The emission estimates incorporate the existing Use Permit mitigation measures (and Project Conditions) and the Permit To Operate conditions (see **Section 6**).

Table 2
Maximum Daily Emissions (pounds) – Existing Condition

					Uncontrolled		Controlled	
Emission Source	**ROG**	**CO**	**NO_x**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**PM_{10}**	**$PM_{2.5}$**
Onsite Equipment	1.14	9.81	8.24	0.32	0.30	0.04	0.30	0.04
Employee Vehicles	0.01	0.51	0.04	<0.01	0.01	<0.01	0.01	<0.01
Haul Trucks	0.07	0.33	4.32	0.10	0.60	0.24	0.60	0.24
Aggregate Plant	-	-	-	-	115	17.3	11.3	1.70
Wash Plant	-	-	-	-	10.0	1.50	1.03	0.15
Unpaved Surfaces	-	-	-	-	321	48.1	32.1	4.81
Material Handling	-	-	-	-	3.88	0.58	0.78	0.12
Blasting	-	-	-	-	16.1	2.42	16.1	2.42
Grand Total	**1.21**	**10.7**	**12.6**	**0.42**	**467**	**70.2**	**62.2**	**9.48**

Source: RCH Group, 2022.

Table 3
Maximum Daily Emissions (pounds) – Proposed Project

					Uncontrolled		Controlled	
Emission Source	**ROG**	**CO**	**NO_x**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**PM_{10}**	**$PM_{2.5}$**
Onsite Equipment	2.27	19.6	16.5	0.64	0.59	0.07	0.59	0.07
Employee Vehicles	0.01	0.57	0.04	<0.01	0.01	<0.01	0.01	<0.01
Haul Trucks	0.14	0.66	8.65	0.20	1.20	0.48	1.20	0.48
Aggregate Plant	-	-	-	-	461	69.1	45.2	6.79
Wash Plant	-	-	-	-	39.9	5.99	4.12	0.62
Unpaved Surfaces	-	-	-	-	532	79.7	53.2	7.97
Material Handling	-	-	-	-	7.76	1.16	1.55	0.23
Blasting	-	-	-	-	16.1	2.42	16.1	2.42
Grand Total	**2.42**	**20.9**	**25.2**	**0.84**	**1,058**	**159**	**122**	**18.6**

Source: RCH Group, 2022.

Table 4
Maximum Daily Emissions (pounds) – Project-Related

					Uncontrolled		Controlled	
Emission Source	**ROG**	**CO**	**NO_x**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**PM_{10}**	**$PM_{2.5}$**
Onsite Equipment	1.14	9.81	8.24	0.32	0.30	0.04	0.30	0.04
Employee Vehicles	0.00	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Haul Trucks	0.07	0.33	4.32	0.10	0.60	0.24	0.60	0.24
Aggregate Plant	-	-	-	-	346	51.8	33.9	5.09
Wash Plant	-	-	-	-	29.9	4.49	3.09	0.46
Unpaved Surfaces	-	-	-	-	211	31.6	21.1	3.16
Material Handling	-	-	-	-	3.88	0.58	0.78	0.12
Blasting	-	-	-	-	0.00	0.00	0.00	0.00
Grand Total	**1.21**	**10.2**	**12.6**	**0.42**	**591**	**88.8**	**59.8**	**9.11**
Significance Threshold (Level A)	25	-	25	-	80	-	80	-
Significance Threshold (Level B)	137	-	137	-	137	-	137	-
Exceeds Threshold?	**No**	**-**	**No**	**-**	**Yes**	**-**	**No**	**-**

Source: RCH Group, 2022.

The proposed project would have less than significant impacts (below Level A) for ROG, NOx, and PM_{10} with project design elements and compliance with regulatory requirements, as shown in **Table 4**.

According to SCAQMD's *Protocol for Review, Land Use Permitting Activities, Procedures for Implementing the California Environmental Quality Act*, if a new project is unable to provide adequate on-site mitigation of their long-term air quality impacts, an off-site mitigation program may be necessary. Projects emitting high levels of pollutants (as determined by the Air District) may be required to implement all feasible on-site mitigation measures and participate in an offsite mitigation program to reduce emissions. The continued implementation of the existing Use Permit 07-020 Statement of Conditions and the Permit To Operate 90-PO-65 applicable air quality related conditions would result in project-related emissions below the Level A significance thresholds.

Annual Air Emission Estimates

Table 5 presents the annual emissions associated with the existing condition while **Table 6** presents the annual emissions associated with the proposed project. **Table 7** presents the annual emissions related to the project (proposed project minus existing condition).

Table 5
Annual Emissions (tons) – Existing Condition

					Uncontrolled		Controlled	
Emission Source	**ROG**	**CO**	**NO_x**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**PM_{10}**	**$PM_{2.5}$**
Onsite Equipment	0.17	1.47	1.24	0.05	0.04	0.01	0.04	0.01
Employee Vehicles	<0.01	0.08	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Haul Trucks	0.01	0.05	0.65	0.01	0.09	0.04	0.09	0.04
Aggregate Plant	-	-	-	-	17.0	2.55	1.70	0.26
Wash Plant	-	-	-	-	1.53	0.23	0.17	0.02
Unpaved Surfaces	-	-	-	-	48.1	7.22	4.81	0.72
Material Handling	-	-	-	-	0.58	0.09	0.12	0.02
Blasting	-	-	-	-	0.10	0.01	0.10	0.01
Grand Total	**0.18**	**1.60**	**1.89**	**0.06**	**67.5**	**10.1**	**7.03**	**1.08**

Source: RCH Group, 2022.

Table 6
Annual Emissions (tons) – Proposed Project

					Uncontrolled		Controlled	
Emission Source	**ROG**	**CO**	**NO_x**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**PM_{10}**	**$PM_{2.5}$**
Onsite Equipment	0.34	2.94	2.47	0.10	0.09	0.01	0.09	0.01
Employee Vehicles	<0.01	0.09	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Haul Trucks	0.02	0.10	1.30	0.03	0.18	0.07	0.18	0.07
Aggregate Plant	-	-	-	-	34.1	5.11	3.40	0.51
Wash Plant	-	-	-	-	3.05	0.46	0.33	0.05
Unpaved Surfaces	-	-	-	-	79.7	11.96	7.97	1.20
Material Handling	-	-	-	-	1.16	0.17	0.23	0.03
Blasting	-	-	-	-	0.19	0.03	0.19	0.03
Grand Total	**0.36**	**3.13**	**3.78**	**0.13**	**118**	**17.8**	**12.4**	**1.90**

Source: RCH Group, 2022.

Table 7
Annual Emissions (tons) – Project-Related

					Uncontrolled		Controlled	
Emission Source	**ROG**	**CO**	**NO_x**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**PM_{10}**	**$PM_{2.5}$**
Onsite Equipment	0.17	1.47	1.24	0.05	0.04	0.01	0.04	0.01
Employee Vehicles	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Haul Trucks	0.01	0.05	0.65	0.01	0.09	0.04	0.09	0.04
Aggregate Plant	-	-	-	-	17.0	2.55	1.70	0.26
Wash Plant	-	-	-	-	1.53	0.23	0.17	0.02
Unpaved Surfaces	-	-	-	-	31.6	4.74	3.16	0.47
Material Handling	-	-	-	-	0.58	0.09	0.12	0.02
Blasting	-	-	-	-	0.10	0.01	0.10	0.01
Grand Total	**0.18**	**1.53**	**1.89**	**0.06**	**51.0**	**7.67**	**5.37**	**0.83**

Source: RCH Group, 2022.

Toxic Air Contaminants

CARB has developed a list of toxic air contaminants (TAC), where a TAC is “an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health (California Health and Safety Code Section 39655). All USEPA hazardous air pollutants are TAC. CARB administers the Air Toxics “Hot Spots” program under Assembly Bill 2588 “Hot Spots” Information and Assessment Act, which requires periodic local review of facilities which emit TAC. Local air agencies periodically must prioritize stationary sources of TAC and prepare health risk assessments for high-priority sources.

Diesel exhaust is a complex mixture of numerous individual gaseous and particulate compounds emitted from diesel-fueled combustion engines. Diesel particulate matter is formed primarily through the incomplete combustion of diesel fuel. DPM is removed from the atmosphere through physical processes including atmospheric fall-out and washout by rain. Humans can be exposed to airborne DPM by deposition on water, soil, and vegetation, although the main pathway of exposure is inhalation. Cal/EPA has concluded that potential cancer risk from inhalation exposure to whole diesel exhaust outweigh the multi-pathway cancer risk from the speciated components.

In August 1998, the CARB identified DPM as an air toxic. CARB developed the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel- Fueled Engines and Vehicles* and *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines* and approved these documents on

September 28, 2000.[13] [14] The documents represent proposals to reduce DPM emissions, with the goal of reducing emissions and the associated health risk by 75 percent in 2010 and by 85 percent in 2020. The program aimed to require the use of state-of-the-art catalyzed DPM filters and ultra-low-sulfur diesel fuel.

In 2001, CARB assessed the state-wide health risks from exposure to diesel exhaust and to other toxic air contaminants. It is difficult to distinguish the health risks of diesel emissions from those of other air toxics, since diesel exhaust contains approximately 40 different TAC. The CARB study detected diesel exhaust by using ambient air carbon soot measurements as a surrogate for diesel emissions. The study reported that the state-wide cancer risk from exposure to diesel exhaust was about 540 per million population as compared to a total risk for exposure to all ambient air toxics of 760 per million. This estimate, which accounts for about 70 percent of the total risk from TAC, included both urban and rural areas in the state. The estimate can also be considered an average worst-case for the state, since it assumes constant exposure to outdoor concentrations of diesel exhaust and does not account for expected lower concentrations indoors, where most of time is spent. DPM is estimated to increase statewide cancer risk by 520 cancers per million residents exposed over a lifetime.[15]

Exposure to DPM results in a greater incidence of chronic non-cancer health effects, such as cough, labored breathing, chest tightness, wheezing, and bronchitis. Individuals particularly vulnerable to DPM are children, whose lung tissue is still developing, the elderly and people with illnesses who may have other serious health problems that can be aggravated by exposure to DPM. In general, children are more vulnerable than adults to air pollutants because they have higher inhalation rates, narrower airways, and less mature immune systems. In addition, children with allergies may have an enhanced allergic response when exposed to diesel exhaust.

Crystalline silica is a component of soil, sand, granite, and many other minerals. Crystalline silica may become respirable-sized particles when workers chip, cut, drill, or grind materials that contain it. If respirable crystalline silica dust enters the lungs, it causes the formation of scar tissue (silicosis) which can be disabling or even fatal, reducing the lungs' ability to take in oxygen and increasing the susceptibility to lung infections like tuberculosis. The non-crystalline form of silica (amorphous silica) is not nearly as toxic, since it usually does not cause the formation of scar tissue in the lungs. High occupational exposure to crystalline silica has been linked to respiratory problems and in some cases to cancer. Crystalline silica related illnesses historically have been associated with industrial processes such as mining. However, due

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[13] California Air Resources Board, *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles,* October 2000, http://www.arb.ca.gov/diesel/documents/rrpfinal.pdf

[14] California Air Resources Board, *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines,* October 2000, https://www.arb.ca.gov/diesel/documents/rmgFinal.pdf

[15] California Air Resources Board, *Summary: Diesel Particulate Matter Health Impacts*, April 12, 2016, https://www.arb.ca.gov/research/diesel/diesel-health_summ.htm

to stringent health and safety regulations that have been imposed over the years, mining related respiratory illnesses have steadily declined.

Land uses such as schools, children's daycare centers, hospitals, and convalescent homes are considered to be more sensitive than the general public to poor air quality because the population groups associated with these uses have increased susceptibility to respiratory distress. Persons engaged in strenuous work or exercise also have increased sensitivity to poor air quality. The CARB has identified the following people as most likely to be affected by air pollution: children less than 14 years of age, the elderly over 65 years of age, athletes, and those with cardiovascular and chronic respiratory diseases. These groups are classified as sensitive population groups.

Residential areas are considered more sensitive to air quality conditions than commercial and industrial areas, because people generally spend longer periods of time at their residences, resulting in greater exposure to ambient air quality conditions. Recreational uses are also considered sensitive, due to the greater exposure to ambient air quality conditions and because the presence of pollution detracts from the recreational experience. Workers are not considered sensitive receptors because all employers must follow regulations set forth by the Occupation Safety and Health Administration to ensure the health and well-being of their employees.

Odor Impacts

Though offensive odors from stationary and mobile sources rarely cause any physical harm, they still remain unpleasant and can lead to public distress, generating citizen complaints to local governments. The occurrence and severity of odor impacts depend on the nature, frequency, and intensity of the source; wind speed and direction; and the sensitivity of receptors.

Potential localized odor sources associated with proposed project operation-related activities could originate from fumes from the diesel exhaust from off-road haul equipment, and diesel exhaust from incoming and out-going diesel-fueled heavy-duty transport vehicles.

Due to the subjective nature of odor impacts, the number of variables that can influence the potential for an odor impact, and the variety of odor sources, there are no quantitative or formulaic methodologies to determine the presence of a significant odor impact. Rather, often air districts recommend that odor analyses strive to fully disclose all pertinent information. The intensity of an odor source's operations and its proximity to sensitive receptors influences the potential significance of odor emissions. For example, San Joaquin Valley Unified Air Pollution Control District has identified some common types of facilities that have been known to produce objectionable odors.[16] The proposed project is not one of the common types of facilities that have been known to produce objectionable odors.

Generally, an odor source with five or more confirmed complaints per year averaged over three years could be considered to have a significant impact. However, it should be recognized that there is not one piece of information that can solely be used to determine the significance of an odor impact. For example, a project that would be located near an existing odor source may not discover any odor complaints for the existing odor source. It is possible that factors such as a small number of existing nearby receptors, predominate wind direction blowing away from the existing receptors, and/or seasonality of the odor source has prevented any odor complaints from being filed about the existing odor source.

Odor emissions are highly dispersive, especially in areas with higher average wind speeds. However, odors disperse less quickly during inversions or during calm conditions, which hamper vertical mixing and dispersion. Inversion conditions may also result in elevated particulate matter concentrations and odor impacts due to air stagnation. Furthermore, the existing facility has not received any odor complaints over the last three years. Therefore, proposed project odor impacts would be less than significant.

6.0 HEALTH RISK ASSESSMENT

The proposed project would constitute an emission source of DPM due to operations associated with haul trucks. Studies have demonstrated that DPM from diesel-fueled engines is a human carcinogen and that chronic (long-term) inhalation exposure to DPM poses a chronic health risk.

Health effects from carcinogenic air toxics are usually described in terms of individual cancer risk. Individual cancer risk is the likelihood that a person exposed to air toxic concentrations over a 70-year lifetime will contract cancer, based on the use of standard risk-assessment methodology. The maximally exposed individual (MEI) represents the worst–case risk estimate, based on a theoretical person continuously exposed for a lifetime at the point of highest compound concentration in the air. This is a highly conservative assumption, since most people do not remain at home all day and on average residents change residences every 11 to 12 years. In addition, this assumption assumes that residents are experiencing outdoor concentrations for the entire exposure period.

This HRA analyzes the incremental cancer risks to sensitive receptors in the vicinity of the proposed project, using emission rates (in pounds per hour). Air toxics emission rates were input into the USEPA's AERMOD atmospheric dispersion model to calculate ambient air concentrations at receptors in the proposed project vicinity. This HRA is intended to provide a worst–case estimate of the increased

[16] San Joaquin Valley Unified Air Pollution Control District, Final Draft Guidance for Assessing and Mitigating Air Quality Impacts, March 19, 2015, https://www.valleyair.org/transportation/GAMAQI-2015/FINAL-DRAFT-GAMAQI.PDF

exposure by employing a standard emission estimation program, an accepted pollutant dispersion model, approved toxicity factors, and conservative exposure parameters.

In accordance with OEHHA *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments,* this HRA was accomplished by applying the highest estimated concentrations of TAC at the receptors analyzed to the established cancer potency factors and acceptable reference concentrations for non-cancer health effects. Increased cancer risks were calculated using the modeled DPM concentrations and OEHHA-recommended methodologies for both a child exposure (3rd trimester through 2 years of age) and adult exposure. The cancer risk calculations were based on applying the OEHHA-recommended age sensitivity factors and breathing rates, as well as fraction of time at home and an exposure duration of 30 years, to the DPM concentration exposures. Age-sensitivity factors reflect the greater sensitivity of infants and small children to cancer causing air pollutants. The supporting methodology and assumptions used in this HRA are provided in **Attachment B: Health Risk Assessment Methodology and Assumptions**.

These conservative methodologies overestimate both non-carcinogenic and carcinogenic health risk, possibly by an order of magnitude or more. Therefore, for carcinogenic risks, the actual probabilities of cancer formation in the populations of concern due to exposure to carcinogenic pollutants are likely to be lower than the risks derived using the HRA methodology. The extrapolation of toxicity data in animals to humans, the estimation of concentration prediction methods within dispersion models; and the variability in lifestyles, fitness and other confounding factors of the human population also contribute to the overestimation of health impacts. Therefore, the results of this HRA are highly overstated.

Health Impacts

The following describes the HRA results associated with existing receptors due to proposed project activities. Sensitive receptors were placed at existing residences to estimate health impacts due to proposed project operations on existing receptors. The project site is surrounded by open lands with some residences to the east, south, and west. Shasta Union Elementary School is 1.2 miles to the southwest of the project site. The maximum project-related cancer risk associated with the proposed project would be 0.54 persons per million, as shown in **Table 8**. The maximum exposed residence (to the southeast of the project site) is approximately 1,600 feet from the aggregate plant and 1,530 feet from the aggregate extraction areas associated with Phase 1, 2, and 3.

The maximum concentrations would occur at a residential receptor (also known as the maximum exposed individual or MEI) to the south of the project site. Thus, the cancer risk due to proposed project activities are below the significance threshold of 10 per million and thus, would be less than significant.

Table 8
Estimated Health Impacts

Source	Cancer Risk	Hazard Impact
Existing Condition	0.47	0.30
Proposed Project	1.08	0.83
Project-Related	**0.54**	**0.54**
Significance Threshold	10	1.0
Potentially Significant (Yes or No)?	No	No

Values represent rounding.
Source: RCH Group, 2022.

Non-Cancer Health Hazard

Both acute (short-term) and chronic (long-term) adverse health impacts unrelated to cancer are measured against a hazard index (HI), which is defined as the ratio of the predicted incremental DPM exposure concentration from the proposed project to a reference exposure level (REL) that could cause adverse health effects. The REL are published by OEHHA based on epidemiological research. The ratio (referred to as the Hazard Quotient [HQ]) of each non-carcinogenic substance that affects a certain organ system is added to produce an overall HI for that organ system. The overall HI is calculated for each organ system. The impact is considered to be significant if the overall HI for the highest-impacted organ system is greater than 1.0.

The chronic reference exposure level for DPM was established by the California OEHHA[17] as 5 $\mu g/m^3$. Thus, the proposed project-related annual concentration of DPM cannot exceed 5.0 $\mu g/m^3$; resulting in a chronic HI of greater than 1.0 (i.e., DPM annual concentration/5.0 $\mu g/m^3$). The chronic reference exposure level for crystalline silica was established by the California OEHHA[18] as 3 $\mu g/m^3$.

The chronic HI associated with the proposed project would be 0.54. The chronic HI would be below the significance threshold of 1 and the impact of the proposed project would therefore be less than significant.

7.0 EMISSION REDUCTION MEASURES

The proposed project would continue to implement existing Use Permit 07-020 Statement of Conditions and the Permit To Operate 90-PO-65 to reduce air quality and fugitive dust impacts:

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[17] California Office of Environmental Health Hazards Assessment - Acute, 8-hour, and Chronic Reference Exposure Levels, http://www.oehha.ca.gov/air/allrels.html
[18] California Office of Environmental Health Hazards Assessment - Acute, 8-hour, and Chronic Reference Exposure Levels, http://www.oehha.ca.gov/air/allrels.html

Use Permit 07-020 Statement of Conditions

The following are the existing Use Permit 07-020 Statement of Conditions (approved June 12, 2008) 46 through 49:

46. The applicant shall obtain an Authority to Construct/Permit To Operate from the SCAQMD.

47. A dust palliative shall be placed and maintained on all stockpiles containing material that has the potential to create fugitive dust, according to criteria established by the SCAQMD, in order to prevent fugitive dust emissions from leaving the property boundaries. Types of palliatives may include physical restraints such as netting, tarping, or other covering, and water.

48. Any secondary source of dust arising from transportation of any materials to and from the site shall be controlled by water spray or other means so as to eliminate any dust nuisance. Roads shall be maintained in a dust free condition.

49. The following Air Quality Standard Mitigation Measures shall apply:

   a. Alternatives to open burning of vegetative material on the project site shall be used by the project applicant unless otherwise deemed infeasible by the SCAQMD. Among suitable alternatives are chipping, mulching, or conversion to biomass fuel.

   b. The applicant shall be responsible for ensuring that all adequate dust control measures are implemented in a timely and effective manner during all phases of project development and construction.

   c. All material excavated, stockpiled, or graded should be sufficiently watered to prevent fugitive dust from leaving property boundaries and causing a public nuisance or a violation of an ambient air standard. Watering should occur at least twice daily with complete site coverage, preferably in the mid-morning and after work is completed each day.

   d. All areas (including unpaved roads) with vehicle traffic should be watered periodically or have dust palliatives applied for stabilization of dust emissions.

   e. All on-site vehicles should be limited to a speed of 15 miles per hour on unpaved roads.

   f. All land clearing, grading, earth moving or excavation activities on a project shall be suspended when winds are expected to exceed 20 miles per hour.

   g. All inactive portions of the development site should be seeded and watered until a suitable vegetative cover is established.

   h. All trucks hauling dirt, sand, soil, or other loose material should be covered or should maintain the minimum required amount of freeboard (i.e., minimum vertical distance between top of the load and the trailer) in accordance with the requirements of CVC Section 23114. This provision shall be enforced by local law enforcement agencies.

i. All material transported off-site shall be either sufficiently watered or securely covered to prevent a public nuisance.

Permit To Operate 90-PO-65

The following are the Permit To Operate 90-PO-65 (dated December 20, 2021) applicable air quality related conditions issued by the Department of Resource Management Air Quality Management District:

General Permit Conditions

- The Permit To Operate shall be posted in a conspicuous location within the control center of the facility for which it was issued. [Rule 2:23]
- Acceptance of the permit is deemed acceptance of all conditions as specified. Failure to comply with any condition of this permit or the Rules and Regulations of the SCAQMD shall be grounds for revocation, either by the Air Pollution Control Officer (APCO) or the Air Quality Management District Hearing Board. [Rule 2:26]
- The SCAQMD reserves the right to amend the permit, if the need arises, in order to ensure compliance of this facility or to abate any public nuisance. [Rule 2:1 Part 600; CH&SC §41700]
- If any provision of the permit is found invalid, such finding shall not affect the remaining provisions. [Rule 2:1 Part 600]
- All equipment, facilities, and systems shall be designed to be operated in a manner that minimizes air pollutant emissions and maintains compliance with the conditions of this permit and the regulations of the SCAQMD. [Rule 2:1 Part 600]
- Periods of excess emission levels with respect to emission limitations specified in the permit shall be reported to the SCAQMD within four hours of the occurrence. In no event, shall the equipment be operated in a manner that creates excessive emissions beyond the end of the first shift or twenty-four hours, whichever occurs first. [Rule 3:10]
- The operating staff of this facility shall be advised of and familiar with all the conditions of this permit. [Rule 2:1 Part 600]
- The facility is subject to all applicable requirements of the Air Toxics "Hot Spots" Information and Assessment Act of 1987, as cited in the CH&SC Sections 44300 et seq.

Operating Conditions

- Fugitive dust from the screening and crushing plant shall be controlled by water sprays as necessary to prevent a public nuisance or opacity violation. [Rule 3:16]

- Fugitive dust from storage piles, processing area, and disturbed areas shall be controlled by periodic cleanup and/or use of sprinklers, tarps, or dust palliative agents as necessary to prevent a public nuisance or opacity violation. [Rule 3:16]

- Fugitive dust generated from access and on-site roads shall be controlled by application of water, dust palliative, chip-sealing, or paving so as to prevent a public nuisance or violation of any applicable ambient air quality standard. [Rule 3:16]

- A water mist system shall be used in the drilling process to prevent fugitive emissions from leaving the property boundary and creating a public nuisance. [Rule 3:16]

- The Federal New Source Performance Standards for Non-Metallic Mineral Processing Plants (40 CFR, Part 60, Chapter 1, Subpart 000) shall be complied with at all times. Fugitive emissions from any transfer point on belt conveyors shall not exceed seven percent opacity in accordance with Section 60.672.(b). Fugitive emissions from any crusher at which a capture system is not used shall be limited to twelve percent opacity in accordance with Section 60.672(c).

