

DRAFT ENGINEERING EVALUATION
Raven SR, Inc.
1 Parr Boulevard, Richmond, CA 94801
Plant No.: 25207
Application No.: 31700

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**Raven SR, Inc.
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BACKGROUND

Raven SR, Inc. has applied for an Authority to Construct for the following sources and abatement devices:

- S1 Organic Waste Storage Pile-covered material storage consistent with CUP requirements
Green Waste Only
Maximum Operating Rate: 99.9 tons/day, 36,465 tons/year
Maximum Storage Time: 24 hours/pile**

- S2 Alkaline Reagents Storage Pile-covered material storage
Maximum Operating Rate: 45 tons/day, 1,051 tons/year**

- S3 Hydrogen Production System Abated by A1
Steam/CO2 Reformer Operation
Operation Time: 24 hours/day, 365 days/year**

- S4 Biogas Engine #1 Abated by A2, A3 and A4
Jenbacher Model JGS 420 B823
1,966 bhp, 8.06 MMBtu/hr
Operation Time: 24 hours/day, 365 days/year**

- S5 Biogas Engine #2 Abated by A2, A5 and A6
Jenbacher Model JGS 420 B823
1,966 bhp, 8.06 MMBtu/hr
Operation Time: 24 hours/day, 365 days/year**

- S6 Biogas Engine #3 Abated by A2, A7 and A8
Jenbacher Model JGS 420 B823
1,966 bhp, 8.06 MMBtu/hr
Operation Time: 24 hours/day, 365 days/year**

- S7 Emergency Standby Diesel Generator for a Fire Pump
2022 Cummins Model QSB4.5
104 bhp, 0.81 MMBtu/hr
EPA Family NCEXL0275AAG
Operation Time for Maintenance and Testing: 32 hours/year**

- S9 Biochar Collection System and Storage
4.0 ton/day, 1,000 tons/year**
- S10 Cooling Tower (exempt), three cell; Make: TBD; Model: TBD
Water Circulation Rate: 5,000 gallons/min maximum**
- S11 Organic Waste Drying Operation
Green Waste Only
Maximum Operating Rate: 20 tons/hour, 99.9 tons/day, 36,465 tons/year
Operation Time: 24 hours/day, 365 days/year**
- A1 Back-up Flare for Hydrogen Plant
Zink OAH Enclosed Flare
Maximum Operating Rate: 0.0144 MMbtu/hr, 24 hours/day, 100 hours/year**
- A2 Landfill Gas Conditioning System**
- A3 Oxidation Catalytic System for S4
Jenbacher Oxidation Catalyst System**
- A4 Selective Catalytic Reduction System for S4
Jenbacher SCR**
- A5 Oxidation Catalytic System for S5
Jenbacher Oxidation Catalyst System**
- A6 Selective Catalytic Reduction System for S5
Jenbacher SCR**
- A7 Oxidation Catalytic System for S6
Jenbacher Oxidation Catalyst System**
- A8 Selective Catalytic Reduction System for S6
Jenbacher SCR**
- A9 Baghouse for S11
Sly Tubejet Model STJ-1616**

Raven SR, Inc. (“Raven” or the “Facility”) is proposing to construct a new green waste to hydrogen plant (the “project”) at the existing West Contra Costa County Sanitary Landfill (WCCCSL, Plant #1840) located at 1 Parr Boulevard, Richmond, CA.

Raven operates their system under several different scenarios. The following is a flow diagram of the process at the facility:

Figure 1 – Organic Waste Flow Diagram

Gas Flow Diagram – Organic Waste Flow Process

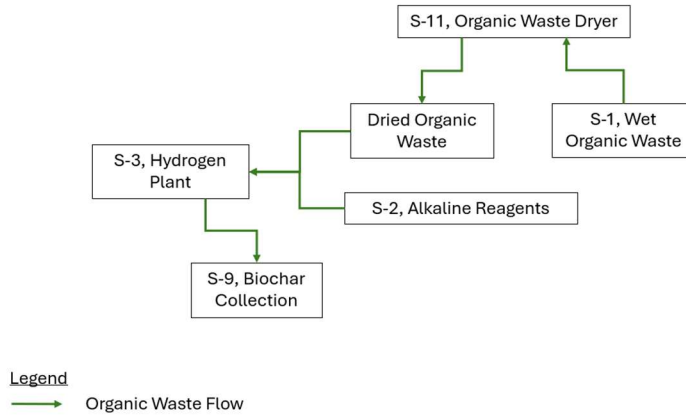


Figure 2 – Gas Flow Diagram During Normal Operations – Scenario 1

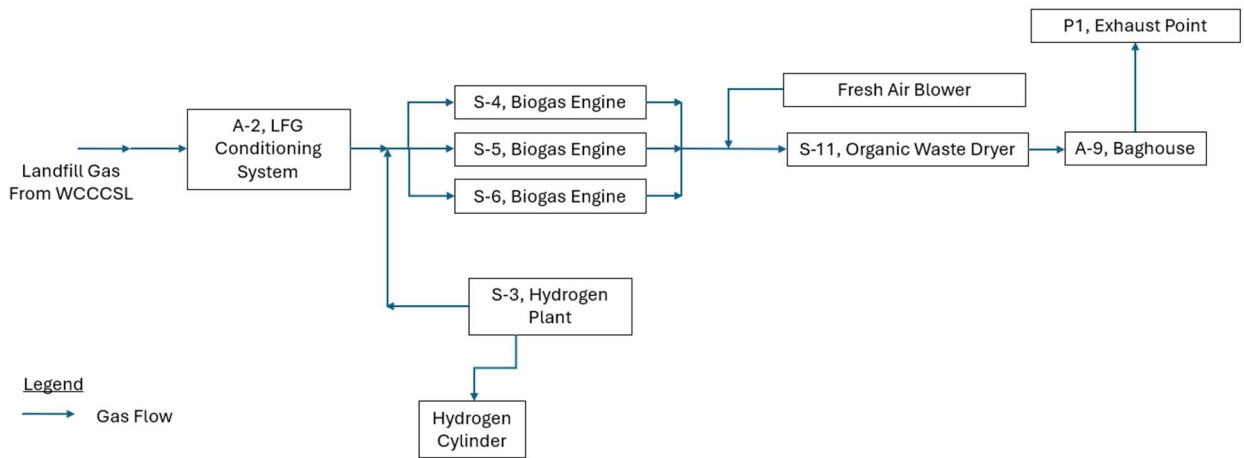


Figure 3 – Gas Flow Diagram During Normal Operations – Scenario 2

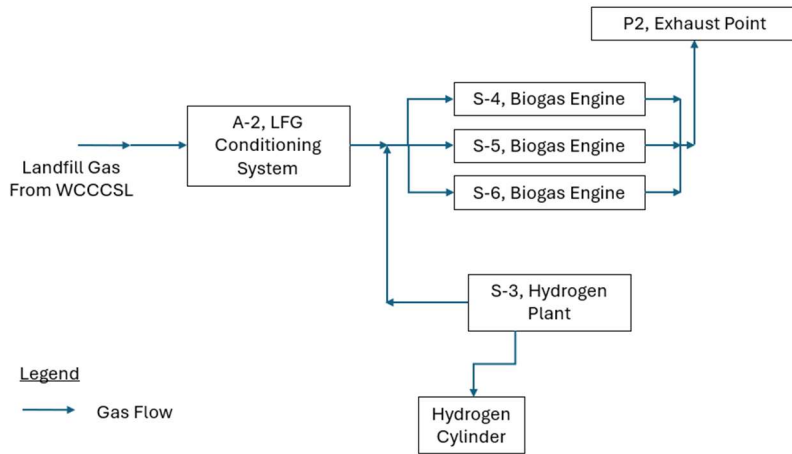


Figure 4 – Gas Flow Diagram During Start-up, Shutdown or Immediate Gas Evacuation Process at S3

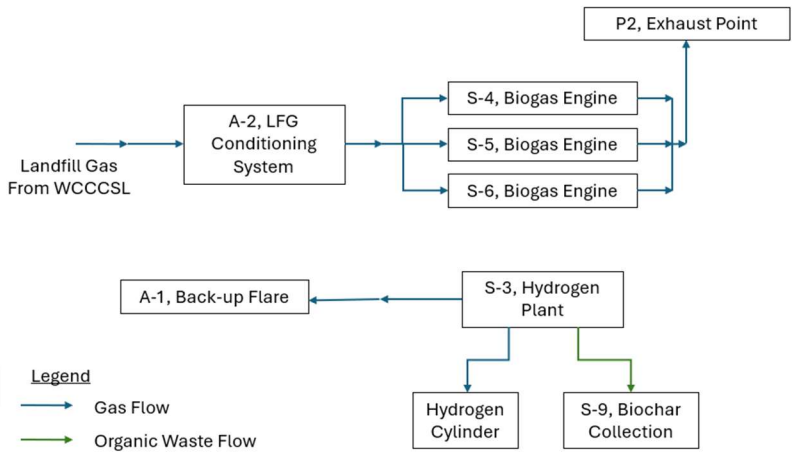
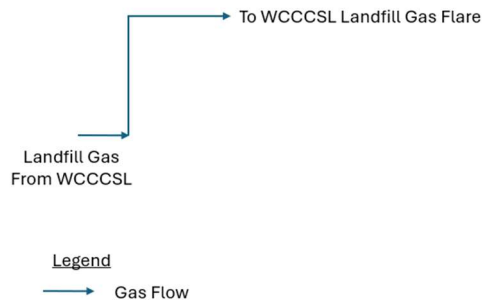


Figure 5 – Gas Flow Diagram During Bypass of Raven’s Operation



A description of each source is provided below:

Organic Waste Stockpile, S1

Raven will receive up to 99.9 tons of organic waste per day and up to 36,465 tons per year from WCCCSL. The waste will contain only green waste such as grass, tree trimmings, and bushes. No food waste, commercial organic waste or industrial organic waste will be processed through the facility. WCCCSL will grind the material prior to delivering the material to the designated organic waste storage area. Raven will sort through the material to remove any inorganic material that is mixed in the pile prior to processing. The organic waste will be processed through the entire system within 24 hours of delivery. The organic waste process is presented in Figure 1.

Alkaline Reagents Storage Pile, S2

The alkaline reagents storage pile will store up to four different products granular or pellet format: hydrated lime, limestone, dolomite, or magnesium carbonate. The alkaline reagents are combined with the organic waste as it is loaded into the hopper of the hydrogen plant. The material is used to help reduce the formation of acid gas from the operation. Any residual alkaline reagents that are not used as part of the operation will be released from the hydrogen plant in the form of a biochar (see Figure 1).

The facility will receive up to 45 tons from each delivery, which will be placed in a sheltered area within the operations area. There will be up to 2 deliveries per week with a maximum of 1,051 tons of alkaline reagents delivered per year.

Hydrogen Plant, S3

The hydrogen plant consists of several components. Green waste and alkaline reagents are loaded into the system. Oxygen is purged from the feeder before waste enters the first stage. The waste is heated electrically. Organic waste, which is green waste from landscaping material such as trimmed grass, trees, and bushes, is primarily composed of carbon, oxygen and hydrogen. The process is designed to break the chemical bonds to reduce green waste to a synthesis gas (syngas). Material that has not decomposed into a gaseous form in the process will exit the first stage as biochar into a storage bin (S9). The syngas that is produced after the first stage will enter a second stage to further break down any methane produced after the first process and remove any additional contaminants from the gas so the final product will consist of mostly hydrogen, carbon monoxide, carbon dioxide and water.

Although organic waste is primarily composed of carbon, oxygen, and hydrogen, other elements may be present in the organic waste such as nitrogen, sulfur, chlorine, and metals, which may result in the formation of other compounds such as hydrogen sulfide and toxic air contaminants. Based on current estimates, the facility will produce up to 14,000 pounds of hydrogen per day and 2,555 tons per year.

Following the second stage, the syngas undergoes a gas purification process. The final product will be predominantly hydrogen gas that will pass through a compressed gas chiller system and loaded into hydrogen cylinders that will be transported offsite for use.

Gas removed from the final product (waste gas) will consist of carbon dioxide, carbon monoxide and compounds containing sulfur, chlorine, and toxic air contaminants that did not break down in the second stage. The waste gas will be directed either to the biogas engines (S4, S5, and S6) onsite as an additional fuel or will be processed through the back-up flare (A1) to reduce the contaminants prior to releasing it to the atmosphere.

The entire hydrogen plant is electrically driven by either electricity from the power grid or electricity generated onsite by the biogas engines (S4, S5, and S6).

Landfill Gas Conditioning System, A2

Landfill gas from WCCCSL will be used as fuel for Raven's operation. A valve will be installed at the landfill gas header. During normal operations, landfill gas will pass through A2, landfill gas conditioning system. Although the system may reduce volatile organic compound and hydrogen sulfide concentrations in the landfill gas, the primary focus of the system is to remove siloxanes from the landfill gas. All gas processed through A2 will be directed to the biogas engines S4, S5, and S6.

In the event where all the biogas engines need to be shut down, the landfill gas will be directed to the landfill gas flare located on WCCCSL (Plant #1840, flares A8 and/or A161). The landfill gas flow during a bypass event is presented in Figure 5.

Biogas Engines: S4, S5, and S6

The facility will operate three biogas engines with a brake horsepower rating of 1,966 for each engine. The biogas engines are designed to either operate on 100% landfill gas from A2 or a blend of 55% landfill gas and 45% waste gas from the hydrogen plant S3.

The outputs for the biogas engines will serve two purposes. The electricity generated from the operation will be used to power the operations at the facility, including providing electrical heat to the hydrogen plant. The exhaust from the biogas engines will be the heat source for S11, organic waste dryer.

Each biogas engine will be abated by an oxidation catalytic system (A3, A5, and A7) and a selective catalytic reduction system (A4, A6, and A8). The combined system will reduce nitrogen oxide (NO_x), precursor organic compounds (POC), methane (CH₄), and carbon monoxide (CO) in the exhaust.

Organic Waste Dryer, S11

Prior to transferring the organic waste to the hydrogen plant, Raven will use an organic waste dryer (S11) to reduce the moisture content from the material. The heat source used for the dryer will be the exhaust from the three biogas engines (S4, S5, and S6). Due to the high

temperatures from the engine exhaust, the facility will use a blower that will incorporate ambient air into the system to reduce the temperature and increase the flow through the system. Exhaust from the dryer will pass through a baghouse (A9) to reduce the amount of particulate emissions at the outlet.

Moisture analyzers located at the dryer will monitor the moisture content during the entire process. The target outlet moisture content for the material is about 15-20%. Once the material has reached the desired moisture content, the dried organic material will be transferred to a temporary storage bin that will store the organic waste prior to use at the hydrogen plant (S3).

The system is designed to operate up to 20 tons per hour, 99.9 tons per day, and 36,464 tons per year.

Biochar Collection and Storage System, S9

Material that does not degrade from the first stage of the Hydrogen Plant, S3, operation will be collected as biochar. The composition of biochar is typically a carbon-based material. Based on the information provided by Raven, the biochar may also contain some inorganic material that was placed in the system that did not degrade in the hydrogen plant.

When the material is released from the first stage, all the material will be released into the biochar collection system (S9) that includes a cyclone. The syngas produced from the operation will enter the second stage. The biochar will be collected at the bottom of the cyclone into a roll-off bin. A vehicle will take the roll-off bin offsite for disposal.

The facility will collect up to 4.0 tons of biochar per day and 1,000 tons of biochar per year.

Cooling Tower, S10

Excess water vapor from the waste is separated from the second stage of the hydrogen plant and passed through the cooling tower. The water that is discharged from the cooling tower will be directed off-site to the West County Wastewater District for processing and disposal.

The cooling tower will not use any chlorinated compounds as a biocide.

Back-up Flare, A1

During periods of start-up, shutdown, or if all the gas produced at the hydrogen plant needs to be evacuated for any reason, the gas will be diverted to the A1 flare for processing. The flare is designed to operate at a minimum combustion temperature of 1,400 degrees Fahrenheit to ensure a minimum destruction efficiency of 98% to minimize emissions that are released to the atmosphere. The process flow that will involve the use of the flare is presented in Figure 4. The facility has agreed to operate the flare for no more than 100 hours in any consecutive 12-month period including emergencies.

Other permits

The project has undergone a review of the California Environmental Quality Act (CEQA) review performed by the City of Richmond (Case #: PLN21-282, State Clearinghouse #2022100145). A discussion of the review is included in the Statement of Compliance section of this evaluation.

In addition, the facility has submitted a permit application for a New Solid Waste Facility Permit (SWFP) through the Contra Costa Environmental Health (CCEH). According to the permit application, the facility will process both green waste and food waste. Since the Air District’s permit application only stated green waste, food waste will not be allowed as part of the operation. The permit allows the facility to store up to 99.9 tons per day and 36,463 tons per year, which matches the throughput used in the Air District’s estimates. The permit was approved on February 3, 2025.

EMISSION CALCULATIONS

Criteria Pollutants

This project deals with a variety of emission sources from organic degradation, combustion, and fugitive emissions. The emission calculations are discussed further below. The full emission calculations are presented in Attachment C.

Although vehicle traffic is discussed in the applicant’s Environmental Impact Report, the emissions are limited to travel offsite. Vehicle emissions within the operating area are included in the emission calculations.

Organic Waste Stockpile, S1

Degradation of organic waste produces volatile organic compounds (VOC) and ammonia. Emission calculations are based on the emission factors and the amount of time the material is stored at the facility. Since the facility receives organic waste directly from WCCCSL, the emission factors are derived from source test reports from WCCCSL. Raven has stated that it will only use green waste, so emission factors are calculated from WCCCSL’s green waste feedstock only. Acetone, a non-precursor organic compound (NPOC) is assumed to be a percentage of the VOC compounds with the remaining emissions assumed to be precursor organic compounds (POC). The following are the emission calculations for NPOC and POC:

Emission Factor for VOC from source test reports = 0.165 lb/wet ton – day

$$\begin{aligned} \text{Maximum Daily Emissions (VOC)} &= \left(\frac{1.65E - 01 \text{ lb}}{\text{wet ton - day}} \right) \times \left(\frac{99.9 \text{ wet tons}}{\text{day}} \right) \times (1 \text{ day storage time}) \\ &= 1.65E + 01 \text{ lb/day} \end{aligned}$$

$$\begin{aligned} \text{Maximum Daily Emissions (NPOC)} &= \left(\frac{1.65E + 01 \text{ lb VOC}}{\text{day}} \right) \times \left(\frac{1.49E - 02 \text{ lb NPOC}}{\text{lb VOC}} \right) \\ &= 2.46E - 01 \text{ lb/day} \end{aligned}$$

$$\begin{aligned} \text{Maximum Daily Emissions (POC)} &= \left(\frac{1.65E + 01 \text{ lb VOC}}{\text{day}} \right) - \left(\frac{2.46E - 01 \text{ lb NPOC}}{\text{day}} \right) \\ &= 1.65E + 01 \text{ lb/day} \end{aligned}$$

$$\begin{aligned} \text{Maximum Annual Emissions (VOC)} &= \left(\frac{1.65E - 01 \text{ lb}}{\text{wet ton - day}} \right) \times \left(\frac{36,464 \text{ wet tons}}{\text{year}} \right) \times (1 \text{ day storage time}) \\ &= 6.01E + 03 \text{ lb/year} = 3.007 \text{ tons/year} \end{aligned}$$

$$\begin{aligned} \text{Maximum Annual Emissions (NPOC)} &= \left(\frac{6.01E + 03 \text{ lb VOC}}{\text{year}} \right) \times \left(\frac{1.49E - 02 \text{ lb NPOC}}{\text{lb VOC}} \right) \\ &= 8.93E + 01 \text{ lb/year} = 0.045 \text{ tons/year} \end{aligned}$$

$$\begin{aligned} \text{Maximum Annual Emissions (POC)} &= \left(\frac{6.01E + 03 \text{ lb VOC}}{\text{year}} \right) - \left(\frac{8.93E + 01 \text{ lb NPOC}}{\text{year}} \right) \\ &= 5.92 + 03 \text{ lb/year} = 2.962 \text{ tons/year} \end{aligned}$$

Particulate emissions are produced from the material handling of the stockpiles and from wind erosion. The material will be manually screened to remove any inorganic material prior to being processed through the system. The green waste in the storage piles will be removed within 24 hours prior to receiving more material. The maximum amount of material delivered will be 99.9 tons per day and 36,465 tons per year.

For material handling, the emission factors are calculated using Environmental Protection Agency's (EPA) Compilation of Air Emission Factors from Stationary Sources (AP-42), Section 13.2.4.3, Eq (1):

$$\text{Emission Factor, } EF \left(\frac{\text{lb}}{\text{ton}} \right) = \frac{k \times 0.032 \times \left(\frac{U}{5} \right)^{1.3}}{\left(\frac{M}{2} \right)^{1.4}}$$

Where:

k = Particulate Size Multiplier.

For PM10, k = 0.35

For PM2.5, k = 0.053

U = Mean Wind Speed, mph = 8.7

M = Moisture Content = 2%

In addition, particulate emissions occur from wind erosion of the stockpile. Emissions from wind erosion are based on AP-42 Table 11.9-4 Wind Erosion of exposed areas, which specifies an emission factor of 0.38 tons of total suspended solids (TSP) per acre-year.

The particulate emissions from wind erosion are based on the following:

$$\text{Wind Erosion Emissions (TSP)} = (\text{Emission Factor for TSP}) \times (\text{Area of Stockpile})$$

The emissions from wind erosion as TSP are multiplied by particulate size multiplier to determine the emissions. The particulate size multipliers used to calculate particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM10) and particulate matter with an aerodynamic diameter less than or equal to 2.5 microns (PM2.5) are based on AP-42 Section 13.2.4-1:

Particle Size Multiplier (PM₁₀) = 0.35
Particle Size Multiplier (PM_{2.5}) = 0.053

The following is a summary of all the emissions for S1.

Table 1 – Summary of Criteria Pollutants Emissions from S1

Pollutant	Maximum Daily Emission Rate (lb/day)	Maximum Annual Emission Rate (lb/year)	Maximum Annual Emission Rate (tpy)
POC	1.53E+01	5.92E+03	2.962
NPOC	2.46E-02	8.93E+01	0.045
PM10	5.61E-01	2.05E+02	0.102
PM2.5	8.40E-02	3.10E+01	0.016

Alkaline Reagents Storage Pile, S2

The emissions from S2 are assumed to only consist of particulate emissions. Similar to S1, the emissions are produced from material handling and wind erosion. The facility anticipates a maximum of 45 tons per day with two deliveries per week. According to the applicant, the maximum that will be processed through the site per year is 1,051 tons per year. The maximum storage area for the alkaline reagents is 0.007 acres. The following is a summary of the emissions from S2:

Table 2 – Summary of Criteria Pollutants Emissions from S2

Pollutant	Maximum Daily Emission Rate (lb/day)	Maximum Annual Emission Rate (lb/year)	Maximum Annual Emission Rate (tpy)
PM10	1.67E-01	5.60E+00	0.003
PM2.5	2.50E-02	9.00E-01	0.000

Hydrogen Plant, S3

The hydrogen plant is a closed system where the only emissions are fugitive from the various components. Emission calculations from the fugitive emissions are based on correlation equation used in the California Air Pollution Control Officers Association (CAPCOA) document “California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon Leaks at Petroleum Facilities” (February 1999).

The facility has agreed to a screening value of 25 ppmv for syngas at all the components. In addition, the facility has agreed that no pegged leaking components will be allowed at any time during the operation of S3. Operation of S3 is assumed to be 24 hours per day and 365 days per year.

Based on the documents provided by the applicant, S3 will produce POC, CO, PM10, and PM2.5 emissions. The emissions are based on the fugitive emissions from the syngas. Below is a summary of the emissions:

Table 3 – Summary of Criteria Pollutants Emissions from S3

Pollutant	Maximum Daily Emission Rate (lb/day)	Maximum Annual Emission Rate (lb/year)	Maximum Annual Emission Rate (tpy)
POC	9.71E-03	3.54E+00	1.77E-03
CO	6.16E-02	2.25E+01	1.13E-02

Biogas Engines, S4 abated by A3 and A4, S5 abated by A5 and A6, S6 abated by A7 and A8

The biogas engines (S4, S5, and S6) are 1,966 bhp each with a selective catalytic reducer (A3, A5, and A7) and an oxidation catalyst (A4, A6, and A8) to reduce emissions. The emissions for NOx and CO are provided by the manufacturer. POC emissions for the outlet are based on outlet concentration of 0.12 grams per brake horsepower-hour (g/bhp-hr). The selective catalytic reduction system and an oxidation catalytic system will reduce the emission of POC, NOx, and CO emissions. Emissions for PM10 and PM2.5 are based on AP-42 Section 3.2, Table 3.2-2 for a 4-Stroke Lean Burn Engine. Sulfur dioxide emissions (SO2) are based on the inlet concentration of H2S. WCCCSL has a permit condition to limit the hydrogen sulfide (H2S) concentration to 100 ppmv. For the purpose of calculating SO2 emissions, the District assumes 100% conversion of H2S to SO2 emissions at the outlet. The following is a summary of the emission calculations:

Table 4 – Criteria Pollutants for Each Biogas Engine

Pollutant	Maximum Daily (lb/day)	Annual (lb/yr)	Annual (TPY)
NO _x	1.29E+01	4.71E+03	2.354
POC	1.25E+01	4.56E+03	2.278
CO	7.28E+01	2.66E+04	13.289
PM ₁₀	1.93E+00	7.05E+02	0.353
PM _{2.5}	1.93E+00	7.05E+02	0.353
SO ₂	1.23E+01	4.49E+03	2.247

Emergency Diesel Generator for a Fire Pump, S7

During periods of emergency operation, the facility will operate an emergency diesel engine for the fire pump. The engine is a 104-brake horsepower (bhp) engine. Daily emissions assume the engine will operate 24 hours per day. For annual emissions, the hours for maintenance and testing are based on the National Fire Protection Associations (NFPA) standards for maintenance and testing (32 hours per year). Emission calculations for criteria pollutants are summarized below:

Table 5 – Criteria Pollutants for S7

Pollutant	Maximum Daily (lb/day)	Annual (lb/yr)	Annual (TPY)
NO _x	1.50E+01	2.00E+01	0.010
POC	6.97E-01	9.29E-01	0.0005
CO	3.69E+00	4.92E+00	0.002
PM ₁₀	5.33E-01	7.11E+01	0.0004
PM _{2.5}	5.33E-01	7.11E+01	0.0004
SO ₂	2.94E-02	3.92E-02	0.00002

Basis:

- 104 hp Max Rated Output – 5.9 gallons/hr Max Fuel Use Rate; 0.81 MMBTU/hr Max Combustion Capacity
- The NO_x, POC, CO, and PM₁₀ emission factors are from CARB certification.
- The SO₂ emission factor is based on 15 ppm sulfur in ULSD fuel derived from EPA AP-42, Table 3.4-1.

