Air Quality Study

for the

Biomass Utilization Fund,

Tuolomne BioEnergy Inc., Woody Biomass Pellet Manufacturing Facility

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1 INTRODUCTION

Ascent Environmental (Ascent) has conducted a comprehensive air quality assessment for the Tuolumne Bioenergy Woody Biomass Pellet Manufacturing Facility (project) to determine the significance of the project's estimated emissions to support environmental review pursuant to the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). The project proposes to construct and operate a woody biomass pellet manufacturing facility in Sonora, CA. The biomass feedstocks would be sourced from low-market-value biomass piles from various forestry thinning and logging activities at sites within 40 miles of the project site. Without the project, these biomass piles would otherwise be likely subject to open pile burning.

This report presents the methodology and results of the estimated criteria air pollutant emissions, toxic air contaminants, and odors, including emissions offset through the avoidance of open pile burning of the same biomass feedstock. The offset pile burning and proposed pellet manufacturing facility would both be located within the Mountain Counties Air Basin. Thus, any regional increase or decrease in criteria air pollutant emissions from the project would occur within the same air basin and can be evaluated as a single net change in emissions.

2 PROJECT DESCRIPTION

The project proposes to construct and operate a woody biomass pellet manufacturing facility (pellet mill) on a 3.27 acre leased property in an industrial business park in Sonora, CA, located in Tuolumne County. According to the California Biomass Utilization Facility Feedstock Supply Report, the project would have access up to 44,000 bone dry tons (BDT) of biomass annually (Department of Housing and Community Development 2018: Table 5.3). The pellet mill is expected to produce between 29,000 and 31,000 tons of wood pellets per year, with a maximum production capacity of 31,200 tons per year. Approximately 9,293 BDT of additional biomass would be used to fuel the on-site combined heat and power (CHP) system proposed for the facility. In total, the facility would consume between 38,293 and 40,493 BDT of biomass. The CHP system will provide heat and electricity for biomass drying, the pellet mill, and other on-site energy needs (e.g., office space, outdoor lighting). The biomass on-site would also be handled via enclosed electrical receivers and conveyers and off-road material handling equipment. The pellet mill would have the ability to run 24 hours per day (up to 8,000 hours per year), 7 days per week, and 333 days per year. Haul trucks are assumed to operate 5 days per week and 42 weeks per year (240 days per year).

The project would source its biomass from small understory trees, shrubs, and limbs and branches left over from forest thinning and fire fuel reduction on U.S. Forest Service and private lands within 40 miles of the project site. In the absence of the project, under existing conditions, the 44,000 BDT of biomass is pile burned annually, generating criteria air pollutants and greenhouse gas (GHG) emissions. GHG emissions from the project are evaluated in a separate Greenhouse Gas Study for this project.

Under the project, the biomass piles would be collected and chipped at two different zones, located up to 20 miles (Zone 1) and 40 miles (Zone 2) from the project site. Deliveries would be made to the project site five days per week. At the project site, the chipped biomass would be dried in a biomass dryer, heated by the CHP system, until it reaches a 12 percent moisture content. About 24 percent of the dried biomass would be used to fuel the CHP system and the remaining biomass would be processed in the pellet mill to manufacture wood pellets. Most material handling will be done via electric conveyer belts and receivers. On-site material handling would also include the use of off-road equipment, such as a yard tractor with a hooklift trailer to dump bins into a receiver or stack and store pallets of finished bagged pellets. The manufactured wood pellets would then be shipped for retail distribution. Waste ash (approximately 700 tons per year) would also be disposed at a compost facility less than one mile from the project site.

The project would purchase all new off-road equipment and on-road trucks to support the operations.

3 ENVIRONMENTAL SETTING

The project site is located in Sonora, California, which is under the jurisdiction of the Tuolumne County Air Pollution Control District (TCAPCD) and is within the Mountain Counties Air Basin (MCAB). The MCAB includes all of Amador, Calaveras, El Dorado, Mariposa, Nevada, Placer, Plumas, Sierra, and Tuolumne Counties. Ambient concentrations of air pollutants are determined by the levels of emissions released by pollutant sources and the ability of the atmosphere to transport and dilute such emissions. Natural factors that affect transport and dilution include terrain, wind, atmospheric stability, and the presence of sunlight.

Concentrations of criteria air pollutants are used to indicate the quality of the ambient air. A brief description of key criteria air pollutants is provided below. Table 1 summarizes the emission source type and the foreseeable health impacts that result from exposure to concentrations of criteria air pollutants that exceed the applicable California Ambient Air Quality Standards (CAAQS) and national ambient air quality standards NAAQS.

Table 1 Sources and Health Effects of Criteria Air Pollutants

Pollutant	Sources	Acute[1] Health Effects	Chronic[2] Health Effects
Ozone	secondary pollutant resulting from reaction of ROG and NO_X in presence of sunlight. ROG emissions result from incomplete combustion and evaporation of chemical solvents and fuels; NO_X results from the combustion of fuels	increased respiration and pulmonary resistance; cough, pain, shortness of breath, lung inflammation	permeability of respiratory epithelia, possibility of permanent lung impairment
Carbon monoxide (CO)	incomplete combustion of fuels; motor vehicle exhaust	headache, dizziness, fatigue, nausea, vomiting, death	permanent heart and brain damage
Nitrogen dioxide (NO_2)	combustion devices; e.g., boilers, gas turbines, and mobile and stationary reciprocating internal combustion engines	coughing, difficulty breathing, vomiting, headache, eye irritation, chemical pneumonitis or pulmonary edema; breathing abnormalities, cough, cyanosis, chest pain, rapid heartbeat, death	chronic bronchitis, decreased lung function
Sulfur dioxide (SO_2)	coal and oil combustion, steel mills, refineries, and pulp and paper mills	Irritation of upper respiratory tract, increased asthma symptoms	There is insufficient evidence linking SO_2 exposure to chronic health impacts.
Respirable particulate matter (PM_{10}), Fine particulate matter ($PM_{2.5}$)	fugitive dust, soot, smoke, mobile and stationary sources, construction, fires and natural windblown dust, and formation in the atmosphere by condensation and/or transformation of SO_2 and ROG	breathing and respiratory symptoms, aggravation of existing respiratory and cardiovascular diseases, premature death	alterations to the immune system, carcinogenesis
Lead	metal processing	reproductive/ developmental effects (fetuses and children)	numerous effects including neurological, endocrine, and cardiovascular effects

Notes: NO_X = oxides of nitrogen; ROG = reactive organic gases; PM_{10} = respirable particulate matter with an aerodynamic diameter of 10 microns or less; $PM_{2.5}$ = fine particulate matter with an aerodynamic diameter of 2.5 microns or less; SO_2 = sulfur dioxide; CO = carbon monoxide

[1] Acute health effects refer to immediate illnesses caused by short-term exposures to criteria air pollutants at fairly high concentrations. An example of an acute health effect includes fatality resulting from short-term exposure to carbon monoxide levels in excess of 1,200 parts per million.

[2] Chronic health effects refer to cumulative effects of long-term exposures to criteria air pollutants, usually at lower, ambient concentrations. An example of a chronic health effect includes the development of cancer from prolonged exposure to particulate matter at concentrations above the national ambient air quality standards.

Sources: U.S Environmental Protection Agency (EPA) 2018

OZONE

Ozone is a photochemical oxidant (a substance whose oxygen combines chemically with another substance in the presence of sunlight) and the primary component of smog. Ozone is not directly emitted into the air but is formed as a secondary pollutant through complex chemical reactions between precursor emissions of reactive organic gases (ROG) and oxides of nitrogen (NO_X) in the presence of sunlight. ROG are volatile organic compounds that are photochemically reactive. ROG emissions result primarily from incomplete combustion and the evaporation of chemical solvents and fuels. NO_X are a group of gaseous compounds of nitrogen and oxygen that result from the combustion of fuels. ROGs and related compounds are also referred to as volatile organic compounds (VOCs), most commonly by EPA. EPA's and California Air Resources Board's (CARB) list of compounds recognized as VOC and ROG differ slightly. In general, most ROG emissions are included as a subset of VOCs. Thus, ROG is assumed to be a suitable substitute for VOC for the purposes of this analysis (CARB 2004).