- All water bars, wet suppression systems must be inspected monthly to check that water is flowing to the discharge spray nozzles in the wet suppression system. Corrective action must be taken immediately if water is not flowing properly to the discharge spray nozzles. A logbook shall be maintained that includes the date of each inspection and any corrective actions taken. The logbook shall be kept on file for a period of two years and made available to the Air District upon request. [40 CFR, Part 60, Subpart OOO]

- The total Crystal Creek Aggregate facility emissions of particulate matter less than 10 microns in size (PM_{10}), nitrogen oxides, reactive organic compounds, and sulfur oxides, shall be limited to 25 tons per year of each pollutant. For purposes of this condition, the facility shall include all emissions units associated with this permit. If any of the above-mentioned nonattainment or precursor pollutants for the facility exceed 25 tons per year, based on SCAQMD calculations of emissions, the permittee will be required to apply for a modified Permit To Operate which shall require emission offsets.

- All mobile rock crushing and screening equipment brought onsite shall maintain valid In-Use Off-Road Diesel-Fueled Fleets Regulation (DOORS) registrations.

- All portable or mobile rock crushing and screening equipment brought onsite shall maintain valid Portable Equipment Registration Program (PERP) registrations.

- Portable/mobile equipment working under this permit shall comply with all General Requirements, Emission Limitations and Operating Requirements of the equipment units PERP operating conditions.
- Daily records of operating hours and material processed shall be maintained and kept on file for a period of two years to verify compliance with PERP operating conditions. Records shall be maintained for each mobile/portable equipment unit. [Rule 2:27 and PERP]
- Annual reporting shall be as follows:
    1. Portable equipment working under this permit shall report hours of operation and throughput to the SCAQMD.
    2. Portable equipment working under this permit shall not report hours of operation and throughput to the PERP.
    3. Mobile equipment shall report engine operation to the DOORS. [Rule 2:27] [PERP] [DOORS]
- Testing and maintenance of the Deutz Model F6L912, 88 HP Diesel engine shall be limited to operate the number of hours necessary to comply with the testing requirements of National Fire Protection Association 25 — "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection System," 1998 edition. [CCR 17 § 93115.3]

8.0 GREENHOUSE GAS EMISSIONS

"Global warming" and "global climate change" are the terms used to describe the increase in the average temperature of the earth's near-surface air and oceans since the mid-20th century and its projected continuation. Warming of the climate system is now considered to be unequivocal, with global surface temperature increasing approximately 1.33 degrees Fahrenheit (°F) over the last 100 years. Continued warming is projected to increase global average temperature between 2 and 11°F over the next 100 years.

Natural processes and human actions have been identified as the causes of this warming. The International Panel on Climate Change (IPCC) concludes that variations in natural phenomena such as solar radiation and volcanoes produced most of the warming from pre-industrial times to 1950 and had a small cooling effect afterward.[19] After 1950, however, increasing GHG concentrations resulting from human activity such as fossil fuel burning and deforestation have been responsible for most of the observed temperature increase. These basic conclusions have been endorsed by more than 45 scientific societies and academies of science, including all the national academies of science of the major

[19] IPCC, *2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf

industrialized countries. Since 2007, no scientific body of national or international standing has maintained a dissenting opinion.

Increases in GHG concentrations in the earth's atmosphere are thought to be the main cause of human-induced climate change. The IPCC is now 95 percent certain that humans are the main cause of current global warming.[20] GHG naturally trap heat by impeding the exit of solar radiation that has hit the earth and is reflected back into space. Some GHG occur naturally and are necessary for keeping the earth's surface inhabitable. However, increases in the concentrations of these gases in the atmosphere during the last 100 years have decreased the amount of solar radiation that is reflected into space, intensifying the natural greenhouse effect and resulting in the increase of global average temperature.

Gases that trap heat in the atmosphere are referred to as GHG because they capture heat radiated from the sun as it is reflected back into the atmosphere, much like a greenhouse does. The accumulation of GHG has been implicated as the driving force for global climate change. The primary GHG are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), ozone, and water vapor.

While the presence of the primary GHG in the atmosphere are naturally occurring, CO_2, CH_4, and N_2O are also emitted from human activities, accelerating the rate at which these compounds occur within earth's atmosphere. Emissions of CO_2 are largely by-products of fossil fuel combustion, whereas methane results from off-gassing associated with agricultural practices, coal mines, and landfills. Other GHG include hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, and are generated in certain industrial processes.

CO_2 is the reference gas for climate change because it is the predominant GHG emitted. The effect that each of the aforementioned gases can have on global warming is a combination of the mass of their emissions and their global warming potential (GWP). GWP indicates, on a pound-for-pound basis, how much a gas is predicted to contribute to global warming relative to how much warming would be predicted to be caused by the same mass of CO_2. CH_4 and N_2O are substantially more potent GHG than CO_2, with GWP of 28 and 265 times that of CO_2, respectively.[21]

In emissions inventories, GHG emissions are typically reported in terms of pounds or metric tons (MT) of CO_2 equivalents (CO_2e). CO_2e are calculated as the product of the mass emitted of a given GHG and its

[20] IPCC, *2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf

[21] IPCC, *2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf

specific GWP. While CH_4 and N_2O have much higher GWP than CO_2, CO_2 is emitted in such vastly higher quantities that it accounts for the majority of GHG emissions in CO_2e.

Greenhouse Gas Reduction Targets

In 2010, the SCAQMD initiated the regional climate action planning process (RCAP). The primary objectives of the RCAP process are to contribute to the State's climate protection efforts and to provide CEQA review streamlining benefits for development projects within the region's four jurisdictions: the City of Anderson, the City of Redding, the City of Shasta Lake, and the unincorporated areas of Shasta County. To facilitate these objectives, the SCAQMD worked with the four jurisdictions to prepare community-specific, independent climate action plans that contain GHG emission inventories and forecasts, emission reduction measures, and implementation and monitoring programs. The Shasta County Regional Climate Action Plan (CAP)[22] provides a summary of jurisdictional GHG inventories and describe how each jurisdiction will achieve GHG reductions through local actions that contribute to the statewide GHG emissions reduction target defined in AB 32, the California Global Warming Solutions Act of 2006, CEQA guidelines, and other State guidance. However, the Shasta County Regional CAP was not adopted and therefore is not used to assess the project's compliance with GHG reduction plans.

Shasta County has selected emission reduction targets that are both ambitious and practical. The targets will allow Shasta County to contribute to State climate protection efforts and are purposely set at levels that are likely to provide CEQA streamlining benefits to new development projects in the community. Unincorporated Shasta County's GHG reduction targets are as follows:

- Reduce community emissions to 15 percent below 2008 levels by 2020 (485,567 MT of CO2e per year);
- Reduce community emissions to 49 percent below 2008 levels by 2035 (291,340 MT of CO2e per year); and
- Reduce community emissions to 83 percent below 2008 levels by 2050 (97,113 MT or CO2e per year).

Shasta Regional Climate Action Plan

The Shasta Regional Climate Action Plan (RCAP) describes measures that can achieve the 2020 reduction target and work toward the 2035 target. While Shasta County supports the goal of Executive Order S-03-05, it recognizes that estimating 2050 emission levels and reduction potentials are highly speculative. For this reason, the County has chosen not to focus on the 2050 reduction target at this time. Shasta County

[22] County of Shasta, Draft Shasta Regional Climate Action Plan, November 2012.

will regularly re-evaluate its long-term GHG reduction efforts to reflect future conditions and adjust emission reduction measures accordingly.

To meet its adopted emissions reduction targets, the RCAP provides policies, programs, and other projects related to energy, waste, water, transportation, and carbon sequestration. The measures are organized into five categories including: energy, water, waste, transportation, and carbon sequestration. Applicable measures relative to the proposed project are listed within the following:

- Develop a priority permitting program for new residential projects that demonstrate 15 percent higher efficiency than Title 24 requirements.
- New homes install ENERGY STAR appliances at the following rates: 40 percent refrigerators, 40 percent clothes washers, and 70 percent dishwashers.
- New homes install ENERGY STAR appliances at the following rates: 90 percent refrigerators, 90 percent clothes washers, and 90 percent dishwashers.
- 67.5 percent of new residential and commercial customers adopt smart-grid technology.
- 11.3 percent each of single-family residential buildings, multi-family residential buildings, and nonresidential buildings install a solar hot water system.
- 22.5 percent of single-family residential units install a rooftop PV system.
- 11.3 percent of residential households install high-efficiency toilets, showerheads, faucets, dishwashers, and clothes washers.

The Shasta County Regional CAP was not adopted and therefore is not used to assess the project's compliance with GHG reduction plans.

Executive Order S-3-05

Governor Schwarzenegger established Executive Order S-3-05 in 2005, in recognition of California's vulnerability to the effects of climate change. Executive Order S-3-05 set forth a series of target dates by which statewide emissions of GHG would be progressively reduced, as follows:

- By 2010, reduce GHG emissions to 2000 levels;
- By 2020, reduce GHG emissions to 1990 levels; and
- By 2050, reduce GHG emissions to 80 percent below 1990 levels.

The executive order directed the Secretary of the CalEPA to coordinate a multi-agency effort to reduce GHG emissions to the target levels. The Secretary will also submit biannual reports to the governor and California Legislature describing the progress made toward the emissions targets, the impacts of global climate change on California's resources, and mitigation and adaptation plans to combat these impacts.

To comply with the executive order, the secretary of CalEPA created the California Climate Action Team, made up of members from various state agencies and commissions. The team released its first report in March 2006. The report proposed to achieve the targets by building on the voluntary actions of California businesses, local governments, and communities and through state incentive and regulatory programs.

Assembly Bill 32 (California Global Warming Solutions Act of 2006)

California passed the California Global Warming Solutions Act of 2006 (AB 32; California Health and Safety Code Division 25.5, Sections 38500 - 38599). AB 32 establishes regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions and establishes a cap on statewide GHG emissions. AB 32 requires that statewide GHG emissions be reduced to 1990 levels by 2020. This reduction will be accomplished by enforcing a statewide cap on GHG emissions that will be phased in starting in 2012. To effectively implement the cap, AB 32 directs CARB to develop and implement regulations to reduce statewide GHG emissions from stationary sources. AB 32 specifies that regulations adopted in response to AB 1493 should be used to address GHG emissions from vehicles. However, AB 32 also includes language stating that if the AB 1493 regulations cannot be implemented, then CARB should develop new regulations to control vehicle GHG emissions under the authorization of AB 32.

AB 32 requires CARB to adopt a quantified cap on GHG emissions representing 1990 emissions levels and disclose how it arrived at the cap; institute a schedule to meet the emissions cap; and develop tracking, reporting, and enforcement mechanisms to ensure that the state reduces GHG emissions enough to meet the cap. AB 32 also includes guidance on instituting emissions reductions in an economically efficient manner, along with conditions to ensure that businesses and consumers are not unfairly affected by the reductions. Using these criteria to reduce statewide GHG emissions to 1990 levels by 2020 would represent an approximate 25 to 30 percent reduction in current emissions levels. However, CARB has discretionary authority to seek greater reductions in more significant and growing GHG sectors, such as transportation, as compared to other sectors that are not anticipated to significantly increase emissions. Under AB 32, CARB must adopt regulations to achieve reductions in GHG to meet the 1990 emissions cap by 2020.

Climate Change Scoping Plan

AB 32 required CARB to develop a Scoping Plan that describes the approach California will take to reduce GHG to achieve the goal of reducing emissions to 1990 levels by 2020. The Scoping Plan was first approved by CARB in 2008 and must be updated every five years. The initial AB 32 Scoping Plan contains the main strategies California will use to reduce the GHG that cause climate change. The initial Scoping Plan has a range of GHG reduction actions which include direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, market-based mechanisms such as a cap-and-trade system, and an AB 32 program implementation fee regulation to fund the program. In August 2011, the initial Scoping Plan was approved by CARB.

The 2013 Scoping Plan Update builds upon the initial Scoping Plan with new strategies and recommendations. The 2013 Update identifies opportunities to leverage existing and new funds to further drive GHG emission reductions through strategic planning and targeted low carbon investments. The 2013 Update defines CARB climate change priorities for the next five years and sets the groundwork to reach California's long-term climate goals set forth in Executive Orders S-3-05 and B-16-2012. The 2013 Update highlights California progress toward meeting the near-term 2020 GHG emission reduction goals defined in the initial Scoping Plan. In the 2013 Update, nine key focus areas were identified (energy, transportation, agriculture, water, waste management, and natural and working lands), along with short-lived climate pollutants, green buildings, and the cap-and-trade program. On May 22, 2014, the First Update to the Climate Change Scoping Plan was approved by the Board, along with the finalized environmental documents.

In May of 2022, CARB released the Draft 2022 Scoping Plan Update to provide a path to achieving carbon neutrality no later than 2045.[23]

Executive Order No. B-30-15

On April 29, 2015, Executive Order No. B-30-15 was issued to establish a California GHG reduction target of 40 percent below 1990 levels by 2030. Executive Order No. B-30-15 sets a new, interim, 2030 reduction goal intended to provide a smooth transition to the existing ultimate 2050 reduction goal set by Executive Order No. S-3-05 (signed by Governor Schwarzenegger in June 2005). It is designed so State agencies do not fall behind the pace of reductions necessary to reach the existing 2050 reduction goal. Executive Order No. B-30-15 orders "All State agencies with jurisdiction over sources of GHG emissions shall implement measures, pursuant to statutory authority, to achieve reductions of GHG emissions to meet the 2030 and 2050 targets." The Executive Order also states that "CARB shall update the Climate Change Scoping Plan to express the 2030 target in terms of million metric tons of carbon dioxide equivalent." The CARB is currently moving forward with a second update to the Climate Change Scoping Plan to reflect the 2030 reduction target. The updated Scoping Plan will provide a framework for achieving the 2030 target. In September of 2016, the AB 32 was extended to achieve reductions in GHG of 40 percent below 1990 levels by 2030. The new plan, outlined in SB 32, involves increasing renewable energy use, putting more electric cars on the road, improving energy efficiency, and curbing emissions from key industries.

[23] California Air Resources Board, *Draft 2022 Scoping Plan Update*, May 10, 2022, https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan#:~:text=The%20Draft%202022%20Scoping%20Plan,neutrality%20no%20later%20than%202045

Federal Vehicle Standards

In addition to the regulations applicable to cars and light-duty trucks described above, in 2011, the USEPA announced fuel economy and GHG standards for medium- and heavy-duty trucks for model years 2014 through 2018. The standards for CO_2 emissions and fuel consumption are tailored to three main vehicle categories: combination tractors, heavy-duty pickup trucks and vans, and vocational vehicles. According to the USEPA, this regulatory program will reduce GHG emissions and fuel consumption for the affected vehicles by 6 to 23 percent over the 2010 baselines.

In August 2016, the USEPA announced the adoption of the phase two program related to the fuel economy and GHG standards for medium- and heavy-duty trucks. The phase two program will apply to vehicles with model year 2018 through 2027 for certain trailers, and model years 2021 through 2027 for semi-trucks, large pickup trucks, vans, and all types and sizes of buses and work trucks. The final standards are expected to lower CO_2 emissions by approximately 1.1 billion metric tons and reduce oil consumption by up to 2 billion barrels over the lifetime of the vehicles sold under the program. On September 27, 2019, the USEPA and the NHTSA published the "Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule Part One: One National Program." (84 Fed. Reg. 51,310 (Sept. 27, 2019.) The Part One Rule revokes California's authority to set its own GHG emissions standards and set zero-emission vehicle mandates in California. On March 31, 2020, the USEPA finalized rulemaking for SAFE Part Two, which sets CO_2 emissions standards and corporate average fuel economy standards for passenger vehicles and light duty trucks, covering model years 2021 through 2026.

Threshold of Significance

At this time, neither the SCAQMD nor Shasta County has adopted numerical thresholds of significance for GHG emissions that would apply to the proposed project. The SCAQMD, however, recommends that all projects subject to CEQA review be considered in the context of GHG emissions and climate change impacts, and that CEQA documents include a quantification of GHG emissions from all project sources, as well as minimize and mitigate GHG emissions as feasible. The project would generate GHG emissions through long-term operational activities.

In light of the lack of established GHG emissions thresholds that would apply to the proposed project, CEQA allows lead agencies to identify thresholds of significance applicable to a project that are supported by substantial evidence. Substantial evidence is defined in the CEQA statute to mean "facts, reasonable assumptions predicated on facts, and expert opinion supported by facts" (14 CCR 15384(b)).[24] Substantial

[24] 14 CCR 15384 provides the following discussion: "Substantial evidence" as used in the Guidelines is the same as the standard of review used by courts in reviewing agency decisions. Some cases suggest that a higher standard, the so called "fair argument standard" applies when a court is reviewing an agency's decision whether to prepare an EIR. Public Resources Code section 21082.2 was amended in 1993 (Chapter 1131) to provide that substantial evidence shall include "facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts." The statute further provides that "argument, speculation,

evidence can be in the form of technical studies, agency staff reports or opinions, expert opinions supported by facts, and prior CEQA assessments and planning documents. Therefore, to establish additional context in which to consider the order of magnitude of the proposed project's GHG emissions, this analysis accounts for the following considerations by other government agencies and associations about what levels of GHG emissions constitute a cumulatively considerable incremental contribution to climate change:

- Sacramento Metropolitan Air Quality Management District established thresholds, including 1,100 metric tons of CO_2e per year for the construction or operational phase of land use development projects, or 10,000 direct metric tons of CO_2e per year from stationary source projects.[25]
- Placer County Air Pollution Control District recommends a tiered approach to determine if a project's GHG emissions would result in a significant impact. First, project GHG emissions are compared to the de minimis level of 1,100 metric tons of CO_2e per year. If a project does not exceed this threshold, it does not have significant GHG emissions. If the project exceeds the de minimis level and does not exceed the 10,000 metric tons of CO_2e per year bright line threshold, then the project's GHG emissions can be compared to the efficiency thresholds. These thresholds are 4.5 metric tons of CO_2e per-capita for residential projects in an urban area, and 5.5 metric tons of CO_2e per-capita for residential projects in a rural area.[26]
- Bay Area Air Quality Management District has adopted 1,100 metric tons of CO_2e per year as a project-level bright-line GHG significance threshold that would apply to operational emissions from mixed land-use development projects, a threshold of 10,000 metric tons of CO_2e per year as the significance threshold for operational GHG emissions from stationary-source projects, and an efficiency threshold of 4.6 metric tons of CO_2e per service population per year.[27]

As described, the 1,100 metric tons of CO_2e per year threshold is used by other air districts for land use development projects. Therefore, the proposed project's GHG emissions were compared to the 10,000 metric tons of CO_2e per year quantitative threshold. The substantial evidence for this GHG emissions threshold is based on the expert opinion of various California air districts, which have applied the 10,000

unsubstantiated opinion or narrative, evidence which is clearly inaccurate or erroneous, or evidence of social or economic impacts which do not contribute to, or are not caused by, physical impacts on the environment, is not substantial evidence."

[25] Sacramento Metropolitan Air Quality Management District, Guide to Air Quality Assessment in Sacramento County, May 2018, http://www.airquality.org/Residents/CEQA-Land-Use-Planning/CEQA-Guidance-Tools

[26] Placer County Air Pollution Control District, 2017 CEQA Handbook – Chapter 2, Thresholds of Significance. https://placerair.org/DocumentCenter/View/2047/Chapter-2-Thresholds-of-Significance-PDf

[27] Bay Area Air Quality Management District, CEQA Air Quality Guidelines, May 2017, http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en

metric tons of CO_2e per year threshold in numerous CEQA documents where those air districts were the lead agency.

Project GHG Emission Estimates

The existing condition, proposed project, and project-related estimated operational GHG emissions are presented in **Table 9**. The estimated GHG project-related operational emissions would be approximately 2,247 metric tons of CO_2e, which is below the significance threshold of 10,000 metric tons of CO_2e.

Estimated annual diesel fuel usage in the existing condition and proposed project are 191,000 and 421,00 gallons, respectively. Therefore, the proposed project-related annual diesel fuel usage would be 230,000 gallons. Estimated annual gasoline fuel usage in the existing condition and proposed project are 2,470 and 3,060 gallons, respectively. Therefore, the proposed project-related annual gasoline fuel usage would be 590 gallons. Estimated annual electrical usage in the existing condition and proposed project are 3,310 and 6,620 megawatts-hour (MWh), respectively. Therefore, the proposed project-related annual electrical usage would be 3,310 MWh.[28]

Table 9
Annual Greenhouse Gas Emissions (metric tons)

Emission Source	Existing Condition	Proposed Project	Project-Related
Onsite Equipment	523	1,047	523
Employee Vehicles	22.0	24.8	2.75
Haul Trucks	1,415	2,830	1,415
Electrical Usage	306	613	306
Grand Total	**2,266**	**4,515**	**2,247**
Significance Threshold	**10,000**	**10,000**	**10,000**
Exceeds Threshold?	**No**	**No**	**No**

Values represent rounding.
Source: RCH Group, 2022.

[28] September 2021 – September 2022: 368,000 KWH/Year – (10 percent) 36,800 KWH = 331,200 KWH / 250 Days per year plant operating = 1324 KWH Average / Day

Attachment A
Air Quality Calculations

The proposed project could affect air quality during project operations (including truck trips, aggregate processing plant, wash plant, and other processing equipment (i.e., loaders, excavators, vehicular traffic on unpaved surfaces, blasting, and material handling/disturbance). This air quality analysis is consistent with the methods described in the Shasta County Air Quality Management District (SCAQMD) *Protocol for Review, Land Use Permitting Activities, Procedures for Implementing the California Environmental Quality Act*[1] and *Environmental Review Guidelines, Procedures for Implementing the California Environmental Quality Act*.[2]

The air quality analysis includes a review of criteria pollutant[3] emissions such as carbon monoxide (CO)[4], nitrogen oxides (NO_x)[5], sulfur dioxide (SO_2)[6], volatile organic compounds (VO) as reactive organic gases (ROG)[7], particulate matter less than 10 micrometers (coarse or PM_{10}), particulate matter less than 2.5 micrometers (fine or $PM_{2.5}$).[8]

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1 Shasta County Air Quality Management District, *Protocol for Review, Land Use Permitting Activities, Procedures for Implementing the California Environmental Quality Act*, November 2003, https://www.shastacounty.gov/sites/default/files/fileattachments/air_quality/page/2415/scaqmd-ceqa-land-use-protocol.pdf

2 Shasta County Air Quality Management District, *Environmental Review Guidelines, Procedures for Implementing the California Environmental Quality Act*, November 2003, https://www.shastacounty.gov/sites/default/files/fileattachments/air_quality/page/2415/scaqmd-ceqa-guidelines.pdf

3 Criteria air pollutants refer to those air pollutants for which the USEPA and CARB has established National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS) under the Federal Clean Air Act (CAA).

4 CO is a non–reactive pollutant that is a product of incomplete combustion of organic material, and is mostly associated with motor vehicle traffic, and in wintertime, with wood–burning stoves and fireplaces.

5 When combustion temperatures are extremely high, as in aircraft, truck and automobile engines, atmospheric nitrogen combines with oxygen to form various oxides of nitrogen (NO_x). Nitric oxide (NO) and NO_2 are the most significant air pollutants generally referred to as NO_x. Nitric oxide is a colorless and odorless gas that is relatively harmless to humans, quickly converts to NO_2 and can be measured. Nitrogen dioxide has been found to be a lung irritant capable of producing pulmonary edema.

6 SO_2 is a combustion product of sulfur or sulfur–containing fuels such as coal and diesel. SO_2 is also a precursor to the formation of atmospheric sulfate and particulate matter and contributes to potential atmospheric sulfuric acid formation that could precipitate downwind as acid rain.

7 VOC means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions and thus, a precursor of ozone formation. ROG are any reactive compounds of carbon, excluding methane, CO, CO_2 carbonic acid, metallic carbides or carbonates, ammonium carbonate, and other exempt compounds. The terms VOC and ROG are often used interchangeably.

8 PM_{10} and $PM_{2.5}$ consists of airborne particles that measure 10 microns or less in diameter and 2.5 microns or less in diameter, respectively. PM_{10} and $PM_{2.5}$ represent fractions of particulate matter that can be inhaled into the air passages and the lungs, causing adverse health effects.