Biochar Collection and Storage System, S9

The biochar from the Hydrogen Plant is removed from the system through a hopper. Emissions from the operations are based on AP-42 Section 13.2.4.3, Eq (1) material handling. The following is a summary of the emissions for S9:

Table 6 – Summary of Criteria Pollutants Emissions from S9

Pollutant	Maximum Daily Emission Rate (lb/day)	Maximum Annual Emission Rate (lb/year)	Maximum Annual Emission Rate (tpy)
PM10	7.24E-03	1.81E+00	0.001
PM2.5	1.10E-03	2.74E-01	0.000

Cooling Tower, S10

The emissions for a cooling tower are calculated from the manufacturer’s specifications and the procedure in AP-42, Chapter 13.4, Wet Cooling Towers. Calculations are based on a flow rate of 1,102 gallons per minute, a drift rate of 0.05% and a concentration of 2,500 milligrams per liter. Emissions for PM2.5 are assumed to be the same as PM10. With a process rate of 1,102 gallons per minute, the following are the emissions for S10:

Maximum Hourly Emissions of Particulate Emission

$$= \left(\frac{5,000 \text{ gal}}{\text{min}}\right) \times \left(\frac{60 \text{ min}}{\text{hour}}\right) \times \left(\frac{3.782 \text{ L}}{\text{gal}}\right) \times \left(\frac{0.005}{100}\right) \times \left(\frac{1,500 \text{ mg}}{\text{L}}\right) \times \left(\frac{\text{g}}{1,000 \text{ mg}}\right) \times \left(\frac{\text{lb}}{453.59 \text{ g}}\right) = 1.88E - 01 \text{ lb/hour}$$

$$\text{Maximum Daily Emissions of Particulate Emissions} = \left(\frac{1.88E - 01 \text{ lb}}{\text{hour}}\right) \times \left(\frac{24 \text{ hours}}{\text{day}}\right) = 4.5E + 00 \text{ lb/day}$$

$$\text{Maximum Annual Emissions of Particulate Emissions} = \left(\frac{4.5E + 00 \text{ lb}}{\text{day}}\right) \times \left(\frac{365 \text{ days}}{\text{year}}\right) = 1.64E + 03 \text{ lb/year} = 0.822 \text{ tpy}$$

Table 7 – Summary of Criteria Pollutants Emissions from S10

Pollutant	Maximum Daily Emission Rate (lb/day)	Maximum Annual Emission Rate (lb/year)	Maximum Annual Emission Rate (tpy)
PM10	4.5E+00	1.64E+03	0.822
PM2.5	4.5E+00	1.64E+03	0.822

Organic Waste Dryer, S11

The dryer is used to reduce the moisture content in the organic waste prior to transferring the waste to the S3 hydrogen plant. Exhaust from the S4, S5 and S6 biogas engines are used as the heat source to dry the green waste. Since the heat from the biogas engines can exceed 800 degrees Fahrenheit, the facility plans to supplement the air with ambient air from the blower to cool the gas prior to coming in contact with the green waste.

Since the emissions from the drying operation are unknown, the applicant has agreed to limit POC emissions from the dryer to 9.5 pounds per day. Annual emissions assume the dryer operates 365 days per year.

Since the dryer is designed to reduce the moisture content from the green waste, particulate emissions will be produced from the rotary operation of the dryer and the constant air flow from the biogas engines and dilution air. The exhaust from the dryer will pass through a baghouse (A9) that will achieve a grain loading of 0.0013 grains per dry standard cubic foot. The gas flow will be no less than 16,000 acfm. The emissions of PM2.5 are assumed to be equivalent to the emissions of PM10. The emissions from S11 are summarized below:

Table 8 – Summary of PM10 and PM2.5 Emissions from S11

Pollutant	Maximum Daily Emission Rate (lb/day)	Maximum Annual Emission Rate (lb/year)	Maximum Annual Emission Rate (tpy)
POC	9.5E+00	3.47E+03	1.73E
PM10	4.28E+00	1.56E+03	0.781
PM2.5	4.28E+00	1.56E+03	0.781

Back-up Flare, A1

The gas directed to the flare will either be from the use of propane for the pilot light or the evacuated gas from the hydrogen plant. The evacuated gas from the hydrogen plant is assumed to be approximately 90% hydrogen. The flare capacity is 0.0144 MMBtu/hr. Emission factors for POC, CO, PM10, and PM2.5 for the flare are from AP-42 Table 2.4-5 for secondary compounds exiting a control device. The emissions for NOx are based on the RACT limit for the flare. The SO2 emission factor is based on the assumption of 100 ppmvd of SO2 at the outlet. Based on the two different types of fuel that can be directed to the flare, the highest emission rate from each criteria pollutant is assumed for the emission estimates. The facility has agreed to an annual limit of 100 hours per year of operation that includes hours of start-up, shutdown, and periods when the facility will need to evacuate all the gas from the hydrogen plant. The following is a summary of the emissions:

Table 9 – Summary of Criteria Pollutant Emissions from A1

Pollutant	Maximum Daily Emission Rate (lb/day)	Maximum Annual Emission Rate (lb/year)	Maximum Annual Emission Rate (tpy)
NOx	2.07E-02	7.57E+00	0.004
POC	1.47E-02	5.36E+00	0.003
CO	1.10E-01	4.02E+01	0.020
PM10	1.48E-02	3.75E+00	0.002
PM2.5	1.48E-02	3.75E+00	0.002
SO2	7.34E-05	2.68E-02	0.000

Landfill Gas Conditioning System, A2

Emissions from A2 landfill gas conditioning system are only fugitive from the various components. The calculations for the fugitive emissions are similar to the calculations for S3 hydrogen plant.

The A2 emissions have been calculated as if the screening value of 100 ppmv of landfill gas is used for all the components including at least one pegged leaking component. Operation of A2 is assumed to be 24 hours per day and 365 days per year.

Based on the composition of the landfill gas, fugitive emissions from A2 will result in only POC emissions. Below is a summary of the emissions:

Table 10 – Summary of Criteria Pollutants Emissions from A2

Pollutant	Maximum Daily Emission Rate (lb/day)	Maximum Annual Emission Rate (lb/year)	Maximum Annual Emission Rate (tpy)
POC	5.43E-03	3.42E-01	9.14E-08

Since the emissions at A2 gas conditioning are negligible, no monitoring of fugitive emissions has been required for these components.

Vehicle Emissions

Emissions from vehicle travel on unpaved roads are associated with the delivery of organic waste to S1, delivery of alkaline reagents to S2, removal of the biochar S9, and the transfer of hydrogen cylinders to and from the site from S3. Vehicles that will be traveling to and from the site will consist of semi-trucks and tube trailers. The vehicles will be traveling on unpaved roads. Emission factors are based on AP-42 Chapter 13.2.2 for unpaved roads:

Emission Factor on Unpaved Roads, $E = [k(s/12)^a \times W^{1.02}](365 - P)/365$

Where:

E = Emission Factor extrapolated for natural mitigation, lb/vehicle miles traveled (VMT)

k = Particulate Size Multiplier.

For PM10, k = 1.5.

For PM2.5, k = 0.15

s = surface material silt content. Assume 6.4 grains/sq m.

W = Average weight of each vehicle, tons

a = empirical constant

For PM10, a = 0.90.

For PM2.5, a = 0.90

b = empirical constant

For PM10, b = 0.45.

For PM2.5, b = 0.45

P = number of wet days. Assume 67 days. (source:

<https://www.ncei.noaa.gov/pub/data/ccd - data/prge0120. dat>)

Based on the average weight of each vehicle of 26.57 tons per vehicle, 5.6 miles of travel per day and 1,992 miles of travel per year, the following is a summary of the emissions from vehicle travel at the facility:

Table 11: Fugitive PM10 and PM2.5 Emissions from Vehicle Travel

Pollutant	Maximum Daily Emissions (lb/day)	Annual Emissions (lb/year)	Annual Emissions (tons/year)
PM10	3.12E+00	1.11E+03	0.554
PM2.5	3.12E-01	1.11E+02	0.055

The following is a summary of the criteria pollutants for all the sources:

Table 12: Summary of Daily Emissions of Criteria Pollutants in pounds per day

Source Description	NO _x	POC	CO	PM ₁₀	PM _{2.5}	SO ₂
S1, Organic Stockpile for Green Waste and Food Waste	0.00E+00	1.53E+01	0.00E+00	5.61E-01	8.40E-02	0.00E+00
S2, Alkaline Reagents Stock Pile	0.00E+00	0.00E+00	0.00E+00	1.67E-01	2.50E-02	0.00E+00
S3, Hydrogen Production System	0.00E+00	9.71E-03	6.16E-02	4.44E-08	4.44E-08	0.00E+00
S4, Biogas Engine #1	1.29E+01	1.25E+01	7.28E+01	1.93E+00	1.93E+00	1.23E+01
S5, Biogas Engine #2	1.29E+01	1.25E+01	7.28E+01	1.93E+00	1.93E+00	1.23E+01
S6, Biogas Engine #3	1.29E+01	1.25E+01	7.28E+01	1.93E+00	1.93E+00	1.23E+01
S7, Emergency Standby Diesel Generator for a Fire Pump	1.50E+01	6.97E-01	3.69E+00	5.33E-01	5.33E-01	2.94E-02
S9, Storage Pile - Biochar	0.00E+00	0.00E+00	0.00E+00	7.24E-03	1.10E-03	0.00E+00
S10, Cooling Tower (Exempt)	0.00E+00	0.00E+00	0.00E+00	4.50E+00	4.50E+00	0.00E+00
S11, Dryer	0.00E+00	9.50E+00	0.00E+00	4.28E+00	4.28E+00	0.00E+00
A1, Flare	2.07E-02	1.47E-02	1.10E-01	1.48E-02	1.48E-02	7.34E-05
Landfill Gas Conditioning System	0.00E+00	5.43E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fugitive - Vehicle Emissions	0.00E+00	0.00E+00	0.00E+00	3.12E+00	3.12E-01	0.00E+00
Cumulative Emissions	5.37E+01	6.30E+01	2.22E+02	1.90E+01	1.55E+01	3.70E+01

Table 13: Summary of Annual Emissions of Criteria Pollutants in tons per year

Source Description	NO _x	POC	CO	PM ₁₀	PM _{2.5}	SO ₂
S1, Organic Stockpile for Green Waste and Food Waste	0.000	2.962	0.000	0.102	0.016	0.000
S2, Alkaline Reagents Stock Pile	0.000	0.000	0.000	0.003	0.000	0.000
S3, Hydrogen Production System	0.000	0.002	0.011	0.000	0.000	0.000
S4, Biogas Engine #1	2.354	2.278	13.289	0.353	0.353	2.247
S5, Biogas Engine #2	2.354	2.278	13.289	0.353	0.353	2.247
S6, Biogas Engine #3	2.354	2.278	13.289	0.353	0.353	2.247
S7, Emergency Standby Diesel Generator for a Fire Pump	0.010	0.000	0.002	0.000	0.000	0.000
S9, Storage Pile - Biochar	0.000	0.000	0.000	0.001	0.000	0.000
S10, Cooling Tower (Exempt)	0.000	0.000	0.000	0.822	0.822	0.000
S11, Dryer	0.000	1.734	0.000	0.781	0.781	0.000
A1, Flare	0.004	0.003	0.020	0.002	0.002	0.000
Landfill Gas Conditioning System	0.000	0.000	0.000	0.000	0.000	0.000
Fugitive - Vehicle Emissions	0.000	0.000	0.000	0.554	0.055	0.000
Cumulative Emissions (ton/year)	7.076	11.535	39.901	3.324	2.735	6.742

Toxic Pollutants

Toxic air contaminants (TACs) are expected from various operations throughout the various operations from this facility. The TAC emissions are broken down based on the operations of each source. The emission calculations for each source are presented in Attachment C.

Organic Waste Stockpile, S1

The TAC emissions are produced from the degradation of organic material. Raven will receive their organic waste from WCCCSL. The emission factors were calculated based on the average weight fraction of TACs from source tests performed on the green waste storage piles at WCCCSL. The weight fraction for each TAC is presented in Attachment C. Below is a summary of the emissions:

Table 14 – Toxic Air Contaminants for S1

Pollutant	Hourly Emissions (lb/hr)	Acute Limits (lb/hr)	Acute Triggers HRA?	Annual Emissions (lb/yr)	Chronic Limits (lb/yr)	Chronic Triggers HRA?
Ammonia	2.09E-01	1.40E+00	NO	3.80E+02	7.70E+03	NO
1,4-Dichlorobenzene	6.58E-03	--	NO	1.20E+01	7.20E+00	YES
Acetaldehyde	8.10E-02	2.10E-01	NO	1.48E+02	2.90E+01	YES
Allyl Chloride (3-Chloropropene)	1.70E-03	--	NO	3.10E+00	1.40E+01	NO
Benzene	3.45E-03	1.20E-02	NO	6.29E+00	2.90E+00	YES
Carbon disulfide	3.43E-03	2.70E+00	NO	6.26E+00	3.10E+04	NO
Chloroform	4.35E-03	6.60E-02	NO	7.93E+00	1.50E+01	NO
Ethyl Chloride (Chloroethane)	2.85E-03	--	NO	5.19E+00	1.20E+06	NO
Ethylbenzene	4.72E-03	--	NO	8.60E+00	3.30E+01	NO
Ethylene Dichloride (1,2-dichloroethane)	2.20E-03	--	NO	4.01E+00	4.00E+00	YES
Isopropyl alcohol (IPA, 2-Propanol)	3.94E-03	1.40E+00	NO	7.18E+00	2.70E+05	NO
Methanol (Methyl alcohol)	1.59E-01	1.20E+01	NO	2.90E+02	1.50E+05	NO
Methyl Ethyl Ketone (2-butanone)	2.98E-02	5.80E+00	NO	5.44E+01	--	NO
Naphthalene	2.85E-03	--	NO	5.19E+00	2.40E+00	YES
n-Hexane	7.57E-03	--	NO	1.38E+01	2.70E+05	NO
Propene (Propylene)	2.71E-02	--	NO	4.94E+01	1.20E+05	NO
Styrene	4.84E-03	9.30E+00	NO	8.83E+00	3.50E+04	NO
Toluene	4.43E-03	2.20E+00	NO	8.07E+00	1.60E+04	NO
Vinyl acetate	1.90E-02	--	NO	3.47E+01	7.70E+03	NO
Xylene (Total)	9.38E-03	9.70E+00	NO	1.71E+01	2.70E+04	NO

Hydrogen Plant, S3

TAC emissions from S3 hydrogen plant are based on two different references provided by the facility. The first reference is based on an article published in Biomass Conversion and Biorefinery. The paper, “Charaterization of trace contaminants in syngas from the thermochemical conversion of biomass” by Hoekman, et al., collected nine samples of syngas after chemical treatment and 1 sample before any chemical treatment. The second reference of information came from Raven’s approximation of TAC emissions after treatment of the syngas.

Since emissions from the hydrogen plant are emitted from fugitive components, the applicant has stated that approximately 25% of the emissions are before any chemical treatment and 75% of the emissions are from after the chemical treatment.

Based on the information provided by Raven, the the highest TAC emissions calculated from the different sources and the percentage breakdown of the pre and post treatment operations were used in the health risk assessment. The applicant will be required to perform periodic source tests to confirm the TAC emissions used in the health risk assessment are not exceeded. Based on source test results, the Air District may revise the health risk assessment. If the final cancer risk does not meet the requirements of Regulation 2-5, the applicant shall shut down all operations until corrective actions are approved and implemented.

The following is a summary of the emissions from based on the percentage of emissions present from the operation:

Table 15 – Toxic Air Contaminants for S3

Toxic Air Contaminants	Hourly (lb/hr)	Acute Trigger Limit (lb/hr)	Acute HRA Triggered?	Annual (lb/yr)	Chronic Trigger Limit (lb/yr)	Chronic HRA Triggered?
1,3-Butadiene	2.74E-07	2.90E-01	NO	2.40E-03	4.80E-01	NO
Acetaldehyde	2.73E-08	2.10E-01	NO	2.39E-04	2.90E+01	NO
Acrolein	1.32E-10	1.10E-03	NO	1.16E-06	1.40E+01	NO
Ammonia	1.88E-04	1.40E+00	NO	1.65E+00	7.70E+03	NO
Benzene	3.66E-04	1.20E-02	NO	3.21E+00	2.90E+00	YES
Cadmium	7.48E-12	--	NO	6.55E-08	1.90E-02	NO
Carbon Disulfide	2.09E-07	2.70E+00	NO	1.84E-03	3.10E+04	NO
Carbonyl Sulfide	7.73E-06	2.90E-01	NO	6.77E-02	3.90E+02	NO
Chlorine	2.74E-11	9.30E-02	NO	2.40E-07	7.70E+00	NO
Cobalt	2.77E-12	--	NO	2.43E-08	1.10E-02	NO
Copper	2.49E-12	4.40E-02	NO	2.18E-08	--	NO
Dioxins PCDDs	1.37E-10	--	NO	1.20E-06	4.40E-08	YES
Ethylbenzene	3.42E-09	--	NO	3.00E-05	3.30E+01	NO
Formaldehyde	7.87E-11	2.40E-02	NO	6.89E-07	1.40E+01	NO
Hydrochloric Acid (Hydrogen Chloride)	2.33E-07	9.30E-01	NO	2.04E-03	3.50E+02	NO
Hydrocyanic Acid (Hydrogen Cyanide)	1.77E-04	1.50E-01	NO	1.55E+00	3.50E+02	NO
Hydrogen Sulfide (H2S)	5.22E-06	1.90E-02	NO	4.57E-02	3.90E+02	NO
Lead	1.33E-11	--	NO	1.16E-07	2.90E-01	NO
Manganese	2.49E-12	--	NO	2.18E-08	3.50E+00	NO
Methyl Ethyl Ketone (2-butanone)	1.04E-09	5.80E+00	NO	9.09E-06	--	NO

Table 15 – Toxic Air Contaminants for S3

Toxic Air Contaminants	Hourly (lb/hr)	Acute Trigger Limit (lb/hr)	Acute HRA Triggered?	Annual (lb/yr)	Chronic Trigger Limit (lb/yr)	Chronic HRA Triggered?
Naphthalene	2.55E-08	--	NO	2.24E-04	2.40E+00	NO
Nickel	1.85E-13	8.80E-05	NO	1.62E-09	3.10E-01	NO
Nitric acid	1.78E-09	3.80E-02	NO	1.56E-05	--	NO
Propene (Propylene)	8.62E-07	--	NO	7.55E-03	1.20E+05	NO
Styrene	5.93E-08	9.30E+00	NO	5.20E-04	3.50E+04	NO
Sulfuric acid	2.50E-08	5.30E-02	NO	2.19E-04	3.90E+01	NO
Toluene	2.39E-07	2.20E+00	NO	2.09E-03	1.60E+04	NO

Biogas Engines, S4, S5, and S6

Sources S4 through S6 biogas engines can operate on one of two scenarios: 100% landfill gas or a blend of 55% landfill gas and 45% waste gas from the hydrogen plant. Emissions from operating on 100% landfill gas are based on source test reports from WCCCSL during a 3 year period. When the system operates on blended fuel, the emissions were based on a combination of landfill gas and the post-treated syngas gas from S3.

TAC emissions modeled in the HRA were based on the highest concentration detected from either scenario. The following is a summary of the emissions are provided below:

Table 16 – Toxic Air Contamiants for each Biogas Engine

Pollutant	Scenario with Highest Concentration	Highest Hourly Emissions	Acute Trigger Limit (lb/hr)	Acute HRA Triggered?	Highest Annual Emissions	Chronic Trigger Limit (lb/yr)	Chronic HRA Triggered?
1,1,1-Trichloroethane (Methyl chloroform)	100% LFG	2.36E-05	3.0E+01	NO	2.07E-01	3.9E+04	NO
1,1,2,2-Tetrachloroethane	100% LFG	2.97E-05	--	NO	2.61E-01	1.4E+00	NO
1,1,2-Trichloroethane (Vinyl trichloride)	100% LFG	2.36E-05	--	NO	2.07E-01	5.0E+00	NO
1,1-Dichloroethane (Ethylidene dichloride)	100% LFG	1.42E-03	--	NO	1.24E+01	5.0E+01	NO
1,1-Dichloroethene (Vinylidene chloride)	100% LFG	1.71E-05	--	NO	1.50E-01	2.7E+03	NO
1,3-Butadiene	55% LFG/45% waste gas	3.35E-04	2.9E-01	NO	2.94E+00	4.8E-01	YES
1,4-Dichlorobenzene	100% LFG	4.35E-04	--	NO	3.82E+00	7.2E+00	NO
1,4-Dioxane (1,4-Diethylene dioxide)	100% LFG	3.12E-05	1.3E+00	NO	2.74E-01	1.1E+01	NO
Acetaldehyde	100% LFG	7.96E-03	2.1E-01	NO	6.99E+01	2.9E+01	YES
Acrolein	100% LFG	1.03E-03	1.1E-03	NO	9.03E+00	1.4E+01	NO
Acrylonitrile	100% LFG	3.75E-05	--	NO	3.29E-01	2.9E-01	YES
Allyl Chloride (3-Chloropropene)	100% LFG	2.71E-05	--	NO	2.38E-01	1.4E+01	NO
Ammonia	55% LFG/45% waste gas	1.22E-01	1.4E+00	NO	1.07E+03	7.7E+03	NO
Benzene	Both ¹	1.40E-01	1.2E-02	YES	1.23E+03	2.9E+00	YES
Benzyl Chloride	100% LFG	3.84E-05	1.1E-01	NO	3.37E-01	1.7E+00	NO
Cadmium	55% LFG/45% waste gas	3.89E-07	--	NO	3.41E-03	1.9E-02	NO
Carbon Disulfide	100% LFG	5.38E-05	2.7E+00	NO	4.72E-01	3.1E+04	NO
Carbon Tetrachloride	100% LFG	2.72E-05	8.4E-01	NO	2.39E-01	1.9E+00	NO
Chlorine	55% LFG/45% waste gas	9.53E-07	9.3E-02	NO	8.35E-03	7.7E+00	NO
Chlorobenzene	100% LFG	2.21E-04	--	NO	1.94E+00	3.9E+04	NO

Pollutant	Scenario with Highest Concentration	Highest Hourly Emissions	Acute Trigger Limit (lb/hr)	Acute HRA Triggered?	Highest Annual Emissions	Chronic Trigger Limit (lb/yr)	Chronic HRA Triggered?
Chloroform	100% LFG	2.11E-05	6.6E-02	NO	1.85E-01	1.5E+01	NO
Copper	55% LFG/45% waste gas	6.15E-08	4.4E-02	NO	5.38E-04	--	NO
Dioxins PCDDs	Both ¹	2.90E-09	--	NO	2.54E-05	4.4E-08	YES
Ethyl Chloride (Chloroethane)	100% LFG	8.95E-05	--	NO	7.85E-01	1.2E+06	NO
Ethylbenzene	100% LFG	3.05E-03	--	NO	2.67E+01	3.3E+01	NO
Ethylene Dibromide (1,2-dibromoethane)	100% LFG	3.32E-05	--	NO	2.92E-01	1.1E+00	NO
Ethylene Dichloride (1,2-dichloroethane)	100% LFG	3.57E-04	--	NO	3.13E+00	4.0E+00	NO
Formaldehyde	Both ²	8.67E-02	2.4E-02	YES	7.59E+02	1.4E+01	YES
Hydrochloric Acid (Hydrogen Chloride)	100% LFG	1.09E-01	9.3E-01	NO	9.55E+02	3.5E+02	YES
Hydrofluoric Acid (Hydrogen Fluoride)	100% LFG	4.62E-03	1.1E-01	NO	4.06E+01	5.8E+01	NO
Hydrogen Sulfide (H ₂ S)	55% LFG/45% waste gas	6.25E-02	1.9E-02	YES	1.19E+02	3.9E+02	NO
Isopropyl alcohol (IPA, 2-Propanol)	100% LFG	5.49E-05	1.4E+00	NO	4.81E-01	2.7E+05	NO
Lead	55% LFG/45% waste gas	9.02E-07	--	NO	7.90E-03	2.9E-01	NO
Manganese	55% LFG/45% waste gas	3.07E-08	--	NO	2.69E-04	3.5E+00	NO
Mercury	100% LFG	1.73E-07	2.7E-04	NO	1.52E-03	2.1E-01	NO
Methanol (Methyl alcohol)	100% LFG	5.67E-05	1.2E+01	NO	4.97E-01	1.5E+05	NO
Methyl Bromide (Bromomethane)	100% LFG	1.68E-05	1.7E+00	NO	1.47E-01	1.9E+02	NO
Methyl Ethyl Ketone (2-butanone)	100% LFG	8.93E-05	5.8E+00	NO	7.83E-01	--	NO
Methyl tert-Butyl Ether	100% LFG	1.56E-05	--	NO	1.37E-01	1.6E+02	NO

Pollutant	Scenario with Highest Concentration	Highest Hourly Emissions	Acute Trigger Limit (lb/hr)	Acute HRA Triggered?	Highest Annual Emissions	Chronic Trigger Limit (lb/yr)	Chronic HRA Triggered?
Methylene Chloride (dichloromethane)	100% LFG	5.47E-03	6.2E+00	NO	4.80E+01	8.2E+01	NO
Naphthalene	100% LFG	6.72E-04	--	NO	5.90E+00	2.4E+00	YES
n-Hexane	100% LFG	8.32E-03	--	NO	7.30E+01	2.7E+05	NO
Nickel	55% LFG/45% waste gas	1.02E-08	8.8E-05	NO	8.97E-05	3.1E-01	NO
Nitric acid	55% LFG/45% waste gas	3.86E-05	3.8E-02	NO	3.38E-01	--	NO
PAH Equivalents as Benzo(a)pyrene	100% LFG	1.31E-05	--	NO	1.15E-01	3.3E-03	YES
Perchloroethylene (tetrachloroethylene)	100% LFG	3.22E-04	8.8E+00	NO	2.82E+00	1.4E+01	NO
Propene (Propylene)	100% LFG	3.59E-03	--	NO	3.15E+01	1.2E+05	NO
Styrene	100% LFG	8.80E-05	9.3E+00	NO	7.73E-01	3.5E+04	NO
Sulfuric acid	55% LFG/45% waste gas	5.88E-06	5.3E-02	NO	5.15E-02	3.9E+01	NO
Toluene	100% LFG	4.95E-03	2.2E+00	NO	4.34E+01	1.6E+04	NO
Trichloroethylene	100% LFG	2.63E-04	--	NO	2.31E+00	4.1E+01	NO
Vinyl Acetate	100% LFG	1.01E-04	--	NO	8.89E-01	7.7E+03	NO
Vinyl Chloride (chloroethylene)	100% LFG	9.44E-04	8.0E+01	NO	8.28E+00	1.1E+00	YES
Xylene (Total)	100% LFG	3.95E-03	9.7E+00	NO	3.47E+01	2.7E+04	NO

Notes:

1. Benzene and Dioxin as PCDD are permit limits to reduces emissions from each compound.
2. Formaldehyde concentrations are based on a manufacturer's guarantee.

Emergency Diesel Generator for a Fire Pump, S7

The fire pump operates on a diesel engine and emits diesel particulate from the operation. All particulate emissions are assumed to be diesel particulate emissions. The following is a summary of the emissions for S7:

Table 17 – Toxic Air Contaminants for S7

Toxic Air Contaminant	Hourly (lb/hr)	Acute Trigger Limit (lb/hr)	Acute HRA Triggered?	Annual (lb/yr)	Chronic Trigger Limit (lb/yr)	Chronic HRA Triggered?
Diesel Exhaust Particulate	2.22E-02	--	NO	7.11E-01	2.60E-01	Yes

Organic Dryer, S11

TAC emissions from the organic waste dryer (S11) are based on the emissions from the organic waste storage pile (S1). Similar to the calculation of TAC emissions at S1, the emissions are a weight fraction of TAC in the POC emissions.