Emissions of the ozone precursors ROG and NO_X have decreased over the past several years because of more stringent motor vehicle standards and cleaner burning fuels. Emissions of ROG and NO_X decreased from 2000 to 2010 and are projected to continue decreasing from 2010 to 2035 (CARB 2013).

NITROGEN DIOXIDE

Nitrogen dioxide (NO_2) is a brownish, highly reactive gas that is present in all urban environments. The major human-made sources of NO_2 are combustion devices, such as boilers, gas turbines, and mobile and stationary reciprocating internal combustion engines. Combustion devices emit primarily nitric oxide (NO), which reacts through oxidation in the atmosphere to form NO_2. The combined emissions of NO and NO_2 are referred to as NO_X and are reported as equivalent NO_2. Because NO_2 is formed and depleted by reactions associated with photochemical smog (ozone), the NO_2 concentration in a particular geographical area may not be representative of the local sources of NO_X emissions (EPA 2012).

PARTICULATE MATTER

Respirable particulate matter with an aerodynamic diameter of 10 micrometers or less is referred to as PM_{10}. PM_{10} consists of particulate matter emitted directly into the air, such as fugitive dust, soot, and smoke from mobile and stationary sources, construction operations, fires and natural windblown dust, and particulate matter formed in the atmosphere by reaction of gaseous precursors (CARB 2013). Fine particulate matter ($PM_{2.5}$) includes a subgroup of smaller particles that have an aerodynamic diameter of 2.5 micrometers or less. PM_{10} emissions in the treatable landscape are dominated by emissions from area sources, primarily fugitive dust from vehicle travel on unpaved and paved roads, farming operations, construction and demolition, and particles from residential fuel combustion.

Direct emissions of PM_{10} in California have increased slightly over the last 20 years, and are projected to increase very slightly through 2035. Emissions of $PM_{2.5}$ are dominated by several of the same sources as emissions of PM_{10}, but are more greatly influenced by combustion sources (CARB 2013).

CARBON MONOXIDE

CO is an odorless and invisible gas. It is a non-reactive pollutant that is a product of incomplete combustion of gasoline in automobile engines. CO is a localized pollutant, and the highest concentrations are found near the source. Ambient carbon monoxide concentrations generally follow the spatial and temporal distributions of vehicular traffic and are influenced by wind speed and atmospheric mixing. CO concentrations are highest in flat areas on still winter nights when temperature inversions trap the carbon monoxide near the ground. When inhaled at high concentrations, carbon monoxide reduces the oxygen-carrying capacity of the blood, which, in turn, results in reduced oxygen reaching parts of the body.

ATTAINMENT DESIGNATIONS

CARB and EPA designate each county (or portions of counties) within California as attainment, maintenance, or nonattainment based on the area's ability to maintain ambient air concentrations below the applicable standards (i.e., CAAQS, NAAQS). Areas are designated as attainment if ambient air concentrations of a criteria pollutant (or precursor) are below the NAAQS. Areas are designated as nonattainment if ambient air concentrations are above the NAAQS. Areas previously designated as nonattainment that subsequently demonstrated compliance with the NAAQS are designated as maintenance. Table 2 shows the attainment status for each criteria air pollutant with respect to the CAAQS and the NAAQS in Tuolumne County.

Table 2 Attainment Status Designations for Tuolumne County

Pollutant	National Ambient Air Quality Standard	California Ambient Air Quality Standard
Ozone	Attainment (1-hour)[1]	Nonattainment (1-hour)
	Nonattainment (8-hour)[3] Classification=Moderate	Nonattainment (8-hour)
	Nonattainment (8-hour)[4] Classification= Marginal	
Respirable particulate matter (PM_{10})	Attainment (24-hour)	Unclassified (24-hour)
		Unclassified (Annual)
Fine particulate matter ($PM_{2.5}$)	Attainment (24-hour)	(No State Standard for 24-Hour)
	Attainment (Annual)	Unclassified (Annual)
Carbon monoxide (CO)	Attainment (1-hour)	Attainment (1-hour)
	Attainment (8-hour)	Attainment (8-hour)
Nitrogen dioxide (NO_2)	Unclassified/Attainment (1-hour)	Attainment (1-hour)
	Unclassified/Attainment (Annual)	Attainment (Annual)
Sulfur dioxide (SO_2)[5]	Attainment (1-Hour)	Attainment (1-hour)
		Attainment (24-hour)
Lead (Particulate)	Attainment (3-month rolling avg.)	Attainment (30 day average)
Hydrogen Sulfide	No Federal Standard	Unclassified (1-hour)
Sulfates		Attainment (24-hour)
Visibly Reducing Particles		Unclassified (8-hour)
Vinyl Chloride		Unclassified (24-hour)

Notes:

1 Air Quality meets federal 1-hour Ozone standard (77 FR 64036). EPA revoked this standard, but some associated requirements still apply.

2 Per Health and Safety Code (HSC) § 40921.5(c), the classification is based on 1989 – 1991 data, and therefore does not change.

3 1997 Standard.

4 2015 Standard.

5 2010 Standard.

Source: CARB 2019a, EPA 2021

SENSITIVE RECEPTORS

Sensitive receptors are generally considered to include those land uses where exposure to pollutants could result in health-related risks to sensitive individuals, such as children or the elderly. Residential dwellings, schools, hospitals, outdoor playgrounds, places of worship, and similar facilities are of primary concern because of the presence of individuals particularly sensitive to pollutants and/or the potential for increased and prolonged exposure of individuals to pollutants. Although the project site is located within an industrial land use area and there are no residential land uses, schools, or hospitals within 1,000 feet of the project boundary, there is one sensitive receptors within 1,000 feet of the project boundary, an outdoor baseball park facility (Standard Park). The details of this receptor are summarized in Table 3.

Table 3 Sensitive Receptors within 1,000 feet of the Project Site

Receptor	Location (easting (m), northing (m))[1]	Distance from Project Site (ft)	Distance from Project Site (m)
Standard Park	735969.69, 4204699.56	270	80

Note: ft = feet, m = meters

[1] Based on Universal Transverse Mercator coordinates

Source: Compiled by Ascent Environmental., Inc. in 2021

4 REGULATORY BACKGROUND

At the federal level, the EPA implements the national air quality programs. EPA's air quality mandates are drawn primarily from the Federal Clean Air Act (CAA), enacted in 1970. The most recent major amendments were made by Congress in 1990. The CAA requires EPA to establish National Ambient Air Quality Standards (NAAQS). EPA has established primary and secondary NAAQS for the following criteria air pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (i.e., respirable particulate matter [PM_{10}] and fine particulate matter [$PM_{2.5}$]), and lead (Pb). The primary standards protect public health, and the secondary standards protect public welfare. The CAA also requires each state to prepare an air quality control plan referred to as a State Implementation Plan (SIP). The Federal Clean Air Act Amendments (CAAA) added requirements for states with nonattainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. The SIP is modified periodically to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies. EPA reviews all state SIPs to determine whether they conform to the mandates of the CAA and its amendments and whether implementing them will achieve air quality goals. If EPA determines a SIP to be inadequate, a Federal Implementation Plan that imposes additional control measures may be prepared for the nonattainment area. If the state fails to submit an approvable SIP or to implement the plan within the mandated time frame, sanctions may be applied to transportation funding and stationary air pollution sources in the air basins.