Regulatory models used to estimate air quality impacts include:

- California Air Resources Board's (CARB) EMFAC2021[9] emissions inventory model. EMFAC2021 is the latest emission inventory model that calculates emission inventories and emission rates for motor vehicles operating on roads in California. This model reflects CARB's current understanding of how vehicles travel and how much they emit. EMFAC can be used to show how California motor vehicle emissions have changed over time and are projected to change in the future.
- CARB OFFROAD2021[10] emissions inventory model. OFFROAD is the latest emission inventory model that calculates emission inventories and emission rates for off-road equipment such as loaders, excavators, and off-road haul trucks operating in California. This model reflects CARB's current understanding of how equipment operates and how much it emits. OFFROAD can be used to show how California off-road equipment emissions have changed over time and are projected to change in the future.
- USEPA AP-42, Compilation of Air Pollutant Emission Factors, has been published since 1972 as the primary compilation of USEPA's emission factor information. It contains emission factors and process information for more than 200 air pollution source categories. A source category is a specific industry sector or group of similar emitting sources. The emission factors have been developed and compiled from source test data, material balance studies, and engineering estimates.[11]

Air Emission Calculation Methodology

The proposed project could affect air quality during project operations (including truck trips, aggregate processing plant, loaders, excavators, haul trucks and other emission sources (i.e., vehicular traffic on unpaved surfaces, and material handling/disturbance).

On-Road Vehicles

Vehicular emissions were computed using the CARB's emission factor model, EMFAC, to estimate on-road emissions. Foreman pickup trucks used on-site were modeled as gasoline and diesel light heavy-duty trucks. Haul trucks were modeled using the diesel T7 single construction haul truck classification, which is a heavy-heavy duty truck emission factor for public vehicles. Criteria pollutant emissions associated with on-road vehicles were calculated by combining the activity information with emissions factors, in grams per mile, derived using the EMFAC emissions model. Emissions calculations were based on **Equation 1**. The EMFAC emissions factors were developed for employee vehicles and haul trucks and

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9 California Air Resources Board, EMFAC2021 User's Guide, January 15, 2021, https://ww2.arb.ca.gov/sites/default/files/2021-01/EMFAC202x_Users_Guide_01112021_final.pdf

10 California Air Resources Board, OFFROAD2021, https://ww2.arb.ca.gov/sites/default/files/offroadzone/offroadzone.html

11 United States Environmental Protection Agency, AP 42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I, https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors

include exhaust as well as brake and tire wear. **Table A-1** displays the emission factors for employee vehicles and haul trucks. The EMFAC emission factors for haul trucks were based on a composite model year and vehicle speed and assume diesel-powered. The EMFAC emission factors for employee vehicles were based on a composite model year and vehicle speed and assume diesel, gasoline, and electric.

Based on knowledge of the existing operations, there are 110 trucks round trips (55 trucks going in and out) for existing condition with 250,000 tons of yearly aggregate sale. In doubling the production of aggregate from 250,000 tons to 500,000 tons in the proposed conditions, the number of daily trips could also double to 220 trucks round trips. However, the average is more likely to be 184 trucks round trips which is based on previous operations. In capturing a conservative approach, the air quality analysis did evaluate the maximum daily truck trips of 220 round trips[12]. The haul truck one-way trip distance was assumed to be 20 miles. Onsite haul truck one-way trip distance was assumed to be one mile.

The existing light duty vehicle trips include all employee trips (two trips per employee – coming in and going out), all deliveries done with light duty trucks (less than three axles), and any customers/consultants. The current number of employees at the site is eight full time and 1 part time employees. Assuming two trips per employee, the light duty daily trips per employees is 18 total round trips. An additional six trips are added to light vehicle trips to account for any other trips made by for deliveries and clients. In the proposed conditions, the number of full-time employees would increase from eight to nine full-time and the number of part-time employees remains at one. The proposed daily light duty trips would therefore add two additional trips from existing conditions.[13] The employee one-way trip distance was assumed to be 15 miles.

Equation 1

*Emission Rate (tons/year) = Emission Factor (gram/mile) * trips per day * miles per trip * days/year * (453.59/2000 tons/gram)*

*Emission Rate (pounds/day) = Emission Factor (gram/mile) * trips per day * miles per trip * (1/453.59 pounds/gram)*

TABLE A-1
EMISSIONS FACTORS (g/mile) FOR ON-ROAD VEHICLES

Vehicle Type	VOC	CO	NO_x	CO_2	SO_2	PM_{10}	$PM_{2.5}$	CH_4
Employee Vehicles	0.01	0.97	0.07	306	<0.01	0.02	0.01	<0.01
Haul Truck	0.01	0.03	0.45	1,072	0.01	0.06	0.02	<0.01

Source: CARB EMFAC Emissions Model.

[12] GHD, Crystal Creek Aggregates Expansion, Final Draft Traffic Impact Analysis Report, July 7, 2022

[13] GHD, Crystal Creek Aggregates Expansion, Final Draft Traffic Impact Analysis Report, July 7, 2022

Off-Road Equipment

Operation of the proposed project would require the use of heavy-duty equipment, such as loaders and backhoes. This equipment would be used to load and unload material. Emission factors from the OFFROAD emissions model were used. Emissions from offroad equipment activities were estimated based on the projected activity schedule, the number of vehicles/pieces of equipment, the types of equipment/type of fuel used, vehicle/equipment utilization rates, equipment horsepower, and the calendar year.

This information was applied to criteria pollutant emissions factors, in grams per horsepower-hour, primarily derived using the OFFROAD emissions model. **Equation 2** outlines how off-road construction equipment emissions were computed, and the emissions factors used in this assessment are summarized, by equipment type within **Table A-2.** The equipment list is based on the Doors Account Vehicle Fleet Inventory.

For the existing condition, the equipment operates for four to six hours per day. In doubling the production of aggregate from 250,000 tons to 500,000 tons in the proposed conditions, the number of off-road equipment and/or daily hours of operation (increasing to eight to 12 hours per day) could also double but is most likely less than double.

Equation 2

*Emission Rate (tons/year) = Emission Factor (gram/hp-hour) * size (hp) * hours of operation per year * Load Factor * usage factor * (453.59/2000 tons/gram)*

*Emission Rate (pounds/day) = Emission Factor (gram/hp-hour) * size (hp) * hours of operation per day * Load Factor * (1/453.59 pounds/gram)*

TABLE A-2
EMISSIONS FACTORS (g/hp-hour) FOR OFFROAD EQUIPMENT

Vehicle Type	HP	VOC	CO	NO_x	CO_2	SO_2	PM_{10}	$PM_{2.5}$	CH_4
Front End Loader	458	0.05	0.43	0.36	194	0.01	0.01	<0.01	<0.01
Front End Loader	402	0.05	0.43	0.36	194	0.01	0.01	<0.01	<0.01
Excavator	220	0.05	0.42	0.38	202	0.01	0.01	<0.01	<0.01
Backhoe/Loader	95	0.07	1.28	0.74	195	0.03	0.03	<0.01	<0.01
Skid Steer Loader	74.2	0.05	1.20	0.69	195	0.02	0.02	<0.01	<0.01
Excavator	475	0.04	0.40	0.27	201	0.01	0.01	<0.01	<0.01
Excavator	513	0.04	0.40	0.27	201	0.01	0.01	<0.01	<0.01
Forklift	125	0.04	0.64	0.33	106	0.02	0.02	<0.01	<0.01
Off-Highway Truck	420	0.07	0.45	0.41	202	0.01	0.01	<0.01	<0.01
Front End Loader	439	0.05	0.43	0.36	194	0.01	0.01	<0.01	<0.01
Off-Highway Truck	420	0.07	0.45	0.41	202	0.01	0.01	<0.01	<0.01

Crawler Tractor	410	0.08	0.61	0.70	226	0.03	0.03	<0.01	<0.01
Front End Loader	430	0.05	0.43	0.36	194	0.01	0.01	<0.01	<0.01
Grader	150	0.14	1.40	1.17	217	0.07	0.06	<0.01	<0.01

Source: CARB OFFROAD Emissions Model.

Aggregate Processing

In the general aggregate processing, rock and crushed stone are loosened by drilling and blasting, loaded by front-end loader into large haul trucks that transport the material to the processing operations. Processing operations include crushing, screening, size classification, conveyance, material handling and storage operations. Air emissions include PM_{10} and $PM_{2.5}$, including crystalline silica.

Fugitive dust sources include the transfer of aggregate, truck loading and unloading, and wind erosion from aggregate storage piles. The amount of fugitive emissions generated during the transfer of the aggregate depends primarily on the surface moisture content of these materials.

The air emission calculations accounted for the production level, the number, types, and size of equipment, the type of material processed, and emission controls. The emission factors were determined using the methodology found in Section 11.19 of USEPA's Compilation of Air Pollutant Emission Factors (AP-42). **Table A-3** presents the emission factors for the aggregate processing operations. A ratio of 0.15 is applied to determine the amount of $PM_{2.5}$ per mass of PM_{10} based on AP-42. Emissions control is based on periodic watering.

The existing aggregate processing plant is typically rated at 150 tons per hour and operates for four to six hours per day (1,000 tons per day) and 300 days per year (250,000 tons per year). The proposed aggregate processing plant would be rated at 300 tons per hour and operates for eight to 12 hours per day (2,000 tons per day) and 300 days per year (500,000 tons per year). For the aggregate operations, there are approximately 1.8 tons per cubic yards. The aggregate plant would apply fugitive dust controls. The wash pant would have the same hourly, daily, and annual throughput as the aggregate processing plant. The wash plant would have one feeder, one screen, and two conveyors. The current permitted production limits are 1,500 tons per day and 396,000 tons per year over 300 day per year.[14]

The following are the listed aggregate transfer points: grizzly feeder (30 hp), jaw crusher (150 hp), dozer trap conveyor (25 hp), dozer trap belt conveyor (10 hp), dry screen feed conveyor (20 hp), triple deck screening plant (40 hp), cone feed conveyor (25 hp), cone crusher (200 hp), return conveyor (10 hp), rock conveyor (25 hp), bin feed hopper (15 hp), wet plant, (15 hp), sand conveyor (25 hp), crushed discharge conveyor (10 hp), discharge conveyor (10 hp), discharge conveyor (10 hp), discharge conveyor

[14] Permit to Operate 90-PTO-65k, December 17, 2021

(10 hp), loam sump pump (20 hp), wash plant pumps (50 hp), conveyor (30 hp), dozer trap portable feeder (10 hp), jaw crusher (50 hp), and portable conveyor (10 hp). The aggregate transfer points would not change as a result of the proposed project.[15]

TABLE A-3
EMISSIONS FACTORS (pounds/tons or material) FOR AGGREGATE PROCESSING

Emission Point	Uncontrolled PM_{10}	Controlled PM_{10}	Controlled $PM_{2.5}$
Jaw Crusher	0.0024	0.00054	0.00010
Cone Crusher	0.0024	0.00054	0.00010
Primary Screening	0.0087	0.00074	0.00005
Deck Conveyor	0.0011	0.000046	0.00013
Secondary Crusher	0.0024	0.00054	0.00010
Secondary Conveyor	0.0011	0.000046	0.00013
Secondary Screen	0.0087	0.00074	0.00005

Source: Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: *Stationary Point and Area Sources*, Section 11.19.2 Crushed Stone Processing, Table 11.19. 2-2, November 2006 and South Coast Air Quality Management District, Particulate Matter Emission Factors For Processes/Equipment at Asphalt, Cement, Concrete, and Aggregate Product Plants, October 2019, https://www.aqmd.gov/docs/default-source/planning/annual-emission-reporting/particulate-matter-emission-factors-for-processes-equipment-at-asphalt-cement-concrete-and-aggragate-product-plants.pdf?sfvrsn=16

The sand washing plant processes sand from its raw state into products that meet various specifications. The process requirements vary depending on the input and desired output, but the plant typically scrub, liberate, deslime, wash, classify, decontaminate and dewater the sand, as well as process the effluent stream that results. The wash plant would have one feeder, one screen, and two conveyors. The emission factors were determined using the methodology found in Section 11.19 of USEPA's Compilation of Air Pollutant Emission Factors (AP-42). **Table A-4** presents the emission factors for the wash plant operations. A ratio of 0.15 is applied to determine the amount of $PM_{2.5}$ per mass of PM_{10} based on AP-42.

TABLE A-4
EMISSIONS FACTORS (pounds/tons of material) FOR SAND WASH PLANT

Emission Point	Uncontrolled PM_{10}	Controlled PM_{10}	Controlled $PM_{2.5}$
Feeder	0.0024	0.00054	0.00010
Primary Screening	0.0087	0.00074	0.00005
Conveyor	0.0011	0.000046	0.00013

Source: Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: *Stationary Point and Area Sources*, Section 11.19.2 Crushed Stone Processing, Table 11.19. 2-2, November 2006.

[15] Permit to Operate 90-PTO-65k, December 17, 2021

Handling and Storage

Fugitive particulate matter emissions are expected from the handling and storage of raw materials from quarry processing. The methodology for the calculation of particulate emissions from the handling and storage of raw materials is described in Section 13.2.4 of USEPA's Compilation of Air Pollutant Emission Factors (AP-42) for aggregate handling and storage piles. The quantity of dust emissions from aggregate handling and storage operations varies with the volume of aggregate passing through the storage cycle. The emission factor for the quantity of emissions per quantity of material was estimated using the following equation:

E = [0.00112*({[G/5]^1.3}/{[H/2]^1.4})]*[I/J]

where:

G = Mean wind speed in miles per hour, 13 mph

H = Moisture Content of soil, 2.0 (dry)

I = pounds of material handled

J = 2,000 (conversion factor, pounds to tons)

The emission factor used in the analysis for handling and storage activities was 0.00388 pounds of PM_{10} per ton of material processed (uncontrolled) and 0.00116 pounds of PM_{10} per ton of material processed (controlled). The $PM_{2.5}$ emissions were assumed to be 15 percent of the PM_{10} emissions (based on AP-42). To account for emission controls, a control efficiency of 80 percent was also applied.

Unpaved Surfaces

When a vehicle travels over an unpaved road, the force of the wheels on the road surface causes pulverization of surface material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong air currents in turbulent shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed.

The emission factors for unpaved roads were calculated using the methodology found in Section 13.2, of the USEPA's Compilation of Air Pollutant Emission Factors (AP-42). The equation for developing the emission factor is:

$$EF = k\,(S/12)^a (W/3)^b\,(1-CE)$$

where:

EF = size-specific emission factor (pound/VMT)

k = empirical constant (PM_{10} = 1.5, $PM_{2.5}$ = 0.15)

S = Silt content of 8.3 percent (use whole number value)

W = Mean vehicle weight (69 tons loaded and 33 tons unloaded)

a = 0.91 (empirical constant)

b = 1.02 (empirical constant)

CE = Control efficiency rate of 90 percent

Based on available data, the uncontrolled emission factor for unpaved roads is 5.58 pounds of PM_{10} per loaded vehicle mile traveled for haul trucks and 4.00 pounds of PM_{10} per unloaded vehicle mile traveled for haul trucks. To account for emission controls, i.e., the improvements to access surface, a control efficiency of 90 percent was applied. The ratio of $PM_{2.5}$ to PM_{10} was assumed to be 10 percent for unpaved roads. The unpaved/gravel access road is approximately 0.25-mile round trip.

Blasting

Air emissions from blasting include PM_{10}, $PM_{2.5}$, and crystalline silica. The emission factor for the quantity of emissions (in pounds) per blast event was estimated using the following equation from Section 11.9 of USEPA's Compilation of Air Pollutant Emission Factors (AP-42):

$$EF = 0.000014 * (A)^{1.5}$$

where:

EF = PM_{30} emission factor (pounds/blast)

A = blast area (17,000 square feet)

A ratio of 0.52 was applied to determine the amount of PM_{10} per PM_{30} based on AP-42. The PM_{10} emission factor used in the analysis was 16.1 pounds per blast event. A ratio of 0.15 was applied to determine the amount of $PM_{2.5}$ per mass PM_{10} based on AP-42. Yearly blasting would increase from 12 to 24 times per year; between 9:30 AM to 3:30 PM, Monday through Friday.

Crystal Creek Aggregate Mobile Equipment - Existing Condition

Source Type	ROG	CO	NOx	CO2	SOx	PM10	PM2.5	CH4	HP	Number of Equipment	Load Factor	Daily Hours	Annual Hours
	Emission Factor (g/hp-hr)												
Front End Loader	0.05	0.43	0.36	194	0.01	0.01	0.00	0.00	**458**	**1**	0.37	**5**	**1,500**
Front End Loader	0.05	0.43	0.36	194	0.01	0.01	0.00	0.00	**402**	**1**	0.37	**5**	**1,500**
Excavator	0.05	0.42	0.38	202	0.01	0.01	0.00	0.00	**220**	**1**	0.38	**5**	**1,500**
Backhoe/Loader	0.07	1.28	0.74	195	0.03	0.03	0.00	0.00	**95**	**1**	0.37	**5**	**1,500**
Skid Steer Loader	0.05	1.20	0.69	195	0.02	0.02	0.00	0.00	**74**	**1**	0.37	**5**	**1,500**
Excavator	0.04	0.40	0.27	201	0.01	0.01	0.00	0.00	**475**	**1**	0.38	**5**	**1,500**
Excavator	0.04	0.40	0.27	201	0.01	0.01	0.00	0.00	**513**	**1**	0.38	**5**	**1,500**
Forklift	0.04	0.64	0.33	106	0.02	0.02	0.00	0.00	**125**	**1**	0.20	**5**	**1,500**
Off-Highway Truck	0.07	0.45	0.41	202	0.01	0.01	0.00	0.00	**420**	**1**	0.38	**5**	**1,500**
Front End Loader	0.05	0.43	0.36	194	0.01	0.01	0.00	0.00	**439**	**1**	0.37	**5**	**1,500**
Off-Highway Truck	0.07	0.45	0.41	202	0.01	0.01	0.00	0.00	**420**	**1**	0.38	**5**	**1,500**
Crawler Tractor	0.08	0.61	0.70	226	0.03	0.03	0.00	0.00	**410**	**1**	0.43	**5**	**1,500**
Front End Loader	0.05	0.43	0.36	194	0.01	0.01	0.00	0.00	**430**	**1**	0.37	**5**	**1,500**
Grader	0.14	1.40	1.17	217	0.07	0.06	0.00	0.00	**150**	**1**	0.41	**5**	**1,500**
	Emission Factor (g/mile)												
Employee Vehicles	0.01	0.97	0.07	306	0.00	0.02	0.01	0.00				**240**	**72,000**
Haul Trucks	0.01	0.03	0.45	1,072	0.01	0.06	0.02	0.00				**4,400**	**1,320,000**

Source Type	Daily Emissions (lbs/day) ROG	CO	NOx	SOx	PM10	PM2.5	CH4
Front End Loader	**0.10**	**0.80**	**0.68**	**0.03**	**0.02**	**0.00**	**0.00**
Front End Loader	**0.09**	**0.71**	**0.60**	**0.02**	**0.02**	**0.00**	**0.00**
Excavator	**0.05**	**0.39**	**0.35**	**0.01**	**0.01**	**0.00**	**0.00**
Backhoe/Loader	**0.03**	**0.50**	**0.29**	**0.01**	**0.01**	**0.00**	**0.00**
Skid Steer Loader	**0.02**	**0.36**	**0.21**	**0.01**	**0.01**	**0.00**	**0.00**
Excavator	**0.09**	**0.79**	**0.54**	**0.02**	**0.02**	**0.00**	**0.00**
Excavator	**0.09**	**0.86**	**0.59**	**0.02**	**0.02**	**0.00**	**0.00**
Forklift	**0.01**	**0.18**	**0.09**	**0.00**	**0.00**	**0.00**	**0.00**
Off-Highway Truck	**0.12**	**0.79**	**0.73**	**0.03**	**0.02**	**0.00**	**0.00**
Front End Loader	**0.09**	**0.77**	**0.65**	**0.03**	**0.02**	**0.00**	**0.00**
Off-Highway Truck	**0.12**	**0.79**	**0.73**	**0.03**	**0.02**	**0.00**	**0.00**
Crawler Tractor	**0.15**	**1.18**	**1.36**	**0.05**	**0.05**	**0.00**	**0.00**
Front End Loader	**0.09**	**0.75**	**0.64**	**0.02**	**0.02**	**0.00**	**0.00**
Grader	**0.09**	**0.95**	**0.79**	**0.04**	**0.04**	**0.00**	**0.00**
Employee Vehicles	**0.01**	**0.51**	**0.04**	**0.00**	**0.01**	**0.00**	**0.00**
Haul Trucks	**0.07**	**0.33**	**4.3**	**0.10**	**0.60**	**0.24**	**0.00**
Onsite	**1.14**	**9.8**	**8.2**	**0.32**	**0.30**	**0.04**	**0.03**
Offsite	**0.08**	**0.84**	**4.4**	**0.10**	**0.61**	**0.24**	**0.00**

Source Type	Annual Emissions (tons/year) ROG	CO	NOx	CO2	SOx	PM10	PM2.5	CH4
Front End Loader	**0.01**	**0.12**	**0.10**	**54**	**0.00**	**0.00**	**0.00**	**0.00**
Front End Loader	**0.01**	**0.11**	**0.09**	**47.7**	**0.00**	**0.00**	**0.00**	**0.00**
Excavator	**0.01**	**0.06**	**0.05**	**27.9**	**0.00**	**0.00**	**0.00**	**0.00**
Backhoe/Loader	**0.00**	**0.07**	**0.04**	**11.3**	**0.00**	**0.00**	**0.00**	**0.00**
Skid Steer Loader	**0.00**	**0.05**	**0.03**	**8.8**	**0.00**	**0.00**	**0.00**	**0.00**
Excavator	**0.01**	**0.12**	**0.08**	**60**	**0.00**	**0.00**	**0.00**	**0.00**
Excavator	**0.01**	**0.13**	**0.09**	**65**	**0.00**	**0.00**	**0.00**	**0.00**
Forklift	**0.00**	**0.03**	**0.01**	**4.38**	**0.00**	**0.00**	**0.00**	**0.00**
Off-Highway Truck	**0.02**	**0.12**	**0.11**	**53**	**0.00**	**0.00**	**0.00**	**0.00**
Front End Loader	**0.01**	**0.12**	**0.10**	**52**	**0.00**	**0.00**	**0.00**	**0.00**
Off-Highway Truck	**0.02**	**0.12**	**0.11**	**53**	**0.00**	**0.00**	**0.00**	**0.00**
Crawler Tractor	**0.02**	**0.18**	**0.20**	**66**	**0.01**	**0.01**	**0.00**	**0.00**
Front End Loader	**0.01**	**0.11**	**0.10**	**51**	**0.00**	**0.00**	**0.00**	**0.00**
Grader	**0.01**	**0.14**	**0.12**	**22.1**	**0.01**	**0.01**	**0.00**	**0.00**
Employee Vehicles	**0.00**	**0.08**	**0.01**	**24.3**	**0.00**	**0.00**	**0.00**	**0.00**
Haul Trucks	**0.01**	**0.05**	**0.65**	**1,560**	**0.01**	**0.09**	**0.04**	**0.00**
Onsite	**0.17**	**1.47**	**1.24**	**577**	**0.05**	**0.04**	**0.01**	**0.00**
Offsite	**0.01**	**0.13**	**0.65**	**1,584**	**0.02**	**0.09**	**0.04**	**0.00**

Crystal Creek Aggregate Mobile Equipment - Proposed Project

Source Type	Emission Factor (g/hp-hr) ROG	CO	NOx	CO2	SOx	PM10	PM2.5	CH4	HP	Number of Equipment	Load Factor	Daily Hours	Annual Hours
Front End Loader	0.05	0.43	0.36	194	0.01	0.01	0.00	0.00	**458**	**1**	0.37	**10**	**3,000**
Front End Loader	0.05	0.43	0.36	194	0.01	0.01	0.00	0.00	**402**	**1**	0.37	**10**	**3,000**
Excavator	0.05	0.42	0.38	202	0.01	0.01	0.00	0.00	**220**	**1**	0.38	**10**	**3,000**
Backhoe/Loader	0.07	1.28	0.74	195	0.03	0.03	0.00	0.00	**95**	**1**	0.37	**10**	**3,000**
Skid Steer Loader	0.05	1.20	0.69	195	0.02	0.02	0.00	0.00	**74**	**1**	0.37	**10**	**3,000**
Excavator	0.04	0.40	0.27	201	0.01	0.01	0.00	0.00	**475**	**1**	0.38	**10**	**3,000**
Excavator	0.04	0.40	0.27	201	0.01	0.01	0.00	0.00	**513**	**1**	0.38	**10**	**3,000**
Forklift	0.04	0.64	0.33	106	0.02	0.02	0.00	0.00	**125**	**1**	0.20	**10**	**3,000**
Off-Highway Truck	0.07	0.45	0.41	202	0.01	0.01	0.00	0.00	**420**	**1**	0.38	**10**	**3,000**
Front End Loader	0.05	0.43	0.36	194	0.01	0.01	0.00	0.00	**439**	**1**	0.37	**10**	**3,000**
Off-Highway Truck	0.07	0.45	0.41	202	0.01	0.01	0.00	0.00	**420**	**1**	0.38	**10**	**3,000**
Crawler Tractor	0.08	0.61	0.70	226	0.03	0.03	0.00	0.00	**410**	**1**	0.43	**10**	**3,000**
Front End Loader	0.05	0.43	0.36	194	0.01	0.01	0.00	0.00	**430**	**1**	0.37	**10**	**3,000**
Grader	0.14	1.40	1.17	217	0.07	0.06	0.00	0.00	**150**	**1**	0.41	**10**	**3,000**
	Emission Factor (g/mile)												
Employee Vehicles	0.01	0.97	0.07	306	0.00	0.02	0.01	0.00				**270**	**81,000**
Haul Trucks	0.01	0.03	0.45	1,072	0.01	0.06	0.02	0.00				**8,800**	**2,640,000**

