

DRAFT ENGINEERING EVALUATION
Thurgood Marshall Academic High School
Plant No. 24953
Application No: 31069

BACKGROUND

The Thurgood Marshall Academic High School is applying for an Authority to Construct an Emergency Standby Natural Gas Engine Generator.

S-1 Emergency Standby Generator Set: Natural Gas Engine Make: Generac; Model: SG080; 1.12 MMBtu; Model Year 2020; Rated Horsepower: 132 Hp ; equipped with an Integral Three-way Catalyst

The emergency standby Natural Gas engine generator, S-1, will be located at 45 Conklin Street, San Francisco, CA. The primary emissions from S-1 include Nitrogen Oxides (NOx), Carbon Monoxide (CO), Precursor Organic Compounds (POC) from combustion of natural gas. Toxic Air Contaminants (TAC) including Benzene, Formaldehyde, and Toluene are also emitted during combustion of natural gas. S-1 is equipped with an integral three-way catalyst.

EMISSION CALCULATIONS

Basis:

- 132 output rating
- Operating 50 hours per year
- Operating 24 hours maximum per day
- Maximum fuel usage of 1.12 MMBtu/hr.
- Natural Gas energy content of 1050 btu/scf was assumed.

ANNUAL EMISSIONS AND DAILY MAXIMUM EMISSIONS:

The NOx, CO, and POC emissions from the engine were calculated using emission factors provided by the manufacturer. The Particulate Matter (PM) and SO₂ emissions were calculated using emission factors from AP-42 Chapter 3.2 Natural Gas-Fired Reciprocating Engines, Table 3.2-3. The daily emissions were calculated assuming 24-hr/day of operation. The emissions from S-1 are summarized in Table 1.

Table (1) Annual and Daily Emissions for S-1

Pollutant	E.F.	E.F. Unit	Max daily Emissions (lbs/day)	Annual Emissions (lb/yr)	Annual Emission (TPY)
NOx	1.80E-01	g/bhp-hr	1.256	2.617	0.001
CO	1.60E-01	g/bhp-hr	1.116	2.326	0.001
POC	1.00E-02	g/bhp-hr	0.070	0.145	0.000
PM ₁₀	1.94E-02	lb/MMBtu	0.521	1.086	0.001
PM _{2.5}	1.94E-02	lb/MMBtu	0.521	1.086	0.001
SO ₂	5.88E-04	lb/MMBtu	0.016	0.033	0.000

**The emission factor for NOx POC, and CO were provided by the manufacturer. The emission factor for PM10 and SO2 are retrieved from Chapter-3, Table 3.2-3 of the EPA Document AP-42, Emission Factors for 4-Stroke Rich-Burn Engines. SO₂:5.88E-4 lb./MMBtu.*

**A breakdown of 1% and 99% for POC and NOx, respectively, assumed to be consistent with Table 3.2-3 of the EPA document AP-42.*

Plant Cumulative Increase:

Table 2 summarizes the cumulative increase in criteria pollutant emissions that result from the operation of S-1.

Table (2) Cumulative Increase

Pollutant	Existing Emissions (TPY)	New Increase (TPY)	TPY
NOx	0.000	0.001	0.001
CO	0.000	0.001	0.001
POC	0.000	0.000	0.000
PM10	0.000	0.001	0.001
PM2.5	0.000	0.001	0.001
SO2	0.000	0.000	0.000

TOXIC HEALTH RISK ASSESSMENT

The emission factors were retrieved from the California Air Toxics Emission Factors (CATEF) for Natural Gas-fired Rich Burn Engines <650 hp. The Toxic Air Contaminant (TAC) emissions estimates are based on uncontrolled emission factors for natural gas engines. Based on the calculations in Tables 3 below, no TACs exceed the District’s Risk Screening trigger levels set forth in Table 1 of Regulation 2-5 (New Source Review for Toxic Air Contaminants). Therefore, a Health Risk Assessment (HRA) is not required.

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Input Data

Engine, BHP	132
Fuel Consumption cf/hr	1063
Non-Emergency operation hours (hr/yr)	50
Higher Heating Value, Btu/cf	1050

Calculated Value

Fuel Usage MMBtu/hr	1.12
Fuel Usage MMBtu/yr	5.58E+01
Fuel Usage MMcf/hr	1.06E-03
Fuel Usage MMcf/yr	5.32E-02

Emission Estimates for a Lean Burn, 4 Stroke, Natural Gas Engine using CATEF Emission Factors