Specifically, Section 176 (C) of the CAA (42 U.S.C. 7506 [C]) requires any entity of the federal government that engages in, supports, or in any way provides financial support for, licenses or permits, or approves any activity to demonstrate that the action conforms to the applicable SIP required under Section 110 (a) of the CAA (42 U.S.C. 7401 [a]) before the action is otherwise approved. In this context, conformity means that such federal actions must be consistent with the SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of those standards. Each federal agency must determine that any action that is proposed by the agency and that is subject to the regulation implementing the conformity requirements would, in fact conform to the applicable SIP before the action is taken.

On November 30, 1993, EPA promulgated final general conformity regulations at 40 CFR 93 Subpart B for all federal activities except those covered under the transportation conformity. The general conformity regulations apply to a proposed federal action in a nonattainment or maintenance area if the total of direct and indirect emissions of the relevant criteria pollutant and precursor emissions caused by the proposed action equal or exceed certain *de minimis* amounts; thus, requiring the federal agency to make a determination of general conformity.

5 SIGNIFICANCE CRITERIA

As mentioned, a general conformity determination (GCD) is required if a federal action results in the generation of air pollutants for which the total of direct and indirect emissions equals or exceeds the *de minimis* thresholds as shown below in Table 4. These emission rates are expressed in units of tons per year and are compared to the total of direct and indirect emissions caused by the project for each calendar year when construction activities would take place.

It should be noted that because ozone is a secondary pollutant (i.e., it is not emitted directly into the atmosphere, but formed in the atmosphere from the photochemical reactions in the presence of sunlight), its *de minimis* level is based on the primary emissions of precursor pollutants – NO_X and VOCs. If the net emissions of either NO_X or VOCs exceeds the *de minimis* level for ozone, the project is subject to a GCD. In addition, there are no *de minimis* levels for pollutants for which the MCAB is designated as an attainment area.

Table 4 De Minimis Thresholds for Determining Applicability of General Conformity Requirements for Federal Actions

Pollutant	Federal Classification	General Conformity De Minimis Levels (tons per year)
Ozone	Nonattainment (Marginal)	NA
VOC (as an ozone precursor)		50
NO_x (as an ozone precursor)		100

Notes: NA: Not Applicable

Source: EPA 2021

In addition, the TCAPCD has established specific thresholds for air quality impacts evaluated under CEQA. Pursuant to the State CEQA Guidelines, air quality impacts related to the project would be significant if the project would:

- conflict with or obstruct implementation of the applicable air quality plan;
- violate any air quality standard or contribute substantially to an existing or project air quality violation—for the purposes of the project locations, result in construction or operations of a project that generated emissions in excess of the following thresholds, except carbon monoxide, used by the TCAPCD:
  - reactive organic gases (ROG) – 1,000 pounds per day or 100 tons per year
  - nitrous oxides (NOX) – 1,000 pounds per day or 100 tons per year
  - particulate matter with diameters generally 10 micrometers and smaller (PM10) – 1,000 pounds per day or 100 tons per year
  - carbon monoxide (CO) – result in an affected intersection experiencing more than 31,600 vehicles per hour.
- result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed qualitative thresholds for ozone precursors);
- expose sensitive receptors to a substantial incremental increase in toxic air contaminants (TAC) emissions that exceed 10 in 1 million for carcinogenic risk (i.e., the risk of developing cancer) and/or a noncarcinogenic hazard index of 1.0 or greater; or
- create objectionable odors affecting a substantial number of people. (TCAPCD 2017)

6 CRITERIA AIR POLLUTANT EMISSIONS

6.1 CONSTRUCTION EMISSIONS

The project would construct the proposed woody biomass pellet manufacturing facility on a 3.27-acre lot. The existing lot is undeveloped and has minimal vegetative cover. Construction of the proposed facilities would require site preparation and grading activities. Based on the project site plan, the project would construct a 4,000 square foot (sf) manufacturing facility, a 5,000-sf covered outdoor storage area, two 100-foot-diameter chip storage silos, outdoor standalone equipment (e.g., dryer, battery, bins, chip receivers, furnace), 10,200 sf of flatwork concrete, 3,300 sf of landscaped area, 3,600 sf of pavement, and a 22,000-sf graveled storage yard. According to TBI, the outdoor standalone equipment is assumed to come preassembled and would require cranes for equipment placement (TBI 2021). Construction is assumed to begin in February 2022. The project site plan is included in Appendix B.

Criteria air pollutant emissions from construction of the proposed project were modeled using the California Emissions Estimator Model (CalEEMod), version 2016.3.2 (California Air Pollution Control Officers Association [CAPCOA] 2016a), which is consistent with analysis performed in the Greenhouse Gas Study. A newer version of CalEEMod (version 2020.4.0) was released on June 23, 2020, after the Greenhouse Gas Study was completed. Based on the information and assumptions described and per discussions with the applicant, CalEEMod estimated a construction duration period of approximately four months, with construction activities ending by June 2022. Construction activities were assumed to occur for 8 hours per day and 5 days per week. The proposed land uses were matched to the most similar land use types available in CalEEMod, which CalEEMod uses to estimate default modeling assumptions (e.g., the construction phasing durations, number of equipment, equipment hours per day, and worker trips). These assumptions are shown in the CalEEMod output remarks in Appendix C. Material hauling emissions during the grading phase were adjusted to account for the gravel that would be needed for the storage yard, assuming a depth of eight inches and an average weight of 1.35 tons per cubic yard of gravel (Inch Calculator 2021). Additional modeling details can be found in Appendix C.

Based on the modeling conducted, Tables 5 and 6 show the estimated criteria air pollutant emissions that would result from construction activities over the four-month construction period.

Table 5 Estimated Construction Criteria Air Pollutant Emissions (Daily)

Phase	ROG (lb/day)	NO_X (lb/day)	PM_{10} (lb/day)	CO (lb/day)
Site Preparation	1	15	7	8
Grading	1	14	6	7
Building Construction	2	17	1	16
Paving	1	7	1	10
Architectural Coating	70	1	0	2
Construction Maximum Daily Emissions	70	17	7	16
TCAPCD Significance Threshold	1,000	1,000	1,000	NA
De minimis Threshold[1]	NA	NA	NA	NA
Exceed Thresholds?	No	No	No	NA

Note: ROG = reactive organic gases, NO_X = oxides of nitrogen, PM_{10} = inhalable particle with diameters of 10 micrometers or smaller, CO = carbon monoxide, TCAPCD = Tuolumne County Air Pollution Control District, NA = not applicable

[1] *De minimis* thresholds are provided in tons per year only.

Source: Modeled by Ascent Environmental., Inc. in 2021

Table 6 Estimated Construction Criteria Air Pollutant Emissions (Annual)

Phase	ROG (lb/year)	NO_X (lb/year)	PM_{10} (lb/year)	CO (lb/year)
Site Preparation	3	29	13	16
Grading	5	55	23	28
Building Construction	133	1006	61	972
Paving	9	69	5	99
Architectural Coating	701	14	1	22
Construction Total (lb/year)	850	1174	103	1137
Construction Total (tons/year)	0.425	0.587	0.052	0.569
TCAPCD Significance Threshold (tons/year)	100	100	100	NA
De minimis Threshold (tons/year)	50	100	NA	NA
Exceed Thresholds?	No	No	No	NA

Note: ROG = reactive organic gases, NOX = oxides of nitrogen, PM10 = inhalable particle with diameters of 10 micrometers or smaller, CO = carbon monoxide, TCAPCD = Tuolumne County Air Pollution Control District, NA = not applicable, lb = pounds.

Source: Modeled by Ascent Environmental., Inc. in 2021

As shown in Tables 5 and 6, criteria air pollutant emissions generated by project construction would not exceed TCAPCD's significance thresholds. Therefore, air quality impacts related to construction would be **less than significant**.