Source Type	Daily Emissions (lbs/day) ROG	CO	NOx	SOx	PM10	PM2.5	CH4	Annual Emissions (tons/year) ROG	CO	NOx	CO2	SOx	PM10	PM2.5	CH4
Front End Loader	**0.20**	**1.61**	**1.36**	**0.05**	**0.05**	**0.01**	**0.01**	**0.03**	**0.24**	**0.20**	**109**	**0.01**	**0.01**	**0.00**	**0.00**
Front End Loader	**0.17**	**1.41**	**1.20**	**0.05**	**0.04**	**0.01**	**0.01**	**0.03**	**0.21**	**0.18**	**95**	**0.01**	**0.01**	**0.00**	**0.00**
Excavator	**0.09**	**0.77**	**0.69**	**0.02**	**0.02**	**0.00**	**0.00**	**0.01**	**0.12**	**0.10**	**56**	**0.00**	**0.00**	**0.00**	**0.00**
Backhoe/Loader	**0.06**	**0.99**	**0.57**	**0.02**	**0.02**	**0.00**	**0.00**	**0.01**	**0.15**	**0.09**	**22.7**	**0.00**	**0.00**	**0.00**	**0.00**
Skid Steer Loader	**0.03**	**0.72**	**0.42**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.11**	**0.06**	**17.7**	**0.00**	**0.00**	**0.00**	**0.00**
Excavator	**0.17**	**1.59**	**1.09**	**0.04**	**0.04**	**0.01**	**0.01**	**0.03**	**0.24**	**0.16**	**120**	**0.01**	**0.01**	**0.00**	**0.00**
Excavator	**0.19**	**1.71**	**1.17**	**0.04**	**0.04**	**0.01**	**0.01**	**0.03**	**0.26**	**0.18**	**130**	**0.01**	**0.01**	**0.00**	**0.00**
Forklift	**0.02**	**0.35**	**0.18**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.05**	**0.03**	**8.8**	**0.00**	**0.00**	**0.00**	**0.00**
Off-Highway Truck	**0.24**	**1.58**	**1.46**	**0.05**	**0.05**	**0.01**	**0.01**	**0.04**	**0.24**	**0.22**	**107**	**0.01**	**0.01**	**0.00**	**0.00**
Front End Loader	**0.19**	**1.54**	**1.31**	**0.05**	**0.05**	**0.01**	**0.01**	**0.03**	**0.23**	**0.20**	**104**	**0.01**	**0.01**	**0.00**	**0.00**
Off-Highway Truck	**0.24**	**1.58**	**1.46**	**0.05**	**0.05**	**0.01**	**0.01**	**0.04**	**0.24**	**0.22**	**107**	**0.01**	**0.01**	**0.00**	**0.00**
Crawler Tractor	**0.30**	**2.36**	**2.72**	**0.11**	**0.10**	**0.01**	**0.01**	**0.05**	**0.35**	**0.41**	**132**	**0.02**	**0.01**	**0.00**	**0.00**
Front End Loader	**0.18**	**1.51**	**1.28**	**0.05**	**0.05**	**0.01**	**0.01**	**0.03**	**0.23**	**0.19**	**102**	**0.01**	**0.01**	**0.00**	**0.00**
Grader	**0.19**	**1.89**	**1.58**	**0.09**	**0.08**	**0.00**	**0.00**	**0.03**	**0.28**	**0.24**	**44.2**	**0.01**	**0.01**	**0.00**	**0.00**
Employee Vehicles	**0.01**	**0.57**	**0.04**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**0.09**	**0.01**	**27.3**	**0.00**	**0.00**	**0.00**	**0.00**
Haul Trucks	**0.14**	**0.66**	**8.6**	**0.20**	**1.20**	**0.48**	**0.01**	**0.02**	**0.10**	**1.30**	**3,119**	**0.03**	**0.18**	**0.07**	**0.00**
Onsite	**2.27**	**19.6**	**16.5**	**0.64**	**0.59**	**0.07**	**0.06**	**0.34**	**2.94**	**2.47**	**1,154**	**0.10**	**0.09**	**0.01**	**0.01**
Offsite	**0.15**	**1.24**	**8.7**	**0.20**	**1.21**	**0.49**	**0.01**	**0.02**	**0.19**	**1.30**	**3,147**	**0.03**	**0.18**	**0.07**	**0.00**

Crystal Creek Aggregate Mobile Equipment - Project-Related

Source Type	ROG	CO	NOx	CO2	SOx	PM10	PM2.5	CH4	HP	Number of Equipment	Load Factor	Daily Hours	Annual Hours
	Emission Factor (g/hp-hr)												
Front End Loader	0.05	0.43	0.36	194	0.01	0.01	0.00	0.00	**458**	**1**	0.37	**5**	**1,500**
Front End Loader	0.05	0.43	0.36	194	0.01	0.01	0.00	0.00	**402**	**1**	0.37	**5**	**1,500**
Excavator	0.05	0.42	0.38	202	0.01	0.01	0.00	0.00	**220**	**1**	0.38	**5**	**1,500**
Backhoe/Loader	0.07	1.28	0.74	195	0.03	0.03	0.00	0.00	**95**	**1**	0.37	**5**	**1,500**
Skid Steer Loader	0.05	1.20	0.69	195	0.02	0.02	0.00	0.00	**74**	**1**	0.37	**5**	**1,500**
Excavator	0.04	0.40	0.27	201	0.01	0.01	0.00	0.00	**475**	**1**	0.38	**5**	**1,500**
Excavator	0.04	0.40	0.27	201	0.01	0.01	0.00	0.00	**513**	**1**	0.38	**5**	**1,500**
Forklift	0.04	0.64	0.33	106	0.02	0.02	0.00	0.00	**125**	**1**	0.20	**5**	**1,500**
Off-Highway Truck	0.07	0.45	0.41	202	0.01	0.01	0.00	0.00	**420**	**1**	0.38	**5**	**1,500**
Front End Loader	0.05	0.43	0.36	194	0.01	0.01	0.00	0.00	**439**	**1**	0.37	**5**	**1,500**
Off-Highway Truck	0.07	0.45	0.41	202	0.01	0.01	0.00	0.00	**420**	**1**	0.38	**5**	**1,500**
Crawler Tractor	0.08	0.61	0.70	226	0.03	0.03	0.00	0.00	**410**	**1**	0.43	**5**	**1,500**
Front End Loader	0.05	0.43	0.36	194	0.01	0.01	0.00	0.00	**430**	**1**	0.37	**5**	**1,500**
Grader	0.14	1.40	1.17	217	0.07	0.06	0.00	0.00	**150**	**1**	0.41	**5**	**1,500**
	Emission Factor (g/mile)												
Employee Vehicles	0.01	0.97	0.07	306	0.00	0.02	0.01	0.00				**30**	**9,000**
Haul Trucks	0.01	0.03	0.45	1,072	0.01	0.06	0.02	0.00				**4400**	**1,320,000**

Source Type	Daily Emissions (lbs/day) ROG	CO	NOx	SOx	PM10	PM2.5	CH4	Annual Emissions (tons/year) ROG	CO	NOx	CO2	SOx	PM10	PM2.5	CH4
Front End Loader	**0.10**	**0.80**	**0.68**	**0.03**	**0.02**	**0.00**	**0.00**	**0.01**	**0.12**	**0.10**	**54**	**0.00**	**0.00**	**0.00**	**0.00**
Front End Loader	**0.09**	**0.71**	**0.60**	**0.02**	**0.02**	**0.00**	**0.00**	**0.01**	**0.11**	**0.09**	**48**	**0.00**	**0.00**	**0.00**	**0.00**
Excavator	**0.05**	**0.39**	**0.35**	**0.01**	**0.01**	**0.00**	**0.00**	**0.01**	**0.06**	**0.05**	**28**	**0.00**	**0.00**	**0.00**	**0.00**
Backhoe/Loader	**0.03**	**0.50**	**0.29**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.07**	**0.04**	**11.3**	**0.00**	**0.00**	**0.00**	**0.00**
Skid Steer Loader	**0.02**	**0.36**	**0.21**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.05**	**0.03**	**8.8**	**0.00**	**0.00**	**0.00**	**0.00**
Excavator	**0.09**	**0.79**	**0.54**	**0.02**	**0.02**	**0.00**	**0.00**	**0.01**	**0.12**	**0.08**	**60**	**0.00**	**0.00**	**0.00**	**0.00**
Excavator	**0.09**	**0.86**	**0.59**	**0.02**	**0.02**	**0.00**	**0.00**	**0.01**	**0.13**	**0.09**	**65**	**0.00**	**0.00**	**0.00**	**0.00**
Forklift	**0.01**	**0.18**	**0.09**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.03**	**0.01**	**4.4**	**0.00**	**0.00**	**0.00**	**0.00**
Off-Highway Truck	**0.12**	**0.79**	**0.73**	**0.03**	**0.02**	**0.00**	**0.00**	**0.02**	**0.12**	**0.11**	**53**	**0.00**	**0.00**	**0.00**	**0.00**
Front End Loader	**0.09**	**0.77**	**0.65**	**0.03**	**0.02**	**0.00**	**0.00**	**0.01**	**0.12**	**0.10**	**52**	**0.00**	**0.00**	**0.00**	**0.00**
Off-Highway Truck	**0.12**	**0.79**	**0.73**	**0.03**	**0.02**	**0.00**	**0.00**	**0.02**	**0.12**	**0.11**	**53**	**0.00**	**0.00**	**0.00**	**0.00**
Crawler Tractor	**0.15**	**1.18**	**1.36**	**0.05**	**0.05**	**0.00**	**0.00**	**0.02**	**0.18**	**0.20**	**66**	**0.01**	**0.01**	**0.00**	**0.00**
Front End Loader	**0.09**	**0.75**	**0.64**	**0.02**	**0.02**	**0.00**	**0.00**	**0.01**	**0.11**	**0.10**	**51**	**0.00**	**0.00**	**0.00**	**0.00**
Grader	**0.09**	**0.95**	**0.79**	**0.04**	**0.04**	**0.00**	**0.00**	**0.01**	**0.14**	**0.12**	**22.1**	**0.01**	**0.01**	**0.00**	**0.00**
Employee Vehicles	**0.00**	**0.06**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.00**	**3.0**	**0.00**	**0.00**	**0.00**	**0.00**
Haul Trucks	**0.07**	**0.33**	**4.3**	**0.10**	**0.60**	**0.24**	**0.00**	**0.01**	**0.05**	**0.65**	**1,560**	**0.01**	**0.09**	**0.04**	**0.00**
Onsite	**1.14**	**9.8**	**8.2**	**0.32**	**0.30**	**0.04**	**0.03**	**0.17**	**1.47**	**1.24**	**577**	**0.05**	**0.04**	**0.01**	**0.00**
Offsite	**0.07**	**0.39**	**4.3**	**0.10**	**0.60**	**0.24**	**0.00**	**0.01**	**0.06**	**0.65**	**1,563**	**0.01**	**0.09**	**0.04**	**0.00**

Aggregate Procesing Plant - Existing Condition

Operating Assumptions

Hourly Process Rate (ton)	150
Daily Process Rate (ton)	1,000
Annual Process Rate (ton)	250,000

						Controlled						Uncontrolled					
Equipment	Process Rate (ton/hr)	Number of Transfers	Daily Operation (hours)	Uncontrolled Emission Factor (lb/ton)	Controlled Emission Factor (lb/ton)	PM10 Hourly (lb/hr)	PM10 Daily (lb/day)	PM10 Annual (ton/yr)	PM2.5 Hourly (lb/hr)	PM2.5 Daily (lb/day)	PM2.5 Annual (ton/yr)	PM10 Hourly (lb/hr)	PM10 Daily (lb/day)	PM10 Annual (ton/yr)	PM2.5 Hourly (lb/hr)	PM2.5 Daily (lb/day)	PM2.5 Annual (ton/yr)
Grizzly feeder	150	1	5	0.0024	0.00054	0.08	0.41	0.07	0.01	0.06	0.01	0.36	1.80	0.30	0.05	0.27	0.05
jaw crusher	150	1	5	0.0024	0.00054	0.08	0.41	0.07	0.01	0.06	0.01	0.36	1.80	0.30	0.05	0.27	0.05
dozer trap conveyor	150	1	5	0.0087	0.00074	0.11	0.56	0.09	0.02	0.08	0.01	1.31	6.5	1.09	0.20	0.98	0.16
dozer trap belt conveyor	150	1	5	0.0087	0.00074	0.11	0.56	0.09	0.02	0.08	0.01	1.31	6.5	1.09	0.20	0.98	0.16
dry screen feed conveyor	150	1	5	0.0087	0.00074	0.11	0.56	0.09	0.02	0.08	0.01	1.31	6.5	1.09	0.20	0.98	0.16
triple deck screening plant	150	3	5	0.0087	0.00074	0.33	1.67	0.09	0.05	0.25	0.01	3.92	19.6	1.09	0.59	2.94	0.16
cone feed conveyor	150	1	5	0.0087	0.00074	0.11	0.56	0.09	0.02	0.08	0.01	1.31	6.5	1.09	0.20	0.98	0.16
cone crusher	150	1	5	0.0024	0.00054	0.08	0.41	0.07	0.01	0.06	0.01	0.36	1.80	0.30	0.05	0.27	0.05
return conveyor	150	1	5	0.0087	0.00074	0.11	0.56	0.09	0.02	0.08	0.01	1.31	6.5	1.09	0.20	0.98	0.16
rock conveyor	150	1	5	0.0087	0.00074	0.11	0.56	0.09	0.02	0.08	0.01	1.31	6.5	1.09	0.20	0.98	0.16
bin feed hopper	150	1	5	0.0024	0.00054	0.08	0.41	0.07	0.01	0.06	0.01	0.36	1.80	0.30	0.05	0.27	0.05
sand conveyor	150	1	5	0.0087	0.00074	0.11	0.56	0.09	0.02	0.08	0.01	1.31	6.5	1.09	0.20	0.98	0.16
Crushed discharge conveyor	150	1	5	0.0087	0.00074	0.11	0.56	0.09	0.02	0.08	0.01	1.31	6.5	1.09	0.20	0.98	0.16
discharge conveyor	150	1	5	0.0087	0.00074	0.11	0.56	0.09	0.02	0.08	0.01	1.31	6.5	1.09	0.20	0.98	0.16
discharge conveyor	150	1	5	0.0087	0.00074	0.11	0.56	0.09	0.02	0.08	0.01	1.31	6.5	1.09	0.20	0.98	0.16
discharge conveyor	150	1	5	0.0087	0.00074	0.11	0.56	0.09	0.02	0.08	0.01	1.31	6.5	1.09	0.20	0.98	0.16
conveyor	150	1	5	0.0087	0.00074	0.11	0.56	0.09	0.02	0.08	0.01	1.31	6.5	1.09	0.20	0.98	0.16
dozer trap portable feeder	150	1	5	0.0024	0.00054	0.08	0.41	0.07	0.01	0.06	0.01	0.36	1.80	0.30	0.05	0.27	0.05
jaw crusher	150	1	5	0.0024	0.00054	0.08	0.41	0.07	0.01	0.06	0.01	0.36	1.80	0.30	0.05	0.27	0.05
portable conveyor	150	1	5	0.0087	0.00074	0.11	0.56	0.09	0.02	0.08	0.01	1.31	6.5	1.09	0.20	0.98	0.16
Total Aggregate Processing Plant Emissions						***2.26***	***11.3***	***1.70***	***0.34***	***1.70***	***0.26***	***23.0***	***115***	***17.0***	***3.46***	***17.3***	***2.55***

Aggregate Procesing Plant - Proposed Project

Operating Assumptions

Hourly Process Rate (ton)	300
Daily Process Rate (ton)	2,000
Annual Process Rate (ton)	500,000

						Controlled						Uncontrolled					
Equipment	Process Rate (ton/hr)	Number of Transfers	Daily Operation (hours)	Uncontrolled Emission Factor (lb/ton)	Controlled Emission Factor (lb/ton)	PM10 Hourly (lb/hr)	PM10 Daily (lb/day)	PM10 Annual (ton/yr)	PM2.5 Hourly (lb/hr)	PM2.5 Daily (lb/day)	PM2.5 Annual (ton/yr)	PM10 Hourly (lb/hr)	PM10 Daily (lb/day)	PM10 Annual (ton/yr)	PM2.5 Hourly (lb/hr)	PM2.5 Daily (lb/day)	PM2.5 Annual (ton/yr)
Grizzly feeder	300	1	10	0.0024	0.00054	0.16	1.62	0.14	0.02	0.24	0.02	0.72	7.20	0.60	0.11	1.08	0.09
jaw crusher	300	1	10	0.0024	0.00054	0.16	1.62	0.14	0.02	0.24	0.02	0.72	7.20	0.60	0.11	1.08	0.09
dozer trap conveyor	300	1	10	0.0087	0.00074	0.22	2.22	0.19	0.03	0.33	0.03	2.61	26.1	2.18	0.39	3.92	0.33
dozer trap belt conveyor	300	1	10	0.0087	0.00074	0.22	2.22	0.19	0.03	0.33	0.03	2.61	26.1	2.18	0.39	3.92	0.33
dry screen feed conveyor	300	1	10	0.0087	0.00074	0.22	2.22	0.19	0.03	0.33	0.03	2.61	26.1	2.18	0.39	3.92	0.33
triple deck screening plant	300	3	10	0.0087	0.00074	0.67	6.66	0.19	0.10	1.00	0.03	7.83	78.3	2.18	1.17	11.75	0.33
cone feed conveyor	300	1	10	0.0087	0.00074	0.22	2.22	0.19	0.03	0.33	0.03	2.61	26.1	2.18	0.39	3.92	0.33
cone crusher	300	1	10	0.0024	0.00054	0.16	1.62	0.14	0.02	0.24	0.02	0.72	7.20	0.60	0.11	1.08	0.09
return conveyor	300	1	10	0.0087	0.00074	0.22	2.22	0.19	0.03	0.33	0.03	2.61	26.1	2.18	0.39	3.92	0.33
rock conveyor	300	1	10	0.0087	0.00074	0.22	2.22	0.19	0.03	0.33	0.03	2.61	26.1	2.18	0.39	3.92	0.33
bin feed hopper	300	1	10	0.0024	0.00054	0.16	1.62	0.14	0.02	0.24	0.02	0.72	7.20	0.60	0.11	1.08	0.09
sand conveyor	300	1	10	0.0087	0.00074	0.22	2.22	0.19	0.03	0.33	0.03	2.61	26.1	2.18	0.39	3.92	0.33
Crushed discharge conveyor	300	1	10	0.0087	0.00074	0.22	2.22	0.19	0.03	0.33	0.03	2.61	26.1	2.18	0.39	3.92	0.33
discharge conveyor	300	1	10	0.0087	0.00074	0.22	2.22	0.19	0.03	0.33	0.03	2.61	26.1	2.18	0.39	3.92	0.33
discharge conveyor	300	1	10	0.0087	0.00074	0.22	2.22	0.19	0.03	0.33	0.03	2.61	26.1	2.18	0.39	3.92	0.33
discharge conveyor	300	1	10	0.0087	0.00074	0.22	2.22	0.19	0.03	0.33	0.03	2.61	26.1	2.18	0.39	3.92	0.33
conveyor	300	1	10	0.0087	0.00074	0.22	2.22	0.19	0.03	0.33	0.03	2.61	26.1	2.18	0.39	3.92	0.33
dozer trap portable feeder	300	1	10	0.0024	0.00054	0.16	1.62	0.14	0.02	0.24	0.02	0.72	7.20	0.60	0.11	1.08	0.09
jaw crusher	300	1	10	0.0024	0.00054	0.16	1.62	0.14	0.02	0.24	0.02	0.72	7.20	0.60	0.11	1.08	0.09
portable conveyor	300	1	10	0.0087	0.00074	0.22	2.22	0.19	0.03	0.33	0.03	2.61	26.1	2.18	0.39	3.92	0.33
Total Aggregate Processing Plant Emissions						***4.52***	***45.2***	***3.40***	***0.68***	***6.79***	***0.51***	***46.1***	***461***	***34.1***	***6.91***	***69.1***	***5.11***

Wash Plant - Existing Condition

Operating Assumptions

Hourly Process Rate (ton)	150
Daily Process Rate (ton)	1,000
Annual Process Rate (ton)	250,000

						Controlled						Uncontrolled					
Equipment	Process Rate (ton/hr)	Number of Transfers	Daily Operation (hours)	Uncontrolled Emission Factor (lb/ton)	Controlled Emission Factor (lb/ton)	PM10 Hourly (lb/hr)	PM10 Daily (lb/day)	PM10 Annual (ton/yr)	PM2.5 Hourly (lb/hr)	PM2.5 Daily (lb/day)	PM2.5 Annual (ton/yr)	PM10 Hourly (lb/hr)	PM10 Daily (lb/day)	PM10 Annual (ton/yr)	PM2.5 Hourly (lb/hr)	PM2.5 Daily (lb/day)	PM2.5 Annual (ton/yr)
Feeder	150	1	5	0.0024	0.00054	0.08	0.41	0.07	0.01	0.06	0.01	0.36	1.80	0.30	0.05	0.27	0.05
Primary Screening	150	1	5	0.0087	0.00074	0.11	0.56	0.09	0.02	0.08	0.01	1.31	6.5	1.09	0.20	0.98	0.16
Conveyor	150	2	5	0.0011	0.000046	0.01	0.07	0.01	0.00	0.01	0.00	0.33	1.65	0.14	0.05	0.25	0.02
Total Wash Plant Emissions						***0.21***	***1.03***	***0.17***	***0.03***	***0.15***	***0.02***	***2.00***	***10.0***	***1.53***	***0.30***	***1.50***	***0.23***

Wash Plant - Proposed Project

Operating Assumptions

Hourly Process Rate (ton)	300
Daily Process Rate (ton)	2,000
Annual Process Rate (ton)	500,000

Equipment	Process Rate (ton/hr)	Number of Transfers	Daily Operation (hours)	Uncontrolled Emission Factor (lb/ton)	Controlled Emission Factor (lb/ton)	Controlled PM10 Hourly (lb/hr)	Controlled PM10 Daily (lb/day)	Controlled PM10 Annual (ton/yr)	Controlled PM2.5 Hourly (lb/hr)	Controlled PM2.5 Daily (lb/day)	Controlled PM2.5 Annual (ton/yr)	Uncontrolled PM10 Hourly (lb/hr)	Uncontrolled PM10 Daily (lb/day)	Uncontrolled PM10 Annual (ton/yr)	Uncontrolled PM2.5 Hourly (lb/hr)	Uncontrolled PM2.5 Daily (lb/day)	Uncontrolled PM2.5 Annual (ton/yr)
Feeder	300	1	10	0.0024	0.00054	0.16	1.62	0.14	0.02	0.24	0.02	0.72	7.20	0.60	0.11	1.08	0.09
Primary Screening	300	1	10	0.0087	0.00074	0.22	2.22	0.19	0.03	0.33	0.03	2.61	26.1	2.18	0.39	3.92	0.33
Conveyor	300	2	10	0.0011	0.000046	0.03	0.28	0.01	0.00	0.04	0.00	0.66	6.60	0.28	0.10	0.99	0.04
Total Wash Plant Emissions						***0.41***	***4.12***	***0.33***	***0.06***	***0.62***	***0.05***	***3.99***	***39.9***	***3.05***	***0.60***	***5.99***	***0.46***

Fugitive PM Emissions - Existing Condition

Fugitive PM from Trucks on Unpaved Surfaces

Operating Assumptions

Haul road length =	0.125	mile
Trucks/day =	134	
VMT =	34	miles/day
Days/year	300	days

Calculated Emission Factor for travel on unpaved roads

PM10 EF = 2.1*(S/12)^0.7*(W/3)^0.45*[(365-K)/365]

S = Silt content, 8.3%

W = Mean vehicle weight, 33 tons unloaded, 69 tons loaded

K = Mean # of days with rain above 0.01 inches, 59

Loaded Emission Factor =	5.58	pounds pm10/vmt
Unloaded Emission Factor =	4.00	pounds pm10/vmt