The TAC emissions from S11 are dependent on the operating scenario. In Scenario 1 (Figure 2), the exhaust from the biogas gas engines are directed to S11 to be used as a heat source. This depicts the typical operating situation for the source. Under Scenario 2 (Figure 3), S11 is not in operation and the exhaust from the biogas engines are directed to a by-pass stack located near the engines. The emissions from S11 are only modeled as part of Scenario 1.

The following is a summary of emissions for S11.:

Table 18 – Toxic Air Contaminants for S11

Pollutant	Hourly Emissions (lb/hr)	Acute Limits (lb/hr)	Triggers HRA?	Annual Emissions (lb/yr)	Chronic Limits (lb/yr)	Triggers HRA?
1,4-Dichlorobenzene	7.90E-04	--	NO	6.92E+00	7.20E+00	NO
Acetaldehyde	9.72E-03	2.10E-01	NO	8.51E+01	2.90E+01	YES
Allyl Chloride (3-Chloropropene)	2.04E-04	--	NO	1.79E+00	1.40E+01	NO
Benzene	4.14E-04	1.20E-02	NO	3.63E+00	2.90E+00	YES
Carbon disulfide	4.12E-04	2.70E+00	NO	3.61E+00	3.10E+04	NO
Chloroform	5.22E-04	6.60E-02	NO	4.57E+00	1.50E+01	NO
Ethyl Chloride (Chloroethane)	3.42E-04	--	NO	2.99E+00	1.20E+06	NO
Ethylbenzene	5.66E-04	--	NO	4.96E+00	3.30E+01	NO
Ethylene Dichloride (1,2-dichloroethane)	2.64E-04	--	NO	2.31E+00	4.00E+00	NO
Isopropyl alcohol (IPA, 2-Propanol)	4.73E-04	1.40E+00	NO	4.14E+00	2.70E+05	NO
Methanol (Methyl alcohol)	1.91E-02	1.20E+01	NO	1.67E+02	1.50E+05	NO

Pollutant	Hourly Emissions (lb/hr)	Acute Limits (lb/hr)	Triggers HRA?	Annual Emissions (lb/yr)	Chronic Limits (lb/yr)	Triggers HRA?
Methyl Ethyl Ketone (2-butanone)	3.58E-03	5.80E+00	NO	3.14E+01	--	NO
Naphthalene	3.42E-04	--	NO	2.99E+00	2.40E+00	YES
n-Hexane	9.08E-04	--	NO	7.96E+00	2.70E+05	NO
Propene (Propylene)	3.25E-03	--	NO	2.85E+01	1.20E+05	NO
Styrene	5.81E-04	9.30E+00	NO	5.09E+00	3.50E+04	NO
Toluene	5.31E-04	2.20E+00	NO	4.65E+00	1.60E+04	NO
Vinyl acetate	2.28E-03	--	NO	2.00E+01	7.70E+03	NO
Xylene (Total)	1.13E-03	9.70E+00	NO	9.86E+00	2.70E+04	NO

Back-up Flare, A1

TAC emissions from the flare were calculated based on the 100 hours of operation per year when it needs to abate the gas from S3 hydrogen plant. As was applied to S3, compounds used for the emission calculations were based on either the Hoekman paper or provided by the applicant for the post purification process. Since the gas directed to the flare are based on situations where the facility will need to evacuate all the syngas from S3, the emissions were based on the worst case scenario, which would be the syngas composition prior to treatment within the system. Due to the higher combustion temperature of the flare, a 98% destruction efficiency is applied to volatile organic compounds and sulfur compounds. A summary of the emissions are presented below:

Table 19 – Toxic Air Contaminants for A1

Pollutant	Hourly Emissions (lb/hr)	Acute Trigger Limit (lb/hr)	Acute HRA Triggered?	Annual Emissions (lb/yr)	Chronic Trigger Limit (lb/yr)	Chronic HRA Triggered?
1,3-Butadiene	1.13E-06	2.90E-01	NO	1.13E-04	4.80E-01	NO
Acetaldehyde	6.00E-08	2.10E-01	NO	6.00E-06	2.90E+01	NO
Acrolein	2.15E-10	1.10E-03	NO	2.15E-08	1.40E+01	NO
Benzene	1.70E-03	1.20E-02	NO	1.70E-01	2.90E+00	NO
Cadmium	1.77E-09	--	NO	1.77E-07	1.90E-02	NO
Chlorine	1.16E-08	9.30E-02	NO	1.16E-06	7.70E+00	NO
Cobalt	5.53E-10	--	NO	5.53E-08	1.10E-02	NO
Copper	1.33E-09	4.40E-02	NO	1.33E-07	--	NO
Dioxins PCDDs	8.91E-10	--	NO	8.91E-08	4.40E-08	YES
Ethylbenzene	5.27E-08	--	NO	5.27E-06	3.30E+01	NO
Hydrogen Sulfide (H ₂ S)	1.70E-07	1.90E-02	NO	1.70E-05	3.90E+02	NO
Lead	8.85E-10	--	NO	8.85E-08	2.90E-01	NO
Manganese	1.66E-09	--	NO	1.66E-07	3.50E+00	NO

Pollutant	Hourly Emissions (lb/hr)	Acute Trigger Limit (lb/hr)	Acute HRA Triggered?	Annual Emissions (lb/yr)	Chronic Trigger Limit (lb/yr)	Chronic HRA Triggered?
Methyl Ethyl Ketone (2-butanone)	1.67E-09	5.80E+00	NO	1.67E-07	--	NO
Naphthalene	3.99E-07	--	NO	3.99E-05	2.40E+00	NO
Nickel	3.69E-11	8.80E-05	NO	3.69E-09	3.10E-01	NO
Nitric acid	1.01E-06	3.80E-02	NO	1.01E-04	--	NO
Propene (Propylene)	3.67E-06	--	NO	3.67E-04	1.20E+05	NO
Styrene	1.63E-06	9.30E+00	NO	1.63E-04	3.50E+04	NO
Sulfuric acid	1.99E-05	5.30E-02	NO	1.99E-03	3.90E+01	NO
Toluene	1.33E-06	2.20E+00	NO	1.33E-04	1.60E+04	NO

Landfill Gas Conditioning System, A2

The TACs from A2 are from the fugitive emissions of landfill gas from the system. The calculations were based on the average concentration of each TAC and the emission rate of landfill gas from the fugitive emissions. Below is a summary of the emissions:

Table 20 – Toxic Air Contaminants for A2

Toxic Air Contaminants	Hourly Emissions (lb/hour)	Acute Trigger Limit (lb/hr)	Acute HRA?	Annual Emissions (lb/yr)	Chronic Trigger Limit (lb/yr)	Chronic HRA?
1,1,1-Trichloroethane (Methyl chloroform)	4.17E-08	3.00E+01	NO	6.30E-05	3.90E+04	NO
1,1,2,2-Tetrachloroethane	5.25E-08	--	NO	7.93E-05	1.40E+00	NO
1,1,2-Trichloroethane (Vinyl trichloride)	4.17E-08	--	NO	6.31E-05	5.00E+00	NO
1,1-Dichloroethane (Ethylidene dichloride)	2.50E-06	--	NO	3.78E-03	5.00E+01	NO
1,1-Dichloroethene (Vinylidene chloride)	3.03E-08	--	NO	4.58E-05	2.70E+03	NO
1,3-Butadiene	1.09E-07	2.90E-01	NO	1.65E-04	4.80E-01	NO
1,4-Dichlorobenzene	7.69E-07	--	NO	1.16E-03	7.20E+00	NO
1,4-Dioxane (1,4-Diethylene dioxide)	5.52E-08	1.30E+00	NO	8.34E-05	1.10E+01	NO
Acrylonitrile	6.63E-08	--	NO	1.00E-04	2.90E-01	NO
Allyl Chloride (3-Chloropropene)	4.79E-08	--	NO	7.24E-05	1.40E+01	NO
Benzene	3.09E-06	1.20E-02	NO	4.67E-03	2.90E+00	NO
Benzyl Chloride	6.79E-08	1.10E-01	NO	1.03E-04	1.70E+00	NO
Carbon Disulfide	9.52E-08	2.70E+00	NO	1.44E-04	3.10E+04	NO
Carbon Tetrachloride	4.81E-08	8.40E-01	NO	7.27E-05	1.90E+00	NO

Toxic Air Contaminants	Hourly Emissions (lb/hour)	Acute Trigger Limit (lb/hr)	Acute HRA?	Annual Emissions (lb/yr)	Chronic Trigger Limit (lb/yr)	Chronic HRA?
Chlorobenzene	3.91E-07	--	NO	5.91E-04	3.90E+04	NO
Chloroform	3.73E-08	6.60E-02	NO	5.64E-05	1.50E+01	NO
Ethyl Chloride (Chloroethane)	1.58E-07	--	NO	2.39E-04	1.20E+06	NO
Ethylbenzene	5.39E-06	--	NO	8.14E-03	3.30E+01	NO
Ethylene Dibromide (1,2-dibromoethane)	5.88E-08	--	NO	8.88E-05	1.10E+00	NO
Ethylene Dichloride (1,2-dichloroethane)	6.31E-07	--	NO	9.54E-04	4.00E+00	NO
Hydrogen Sulfide (H2S)	4.81E-05	1.90E-02	NO	7.27E-02	3.90E+02	NO
Isopropyl alcohol (IPA, 2-Propanol)	9.70E-08	1.40E+00	NO	1.47E-04	2.70E+05	NO
Mercury	3.07E-10	2.70E-04	NO	4.63E-07	2.10E-01	NO
Methanol (Methyl alcohol)	1.00E-07	1.20E+01	NO	1.51E-04	1.50E+05	NO
Methyl Bromide (Bromomethane)	2.97E-08	1.70E+00	NO	4.49E-05	1.90E+02	NO
Methyl Ethyl Ketone (2-butanone)	1.58E-07	5.80E+00	NO	2.39E-04	--	NO
Methyl tert-Butyl Ether	2.76E-08	--	NO	4.17E-05	1.60E+02	NO
Methylene Chloride (dichloromethane)	9.68E-06	6.20E+00	NO	1.46E-02	8.20E+01	NO
n-Hexane	1.47E-05	--	NO	2.22E-02	2.70E+05	NO
Perchloroethylene (tetrachloroethylene)	5.69E-07	8.80E+00	NO	8.60E-04	1.40E+01	NO
Propene (Propylene)	6.66E-06	--	NO	1.01E-02	1.20E+05	NO
Styrene	1.56E-07	9.30E+00	NO	2.35E-04	3.50E+04	NO
Toluene	8.76E-06	2.20E+00	NO	1.32E-02	1.60E+04	NO
Trichloroethylene	4.65E-07	--	NO	7.03E-04	4.10E+01	NO
Vinyl Acetate	1.79E-07	--	NO	2.71E-04	7.70E+03	NO
Vinyl Chloride (Chloroethylene)	1.67E-06	8.00E+01	NO	2.52E-03	1.10E+00	NO
Xylene (Total)	6.99E-06	9.70E+00	NO	1.06E-02	2.70E+04	NO

Vehicle Emissions

Raven operates within a space within a closed landfill. The road dust present onsite contains various metals. The emission factors for the TACs are based on samples collected from WCCSL. Since the samples analyzed for total chromium rather than hexavalent chromium, the Air District assumed 14% of the total chromium is hexavalent chromium. Emissions were calculated based on the weight fraction of each compound as a fraction of the total suspended solids calculated for this project. The calculations are presented in Attachment X. Below is a summary of the emissions:

Table 21 – Toxic Air Contaminants for Vehicle Emissions

Toxic Air Contaminants	Hourly (lb/hour)	Acute Trigger (lb/hr)	Exceed Acute Trigger?	Annual (lb/year)	Chronic Trigger (lb/yr)	Exceed Chronic Trigger?
Arsenic	4.15E-06	8.80E-05	NO	1.92E-02	1.60E-03	YES
Cadmium	2.58E-07	--	NO	1.19E-03	1.90E-02	NO
Hexavalent Chromium	1.67E-06	--	NO	7.72E-03	5.10E-04	YES
Copper	1.88E-05	4.40E-02	NO	8.70E-02	--	NO
Lead	1.20E-05	--	NO	5.55E-02	2.90E-01	NO
Mercury	1.19E-07	2.70E-04	NO	5.51E-04	2.10E-01	NO
Nickel	3.21E-05	8.80E-05	NO	1.49E-01	3.10E-01	NO
Selenium	8.88E-07	--	NO	4.11E-03	8.00E+00	NO

The following is a cumulative summary of the TAC emissions for the project:

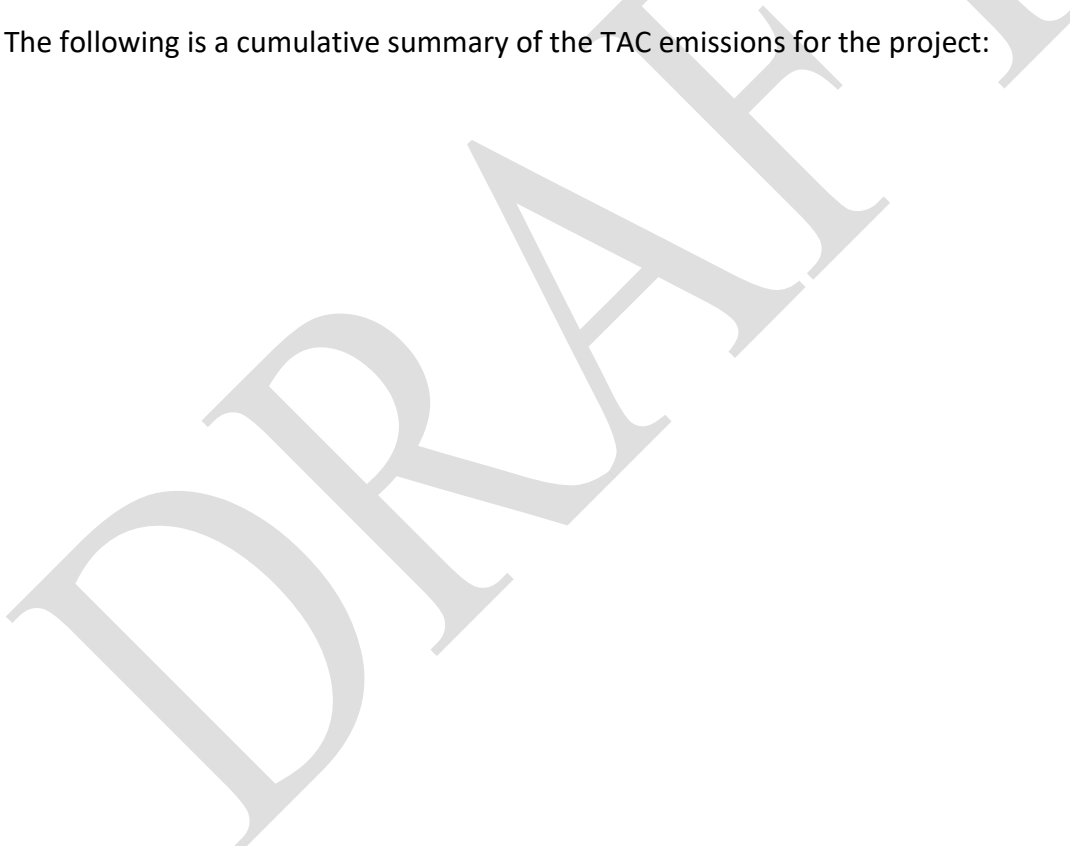


Table 22 – Summary of Hourly Emissions for Toxic Air Contaminants by Source

Toxic Air Contaminants	S1	S2	S3	S4	S5	S6	S7	S9	S10	S11	A1	A2	Vehicle Emissions	Total Hourly Emissions (lb/hr)	Acute Limits (lb/hr)	Acute HRA Triggered ?
1,1,1-Trichloroethane (Methyl chloroform)	--	--	--	2.36E-05	2.36E-05	2.36E-05	--	--	--	--	--	4.17E-08	--	7.08E-05	3.00E+01	NO
1,1,2,2-Tetrachloroethane	--	--	--	2.97E-05	2.97E-05	2.97E-05	--	--	--	--	--	5.25E-08	--	8.91E-05	--	NO
1,1,2-Trichloroethane (Vinyl trichloride)	--	--	--	2.36E-05	2.36E-05	2.36E-05	--	--	--	--	--	4.17E-08	--	7.08E-05	--	NO
1,1-Dichloroethane (Ethylidene dichloride)	--	--	--	1.42E-03	1.42E-03	1.42E-03	--	--	--	--	--	2.50E-06	--	4.25E-03	--	NO
1,1-Dichloroethene (Vinylidene chloride)	--	--	--	1.71E-05	1.71E-05	1.71E-05	--	--	--	--	--	3.03E-08	--	5.15E-05	--	NO
1,3-Butadiene	--	--	2.74E-07	3.35E-04	3.35E-04	3.35E-04	--	--	--	--	1.13E-06	1.09E-07	--	1.01E-03	2.90E-01	NO
1,4-Dichlorobenzene	6.58E-03	--	--	4.35E-04	4.35E-04	4.35E-04	--	--	--	7.90E-04	--	7.69E-07	--	8.68E-03	--	NO
1,4-Dioxane (1,4-Diethylene dioxide)	--	--	--	3.12E-05	3.12E-05	3.12E-05	--	--	--	--	--	5.52E-08	--	9.37E-05	1.30E+00	NO
Acetaldehyde	8.10E-02	--	2.73E-08	7.96E-03	7.96E-03	7.96E-03	--	--	--	9.72E-03	6.00E-08	--	--	1.15E-01	2.10E-01	NO
Acrolein	--	--	1.32E-10	1.03E-03	1.03E-03	1.03E-03	--	--	--	--	2.15E-10	--	--	3.09E-03	1.10E-03	YES
Acrylonitrile	--	--	--	3.75E-05	3.75E-05	3.75E-05	--	--	--	--	--	6.63E-08	--	1.13E-04	--	NO
Allyl Chloride (3-Chloropropene)	1.70E-03	--	--	2.71E-05	2.71E-05	2.71E-05	--	--	--	2.04E-04	--	4.79E-08	--	1.98E-03	--	NO
Ammonia	2.09E-01	--	1.88E-04	1.22E-01	1.22E-01	1.22E-01	--	--	--	--	--	--	--	5.75E-01	1.40E+00	NO
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	4.15E-06	4.15E-06	8.80E-05	NO
Benzene	3.45E-03	--	3.66E-04	1.40E-01	1.40E-01	1.40E-01	--	--	--	4.14E-04	1.70E-03	3.09E-06	--	4.26E-01	1.20E-02	YES
Benzyl Chloride	--	--	--	3.84E-05	3.84E-05	3.84E-05	--	--	--	--	--	6.79E-08	--	1.15E-04	1.10E-01	NO
Cadmium	--	--	7.48E-12	3.89E-07	3.89E-07	3.89E-07	--	--	--	--	1.77E-09	--	2.58E-07	1.43E-06	--	NO
Carbon Disulfide	3.43E-03	--	2.09E-07	5.38E-05	5.38E-05	5.38E-05	--	--	--	4.12E-04	--	9.52E-08	--	4.01E-03	2.70E+00	NO
Carbon Tetrachloride	--	--	--	2.72E-05	2.72E-05	2.72E-05	--	--	--	--	--	4.81E-08	--	8.17E-05	8.40E-01	NO
Carbonyl Sulfide	--	--	7.73E-06	--	--	--	--	--	--	--	--	--	--	7.73E-06	2.90E-01	NO
Chlorine	--	--	2.74E-11	9.53E-07	9.53E-07	9.53E-07	--	--	--	--	1.16E-08	--	--	2.87E-06	9.30E-02	NO
Chlorobenzene	--	--	--	2.21E-04	2.21E-04	2.21E-04	--	--	--	--	--	3.91E-07	--	6.64E-04	--	NO
Chloroform	4.35E-03	--	--	2.11E-05	2.11E-05	2.11E-05	--	--	--	5.22E-04	--	3.73E-08	--	4.94E-03	6.60E-02	NO
Cobalt	--	--	2.77E-12	--	--	--	--	--	--	--	5.53E-10	--	--	5.56E-10	--	NO
Copper	--	--	2.49E-12	6.15E-08	6.15E-08	6.15E-08	--	--	--	--	1.33E-09	--	1.88E-05	1.90E-05	4.40E-02	NO
Diesel Particulate	--	--	--	--	--	--	2.22E-02	--	--	--	--	--	--	2.22E-02	--	NO
Dioxins PCDDs	--	--	1.37E-10	2.90E-09	2.90E-09	2.90E-09	--	--	--	--	8.91E-10	--	--	9.74E-09	--	NO
Ethyl Chloride (Chloroethane)	2.85E-03	--	--	8.95E-05	8.95E-05	8.95E-05	--	--	--	3.42E-04	--	1.58E-07	--	3.46E-03	--	NO
Ethylbenzene	4.72E-03	--	3.42E-09	3.05E-03	3.05E-03	3.05E-03	--	--	--	5.66E-04	5.27E-08	5.39E-06	--	1.44E-02	--	NO
Ethylene Dibromide	--	--	--	3.32E-05	3.32E-05	3.32E-05	--	--	--	--	--	5.88E-08	--	9.98E-05	--	NO

Table 22 – Summary of Hourly Emissions for Toxic Air Contaminants by Source

Toxic Air Contaminants	S1	S2	S3	S4	S5	S6	S7	S9	S10	S11	A1	A2	Vehicle Emissions	Total Hourly Emissions (lb/hr)	Acute Limits (lb/hr)	Acute HRA Triggered ?
(1,2-dibromoethane)																
Ethylene Dichloride (1,2-dichloroethane)	2.20E-03	--	--	3.57E-04	3.57E-04	3.57E-04	--	--	--	2.64E-04	--	6.31E-07	--	3.53E-03	--	NO
Formaldehyde	--	--	7.87E-11	8.67E-02	8.67E-02	8.67E-02	--	--	--	--	--	--	--	2.60E-01	2.40E-02	YES
Hexavalent Chromium	--	--	--	--	--	--	--	--	--	--	--	--	1.67E-06	1.67E-06	--	NO
Hydrochloric Acid (Hydrogen Chloride)	--	--	2.33E-07	1.09E-01	1.09E-01	1.09E-01	--	--	--	--	--	--	--	3.26E-01	9.30E-01	NO
Hydrocyanic Acid (Hydrogen Cyanide)	--	--	1.77E-04	--	--	--	--	--	--	--	--	--	--	1.77E-04	1.50E-01	NO
Hydrofluoric Acid (Hydrogen Fluoride)	--	--	--	4.62E-03	4.62E-03	4.62E-03	--	--	--	--	--	--	--	1.39E-02	1.10E-01	NO
Hydrogen Sulfide (H2S)	--	--	5.22E-06	6.25E-02	6.25E-02	6.25E-02	--	--	--	--	1.70E-07	4.81E-05	--	1.88E-01	1.90E-02	YES
Isopropyl alcohol (IPA, 2-Propanol)	3.94E-03	--	--	5.49E-05	5.49E-05	5.49E-05	--	--	--	4.73E-04	--	9.70E-08	--	4.58E-03	1.40E+00	NO
Lead	--	--	1.33E-11	9.02E-07	9.02E-07	9.02E-07	--	--	--	--	8.85E-10	--	1.20E-05	1.47E-05	--	NO
Manganese	--	--	2.49E-12	3.07E-08	3.07E-08	3.07E-08	--	--	--	--	1.66E-09	--	--	9.39E-08	--	NO
Mercury	--	--	--	1.73E-07	1.73E-07	1.73E-07	--	--	--	--	--	3.07E-10	1.19E-07	6.40E-07	2.70E-04	NO
Methanol (Methyl alcohol)	1.59E-01	--	--	5.67E-05	5.67E-05	5.67E-05	--	--	--	1.91E-02	--	1.00E-07	--	1.78E-01	1.20E+01	NO
Methyl Bromide (Bromomethane)	--	--	--	1.68E-05	1.68E-05	1.68E-05	--	--	--	--	--	2.97E-08	--	5.04E-05	1.70E+00	NO
Methyl Ethyl Ketone (2-butanone)	2.98E-02	--	1.04E-09	8.93E-05	8.93E-05	8.93E-05	--	--	--	3.58E-03	1.67E-09	1.58E-07	--	3.37E-02	5.80E+00	NO
Methyl tert-Butyl Ether	--	--	--	1.56E-05	1.56E-05	1.56E-05	--	--	--	--	--	2.76E-08	--	4.68E-05	--	NO
Methylene Chloride (dichloromethane)	--	--	--	5.47E-03	5.47E-03	5.47E-03	--	--	--	--	--	9.68E-06	--	1.64E-02	6.20E+00	NO
Naphthalene	2.85E-03	--	2.55E-08	6.72E-04	6.72E-04	6.72E-04	--	--	--	3.42E-04	3.99E-07	--	--	5.20E-03	--	NO
n-Hexane	7.57E-03	--	--	8.32E-03	8.32E-03	8.32E-03	--	--	--	9.08E-04	--	1.47E-05	--	3.35E-02	--	NO
Nickel	--	--	1.85E-13	1.02E-08	1.02E-08	1.02E-08	--	--	--	--	3.69E-11	--	3.21E-05	3.22E-05	8.80E-05	NO
Nitric acid	--	--	1.78E-09	3.86E-05	3.86E-05	3.86E-05	--	--	--	--	1.01E-06	--	--	1.17E-04	3.80E-02	NO
PAH Equivalents as Benzo(a)pyrene	--	--	--	1.31E-05	1.31E-05	1.31E-05	--	--	--	--	--	--	--	3.94E-05	--	NO
Perchloroethylene (tetrachloroethylene)	--	--	--	3.22E-04	3.22E-04	3.22E-04	--	--	--	--	--	5.69E-07	--	9.66E-04	8.80E+00	NO
Propene (Propylene)	2.71E-02	--	8.62E-07	3.59E-03	3.59E-03	3.59E-03	--	--	--	3.25E-03	3.67E-06	6.66E-06	--	4.11E-02	--	NO
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	8.88E-07	8.88E-07	--	NO
Styrene	4.84E-03	--	5.93E-08	8.80E-05	8.80E-05	8.80E-05	--	--	--	5.81E-04	1.63E-06	1.56E-07	--	5.69E-03	9.30E+00	NO
Sulfates	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00E+00	5.30E-02	NO
Sulfuric acid	--	--	2.50E-08	5.88E-06	5.88E-06	5.88E-06	--	--	--	--	1.99E-05	--	--	3.75E-05	5.30E-02	NO
Toluene	4.43E-03	--	2.39E-07	4.95E-03	4.95E-03	4.95E-03	--	--	--	5.31E-04	1.33E-06	8.76E-06	--	1.98E-02	2.20E+00	NO