6.2 OPERATIONAL EMISSIONS

Operation of the proposed project would involve chipping at the forest biomass pile collection sites, hauling the chips to the pellet mill, drying and milling of the chips at the mill, and delivery of the wood pellets for retail sale. These activities would result in criteria air pollutant emissions from the operation of diesel chipping and biomass handling equipment, worker trips to the collection sites and pellet mill, diesel truck haul trips between the biomass collection sites, pellet mill, and retail distribution; and combustion of a portion of the biomass in a CHP system to provide heat and electricity to power the pellet mill and other accessory buildings and lighting. The proposed project would not use natural gas or grid-based electricity but would operate a standby generator for initial system start-up and emergencies. Pellet mill operations are assumed to occur 333 days per year and up to 8,000 hours per year, and the first full year of operation would begin in 2023. Haul trucks and field operations are assumed to operate 240 days per year, or 5 days per week and 48 weeks per year.

The modeling assumptions for the off-road mobile sources, on-road mobile sources, biomass combustion at the pellet mill, and offset emissions from avoided pile burning are described in the following sections. Detailed calculations and assumptions can be found in Appendix A.

6.2.1 Off-Road Mobile Sources

Off-road mobile sources used during project operations include diesel-fueled chippers, forwarders, tractors, and other material handling equipment. Based on information provided by TBI, equipment at the forest collection sites would include all new 500-horsepower (hp) Bruks chippers attached to 285-hp Ponsse forwarders and one 217-hp JBC 4220 field tractor (TBI 2021). During biomass collection, three chippers and three forwarders are assumed to operate, one set in Zone 1 and two sets in Zone 2, based on the amount of biomass available in each Zone (TBI 2021). This equipment would operate 8 hours per day and 333 days per year. During pellet mill operations, diesel off-road equipment, such as tractor, chip reloaders, and bin trucks, are assumed to handle material at various stages of the manufacturing process (TBI 2021). (Patenaude pers. comm., 2021a, 2021b).

All off-road equipment manufactured after 2014 is required to meet EPA's Tier 4 emissions standards. The proposed off-road equipment and corresponding horsepower ratings were matched with emission factors from EPA's *Nonroad Compression-Ignition Engines: Exhaust Emission Standards* for Tier 4 engines to quantify the criteria air pollutant emissions from off-road mobile sources (EPA 2016). The equipment load factors, which estimate the percent of time during which an engine is engaged during operations, were obtained from CalEEMod's default assumptions for material handling equipment and off-highway trucks (CAPCOA 2016b:Table 3.3). The forwarder/chipper combination is assumed to operate as two separate engines, but because of their tandem operations the load factors were assumed to be 50 percent of the default assumptions in CalEEmod. The activity and equipment assumptions, including the number of equipment, hours of operation per year, and load factors can be found in Table 1 of the Greenhouse Gas Study for this project. Emission factors and calculated criteria air pollutant emissions are shown in Tables 7 through 9 below. Additional modeling information is available in Appendix A.

Table 7 Off-Road Equipment Power Ratings, Load Factors, and Emission Factors

Activity	Off-Road Equipment (hp)	Load Factor	ROG (lb/hr)	NO_X (lb/hr)	PM_{10} (lb/hr)	CO (lb/hr)
Forest Biomass Collection	Forwarder (285)	0.20	0.09	0.19	0.01	1.64
	Chipper (500)	0.20	0.16	0.33	0.02	2.88
	Field Tractor (68)	0.38	0.07	0.14	0.01	0.80
Pellet Mill Operations	Yard Tractor (125)	0.40	0.04	0.08	<0.01	1.03
	Field Tractor (68)	0.40	0.02	0.04	<0.01	0.56
	Bin Truck (400)	0.40	0.12	0.26	0.01	2.30

Note: ROG = reactive organic gases, NO_X = nitrous oxide; PM_{10} = particulate matter with diameters generally 10 micrometers and smaller, CO = carbon monoxide, lb/hr = pounds per hour, hp = horsepower

Source: CAPCOA 2016:Table 3.3, EPA 2016

Table 8 Estimated Off-Road Equipment Daily Emissions

Activity	Off-Road Equipment	ROG (lb/day)	NO_X (lb/day)	PM_{10} (lb/day)	CO (lb/day)
Forest Biomass Collection	Forwarder	0.43	0.90	0.04	7.87
	Chipper	0.75	1.58	0.08	13.81
	Field Tractor	0.62	1.30	0.07	7.33
Forest Biomass Collection Subtotal		**1.80**	**3.78**	**0.19**	**29.01**
Pellet Mill Operations	Yard Tractor	0.02	0.03	<0.01	0.41
	Field Tractor	0.01	0.01	<0.01	0.15
	Bin Truck	0.07	0.16	0.01	1.38
Mill Operations Subtotal		**0.10**	**0.20**	**0.01**	**1.94**
Total		**1.89**	**3.98**	**0.20**	**30.95**

Note: ROG = reactive organic gases, NO_X = nitrous oxide; PM_{10} = particulate matter with diameters generally 10 micrometers and smaller, CO = carbon monoxide, lb/day = pounds per day. Values may not sum exactly due to rounding.

Source: Modeled by Ascent Environmental. Inc., in 2021 based on information received from TBI (TBI 2021).

Table 9 Estimated Off-Road Equipment Annual Emissions

Activity	Off-Road Equipment	ROG (tons/year)	NO_X (tons/year)	PM_{10} (tons/year)	CO (tons/year)
Forest Biomass Collection[1]	Forwarder	0.05	0.11	0.01	0.94
	Chipper	0.09	0.19	0.01	1.66
	Field Tractor	0.07	0.16	0.01	0.88
Forest Biomass Collection Subtotal		**0.22**	**0.45**	**0.02**	**3.48**
Pellet Mill Operations[3]	Yard Tractor	<0.01	0.01	0.0003[2]	0.07
	Field Tractor	<0.01	<0.01	0.0001[2]	0.02
	Bin Truck	0.01	0.03	0.0013[2]	0.23
Mill Operations Subtotal		**0.02**	**0.03**	**0.0017[2]**	**0.32**
Total		**0.23**	**0.49**	**0.02**	**3.80**

Note: ROG = reactive organic gases, NO_X = nitrous oxide; PM_{10} = particulate matter with diameters generally 10 micrometers and smaller, CO = carbon monoxide, lb/day = pounds per day. Values may not sum exactly due to rounding.

[1] Calculated from daily emissions and assumption of 240 days per year, consistent with assumptions for haul truck days.

[2] Additional significant figures are shown for these values to substantiate the calculations for diesel particulate matter emissions discussed in Section 7: Toxic Air Contaminants

[3] Calculated from daily emissions and assumption of 333 days per year, consistent with assumptions for the pellet mill operations.

Source: Modeled by Ascent Environmental. Inc., in 2021 based on information received from TBI (TBI 2021).

6.2.2 On-Road Mobile Sources

On-road mobile sources include worker trips (to the forest biomass collection sites and the pellet mill) and diesel haul truck trips (between the forest biomass collection sites, the pellet mill, and retail sales distribution). For worker trips, each Zone is assumed to have 6 workers and the pellet mill is assumed to employ 25 workers (TBI 2021). Based on the default worker commute assumptions in CalEEMod, each worker's commute trip is assumed to be an average of 16.8 miles. The calculated vehicle miles traveled (VMT) for worker commute trips were then applied to the average criteria air pollutant emission factors for light duty vehicles in Tuolumne County for calendar year 2023, as derived from CARB's EMission FACtor model (EMFAC), version EMFAC 2021 (CARB 2021b).