	PM10 Uncontrolled	PM10 Controlled	PM2.5 Uncontrolled	PM2.5 Controlled
Unpaved Fugitive Emissions (pounds/day)	321	32.1	48.1	4.81
Unpaved Fugitive Emissions (tons/year)	48.1	4.81	7.22	0.72

Fugitive PM Eissions from Material Handling

E = [0.00112*({[G/5]^1.3}/{[H/2]^1.4})]*[I/J]

G = Mean wind speed in miles per hour, 13 mph	1,000	tons/day
H = Moisture Content of soil, 2.0 (dry)	556	cy/day

I = lbs of material handled

J = 2,000 (conversion factor, lbs to tons)

	PM10 Uncontrolled	PM10 Controlled	PM2.5 Uncontrolled	PM2.5 Controlled
Material Handling Fugitive Emissions (pounds/day)	3.88	0.78	0.58	0.12
Material Handling Fugitive Emissions (tons/year)	0.58	0.12	0.09	0.02

Blasting

E = 0.000014 (A)^1.5 from AP-42 11.9

E= PM30 emissions

A = horizontal area

PM -10 emissions = 0.52 x E

Approx area = 17,000 sf

E=	31.0	pounds of TSP/blast		
PM10 =	**16.1**	**pounds/blast**		
	194	pounds/year	12	blasts/year
PM2.5 =	**2.42**	**pounds/blast**		
	29.0	pounds/year		

Fugitive PM Emissions - Proposed Project

Fugitive PM from Trucks on Unpaved Surfaces

Operating Assumptions

Haul road length =	0.125	mile
Trucks/day =	222	
VMT =	56	miles/day
Days/year	300	days

Calculated Emission Factor for travel on unpaved roads

PM10 EF = 2.1*(S/12)^0.7*(W/3)^0.45*[(365-K)/365]

S = Silt content, 8.3%

W = Mean vehicle weight, 33 tons unloaded, 69 tons loaded

K = Mean # of days with rain above 0.01 inches, 59

Loaded Emission Factor =	5.58	pounds pm10/vmt
Unloaded Emission Factor =	4.00	pounds pm10/vmt

	PM10 Uncontrolled	PM10 Controlled	PM2.5 Uncontrolled	PM2.5 Controlled
Unpaved Fugitive Emissions (pounds/day)	532	53.2	79.7	7.97
Unpaved Fugitive Emissions (tons/year)	79.7	7.97	12.0	1.20

Fugitive PM Eissions from Material Handling

E = [0.00112*({[G/5]^1.3}/{[H/2]^1.4})]*[I/J]

G = Mean wind speed in miles per hour, 13 mph	2,000	tons/day
H = Moisture Content of soil, 2.0 (dry)	1,111	cy/day

I = lbs of material handled

J = 2,000 (conversion factor, lbs to tons)

	PM10 Uncontrolled	PM10 Controlled	PM2.5 Uncontrolled	PM2.5 Controlled
Material Handling Fugitive Emissions (pounds/day)	7.76	1.55	1.16	0.23
Material Handling Fugitive Emissions (tons/year)	1.16	0.23	0.17	0.03

Blasting

E = 0.000014 (A)^1.5 from AP-42 11.9

E= PM30 emissions

A = horizontal area

PM -10 emissions = 0.52 x E

Approx area = 17,000 sf

E=	31.0	pounds of TSP/blast		
PM10 =	**16.1**	**pounds/blast**		
	387	pounds/year	24	blasts/year
PM2.5 =	**2.42**	**pounds/blast**		
	58.1	pounds/year		

Fugitive PM Emissions - Project-Related

Fugitive PM from Trucks on Unpaved Surfaces

Operating Assumptions

Haul road length =	0.125	mile
Trucks/day =	88	
VMT =	22	miles/day
Days/year	300	days

Calculated Emission Factor for travel on unpaved roads
PM10 EF = 2.1*(S/12)^0.7*(W/3)^0.45*[(365-K)/365]
S = Silt content, 8.3%
W = Mean vehicle weight, 33 tons unloaded, 69 tons loaded
K = Mean # of days with rain above 0.01 inches, 59

Loaded Emission Factor =	5.58	pounds pm10/vmt
Unloaded Emission Factor =	4.00	pounds pm10/vmt

	PM10 Uncontrolled	PM10 Controlled	PM2.5 Uncontrolled	PM2.5 Controlled
Unpaved Fugitive Emissions (pounds/day)	211	21.1	31.6	3.16
Unpaved Fugitive Emissions (tons/year)	31.6	3.16	4.74	0.47

Fugitive PM Eissions from Material Handling

E = [0.00112*({[G/5]^1.3}/{[H/2]^1.4})]*[I/J]

G = Mean wind speed in miles per hour, 13 mph	1,000	tons/day
H = Moisture Content of soil, 2.0 (dry)	556	cy/day
I = lbs of material handled		
J = 2,000 (conversion factor, lbs to tons)		

	PM10 Uncontrolled	PM10 Controlled	PM2.5 Uncontrolled	PM2.5 Controlled
Material Handling Fugitive Emissions (pounds/day)	3.88	0.78	0.58	0.12
Material Handling Fugitive Emissions (tons/year)	0.58	0.12	0.09	0.02

Blasting

E = 0.000014 (A)^1.5 from AP-42 11.9

E= PM30 emissions
A = horizontal area

PM -10 emissions = 0.52 x E

Approx area = 17,000 sf

E=	31.0	pounds of TSP/blast		
PM10 =	**16.1**	**pounds/blast**		
	194	pounds/year	12	blasts/year
PM2.5 =	**2.42**	**pounds/blast**		
	29.0	pounds/year		

Daily Emissions (lbs/day) - Existing

	ROG	CO	NOx	SOx	PM10	PM2.5	PM10	PM2.5
Onsite Equipment	1.14	9.8	8.24	0.32	0.30	0.04	0.30	0.04
Employee Vehicles	0.01	0.51	0.04	0.00	0.01	0.00	0.01	0.00
Haul Trucks	0.07	0.33	4.32	0.10	0.60	0.24	0.60	0.24
Aggregate Plant					115	17.3	11.3	1.70
Wash Plant					10.0	1.50	1.03	0.15
Unpaved					321	48.1	32.1	4.81
Material Handling					3.88	0.58	0.78	0.12
Blasting					16.1	2.42	16.1	2.42
Total	**1.21**	**10.7**	**12.6**	**0.42**	**467**	**70.2**	**62.2**	**9.48**

Annual Emissions (tons/year) - Existing

	ROG	CO	NOx	SOx	PM10	PM2.5	PM10	PM2.5	CO2
Onsite Equipment	0.17	1.47	1.24	0.05	0.04	0.01	0.04	0.01	523
Employee Vehicles	0.00	0.08	0.01	0.00	0.00	0.00	0.00	0.00	22.0
Haul Trucks	0.01	0.05	0.65	0.01	0.09	0.04	0.09	0.04	1,415
Aggregate Plant					17.0	2.55	1.70	0.26	
Wash Plant					1.53	0.23	0.17	0.02	
Unpaved					48.1	7.22	4.81	0.72	
Material Handling					0.58	0.09	0.12	0.02	
Blasting					0.10	0.01	0.10	0.01	
Total	**0.18**	**1.60**	**1.89**	**0.06**	**67.5**	**10.1**	**7.03**	**1.08**	**1,960**

Daily Emissions (lbs/day) - Project

	ROG	CO	NOx	SOx	PM10	PM2.5	PM10	PM2.5
Onsite Equipment	2.27	19.6	16.5	0.64	0.59	0.07	0.59	0.07
Employee Vehicles	0.01	0.57	0.04	0.00	0.01	0.00	0.01	0.00
Haul Trucks	0.14	0.66	8.65	0.20	1.20	0.48	1.20	0.48
Aggregate Plant					461	69.1	45.2	6.79
Wash Plant					39.9	5.99	4.12	0.62
Unpaved					532	79.7	53.2	7.97
Material Handling					7.76	1.16	1.55	0.23
Blasting					16.1	2.42	16.1	2.42
Total	**2.42**	**20.9**	**25.2**	**0.84**	**1,058**	**159**	**122**	**18.6**

Annual Emissions (tons/year) - Project

	ROG	CO	NOx	SOx	PM10	PM2.5	PM10	PM2.5	CO2
Onsite Equipment	0.34	2.94	2.5	0.10	0.09	0.01	0.09	0.01	1,047
Employee Vehicles	0.00	0.09	0.01	0.00	0.00	0.00	0.00	0.00	24.8
Haul Trucks	0.02	0.10	1.30	0.03	0.18	0.07	0.18	0.07	2,830
Aggregate Plant					34.1	5.11	3.40	0.51	
Wash Plant					3.05	0.46	0.33	0.05	
Unpaved					79.7	11.96	7.97	1.20	
Material Handling					1.16	0.17	0.23	0.03	
Blasting					0.19	0.03	0.19	0.03	
Total	**0.36**	**3.13**	**3.78**	**0.13**	**118**	**17.8**	**12.4**	**1.90**	**3,902**

Daily Emissions (lbs/day) - Project-Related

	ROG	CO	NOx	SOx	PM10	PM2.5	PM10	PM2.5
Onsite Equipment	1.14	9.8	8.24	0.32	0.30	0.04	0.30	0.04
Employee Vehicles	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00
Haul Trucks	0.07	0.33	4.32	0.10	0.60	0.24	0.60	0.24
Aggregate Plant					346	51.8	33.9	5.09
Wash Plant					29.9	4.49	3.09	0.46
Unpaved					211	31.6	21.1	3.16
Material Handling					3.88	0.58	0.78	0.12
Blasting					0.00	0.00	0.00	0.00
Total	**1.21**	**10.2**	**12.6**	**0.42**	**591**	**88.8**	**59.8**	**9.11**
Significance Threshold (Level A)	25		25		80		80	
Significance Threshold (Level B)	137		137		137		137	

Annual Emissions (tons/year) - Project-Related

	ROG	CO	NOx	SOx	PM10	PM2.5	PM10	PM2.5	CO2
Onsite Equipment	0.17	1.47	1.2	0.05	0.04	0.01	0.04	0.01	523
Employee Vehicles	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	2.75
Haul Trucks	0.01	0.05	0.65	0.01	0.09	0.04	0.09	0.04	1,415
Aggregate Plant					17.0	2.55	1.70	0.26	
Wash Plant					1.53	0.23	0.17	0.02	
Unpaved					31.6	4.74	3.16	0.47	
Material Handling					0.58	0.09	0.12	0.02	
Blasting					0.10	0.01	0.10	0.01	
Total	**0.18**	**1.53**	**1.89**	**0.06**	**51.0**	**7.67**	**5.37**	**0.83**	**1,941**

Shasta County

DEPARTMENT OF RESOURCE MANAGEMENT
1855 Placer Street, Redding, CA 96001

Paul A. Hellman
Director

Dale J. Fletcher, CBO
Assistant Director

December 20, 2021

Tullis Inc. DBA Crystal Creek Aggregate
ATTN: Dusten Hiser
PO BOX 493416
Redding, CA 96049

PERMIT TO OPERATE 90-PO-65

The Shasta County Air Quality Management District (District) received your application for an Authority to Construct at 10936 Iron Mountain Road, Redding, CA 96001 on 11/05/2021. Additional information was requested and received on 12/01/2021. Upon review, the District deemed the application complete on 12/06/2021.

Attached is the Permit to Operate for this equipment. It is based on the information provided in your application.

Please be advised that the permit is given solely with respect to air quality concerns and does not relieve you of the responsibility to obtain a use permit as may be required by the County or City Planning Departments and any other necessary permit or authorization.

If you have questions, please call the District office at 530-225-5674.

Sincerely,

Chad Peterson
Air Pollution Inspector II

CP/LW

Enclosure

RENEWAL DATE:
JUNE 14

PERMIT TO OPERATE NO:
90-PO-65k

SHASTA COUNTY
DEPARTMENT OF RESOURCE MANAGEMENT
AIR QUALITY MANAGEMENT DISTRICT

TULLIS, INC. DBA CRYSTAL CREEK AGGREGATE
(Applicant)

IS HEREBY GRANTED A

PERMIT TO OPERATE

SUBJECT TO CONDITIONS NOTED

CRUSHING AND SCREENING OPERATION
(Nature of Activity)

AT: **10936 Iron Mountain Road (North of Middle Creek), Redding, CA**
(AP# 065-250-002-000)

DATE ISSUED: December 17, 2021

APPROVED: [signature] for:
Air Pollution Control Officer

EQUIPMENT UNDER PERMIT

Dry Side
- Bulk Loading
- Armadillo Jaw Crusher
- ElJay Model 54" Standard Cone Crusher
- ElJay 5x16 Triple Deck Dry Screen
- Eleven (11) Transfer Points - Dry
- Stackers/Conveying Dry

Wet Side
- One (1) Feed Hopper
- ElJay Model 1324 Triple Deck Wet Screen
- One (1) Balzer Feed Hopper
- Sand/Water Separator
- Seven (7) Transfer Points - Wet
- Three (3) Stackers - Wet

One (1) Deutz, Model F6L912, 88 HP Diesel Engine (Emergency Fire Pump)
Mobile/Portable Equipment as Needed

TULLIS, INC. DBA CRYSTAL CREEK AGGREGATE
PERMIT TO OPERATE #90-PO-65k
CRUSHING AND SCREENING OPERATION
December 17, 2021

GENERAL PERMIT CONDITIONS

1. This Permit to Operate shall be posted in a conspicuous location within the control center of the facility for which it was issued. [Rule 2:23]

2. This permit not transferable from either one location to another, one piece of equipment to another, or from one person to another. [Rule 2:21]

3. Equipment is to be maintained so that it operates as it did when the permit was issued. [Rule 2:1 Part 600]

4. This permit shall be valid for a period of one (1) year from the anniversary date. [Rule 2:1A]

5. Acceptance of this permit is deemed acceptance of all conditions as specified. Failure to comply with any condition of this permit or the Rules and Regulations of the Shasta County Air Quality Management District (District) shall be grounds for revocation, either by the Air Pollution Control Officer (APCO) or the Air Quality Management District Hearing Board. [Rule 2:26]

6. The District reserves the right to amend this permit, if the need arises, in order to ensure compliance of this facility or to abate any public nuisance. [Rule 2:1 Part 600; CH&SC §41700]

7. If any provision of this permit is found invalid, such finding shall not affect the remaining provisions. [Rule 2:1 Part 600]

8. All equipment, facilities, and systems shall be designed to be operated in a manner that minimizes air pollutant emissions and maintains compliance with the conditions of this permit and the regulations of the District. [Rule 2:1 Part 600]

9. Periods of excess emission levels with respect to emission limitations specified in this permit shall be reported to the District within four (4) hours of the occurrence. In no event, shall the equipment be operated in a manner that creates excessive emissions beyond the end of the first shift or twenty-four (24) hours, whichever occurs first. [Rule 3:10]

10. The right of entry described in the *California Health and Safety Code* (CH&SC) Section 41510, Division 26, shall always apply.

11. The operating staff of this facility shall be advised of and familiar with all the conditions of this permit. [Rule 2:1 Part 600]

12. This facility is subject to all applicable requirements of the Air Toxics "Hot Spots" Information and Assessment Act of 1987, as cited in the CH&SC Sections 44300 et seq.

OPERATING CONDITIONS

13. The plant operating hours shall be between the hours of 6 a.m. and 5 p.m. Pacific Standard Time and between the hours of 6 a.m. and 6 p.m. Pacific Daylight Time. Annual plant operation is restricted to 300 days per calendar year.

14. The processing rate of raw material through the stationary primary crusher shall be limited to a maximum of 1,500 tons per day.

15. The total calendar year process weight shall not exceed 396,000 tons from the crushing and screening operation. Total calendar year process weight shall include material processed through the stationary "Dry Side" crushing and screening plant plus final product produced through portable equipment.

16. Fugitive dust from the screening and crushing plant shall be controlled by water sprays as necessary to prevent a public nuisance or opacity violation. [Rule 3:16]

17. Fugitive dust from storage piles, processing area, and disturbed areas shall be controlled by periodic cleanup and/or use of sprinklers, tarps, or dust palliative agents as necessary to prevent a public nuisance or opacity violation. [Rule 3:16]

18. Fugitive dust generated from access and on-site roads shall be controlled by application of water, dust palliative, chip-sealing, or paving so as to prevent a public nuisance or violation of any applicable ambient air quality standard. [Rule 3:16]

19. A water mist system shall be used in the drilling process to prevent fugitive emissions from leaving the property boundary and creating a public nuisance. [Rule 3:16]

20. The Federal New Source Performance Standards for Non-Metallic Mineral Processing Plants (40 CFR, Part 60, Chapter 1, Subpart 000) shall be complied with at all times. Fugitive emissions from any transfer point on belt conveyors shall not exceed seven (7) percent opacity in accordance with Section 60.672.(b). Fugitive emissions from any crusher at which a capture system is not used shall be limited to twelve (12) percent opacity in accordance with Section 60.672(c).

21. All water bars, wet suppression systems must be inspected monthly to check that water is flowing to the discharge spray nozzles in the wet suppression system. Corrective action must be taken immediately if water is not flowing properly to the discharge spray nozzles. A logbook shall be maintained that includes the date of each inspection and any corrective actions taken. The logbook shall be kept on file for a period of two (2) years and made available to the District upon request. [40 CFR, Part 60, Subpart OOO]

22. The total Crystal Creek Aggregate facility emissions of particulate matter less than 10 microns in size (PM_{10}), nitrogen oxides (NO_x), reactive organic compounds (ROG), and sulfur oxides (SO_x), shall be limited to 25 tons per year of each pollutant. For purposes of this condition, the facility shall include all emissions units associated with this permit. If any of the above-mentioned nonattainment or precursor pollutants for the facility exceed 25 tons per year, based on District calculations of emissions, the permittee will be required to apply for a modified Permit to Operate which shall require emission offsets.

23. All mobile rock crushing and screening equipment brought onsite shall maintain valid In-Use Off-Road Diesel-Fueled Fleets Regulation (DOORS) registrations.

24. All portable or mobile rock crushing and screening equipment brought onsite shall maintain valid Portable Equipment Registration Program (PERP) registrations.

25. Portable/mobile equipment working under this permit shall comply with all General Requirements, Emission Limitations and Operating Requirements of the equipment units Portable Equipment Registration Program (PERP) operating conditions.

26. Daily records of operating hours and material processed shall be maintained and kept on file for a period of two (2) years to verify compliance with Portable Equipment Registration Program (PERP) operating conditions. Records shall be maintained for each mobile/portable equipment unit. [Rule 2:27 and PERP]

27. Annual reporting shall be as follows:
    1. Portable equipment working under this permit shall report hours of operation and throughput to the District.
    2. Portable equipment working under this permit shall **not** report hours of operation and throughput to the Portable Equipment Registration Program (PERP).
    3. Mobile equipment shall report engine operation to the Diesel Off-Road Online Reporting System (DOORS)

    [Rule 2:27] [PERP] [DOORS]

28. Testing and maintenance of the Deutz Model F6L912, 88 HP Diesel engine shall be limited to operate the number of hours necessary to comply with the testing requirements of National Fire Protection Association (NFPA) 25 – "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection System," 1998 edition. [CCR 17 § 93115.3]

CCA STATIONARY EQUIPMENT

ITEM #	DESCRIPTION	(GEARBOX SIZE) SERIAL/MODEL #	HP
1.	16' VIBRATING GRIZZLY FEEDER	B1125-18-2844	30HP
2.	30"X42" ARMADILLO JAW CRUSHER	2669478	150HP
3.	42'X45' INCLINE TO DOZER TRAP CONVEYOR	(TXT4)	25HP
4.	48"X14' DOZER TRAP BELT CONVEYOR. W/VARI SPEED DRIVE F7 YASKAWA	(TXT4)	10HP
5.	42"X45' DRY SCREEN FEED CONVEYOR	(TXT4)	20HP
6.	5'X16' EL JAY TRIPLE DECK HORIZONTAL SCREENING PLANT	34C0187	40HP
7.	42"X45' CONE FEED CONVEYOR	(TXT4)	25HP
8.	54" ELJAY STANDARD CONE CRUSHER W/ELECTRIC MOTOR DRIVE, 36" DISCHARGE CONVEYOR MOUNTED ON PORTABLE CHASSIS W/UNDERCARRIAGE REMOVED	23F0788	200HP
9.	30"X45' RETURN CONVEYOR	(TXT4)	10HP
10.	36"X56' BASE ROCK CONVEYOR	(TXT4)	25HP
11.	WET PLANT FEEDER BALZER PACIFIC 36"X25' BIN FEED HOPPER W/MANUAL VARIABLE SPEED		15HP
12.	36"X65' INCLINE TO WET PLANT	(TXT4)	15HP

ITEM #	DESCRIPTION	(GEARBOX SIZE) SERIAL/MODEL #	HP
13.	5'X16' ELJAY TRIPLE DECK HORIZONTAL WASH SCREENING PLANT W/TWIN EAGLE 36" SAND SCREWS	34E0588	
14.	30'X120' SAND CONVEYOR COLEMAN RADIAL STAKER W/HYD LIFT, NON FUNCTIONING FOLDING HEAD AND TAIL SECTIONS	(TXT5)	25HP
15.	30"X45" CRUSHED DISCHARGE CONVEYOR	(TXT3)	10HP
16.	30"X50' (1 1/2") DISCHARGE CONVEYOR	(TXT3)	10HP
17.	24"X45' (3/8") DISCHARGE CONVEYOR	(TXT3)	10HP
18.	LOAM SUMP PUMP (GALLAGHER)	SP90-26155	20HP
19.	CYCLONE CENTRIFICAL SEPARATION SYSTEM		
20.	FLOCCULANT TANK, 1200 GALLON MIXING TANK W/LIGHTNING MIXER		
21.	FLOCCULANT INJECTION SYSTEM, FREQUENCY DRIVE FOR METERING FLOCCULANT		ITEM 19-21
22.	WASH PLANT PUMPS		50HP
23.	8'X30' PARTS VAN W/AXLES REMOVED STATIONARY ON GROUND		
24.	12'X16' PORTABLE GRIZZLY ON SKIDS W/OPTIONAL DIFFERENT SCREEN MESH	(TXT3)	
25.	36"X80' CONVEYOR W/TEFLON TROUGHING & RETURN ROLLS	(TXT4)	30HP

ITEM #	DESCRIPTION	(GEARBOX SIZE) SERIAL/MODEL #	HP
26.	36"X56' CONVEYOR NO MOTOR GEARBOX OF HEAD PULLEY EQUIPPED W/TAIL PULLEY		
27.	24"X40' FLOATING WALKWAY W/6" GORMAN RUPPS ELECTRIC PUMP		
28.	36"X40 CONVEYOR NO MOTOR, GEARBOX HEAD OR TAIL PULLEY HAS GOOD TROUGHING ROLLERS		
29.	36"X80 CONVEYOR W/TAIL PULLEY NO MOTOR, GEARBOX OR HEAD PULLEY		
30.	DOZER TRAP PORTABLE FEEDER W48"X14'BELT	(TXT5)	10HP
31.	30 25' PIECES OF 6" ALUMINIM SPRINKLER PIPE ON TRAILER		
32.	2 MOBILE STORAGE VANS 30'		
33.	2 8'X40' STORAGE CONTAINERS		
34.	WEIGH TRONIX 11'X70' TRUCK SCALE, COMPLETE W/DIGITAL READOUT AND TWO CONTROLS W/PRINTERS		
35.	14'X70' MOBILE OFFICE TRAILER W/STAIRS		
36.	2000 6'X20' TRIPLE DECK HORIZONTAL STATIONARY SCREEN PLANT W/NEW FRAME & DISCHARGE CHUTE. SEPARATE SUPPORT STRUCTURE. *NOTE* THIS WAS USED AS A WASH SCREEN, NEEDS TO BE ASSEMBLED AND TRANSFORMED TO WET APPLICATION	46505	

ITEM #	DESCRIPTION	(GEARBOX SIZE) SERIAL/MODEL #	HP
37.	DUETZ DIELSEL POWERED 4 CYL W/6" GORMAN RUPPS CENTRIFICAL PUMP, INCLUDES SUCTION & DISCHARGE HOSES	6962343	
38.	GAS POWERED HONDA MOTOR W/3" GORMAN RUPPS WATER PUMP		
39.	24"X30" ELJAY JAW CRUSHER		50HP
40.	PORTABLE CONVEYOR 24"X26' NO GEARBOX		10HP
41.	SHAKER SCREEN 5'X8' MOUNTED ON 8' STAND		
	SKIDS W/OPTIONAL DIFFERENT		

Doors Account Vehicle Fleet Inventory

EIN #	Vehicle Serial #	Vehicle Type	Manufacturer	Veh Model	Veh MY	Engine Serial #	Engine Manufacturer	Eng Model	Eng MY	Eng HP	Eng Tier	Eng Family
TD8F58	2ZR0774	FRONT END LOADER	CATERPILLAR	988F	1997	99C02124	CATERPILLAR, INC.	3408	1997	458	T1	YCPXL18.0HRN
MW6W87	W7K02164	FRONT END LOADER	CATERPILLAR	980K	2014	TXM05764	CATERPILLAR, INC.	C13	2013	402	T4I	DCPXL12.5HPB
WB5M46	6DR00357	EXCAVATOR	CATERPILLAR	330BL	1996	8Z93366	CATERPILLAR, INC.	3306	1996	220	T1	
XU8N38	N6C412078	BACKHOE / LOADER	CASE	580 SUPER M SERIES	2007	46659447	CASE CORPORATION	F4GE0454C*D	2006	95	T2	6NHXL067DTC
GP3P79	KC600903	SKID STEER LOADER	CATERPILLAR	246D3	2020	8KU7193	KUBOTA CORPORATION	C3.3B	2019	74.2	T4F	KKBXL03.3EKD
WX7B54	1JM003892	EXCAVATOR	CATERPILLAR	375L	1998	TXG07334	CATERPILLAR, INC.	C15	2013	475	T4I	ACPXL15.2.EPW
RS9D83	ARCD00190	EXCAVATOR	CATERPILLAR	385BL	2004	BLC01033A	CATERPILLAR, INC.	3456 ATTAC	2004	513	T2	4CPXL15.8ESK
PM3S83	17V538	FORKLIFT	CATERPILLAR	V160	1978	62W5987	CATERPILLAR, INC.	3208	1978	125	T0	
JG3L74	2YR00122	OFF-HIGHWAY TRUCKS	CATERPILLAR	D400E	2001	41Z00201	CATERPILLAR, INC.	3406	2001	420	T2	
HE8M77	ANZ00304	FRONT END LOADER	CATERPILLAR	966G	2002	3PD02367	CATERPILLAR, INC.	3176	2002	439	T2	2CPXL10.3ESX
RW7M59	2YR01011	OFF-HIGHWAY TRUCKS	CATERPILLAR	D400E	1998	41Z10429	CATERPILLAR, INC.	3406	1998	420	T1	WCPXL14.6MRJ
MY7M76	90V9048	CRAWLER TRACTOR	CATERPILLAR	D9H	1980	97U	CATERPILLAR, INC.	D353TA	1980	410	T0	
JB6P78	2ZR00546	FRONT END LOADER	CATERPILLAR	988F	1997	99C01406	CATERPILLAR, INC.	3408	1996	430	T1	TCP18.RZDBRN
DY8H39	72V08485	GRADER	CATERPILLAR	140G	1985	8TD	CATERPILLAR, INC.	3306T	1985	150	T0	

Attachment B

Health Risk Assessment Methodology and Assumptions

A health risk assessment (HRA) is accomplished in four steps: 1) hazards identification, 2) exposure assessment, 3) toxicity assessment, and 4) risk characterization. These steps cover the estimation of air emissions, the estimation of the air concentrations resulting from a dispersion analysis, the incorporation of the toxicity of the pollutants emitted, and the characterization of the risk based on exposure parameters such as breathing rate, age adjustment factors, and exposure duration; each depending on receptor type (i.e., residence, school, daycare centers, hospitals, senior care facilities, recreational areas, adult, infant, child).