Table 22 – Summary of Hourly Emissions for Toxic Air Contaminants by Source

Toxic Air Contaminants	S1	S2	S3	S4	S5	S6	S7	S9	S10	S11	A1	A2	Vehicle Emissions	Total Hourly Emissions (lb/hr)	Acute Limits (lb/hr)	Acute HRA Triggered ?
Trichloroethylene	--	--	--	2.63E-04	2.63E-04	2.63E-04	--	--	--	--	--	4.65E-07	--	7.89E-04	--	NO
Vanadium (fume or dust)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00E+00	1.30E-02	NO
Vinyl acetate	1.90E-02	--	--	1.01E-04	1.01E-04	1.01E-04	--	--	--	2.28E-03	--	1.79E-07	--	2.16E-02	--	NO
Vinyl Chloride (chloroethylene)	--	--	--	9.44E-04	9.44E-04	9.44E-04	--	--	--	--	--	1.67E-06	--	2.83E-03	8.00E+01	NO
Xylene (Total)	9.38E-03	--	--	3.95E-03	3.95E-03	3.95E-03	--	--	--	1.13E-03	--	6.99E-06	--	2.24E-02	9.70E+00	NO

Table 23 – Summary of Annual Emissions for Toxic Air Contaminants by Source

Toxic Air Contaminants	S1	S2	S3	S4	S5	S6	S7	S9	S10	S11	A1	A2	Vehicle Travel (Unpaved Roads)	Total Annual Emissions (lb/yr)	Chronic Limits (lb/yr)	Exceeds Trigger Limits?
1,1,1-Trichloroethane (Methyl chloroform)	--	--	--	2.07E-01	2.07E-01	2.07E-01	--	--	--	--	--	6.30E-05	--	6.21E-01	3.90E+04	NO
1,1,2,2-Tetrachloroethane	--	--	--	2.61E-01	2.61E-01	2.61E-01	--	--	--	--	--	7.93E-05	--	7.82E-01	1.40E+00	NO
1,1,2-Trichloroethane (Vinyl trichloride)	--	--	--	2.07E-01	2.07E-01	2.07E-01	--	--	--	--	--	6.31E-05	--	6.21E-01	5.00E+00	NO
1,1-Dichloroethane (Ethylidene dichloride)	--	--	--	1.24E+01	1.24E+01	1.24E+01	--	--	--	--	--	3.78E-03	--	3.73E+01	5.00E+01	NO
1,1-Dichloroethene (Vinylidene chloride)	--	--	--	1.50E-01	1.50E-01	1.50E-01	--	--	--	--	--	4.58E-05	--	4.51E-01	2.70E+03	NO
1,3-Butadiene	--	--	2.40E-03	2.94E+00	2.94E+00	2.94E+00	--	--	--	--	1.13E-04	1.65E-04	--	8.82E+00	4.80E-01	YES
1,4-Dichlorobenzene	1.20E+01	--	--	3.82E+00	3.82E+00	3.82E+00	--	--	--	6.92E+00	--	1.16E-03	--	3.04E+01	7.20E+00	YES
1,4-Dioxane (1,4-Diethylene dioxide)	--	--	--	2.74E-01	2.74E-01	2.74E-01	--	--	--	--	--	8.34E-05	--	8.22E-01	1.10E+01	NO
Acetaldehyde	1.48E+02	--	2.39E-04	6.99E+01	6.99E+01	6.99E+01	--	--	--	8.51E+01	6.00E-06	--	--	4.42E+02	2.90E+01	YES
Acrolein	--	--	1.16E-06	9.03E+00	9.03E+00	9.03E+00	--	--	--	--	2.15E-08	--	--	2.71E+01	1.40E+01	YES
Acrylonitrile	--	--	--	3.29E-01	3.29E-01	3.29E-01	--	--	--	--	--	1.00E-04	--	9.87E-01	2.90E-01	YES
Allyl Chloride (3-Chloropropene)	3.10E+00	--	--	2.38E-01	2.38E-01	2.38E-01	--	--	--	1.79E+00	--	7.24E-05	--	5.60E+00	1.40E+01	NO
Ammonia	3.80E+02	--	1.65E+00	1.07E+03	1.07E+03	1.07E+03	--	--	--	--	--	--	--	3.59E+03	7.70E+03	NO
Arsenic	--	--	--	--	--	--	--	--	--	--	--	--	1.92E-02	1.92E-02	1.60E-03	YES
Benzene	6.29E+00	--	3.21E+00	1.23E+03	1.23E+03	1.23E+03	--	--	--	3.63E+00	1.70E-01	4.67E-03	--	3.69E+03	2.90E+00	YES
Benzyl Chloride	--	--	--	3.37E-01	3.37E-01	3.37E-01	--	--	--	--	--	1.03E-04	--	1.01E+00	1.70E+00	NO
Cadmium	--	--	6.55E-08	3.41E-03	3.41E-03	3.41E-03	--	--	--	--	1.77E-07	--	1.19E-03	1.14E-02	1.90E-02	NO

Table 23 – Summary of Annual Emissions for Toxic Air Contaminants by Source

Toxic Air Contaminants	S1	S2	S3	S4	S5	S6	S7	S9	S10	S11	A1	A2	Vehicle Travel (Unpaved Roads)	Total Annual Emissions (lb/yr)	Chronic Limits (lb/yr)	Exceeds Trigger Limits?
Carbon Disulfide	6.26E+00	--	1.84E-03	4.72E-01	4.72E-01	4.72E-01	--	--	--	3.61E+00	--	1.44E-04	--	1.13E+01	3.10E+04	NO
Carbon Tetrachloride	--	--	--	2.39E-01	2.39E-01	2.39E-01	--	--	--	--	--	7.27E-05	--	7.16E-01	1.90E+00	NO
Carbonyl Sulfide	--	--	6.77E-02	--	--	--	--	--	--	--	--	--	--	6.77E-02	3.90E+02	NO
Chlorine	--	--	2.40E-07	8.35E-03	8.35E-03	8.35E-03	--	--	--	--	1.16E-06	--	--	2.50E-02	7.70E+00	NO
Chlorobenzene	--	--	--	1.94E+00	1.94E+00	1.94E+00	--	--	--	--	--	5.91E-04	--	5.83E+00	3.90E+04	NO
Chloroform	7.93E+00	--	--	1.85E-01	1.85E-01	1.85E-01	--	--	--	4.57E+00	--	5.64E-05	--	1.31E+01	1.50E+01	NO
Cobalt	--	--	2.43E-08	--	--	--	--	--	--	--	5.53E-08	--	--	7.95E-08	1.10E-02	NO
Copper	--	--	2.18E-08	5.38E-04	5.38E-04	5.38E-04	--	--	--	--	1.33E-07	--	8.70E-02	8.86E-02	--	NO
Diesel Particulate	--	--	--	--	--	--	7.11E-01	--	--	--	--	--	--	7.11E-01	2.60E-01	YES
Dioxins PCDDs	--	--	1.20E-06	2.54E-05	2.54E-05	2.54E-05	--	--	--	--	8.91E-08	--	--	7.76E-05	4.40E-08	YES
Ethyl Chloride (Chloroethane)	5.19E+00	--	--	7.85E-01	7.85E-01	7.85E-01	--	--	--	2.99E+00	--	2.39E-04	--	1.05E+01	1.20E+06	NO
Ethylbenzene	8.60E+00	--	3.00E-05	2.67E+01	2.67E+01	2.67E+01	--	--	--	4.96E+00	5.27E-06	8.14E-03	--	9.38E+01	3.30E+01	YES
Ethylene Dibromide (1,2-dibromoethane)	--	--	--	2.92E-01	2.92E-01	2.92E-01	--	--	--	--	--	8.88E-05	--	8.75E-01	1.10E+00	NO
Ethylene Dichloride (1,2-dichloroethane)	4.01E+00	--	--	3.13E+00	3.13E+00	3.13E+00	--	--	--	2.31E+00	--	9.54E-04	--	1.57E+01	4.00E+00	YES
Formaldehyde	--	--	6.89E-07	7.59E+02	7.59E+02	7.59E+02	--	--	--	--	--	--	--	2.28E+03	1.40E+01	YES
Hexavalent Chromium	--	--	--	--	--	--	--	--	--	--	--	--	7.72E-03	7.72E-03	5.10E-04	YES
Hydrochloric Acid (Hydrogen Chloride)	--	--	2.04E-03	9.55E+02	9.55E+02	9.55E+02	--	--	--	--	--	--	--	2.86E+03	3.50E+02	YES
Hydrocyanic Acid (Hydrogen Cyanide)	--	--	1.55E+00	--	--	--	--	--	--	--	--	--	--	1.55E+00	3.50E+02	NO
Hydrofluoric Acid (Hydrogen Fluoride)	--	--	--	4.06E+01	4.06E+01	4.06E+01	--	--	--	--	--	--	--	1.22E+02	5.80E+01	YES
Hydrogen Sulfide (H2S)	--	--	4.57E-02	1.19E+02	1.19E+02	1.19E+02	--	--	--	--	1.70E-05	7.27E-02	--	3.58E+02	3.90E+02	NO
Isopropyl alcohol (IPA, 2-Propanol)	7.18E+00	--	--	4.81E-01	4.81E-01	4.81E-01	--	--	--	4.14E+00	--	1.47E-04	--	1.28E+01	2.70E+05	NO
Lead	--	--	1.16E-07	7.90E-03	7.90E-03	7.90E-03	--	--	--	--	8.85E-08	--	5.55E-02	7.92E-02	2.90E-01	NO
Manganese	--	--	2.18E-08	2.69E-04	2.69E-04	2.69E-04	--	--	--	--	1.66E-07	--	--	8.08E-04	3.50E+00	NO
Mercury	--	--	--	1.52E-03	1.52E-03	1.52E-03	--	--	--	--	--	4.63E-07	5.51E-04	5.12E-03	2.10E-01	NO
Methanol (Methyl alcohol)	2.90E+02	--	--	4.97E-01	4.97E-01	4.97E-01	--	--	--	1.67E+02	--	1.51E-04	--	4.58E+02	1.50E+05	NO
Methyl Bromide (Bromomethane)	--	--	--	1.47E-01	1.47E-01	1.47E-01	--	--	--	--	--	4.49E-05	--	4.42E-01	1.90E+02	NO
Methyl Ethyl Ketone (2-butanone)	5.44E+01	--	9.09E-06	7.83E-01	7.83E-01	7.83E-01	--	--	--	3.14E+01	1.67E-07	2.39E-04	--	8.81E+01	--	NO
Methyl tert-Butyl Ether	--	--	--	1.37E-01	1.37E-01	1.37E-01	--	--	--	--	--	4.17E-05	--	4.10E-01	1.60E+02	NO
Methylene Chloride (dichloromethane)	--	--	--	4.80E+01	4.80E+01	4.80E+01	--	--	--	--	--	1.46E-02	--	1.44E+02	8.20E+01	YES

Table 23 – Summary of Annual Emissions for Toxic Air Contaminants by Source

Toxic Air Contaminants	S1	S2	S3	S4	S5	S6	S7	S9	S10	S11	A1	A2	Vehicle Travel (Unpaved Roads)	Total Annual Emissions (lb/yr)	Chronic Limits (lb/yr)	Exceeds Trigger Limits?
Naphthalene	5.19E+00	--	2.24E-04	5.90E+00	5.90E+00	5.90E+00	--	--	--	2.99E+00	3.99E-05	--	--	2.59E+01	2.40E+00	YES
n-Hexane	1.38E+01	--	--	7.30E+01	7.30E+01	7.30E+01	--	--	--	7.96E+00	--	2.22E-02	--	2.41E+02	2.70E+05	NO
Nickel	--	--	1.62E-09	8.97E-05	8.97E-05	8.97E-05	--	--	--	--	3.69E-09	--	1.49E-01	1.49E-01	3.10E-01	NO
Nitric acid	--	--	1.56E-05	3.38E-01	3.38E-01	3.38E-01	--	--	--	--	1.01E-04	--	--	1.01E+00	--	NO
PAH Equivalents as Benzo(a)pyrene	--	--	--	1.15E-01	1.15E-01	1.15E-01	--	--	--	--	--	--	--	3.46E-01	3.30E-03	YES
Perchloroethylene (tetrachloroethylene)	--	--	--	2.82E+00	2.82E+00	2.82E+00	--	--	--	--	--	8.60E-04	--	8.47E+00	1.40E+01	NO
Propene (Propylene)	4.94E+01	--	7.55E-03	3.15E+01	3.15E+01	3.15E+01	--	--	--	2.85E+01	3.67E-04	1.01E-02	--	1.72E+02	1.20E+05	NO
Selenium	--	--	--	--	--	--	--	--	--	--	--	--	4.11E-03	4.11E-03	8.00E+00	NO
Styrene	8.83E+00	--	5.20E-04	7.73E-01	7.73E-01	7.73E-01	--	--	--	5.09E+00	1.63E-04	2.35E-04	--	1.62E+01	3.50E+04	NO
Sulfates	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00E+00	--	NO
Sulfuric acid	--	--	2.19E-04	5.15E-02	5.15E-02	5.15E-02	--	--	--	--	1.99E-03	--	--	1.57E-01	3.90E+01	NO
Toluene	8.07E+00	--	2.09E-03	4.34E+01	4.34E+01	4.34E+01	--	--	--	4.65E+00	1.33E-04	1.32E-02	--	1.43E+02	1.60E+04	NO
Trichloroethylene	--	--	--	2.31E+00	2.31E+00	2.31E+00	--	--	--	--	--	7.03E-04	--	6.92E+00	4.10E+01	NO
Vanadium (fume or dust)	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00E+00	--	NO
Vinyl acetate	3.47E+01	--	--	8.89E-01	8.89E-01	8.89E-01	--	--	--	2.00E+01	--	2.71E-04	--	5.73E+01	7.70E+03	NO
Vinyl Chloride (chloroethylene)	--	--	--	8.28E+00	8.28E+00	8.28E+00	--	--	--	--	--	2.52E-03	--	2.48E+01	1.10E+00	YES
Xylene (Total)	1.71E+01	--	--	3.47E+01	3.47E+01	3.47E+01	--	--	--	9.86E+00	--	1.06E-02	--	1.31E+02	2.70E+04	NO

This project is expected to exceed the toxic air contaminant trigger levels of Regulation 2-5 for 20 different chemicals: 1,3-butadiene, 1,4-dichlorobenzene, acetaldehyde, acrolein, acrylonitrile, arsenic, benzene, diesel particulate, dioxins as PCDDs, ethylbenzene, ethylene dichloride, formaldehyde, hexavalent chromium, hydrochloric acid, hydrofluoric acid, hydrogen sulfide, methylene chloride, naphthalene, PAH equivalent as benzo(a)pyrene, and vinyl chloride. This project is subject to a health risk assessment per Regulation 2-5.

Cumulative Increase

The table below summarizes the cumulative increase in criteria pollutants at this facility:

Table 24 – Plant Cumulative Emissions Increase, Post 4/5/91

Pollutant	Permitted Emissions, Post 4/5/91 (TPY)		Project Cumulative Emissions Increase (TPY)		Plant Cumulative Emissions Increase (TPY)
NO _x	0.000	+	7.076	=	7.076
POC	0.000	+	11.535	=	11.535
CO	0.000	+	39.901	=	39.901
PM ₁₀	0.000	+	3.324	=	3.324
PM _{2.5}	0.000	+	2.735	=	2.735
SO ₂	0.000	+	6.742	=	6.742

STATEMENT OF COMPLIANCE

Regulation 1, General Provisions and Definitions

Combination of Emissions (Section 1-107)

If two or more sources are combined with no adequate and reliable means to establish the nature, extent, and quantity of emission from each source, then the most stringent limits will be applied. Based on the current system design, exhaust from the three biogas engines (S4, S5, and S6) are combined to emit from a stack located near the engines or will pass through the organic waste dryer (S11) before being emitted from a stack located near the organic waste dryer. Although the emissions are combined, permit conditions will be put in place to delineate the emissions from each source. Additional permit conditions will be put in place if the testing methods are unable to delineate the emissions between each source.

Public Nuisance (Section 1-301)

No person shall discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance or annoyance to any considerable number of persons or the public; or which endangers the comfort, repose, health or safety of any such persons or the public, or which causes, or has a natural tendency to cause, injury or damage to business or property. For purposes of this section, three or more violation notices validly issued in a 30-day period to a facility for public nuisance shall give rise to a rebuttable presumption that the violations resulted from negligent conduct.

Continuous Emissions Monitoring and Recordkeeping Procedures (Section 1-522)

Until the EPA issues a formal written applicability determination that finds Raven’s facility, sources, and operations are not subject to the requirements of 40 CFR 60, Subpart AAAA, then the installation of continuous emission monitoring systems (CEMS) will need to be installed as part of the federal requirements. The Air District outlines the installation and reporting requirements in the Air District’s Manual of Procedures, Volume V. Permit conditions will include requirements outlining the contaminants that need to be monitored as part of 40 CFR 60, Subpart AAAA. These are: opacity, SO₂, CO, and oxygen or CO₂.

Parametric Monitoring and Recordkeeping Procedures (Section 1-523)

The installation of any parametric monitors will need to comply with the requirements of Section 1-523, which includes reporting any periods of in operation greater than 24 continuous hours, ensuring parametric monitors do not exceed in operation periods of 15 consecutive days per incident or 30 calendar days during any consecutive 12-month period, reporting any violations of permit condition or Air District regulations which the source is required to conform within 96 hours of such occurrence, maintain the records per a period of at least 2 years, and maintain and calibrate the monitors in accordance with the manufacturer’s specifications. Permit conditions will be included to ensure compliance with these requirements.

Regulation 2 - Permits, Rule 1 – General Requirements

Exemption, Miscellaneous Equipment (Section 2-1-128)

Per Section 2-1-128.4, water cooling towers and water cooling ponds not used for evaporative cooling of process water, or not used for evaporative cooling of water from barometric jets or barometric condensers are exempt from Section 2-1-301 and 302, barring it does not require a permit pursuant to Section 2-1-319.

Per Section 2-1-319, a source is no longer exempt if the source emits more than 5.0 tons per year of an air regulated pollutant (except for greenhouse gases), and the source is not subject to the requirements of Sections 2-1-316 through 318. Emissions for the cooling tower are calculated to be 3.02 tons per year. S10 complies with the requirements of this exemption.

California Environmental Quality Act (CEQA)

The California Environmental Quality Act (CEQA) requires public agencies (e.g., local, county, regional, and state government) to consider and disclose the environmental effects of their decisions to the public and governmental decision makers before approving a project. CEQA also mandates that agencies implement feasible mitigation measures or alternatives that would mitigate significant adverse effects on the environment. Projects must comply with the provisions of CEQA, which are found in the California Public Resources Code, Sections 21000 et seq. as well as the State CEQA Guidelines, Title 14 of the California Code of Regulations, Sections 15000 et seq., which are administrative regulations governing the implementation of CEQA. The Air District also publishes guidance for evaluating the air quality and climate impacts of projects under CEQA.

The City of Richmond is the Lead Agency under CEQA Lead Agency for the Raven SR Bioenergy Project (Project, Case #: PLN21-282, State Clearinghouse #2022100145) and prepared an Initial Study/Mitigated Negative Declaration (IS/MND) for the project in 2022. On October 20, 2022, the Air District submitted written comments on the project to the City of Richmond regarding construction dust best management practices. On November 3, 2022, Air District staff met with the City of Richmond staff to provide additional comments on the project's potential odors and allowable feedstocks that included materials other than green waste and food waste. On November 9, 2022, the City informed the Air District staff that the project's draft conditions of approval for the Conditional Use Permit were updated to address the Air District's comments regarding odor prevention and limiting the feedstock.

On November 7, 2022, a notice of intent to adopt the City's approved MND was distributed for 30-day public review and comment period, in accordance with CEQA Guidelines Section 15072 and 15105. On December 7, 2022, the public review and comment period was extended for an additional 15 days. The City of Richmond responded to all written comments received. On December 15, 2022, the City of Richmond held a public hearing, where the Planning Commission considered the IS/MND and conditional use and design review permits. The Planning Commission voted to conditionally approve Planning Application No. PLN21-282 on December 15, 2022. The Planning Commission decisions were appealed on December 16, 2022. To provide clarity to questions raised in the appeal, the City of Richmond prepared an updated Initial Study/MND, which included a 34-day public review and comment period. The City of Richmond responded to all written comments received and approved the IS /MND on May 16, 2023 (Resolution #42-23) at a public hearing.

In Resolution #42-23, the City Council found and determined that there is no substantial evidence in the record that Planning Application No. PLN21-282 may have a significant effect on the environment as identified by the Initial Study/Mitigated Negative Declaration, prepared for the project as updated. The City Council found that an Initial Study (Environmental Assessment) was prepared for this project in accordance with the requirements of CEQA Guidelines and reflects the Council's independent judgment and analysis. This process included the distribution of requests for comment from other responsible or affected agencies and interested organizations. Preparation of the Environmental Assessment necessitated a thorough review of the proposed project and relevant environmental issues and considered previously prepared environmental and technical studies. While the proposed project could have a potentially significant effect on the environment, based on its independent judgment and analysis, the City Council finds that feasible mitigation measures or alternatives have been incorporated into the project in order to avoid the effects or mitigate the effects to a point where no significant effect on the environment will occur, and there is no substantial evidence in the record that this project may have any direct, indirect or cumulative effects on the environment that are potentially significant and adverse. The proposed project will not result in any adverse effects which fall within the "Mandatory Findings of Significance" contained in Section 15065 of the State CEQA Guidelines. The project-specific mitigation measures included in the project to avoid potentially significant effects are set forth in the Initial Study/Mitigated Negative Declaration

and accompanying Mitigation Monitoring and Reporting Program. With the project specific mitigations imposed, there is no substantial evidence in the record that this project may have significant direct, indirect, or cumulative effects on the environment. As such, the City Council finds and determines that there is substantial evidence in the administrative record to support the Planning Commission determination that the project has been adequately environmentally assessed as required by CEQA. The City Council also finds and determines that in light of the entire administrative record and the substantial evidence before it, the project has been adequately environmentally assessed as required by CEQA.

The City of Richmond's reports and other environmental review documents are posted on the State Clearinghouse (<https://ceqanet.lci.ca.gov/Project/2022100145>) and are available to the general public at: City of Richmond Community Development Department, 450 Civic Center Plaza, Richmond, CA 94804.

As a responsible agency, the Air District independently reviewed the project's environmental impacts in the IS/MND, updated IS/MND, and the applicant's permit submittal, including CEQA Appendix H form. The City of Richmond determined that the project, with the implementation of the recommended mitigation measures, would not result in significant environmental impacts. The Air District's Engineering Evaluation for this project also did not find any significant air quality impacts for this project. The Air District has reviewed and considered the project's environmental impacts as discussed in the IS/MND and Addendum pursuant to CEQA Guidelines Section 15096. Based on that analysis, the Air District has concluded that the project will not have any significant adverse effect on the environment. As the project will not have any significant impacts, CEQA does not require the Air District to consider alternatives or mitigation measures to avoid or minimize any such impacts. Since the Air District is not imposing any mitigation measures under CEQA, CEQA does not require the adoption of a mitigation monitoring or reporting plan. With the implementation of the permit conditions outlined in this engineering evaluation and the operational requirements in the IS/MND and updated IS/MND, the Air District concludes that no further CEQA environmental review is required for this project.

The Air District's records for project approval are available to the general public for review at the District offices, 375 Beale Street, Suite 600, San Francisco, California (District Permit Application Number: 31700).

Public Notice, Schools & Overburden Communities (Section 2-1-412)

A new or modified source located (i) within 1,000 feet of the outer boundary of a K-12 school site which results in an increase of emissions from toxic air contaminants or (ii) within an Overburdened Community as defined by Section 2-1-243 are subject to the public notice requirement. Although the outer boundary of the nearest K-12 school, Verde Elementary School, is over 1,000 feet from the facility boundary as shown in Attachment B, the facility is located within a census tract identified by the California Communities Environmental Health Screening Tool as having an overall CalEnviroScreen score at or above the 70th percentile as

defined in Regulation 2-1-243. Therefore, this project is subject to the public notification requirements of this regulation.

Regulation 2 - Permits, Rule 2 – New Source Review

PSD Projects (Section 2-2-224)

This section defines a PSD project as one at a facility that has the potential to emit 100 tons or more per year of any PSD pollutant. This facility will not have the potential to emit 100 tons or more of any PSD pollutant therefore, this project is not a PSD project.

Best Available Control Technology Requirement (Section 2-2-301)

Any new source is required to use Best Available Control Technology (BACT) to control emissions of any Air District BACT pollutants if the source has the potential to emit 10 or more pounds on any day. Per Section 2-2-202, BACT is defined as an emission limitation, control devices, or control technique applied at a source. The BACT pollutants are precursor organic compounds (POC), non-precursor organic compounds (NPOC), oxides of nitrogen (NO_x), sulfur dioxide (SO₂), particulate matter with an aerodynamic diameter equal to or less than either 10 microns (PM₁₀) or 2.5 microns (PM_{2.5}), and/or carbon monoxide (CO).

These requirements are generally categorized as either technologically feasible and cost effective (BACT1) or achieved in practice (BACT 2).

Sources S1, Stockpile, S4, S5, S6, Biogas Engines, and S7, Emergency Engine, will be subject to BACT.

To determine the level of control for BACT for each source, the Air District reviews available control technologies that can be effective for controlling each applicable criteria pollutant.

The following is an analysis for each source based on each BACT pollutant that exceeds 10 pounds per day:

POC Emissions for Organic Waste Stockpile, S1

The stockpiles of green waste triggered BACT for POC emissions, because emissions from S1 will exceed 10 pounds of POC per highest day. In order to determine the applicable requirements for BACT, the Air District performed a review of the available technologies to control POC emissions from an organic storage pile. The technology for controlling POC emissions involves full enclosures and directing all the captured emissions to an emission control device. The control devices reviewed for this source includes a thermal/catalytic oxidizer, a wet scrubber, a carbon adsorption system, or a biofilter.

The use of thermal or catalytical oxidation is a process to oxidize the compound to something less harmful. The oxidation of POCs will result in the formation of carbon dioxide and water. Since it is an oxidation process, it is not limited to the oxidation of only POC compounds. Ammonia is a common compound found in organic storage piles. The oxidation of ammonia will result in the formation of NO_x if it is not removed from the captured emissions. Due to

the formation of NO_x from the exposure to ammonia, thermal or catalytic oxidation is not an ideal technology to control organic emissions.

Wet scrubbers remove pollutants from a gas stream by exposing the gas stream to a scrubbing liquid. In most cases, the scrubbing liquid is water, which is effective for removing POC emissions, but will also remove any water-soluble compounds such as ammonia and alcohols. However, a wet scrubber effluent must be disposed of or treated in such a way to avoid re-emitting the adsorbed pollutants into the atmosphere. If the exhaust gas has a low chemical loading of organic compounds such as the concentration present in organic waste storage piles, then then this will reduce the effectiveness of the wet scrubber.

Carbon adsorption process removes gaseous pollutants by adhering to a solid surface or an adsorbent. The exhaust air from the organic waste storage pile has a high amount of humidity. If activated carbon can absorb roughly 20% of its weight, an enormous tonnage of activated carbon would be required to serve as a control device. In addition, similar to the wet scrubber, the adsorbed pollutant will need to be disposed or regenerated in a manner that avoids re-emitting the compounds into the atmosphere.