Emissions from haul trucks include exhaust from on-road transportation and from idling during loading and unloading at each terminal site. Haul truck activities are divided into two categories: transportation from the biomass collection site to the pellet mill and transportation from the pellet mill to retail sales and ash disposal. The number of haul trips for each category was calculated based on the tonnage of material needed to be transported, the capacity of the trucks, and the trip lengths. The project is anticipated to haul up to 12,821 BDT of biomass from Zone 1 and up to 27,473 BDT from Zone 2 annually to the project site. BDT refers to the equivalent tonnage of the biomass at zero percent moisture. Assuming the collected green biomass has a moisture content of 35 percent, the haul trucks are assumed to carry up to 19,724 tons of green biomass from Zone 1 and up to 42,265 tons from Zone 2. In all cases, trucks are assumed to carry 20 tons per load. The trip lengths from Zone 1 and 2 to the project site were estimated to be 20 and 40 miles per trip, respectively, based on information provided by TBI. The trip length between the pellet mill and retail sales was estimated to be 50 miles, which is the approximate driving distance between the project site and Merced, CA, which is the closest urban center. Trips outside of this range were not included due to the speculative nature of further retail destinations and the tonnages shipped beyond this range. Trucks were assumed to idle for a maximum of five minutes at each site (biomass collection and pellet mill) to account for loading and unloading activities. Under its adopted Airborne Toxic Control Measure set forth in Title 13 of the California Code of Regulations, Section 2485, CARB requires that diesel-fueled commercial motor vehicles with gross vehicle weight ratings greater than 10,000 pounds not idles for longer than five minutes at any location (CARB 2021c).

To calculate the emissions from haul trucks, the calculated VMT and total idling time for haul truck trips were applied to the average criteria air pollutant emission factors for T6 in-state heavy duty diesel trucks in Tuolumne County for calendar year 2023 for 2022 truck model years, as derived from EMFAC 2021 (CARB 2021b). The project applicant has identified that all new vehicles would be purchased for this project, which would begin full operations in 2023 (Patenaude, pers comm., 2021b). Additional modeling information is available in Appendix A.

The on-road mobile source activity and vehicle trip assumptions, including trips per day, trip length, and VMT per year can be found in Table 2 of the Greenhouse Gas Study for this project. Criteria air pollutant emission factors and calculated emissions are shown in Tables 10 through 12.

Table 10 On-Road Mobile Source Emission Factors

Activity	ROG	NO_X	PM_{10}	CO
Commute Trips[1]				
Worker Trips (lb/mi)	5.69E-04	4.59E-04	9.77E-06	3.40E-03
Truck Haul Trips and Idling[2]				
Haul Trips (lb/mi)	1.74E-05	8.67E-03	4.32E-05	4.84E-03
Idling (g/min)	1.05E-04	7.16E-03	1.93E-06	4.99E-03

Note: ROG = reactive organic gases, NO_X = nitrous oxide; PM_{10} = particulate matter with diameters generally 10 micrometers and smaller, CO = carbon monoxide, lb/mi = pounds per mile, g/min = grams per minute.

[1] Commute trip average vehicle emission factors based on the LDA, LDT1, and LDT2 vehicle categories in EMFAC 2021.

[2] Haul truck emission factors based on the diesel "T6 instate heavy" vehicle category and 2022 model year in EMFAC 2021. EMFAC 2021 results reflect conditions for Tuolumne County for calendar year 2023.

Source: Modeled by Ascent Environmental., Inc. in 2021

Table 11 Estimated On-Road Mobile Source Daily Emissions

Activity	ROG (lb/day)	NO_X (lb/day)	PM_{10} (lb/day)	CO (lb/day)
Commute Trips				
Biomass Collection – Worker Trips	0.344	0.278	0.006	2.059
Pellet Mill – Worker Trips	0.478	0.386	0.008	2.859
Commute Trips Subtotal	0.822	0.664	0.014	4.918
Haul Trips				
Zone 1 Biomass Collection to Pellet Mill	0.003	1.424	0.007	0.796
Zone 2 Biomass Collection to Pellet Mill	0.006	3.052	0.015	1.706
Zone 1 Idling	<0.001	0.001	<0.001	0.001
Zone 2 Idling	<0.001	0.001	<0.001	0.001
Biomass Collection Subtotal	0.009	4.478	0.022	2.503
Idling	<0.001	0.001	<0.001	0.001
Pellet Mill to Ash Disposal	<0.001	0.003	<0.001	0.001
Pellet Mill to Retail Sales	0.011	5.416	0.027	3.027
Pellet Mill Trips Subtotal	0.011	5.420	0.027	3.029
Haul Trips Subtotal	0.020	9.898	0.049	5.532
TOTAL On-Road Mobile Sources	0.841	10.562	0.063	10.450

Note: ROG = reactive organic gases, NO_X = nitrous oxide; PM_{10} = particulate matter with diameters generally 10 micrometers and smaller, CO = carbon monoxide, lb/day = pounds per day. Values may not sum due to rounding.

Source: Modeled by Ascent Environmental., Inc. in 2021

Table 12 Estimated On-Road Mobile Source Annual Emissions

Activity	ROG (tons/year)	NO_X (tons/year)	PM_{10} (tons/year)	CO (tons/year)
Commute Trips				
Biomass Collection – Worker Trips	0.041	0.033	0.001	0.247
Pellet Mill – Worker Trips	0.057	0.046	0.001	0.343
Commute Trips Subtotal	**0.099**	**0.080**	**0.002**	**0.590**
Haul Trips				
Zone 1 Biomass Collection to Pellet Mill	<0.001	0.171	0.001	0.096
Zone 2 Biomass Collection to Pellet Mill	0.001	0.366	0.002	0.205
Zone 1 Idling	<0.001	<0.001	<0.001	<0.001
Zone 2 Idling	<0.001	<0.001	<0.001	<0.001
Biomass Collection Subtotal	**0.001**	**0.537**	**0.003**	**0.300**
Idling	<0.001	<0.001	<0.001	<0.001
Pellet Mill to Ash Disposal	<0.001	<0.001	<0.001	<0.001
Pellet Mill to Retail Sales	0.001	0.650	0.003	0.363
Pellet Mill Trips Subtotal	**0.001**	**0.650**	**0.003**	**0.363**
Haul Trips Subtotal	**0.002**	**1.188**	**0.006**	**0.664**
TOTAL On-Road Mobile Sources	**0.101**	**1.267**	**0.008**	**1.254**

Note: ROG = reactive organic gases, NO_X = nitrous oxide; PM_{10} = particulate matter with diameters generally 10 micrometers and smaller, CO = carbon monoxide. Values may not sum due to rounding.

Source: Modeled by Ascent Environmental., Inc. in 2021

6.2.3 Pellet Mill Operations (Biomass Combustion and Fugitive Dust)

The proposed project operations at the pellet mill would result in criteria air pollutant emissions from the on-site combustion of 9,293 BDT of biomass per year and in fugitive dust from the processing of 31,000 BDT of biomass for pellet production. Accounting for 12 percent moisture content in oven-dried biomass, this equates to 10,560 tons per year used for combustion and 35,227 tons per year used in pellet production. With respect to combustion, oven-dried tonnage contrasts with bone dry tonnage in that BDT is a metric of the fuel contained within biomass, as any moisture cannot be combusted. Criteria air pollutant emissions from the on-site combustion of biomass were calculated based on emission factors and average operating hours of the SuperBrix Teo-IV6000 furnace, as recommended by the applicant as a proxy for the proposed pellet mill CHP system (Patenaude, pers. comm., 2021c). The mill's furnace will have a maximum consumption rate of 1.32 tons of dried wood (12 percent moisture content) per hour and operates 24 hours per day. Fugitive PM dust emissions from pellet mill production are filtered through a series of cyclones and baghouses, resulting in an efficiency where up to 99.999 percent of particles larger than 3 microns are filtered out (Patenaude, pers. comm., 2021d).