This HRA was conducted in accordance with technical guidelines developed by federal, state, and regional agencies, including U.S. Environmental Protection Agency (USEPA), California Environmental Protection Agency (CalEPA), and California Office of Environmental Health Hazard Assessment (OEHHA) *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments.*[1] This HRA addresses the diesel particulate matter (DPM) emissions from onsite equipment and haul trucks as well as crystalline silica from aggregate processing.

According to CalEPA, a HRA should not be interpreted as the expected rates of cancer or other potential human health effects, but rather as estimates of potential risk or likelihood of adverse effects based on current knowledge, under a number of highly conservative assumptions and the best assessment tools currently available.

TERMS AND DEFINITIONS

As the practice of conducting a HRA is particularly complex and involves concepts that are not altogether familiar to most people, several terms and definitions are provided that are considered essential to the understanding of the approach, methodology and results:

> *Acute effect* – a health effect (non-cancer) produced within a short period of time (few minutes to several days) following an exposure to toxic air contaminants (TAC).
>
> *Cancer risk* – the probability of an individual contracting cancer from a lifetime (i.e., 70 year) exposure to TAC such as DPM in the ambient air.
>
> *Chronic effect* – a health effect (non-cancer) produced from a continuous exposure occurring over an extended period of time (weeks, months, years).

[1] Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*, March 6, 2015, http://oehha.ca.gov/air/hot_spots/hotspots2015.html.

Hazard Index (HI) – the unitless ratio of an exposure level over the acceptable reference dose. The HI can be applied to multiple compounds in an additive manner.

Hazard Quotient (HQ) – the unitless ratio of an exposure level over the acceptable reference dose. The HQ is applied to individual compounds.

Toxic Air Contaminants – any air pollutant that is capable of causing short-term (acute) and/or long-term (chronic or carcinogenic, i.e., cancer causing) adverse human health effects (i.e., injury or illness). The current California list of TAC lists approximately 200 compounds, including particulate emissions from diesel-fueled engines.

Human Health Effects - comprise disorders such as eye watering, respiratory or heart ailments, and other (i.e., non-cancer) related diseases.

Health Risk Assessment – an analysis designed to predict the generation and dispersion of TAC in the outdoor environment, evaluate the potential for exposure of human populations, and to assess and quantify both the individual and population-wide health risks associated with those levels of exposure.

Incremental – under CEQA, the net difference (or change) in conditions or impacts when comparing the baseline to future year project conditions.

Maximum exposed individual (MEI) – an individual assumed to be located at the point where the highest concentrations of TAC, and therefore, health risks are predicted to occur.

Non-cancer risks – health risks such as eye watering, respiratory or heart ailments, and other non-cancer related diseases.

Receptors – the locations where potential health impacts or risks are predicted (i.e., schools, residences, and recreational sites).

LIMITATIONS AND UNCERTAINTIES

There are a number of important limitations and uncertainties commonly associated with a HRA due to the wide variability of human exposures to TAC, the extended timeframes over which the exposures are evaluated, and the inability to verify the results. Limitations and uncertainties associated with the HRA and identified by the CalEPA include: (a.) lack of reliable monitoring data; (b.) extrapolation of toxicity data in animals to humans; (c.) estimation errors in calculating TAC emissions; (d.) concentration prediction errors with dispersion models; and (e.) the variability in lifestyles, fitness and other confounding factors of the human population. This HRA was performed using the best available data and methodologies, notwithstanding the following uncertainties:

- There are uncertainties associated with the estimation of emissions from project activities. Where project-specific data, such as emission factors, are not available, default assumptions in emission models were used.

- The limitations of the air dispersion model provide a source of uncertainty in the estimation of exposure concentrations. According to USEPA, errors due to the limitation of the algorithms implemented in the air dispersion model in the highest estimated concentrations of +/- 10 percent to 40 percent are typical.[2]

- The source parameters used to model emission sources add uncertainty. For all emission sources, the source parameters used source-specific, recommended as defaults, or expected to produce more conservative results. Discrepancies might exist in actual emissions characteristics of an emission source and its representation in the dispersion model.

- The exposure duration estimates do not take into account that people do not usually reside at the same location for 30 years and that other exposures (i.e., school children) are also of much shorter durations than was assumed in this HRA. This exposure duration is a highly conservative assumption, since most people do not remain at home all day and on average residents change residences every 11 to 12 years. In addition, this assumption adopts that residents are experiencing outdoor concentrations for the entire exposure period.

- For the risk and hazards calculations as well as the cumulative health impact, numerous assumptions must be made in order to estimate human exposure to pollutants. These assumptions include parameters such as breathing rates, exposure time and frequency, exposure duration, and human activity patterns. While a mean value derived from scientifically defensible studies is the best estimate of central tendency, most of the exposure variables used in this HRA are high-end estimates. The combination of several high-end estimates used as exposure parameters may substantially overestimate pollutant intake. The excess lifetime cancer risks calculated in this HRA are therefore likely to be higher than may be required to be protective of public health.

- The Cal/EPA cancer potency factor for DPM was used to estimate cancer risks associated with exposure to DPM emissions from construction activities. However, the cancer potency factor derived by Cal/EPA for DPM is highly uncertain in both the estimation of response and dose. In the past, due to inadequate animal test data and epidemiology data on diesel exhaust, the International Agency for Research on Cancer (IARC), a branch of the World Health Organization, had classified DPM as Probably Carcinogenic to Humans (Group 2); the USEPA had also

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[2] United States Environmental Protection Agency, *Guideline on Air Quality Models (Revised), 40 Code of Federal Regulations, Part 51, Appendix W,* January 2017, https://www.epa.gov/scram/clean-air-act-permit-modeling-guidance

concluded that the existing data did not provide an adequate basis for quantitative risk assessment.[3] However, based on two recent scientific studies,[4] IARC recently re-classified DPM as Carcinogenic to Humans to Group 1,[5] which means that the agency has determined that there is "sufficient evidence of carcinogenicity" of a substance in humans and represents the strongest weight-of-evidence rating in IARC's carcinogen classification scheme. This determination by the IARC may provide additional impetus for the USEPA to identify a quantitative dose-response relationship between exposure to DPM and cancer.

In summary, the estimated health impacts are based primarily on a series of conservative assumptions related to predicted environmental concentrations, exposure, and chemical toxicity. The use of conservative assumptions tends to produce upper-bound estimates of risk. USEPA acknowledges this uncertainty by stating: "the methods used [to estimate risk] are conservative, meaning that the real risks from the source may be lower than the calculations, but it is unlikely that they will be higher." The USEPA notes that the conservative assumptions used in a HRA are intended to assure that the estimated risks do not underestimate the actual risks posed by a site and that the estimated risks do not necessarily represent actual risks experienced by populations at or near a site.[6]

HAZARDS IDENTIFICATION

California Air Resources Board (CARB) has developed a list of TAC, where a TAC is "an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health (California Health and Safety Code Section 39655). All USEPA hazardous air pollutants are TAC. CARB administers the Air Toxics "Hot Spots" program under Assembly Bill 2588 "Hot Spots" Information and Assessment Act, which requires periodic local review of facilities which emit TAC. Local air agencies periodically must prioritize stationary sources of TAC and prepare health risk assessments for high-priority sources.

Diesel exhaust is a complex mixture of numerous individual gaseous and particulate compounds emitted from diesel-fueled combustion engines. Diesel particulate matter is formed primarily through the incomplete combustion of diesel fuel. DPM is removed from the atmosphere through physical processes including atmospheric fall-out and washout by rain. Humans can be exposed to airborne DPM by

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[3] United States Environmental Protection Agency, *Health Assessment Document for Diesel Engine Exhaust*, May 2002, https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=29060

[4] Attfield MD, Schleiff PL, Lubin JH, Blair A, Stewart PA, Vermeulen R, Coble JB, Silverman DT, *The Diesel Exhaust in Miners Study: A Nested Case-Control Study of Lung Cancer and Diesel Exhaust*, June 2012, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3369553/

[5] International Agency for Research on Cancer, *Diesel Engine Exhaust Carcinogenic*, June 2012, https://www.iarc.fr/en/media-centre/pr/2012/pdfs/pr213_E.pdf

[6] United States Environmental Protection Agency, *Risk Assessment Guidance for Superfund Human Health Risk Assessment*, December 1989, https://www.epa.gov/sites/production/files/2015-09/documents/rags_a.pdf

deposition on water, soil, and vegetation; although the main pathway of exposure is inhalation. Cal/EPA has concluded that potential cancer risk from inhalation exposure to whole diesel exhaust outweigh the multi-pathway cancer risk from the speciated components.

In August 1998, the CARB identified DPM as an air toxic. CARB developed the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel- Fueled Engines and Vehicles* and *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines* and approved these documents on September 28, 2000.[7,8] The documents represent proposals to reduce DPM emissions, with the goal of reducing emissions and the associated health risk by 75 percent in 2010 and by 85 percent in 2020. The program aimed to require the use of state-of-the-art catalyzed DPM filters and ultra-low-sulfur diesel fuel.

In 2001, CARB assessed the state-wide health risks from exposure to diesel exhaust and to other toxic air contaminants. It is difficult to distinguish the health risks of diesel emissions from those of other air toxics, since diesel exhaust contains approximately 40 different TAC. The CARB study detected diesel exhaust by using ambient air carbon soot measurements as a surrogate for diesel emissions. The study reported that the state-wide cancer risk from exposure to diesel exhaust was about 540 per million population as compared to a total risk for exposure to all ambient air toxics of 760 per million. This estimate, which accounts for about 70 percent of the total risk from TAC, included both urban and rural areas in the state. The estimate can also be considered an average worst-case for the state, since it assumes constant exposure to outdoor concentrations of diesel exhaust and does not account for expected lower concentrations indoors, where most of time is spent. Based on 2012 estimates of California statewide exposure, DPM is estimated to increase statewide cancer risk by 520 cancers per million residents exposed over a lifetime.[9]

Exposure to DPM results in a greater incidence of chronic non-cancer health effects, such as cough, labored breathing, chest tightness, wheezing, and bronchitis. Individuals particularly vulnerable to DPM are children, whose lung tissue is still developing, the elderly and people with illnesses who may have other serious health problems that can be aggravated by exposure to DPM. In general, children are more vulnerable than adults to air pollutants because they have higher inhalation rates, narrower airways, and less mature immune systems. In addition, children with allergies may have an enhanced allergic response when exposed to diesel exhaust).

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[7] California Air Resources Board, *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles*, October 2000, http://www.arb.ca.gov/diesel/documents/rrpfinal.pdf

[8] California Air Resources Board, *Risk Management Guidance for the Permitting of New Stationary Diesel-Fueled Engines*, October 2000, https://www.arb.ca.gov/diesel/documents/rmgFinal.pdf

[9] California Air Resources Board, *Summary: Diesel Particulate Matter Health Impacts*, April 12, 2016, https://www.arb.ca.gov/research/diesel/diesel-health_summ.htm

In 2005, the California Office of Environmental Health Hazard Assessment (OEHHA) added a chronic reference exposure level (REL) for crystalline silica. Silica is a hazardous substance when it is inhaled, and the airborne dust particles that are formed when the material containing the silica are broken, crushed, or sawn pose potential risks.

Respirable crystalline silica refers to crystalline silicon dioxide with aerodynamic diameter less than four microns (i.e., 0.0004 cm). Crystalline silica or quartz is ubiquitous in nature. Most dust generated by reclamation activities and Quarry operations including blasting produces dust particles larger than 4 microns. These particles are too large to reach the alveoli of the lungs which are the target organ. Thus, crystalline silica constitutes a tiny fraction of the dust from these sources and does not represent a significant health risk to neighbors of these types of projects. In order to result in toxic effects, the silica needs to be crystalline, smaller than 4 microns, inhaled, and not exhaled.

Inhalation of crystalline silica initially causes respiratory irritation and an inflammatory reaction in the lungs. Silicosis results from chronic exposure; it is characterized by the presence of histologically unique silicotic nodules and by fibrotic scarring of the lung. Lung diseases other than cancer associated with silica exposure include silicosis, tuberculosis/silicotuberculosis, chronic bronchitis, small airways disease, and emphysema. Ambient air exposures do not cause concern but levels to which workers (e.g., miners, sandblasters) may be exposed have been shown to cause cancer.

Soil and rock materials within specific areas were sampled using random multi-increment sampling. The two sample locations are shown on Plate 3. Sample materials were collected in 6-inch long and 4-inch diameter plastic sample containers, labeled appropriately, then sealed to prevent loss or introduction of contaminates. All samples were transported by Bajada Geosciences personnel to its Redding facility.[10]

Two samples were transmitted from our Redding office to Asbestos TEM Laboratories, Inc., to perform testing for the potential presence of Naturally-occurring asbestos (NOA). Testing was performed on each sample using a polarized light microscope with a point count of 400 in conformance with standard test method CARB 435. Results of the laboratory testing found that NOA was not present in the samples that were analyzed.[11]

EXPOSURE ASSESSMENT

Dispersion is the process by which atmospheric pollutants disseminate due to wind and vertical stability. The results of a dispersion analysis are used to assess pollutant concentrations at or near an emission source. The results of an analysis allow predicted concentrations of pollutants to be compared directly to air quality standards and other criteria such as health risks based on modeled concentrations.

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[10] Bajada Geosciences, Inc, Geotechnical Report, Crystal Creek Aggregates Quarry Expansion, September 2, 2022

[11] Bajada Geosciences, Inc, Geotechnical Report, Crystal Creek Aggregates Quarry Expansion, September 2, 2022

A rising pollutant plume reacts with the environment in several ways before it levels off. First, the plume's own turbulence interacts with atmospheric turbulence to entrain ambient air. This mixing process reduces and eventually eliminates the density and momentum differences that cause the plume to rise. Second, the wind transports the plume during its rise and entrainment process. Higher winds mix the plume more rapidly, resulting in a lower final rise. Third, the plume interacts with the vertical temperature stratification of the atmosphere, rising as a result of buoyancy in the unstable-to-neutrally stratified mixed layer. However, after the plume encounters the mixing lid and the stably stratified air above, its vertical motion is dampened.

Molecules of gas or small particles injected into the atmosphere will separate from each other as they are acted on by turbulent eddies. The Gaussian mathematical model such as AERMOD simulates the dispersion of the gas or particles within the atmosphere. The formulation of the Gaussian model is based on the following assumptions:

- The predictions are not time-dependent (all conditions remain unchanged with time)
- The wind speed and direction are uniform, both horizontally and vertically, throughout the region of concern
- The rate of diffusion is not a function of position
- Diffusion in the direction of the transporting wind is negligible when compared to the transport flow

Dispersion Modeling Approach

Air dispersion modeling was performed to estimate the downwind dispersion of DPM exhaust emissions resulting from construction activities. The following sections present the fundamental components of an air dispersion modeling analysis including air dispersion model selection and options, receptor locations, meteorological data, and source exhaust parameters.

Model Selection and Options

AERMOD (Version 21112)[12] was used for the dispersion analysis. AERMOD is the USEPA preferred atmospheric dispersion modeling system for general industrial sources. The model can simulate point, area, volume, and line sources. AERMOD is the appropriate model for this analysis based on the coverage of simple, intermediate, and complex terrain. It also predicts both short-term and long-term (annual) average concentrations. The model was executed using the regulatory default options (stack-tip downwash, buoyancy-induced dispersion, and final plume rise), default wind speed profile categories, default potential temperature gradients, and assuming no pollutant decay.

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[12] United States Environmental Protection Agency, AERMOD Modeling System, https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models

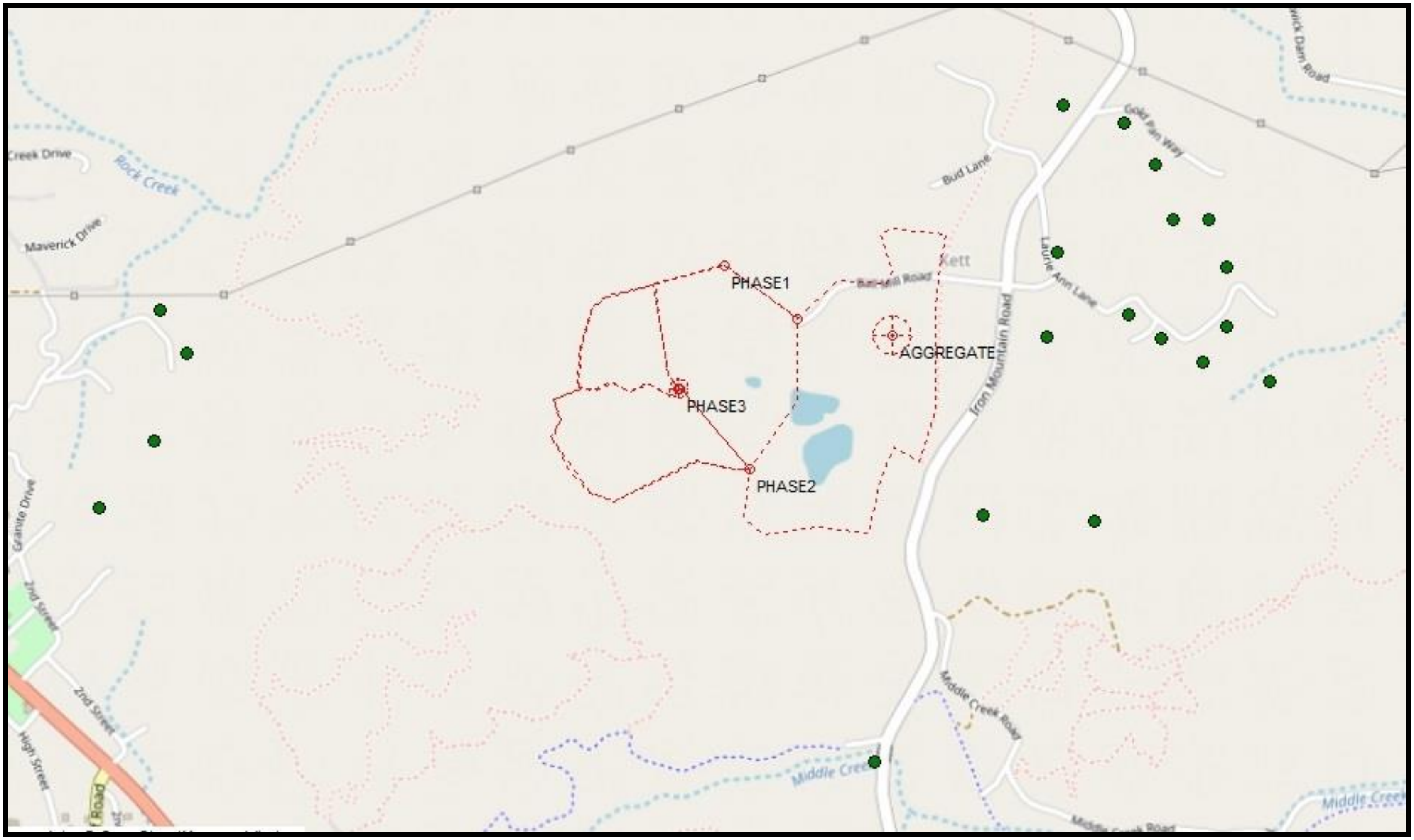
The selection of the appropriate dispersion coefficients depends on the land use within three kilometers (km) of the project site. The types of land use were based on the classification method defined by Auer (1978); using pertinent United States Geological Survey (USGS) 1:24,000 scale (7.5 minute) topographic maps of the area. If the Auer land use types of heavy industrial, light-to-moderate industrial, commercial, and compact residential account for 50 percent or more of the total area, the USEPA *Guideline on Air Quality Models* recommends using urban dispersion coefficients; otherwise, the appropriate rural coefficients can be used. Based on observation of the area surrounding the project site, rural (urban is only designated within dense city centers such as downtown San Francisco) dispersion coefficients were applied within AERMOD.

Receptor Locations

Some receptors are considered more sensitive to air pollutants than others, because of preexisting health problems, proximity to the emissions source, or duration of exposure to air pollutants. Land uses such as primary and secondary schools, hospitals, and convalescent homes are considered to be relatively sensitive to poor air quality because the very young, the old, and the infirm are more susceptible to respiratory infections and other air quality-related health problems than the general public. Residential areas are also considered sensitive to poor air quality because people in residential areas are often at home for extended periods. Recreational land uses are moderately sensitive to air pollution because vigorous exercise associated with recreation places having a high demand on respiratory system function.

Sensitive receptors were placed at existing residences to estimate health impacts due to proposed project operations on existing receptors. The project site is surrounded by open lands with some residences to the east, south, and west. The nearest residence is approximately 1,150 feet from the aggregate plant and 2,000 feet from the aggregate extraction areas associated with Phase 1, 2, and 3. Shasta Union Elementary School is 1.2 miles to the southwest of the project site. **Figure 1** displays the location of the sensitive receptors used in this HRA. Receptors were placed at a height of 1.8 meters (typical breathing height). Terrain elevations for receptor locations were used based on available USGS information for the area.