Biofilters control the air pollutants by biologically degrading the compounds using microorganisms that are naturally present with biofilters. The process requires maintaining a healthy environment that controls the moisture content, pH, temperature, and air flow to effectively remove the compounds from the gas stream. Since the process involves degradation of the compound, this eliminates the issues associated with disposal that may be present with other control technologies. Biofilters are the control device that will be considered for BACT purposes.

For achieved in practice, a review of the existing regulations and policies at other air districts within California was included in the analysis. There are two rules that exist that specify requirements for organic waste storage piles: San Joaquin Valley Air Pollution Control District (SJVAPCD) Rule 4566 and South Coast Air Quality Management District (South Cost AQMD) Rule 1133.3.

At SJVAPCD, the rule requires facilities with a throughput less than 100,000 tons per year to do one of the following within 10 days of receipt:

- Remove the organic material from the facility;
- Start the active phase composting;
- Cover the organic material with a waterproof cover that has at least a six-foot overlap of adjacent sheets and be securely anchored; or
- Implement an Air Pollution Control Officer (APCO) approved alternative mitigation measure not listed above.

SJVAPCD BACT Guideline 64.15 Achieved in Practice for POC emissions requires the same as Rule 4566, but requires food waste to be processed within 48 hours of receipt.

For South Coast AQMD Rule 1133.3, food waste needs to be composted or covered with finished compost within 48 hours of receipt.

As for the Bay Area, most facilities process organic waste (both food waste and green waste) within 48 hours of receipt. Since longer storage periods may result in higher emissions and may require the facility to provide POC offsets as required by Air District Regulation 2-2-302, most facilities have opted to process the organic waste in a shorter period of time.

To consider if an enclosure with a biofilter is a feasible option, the Air District needs to consider the cost effectiveness of the technology. Although the cost of the enclosure is not considered BACT, it is necessary to determine if the cumulative cost is considered cost effective. Based on a review from a document from South Coast AQMD, the estimated cost for an enclosure is approximately \$110 per square foot. The estimated size for the organic waste storage pile is approximately 871 square feet, which will result in an estimated cost for the enclosure to be \$95,810.

Emissions from the organic waste storage pile are approximately 2.962 tons per year. With an estimated 95% capture efficiency and a 90% destruction efficiency, the POC reduction is 2.533 tons per year.

$$\text{Cost Effectiveness} = \frac{\$95,810}{2.533 \text{ tons}} = \$37,825/\text{ton}$$

The estimated cost without including the cost for the biofilter will exceed the \$17,500 per POC ton limit from the BACT/TBACT Policy and Implementation Procedures. Since the facility does not produce any compost nor does it grind any material, the facility will be required to import material for a biofilter, which will increase the cost effectiveness for the abatement control. The control is not considered cost effective for this source.

The BACT control that is achieved in practice for organic waste storage piles is a limit on the storage period to 48 hours. For this project, the facility has agreed to limit the storage period

of organic waste to 24 hours to minimize the emissions of criteria pollutants and toxic air contaminants. S1 will satisfy achieved in practice for BACT for POC controls.

NO_x, CO, and POC Emissions for Biogas Engines, S4, S5, and S6

Each of the biogas engines (S4, S5, and S6) will exceed 10.0 pounds per day for NO_x, CO, and POC. To determine the control technologies available to reduce NO_x, CO and POC, the following categories were reviewed for combustion sources: Clean Fuel, Combustion Technologies, and Post-Combustion Technologies.

For Clean Fuel Technology, one needs to consider the quality of the gas used for a biogas engine. Landfill gas consists of mostly methane and carbon dioxide. The quality of landfill gas varies depending on the type of waste placed in the landfill. Prior to receiving the landfill gas, the landfill gas passes through a water knock out tank to remove excess moisture from the landfill gas. The removal of the moisture from the landfill gas assists with improving the destruction efficiency of the gas from the process. In addition, the facility will be using a landfill gas conditioning system. The primary use of the landfill gas conditioning system is to remove the presence of siloxanes to reduce the damage of components in the engine, but the system may remove some organic compounds prior to combustion.

For Combustion Technologies, NO_x, CO, and POC can be minimized by optimizing the engines combustion process using techniques such as injection time retard, preignition chamber combustion, air-to-fuel ratio adjustments, and derating. These combustion characteristics are determined by the design of the engine, which is dictated by the manufacturer and cannot be controlled by the end user. Although the biogas engines can be certified by EPA to meet certain emission standards, most biogas engines are not certified. In place of certification of the engines, 40 CFR 60, Subpart JJJJ outlines testing standards for the engines to meet the emissions limits outlined in the regulations.

For Post-Combustion Technologies, the most effective and prevalent post combustion technologies used to abate NO_x, CO and POC rely on the use of catalysts. For NO_x reduction, catalyst technology can come in the form of a selective catalytic reduction unit, lean-NO_x catalyst, or a NO_x adsorber. For CO and POC, the primary method for reduction includes the use of an oxidation catalyst system. For engines that operate continuously as S4, S5, and S6 are designed to do, the installation of the post-combustion technologies is taken into consideration.

To consider the BACT guidelines for S4, S5, and S6, the Air District took into consideration all the devices the facility will implement in order to reduce the emissions. The landfill gas will pass through a water knockout tank to remove excess moisture that may be present from the landfill gas to improve the destruction efficiency in the engines. In addition, the facility will install a landfill gas conditioning system (A2) to remove siloxanes from the landfill gas. In terms of post-combustion technologies, the facility will install a selective oxidation reduction and an oxidation catalyst to reduce NO_x, CO, and POC emissions. The Air District is unaware

of any other installations that are consistently meeting lower limits than the proposed control technology.

According to the Air District’s BACT guideline, a spark ignition internal combustion engine that operates on biogas is identified in Document #96.2.4. When reviewing each criteria pollutant subject to BACT, the Air District considered the emission rates that are currently achieved in practice. The following are the proposed emissions for each engine when compared to the BACT limits in the guidelines:

Table 25 – BACT Analysis for S4, S5 and S6

BACT Pollutant Triggers	BACT Limit for Biogas Engines (g/bhp-hr)	Engine Emission Rate (g/bhp-hr)
NOx	0.15	0.124
CO	0.89	0.70
POC	0.12	0.12

The engine emission rates are included as permit conditions for S4, S5, and S6. With the testing requirements that the facility is required to use to demonstrate compliance with the emission standards, the engines are expected to comply with the BACT.

NOx Emissions for Emergency Diesel Generator for a Fire Pump, S7

The engine will exceed 10.0 pounds per day for NOx. Similar to the analysis for the biogas engines, a review was performed for each control technology available for an emergency diesel generator.

For Clean Fuel Technology, the use of diesel fuel with a low nitrogen content reduces the amount of NOx formed during the combustion. The less nitrogen available in the fuel, the less that can be converted to NOx upon combustion. Diesel fuel producers are not required to remove nitrogen from the fuel specifically for NOx reduction purposes. However, they are required to remove sulfur to comply with regulatory mandates, and hydro-treating technique they use to remove the sulfur also removes most of the nitrogen. As a result, using ultra-low sulfur diesel (ULSD) will provide benefits in reducing NOx emissions as well as reducing sulfur dioxide emissions. ULSD is required to be used by the California Air Resources Board (CARB) and is therefore achieved in practice for this engine.

Similar to the analysis for the biogas engines, the control technologies are limited to the manufacturer. The end user can reduce emissions by using the cleanest engine available, however. Engines are certified to meet progressively more stringent emissions performance standards using EPA’s “Tier” system with higher-tier engines representing more stringent levels of emissions control. For the size of the engine that will be used for this project, the most stringent level of emissions control that can be achieved using combustion controls is Tier 3. Therefore, the use of a Tier 3 engine is achieved in practice.

As discussed for the biogas engines, for Post-Combustion Technologies, the most effective and prevalent post combustion technologies used to abate NO_x rely on the use of a catalyst. For emergency standby engines, the catalyst would not reach its effective temperature during short-duration operations associated with the periodic testing and maintenance, which is primarily how these engines will be operated.

To determine the level of emissions control that has been achieved in practice, the Air District has reviewed similar post-combustion technologies that have been achieved in practice for smaller emergency standby generators. The Air District reviewed the BACT clearinghouses and guidelines published by EPA, CARB, and other Air Districts within the state. The Air District is unaware of any engines in this size range that are operating under any more stringent standards than Tier 3 that would qualify as achieved in practice for BACT. Since S7 achieves Tier 3 standards without post-combustion control, post-combustion catalytic control technologies are not considered BACT for S7.

Next would be a review of the technologically feasible and cost-effective control devices for S7. Catalytic controls devices only become effective when the engines are operated for longer periods in the case of power outage. Emergency operation will be infrequent and is not expected to last for a significant amount of time when it does occur. As a result, the emission reduction benefit from having a catalytic control device would be less than optimal and would not be cost-effective under the Air District's BACT regulation given the costs involved. Studies that have evaluated the additional costs and emission reduction benefits that would be involved in implementing catalytic control technologies on emergency diesel engines have shown that cost would be in the range of \$68,000 to \$682,000 per ton of emission reduction benefit. This cost per ton greatly exceeds the BACT cost-effectiveness threshold of \$17,500 per ton for NO_x, which is set forth in the Air District's BACT Policy & Implementation Procedures.

From the analysis of the various technologies that could be implemented to reduce NO_x, the Air District concluded that the use of ULSD fuel and an EPA Tier 3 certified engine are achieved-in-practice control technologies. These control technologies are therefore required as part BACT for the source. S7 is certified to meet the EPA Tier 3 emissions standards, and the applicant will be required by CARB regulations to use ULSD fuel. Therefore, S7 complies with the BACT requirements.

According to the emission data submitted to EPA for the engine family S7, the NO_x emission rates are below the applicable BACT emission limits shown below:

Table 26 – BACT Analysis for S7

BACT Pollutant Triggers	BACT Limit for Tier 3 Engines 100≤HP<175 (g/bhp-hr)	Engine Emission Rate (g/bhp-hr)
NOx	2.85	2.73

Offset Requirement, Precursor Organic Compounds and Nitrogen Oxides (2-2-302)

This section establishes emission offset requirements for POC and NOx at facilities that will have the potential to emit more than 10 tons per year of POC or NOx. If the facility will have the potential to emit more than 10 tons per year but less than 35 tons per year of NOx or POC after the new or modified source is constructed, offsets must be provided at a 1:1 ratio for any un-offset cumulative increase in emissions at the facility. These offsets shall be provided by the Air District’s Small Facility Banking Account if available and the applicant does not own offsets. The Potential to Emit at the facility for POC is 11.535 tpy. Since POC emissions are less than 35 tpy, the offsets will be provided at a ratio of 1:1 by the Small Facility Bank. Since NOx emissions are less than 10 tpy, no NOx offsets are required.

Offset Requirement, PM2.5, PM10 and Sulfur Dioxide (2-2-303)

Since the potential to emit PM2.5, PM10 or sulfur dioxide at the facility are each below 100 tons per year, this facility is not subject to the offset requirements of Regulation 2-2-303.

Regulation 2- Permits, Rule 5 – New Source Review of Toxic Air Contaminants

General (2-5-100)

All TAC emissions from new and modified sources are subject to a health risk assessment if the emissions from any individual TAC exceed either the acute or chronic emission thresholds defined in Table 2-5-1 of Regulation 2, Rule 5. If the health risk assessment is triggered, related projects permitted within the previous five years must be considered in the assessment. Since this is a new project, there are no related projects associated with the application.

The health risk assessment modeled two scenarios based on the operations at the site:

Scenario 1: When the dryer S11 is operating, all the emissions from the biogas engines (S4, S5, and S6) and the dryer (S11) are vented through a single stack (P-1) located near the dryer.

Scenario 2: When the dryer S11 is not operating, all the emissions from the biogas engines (S4, S5, and S6) are vented through a bypass stack (P-2) located near the biogas engines.

Based on the two scenarios, the following is a summary of the health risk analysis for the overall project:

Table 27 – Summary of Compliance with Regulation 2-5-302.1

Scenario	Residential Cancer Risk (in a million)	Onsite Worker Cancer Risk (in a million)	Project Risk Limit (in a million)
Scenario 1	0.76	1.7	6.0
Scenario 2	0.86	3.1	6.0

Table 28 – Summary of Compliance with Regulation 2-5-302.2

Scenario	Residential Chronic Hazard Index	Onsite Worker Chronic Hazard Index	Project Risk Limit
Scenario 1	0.004	0.2	1.0
Scenario 2	0.0043	0.23	1.0

Table 29 – Summary of Compliance with Regulation 2-5-302.3

Scenario	Acute Hazard Index	Project Risk Limit
Scenario 1	0.42	1.0
Scenario 2	1.0	1.0

As shown in the summary tables above, the project does not exceed the limits of Regulation 2-5-302 and is in compliance with this requirement.

A new or modified source of toxic air contaminants is subject to the requirements of Regulation 2-5-301, Best Available Control Technologies for Toxics (TBACT), if a source exceeds a cancer risk of 1.0 in a million or if the chronic hazard index exceeds 0.2. Based on a review of the health risk assessment, all the sources individually are below the limits. None of the sources are subject to the TBACT requirements.

Regulation 2 - Permits, Rule 6 – Major Facility Review

Air District Regulation 2-6-229 defines solid waste incinerators as “[a]ny source that burns solid waste . . . from commercial, industrial, or general public sources in a category for which a New Source Performance Standards has been adopted.” Under Air District Regulation 2-6-303, “[a]ny subject solid waste incinerator facility subject shall undergo a major facility review in accordance with the requirements in District Regulation 2-6.” The regulation requires subject facilities to acquire a Major Facility Review Permit, commonly known as a Clean Air Act Title V Operating Permit, and must comply with all applicable New Source Performance Standards adopted by the US EPA.

US EPA promulgated New Source Performance Standards for municipal solid waste combustion units in Title 40, Code of Federal Regulation, Part 60, Subpart AAAA - Standards of Performance for Small Municipal Waste Combustion Units for Which Construction is Commenced After August 30, 1999, or for Which Modification or Reconstruction is Commenced After June 6, 2001.

The Air District has determined that the project is subject to the requirements in Regulation 2, Rule 6. Raven shall comply with the permit condition(s) in an Authority to Construct and/or Permit to Operate that require the facility to apply for a Title V permit application within 12 months of startup.

Regulation 6 - Particulate Matter, Rule 1 - General Requirements

Sources that may generate particulate emissions are subject to this requirement. Based on a review of the emissions, sources S1, S2, S4, S5, S6, S7, S9, S10, S11, and A1 will be subject to the requirements of this regulation.

Ringelmann No. 1 Limitation (Section 6-1-301)

Unless the source is subject to the requirements of Sections 6-1-303, 304, and 306, a person shall not emit from any source for a period of 3 minutes in any hour a visible emission that is as dark or darker than No. 1 on the Ringelmann Chart. S7 is an emergency standby engine that is subject to the requirements of Section 6-1-303 and is not subject to the requirements of this section. Sources S1, S2, S4, S5, S6, S9, S10, and S11, and A1, Flare, are subject to this requirement. These sources are expected to comply with this requirement.

Opacity Limits (Section 6-1-302)

This section sets a limit of 20% opacity for a period of more than 3 minutes during any hour for sources that have opacity meters. 40 CFR 60, Subpart AAAAA, requires the facility to use an opacity meter for the subject sources (S3, S4, S5, and S6), so compliance with this limit is assured. As part of the requirements for 40 CFR 60, Subpart AAAAA, opacity meters will be installed at the stacks, which includes the outlet of the A9 baghouse and the bypass stack after the S4, S5, and S6 engines, but before the S11 dryer.

Ringelmann No. 2 Limitation (Section 6-1-303)

Engines with a displacement of less than 1,500 cubic inches or used solely as a standby source are subject to this section. S7 is an emergency diesel engine with a displacement of 272 cubic inches. S7 is expected to comply with this requirement with regular maintenance and inspections.

Visible Particles (Section 6-1-305)

This section prohibits emissions of visible particles on real property other than the person responsible for the emissions. S1 is organic waste that typically has a high moisture content which will minimize the emissions from the source. S2 is a storage pile for specified alkaline reagents which are in pellet form rather than a powder, so the emissions should be minimal from the source. Sources S4, S5, S6, S7, and S11 have stacks and are expected to emit a minimum amount of particulate matter. The facility is expected to comply with this requirement.

Total Suspended Particulate (Section 6-1-310)

A person shall not emit from any source total suspended particulate in excess of 0.15 grains/dscf of exhaust gas volume. Since S1 and S2 are stockpiles and do not have stacks, they are not subject to the requirements of this section.

The emission rate for sources S4, S5, and S6 are based on AP-42 emission factors for filterable and condensable particulate, which is 0.009987 lb/MMBtu. This results in an outlet grain loading of 0.000364 grains/dscf at 0% oxygen, which will comply with this requirement.

The emission rate from S7 is 0.10 grams/bhp-hr, which results in an outlet grain loading of 0.0209 grains/dscf at 0% O₂, which is below the limit of 0.15 grains/dscf.

The PM emission rates for S10, Cooling Tower, will be a maximum of 0.188 lb/hr, 0.822 tpy, and 747 kg/yr. The applicant has provided an approximate airflow of 375,000 acfm. At this rate, 0.00006 grains/actual scf are emitted. The concentration is so low that no corrections for standard conditions or moisture are necessary.

The emission rate for S11, Dryer, has a grain loading of 0.0013 gr/dscf. Therefore, it will comply with 6-1-310.1.

Regulation 6-1-310.2 applies to a source if emissions are over 1,000 kg/yr of total suspended particulate (TSP). None of the sources will emit more than 1,000 kg/yr of TSP, so Section 6-1-310.2 will not apply.

Total Suspended Particulate (TSP) Weight Limits (Section 6-1-311)

A person shall not emit from any source total suspended particulate at a rate that exceeds the limits in Table 6-1-311.1. The requirement does not apply to sources S4, S5, S6, and S7 because process weight excludes liquids and gases used as fuels and combustion air per Section 6-1-206.

For sources S1 and S2, the particulate multiplier of 0.35 is applied to the TSP emissions to estimate the PM₁₀ emissions. Based on information from the facility, the process weight is 20 tons per hour. The following is a summary of the emissions for S1 and S2:

Table 30 – TSP Emission Summary for S1 and S2

Source	Process Weight (lb/hr)	PM ₁₀ Emission Rate (lb/hr)	TSP Emission Rate (lb/hr)	TSP Emission Rate (lb/hr)
S1	40,000	0.0362	0.103	33.6
S2	40,000	0.0362	0.103	33.6

S1 and S2 will comply with the requirements.

S10, Cooling Tower, is subject to the process weight limits in Sections 6-1-311.1.

For S10, Cooling Tower, the process weight will be based on amount of water flow of 5,000 gal/min. The process weight is:

$$5,000 \text{ gpm} \times 60 \text{ min/hr} \times 8.34 \text{ lb/gal} = 2.5 \text{ million lb/hr}$$

The calculated emissions are: 0.188 lb PM/hr.

The limit in 6-1-311.1 for this process weight is 40 lb PM/hr. The source is in compliance with this limit.

S10 is not subject to the requirements of Section 6-1-311.2 because its potential to emit is less than 1,000 kg/year. For S11 dryer, the process weight will be based on the amount of material dried. The average throughput is 4.2 tons/hr. The maximum throughput is 20 tons/hr. At those throughputs, the limits are 19.7 and 33.6 lb/hr of TSP, respectively. Since the applicant has promised to limit PM10 emissions to less than 10 lb/day (0.42 lb/hr), the source will be in compliance. In this case, PM10 is assumed to be equivalent to TSP, because the gases flow through a baghouse designed to emit less than 0.0013 grains/dscf. S11 is not subject to the requirements of Section 6-1-311.2 because its potential to emit is less than 1,000 kg/year.

For the A1 flare, assuming all the PM10 emissions are equivalent to TSP, the emission rate is 0.000615 lb/hr. Since the emission rate is less than the minimum allowed process weight rate per Table 6-1-311.1, A1 flare is expected to comply with this requirement.

Demonstration of Total Suspended Particles (TSP) Compliance (Section 6-1-504)

This section will not apply because no source will emit more than 2,000 kg TSP/yr.

Regulation 6 – Particulate Matter, Rule 6, Prohibition of Trackout

This regulation applies to the control of trackout onto paved public roads outside the boundaries of the property. Raven is located within the property boundaries of WCCCSL. Public paved roads are located outside the boundaries of WCCCSL. Since any trackout onto public roads will need to cross through WCCCSL, the responsibility of ensuring there is no trackout onto the public roads will be the responsibility of WCCCSL. WCCCSL does operate sweepers with water suppressant to control any trackout on public roads.

Regulation 7- Odorous Substances

According to Regulation 7-102, the limitations of this Regulation shall not be applicable until the Air District receives odor complaints from 10 or more complainants within a 90-day period, alleging that a person has caused odors perceived at or beyond the property line of such person and deemed to be objectionable by the complainants in the normal course of their work, travel, or residence. When the limits of this regulation become effective as a result of citizen complaints described above, the limits shall remain effective until such time as no citizen complaints have been received by the District for 1 year. The limits of this Regulation shall become applicable again when the District receives odor complaints from five or more complainants within a 90-day period.

Regulation 8- Organic Compounds, Rule 2, Miscellaneous Operations

Sources with a stack that are not subject to any of the other requirements within Regulation 8 are subject to Regulation 8, Rule 2.

The requirement is that a subject source cannot have emissions containing more than 15 pounds per day and containing a concentration of more than 300 PPM total carbon on a dry basis. 1,1,1, trichloroethane, methylene chloride, methane and chlorofluorocarbons shall be excluded from the total carbon.

The S3 waste gas is not subject to Regulation 8, Rule 2 since it is an enclosed system with no stacks. The components are subject to Regulation 8, Rule 18.

Compliance with the limit will be determined at S4, S5, and S6, Engines, S11, Dryer, and A1, Flare.

The engines are subject to Regulation 8, Rule 2, when they are burning waste gas from S3, Hydrogen Plant.

S4 through S6, Engines, can be excluded from Regulation 8, Rule 2, when they are burning landfill gas exclusively since they are subject to Regulation 8, Rule 34. When the engine exhaust gases flow through the dryer, the dryer stack is subject to Regulation 8, Rule 2, and so are the engine exhaust gases, per Regulation 1-107.

S11, Dryer, will be subject to the requirement. The dryer will not be subject to the control requirements in Regulation Section 8-34-301.4 because compliance can be determined separately at the engines before the gases enter the dryer. Permit conditions for S4 through S6 will also limit the outlet NMOC concentration from the engines for the purposes of Regulation 8, Rule 34.

The remaining sources with organic emissions are S1 (organic waste storage pile), S7, Emergency Diesel Engine, and A1 (flare for hydrogen plant).

S1, Organic Stockpile, does not have a stack that is necessary to demonstrate compliance with Regulation 8, Rule 2 and will not be subject to this requirement.

S11 and A1 will be subject to this requirement.

S4 through S6, Biogas Engines, will comply with the regulation because they will be limited to a concentration of no more than 100 ppmv, dry basis expressed as methane corrected to 3% oxygen to comply with Regulation 8, Rule 34.

S7 will comply with the requirement because it will emit about 0.7 lb POC/day.

S11 should comply with the requirement because the applicant has agreed to a POC emission limit of less than 9.5 lb/day. Permit conditions will be included that will require annual source testing of the stack to determine compliance with this requirement.

A1 is a back-up flare that will be used when all the gas from the hydrogen plant needs to be evacuated from the system. While A1 is on standby, the flare will use propane to maintain the pilot light. The maximum daily operations from either situation are expected to be 3.95 pounds per day.

S11 and A1 are expected to comply with this requirement.

Regulation 8- Organic Compounds, Rule 18, Equipment Leaks

Source S3 produces hydrogen from organic waste. Per the definition in Regulation 8-18-203, the facility is considered a chemical plant for producing inorganic chemicals. S3 is subject to the requirements of Regulation 8, Rule 18.

General (8-18-301)

Other than items specified in Sections 8-18-302 through 305, the total organic emissions from each equipment shall not exceed 100 ppm unless the leak has been discovered by the operator, minimized within 24 hours, and repaired within 7 days. The facility has agreed to limit leaks to 25 ppmv. Permit conditions are included to comply with this requirement.

Valves (8-18-302)

S3 will have 150 valves. All valves shall not exceed 100 ppm. If the leak has been discovered by the operator, minimized within 24 hours, and repaired within 7 days. If the leak is discovered by the Air District, the leak must be repaired within 24 hours. The facility has agreed to limit leaks to 25 ppmv. Permit conditions are included to comply with this requirement.

Pumps and compressors (8-18-303)

S3 will have 40 pumps. All pumps shall not exceed 500 ppm. Since the pumps are subject to BACT guidelines, the screening value will be reduced to 100 ppm. If the leak has been discovered by the operator, minimized within 24 hours, and repaired within 7 days. If the leak is discovered by the Air District, the leak must be repaired within 24 hours. The facility has agreed to limit leaks to 25 ppmv. Permit conditions are included to comply with this requirement.

Connections (8-18-304)

S3 will have 150 connectors. All connections shall not exceed 100 ppm. If the leak has been discovered by the operator, minimized within 24 hours, and repaired within 7 days. If the leak is discovered by the Air District, the leak must be repaired within 24 hours. The facility has agreed to limit leaks to 25 ppmv. Permit conditions are included to comply with this requirement.

Pressure Relief Devices (8-18-305)

According to the facility, there will be no pressure relief valves installed for S3. The facility is not subject to this section.

Non-repairable Equipment (8-18-306)

Equipment that exceeds the limit of Sections 8-18-302 through 8-18-303 may remain in compliance if it complies with the requirements per Sections 8-18-306.1 through 306.4. Permit conditions will be included to comply with this requirement.

Regulation 8- Organic Compounds, Rule 34, Solid Waste Disposal Sites

S4, S5 and S6 use either 100% landfill gas or a blend of landfill gas and waste gas from S3. A2 is a landfill gas conditioning system that will process landfill gas prior to use at the biogas engines. Any equipment processing any landfill gas is subject to Regulation 8, Rule 34. Since A1 does not process any landfill gas, it is not subject to this regulation.

Landfill Gas Collection and Emission Control System Requirements (8-34-301)

Regulation 8-34-301.2 limits leaks from any component of a landfill gas emission control system to 1,000 ppmv expressed as methane. A properly maintained landfill gas fired engine is not expected to result in any component leaks in excess of this limit.

The component leaks for A2 are expected to be less than 1000 ppmv at any given time with proper monitoring and maintenance.

Regulation 8-34-301.4 requires any gas collected in an energy recovery device or emission control system reduces the NMOC concentration in the collected gas by at least 98% by weight or emits less than 120 ppmv by volume of NMOC at the outlet, dry basis expressed as methane corrected to 3% oxygen. Permit conditions for S4 through S6 will limit the outlet NMOC concentration to no more than 100 ppmv, dry basis expressed as methane corrected to 3% oxygen. The permitted limit will comply with this requirement.

Operating Records (8-34-501)

Regulation 8-34-501.4 and 8-34-501.11 requires the site to maintain records of key parameter monitoring data and all other test data necessary to demonstrate compliance with this rule. Permit conditions will require the facility to perform annual source testing on S4 through S6 to comply with the requirements.