Based on values provided by the applicant, the furnace would emit 2.17 pounds of NO_X, 0.30 pounds of SO_2, and 0.95 pounds of PM_{10} per hour. Although TCAPCD does not have thresholds for SO_2, these values are provided for TAC quantification purposes. This hot exhaust is vented through a heat exchanger then a belt dryer that dries the pellets. The dryer functions as a filter for the PM emissions as the exhaust is slowed and particulates fall from the exhaust stream. Fugitive dust from pellet mill production are also filtered through separate baghouses and result in additional 0.22 pounds of PM_{10} per hour. The resulting total PM_{10} emissions from the furnace and baghouse are estimated to be 1.17 pounds per hour . Thus, assuming a maximum of 24 hours of operation per day and 8,000 hours per years, pellet mill operations would consume 1.32 tons per hour and result in maximum daily emissions of 52.0 pounds of NO_X, 28.1 pounds of PM_{10}, and 5.4 pounds of SO_2 per day, and annual emissions of 8.7 tons of NO_X, 4.7 tons of PM_{10}, 0.9 tons of

SO_2. ROG and CO emissions were not detected in the emissions tests for SuperBrix and are excluded from Table 13. These calculations are shown in additional detail in Appendix A and summarized in Table 13. (Patenaude, pers. comm., 2021c, 2021d).

Table 13 Pellet Mill Criteria Air Pollutant Emissions Summary

Emissions Source[1]	NO_X	PM_{10}	SO_2[3]
Furnace Hourly (lb/hr)	2.17	0.95	0.30
Baghouse Hourly (lb/hr)[2]	-	0.22	-
Total Hourly (lb/hr)	**2.17**	**1.17**	**0.30**
Total Daily (lb/day)	**52.02**	**28.10**	**7.19**
Total Annual (tons/year)	**8.67**	**4.68**	**1.20**

Note: NO_X = nitrous oxide; PM_{10} = particulate matter with diameters generally 10 micrometers and smaller, SO_2 = sulfur dioxide, lb = pounds, hr = hour. Values may not sum due to rounding.

[1] Daily and hourly emissions are based on operating times of 24 hours per day and 8,000 hours per year. ROG and CO emissions were not detected in the emissions tests for SuperBrix and are excluded from this table. (Patenaude, pers. comm., 2021b, 2021c)

[2] The baghouse emits PM emissions only.

[3] SO_2 values provided here for TAC calculation purposes only.

Source: Modeled by Ascent Environmental., Inc. in 2021

Combustion of the wood pellets manufactured by the proposed project is not included in this analysis. This is largely because specifying the air basin in which these wood pellets would be combusted would be speculative, as they could occur anywhere in the country after they have been sold for retail distribution. The air basin where combustion of wood pellets could occur is an important consideration in estimation of air pollutant emissions and the determination of significance for such emissions. This is because the ambient concentrations of air pollutant emissions are determined by conditions unique to each air basin (e.g., meteorological and topographical conditions). This results in different attainment designations for the California ambient air quality standards and the national ambient air quality standards as well as distinct thresholds set by air districts to determine when air quality standards have been violated. The regulatory framework in air basins outside California may also differ in how ambient air quality standards are set and project impacts are assessed. Therefore, it would be speculative for this analysis to attempt to characterize air emissions and associated impacts from combustion of wood pellets after retail sale. In addition, the project would not result in net new consumption of wood pellets but would rather replace pellets that may be sourced from less sustainable resources (e.g., virgin timber).

6.2.4 Offset Pile Burning

Under a No Project alternative, the biomass collected for the proposed project would otherwise likely be burned in piles at the forest collection sites. Based on a report released by the National Wildfire Coordinating Group (NWCG 2020), average pile burning generates 11.6 pounds of ROG, 4.1 pounds of NO_X, 17.1 pounds of $PM_{2.5}$, and 169 pounds of CO per ton of fuel consumed (NWCG 2020: Table 4.1.1, Peterson, pers. comm., 2021). Based on the total annual tons of fuel consumed (40,293 BDT per year), the project would preclude 234 tons of ROG, 83 tons of NO_X, 381 tons of PM_{10}, and 3,405 tons of CO emissions per year that would otherwise occur from pile burning. Assuming pile burning would occur 100 days per year, based on the approximate average number of days that are classified as burn windows elsewhere in the Sierra Nevada, the project would avoid maximum daily emissions of 4,674 pounds of ROG, 1,652 pounds of NO_X, 7,611 pounds of PM_{10} and 68,095 pounds of CO per day (Striplin et. al., 2020).

6.2.5 Total Operational Emissions

Under the project operations, criteria air pollutant emissions would be generated by off-road equipment, on-road haul trucks and worker trips, and combustion of biomass at the pellet mill. Criteria air pollutant emissions would also be avoided because the same biomass material delivered to the project site would no longer be piled and burned in the forest. A summary of the emissions levels associated with these activities is provided in Tables 14 and 15. See Appendix A for detailed parameters and calculations.

Table 14 Operational Emissions Summary (Daily)

Emissions Source	ROG (lb/day)	NO_X (lb/day)	PM_{10} (lb/day)	CO (lb/day)
Off-Road Equipment	1.89	3.98	0.20	30.95
Worker Commute	0.82	0.66	0.01	4.92
Haul Trips	0.02	9.90	0.05	5.53
Biomass Combustion at the Pellet Mill	-	52.02	28.10	-
Total Emissions from Pellet Mill	**2.73**	**66.56**	**28.36**	**41.40**
Avoided Emissions from Burning of Biomass Piles	4,673.99	1,652.01	7,611.16	68,095.17
Net Change in Emissions	**-4,671.26**	**-1,585.45**	**-7,582.80**	**-68,053.77**
TCAPCD Threshold	1,000	1,000	1,000	NA
***De minimis* Threshold[1]**	NA	NA	NA	NA
Threshold Exceeded?	No	No	No	NA

Note: ROG = reactive organic gases, NO_X = nitrous oxide; PM_{10} = particulate matter with diameters generally 10 micrometers and smaller, CO = carbon monoxide, lb/day = pounds per day. Values may not sum due to rounding.

[1] *De minimis* thresholds are provided in tons per year only.

Source: Modeled by Ascent Environmental., Inc. in 2021

Table 15 Operational Emissions Summary (Annual)

Emissions Source	ROG (tons/year)	NO_X (tons/year)	PM_{10} (tons/year)	CO (tons/year)
Off-Road Equipment	0.23	0.49	0.02	3.80
Worker Commute	0.10	0.08	0.00	0.59
Haul Trips	0.00	1.19	0.01	0.66
Biomass Combustion at the Pellet Mill	-	8.67	4.68	-
Total Emissions from Pellet Mill	**0.33**	**10.42**	**4.72**	**5.06**
Avoided Emissions from Burning of Biomass Piles	233.70	82.60	380.56	3,404.76
Net Change in Emissions	**-233.37**	**-72.18**	**-375.84**	**-3,399.70**
TCAPCD Threshold	100	100	100	NA
***De minimis* Threshold**	50	100	NA	NA
Threshold Exceeded?	No	No	No	NA

Note: ROG = reactive organic gases, NO_X = nitrous oxide; PM_{10} = particulate matter with diameters generally 10 micrometers and smaller, CO = carbon monoxide, lb/day = pounds per day. Values may not sum due to rounding.

Source: Modeled by Ascent Environmental., Inc. in 2021

As shown in Tables 14 and 15, implementation of the project would result in a net reduction in all four criteria air pollutants of concern. This is primarily because the open burning of biomass piles generates more emissions than the combustion of biomass at the pellet mill and other supporting activities. In addition, the direct emissions from project operation would be well below TCAPCD and *de minimis* thresholds. The estimates in Tables 14 and 15 do not account for emissions associated with the fate of wood pellets sold by the pellet mill. Under existing conditions, it is assumed that the biomass that would be used by the project would be piled and burned on site. As part of this project, it is certain that the biomass would be utilized as an energy source both by the pellet mill as dried biomass and by the end consumers as wood pellets. Thus, the effect of utilizing biomass from this site on the project would result in a net decrease in criteria air pollutant emissions because pile burning of this biomass would be avoided, and project operations would not exceed TCAPCD significance thresholds and *de minimis* thresholds.