FIGURE 1
HEALTH RISK ASSESSMENT RECEPTORS



Meteorological Data

Hourly meteorological data from Redding Municipal Airport, located approximately 50 miles to the southwest of the proposed project were used in the dispersion modeling analysis. Meteorological data from 2017 through 2021 were used.[13] **Figure 2** displays the annual wind rose. Wind directions are predominately from the south and north with a low frequency of calm wind speed conditions (approximately 1.4 percent), as shown in **Figure 3**. The average annual wind speed is 6.7 miles per hour (3.0 meters per second).[14]

Source Release Characteristics

Operational equipment activities were treated as an area source. The release height of the off-road equipment exhaust was 5.0 meters (16.4 feet) and an initial vertical dimension of 1.4 meters (4.6 feet), which reflects the height of the equipment plus an additional height of the exhaust plume above the exhaust point to account for plume rise due to buoyancy and momentum. Haul trucks were treated as a line source (i.e., volume sources placed at regular intervals) located along an access road. The haul trucks were assigned a release height of 5.0 meters (16.4 feet) and an initial vertical dimension of 1.4 meters (4.6 feet), which accounts for dispersion from the movement of vehicles.[15]

Normal mining and processing activities occur up to 6 days per week, Monday through Saturday. Current hours of operation are from 6:00 a.m. to 5:00 p.m. during pacific standard time. During daylight savings time, hours are from 6:00 a.m. to 6:00 p.m., Monday through Friday and 6:00 a.m. to 5:00 p.m. on Saturdays.

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[13] California Air Resources Board, Hotspots Analysis and Reporting Program Meteorological Files, October 5, 2015, https://www.arb.ca.gov/toxics/harp/metfiles2.htm

[14] South Coast Air Quality Management District, Final Localized Significance Threshold Methodology. July 2008, http://www.aqmd.gov/docs/default-source/ceqa/handbook/localized-significance-thresholds/final-lst-methodology-document.pdf?sfvrsn=2

[15] While haul truck emissions contribute substantially to overall project emissions, they are spread over many miles. Hence, the portion of trucking emissions that would impact one receptor is much smaller than the emissions that the clustered off-road activity at the project site would impact a receptor near the site. For example, the DPM emissions from truck travel within 1,000 feet of the project are less than one percent of the total off-road DPM emissions.

FIGURE 2
ANNUAL WINDROSE

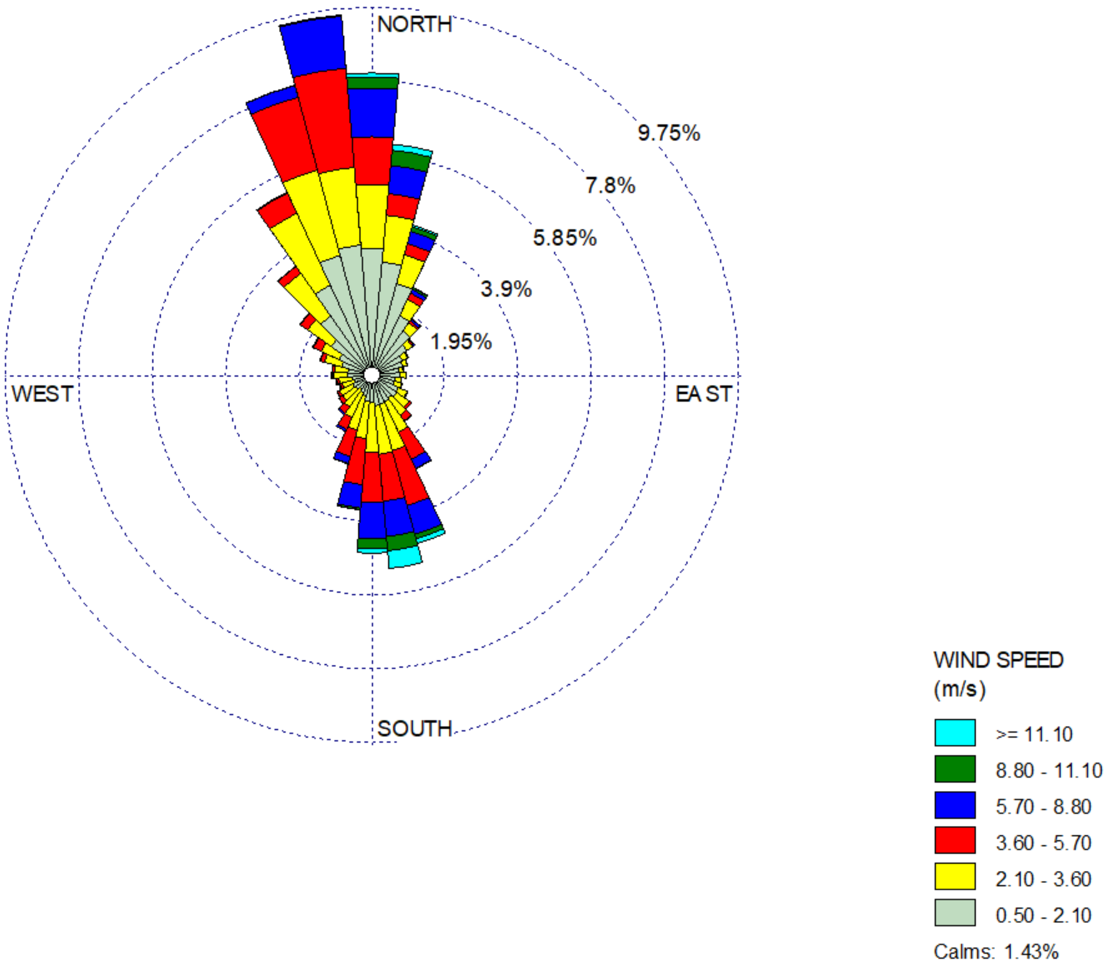
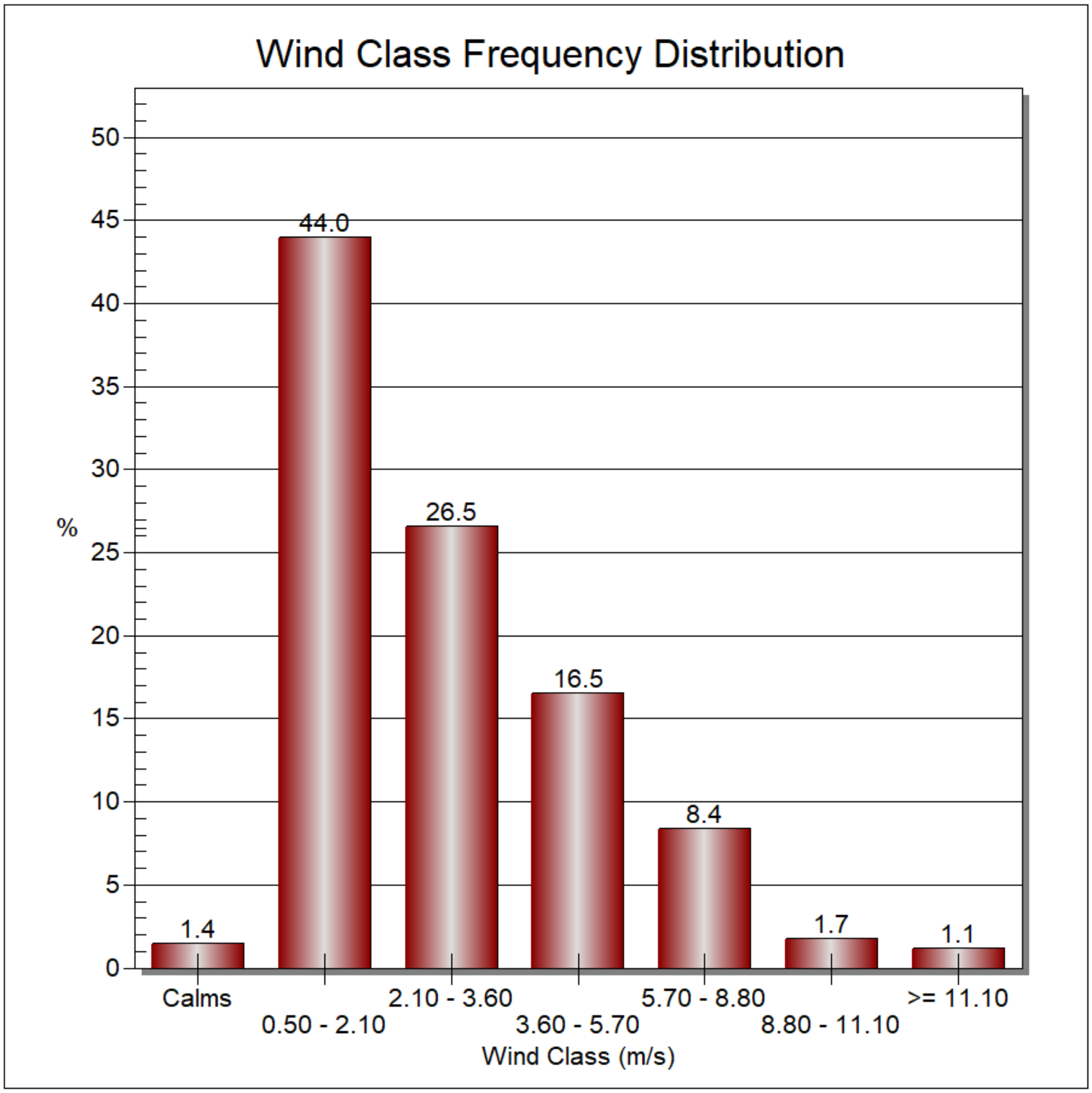


FIGURE 3
ANNUAL WIND SPEED DISTRIBUTION



EXPOSURE PARAMETERS

This HRA was conducted following methodologies in OEHHA's *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*.[16] This was accomplished by applying the estimated concentrations at the receptors analyzed to the established cancer risk estimates and acceptable reference concentrations for non-cancer health effects.

OEHHA's revisions to its *Guidance Manual* were primarily designed to ensure that the greater sensitivity of children to cancer and other health risks is reflected in HRAs. For example, OEHHA now recommends that risks be analyzed separately for multiple age groups, focusing especially on young children and teenagers, rather than the past practice of analyzing risks to the general population, without distinction by age. OEHHA also now recommends that statistical "age sensitivity factors" be incorporated into a HRA, and that children's relatively high breathing rates be accounted for. On the other hand, the *Guidance Manual* revisions also include some changes that would reduce calculated health risks. For example, under the former guidance, OEHHA recommended that residential cancer risks be assessed by assuming 70 years of exposure at a residential receptor; under the *Guidance Manual*, this assumption is lessened to 30 years.

OEHHA has developed exposure factors (e.g., daily breathing rates) for six age groups including the last trimester to birth, birth to 2 years, 2 to 9 years, 2 to 16 years, 16 to 30 years, and 16 to 70 years. These age bins allow for more refined exposure information to be used when estimating exposure and the potential for developing cancer over a lifetime. This means that exposure variates are needed for the third trimester, ages zero to less than two, ages two to less than nine, ages two to less than 16, ages 16 to less than 30, and ages 16 to 70. Residential receptors utilize the 95th percentile breathing rate values. The breathing rates are age-specific and are 1,090 liters per kilogram-day for ages less than 2 years, 745 liters per kilogram-day for ages 2 to 16 years, 335 liters per kilogram-day for ages 16 to 30 years, and 290 liters per kilogram-day for ages 30 to 70 years. A school child breathing rate is 520 liters per kilogram-day and an off-site worker breathing rate is 230 liters per kilogram-day.

OEHHA developed age sensitivity factors (ASF) to take into account the increased sensitivity to carcinogens during early-in-life exposures. OEHHA recommends that cancer risks be weighted by a factor of 10 for exposures that occur from the third trimester of pregnancy to 2 years of age, and by a factor of 3 for exposures from 2 years through 15 years of age.

Based on OEHHA recommendations, the cancer risk to residential receptors assumes exposure occurs 24 hours per day for 350 days per year while accounting for a percentage of time at home. OEHHA evaluated information from activity pattern databases to estimate the fraction of time at home (FAH)

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[16] Office of Environmental Health Hazard Assessment, *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*, March 6, 2015, http://oehha.ca.gov/air/hot_spots/hotspots2015.html

during the day. This information was used to adjust exposure duration and cancer risk based on the assumption that a person is not present at home continuously for 24 hours and therefore exposure to emissions is not occurring when a person is away from their home. In general, the FAH factors are age-specific and are 0.85 for ages less than 2 years, 0.72 for ages 2 to 16 years, and 0.73 for ages 30 to 70 years.

OEHHA has decreased the exposure duration currently being used for estimating cancer risk at the maximum exposed individual resident from 70 years to 30 years. This is based on studies showing that 30 years is a reasonable estimate of the 90^{th} to 95^{th} percentile of residency duration in the population. Additionally, OEHHA recommends using the 9 and 70-year exposure duration to represent the potential impacts over the range of residency periods.

Given the exposure durations of less than 24 hours, sensitive recreational receptors were evaluated for acute impacts only. Based on OEHHA recommendations, for children at school sites, exposure is assumed to occur 10 hours per day for 180 days (or 36 weeks) per year. Cancer risk estimates for children at school sites are calculated based on 9-year exposure duration. School sites also include teachers and other adult staff which are treated as off-site workers.

RISK CHARACTERIZATION

Cancer risk is defined as the lifetime probability of developing cancer from exposure to carcinogenic substances. Cancer risks are expressed as the chance in one million of getting cancer (i.e., number of cancer cases among one million people exposed). The cancer risks are assumed to occur exclusively through the inhalation pathway. The cancer risk can be estimated by using the cancer potency factor (milligrams per kilogram of body weight per day [mg/kg-day]), the 30-year annual average concentration (microgram per cubic meter [$\mu g/m^3$]), and the lifetime exposure adjustment.

Following guidelines established by OEHHA, the incremental cancer risks attributable to the proposed project were calculated by applying exposure parameters to modeled DPM concentrations in order to determine the inhalation dose (mg/kg-day) or the amount of pollutants inhaled per body weight mass per day. The cancer risks occur exclusively through the inhalation pathway; therefore, the cancer risks can be estimated from the following equation:

$$\text{Dose-inh} = \frac{C_{air} * \{DBR\} * A * ASF * FAH * EF * ED * 10^{-6}}{AT}$$

where:

Dose-inh = Dose of the toxic substance through inhalation in mg/kg-day

10^{-6} = Micrograms to milligrams conversion, Liters to cubic meters conversion

C_{air}	= Concentration in air in microgram (µg)/cubic meter (m^3)
{DBR}	= Daily breathing rate in liter (L)/kg body weight – day
A	= Inhalation absorption factor, 1.0
ASF	= Age Sensitivity Factor
EF	= Exposure frequency (days/year)
ED	= Exposure duration (years)
FAH	= Fraction of Time at Home
AT	= Averaging time period over which exposure is averaged in days (25,550 days for a 70 year cancer risk)

To determine incremental cancer risk, the estimated inhalation dose attributed to the proposed project was multiplied by the cancer potency slope factor (cancer risk per mg/kg-day). The cancer potency slope factor is the upper bound on the increased cancer risk from a lifetime exposure to a pollutant. These slope factors are based on epidemiological studies and are different values for different pollutants. This allows the estimated inhalation dose to be equated to a cancer risk.

Non-cancer adverse health impacts, acute (short-term) and chronic (long-term), are measured against a hazard index (HI), which is defined as the ratio of the predicted incremental exposure concentration from the proposed project to a published reference exposure level (REL) that could cause adverse health effects as established by OEHHA. The ratio (referred to as the Hazard Quotient [HQ]) of each non-carcinogenic substance that affects a certain organ system is added to produce an overall HI for that organ system. The overall HI is calculated for each organ system. If the overall HI for the highest-impacted organ system is greater than one, then the impact is considered to be significant.

The HI is an expression used for the potential for non-cancer health effects. The relationship for the non-cancer health effects is given by the annual concentration (in µg/m^3) and the REL (in µg/m^3). The acute hazard index was determined using the "simple" concurrent maximum approach, which tends to be conservative (i.e., overpredicts).

The relationship for the non-cancer health effects is given by the following equation:

$$HI = C/REL$$

Where:

HI	= Hazard index; an expression of the potential for non-cancer health effects.
C	= Annual average concentration (µg/m^3) during the 70 year exposure period.
REL	= Concentration at which no adverse health effects are anticipated.

The chronic REL for DPM was established by the California OEHHA as 5 $\mu g/m^3$.[17] The chronic REL for crystalline silica was established by the California OEHHA as 3 $\mu g/m^3$.[18]

[17] Office of Environmental Health Hazards Assessment - Acute, 8-hour, and Chronic Reference Exposure Levels, August 20, 2020, http://www.oehha.ca.gov/air/allrels.html

[18] Office of Environmental Health Hazards Assessment - Acute, 8-hour, and Chronic Reference Exposure Levels, August 20, 2020, http://www.oehha.ca.gov/air/allrels.html

Health Risk Assessment Assumptions

5	Chronic Reference Exposure Level (ug/m3)
1.1	Cancer Potency Slope Factor (cancer risk per mg/kg-day)
350	days per year
25,550	days per lifetime
1090	95th Percentile Daily Breathing Rates (l 0<2 Years
861	95th Percentile Daily Breathing Rates (l 2<9 Years
745	95th Percentile Daily Breathing Rates (l 2<16 Years
335	95th Percentile Daily Breathing Rates (l 16<30 Years
290	95th Percentile Daily Breathing Rates (l 30<70 Years
0.85	fraction of 0<2 Years
0.72	fraction of 2<16 Years
0.73	fraction of 16<70 Years

Project:	Crystal Creek Aggregate
Date:	October 12, 2022
Condition:	Existing Condition
Receptor:	Existing Residence
Pollutant:	DPM

Exposure Year	Calender Year	Annual PM2.5 Concentration (ug/m3)	Daily Breathing Rates (L/kg-day)	Exposure Factor	fraction of time at home	Cancer Risk
1	2021	6.15E-04	1,090	10.0	0.85	0.09
2	2022	6.15E-04	1,090	10.0	0.85	0.09
3	2023	6.15E-04	745	4.75	0.72	0.02
4	2024	6.15E-04	745	3.00	0.72	0.01
5	2025	6.15E-04	745	3.00	0.72	0.01
6	2026	6.15E-04	745	3.00	0.72	0.01
7	2027	6.15E-04	745	3.00	0.72	0.01
8	2028	6.15E-04	745	3.00	0.72	0.01
9	2029	6.15E-04	745	3.00	0.72	0.01
10	2030	6.15E-04	745	3.00	0.72	0.01
11	2031	6.15E-04	745	3.00	0.72	0.01
12	2032	6.15E-04	745	3.00	0.72	0.01
13	2033	6.15E-04	745	3.00	0.72	0.01
14	2034	6.15E-04	745	3.00	0.72	0.01
15	2035	6.15E-04	745	3.00	0.72	0.01
16	2036	6.15E-04	745	3.00	0.72	0.01
17	2037	6.15E-04	335	1.70	0.73	0.00
18	2038	6.15E-04	335	1.00	0.73	0.00
19	2039	6.15E-04	335	1.00	0.73	0.00
20	2040	6.15E-04	335	1.00	0.73	0.00
21	2041	6.15E-04	335	1.00	0.73	0.00
22	2042	6.15E-04	335	1.00	0.73	0.00
23	2043	6.15E-04	335	1.00	0.73	0.00
24	2044	6.15E-04	335	1.00	0.73	0.00
25	2045	6.15E-04	335	1.00	0.73	0.00
26	2046	6.15E-04	335	1.00	0.73	0.00
27	2047	6.15E-04	335	1.00	0.73	0.00
28	2048	6.15E-04	335	1.00	0.73	0.00
29	2049	6.15E-04	335	1.00	0.73	0.00
30	2050	6.15E-04	335	1.00	0.73	0.00
31	2051	6.15E-04	335	1.00	0.73	0.00
32	2052	6.15E-04	335	1.00	0.73	0.00
33	2053	6.15E-04	335	1.00	0.73	0.00
34	2054	6.15E-04	335	1.00	0.73	0.00
35	2055	6.15E-04	335	1.00	0.73	0.00
36	2056	6.15E-04	335	1.00	0.73	0.00
37	2057	6.15E-04	335	1.00	0.73	0.00
38	2058	6.15E-04	335	1.00	0.73	0.00
39	2059	6.15E-04	335	1.00	0.73	0.00
40	2060	6.15E-04	335	1.00	0.73	0.00
41	2061	6.15E-04	335	1.00	0.73	0.00
42	2062	6.15E-04	335	1.00	0.73	0.00
43	2063	6.15E-04	335	1.00	0.73	0.00
44	2064	6.15E-04	335	1.00	0.73	0.00
45	2065	6.15E-04	335	1.00	0.73	0.00
46	2066	6.15E-04	335	1.00	0.73	0.00
47	2067	6.15E-04	335	1.00	0.73	0.00
48	2068	6.15E-04	335	1.00	0.73	0.00
49	2069	6.15E-04	335	1.00	0.73	0.00
50	2070	6.15E-04	335	1.00	0.73	0.00
51	2071	6.15E-04	335	1.00	0.73	0.00
52	2072	6.15E-04	335	1.00	0.73	0.00

0.00	Chronic Hazard Impact
1	Significance Threshold
No	Significant?
0.47	Cancer Risk
10	Significance Threshold
No	Significant?

Health Risk Assessment Assumptions

3	Chronic Reference Exposure Level (ug/m3)
	Cancer Potency Slope Factor (cancer risk per mg/kg-day)
350	days per year
25,550	days per lifetime
1090	95th Percentile Daily Breathing Rates (I 0<2 Years
861	95th Percentile Daily Breathing Rates (I 2<9 Years
745	95th Percentile Daily Breathing Rates (I 2<16 Years
335	95th Percentile Daily Breathing Rates (I 16<30 Years
290	95th Percentile Daily Breathing Rates (I 30<70 Years
0.85	fraction of 0<2 Years
0.72	fraction of 2<16 Years
0.73	fraction of 16<70 Years

Project: Crystal Creek Aggregate
Date: October 12, 2022
Condition: Existing Condition
Receptor: Existing Residence
Pollutant: Crystalline Silica

Exposure Year	Calender Year	Annual PM2.5 Concentration (ug/m3)	Daily Breathing Rates (L/kg-day)	Exposure Factor	fraction of time at home	Cancer Risk
1	2021	8.90E-01	1,090	10.0	0.85	-
2	2022	8.90E-01	1,090	10.0	0.85	-
3	2023	8.90E-01	745	4.75	0.72	-
4	2024	8.90E-01	745	3.00	0.72	-
5	2025	8.90E-01	745	3.00	0.72	-
6	2026	8.90E-01	745	3.00	0.72	-
7	2027	8.90E-01	745	3.00	0.72	-
8	2028	8.90E-01	745	3.00	0.72	-
9	2029	8.90E-01	745	3.00	0.72	-
10	2030	8.90E-01	745	3.00	0.72	-
11	2031	8.90E-01	745	3.00	0.72	-
12	2032	8.90E-01	745	3.00	0.72	-
13	2033	8.90E-01	745	3.00	0.72	-
14	2034	8.90E-01	745	3.00	0.72	-
15	2035	8.90E-01	745	3.00	0.72	-
16	2036	8.90E-01	745	3.00	0.72	-
17	2037	8.90E-01	335	1.70	0.73	-
18	2038	8.90E-01	335	1.00	0.73	-
19	2039	8.90E-01	335	1.00	0.73	-
20	2040	8.90E-01	335	1.00	0.73	-
21	2041	8.90E-01	335	1.00	0.73	-
22	2042	8.90E-01	335	1.00	0.73	-
23	2043	8.90E-01	335	1.00	0.73	-
24	2044	8.90E-01	335	1.00	0.73	-
25	2045	8.90E-01	335	1.00	0.73	-
26	2046	8.90E-01	335	1.00	0.73	-
27	2047	8.90E-01	335	1.00	0.73	-
28	2048	8.90E-01	335	1.00	0.73	-
29	2049	8.90E-01	335	1.00	0.73	-
30	2050	8.90E-01	335	1.00	0.73	-
31	2051	8.90E-01	335	1.00	0.73	-
32	2052	8.90E-01	335	1.00	0.73	-
33	2053	8.90E-01	335	1.00	0.73	-
34	2054	8.90E-01	335	1.00	0.73	-
35	2055	8.90E-01	335	1.00	0.73	-
36	2056	8.90E-01	335	1.00	0.73	-
37	2057	8.90E-01	335	1.00	0.73	-
38	2058	8.90E-01	335	1.00	0.73	-
39	2059	8.90E-01	335	1.00	0.73	-
40	2060	8.90E-01	335	1.00	0.73	-
41	2061	8.90E-01	335	1.00	0.73	-
42	2062	8.90E-01	335	1.00	0.73	-
43	2063	8.90E-01	335	1.00	0.73	-
44	2064	8.90E-01	335	1.00	0.73	-
45	2065	8.90E-01	335	1.00	0.73	-
46	2066	8.90E-01	335	1.00	0.73	-
47	2067	8.90E-01	335	1.00	0.73	-
48	2068	8.90E-01	335	1.00	0.73	-
49	2069	8.90E-01	335	1.00	0.73	-
50	2070	8.90E-01	335	1.00	0.73	-
51	2071	8.90E-01	335	1.00	0.73	-
52	2072	8.90E-01	335	1.00	0.73	-

0.30	Chronic Hazard Impact
1	Significance Threshold
No	Significant?
-	Cancer Risk
10	Significance Threshold
No	Significant?