Continuous Temperature Monitor and Recorder (8-34-507)

An owner or operator of a flare or other enclosed combustion device will need to measure the temperature in the combustion zone of each device using a continuous combustion temperature monitor and recorder. Permit conditions will be included to require the installation, monitoring, maintenance and record keeping for the temperature readings.

Gas Flow Meter (8-34-508)

In order to determine the landfill gas consumption rate for the biogas engine and the operating times, the facility is required to install gas flow monitoring device that records the landfill gas to each control device at least every 15 minutes.

Key Emission Control System Operating Parameter(s) (8-34-509)

The facility is required to determine key emission control system operating parameter(s) for devices for control devices that are not flares or enclosed combustors using District approved methods. Records will be maintained to determine compliance with Regulation 8-34-501.11.

Regulation 9 – Inorganic Gaseous Pollutants, Rule 1 Sulfur Dioxide

The formation of sulfur dioxide results from the combustion from sulfur compounds. Sources that will emit SO₂ include S4, S5, S6, S7, S11, and A1. These sources are subject to the requirements of this regulation.

Limitations on Ground Level Concentrations (Section 9-1-301)

Sulfur dioxide emissions shall not result in ground level concentrations in excess of 0.5 ppm continuously for 3 consecutive minutes or 0.25 ppm averaged over 60 consecutive minutes, or 0.05 ppm averaged over 24 hours. The facility is expected to comply with this requirement.

General Emission Limitation (Section 9-1-302)

A gas stream containing sulfur dioxide shall not contain sulfur dioxide in excess of 300 ppm (dry). The concentration is not corrected for dilution. Landfill gas used at S4, S5, and S6 will have a maximum sulfur content of 100 ppmv at the inlet. The sulfur content in the syngas from S3 directed to S4, S5, S6, and A1 is expected to have a low sulfur content due to the decomposition from organic waste. The permit condition limits the sulfur content of both the landfill gas and the landfill gas/waste gas blend to less than 100 ppm. A condition has been added to monitor the sulfur content of the landfill or blended gas on a monthly basis. This project is expected to comply with this requirement.

Most of the SO₂ from this facility will be emitted at S11, organic waste dryer because the engine exhaust will be used to dry the organic material. A requirement to test for SO₂ during the annual source testing of the dryer will be added to the permit conditions.

S7, Emergency Engine, is not subject to Section 9-1-302 because it burns diesel, a liquid fuel.

Fuel Burning (Liquid and Solid Fuels) (Section 9-1-304)

The sulfur content of liquid fuel burned shall not exceed 0.5% by weight. The only liquid fuel is the use of low sulfur diesel used for S7. The source is expected to comply with this requirement.

Regulation 9- Inorganic Compounds, Rule 2, Hydrogen Sulfide

Limitations on Hydrogen Sulfide (9-2-301)

The ground level concentration limit on hydrogen sulfide (H₂S) is 0.06 ppm averaged over 3 minutes or 0.03 ppm averaged over 60 minutes. Sources that emit H₂S include S3, S4, S5, S6, S11, and A1. The emissions were entered into an air dispersion model for the site to determine the average concentration. Based on the model, the highest concentration was based on Scenario #2 when the emissions from the biogas engines (S4 through S6) are emitted through a bypass stack. The estimated fence-line concentration is 11.1 µg/m³, which converts to 0.0079 ppm. The emissions are less than the 0.06 ppm average limit and comply with the requirements of this regulation.

Regulation 9 – Inorganic Gaseous Pollutants, Rule 8, NO_x and CO from Stationary Internal Combustion Engines

S4, S5, and S6 are internal combustion engines that operate on fuel derived from waste. S7 is an emergency standby engine using diesel fuel. These sources are subject to the requirements of Regulation 9, Rule 8.

Exemptions (Section 9-8-110)

Section 110.5 exempts emergency standby engines from the requirements of Sections 9-8-301 through 305, 501 and 503. S7 is an emergency standby engine for a fire pump and meets the requirements for this exemption.

Emergency Standby Engines, Hours of Operation (Section 9-8-330)

S7 is subject to the requirements of Regulation 9-8-330 which limits reliability related operation of the engines to 50 hours per year. Permit Conditions for S7 will limit the hours for reliability testing operations to 32 hours per year, which will meet this requirement.

Emission Limits – Spark-Ignited Engines Powered by Waste Derived Fuels (Section 9-8-302)

S4, S5, and S6 are subject to Regulation 9-8-302, which limits the NOx and CO emissions for stationary internal combustion engines rated at over 50 bhp or more. Regulation 9-8-302.1 limits the NOx emissions to 70 ppmv corrected to 15% O₂, dry basis for lean burn engines. Regulation 9-8-302.3 limits to CO emissions to 2,000 ppmv, corrected to 15% O₂, dry basis. Based on the emissions provided by Raven, the emissions from S4, S5, and S6 are expected to be 16.28 ppmv for NOx and 150.93 ppmv for CO corrected to 15% O₂, dry basis. S4, S5, and S6 will comply with this requirement.

Recordkeeping (Section 9-8-502)

Engines that are subject to 9-8-300 shall comply with the record keeping requirements in Regulation 9-8-502. Permit conditions will be included for S4, S5, S6, and S7 to meet this requirement.

Quarterly Demonstration of Compliance (Section 9-8-503)

Since S4, S5, and S6 must comply with Regulation 9-8-503. Emissions from NOx and CO will be analyzed using a portable analyzer at least once during each calendar quarter if a source test is not performed. For sources S4, S5, and S6, a source test will be performed annually. Permit conditions will be included to meet this requirement.

Regulation 13 – Climate Pollutants, Rule 5, Industrial Hydrogen Plants

Regulation 13-5 applies to all industrial hydrogen plants including third parties. S3 converts organic waste to hydrogen and will be subject to this rule.

Limited Exemption, Small-Scale Industrial Hydrogen Plants (Section 13-5-105)

With the exception of Section 13-5-506.3, the requirements of this rule do not apply to industrial hydrogen plants with a maximum design capacity less than 20 tons of hydrogen per day. Based on information provided by Raven, production is currently estimated to be about 14,000 pounds or 7.0 tons per day. The facility will remain within the limits of this exemption.

Recordkeeping Requirements (Section 13-5-506.3)

Since S3 qualifies for the limited exemption, the Facility is only subject to the requirements of Section 13-5-506.3. Per the requirements, the facility is required to maintain annual hydrogen production and basis for the production determination for a minimum of five years. Permit conditions will be included to ensure compliance with this requirement.

State Requirements

Airborne Toxic Control Measure (ATCM) for Stationary Compression-Ignition Engines

Subsection 93115.6(a)(4) Table 2 sets forth emission standards for new stationary emergency standby fire pump engines with maximum engine power between 100 to 175 bhp with a model year 2010 or later. S7 is subject to and meets the requirement of this section of the ATCM as shown in the table below:

Table 31 – Summary of Compliance with Subsection 93115.6(a)(4)

Pollutant	Manufacturer’s Abated Performance Data (g/bhp-hr)	ATCM Emission Standards (g/bhp-hr)
PM	0.10	0.22
NMHC + NOx	2.86	3.0
CO	0.67	3.7

Subsection 93115.6(a)(4)(A)(1)(b) requires that new stationary emergency standby diesel-fueled engines (>50 bhp) be certified to the emission standards as specified in 40 CFR 60.4202(d) Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (2006). The engine is in compliance with the requirements of 40 CFR 4202(d) Table 4 as shown above in this evaluation.

Subsection 93115.6(a)(4)(A)(1)(c) limits the non-emergency operation to no more than the hours necessary to comply with the testing requirements of the National Fire Protection Association (NFPA) 25. Permit Conditions for S7 will limit non-emergency operation to 32 hours/year, which accounts for the minimum of 30 minutes of testing every 2 weeks and some additional hours for maintenance. S7 will comply with this section of the ATCM.

Methane Emissions from Municipal Solid Waste Landfills

Subsection 95461 applies to all municipal solid waste landfills that received solid waste after January 1, 1977. WCCCSL is the landfill that receives the landfill gas and directs it to Raven for use. Since Raven is not the facility that receives solid waste, it is not subject to this regulation.

Federal Requirements

Clean Air Act Part 129 [42 U.S.C. § 7429]

Part 129 of the Clean Air Act establishes regulatory standards of performance for solid waste combustion. The regulations that EPA has promulgated to implement this section are in 40 CFR 60, Standards of Performance for New Sources.

40 CFR 60, Subpart AAAA applies to new units that combust municipal solid waste or refuse derived fuel with a capacity between 35 and 250 tons per day. 40 CFR §§ 60.1010; 60.1015).

A municipal waste combustion unit refers to “any setting or equipment that combusts solid, liquid, or gasified municipal solid waste” (40 CFR § 60.1465).

Municipal waste is defined as “refuse (and refuse-derived fuel) collected from the general public and from residential, commercial, institutional, and industrial sources consisting of paper, wood, yard waste, food wastes” (42 U.S.C. § 7429(g)(5); 40 CFR § 60.1465). The federal regulations specifically define yard waste as “grass, grass clippings, bushes, shrubs, and clippings from bushes and shrubs. They come from residential, commercial/retail, institutional, or industrial sources as part of maintaining yards or other private or public lands” (40 CFR §§ 60.1440, 60.1465).

This project is consistent with the federal definition of a municipal waste combustion unit because it is an integrated gasifier/combustion unit.¹ Raven will receive up to 99.9 tons of organic/green waste per day. The waste will contain only green waste such as grass, tree trimmings, and bushes. No food waste, commercial organic waste or industrial organic waste will be processed through the facility. The organic waste/green waste will be placed in the organic waste dryer (S11) to reduce the moisture content from the material before it is conveyed into the hydrogen plant (S3) where it will undergo gasification, a process that converts dried green/organic waste into synthesis gas (“syngas”), which is mixture of carbon monoxide and hydrogen), that is produced by subjecting the material to high temperatures.²

To produce syngas, Raven will gasify the green/organic waste in the hydrogen plant (S3) by heating the organic material indirectly with electricity at high temperatures. In a second stage, the gases are converted to syngas. The resulting syngas is then purified into hydrogen—the final product—by removing water, carbon dioxide, carbon monoxide and gas compounds containing sulfur, chlorine, and toxic air contaminants that did not break down during the second stage (waste gas).

The project’s waste gas will be funneled to the biogas engines (S4, S5, and S6) for combustion and will serve two purposes. First, combustion of the waste gas at the biogas engines, along with landfill gas from West Contra Costa County Landfill, will be used to generate electricity to power all operations at the facility, including providing electrical power to the hydrogen plant (S3). Second, the exhaust produced from the combustion of waste gas and landfill gas at the biogas engines will be the sole heat source for the organic waste dryer (S11), which is a critical first step in Raven’s gasification process to produce hydrogen gas from the heating of municipal solid waste. If the facility needs to start-up, shut down, or needs to evacuate any gas from the hydrogen operation, then the gas will be directed to the flare (A1) for combustion, and the resulting emissions will be vented to the atmosphere.

Based on the information provided by Raven regarding the project, the Air District has determined that the hydrogen plant (S3), biogas engines (S4, S5, S6), organic waste dryer (S11), and flare (A1) form an integrated gasifier/combustion unit. The Air District’s determination is based on the following:

¹ 86 Fed. Reg. 50,296, 50,300 (Sept. 8, 2021) (municipal waste combustion units “produce gases, liquids, or solids through the heating of [municipal solid waste], and the gases, liquids, or solids produced are combusted and emissions vented to the atmosphere”).

² 86 Fed. Reg. 50,296, 50,300 (Sept. 8, 2021) (US EPA describing gasification).

1. The project's processing capacity (99.9 tons per day) falls within the range processing rates for facilities covered by 40 CFR 60, Subpart AAAAA.
2. Raven has indicated that the facility cannot feasibly operate without producing electricity from the combustion of waste gas at the biogas engines (S4, S5, S6).
3. All the waste gas will be directed to the biogas engines (S4, S5, S6) to maintain operation of the hydrogen plant (S3) where gasification occurs.
4. The hydrogen plant (S3) and biogas engines (S4, S5, and S6) are connected by a pipe, and the waste gas does not undergo any processing prior to combustion at the biogas engines.
5. The exhaust (heat energy) from the combustion of waste gas at the biogas engines (S4, S5, S6) is the only source of heat energy input into the organic waste dryer (S11).
6. The biogas engines (S4, S5, S6) and the organic waste dryer (S11) are connected by a pipe.
7. Waste gas is necessary to sustain operation of the biogas engines, which in turn maintain operation of the hydrogen plant (S3) where the gasification process occurs and the dryer (S11), which is necessary to reduce the amount of water entering S3.

Given the above, the project is a municipal waste combustion unit under 40 CFR § 60.1465, and it is subject to the statutory requirements in Part 129 of the Clean Air Act (42 U.S.C. § 7429) and the regulatory requirements in Title 40 C.F.R. Part 60, Subpart AAAAA.³ Thus, the project must comply with the permit condition(s) in the Authority to Construct and/or Permit to Operate that requires the facility to comply with Title V of the Clean Air Act (42 U.S.C. Chapter 84, Subchapter V [§§ 7661-7661f]) and the regulatory requirements in Title 40 C.F.R. Part 60, Subpart AAAAA.⁴

New Source Performance Standards (NSPS)

³ Raven disagrees that the project is a municipal waste combustion unit under the Clean Air Act. See 42 U.S.C. § 7429(g); 40 CFR § 60.1465. On or about March 12, 2024, Raven submitted a request to US EPA for an applicability determination under Title 40 C.F.R. Part 60, Subpart AAAAA for the project. Raven's request is currently pending before US EPA.

⁴ Should US EPA issue a formal, written applicability determination that finds Raven's project does not meet the definition of a "municipal waste combustion unit" under the Clean Air Act, the permit condition(s) in an Authority to Construct and/or Permit to Operate that require Raven to apply for a Title V permit within 12 months of startup and to comply with the regulatory requirements in Title 40 C.F.R. Part 60, Subpart AAAAA shall be unenforceable.

40 CFR 60, Subpart WWW – Standards for Performance for Municipal Solid Waste Landfills That Commenced Construction, Reconstruction, or Modification on or After May 30, 1991, but Before July 18, 2014.

WCCCSL is subject to the requirements of 40 CFR 60, Subpart WWW, which requires the facility to collect and control of gas from the landfill. Under Section 60.752(b)(2)(iii)(C), WCCCSL is allowed to route the landfill gas for subsequent sale or use, which it will do by transferring the gas to Raven for use at the biogas engines S4 through S6.

No requirements apply to the offsite user of the landfill gas that is subject to 40 CFR 60.752(b)(2)(iii)(C). Therefore, the operation of the biogas engines is not subject to the requirements of 40 CFR 60, Subpart WWW.

40 CFR 60, Subpart AAAA – Standards of Performance for Small Municipal Waste Combustion Units for Which Construction is Commenced After August 30, 1999, or for Which Modification or Reconstruction is Commenced After June 6, 2001.

Under section 60.1010, Subpart AAAA is applicable to municipal waste combustion units that commenced construction after August 30, 1999, or for which modification or reconstruction is commenced after June 6, 2001, and that have the capacity to combust at least 35 tons per day but no more than 250 tons per day of municipal solid waste. Section 60.1465 defines multiple terms that were used to determine the applicability of Subpart AAAA to Raven's proposed facility and operation. These key terms and definitions include the following:

- *Municipal waste combustion unit* means any setting or equipment that combusts solid, liquid, or gasified municipal solid waste including, but not limited to, field-erected combustion units (with or without heat recovery), modular combustion units (starved-air or excess-air), boilers (for example, steam generating units), furnaces (whether suspension-fired, grate-fired, mass-fired, air curtain incinerators, or fluidized bed-fired), and pyrolysis/combustion units.
- *Municipal solid waste* or *municipal-type solid waste* means household, commercial/retail, or institutional waste. Household waste includes material discarded by residential dwellings, hotels, motels, and other similar permanent or temporary housing. Household, commercial/retail, and institutional waste does include yard waste and refuse-derived fuel. Household, commercial/retail, and institutional waste does not include used oil; sewage sludge; wood pallets; construction, renovation, and demolition wastes (which include railroad ties and telephone poles); clean wood; industrial process or manufacturing wastes; medical waste; or motor vehicles (including motor vehicle parts or vehicle fluff).
- *Yard waste* means grass, grass clippings, bushes, shrubs, and clippings from bushes and shrubs. They come from residential, commercial/retail, institutional, or industrial sources as part of maintaining yards or other private or public lands. Yard waste does not include two items:

- (1) Construction, renovation, and demolition wastes that are exempt from the definition of “municipal solid waste” in this section.
- (2) Clean wood that is exempt from the definition of “municipal solid waste” in this section.

This project gasifies yard waste to produce syngas, which is purified to produce hydrogen—Raven’s final product—and waste gas. The project’s waste gas is directly routed to the onsite flare (A1) or the biogas engines (S4, S5, and S6) for combustion. A review of the exemptions determined the project does not meet any of the exemption requirements in 40 CFR Section 60.1020. Based on the information Raven provided to the Air District, the project is subject to the requirements of 40 CFR 60, Subpart AAAA.

Per 40 CFR Section 60.1035:

§60.4230 How are these new source performance standards structured?

These new source performance standards contain five major components:

- (a) Preconstruction requirements.
 - (1) Materials separation plan.
 - (2) Siting analysis.
- (b) Good combustion practices.
 - (1) Operator training.
 - (2) Operator certification.
 - (3) Operating requirements.
- (c) Emission limits.
- (d) Monitoring and stack testing.
- (e) Recordkeeping and reporting.

Per 40 CFR Section 60.1045(a)(2) this process will meet the definition for a Class II Unit for processing less than 250 tons per day. Per Section 60.1045(b), by being classified as a Class II unit, the system is not subject to the nitrogen oxides limits per Table 1 of this subpart, are not required to install a continuous emissions monitoring system, record keeping, and reporting requirements for nitrogen oxides. In addition, it is eligible for reduced testing operations.

The following are the emission limits for the system per 40 CFR 60.1210 and Table 1 and 2 of this subpart:

Table 32 – Summary of Emission Limits per 40 CFR 60.1210, Tables 1 and 2

Regulated Pollutant	Emission Limit
Dioxins/Furans (total mass)	13 ng/dscm
Cadmium	0.20 mg/dscm
Lead	0.20 mg/dscm
Mercury	0.80 dscm or 85% reduction of potential mercury emissions
Opacity	10%
Particulate Matter	24 mg/dscm
Hydrogen Chloride	25 ppmv or 95% reduction of potential hydrogen chloride emissions
Nitrogen Oxides	50 ppmv, dry basis
Sulfur Dioxide	30 ppmv or 80% reduction of potential sulfur dioxide emissions
Carbon Monoxide	50 ppmv, dry basis
Fugitive Ash	Visible emissions for no more than 5% of hourly observation period

Per 40 CFR 60.1230, the owner or operator must install a continuous emission monitoring system (CEMS) to monitor oxygen (or carbon dioxide), sulfur dioxide, and carbon monoxide. Since this is a Class II unit, it is not required to install a monitor for nitrogen oxides. Continuous opacity monitoring systems (COMS) will need to be installed per 40 CFR 60.1270. All the monitoring systems will need to comply with the requirements of 40 CFR 60, Appendix B. The CEMS units will need to comply with the quality assurance procedures of 40 CFR 60, Appendix F. The COMS will need to be tested in accordance with the requirements in EPA Reference Method 9 in 40 CFR 60, Appendix A.

The O₂, SO₂, and CO CEMS could be installed in the duct between the engines and the dryer. The opacity meter should be installed in the dryer stack upstream of the baghouse, A9.

Per Section 60.1315, additional monitoring requirements include the load levels of each municipal waste combustion unit and temperature monitoring of the flue gases at the inlet of the particulate matter air pollution control device. There is an additional requirement to monitor the carbon feed rate if activated carbon is used to control dioxins/furans or mercury

emissions. The facility is currently not using activated carbon as a control and would not be subject to this requirement unless there are changes to the system.

40 CFR 60, Subpart III – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

Per 40 CFR Section 60.4200(a)(1)(ii), engines are subject to 40 CFR 60, Subpart III, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines if the model year for the fire pump is either equal to or later than model year listed in Table 3 of this subpart. Per Table 3, the starting model year for an engine with a power rating between 100 HP and 175 HP is 2010. S7 is a 2022 model year. This engine is subject to this subpart.

Section 60.4202(d), Section 60.4205(c) and Section 60.4211(c) require that the owner/operator of the engine must comply with the emission standards in Table 4 of this subpart, for all pollutants. S7 meets the limits for engines between 100 HP and 175 HP with a model year of 2010 or later, as shown in the table below:

Table 33 – Summary of Compliance with 40 CFR 60, Subpart III, Table 4

Pollutant	Manufacturer's Performance Data (g/bhp-hr)	40 CFR 60 Table 4 Emission Limits (g/bhp-hr)
PM	0.10	0.22
NMHC + NOx	2.86	3.0
CO	0.67	3.7

Section 60.4206 requires that the owner/operator operate and maintain the engine according to the manufacturer's written instructions or procedures developed by the owner or operator that are approved by the engine manufacturer, over the entire life of the engine. The owner/operator is expected to comply with this requirement.

Section 60.4207(b) requires that by October 1, 2010, the owner/operator must use fuel that complies with 40 CFR 80.510(b). This means that the fuel must have a sulfur content of 15 parts per million (ppm) maximum, and a cetane index of 40 or a maximum aromatic content of 35 volume percent. Since the California Air Resources Board (CARB) allows only the use of ultra-low sulfur diesel to be used in California, the owner/operator is expected to comply with this requirement.

Section 60.4209(a) requires a non-resettable hour meter. S7 will be subject to standard permit conditions that include this requirement.

Section 60.4210(c)(3) states that engines will need to comply with the provisions of 40 CFR Part 1039. S7 is certified in accordance with 40 CFR 89 under engine family NCEXL0275AAG. Per 40 CFR 89, EPA has migrated the regulatory requirements for these engines to 40 CFR 1039. S7 will comply with this requirement.

Standard permit conditions limiting operation to 32 hours per year for reliability testing except for operating during emergencies at S7 ensure that it will comply with the requirement in Section 60.4211(f) which limits such operation to less than 100 hours per year.

40 CFR 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

To determine if S4 through S6 are subject to the requirements of 40 CFR 60, Subpart JJJJ, the engines were reviewed based on the requirements of 40 CFR Section 60.4230(a).

Per 40 CFR Section 60.4230(a)(4)(i):

§60.4230 Am I subject to this subpart?

(f) The provisions of this subpart are applicable to manufacturers, owners, and operators of stationary spark ignition (SI) internal combustion engines (ICE) as specified in paragraphs (a)(1) through (6) of this section. For the purposes of this subpart, the date that construction commences is the date the engine is ordered by the owner or operator:

(1) Owners or operators of stationary SI ICE that commence construction after June 1, 2006, where the stationary SI IC are manufactured:

- i. On or after July 1, 2007, for engines with a maximum engine power greater than or equal to 500 HP (except lean burn engines with a maximum engine power greater than or equal to 500 HP and less than 1,350 HP);

S4, S5, and S6 are lean burn, spark ignition engines with a maximum engine horsepower of 1,966 for each engine. The engine model is 2022, therefore the commence construction date is after June 1, 2006. The engines are subject to the requirements of this regulation.

Per 40 CFR Section 60.4230(a)(6), all owners and operators of stationary SI ICE that commence after June 1, 2006, are subject to the provisions of Section 60.4236. For these biogas engines, the provisions are subject to the requirements of Section 60.4236(b):

§60.4236 What is the deadline for importing or installing stationary SI ICE produced in previous model years?

(1) After July 1, 2009, owners and operators may not install stationary SI ICE with a maximum engine power greater than or equal to 500 HP that do not meet the applicable requirements in §60.4233, except that lean burn engines with a maximum engine power greater than or equal to 500 HP and less than 1,350 HP that do not meet the applicable requirements of §60.4233 may not be installed after January 1, 2011.

Per 40 CFR 60.4233(e), engines with a maximum engine power greater than or equal to 100 HP must meet the emissions standards of Table 1 of this subpart. Based on the emissions provided, these engines will meet the requirements:

Table 34 – Summary of Compliance with 40 CFR 60, Subpart JJJJ, Table 1

Pollutant	Emissions Factors for S4, S5, and S6 (g/bhp-hr)	Landfill/ Digester Gas Lean Burn (g/bhp-hr)	Non-Emergency SI Natural Gas and Non-Emergency SI Lean Burn LPG (g/bhp-hr)
NOx	0.124	2.0	2.0
CO	0.89	5.0	4.0
VOC	0.12	1.0	1.0

The engines are not certified for use of landfill gas and waste gas. Therefore, the owner or operator is subject to the requirements of Section 60.4243(b)(2)(ii) including a maintenance plan and records of maintenance conducted on each engine operating to minimize emissions, and source testing initially and every 8,760 hours of operation or every three years, whichever comes first. The owner or operator must use the test procedures in 60.4244 including three one-hour runs for the test.

Per 40 CFR 60.4245(a), the operator must maintain records of all notifications, all maintenance conducted on the engines, and all performance tests. The initial notification is required pursuant to 40 CFR 60.4245(c) and 60.7(a)(1).

Per Section 60.4245(c), the notifications must be submitted electronically per Section 60.4545(g).

Section 60.4245(d) requires the submittal of every performance test within 60 days after the test is complete. The results must be submitted electronically per Section 60.4545(f).

Section 60.4245(g), (h), (i), and (j) have details of submitting notifications and reports through EPA’s Compliance and Emissions Data Reporting Interface (CEDRI).

These requirements were added as permit conditions.

National Emission Standards for Hazardous Air Pollutants for Source Categories

40 CFR 63, Subpart AAAA -National Emission Standards for Hazardous Air Pollutants: Municipal Solid Waste Landfills

Although Raven will receive landfill gas from WCCCSL for use at the biogas engines S4, S5, and S6, Raven does not own or operate a municipal solid waste landfill as defined by 40 CFR 63.1990. Therefore, this facility is not subject to the requirements of 40 CFR 63, Subpart AAAA.

40 CFR 63, Subpart ZZZZ – National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

S4, S5, S6, and S7 are subject to the requirements of 40 CFR 63, Subpart ZZZZ. Per 40 CFR 63.6590(c)(1), a new or reconstructed stationary RICE located at an area source must meet

the requirements of 40 CFR part 60 subpart IIII, for compression ignition engines, or 40 CFR 60 Subpart JJJJ, for spark ignition engines. As shown, S7 will be in compliance with the requirements of 40 CFR 60, Subpart IIII. S4, S5, and S6 will be in compliance with the requirements of 40 CFR 60, Subpart JJJJ.

Chemical Accident Prevention Provisions, 40 CFR 68

Per 40 CFR 68.90(b)(2) for a stationary source with only regulated substances held in a process above the threshold quantity, are subject to this requirement. Per Table 3 of Section 68.130, hydrogen is listed as a flammable substance with a threshold quantity of 10,000 pounds at any given time. According to Raven, the facility will not store more than 10,000 pounds of hydrogen. In California, if the Facility does exceed the 10,000-pound limit, then Raven will need to coordinate with the California Office of Emergency Services to address the requirements of this regulation.