In addition, as shown in Table 2, the Mountain Counties Air Basin is in attainment or unclassified for CO, NO_X, $PM_{2.5}$, PM_{10}, sulfur oxides, sulfates, and lead for both the CAAQS and NAAQS and is in attainment for ozone for the CAAQS but in marginal non-attainment for ozone for the NAAQS, of which ROG and NOx are precursors (CARB 2019a and EPA 2021). As shown in Tables 14 and 15, the project would result in a net reduction in both ROG and NO_X emissions in the basin. Thus, the project would not result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment.

The project would not exceed TCAPCD significance thresholds nor exceed the federal *de minimis* thresholds and would result in a net reduction in ozone precursors in the air basin, which is in marginal non-attainment for ozone. As such, the project would not require a GCD and impacts related to criteria air pollutants would be **less than significant.**

6.2.6 Carbon Monoxide

Project operations would result in an increase in truck and light duty vehicles on nearby roadways. As discussed in Section 4.2.2 and detailed in Table 2 of the Greenhouse Gas Study for this project, the combined additional trips generated by the project would not exceed 121 trips per day across both haul and worker commute trips. Thus, the project would not result in an affected intersection experiencing more than 31,600 vehicles per hour, and project impacts related to carbon monoxide would be **less than significant.**

7 TOXIC AIR CONTAMINANTS

According to the California Almanac of Emissions and Air Quality (CARB 2013), the majority of the estimated health risks from TACs can be attributed to relatively few compounds, the most prevalent being diesel PM. In addition to diesel PM, the TACs for which data are available that pose the greatest existing ambient risk in California are benzene, 1,3-butadiene, acetaldehyde, carbon tetrachloride, hexavalent chromium, para-dichlorobenzene, formaldehyde, methylene chloride, and perchloroethylene. Diesel PM poses the greatest health risk among these 10 TACs mentioned. It is estimated that about 70 percent of total known cancer risk related to air toxics in California is attributable to diesel PM (CARB 2019b). The potential cancer risk from inhaling diesel PM is greater than the potential for all other diesel PM–related health impacts (i.e., noncancer chronic risk, short-term acute risk) and health impacts from other TACs (CARB 2003:K-1). The project would result in exhaust emissions of diesel PM from off-road equipment and haul truck trips as well as TACs from the combustion of wood within the proposed CHP system.

Because health effects are related to both the proximity of the emissions sources to sensitive receptors as well as the duration of exposure to the pollutant, the health risks should be evaluated at separate locations at which these TAC emissions would occur: near the biomass collection sites, along haul routes, and near the pellet mill.

7.1 BIOMASS COLLECTION SITES

Mechanical treatments of forested lands would generally involve the greatest number of large, heavy-duty off-road diesel equipment such as forwarders and chippers in comparison to other project activities. Diesel-powered on-road trucks would also be used to haul biomass products to and from the pellet mill. Diesel-powered material handling off-road equipment would be used on-site at the pellet mill.

Diesel PM emissions from the collection of biomass in forested land would occur at two separate sites at Zones 1 and 2, approximately 20 and 40 miles away from the project site, respectively. The exact location of these biomass collection sites would change over the course of time as the biomass is collected but are assumed to remain within the same "zones." Due to their remote locations and shifting locations, it is assumed that the biomass collection operations would occur more than one mile from the nearest sensitive receptor and would not take place near any sensitive receptors for an extended period of time. Thus, diesel PM generated during biomass collection would not expose any person to an incremental increase in cancer risk greater than 10 in one million or a Hazard Index of 1.0 or greater.

7.2 HAUL ROUTES

Diesel PM emissions from hauling activities would occur along roadways between biomass collection sites, the pellet mill, retail destinations, and ash disposal locations. Some these roadways may be adjacent to residential and other sensitive receptors. Diesel PM emissions would be dispersed along the roadways travelled by the haul trucks but would concentrate as the roads converge at the project site. (Idling emissions are considered separately along with the pellet mill on-site diesel usage.) CARB's Air Quality and Land Use Handbook states that sensitive land uses should not be sited within 1,000 feet of a distribution center that accommodates more than 100 trucks per day (CARB 2005: 15). This standard can be applied to the proposed project as it also generates heavy duty diesel truck trips similar to a distribution center. The project would not generate more than 11 truck trips per day. Thus, diesel PM generated during hauling activities would not expose any person to an incremental increase in cancer risk greater than 10 in one million or a Hazard Index of 1.0 or greater.

7.3 PELLET MILL

TAC emissions from the pellet mill itself would occur both from the diesel PM from the operation of off-road material handling equipment and from the combustion emissions from the CHP system. The Project site is also located within 1,000 feet of two sensitive receptors, as shown in Table 3

As shown in Table 8, operations at the pellet mill would result in 0.03 tons, or 69.72 pounds, of PM_{10} per year from diesel exhaust from off-road equipment and haul truck idling. Haul truck idling events accounts for less than 0.1 percent of diesel PM emissions on-site. TACs would also be generated from the combustion of biomass in the pellet mill's cyclonic chamber furnace. However, TAC emissions factors from cyclonic combustion of biomass are not well documented. As a proxy, TAC emissions from biomass combustion at the mill were estimated using San Joaquin Valley Air Pollution Control District's (SJVAPCD) TAC calculator for biomass combustion systems using sawmill waste as fuel (SJVAPCD 2016). Although SJVAPCD represents a different air district, the biomass TAC calculator itself is based on CARB's 1999 state-level evaluation of TACs from biomass and other combustion sources (CARB 1999). Sawmill waste has similar moisture content (between 8 to 10 percent) use similar forest-based biomass as the forest-thinning waste to be used in the proposed mill. The biomass TAC calculator is based on tests from fluidized combustion beds (FCB), FCBs have similar emissions controls as the proposed cyclonic chamber furnace. Both combustion methods are used to burn solid fuels such as biomass and coal. Fluidized beds reduce combustion-related emissions by suspending fuel particles on a bed through which air is blown through vertically to provide more oxygen for combustion for a more complete and even burn. Similarly, cyclonic chambers also combust solid fuel particles through suspension, but in a conical chamber where air is blown into the chamber and mixed with the fuel in a cyclonic manner. Although the calculator is based on source tests from FBCs, the main difference with the emissions controls of fluidized beds, is the addition of limestone and dolomite, which primarily reduces NO_X and SO_2 emissions. NO_X and SO_2 emissions are accounted for separately based on the available SuperBrix emission factors. Thus, the biomass TAC calculator was used to estimate all other TAC pollutants generated by biomass combustion. For the calculator inputs, it was assumed that 1.32 tons per hour and 10,560 tons per year of dried biomass (at 12 moisture content) would be consumed. The results of the diesel PM and biomass TAC estimates are shown in Table 16.