Health Risk Assessment Assumptions

5	Chronic Reference Exposure Level (ug/m3)
1.1	Cancer Potency Slope Factor (cancer risk per mg/kg-day)
350	days per year
25,550	days per lifetime
1090	95th Percentile Daily Breathing Rates (I 0<2 Years
861	95th Percentile Daily Breathing Rates (I 2<9 Years
745	95th Percentile Daily Breathing Rates (I 2<16 Years
335	95th Percentile Daily Breathing Rates (I 16<30 Years
290	95th Percentile Daily Breathing Rates (I 30<70 Years
0.85	fraction of 0<2 Years
0.72	fraction of 2<16 Years
0.73	fraction of 16<70 Years

Project: Crystal Creek Aggregate
Date: October 12, 2022
Condition: Proposed Project
Receptor: Existing Residence
Pollutant: DPM

Exposure Year	Calender Year	Annual PM2.5 Concentration (ug/m3)	Daily Breathing Rates (L/kg-day)	Exposure Factor	fraction of time at home	Cancer Risk
1	2021	1.23E-03	1,090	10.0	0.85	0.17
2	2022	1.23E-03	1,090	10.0	0.85	0.17
3	2023	1.23E-03	745	4.75	0.72	0.05
4	2024	1.23E-03	745	3.00	0.72	0.03
5	2025	1.23E-03	745	3.00	0.72	0.03
6	2026	1.23E-03	745	3.00	0.72	0.03
7	2027	1.23E-03	745	3.00	0.72	0.03
8	2028	1.23E-03	745	3.00	0.72	0.03
9	2029	1.23E-03	745	3.00	0.72	0.03
10	2030	1.23E-03	745	3.00	0.72	0.03
11	2031	1.23E-03	745	3.00	0.72	0.03
12	2032	1.23E-03	745	3.00	0.72	0.03
13	2033	1.23E-03	745	3.00	0.72	0.03
14	2034	1.23E-03	745	3.00	0.72	0.03
15	2035	1.23E-03	745	3.00	0.72	0.03
16	2036	1.23E-03	745	3.00	0.72	0.03
17	2037	1.23E-03	335	1.70	0.73	0.01
18	2038	1.23E-03	335	1.00	0.73	0.00
19	2039	1.23E-03	335	1.00	0.73	0.00
20	2040	1.23E-03	335	1.00	0.73	0.00
21	2041	1.23E-03	335	1.00	0.73	0.00
22	2042	1.23E-03	335	1.00	0.73	0.00
23	2043	1.23E-03	335	1.00	0.73	0.00
24	2044	1.23E-03	335	1.00	0.73	0.00
25	2045	1.23E-03	335	1.00	0.73	0.00
26	2046	1.23E-03	335	1.00	0.73	0.00
27	2047	1.23E-03	335	1.00	0.73	0.00
28	2048	1.23E-03	335	1.00	0.73	0.00
29	2049	1.23E-03	335	1.00	0.73	0.00
30	2050	1.23E-03	335	1.00	0.73	0.00
31	2051	1.23E-03	335	1.00	0.73	0.00
32	2052	1.23E-03	335	1.00	0.73	0.00
33	2053	1.23E-03	335	1.00	0.73	0.00
34	2054	1.23E-03	335	1.00	0.73	0.00
35	2055	1.23E-03	335	1.00	0.73	0.00
36	2056	1.23E-03	335	1.00	0.73	0.00
37	2057	1.23E-03	335	1.00	0.73	0.00
38	2058	1.23E-03	335	1.00	0.73	0.00
39	2059	1.23E-03	335	1.00	0.73	0.00
40	2060	1.23E-03	335	1.00	0.73	0.00
41	2061	1.23E-03	335	1.00	0.73	0.00
42	2062	1.23E-03	335	1.00	0.73	0.00
43	2063	1.23E-03	335	1.00	0.73	0.00
44	2064	1.23E-03	335	1.00	0.73	0.00
45	2065	1.23E-03	335	1.00	0.73	0.00
46	2066	1.23E-03	335	1.00	0.73	0.00
47	2067	1.23E-03	335	1.00	0.73	0.00
48	2068	1.23E-03	335	1.00	0.73	0.00
49	2069	1.23E-03	335	1.00	0.73	0.00
50	2070	1.23E-03	335	1.00	0.73	0.00
51	2071	1.23E-03	335	1.00	0.73	0.00
52	2072	1.23E-03	335	1.00	0.73	0.00
53	2073	1.23E-03	335	1.00	0.73	0.00
54	2074	1.23E-03	335	1.00	0.73	0.00
55	2075	1.23E-03	335	1.00	0.73	0.00
56	2076	1.23E-03	335	1.00	0.73	0.00
57	2077	1.23E-03	335	1.00	0.73	0.00
58	2078	1.23E-03	335	1.00	0.73	0.00
59	2079	1.23E-03	335	1.00	0.73	0.00
60	2080	1.23E-03	335	1.00	0.73	0.00
61	2081	1.23E-03	335	1.00	0.73	0.00
62	2082	1.23E-03	335	1.00	0.73	0.00
63	2083	1.23E-03	335	1.00	0.73	0.00
64	2084	1.23E-03	335	1.00	0.73	0.00
65	2085	1.23E-03	335	1.00	0.73	0.00
66	2086	1.23E-03	335	1.00	0.73	0.00
67	2087	1.23E-03	335	1.00	0.73	0.00
68	2088	1.23E-03	335	1.00	0.73	0.00
69	2089	1.23E-03	335	1.00	0.73	0.00
70	2090	1.23E-03	335	1.00	0.73	0.00

0.00	Chronic Hazard Impact
1	Significance Threshold
No	Significant?
1.08	Cancer Risk
10	Significance Threshold
No	Significant?

71	2091	1.23E-03	335	1.00	0.73	0.00
72	2092	1.23E-03	335	1.00	0.73	0.00
73	2093	1.23E-03	335	1.00	0.73	0.00
74	2094	1.23E-03	335	1.00	0.73	0.00
75	2095	1.23E-03	335	1.00	0.73	0.00
76	2096	1.23E-03	335	1.00	0.73	0.00
77	2097	1.23E-03	335	1.00	0.73	0.00
78	2098	1.23E-03	335	1.00	0.73	0.00
79	2099	1.23E-03	335	1.00	0.73	0.00
80	2100	1.23E-03	335	1.00	0.73	0.00
81	2101	1.23E-03	335	1.00	0.73	0.00

Health Risk Assessment Assumptions

3	Chronic Reference Exposure Level (ug/m3)
	Cancer Potency Slope Factor (cancer risk per mg/kg-day)
350	days per year
25,550	days per lifetime
1090	95th Percentile Daily Breathing Rates (I 0<2 Years
861	95th Percentile Daily Breathing Rates (I 2<9 Years
745	95th Percentile Daily Breathing Rates (I 2<16 Years
335	95th Percentile Daily Breathing Rates (I 16<30 Years
290	95th Percentile Daily Breathing Rates (I 30<70 Years
0.85	fraction of 0<2 Years
0.72	fraction of 2<16 Years
0.73	fraction of 16<70 Years

Project: Crystal Creek Aggregate
Date: October 12, 2022
Condition: Proposed Project
Receptor: Existing Residence
Pollutant: Crystalline Silica

Exposure Year	Calender Year	Annual PM2.5 Concentration (ug/m3)	Daily Breathing Rates (L/kg-day)	Exposure Factor	fraction of time at home	Cancer Risk
1	2021	2.50E+00	1,090	10.0	0.85	-
2	2022	2.50E+00	1,090	10.0	0.85	-
3	2023	2.50E+00	745	4.75	0.72	-
4	2024	2.50E+00	745	3.00	0.72	-
5	2025	2.50E+00	745	3.00	0.72	-
6	2026	2.50E+00	745	3.00	0.72	-
7	2027	2.50E+00	745	3.00	0.72	-
8	2028	2.50E+00	745	3.00	0.72	-
9	2029	2.50E+00	745	3.00	0.72	-
10	2030	2.50E+00	745	3.00	0.72	-
11	2031	2.50E+00	745	3.00	0.72	-
12	2032	2.50E+00	745	3.00	0.72	-
13	2033	2.50E+00	745	3.00	0.72	-
14	2034	2.50E+00	745	3.00	0.72	-
15	2035	2.50E+00	745	3.00	0.72	-
16	2036	2.50E+00	745	3.00	0.72	-
17	2037	2.50E+00	335	1.70	0.73	-
18	2038	2.50E+00	335	1.00	0.73	-
19	2039	2.50E+00	335	1.00	0.73	-
20	2040	2.50E+00	335	1.00	0.73	-
21	2041	2.50E+00	335	1.00	0.73	-
22	2042	2.50E+00	335	1.00	0.73	-
23	2043	2.50E+00	335	1.00	0.73	-
24	2044	2.50E+00	335	1.00	0.73	-
25	2045	2.50E+00	335	1.00	0.73	-
26	2046	2.50E+00	335	1.00	0.73	-
27	2047	2.50E+00	335	1.00	0.73	-
28	2048	2.50E+00	335	1.00	0.73	-
29	2049	2.50E+00	335	1.00	0.73	-
30	2050	2.50E+00	335	1.00	0.73	-
31	2051	2.50E+00	335	1.00	0.73	-
32	2052	2.50E+00	335	1.00	0.73	-
33	2053	2.50E+00	335	1.00	0.73	-
34	2054	2.50E+00	335	1.00	0.73	-
35	2055	2.50E+00	335	1.00	0.73	-
36	2056	2.50E+00	335	1.00	0.73	-
37	2057	2.50E+00	335	1.00	0.73	-
38	2058	2.50E+00	335	1.00	0.73	-
39	2059	2.50E+00	335	1.00	0.73	-
40	2060	2.50E+00	335	1.00	0.73	-
41	2061	2.50E+00	335	1.00	0.73	-
42	2062	2.50E+00	335	1.00	0.73	-
43	2063	2.50E+00	335	1.00	0.73	-
44	2064	2.50E+00	335	1.00	0.73	-
45	2065	2.50E+00	335	1.00	0.73	-
46	2066	2.50E+00	335	1.00	0.73	-
47	2067	2.50E+00	335	1.00	0.73	-
48	2068	2.50E+00	335	1.00	0.73	-
49	2069	2.50E+00	335	1.00	0.73	-
50	2070	2.50E+00	335	1.00	0.73	-
51	2071	2.50E+00	335	1.00	0.73	-
52	2072	2.50E+00	335	1.00	0.73	-
53	2073	2.50E+00	335	1.00	0.73	-
54	2074	2.50E+00	335	1.00	0.73	-
55	2075	2.50E+00	335	1.00	0.73	-
56	2076	2.50E+00	335	1.00	0.73	-
57	2077	2.50E+00	335	1.00	0.73	-
58	2078	2.50E+00	335	1.00	0.73	-
59	2079	2.50E+00	335	1.00	0.73	-
60	2080	2.50E+00	335	1.00	0.73	-
61	2081	2.50E+00	335	1.00	0.73	-
62	2082	2.50E+00	335	1.00	0.73	-
63	2083	2.50E+00	335	1.00	0.73	-
64	2084	2.50E+00	335	1.00	0.73	-
65	2085	2.50E+00	335	1.00	0.73	-
66	2086	2.50E+00	335	1.00	0.73	-
67	2087	2.50E+00	335	1.00	0.73	-
68	2088	2.50E+00	335	1.00	0.73	-
69	2089	2.50E+00	335	1.00	0.73	-
70	2090	2.50E+00	335	1.00	0.73	-

0.83	Chronic Hazard Impact
1	Significance Threshold
No	Significant?
-	Cancer Risk
10	Significance Threshold
No	Significant?

71	2091	2.50E+00	335	1.00	0.73	-	
72	2092	2.50E+00	335	1.00	0.73	-	
73	2093	2.50E+00	335	1.00	0.73	-	
74	2094	2.50E+00	335	1.00	0.73	-	
75	2095	2.50E+00	335	1.00	0.73	-	
76	2096	2.50E+00	335	1.00	0.73	-	
77	2097	2.50E+00	335	1.00	0.73	-	
78	2098	2.50E+00	335	1.00	0.73	-	
79	2099	2.50E+00	335	1.00	0.73	-	
80	2100	2.50E+00	335	1.00	0.73	-	
81	2101	2.50E+00	335	1.00	0.73	-	

Health Risk Assessment Assumptions

5	Chronic Reference Exposure Level (ug/m3)
1.1	Cancer Potency Slope Factor (cancer risk per mg/kg-day)
350	days per year
25,550	days per lifetime
1090	95th Percentile Daily Breathing Rates (l 0<2 Years
861	95th Percentile Daily Breathing Rates (l 2<9 Years
745	95th Percentile Daily Breathing Rates (l 2<16 Years
335	95th Percentile Daily Breathing Rates (l 16<30 Years
290	95th Percentile Daily Breathing Rates (l 30<70 Years
0.85	fraction of 0<2 Years
0.72	fraction of 2<16 Years
0.73	fraction of 16<70 Years

Project:	Crystal Creek Aggregate
Date:	October 12, 2022
Condition:	Proposed Project-Related
Receptor:	Existing Residence
Pollutant:	DPM

Exposure Year	Calender Year	Annual PM2.5 Concentration (ug/m3)	Daily Breathing Rates (L/kg-day)	Exposure Factor	fraction of time at home	Cancer Risk
1	2021	6.15E-04	1,090	10.0	0.85	0.09
2	2022	6.15E-04	1,090	10.0	0.85	0.09
3	2023	6.15E-04	745	4.75	0.72	0.02
4	2024	6.15E-04	745	3.00	0.72	0.01
5	2025	6.15E-04	745	3.00	0.72	0.01
6	2026	6.15E-04	745	3.00	0.72	0.01
7	2027	6.15E-04	745	3.00	0.72	0.01
8	2028	6.15E-04	745	3.00	0.72	0.01
9	2029	6.15E-04	745	3.00	0.72	0.01
10	2030	6.15E-04	745	3.00	0.72	0.01
11	2031	6.15E-04	745	3.00	0.72	0.01
12	2032	6.15E-04	745	3.00	0.72	0.01
13	2033	6.15E-04	745	3.00	0.72	0.01
14	2034	6.15E-04	745	3.00	0.72	0.01
15	2035	6.15E-04	745	3.00	0.72	0.01
16	2036	6.15E-04	745	3.00	0.72	0.01
17	2037	6.15E-04	335	1.70	0.73	0.00
18	2038	6.15E-04	335	1.00	0.73	0.00
19	2039	6.15E-04	335	1.00	0.73	0.00
20	2040	6.15E-04	335	1.00	0.73	0.00
21	2041	6.15E-04	335	1.00	0.73	0.00
22	2042	6.15E-04	335	1.00	0.73	0.00
23	2043	6.15E-04	335	1.00	0.73	0.00
24	2044	6.15E-04	335	1.00	0.73	0.00
25	2045	6.15E-04	335	1.00	0.73	0.00
26	2046	6.15E-04	335	1.00	0.73	0.00
27	2047	6.15E-04	335	1.00	0.73	0.00
28	2048	6.15E-04	335	1.00	0.73	0.00
29	2049	6.15E-04	335	1.00	0.73	0.00
30	2050	6.15E-04	335	1.00	0.73	0.00
31	2051	6.15E-04	335	1.00	0.73	0.00
32	2052	6.15E-04	335	1.00	0.73	0.00
33	2053	6.15E-04	335	1.00	0.73	0.00
34	2054	6.15E-04	335	1.00	0.73	0.00
35	2055	6.15E-04	335	1.00	0.73	0.00
36	2056	6.15E-04	335	1.00	0.73	0.00
37	2057	6.15E-04	335	1.00	0.73	0.00
38	2058	6.15E-04	335	1.00	0.73	0.00
39	2059	6.15E-04	335	1.00	0.73	0.00
40	2060	6.15E-04	335	1.00	0.73	0.00
41	2061	6.15E-04	335	1.00	0.73	0.00
42	2062	6.15E-04	335	1.00	0.73	0.00
43	2063	6.15E-04	335	1.00	0.73	0.00
44	2064	6.15E-04	335	1.00	0.73	0.00
45	2065	6.15E-04	335	1.00	0.73	0.00
46	2066	6.15E-04	335	1.00	0.73	0.00
47	2067	6.15E-04	335	1.00	0.73	0.00
48	2068	6.15E-04	335	1.00	0.73	0.00
49	2069	6.15E-04	335	1.00	0.73	0.00
50	2070	6.15E-04	335	1.00	0.73	0.00
51	2071	6.15E-04	335	1.00	0.73	0.00
52	2072	6.15E-04	335	1.00	0.73	0.00
53	2073	6.15E-04	335	1.00	0.73	0.00
54	2074	6.15E-04	335	1.00	0.73	0.00
55	2075	6.15E-04	335	1.00	0.73	0.00
56	2076	6.15E-04	335	1.00	0.73	0.00
57	2077	6.15E-04	335	1.00	0.73	0.00
58	2078	6.15E-04	335	1.00	0.73	0.00
59	2079	6.15E-04	335	1.00	0.73	0.00
60	2080	6.15E-04	335	1.00	0.73	0.00
61	2081	6.15E-04	335	1.00	0.73	0.00
62	2082	6.15E-04	335	1.00	0.73	0.00
63	2083	6.15E-04	335	1.00	0.73	0.00
64	2084	6.15E-04	335	1.00	0.73	0.00
65	2085	6.15E-04	335	1.00	0.73	0.00
66	2086	6.15E-04	335	1.00	0.73	0.00
67	2087	6.15E-04	335	1.00	0.73	0.00
68	2088	6.15E-04	335	1.00	0.73	0.00
69	2089	6.15E-04	335	1.00	0.73	0.00
70	2090	6.15E-04	335	1.00	0.73	0.00

0.00	Chronic Hazard Impact
1	Significance Threshold
No	Significant?
0.54	Cancer Risk
10	Significance Threshold
No	Significant?

71	2091	6.15E-04	335	1.00	0.73	0.00	
72	2092	6.15E-04	335	1.00	0.73	0.00	
73	2093	6.15E-04	335	1.00	0.73	0.00	
74	2094	6.15E-04	335	1.00	0.73	0.00	
75	2095	6.15E-04	335	1.00	0.73	0.00	
76	2096	6.15E-04	335	1.00	0.73	0.00	
77	2097	6.15E-04	335	1.00	0.73	0.00	
78	2098	6.15E-04	335	1.00	0.73	0.00	
79	2099	6.15E-04	335	1.00	0.73	0.00	
80	2100	6.15E-04	335	1.00	0.73	0.00	
81	2101	6.15E-04	335	1.00	0.73	0.00	

Health Risk Assessment Assumptions

3	Chronic Reference Exposure Level (ug/m3)
	Cancer Potency Slope Factor (cancer risk per mg/kg-day)
350	days per year
25,550	days per lifetime
1090	95th Percentile Daily Breathing Rates (I 0<2 Years
861	95th Percentile Daily Breathing Rates (I 2<9 Years
745	95th Percentile Daily Breathing Rates (I 2<16 Years
335	95th Percentile Daily Breathing Rates (I 16<30 Years
290	95th Percentile Daily Breathing Rates (I 30<70 Years
0.85	fraction of 0<2 Years
0.72	fraction of 2<16 Years
0.73	fraction of 16<70 Years

Project:	Crystal Creek Aggregate
Date:	October 12, 2022
Condition:	Proposed Project-Realted
Receptor:	Existing Residence
Pollutant:	Crystalline Silica

Exposure Year	Calender Year	Annual PM2.5 Concentration (ug/m3)	Daily Breathing Rates (L/kg-day)	Exposure Factor	fraction of time at home	Cancer Risk
1	2021	1.61E+00	1,090	10.0	0.85	-
2	2022	1.61E+00	1,090	10.0	0.85	-
3	2023	1.61E+00	745	4.75	0.72	-
4	2024	1.61E+00	745	3.00	0.72	-
5	2025	1.61E+00	745	3.00	0.72	-
6	2026	1.61E+00	745	3.00	0.72	-
7	2027	1.61E+00	745	3.00	0.72	-
8	2028	1.61E+00	745	3.00	0.72	-
9	2029	1.61E+00	745	3.00	0.72	-
10	2030	1.61E+00	745	3.00	0.72	-
11	2031	1.61E+00	745	3.00	0.72	-
12	2032	1.61E+00	745	3.00	0.72	-
13	2033	1.61E+00	745	3.00	0.72	-
14	2034	1.61E+00	745	3.00	0.72	-
15	2035	1.61E+00	745	3.00	0.72	-
16	2036	1.61E+00	745	3.00	0.72	-
17	2037	1.61E+00	335	1.70	0.73	-
18	2038	1.61E+00	335	1.00	0.73	-
19	2039	1.61E+00	335	1.00	0.73	-
20	2040	1.61E+00	335	1.00	0.73	-
21	2041	1.61E+00	335	1.00	0.73	-
22	2042	1.61E+00	335	1.00	0.73	-
23	2043	1.61E+00	335	1.00	0.73	-
24	2044	1.61E+00	335	1.00	0.73	-
25	2045	1.61E+00	335	1.00	0.73	-
26	2046	1.61E+00	335	1.00	0.73	-
27	2047	1.61E+00	335	1.00	0.73	-
28	2048	1.61E+00	335	1.00	0.73	-
29	2049	1.61E+00	335	1.00	0.73	-
30	2050	1.61E+00	335	1.00	0.73	-
31	2051	1.61E+00	335	1.00	0.73	-
32	2052	1.61E+00	335	1.00	0.73	-
33	2053	1.61E+00	335	1.00	0.73	-
34	2054	1.61E+00	335	1.00	0.73	-
35	2055	1.61E+00	335	1.00	0.73	-
36	2056	1.61E+00	335	1.00	0.73	-
37	2057	1.61E+00	335	1.00	0.73	-
38	2058	1.61E+00	335	1.00	0.73	-
39	2059	1.61E+00	335	1.00	0.73	-
40	2060	1.61E+00	335	1.00	0.73	-
41	2061	1.61E+00	335	1.00	0.73	-
42	2062	1.61E+00	335	1.00	0.73	-
43	2063	1.61E+00	335	1.00	0.73	-
44	2064	1.61E+00	335	1.00	0.73	-
45	2065	1.61E+00	335	1.00	0.73	-
46	2066	1.61E+00	335	1.00	0.73	-
47	2067	1.61E+00	335	1.00	0.73	-
48	2068	1.61E+00	335	1.00	0.73	-
49	2069	1.61E+00	335	1.00	0.73	-
50	2070	1.61E+00	335	1.00	0.73	-
51	2071	1.61E+00	335	1.00	0.73	-
52	2072	1.61E+00	335	1.00	0.73	-
53	2073	1.61E+00	335	1.00	0.73	-
54	2074	1.61E+00	335	1.00	0.73	-
55	2075	1.61E+00	335	1.00	0.73	-
56	2076	1.61E+00	335	1.00	0.73	-
57	2077	1.61E+00	335	1.00	0.73	-
58	2078	1.61E+00	335	1.00	0.73	-
59	2079	1.61E+00	335	1.00	0.73	-
60	2080	1.61E+00	335	1.00	0.73	-
61	2081	1.61E+00	335	1.00	0.73	-
62	2082	1.61E+00	335	1.00	0.73	-
63	2083	1.61E+00	335	1.00	0.73	-
64	2084	1.61E+00	335	1.00	0.73	-
65	2085	1.61E+00	335	1.00	0.73	-
66	2086	1.61E+00	335	1.00	0.73	-
67	2087	1.61E+00	335	1.00	0.73	-
68	2088	1.61E+00	335	1.00	0.73	-
69	2089	1.61E+00	335	1.00	0.73	-
70	2090	1.61E+00	335	1.00	0.73	-

0.54	Chronic Hazard Impact
1	Significance Threshold
No	Significant?
-	Cancer Risk
10	Significance Threshold
No	Significant?

71	2091	1.61E+00	335	1.00	0.73	-
72	2092	1.61E+00	335	1.00	0.73	-
73	2093	1.61E+00	335	1.00	0.73	-
74	2094	1.61E+00	335	1.00	0.73	-
75	2095	1.61E+00	335	1.00	0.73	-
76	2096	1.61E+00	335	1.00	0.73	-
77	2097	1.61E+00	335	1.00	0.73	-
78	2098	1.61E+00	335	1.00	0.73	-
79	2099	1.61E+00	335	1.00	0.73	-
80	2100	1.61E+00	335	1.00	0.73	-
81	2101	1.61E+00	335	1.00	0.73	-