CONDITIONS

Permit Condition 100760 for S1, Organic Waste Storage Pile

1. The owner or operator of S1 shall not exceed the following throughput limits in wet tons:
 - a. 99.9 wet-tons for any rolling 24-hour period.
 - b. 36,465 wet-tons for any rolling 12-month consecutive period.[Basis: Cumulative Increase]
2. The owner or operator of S1 shall only store green waste at the facility. The facility shall submit an application for Air District approval prior to accepting any new material for storage.
[Basis: Cumulative Increase]
3. The owner or operator of S1 shall process the stored material through S11 and S3 within 24 hours from when the material is received at the facility. The owner shall be subject to record keeping requirements in Part 5.
[Basis: Cumulative Increase, BACT, Regulation 2-5]
4. The owner or operator of S1 shall ensure that visible dust emissions from S1 shall not exceed 10% opacity and/or Ringelmann 0.5 for longer than three (3) minutes during any one-hour period or result in fallout on adjacent property in such quantities as to cause a public nuisance per Regulation 1-301.
[Basis: Cumulative increase, Regulations 1-301, 2-1-403, 2-2-301, and 6-1]
5. To demonstrate compliance with this Permit Condition, the owner or operator of S1 shall maintain dated records in a District approved log of the following on a daily basis and at the monitoring frequency specified in other parts of this permit condition for the specific parameters:

- a. Record the weight of the feedstock delivered as permitted in Part 1 on a daily basis.
- b. Date and time for the material received.

All measurements, records, and data required to be maintained by the owner or operator shall be retained and made available for inspection by the District for at least five years following the date the data is recorded.

[Basis: Cumulative Increase]

6. If the owner or operator of S1 receives 10 or more complaints within a 90-day period, alleging an odor perceived at or beyond the property line and deemed to be objectionable by the complainants in the normal course of their work, travel or residence, then the owner or operator of S1 shall be subject to the requirements of Regulation 7, Rule 1.

[Basis: Regulation 7-1-302]

Permit Condition 100761 for S2, Alkaline Reagent Storage

1. The owner or operator of S2 shall not exceed the following throughput limits:
 - a. 45.0 tons for any rolling 24-hour period.
 - b. 1,051 tons for any rolling 12-month consecutive period.[Basis: Cumulative Increase]
2. The owner or operator of S2 shall only store hydrated lime, limestone, dolomite, and magnesium carbonate in granular or pellet format at S2.
[Basis: Cumulative Increase]
3. The owner or operator of S2 shall ensure that visible dust emissions from S2 shall not exceed 10% opacity and/or Ringelmann 0.5 for longer than three (3) minutes during any one-hour period or result in fallout on adjacent property in such quantities as to cause a public nuisance per Regulation 1-301.
[Basis: Cumulative increase, Regulations 1-301, 2-1-403, and 6-1]
4. To demonstrate compliance with this Permit Condition, the owner or operator of S2 shall maintain dated records in a District approved log:
 - a. Record the weight of the material delivered as permitted in Part 1 on a daily basis.
 - b. Date and time for the material received.

All measurements, records, and data required to be maintained by the owner or operator shall be retained and made available for inspection by the District for at least five years following the date the data is recorded.

[Basis: Cumulative Increase]

Permit Condition 100762 for S3, Hydrogen Production System, and A1, Flare

1. The owner or operator of S3 shall not exceed the following green waste throughput limits:
 - a. 99.9 wet tons during any rolling 24-hour period
 - b. 36,465 wet tons during any rolling 12-month consecutive period.[Basis: Cumulative Increase]
2. The owner or operator of S3 shall not exceed the following production rate of hydrogen:
 - a. 14,000 pounds of hydrogen during any rolling 24-hour period
 - b. 2,555 tons during any rolling 12-month consecutive period.[Basis: Cumulative Increase, 2-5]
3. The owner or operator shall not exceed the following production rate of biochar:
 - a. 4.0 tons in any rolling 24-hour period
 - b. 1,000 tons in any rolling 12-month consecutive period.[Basis: 2-1-320]
4. Within 30 days of start-up, the owner or operator of S3 shall report the final component count. The Air District will adjust the cumulative increase if the component count is greater than the numbers below.
 - a. Valves: 150
 - b. Pumps: 40
 - c. Connectors: 150[Basis: Regulation 2-5]
5. Within 30 days of start-up, the owner or operator of S3 shall perform an initial screening of all the components listed in Part 4 of this permit condition and submit them to the Air District. The screening value for each component shall not exceed the limits below for each component for total organic compounds as defined in Regulation 8-18-219 in ppmv as methane.
 - a. Valves: 25
 - b. Pumps: 25
 - c. Connectors: 25[Basis: Regulation 2-5]
6. During normal operations, the owner or operator of S3 shall abate all gas that is produced as by-products from the operation (waste gas) to S4, S5, and S6 at all times.
[Basis: Cumulative Increase, 2-5]

7. During start-up, shutdown, or during situations when the owner or operator of S3 shall need to evacuate all the syngas from the S3, the owner or operator of S3 shall abate all gases produced from S3 to A1 flare.
 [Basis: Cumulative Increase, 2-5]
8. The owner or operator of A1 shall not exceed 100 hours of operation for any rolling 12-month period for any reason.
 [Basis: Cumulative Increase]
9. The owner or operator of A1 shall operate the flare at a minimum operating temperature of 1400 degrees Fahrenheit when gas from S3 is directed to A1.
 [Basis: Cumulative Increase]
10. The owner or operator of S3 shall install flow meters to determine compliance with Part 2 and part 6 of this permit condition.
 [Basis: Cumulative Increase]
11. The owner or operator of A1 shall install a temperature monitor to determine compliance with Part 9 of this permit condition.
 [Basis: Cumulative Increase]
12. The owner or operator shall properly maintain and operate the flow meters for Part 2 and Part 6 in accordance to the manufacturer’s specifications during all periods of operations of S3 and A1.
 [Basis: Cumulative Increase, Regulation 1-523]
13. The owner operator of S3 shall perform tagging, monitoring, and leak detection and repair requirements to demonstrate compliance with Regulation 8, Rule 18.
 [Basis: Cumulative Increase, Regulations 2-5 and 8-18]
14. The owner or operator of S3 shall not exceed the following concentrations for each of the following compounds.:

Toxic Air Contaminants	Concentrations in the syngas after 2 nd Stage (ppbv)	Concentration in the waste gas (ppbv)
1,3-Butadiene	5.62E+03	1.07E+03
Acetaldehyde	3.65E+02	2.39E+02
Benzene	5.85E+06	7.78E+05
Chlorine	1.05E+03	3.10E+02
Dioxins as PCDDs	6.50E+00	9.75E-04
Ethylbenzene	2.38E+02	2.98E+03
Formaldehyde	2.11E+00	8.20E-01

Toxic Air Contaminants	Concentrations in the syngas after 2 nd Stage (ppbv)	Concentration in the waste gas (ppbv)
Hydrogen Sulfide	7.67E+02	2.65E-01
Lead	8.00E+01	2.93E+02
Methyl Ethyl Ketone	6.19E+00	6.31E+00
Naphthalene	1.80E+06	1.27E+01
Propene	2.23E+04	3.95E+03
Styrene	4.19E+06	2.97E+04
Toluene	3.88E+03	2.15E+02

The owner/operator shall perform an analysis of the syngas after the second stage and in the waste gas to determine the concentration of the toxic air contaminants above during every source test.

The owner or operator shall calculate the Dioxin as PCDDs equivalent for PCDDs, PCDFs, and dioxin-like PCBs compounds using the toxicity equivalency factor (TEF) presented in Regulation 2, Rule 5, Note 7.

[Basis: Regulation 2-5]

15. The owner or operator of A1 shall not exceed the following emission limits for each of the following compounds:

Toxic Air Contaminants	Hourly Emission rate (lb/hour)	Annual Emission Rate (lb/year)
1,3-Butadiene	1.13E-06	1.13E-04
Acetaldehyde	6.00E-06	6.00E-06
Benzene	1.70E-03	1.70E-01
Chlorine	1.16E-08	1.16E-06
Dioxins as PCDDs	8.91E-10	8.91E-08
Ethylbenzene	5.27E-08	5.27E-06
Hydrogen Sulfide	1.70E-07	1.70E-05
Lead	8.85E-10	8.85E-08
Methyl Ethyl Ketone	1.67E-09	1.67E-07
Naphthalene	3.99E-07	3.99E-05
Propene	3.67E-06	3.67E-04
Styrene	1.63E-06	1.63E-04
Toluene	1.33E-06	1.33E-04

To calculate the emission rates, the owner or operator shall calculate the emissions identified in Part 14 based on the concentrations in the syngas after the second stage at S3 and assume a 98% destruction efficiency volatile organic compounds only to determine the emission rate at A1.

[Basis: Regulation 2-5]

16. Based on the results of Parts 4, Part 5, 14, 15, and 18 of this permit condition, the Air District may revise the health risk assessment. If the final cancer risk for the overall project under Application #31700 is over 6 in a million, the owner or operator shall shut down all operations at the facility until corrective actions are approved and implemented.

[Basis: Regulation 2-5]

17. The owner or operator shall ensure that S3 complies with Air District Regulation 8, Rule 2. The source may not discharge into the atmosphere an emission containing more than 15 pounds per day and containing a concentration of more than 300 ppm total carbon on a dry basis. For the purposes of this requirement, total carbon includes all organic compounds except 1,1,1-trichloroethane, methylene chloride, methane, and chlorofluorocarbons.

[Basis: Regulation 8-2]

18. In order to determine compliance with Parts 14 and 15 and Regulation 8, Rule 2, the owner or operator of S3 shall perform a source test at each of the designated locations identified in Part 18. The owner or operator of S3 shall perform source tests for the following compounds to determine the change of emissions from S3, S4, S5, S6, and S11.

Compounds/Toxic Air Contaminants
NOx
POC
Organic compounds as defined by BAAQMD Regulation 8, Rule 2
CO
Methane
Hydrogen
1,3-Butadiene
Acetaldehyde
Acrylonitrile
Benzene
Cadmium
Chlorine
Dioxin as PCDDs
Ethyl Benzene
Formaldehyde
Hydrogen Chloride
Hydrogen Sulfide
Lead

Compounds/Toxic Air Contaminants
Mercury
Methyl Ethyl Ketone
Naphthalene
PAH Equivalent as Benzo(a)Pyrene
Propene
Styrene
Toluene
Vinyl Chloride

[Basis: Cumulative Increase, BACT, Regulation 2-5, Regulation 1-107 Avoidance]

19. Starting with the initial start-up of S3, the owner or operator of S3 shall perform a source test within 60 days when operations increase to each of the following stages of operation:
- a. Initial Start-up
 - b. Operations at 20% of maximum capacity from initial start-up
 - c. Operations at 40% of maximum capacity from initial start-up
 - d. Operations at 60% of maximum capacity from initial start-up
 - e. Operations at 80% of maximum capacity from initial start-up
 - f. Operations at 100% of maximum capacity from initial start-up

Once the owner or operator of S3 reaches 100% of maximum capacity from the initial start-up period, the owner or operator of S3 shall perform a source test annually thereafter. If the owner or operator of S3 performs a source test at less than 80% of maximum operating capacity, then the owner or operator shall limit overall operations to the operating parameters demonstrated in the source test until the facility is able to perform an additional source test to demonstrate compliance with higher operating conditions.

[Basis: Cumulative increase, Regulation 2-5]

20. The owner or operator of S3 shall obtain approval for all source test procedures from the Air District's Source Test Section prior to conducting any tests at S3. The owner or operator shall notify the Air District's Source Test Section, in writing, of the source test protocols and projected test dates at least 30 days prior to testing. The owner or operator of S3 shall not perform the source test without prior written approval from Air District's Source Test Section.

The source test report shall be submitted to the Compliance and Enforcement Division and the Source Test Division within 60 days of completion of the source test.

[Basis: Regulation 2-1-403]

21. The owner or operator of S3 and A1 shall install sampling platforms and sampling ports in accordance with the Air District's Manual of Procedures.
[Basis: Air District's Manual of Procedures]

22. To determine compliance with the above parts, the owner/operator shall maintain the following records and provide all of the data necessary to evaluate compliance with the above parts, including the following information:
 - a. Total daily throughput of organic waste processed at S3.
 - b. Total daily throughput of hydrogen produced at S3
 - c. Total daily throughput of biochar produced at S3
 - d. Total monthly throughput of organic waste processed at S3.
 - e. Total monthly throughput of hydrogen produced at S3
 - f. Total monthly throughput of biochar produced at S3
 - g. Total monthly hours of operation at A1.
 - h. The monthly hours of operation at A1 shall be totaled for each consecutive 12-month period.
 - i. Total monthly throughputs shall be totaled for each consecutive 12-month period.
 - j. A1 temperature measurements and time of measurement;
 - k. Records of source tests performed.
 - l. Records of all inspections and all maintenance work including repairs to any leak components and changes to the system that may result in changes in emissions. Records of each inspection shall consist of a log containing the date of inspection and the initials of the personnel that inspects.
 - m. Records on monitoring pursuant to Regulation 8, Rule 18

All measurements, records, and data required to be maintained by the owner/operator shall be retained and made available for inspection by the District for at least five years following the date the data is recorded.

[Basis: Cumulative increase, Regulations 1-107, 2-1-320, 2-1-403, 2-5, 8-18, Regulation 13-5]

Permit Condition 100763 for S3, Hydrogen Production System, S4, S5, S6, Biogas Engines, S11, Dryer, and A1, Flare

1. Until otherwise determined by the United States Environmental Protection Agency in a written Applicability Determination for Title 40 C.F.R. Part 60, Subpart AAAA (Standards of Performance for Small Municipal Waste Combustion Units), the owner or operator of S3, S4, S5 and S6 shall comply with the requirements of Permit Condition 100763.
[Basis: 40 CFR 60, Subpart AAAA]

2. The owner or operator of S3, S4, S5 and S6 shall comply with the five major components of the new source performance standards as outlined in 40 CFR 60, Subpart AAAA.

[Basis: 40 CFR 60, Subpart AAAA]

3. The owner/operator shall apply for a Title V permit within one year of startup.
[Basis: Federal Clean Air Act Section 129(e), 40 CFR 70.3(a) and (b)(1), Regulation 2-6-303]
4. The owner/operator of S4, S5, S6, and A1 shall install a continuous emission monitoring system for oxygen, sulfur dioxide, and carbon monoxide, as required in 40 CFR 60 Section 60.1230. The continuous emission monitoring system shall comply with the requirements outlined in 40 CFR 60, Appendix B and Appendix F, and the Manual of Procedures, Volume V.
[Basis: 40 CFR 60, Subpart AAAA, Air District's Manual of Procedures]
5. The owner/operator of S4, S5, S6, and A1 shall install a continuous opacity monitoring system, as required in 40 CFR 60 Section 60.1270. The continuous opacity monitoring system shall comply with the requirements outlined in 40 CFR 60, Appendix B and EPA Reference Method 9 in 40 CFR 60, Appendix A, and the Manual of Procedures, Volume V.
[Basis: 40 CFR 60, Subpart AAAA, Air District's Manual of Procedures]
6. The owner/operator shall ensure that the emissions from S4, S5, S6, and A1 meet the standards listed in Table 1 and Table 2 for a Class II Unit of 40 CFR 60, Subpart AAAA within 60 days of S3 reaching the maximum load level, but no later than 180 days after initial startup:
 - a. Dioxins/furans – 13 ng/dscm as total mass
 - b. Cadmium – 0.020 milligrams/dscm
 - c. Lead – 0.20 milligrams/dscm
 - d. Mercury – 0.080 milligrams/dscm or 85% reduction of potential mercury emissions
 - e. Opacity – 10%
 - f. Particulate matter – 24 milligrams/dscm
 - g. Hydrogen chloride – 25 ppmvd or 95% reduction of potential hydrogen chloride emissions
 - h. Oxides of nitrogen – 500 ppmvd, dry basis
 - i. Sulfur dioxide – 30 ppmvd or 80 percent reduction of potential sulfur dioxide emissions
 - j. Fugitive ash – Visible emissions for no more than 5 percent of observation period
 - k. Carbon monoxide: 50 ppmvd, dry basis
 - l. All emission limitations in this part are measured at 7% oxygen, dry basis at standard conditions.

(Basis: 40 CFR 60, Subpart AAAA)

7. The owner/operator shall conduct an initial performance test within 60 days after S3 reaches the maximum load rate of 5.0 wet tons of organic waste per hour at which it will operate, but no later than 180 days after its initial startup. The owner/operator shall conduct an annual performance test within 12 months of the last source test.
[Basis: 40 CFR 60, Subpart AAAA]
8. During the performance test required by Part 7 of this condition, the owner/operator shall conduct District approved source tests to determine compliance with the limits in Part 6. The owner/operator shall submit the source test results to the District's Source Test Section no later than 60 days after the source test.
[Basis: Regulation 2-1-403]
9. The owner/operator shall obtain approval for all source test procedures from the District's Source Test Section prior to conducting any tests. The owner/operator shall comply with all applicable testing requirements as specified in Volume IV of the District's Manual of Procedures. The owner/operator shall notify the District's Source Test Section, in writing, of the source test protocols and projected test dates at least 30 days prior to testing.
[Basis: Regulation 2-1-403]
10. The owner/operator shall report all instances of non-compliance with 40 CFR 60, Subpart AAAA in writing to the District's Compliance and Enforcement Division within 10 calendar days of the discovery of the non-compliance. Within 30 calendar days of the discovery of any non-compliance, the facility shall submit a written report including the probable cause of the non-compliance and any corrective or preventative actions. The reports shall be sent by e-mail to compliance@baaqmd.gov or by postal mail to the following address:
Director of Compliance and Enforcement
Bay Area Air Quality Management District
375 Beale Street, Suite 600
San Francisco, CA 94105
[Basis: Regulation 2-1-403]

Permit Condition 100764 S4 abated by A2, A3 and A4, S5 abated by A2, A5 and A6, and S6 abated by A2, A7 and A8, Biogas Engines, Landfill Gas Conditioning System, Oxidation Catalysts, and Selective Catalytic Reduction Systems

1. The owner or operator of S4, S5 and S6 shall be fired exclusively on the following:
 - a. 100% on treated landfill gas from A2 Landfill Gas Conditioning System or
 - b. A blend of landfill gas treated through A2 Landfill Gas Conditioning System and up to 45% waste gas from S3.
[Basis: Cumulative Increase]

2. The owner or operator of A2 shall not exceed 271 million standard cubic feet landfill gas during any rolling 12-month consecutive period.
[Basis: Cumulative Increase, Regulation 2-5]
3. The owner or operator of S4, S5, and S6 shall not exceed 118 million standard cubic feet of waste gas from S3 during any rolling 12-month consecutive period.
[Basis: Cumulative Increase, Regulation 2-5]
4. The owner or operator of S4, S5, and S6 shall not exceed a heat input of 85,918 MMBtu during any 12-month consecutive period for each engine. The limit is based on the full rated input capacity for each internal combustion engine operating continuously.
[Basis: Cumulative Increase]
5. The owner or operator of S4, S5, and S6 shall ensure that all landfill gas combusted in S4, S5, and S6 are treated by A2 prior to combustion.
[Basis: Cumulative Increase]
6. The owner or operator shall properly maintain and operate A2 in accordance with the manufacturer's specifications during all periods of operations of S4, S5, and S6. The owner or operator of A2 shall not regenerate the media on site.
[Basis: Cumulative Increase]
7. The owner or operator of each of the following sources shall abate all NO_x emissions from each of the following abatement devices except during startup and shutdown of each source:
 - a. S4 abated by A3 Selective Catalytic Reduction
 - b. S5 abated by A5 Selective Catalytic Reduction
 - c. S6 abated by A7 Selective Catalytic ReductionThe owner or operator of A3, A5, and A7 shall ensure that each SCR catalyst bed is equipped with a temperature monitor and continuous recorder that accurately measures and records the temperature of the exhaust gas from the catalyst during all periods of operation. Except during periods of start-up or shutdown, the owner or operator shall maintain the exhaust gas temperature within a range of 575 degrees Fahrenheit and 960 degrees Fahrenheit while each engine is in operation.
[Basis: Cumulative Increase, BACT]
8. The owner or operator shall properly maintain and operate A3, A5, and A7 in accordance with the manufacturer's specifications during all periods of operation of S4, S5, and S6.
[Basis: Cumulative Increase, BACT]
9. The owner or operator of each of the following sources shall abate all CO and organic compound emissions by each of the following abatement devices except during startup and shutdown of each source:

- a. S4 abated by A4 Oxidation Catalyst
 - b. S5 abated by A6 Oxidation Catalyst
 - c. S6 abated by A8 Oxidation Catalyst

[Basis: Cumulative Increase, BACT Regulation 2-5-302]
10. The owner or operator of S4, S5, and S6 shall not exceed a startup period of two (2) hours and shall not exceed a shutdown period of one (1) hour for each engine.
[Basis: Cumulative Increase, BACT]
11. The owner or operator shall properly maintain and operate A4, A6, and A8 in accordance with the manufacturer's specifications during all periods of operations of S4, S5, and S6.
[Basis: Cumulative Increase, BACT, Regulation 2-5-302]
12. The owner or operator of S4, S5, and S6 shall not exceed 0.124 grams of nitrogen oxide per brake-horsepower/hour for each source. The owner or operator shall demonstrate compliance by having nitrogen oxides concentration in the engine exhaust of no more than 16.27 ppmv of NO_x, corrected to 15% oxygen, dry basis.
[Basis: Cumulative Increase, BACT]
13. The owner or operator of S4, S5, and S6 shall not allow total NO_x emissions to exceed 2.354 tons per year per engine.
[Basis: Cumulative Increase]
14. The owner or operator of S4, S5, and S6 shall not exceed 0.70 grams of CO per brake-horsepower-hour for each source. The owner or operator shall demonstrate compliance by having carbon monoxide concentration in the engine exhaust of no more than 150.9 ppmv of CO, corrected to 15% oxygen, dry basis.
[Basis: Cumulative Increase, BACT]
15. The owner or operator of S4, S5, and S6 shall not allow total CO emissions to exceed 13.289 tons per year per engine.
[Basis: Cumulative Increase]
16. The owner or operator of S4, S5, and S6 shall not exceed 0.12 grams per brake-horsepower per hour of non-methane organic compounds at the exhaust of each engine. The owner or operator shall demonstrate compliance by having organic compound concentration in the engine exhaust of no more than 45.1 ppmv as methane, corrected to 15% oxygen, dry basis.
[Basis: Cumulative Increase, BACT]
17. The owner or operator of S4, S5, and S6 shall not allow total organic compound emission to exceed 2.278 tons per year per engine.
[Basis: Cumulative Increase]

18. The owner or operator of S4, S5, and S6 shall not allow the concentration of total sulfur in the fuel to exceed 100 ppmv.
[Basis: Cumulative Increase]
19. The owner or operator of S4, S5, and S6 shall not exceed 6.74 tpy SO₂ for all three engines combined during any consecutive 12-month period.
[Basis: Cumulative Increase]
20. The owner or operator shall ensure that S4, S5, and S6 comply with Air District Regulation 8, Rule 2. The source may not discharge into the atmosphere an emission containing more than 15 pounds per day and containing a concentration of more than 300 ppm total carbon on a dry basis when burning waste gas from S3. For the purposes of this requirement, total carbon includes all organic compounds except 1,1,1-trichloroethane, methylene chloride, methane, and chlorofluorocarbons.
[Basis: Regulation 8-2]
21. The owner or operator of S4, S5, and S6 shall direct the exhaust from each engine to one of the following locations:
 - a. When S11 is in operation, all the exhaust from S4, S5, and S6 shall be directed to S11.
 - b. When S11 is not in operation, all the exhaust from S4, S5, and S6 shall be directed to a bypass stack.[Basis: Cumulative Increase, Regulation 2-5]
22. The owner or operator of S4, S5, and S6 shall ensure the minimum exhaust rate at the bypass stack is 11,483 cubic feet per minute.
[Basis: Regulation 2-5]
23. The owner or operator of S4, S5, and S6 shall ensure the minimum exhaust temperature is 912 degrees Fahrenheit.
[Basis: Regulation 2-5]
24. To demonstrate compliance with Part 1, the owner or operator of S4, S5, and S6 shall install a flow meter on the pipe from A2 and the pipe from S3 to determine the blend percentage of each gas used as fuel for the engines. The owner or operator shall not exceed the blend percentages as outlined in Part 1 of this permit condition.
[Basis: Cumulative Increase]
25. To demonstrate compliance with Parts 2 and 3, the owner or operator of S4, S5, and S6 shall install a flow meter at the inlet of each engine to determine the amount of fuel directed to each engine.
[Basis: Cumulative Increase, Regulation 2-5]

26. To demonstrate compliance with Parts 22, the owner or operator of S4, S5, and S6 shall install a flow meter at the bypass stack.

[Basis: Cumulative Increase, Regulation 2-5]

27. To demonstrate compliance with Part 7 and Part 23, the owner or operator of S4, S5, and S6 shall install temperature monitors at each of the following locations:

- a. The outlet of each engine.
- b. The exhaust point for the bypass stack.

[Basis: Cumulative Increase, Regulation 2-5]

28. The owner or operator shall properly maintain and operate the flow meters and temperature monitors in Parts 24, 25, 26 and 27 in accordance to the manufacturer's specifications during all periods of operation of S4, S5, and S6.

[Basis: Cumulative Increase, BACT, Regulation 1-523]

29. The owner or operator of S4, S5, or S6 shall not exceed the following emissions rates for each of the following compounds:

Toxic Air Contaminants	Hourly Emission Rate (lb/hour)	Annual Emission Rate (lb/year)
1,3-Butadiene	3.35E-04	1.94E+00
Acetaldehyde	7.96E-03	6.99E+01
Acrylonitrile	3.75E-05	3.29E-01
Benzene	1.40E-01	1.23E+03
Dioxin as PCDDs	6.15E-08	5.38E-04
Formaldehyde	8.67E-02	7.59E+02
Hydrogen Chloride	1.09E-01	9.55E+02
Hydrogen Sulfide	6.25E02	1.19E+02
Naphthalene	6.72E-04	5.90E+00
PAH Equivalent as Benzo(a)Pyrene	1.31E-05	1.15E-01
Vinyl Chloride	9.44E-04	8.28E+00

To calculate the emission rate for Dioxins as PCDDs, the owner or operator shall calculate the PCDD equivalent for PCDDs, PCDFs, and dioxin-like PCBs compounds using the toxicity equivalency factor (TEF) presented in Regulation 2, Rule 5, Note 7.

To calculate the emission rate for PAH Equivalent as Benzo(a)Pyrene, the owner or operator shall calculate the PAH compounds using the potency equivalency factor (PEF) presented in Regulation 2, Rule 5, Note 8.

[Basis: Regulation 2-5]

30. In order to demonstrate compliance with this permit condition, the owner or operator of S4, S5, and S6 shall perform a District approved source test to be conducted within 60 days of start-up of each engine and annually thereafter to demonstrate compliance with these permit conditions. The source test shall be conducted while the engine is operating under the different scenarios described under Part 1 of this permit condition. If the owner or operator of S4, S5, and S6 performs the source test at less than the 80% of the maximum operating rate, then the maximum throughput shall be reduced until the owner or operator is able to perform a source test to demonstrate compliance with operating the system at a higher operating rate.

The source test procedures and scheduled test date shall be submitted to the Source Test Division within 30 days prior to conducting each source test. The source test report shall be submitted to the Compliance and Enforcement Division and the Source Test Division within 60 days of completion of the source test.