Table 16 Pellet Mill TAC Emissions and Health Risk Prioritization Score Calculator Inputs

Substance	CAS#	Annual Emissions (lb/year)[1]	Maximum Hourly (lb/hour)[1]
Diesel engine exhaust, particulate matter (Diesel PM)	9901	3.37E+00	3.00E-03
Sulfur Dioxide[2]	7446095	2.40E+03	3.00E-01
Benz[a]anthracene	56553	2.16E-04	2.71E-08
Benzo[a]pyrene	50328	1.73E-04	2.16E-08
Benzo[b]fluoranthene	205992	1.32E-03	1.65E-07
Benzo[k]fluoranthene	207089	3.17E-04	3.96E-08
Chrysene	218019	2.48E-03	3.10E-07
Dibenz[a,h]anthracene	53703	1.73E-04	2.16E-08
2,3,7,8-Tetrachlorodibenzo-P-Dioxin	1746016	3.05E-07	3.81E-11
1,2,3,7,8-Pentachlorodibenzo-P-dioxin	40321764	3.46E-07	4.33E-11
1,2,3,4,7,8-Hexachlorodibenzo-P-dioxin	39227286	4.60E-07	5.76E-11
1,2,3,6,7,8-Hexachlorodibenzo-P-dioxin	57653857	6.74E-07	8.42E-11
1,2,3,7,8,9-Hexachlorodibenzo-P-dioxin	19408743	5.04E-07	6.30E-11
1,2,3,4,6,7,8-Heptachlorodibenzo-P-dioxin	35822469	7.29E-06	9.11E-10
1,2,3,4,6,7,8,9-Octachlorodibenzo-P-dioxin	3268879	7.06E-05	8.83E-09
Formaldehyde	50000	3.86E+00	4.83E-04
2,3,7,8-Tetrachlorodibenzofuran	51207319	1.36E-06	1.70E-10
1,2,3,7,8-Pentachlorodibenzofuran	57117416	6.62E-07	8.28E-11
2,3,4,7,8-Pentachlorodibenzofuran	57117314	1.09E-06	1.36E-10
1,2,3,4,7,8-Hexachlorodibenzofuran	70648269	8.02E-07	1.00E-10
1,2,3,6,7,8-Hexachlorodibenzofuran	57117449	1.18E-06	1.48E-10
1,2,3,7,8,9-Hexachlorodibenzofuran	72918219	2.93E-07	3.66E-11
2,3,4,6,7,8-Hexachlorodibenzofuran	60851345	3.19E-06	3.99E-10
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562394	1.45E-05	1.81E-09
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673897	9.47E-07	1.18E-10
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	39001020	1.70E-05	2.13E-09
Indeno[1,2,3-cd]pyrene	193395	2.61E-04	3.26E-08
Naphthalene	91203	3.16E+00	3.95E-04
PCBs {Polychlorinated biphenyls}	1336363	8.57E-04	1.07E-07

Note: lb = pounds. CHP = combined heat and power. CAS# = Chemical Abstract Service registry number

[1] The Prioritization Calculator requires inputs in these units. The maximum hourly emissions were based on the 1.32 tons of dry biomass consumed per hour, 24-hour operation of the CHP system, and an 8-hour workday for the off-road equipment operations. Substances without health risk values are excluded from this list. Diesel PM emission rates were based on results shown in Tables 8 and 9.

[2] SO_2 emissions based on emissions from furnace only, as shown in Table 13. Health risks from SO_2 are limited to acute factors only and have an insignificant effect on the total health risks shown in Table 17. Associated risks from on-site off-road diesel equipment are considered negligible and not included.

Source: Modeled by Ascent Environmental., Inc. in 2021

In the absence of a health risk screening tool from the TCAPCD, to gauge the necessity of preparing a health risk assessment (HRA), Ascent used SJVAPCD's screening tool: Prioritization Calculator (SJVACPD 2020). Although the Prioritization Calculator was developed for projects within the SJVAPCD, the project is located adjacent to the SJVAPCD and shares similar meteorological conditions due to its location close to the Central Valley. Thus, the Prioritization Calculator is considered to be appropriate to use for the proposed project. The Prioritization Calculator is also a conservative screening tool as it is based on a 70-year cancer risk scenario and worst-case meteorological conditions (CAPCOA 2016c).

SJVACPD recommends that projects with a prioritization score of 10 or greater should be considered significant, and SJVAPCD recommends that a refined HRA be prepared for these projects. The calculator was used to provide a conservative estimate of the health risks from plant operations (SJVAPCD 2020). The calculator provides conservative unitless health risk scores and screening factors based on the proximity to nearby sensitive receptors. Table 16 shows the annual and maximum hourly TAC emissions that would be emitted from the pellet mill which were input into the prioritization calculator. Table 17 shows the results of the screening exercise.

Table 17 Pellet Mill TAC Emissions: Health Risk Prioritization Score Calculator Results

Receptor Proximity (m)	Cancer Score	Chronic Score	Acute Score	Maximum Score	Screening Factor	Exceeds Screening Factor?
0< R<100	9.41	0.11	0.01	9.41	10	No
100<R<250	2.35	0.03	0.00	2.35	10	No
250<R<500	0.38	0.00	0.00	0.38	10	No
500<R<1000	0.10	0.00	0.00	0.10	10	No
1000<R<1500	0.03	0.00	0.00	0.03	10	No
1500<R<2000	0.02	0.00	0.00	0.02	10	No

Note: R = receptor, m = meter

Source: Modeled by Ascent Environmental., Inc. in 2021 using the San Joaquin Valley Air Pollution Control District Prioritization Calculator (SJVAPCD 2020)

As shown in Table 17 and with the understanding that risks decrease with distance from the emissions source, the TAC emission concentrations from the pellet mill operations would not exceed the SJVAPCD screening factors at any receptor location. As mentioned, the closest sensitive receptor to the project is Standard Park, located within 80 feet from the project boundary. The maximum risk score at this location would not exceed the prioritization screening score of 10. Additionally, these results are conservative based on the worst-case assumptions within the Prioritization Calculator. Actual health risks will likely be lower at Standard Park, especially with intermittent use of the facility. Based on these results, the project meets the screening criteria of the prioritization calculator and health risks associated with TAC emissions from the project site would be less than significant and any additional health risk assessments would not be required.

8 ODOR

Odors are generally regarded as an annoyance rather than a health hazard. However, manifestations of a person's reaction to foul odors can range from psychological (e.g., irritation, anger, or anxiety) to physiological (e.g., circulatory and respiratory effects, nausea, vomiting, and headache).

With respect to odors, the human nose is the sole sensing device. The ability to detect odors varies considerably among the population and overall is quite subjective. Some individuals can smell very minute quantities of specific substances; others may not have the same sensitivity but may have sensitivities to odors of other substances. In addition, people may have different reactions to the same odor; an odor that is offensive to one person may be perfectly acceptable to another (e.g., smells from fast food restaurants). It is important to also note that an unfamiliar odor is more easily detected and is more likely to cause complaints than a familiar one. This is because of the phenomenon known as odor fatigue, in which a person can become desensitized to almost any odor and recognition only occurs with an alteration in the intensity. Odor sources of concern include wastewater treatment plants, sanitary landfills, composting facilities, recycling facilities, petroleum refineries, chemical manufacturing plants, painting operations, rendering plants, and food packaging plants.

The occurrence and severity of odor impacts depends on numerous factors, including: the nature, frequency, and intensity of the source; wind speed and direction; and the proximity and sensitivity of exposed individuals. The project may generate odors at all three affected locations: biomass collection site, hauling, and the pellet mill. At all three locations, odors would result from diesel exhaust. Biomass collection activities are generally in less populated, rural, or undeveloped areas, where human receptors are sparse. Odors from diesel haul trips would be quickly dissipated, there would be no more than 20 trips per day on any given roadway, trucks would not concentrate at any single location, and trucks would also be limited to idling for no longer than five minutes at any location. At the pellet mill, storage of the delivered and dried biomass could also generate odors, especially if any of the wood mass had had a bacterial infection (Lignomat 2006). However, the degree to which these odors would be generated from the mill is uncertain due to the variability of the biomass origins and the duration and condition of outdoor storage prior to drying and combustion that could accelerate or inhibit any infections. However, these biomass piles are not anticipated to be stored for extended periods of time as the plant continually processes the delivered wood chips. As discussed, combustion of the dried biomass chips at the mill would result in negligible ROG emissions. Given that odors are primarily organic compounds, it is unlikely that the CHP system would generate noticeable odors during operation. This impact would be **less than significant**.

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Air Quality Study
Appendix A

Air Quality Calculations

Air Quality Study
Appendix B

Site Plan

Air Quality Study Appendix C

CalEEMod Construction Modeling Outputs