[Basis: Cumulative Increase]

31. In order to determine compliance with Part 29, the owner or operator of S4, S5, and S6 shall perform a source test at the outlet of S4, S5, and S6. The owner or operator of S4, S5, and S6 shall perform a source test for the following compounds to determine the change of emissions from S3, S4, S5, S6, and S11.

Toxic Air Contaminants/Compounds
NOx
POC
Organic compounds as defined by BAAQMD Regulation 8, Rule 2
CO
Methane
Hydrogen
1,3-Butadiene
Acetaldehyde
Acrylonitrile
Benzene
Cadmium
Chlorine
Dioxin as PCDDs
Ethyl Benzene
Formaldehyde
Hydrogen Chloride
Hydrogen Sulfide
Lead
Mercury
Methyl Ethyl Ketone

Toxic Air Contaminants/Compounds
Naphthalene
PAH Equivalent as Benzo(a)Pyrene
Propene
Styrene
Toluene
Vinyl Chloride

[Basis: Cumulative Increase, BACT Regulation 2-5, Regulation 1-107 Avoidance]

32. Unless otherwise approved by the District’s Source Test Division, the owner or operator shall perform the source test using the following references methods:

Pollutant	Reference Method
NOx	EPA M7E
CO	EPA M10
VOCs	EPA M25A/18 or equivalent method and TO-15
Dioxins/Furans/PCBs	EPA M23
Sulfur Compounds	EPA M15 or M16 and ASTM D5504
Metals	EPA M29 and CARB M425
Formaldehyde	Either EPA M323 or CARB M430
Ammonia	District Method ST-1B

[Basis: Regulation 2-5]

33. The owner or operator of S4, S5 and S6 shall install sampling platforms and sampling ports in accordance with the Air District’s Manual of Procedures.
 [Basis: Air District’s Manual of Procedures]
34. The Air District may reassess the risk from the operation of S4, S5, and S6 after reviewing the results of the initial source testing. If the cancer risk exceeds 6 in a million, for all the sources associated with Application #31700, the Air District shall restrict operation of the equipment.
 [Basis: Regulation 2-5]
35. To demonstrate compliance with the limit in Part 18, the owner/operator shall monitor and record the sulfur content of the fuel to the engines at least once each month. If waste gas is in the mixture, the owner/operator shall monitor the blended gas. (Basis: Cumulative Increase)
36. To determine compliance with the above parts, the owner or operator shall maintain the following records and provide all of the data necessary to evaluate compliance with the above parts, including the following information:
- a. Total daily throughput of landfill gas from A2.

- b. Total daily throughput of waste gas from S3.
- c. Calculation of the percentage blend of gas from A2 and S3.
- d. Total monthly throughput from A2 and S3.
- e. Total monthly throughputs shall be totaled for each consecutive 12-month period.
- f. Records of monthly sulfur monitoring of fuel to engines
- g. Records of disposal for all media at A2
- h. Records of source tests performed.
- i. Records of all inspections and all maintenance work including repairs to any leak components and changes to the system that may result in changes in emissions. Records of each inspection shall consist of a log containing the date of inspection and the initials of the personnel that inspects.

All measurements, records, and data required to be maintained by the owner or operator shall be retained and made available for inspection by the District for at least five years following the date the data is recorded.

[Basis: Cumulative Increase, BACT, Regulations 1-523, 2-5]

37. If the owner or operator of S4, S5, and/or S6 exceeds a benzene emission rate of 0.14 pounds per hour at any of the engines during a source test, the owner or operator of S4, S5, and/or S6 shall shut down all operations at the facility until corrective actions are approved and implemented.
[Basis: Regulation 2-5]
38. The owner/operator shall comply with the requirements of 40 CFR 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines including the notification and testing requirements. One-hour test runs are required for this standard. [Basis: 40 CFR 60, Subpart JJJJ]
39. The owner/operator shall report all instances of non-compliance with this permit condition in writing to the District's Compliance and Enforcement Division within 10 calendar days of the discovery of the non-compliance. Within 30 calendar days of the discovery of any non-compliance, the facility shall submit a written report including the probable cause of the non-compliance and any corrective or preventative actions. The reports shall be sent by e-mail to compliance@baaqmd.gov or by postal mail to the following address:
- Director of Compliance and Enforcement
 - Bay Area Air Quality Management District
 - 375 Beale Street, Suite 600
 - San Francisco, CA 94105
- [Basis: Regulation 2-1-403]

Permit Condition 100072 for S7, Emergency Standby Diesel Generator for a Fire Pump

1. The owner or operator shall operate each emergency standby engine only for the following purposes: to mitigate emergency conditions, for emission testing to demonstrate compliance with a District, state or Federal emission limit, or for reliability-related activities (maintenance and other testing, but excluding emission testing). Operating while mitigating emergency conditions or while emission testing to show compliance with District, state or Federal emission limits is not limited.
[Basis: Title 17, California Code of Regulations, section 93115, ATCM for Stationary CI Engines]
2. The owner/operator shall operate each emergency standby engine only when a non-resettable totalizing meter (with a minimum display capability of 9,999 hours) that measures the hours of operation for the engine is installed, operated and properly maintained.
[Basis: Title 17, California Code of Regulations, section 93115, ATCM for Stationary CI Engines]
3. Records: The owner/operator shall maintain the following monthly records in a District-approved log for at least 36 months from the date of entry (60 months if the facility has been issued a Title V Major Facility Review Permit or a Synthetic Minor Operating Permit). Log entries shall be retained on-site, either at a central location or at the engine's location, and made immediately available to the District staff upon request.
 - a. Hours of operation for reliability-related activities (maintenance and testing).
 - b. Hours of operation for emission testing to show compliance with emission limits.
 - c. Hours of operation (emergency).
 - d. For each emergency, the nature of the emergency condition.
 - e. Fuel usage for each engine(s).[Basis: Title 17, California Code of Regulations, section 93115, ATCM for Stationary CI Engines]
4. At School and Near-School Operation: If the emergency standby engine is located on school grounds or within 500 feet of any school grounds, the following requirements shall apply: The owner or operator shall not operate each stationary emergency standby diesel-fueled engine for non-emergency use, including maintenance and testing, during the following periods:
 - a. Whenever there is a school sponsored activity (if the engine is located on school grounds)
 - b. Between 7:30 a.m. and 3:30 p.m. on days when school is in session."School" or "School Grounds" means any public or private school used for the purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in a private home(s). "School" or "School Grounds" includes any building or structure, playground, athletic field, or other areas of school property but does not include unimproved school property.

[Basis: Title 17, California Code of Regulations, section 93115, ATCM for Stationary CI Engines]

Permit Condition 100073 for S7, Emergency Standby Diesel Generator for a Fire Pump

1. The owner/operator shall not exceed the following limits per year per engine for reliability-related activities:
S7 – 32 Hours of Diesel Fuel
[Basis: Cumulative Increase: Regulation 2-5, Title 17, California Code of Regulations, Section 93115 ATCM for Stationary CI Engines]

Permit Condition 100076 for S7, Emergency Standby Diesel Generator for a Fire Pump

1. The owner/operator shall operate this emergency standby engine only when directly coupled to pump(s) exclusively used in water-based fire protection system(s).

Permit Condition 100765 for S9, Biochar Collection System

1. The owner or operator of S9 shall not exceed the following throughput limits:
 - a. 4.0 tons for any rolling 24-hour period.
 - b. 1,000 tons for any rolling 12-month consecutive period.[Basis: Cumulative Increase]
2. The owner or operator of S9 shall only collect biochar produced from at S3.
[Basis: Cumulative Increase]
3. The owner or operator of S9 shall ensure that visible dust emissions from S9 shall not exceed 10% opacity and/or Ringelmann 0.5 for longer than three (3) minutes during any one-hour period or result in fallout on adjacent property in such quantities as to cause a public nuisance per Regulation 1-301.
[Basis: Cumulative increase, Regulations 1-301, 2-1-403, and 6-1]
4. To demonstrate compliance with this Permit Condition, the owner or operator of S9 shall maintain dated records in a District approved log:
 - a. Record the weight of the material delivered as permitted in Part 1 on a daily basis.
 - b. Date and time for the material received.

All measurements, records, and data required to be maintained by the owner or operator shall be retained and made available for inspection by the District for at least five years following the date the data is recorded.

[Basis: Cumulative Increase]

Permit Condition 100766 for S11, Dryer, abated by A9, Baghouse

1. The owner or operator of S11 shall not exceed the following throughput limits:
 - a. 99.9 wet-tons for any consecutive 24-hour period.
 - b. 36,464 wet-tons for any rolling 12-month consecutive period.

[Basis: Cumulative Increase]
2. The owner or operator of S11 shall only process organic waste from S1.

[Basis: Cumulative Increase]
3. The owner or operator of S11 shall not exceed the following emissions for precursor organic compounds:
 - a. 9.5 pounds per day
 - b. 1.73 tons per year

[Basis: Cumulative Increase, BACT Avoidance]
4. The owner or operator of S11 shall abate all emissions through A9 baghouse.

[Basis: Cumulative Increase]
5. The owner or operator of A9 shall operate such that the outlet PM10 emissions, as defined in Regulation 2, Rule 1, have a grain loading not to exceed 0.0013 grains per dry standard cubic foot. The outlet PM10 emissions at A9 shall not exceed 0.178 pounds per hour and shall not exceed 0.781 tons in any 12-month consecutive period.

[Basis: Cumulative Increase, 2-1-320]
6. The owner or operator of S11 shall ensure the flow rate at the exhaust operates at minimum of 25,816 cubic feet per minute at all times of operation.

[Basis: Regulation 2-5]
7. The owner or operator of S11 shall ensure the temperature is at a minimum of 350 degrees Fahrenheit at all times of operation.

[Basis: Regulation 2-5]
8. The owner or operator of S11 shall install a flow meter and a temperature reader to record the flow rate and temperature.

[Basis: Regulation 2-5]
9. The owner or operator of S11 shall not exceed the following emissions rates for each of the following compounds:

Toxic Air Contaminants	Hourly Emission Rate	Annual Emission Rate
------------------------	----------------------	----------------------

	(lb/hour)	(lb/year)
Acetaldehyde	9.72E-03	8.51E+01
Benzene	4.14E-04	3.63E+00
Naphthalene	3.42E-04	2.99E+00

[Basis: Regulation 2-5]

10. The owner or operator of A9 shall equip the baghouse with a device for measuring the pressure drop across the baghouse. The owner/operator shall check A9 for plugging at least every week.

[Basis: Regulations 6-1-301, 6-1-310, 6-1-311, 2-1-403]

11. The owner or operator of A9 shall inspect the baghouse, weekly to ensure proper operation. The following items shall be checked:
- a. The pressure drop across the baghouse shall be checked weekly. The pressure drop shall be no less than 0.5 and no greater than 10 inches of water.
 - b. The baghouse exhaust shall be checked weekly for evidence of particulate breakthrough. If breakthrough is evident from plume observations, dust buildup near the stack outlet, or abnormal pressure drops, the filter bags shall be checked for any tears, holes, abrasions, and scuffs, and replaced as needed.
 - c. All hoppers shall be discharged in a timely manner.
 - d. The pulsejet shall be maintained and operated at sufficient intervals to maintain compliance.

[Basis: Regulation 2-1-403]

12. The owner or operator shall properly maintain and operate the flow meters, temperature monitors, and pressure gauges for this permit condition in accordance to the manufacturer’s specifications during all periods of operations of S11 and A9.

[Basis: Cumulative Increase, Regulation 1-523]

13. In order to demonstrate compliance with requirements of this permit condition, the owner or operator of S11 and A9 shall perform a District approved source test to be conducted within 60 days of start-up of each engine and annually thereafter to demonstrate compliance with these permit conditions. The source test shall be conducted while the engines are operating under the different scenarios described under Part 1 of Condition #100764. If the owner or operator of S11 and A9 performs the source test at less than 80% of maximum operating rate of 20 tons per hour, then the throughput for S11 shall be reduced to the throughput demonstrated by the most recent source test until the owner or operator is able to operate S11 and A9 at a higher operating rate and remain in compliance with the emissions limits in this permit condition.

The source test procedures shall be submitted to the Source Test Division within 30 days prior to conducting each source test. The source test report shall be submitted to the

Compliance and Enforcement Division and the Source Test Division within 60 days of completion of the source test.

[Basis: Cumulative Increase]

14. In order to determine compliance with Part 10 and Regulation 8, Rule 2, the owner or operator of S11 shall perform a source test at the inlet and outlet of S11 to determine the actual emissions from S11. The owner or operator of S11 shall perform a source test for the following compounds to determine the change of emissions from the various sources.

Toxic Air Contaminants/Compounds
NOx
POC
Organic compounds as defined by BAAQMD Regulation 8, Rule 2
CO
Methane
Hydrogen
1,3-Butadiene
Acetaldehyde
Acrylonitrile
Benzene
Cadmium
Chlorine
Dioxin as PCDDs
Ethyl Benzene
Formaldehyde
Hydrogen Chloride
Hydrogen Sulfide
Lead
Mercury
Methyl Ethyl Ketone
Naphthalene
PAH Equivalent as Benzo(a)Pyrene
Propene
Styrene
Toluene
Vinyl Chloride

[Basis: Cumulative Increase, BACT Regulation 2-5, Regulation 1-107 Avoidance]

15. Unless otherwise approved by the District’s Source Test Division, the owner or operator shall perform the source test using the following references methods:

Pollutant	Reference Method
NOx	EPA M7E
CO	EPA M10
VOCs	EPA M25A/18 or equivalent method and TO-15
PM	EPA M5 and 201A/202 or equivalent method
Dioxins/Furans/PCBs	EPA M23
Sulfur Compounds	EPA M15 or M16 and ASTM D5504
Metals	EPA M29 and CARB M425
Formaldehyde	Either EPA M323 or CARB M430
Ammonia	District Method ST-1B

16. The owner or operator of S11 and A9 shall install sampling platforms and sampling ports in accordance with the Air District’s Manual of Procedures.

[Basis: Air District’s Manual of Procedures]

17. To determine compliance with this permit condition, the owner/operator shall maintain the following records and provide all of the data necessary to evaluate compliance with the above parts, including the following information:

- a. Total daily throughput of material.
- b. Total monthly throughput of material
- c. Total monthly hours of operation.
- d. The monthly hours of operation shall be totaled for each consecutive 12-month period.
- e. Records of source tests performed.
- f. Records of all inspections and all maintenance work including bag replacement for the baghouse. Records of each inspection shall consist of a log containing the date of inspection and the initials of the personnel that inspects the baghouses.
- g. Records of pressure drop monitoring

All measurements, records, and data required to be maintained by the owner/operator shall be retained and made available for inspection by the District for at least five years following the date the data is recorded.

[Basis: Cumulative Increase, 2-1-320, BACT Avoidance, Regulation 2-5]

11. The owner/operator shall report all instances of non-compliance with this permit condition in writing to the District’s Compliance and Enforcement Division within 10 calendar days of the discovery of the non-compliance. Within 30 calendar days of the discovery of any non-compliance, the facility shall submit a written report including the probable cause of the non-compliance and any corrective or preventative actions. The

reports shall be sent by e-mail to compliance@baaqmd.gov or by postal mail to the following address:

Director of Compliance and Enforcement
Bay Area Air Quality Management District
375 Beale Street, Suite 600
San Francisco, CA 94105

[Basis: Regulation 2-1-403]

Permit Condition 100768 for S10, Cooling Tower

1. The owner/operator shall ensure that the particulate emissions of S10, Cooling Tower, as calculated using the procedure in AP-42, Chapter 13.4, Wet Cooling Towers, are below 0.822 tons in any consecutive 12-month period. [Basis: Regulation 2-1-320]
2. The owner/operator shall record the total water flow at S10, Cooling Tower, on a monthly basis. The owner/operator shall record total flow, not make-up water. The owner/operator may record maximum design flow in lieu of measuring flow. [Basis: Regulations 2-1-128.4, 2-1-319]
3. The owner/operator shall ensure that the water flow at S10, Cooling Tower, does not exceed 5,000 gal/min. [Basis: Regulation 2-1-320]
4. The owner/operator shall ensure that S10, Cooling Tower, drift is designed to not exceed 0.005%. [Basis: Regulations 2-1-128.4, 2-1-319, 2-1-320]
5. The owner/operator shall ensure that the total dissolved solids in the water S10, Cooling Tower, does not exceed 1500 milligrams/liter. The owner/operator shall measure and record the total dissolved solids on a monthly basis. [Basis: Regulations 2-1-128.4, 2-1-319, 2-1-320]
6. The owner/operator shall report the water flow throughput at S10, Cooling Tower, to the Air District upon request. [Basis: Regulations 1-441, 2-1-128.4, 2-1-319]
7. The owner/operator shall not use any biocides or toxic air contaminants at S10, Cooling Tower, including sodium hypochlorite. [Basis: Regulations 2-1-320, 2-1-412]
8. All measurements, records, and data required to be maintained by the owner/operator shall be retained and made available for inspection by the District for at least five years following the date the data is recorded.
[Basis: 2-1-128.4, 2-1-319, 2-1-320]

RECOMMENDATIONS

The Air District has reviewed the material contained in the permit application for the proposed project and has made a preliminary determination that the project is expected to comply with all applicable requirements of Air District, state, and federal air quality-related regulations. The preliminary recommendation is to issue an Authority to Construct/Permit to Operate for the equipment listed below. However, the proposed sources will be located within an Overburdened Community as defined in Air District Regulation 2-1-243. Per Air District Regulation 2-1-412, the project triggers a public notification requirement. After the comments are received and reviewed, the Air District will make a final determination on the permit.

I recommend that the Air District initiate a public notice and consider any comments received prior to taking any final action on the issuance of an Authority to Construct/Permit to Operate for the following sources:

- S1 Organic Waste Storage Pile-covered material storage consistent with CUP requirements
Green Waste Only
Maximum Operating Rate: 99.9 tons/day, 36,465 tons/year
Maximum Storage Time: 24 hours/pile**

- S2 Alkaline Reagents Storage Pile-covered material storage
Maximum Operating Rate: 45 tons/day, 1,051 tons/year**

- S3 Hydrogen Production System Abated by A1
Steam/CO2 Reformer Operation
Operation Time: 24 hours/day, 365 days/year**

- S4 Biogas Engine #1 Abated by A2, A3 and A4
Jenbacher Model JGS 420 B823
1,966 bhp, 8.06 MMbtu/hr
Operation Time: 24 hours/day, 365 days/year**

- S5 Biogas Engine #2 Abated by A2, A5 and A6
Jenbacher Model JGS 420 B823
1,966 bhp, 8.06 MMbtu/hr
Operation Time: 24 hours/day, 365 days/year**

- S6 Biogas Engine #3 Abated by A2, A7 and A8
Jenbacher Model JGS 420 B823
1,966 bhp, 8.06 MMbtu/hr
Operation Time: 24 hours/day, 365 days/year**

- S7 Emergency Standby Diesel Generator for a Fire Pump**

2022 Cummins Model QSB4.5
104 bhp, 0.81 MMBtu/hr
EPA Family NCEXL0275AAG
Operation Time for Maintenance and Testing: 32 hours/year

- S9 Biochar Collection System and Storage**
4.0 ton/day, 1,000 tons/year

- S10 Cooling Tower (exempt), three cell ; Make: TBD; Model: TBD**
Water Circulation Rate: 5,000 gallons/min maximum

- S11 Organic Waste Drying Operation**
Green Waste Only
Maximum Operating Rate: 20 tons/hour, 99.9 tons/day, 36,465 tons/year
Operation Time: 24 hours/day, 365 days/year

- A1 Back-up Flare for Hydrogen Plant**
Zink OAH Enclosed Flare
Maximum Operating Rate: 0.0144 MMbtu/hr, 24 hours/day, 100 hours/year

- A2 Landfill Gas Conditioning System**

- A3 Oxidation Catalytic System for S4**
Jenbacher Oxidation Catalyst System

- A4 Selective Catalytic Reduction System for S4**
Jenbacher SCR

- A5 Oxidation Catalytic System for S5**
Jenbacher Oxidation Catalyst System

- A6 Selective Catalytic Reduction System for S5**
Jenbacher SCR

- A7 Oxidation Catalytic System for S6**
Jenbacher Oxidation Catalyst System

- A8 Selective Catalytic Reduction System for S6**
Jenbacher SCR

**A9 Baghouse for S11
Sly Tubejet Model STJ-1616**

Loi Chau, Air Quality Engineer

Date

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ATTACHMENT A:
List of Acronyms and Abbreviations

<u>Acronym/Abbreviation</u>	<u>Definition</u>
acfm	Actual cubic feet per minute
AP-42	Environmental Protection Agency Compilation of Air Emission Factors from Stationary Sources
APCO	Air Pollution Control Officer
ATCM	Airborne Toxic Control Measure
BACT	Best Available Control Technology
bhp	brake horsepower
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CCEH	Contra Costa Environmental Health
CEDRI	Compliance and Emissions Data Reporting Interface
CEMS	continuous emission monitoring system
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfm	Cubic feet per minute
CH ₄	methane
CO	carbon monoxide
CO ₂	carbon dioxide
CUP	Conditional Use Permit
EPA	Environmental Protection Agency
Facility	Raven SR, Inc.
g	grams
g/bhp-hr	grams per brake horsepower per hour
gal	gallons
gr/dcsf	grains per dry standard cubic feet
H ₂ S	hydrogen sulfide
hp	horsepower
hr	hour
hr/day	hours per day
hr/yr	hours per year
HRA	health risk assessment
ICE	internal combustion engine
IS	Initial Study
kg/yr	kilogram per year
L	liters

<u>Acronym/Abbreviation</u>	<u>Definition</u>
lb	pound
lb/hr	pounds per hour
lb/yr	pounds per year
mg	milligram
min	minutes
MMBtu	million British Thermal Units
MND	Mitigated Negative Declaration
mph	miles per hour
NFPA	National Fire Protection Association
NMOC	non-methane organic compounds
NOx	nitrogen oxide
NPOC	non-precursor organic compound
O2	oxygen
PAH	polycyclic aromatic hydrocarbon
PCDD	polychlorinated dibenzo-p-dioxin
PM10	particulate matter with an aerodynamic diameter less than or equal to 10 microns
PM2.5	particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
POC	precursor organic compounds
ppm	parts per million
ppmv	parts per million by volume
ppmvd	parts per million by volume, dry basis
project	Sources associated with Application #31700
Raven	Raven SR, Inc.
scfm	Standard cubic feet per minute
SI	spark ignition
SJVAPCD	San Joaquin Valley Air Pollution Control District
SO2	sulfur dioxide
South Coast AQMD	South Coast Air Quality Management District
SWFP	Solid Waste Facility Permit
syngas	synthesis gas
TAC	toxic air contaminant
TBACT	Best Available Control Technology for Toxics
TDB	To be determined
tpy	tons per year
TSP	total suspended particulates
µg/m3	micrograms per cubic meter

<u>Acronym/Abbreviation</u>	<u>Definition</u>
ULSD	ultra low sulfur diesel
VMT	vehicle miles traveled
VOC	volatile organic compound
WCCSL	West Contra Costa County Sanitary Landfill

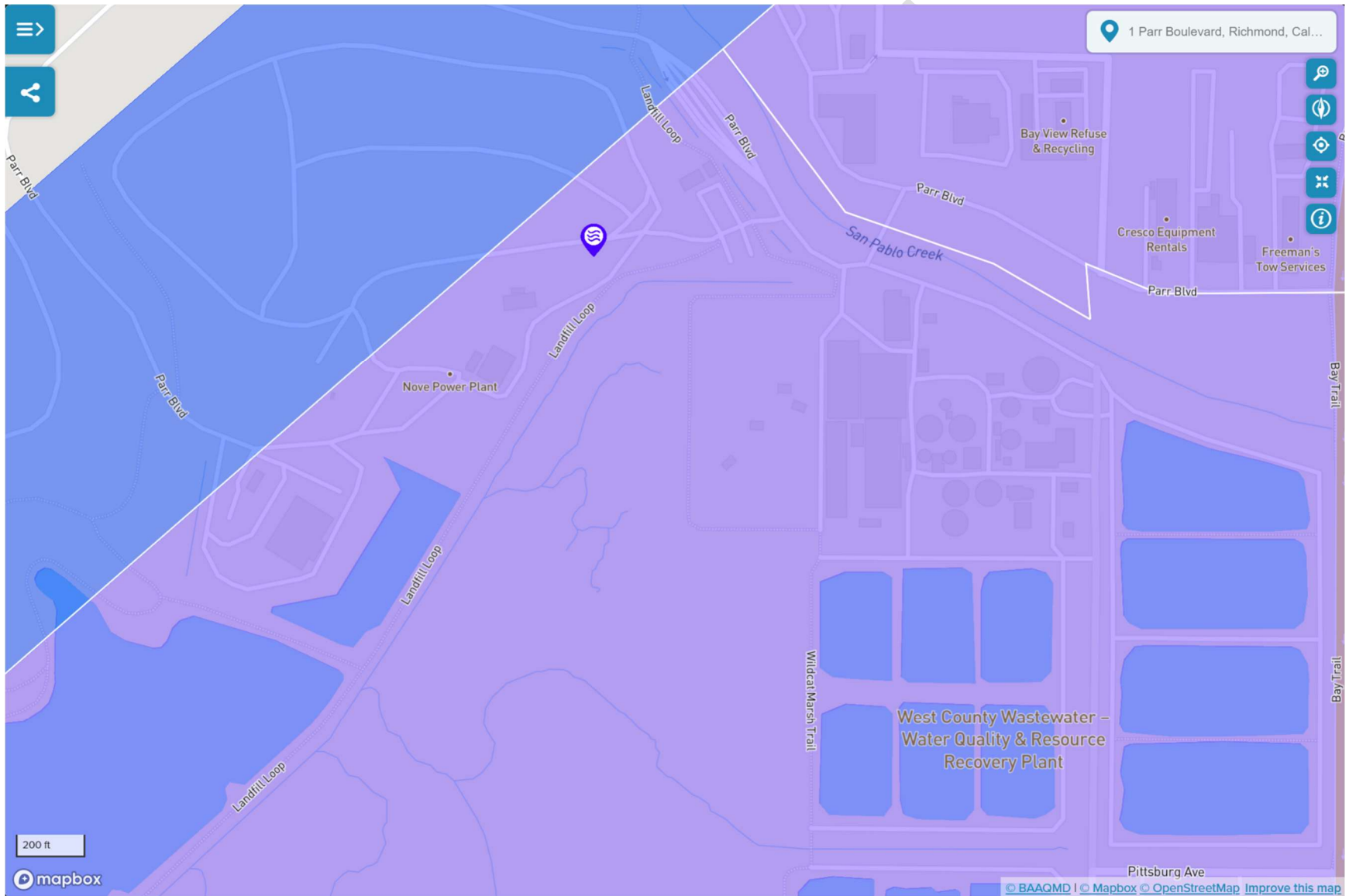
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ATTACHMENT B:
Distance to Nearest Public School and
Overlay of Overburdened Community
Map

Figure B-1: Distance to Nearest Public School – Verde Elementary School



Figure B-2: Overburden Community Map



ATTACHMENT C:
Emission Calculations

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