Abatement Efficiency (assumed)	50%
% Emitted	50%

CATEF Emission Factors for Rich Burn, 4 Stroke, Natural Gas Engines, < 650 HP

Compound	PEF for PAHs	E.F. [lb/MMcf]	Hourly	Acute	HRSA Triggered? [Y/N]	Annual	Chronic	HRSA Triggered? [Y/N]
			Abated Emissions [lb/hr] ¹	Trigger Level [lb/hr]		Abated Emissions [lb/yr]	Trigger Level [lb/yr]	
1,3-Butadiene		1.04E-01	5.53E-05	1.50E+00	No	2.76E-03	4.80E-01	No
Acetaldehyde		8.83E-01	4.69E-04	1.00E+00	No	2.35E-02	2.90E+01	No
Acrolein		5.47E-01	2.91E-04	5.50E-03	No	1.45E-02	1.40E+01	No
Benzene		7.39E-02	7.86E-05	6.00E-02	No	3.93E-03	2.90E+00	No
Ethylbenzene		1.16E-02	6.17E-06	None	No	3.08E-04	3.30E+01	No
Formaldehyde		4.99E-02	5.30E-05	1.20E-01	No	2.65E-03	1.40E+01	No
Naphthalene		7.65E-02	4.07E-05	None	No	2.03E-03	2.40E+00	No
PAH or derivatives		1.12E-05	5.98E-09	None	No	2.99E-07	3.30E-03	No
Benzo(a)anthracene	0.1	2.94E-04	1.56E-07	None	No	7.81E-06	None	No
Benzo(a)pyrene	1	1.15E-04	6.11E-08	None	No	3.06E-06	None	No
Benzo(b)fluoranthene	0.1	2.37E-04	1.26E-07	None	No	6.30E-06	None	No
Benzo(k)fluoranthene	0.1	1.03E-04	5.47E-08	None	No	2.74E-06	None	No
Chrysene	0.01	3.10E-04	1.65E-07	None	No	8.24E-06	None	No
Dibenz(a,h)anthracene	1.05	1.25E-05	6.64E-09	None	No	3.32E-07	None	No
Indeno(1,2,3-cd)pyrene	0.1	1.69E-04	8.98E-08	None	No	4.49E-06	None	No

PAH or derivative TOTAL		2.12E-04	1.12E-07	None	No	5.62E-06	3.30E-03	No
Propylene		1.60E+01	8.50E-03	None	No	4.25E-01	1.20E+05	No
Toluene		1.07E+00	5.69E-04	8.20E+01	No	2.84E-02	1.20E+04	No
Xylene		6.02E-02	3.20E-05	4.90E+01	No	1.60E-03	2.70E+04	No

PAH EF Derivation**

Compound	PEF for PAHs	E.F. [lb/MMcf]	(E.F)(PEF)
Benzo(a)anthracene	0.1	2.94E-04	1.56E-06
Benzo(a)pyrene	1	1.15E-04	6.11E-06
Benzo(b)fluoranthene	0.1	2.37E-04	1.26E-06
Benzo(k)fluoranthene	0.1	1.03E-04	5.47E-07
Chrysene	0.01	3.10E-04	1.65E-07
Dibenz(a,h)anthracene	1.05	1.25E-05	6.98E-07
Indeno(1,2,3-cd)pyrene	0.1	1.69E-04	8.98E-07
		PAH E.F	1.12E-05

***These substances are PAH-derivatives that have OEHHA-developed Potency Equivalency Factors (PEFs). PAHs should be evaluated as benzo(a)pyrene-equivalents. This evaluation process consists of multiplying individual PAH-specific emission levels with their corresponding PEFs listed below. The sum of these products is the benzo(a)pyrene-equivalent level and should be compared to the benzo(a)pyrene equivalent trigger level. (Source 2-5, Table 2-5-1, Footnote #8)*

BEST AVAILABLE CONTROL TECHNOLOGY (BACT):

In accordance with Regulation 2, Rule 2, Section 301, BACT is triggered for any new or modified source with the potential to emit 10 pounds or more per highest day of POC, NPOC, NO_x, CO, SO₂ or PM₁₀, or PM_{2.5}. Based on the emission calculations in Table 1 the engine will not emit more than 10 lb./day of any of these pollutants, and is not subject to BACT.

STATEMENT OF COMPLIANCE

The owner/operator of S-1 shall comply with Regulation 6-1 (Particulate Matter and Visible Emissions Standards), Regulation 9-1-301 (Inorganic Gaseous Pollutants: Sulfur Dioxide for Limitations on Ground Level Concentrations), and Regulation 9-8 (Nitrogen Oxides and Carbon Monoxide from Stationary ICE)

The owner/operator is expected to comply with Regulation 6-1 since the unit is fueled with Natural Gas. Thus, for any period aggregating more than three minutes in any hour, there should be no visible emission as dark or darker than No.1 on the Ringlemann Chart (Regulation 6-1-301) and no visible emission to exceed 20% opacity (Regulation 6-1-302).

Based on Regulation 9-8-110.5 (Exemptions for Emergency Standby Engines), S-1 is exempt from the requirements of Regulation 9-8-301 (Emission Limits on Fossil Derived Fuel Gas), 9-8-302 (Emission Limits on Waste Derived Fuel Gas), 9-8-303 (Emission Limits – Delayed Compliance, Existing Spark-Ignited Engines, 51 to 250 bhp or Model Year 1996 or Later), 9-8-304 (Emission Limits – Compression-Ignited Engines), 9-8-305 (Emission Limits – Delayed Compliance, Existing Compression-Ignited Engines, Model Year 1996 or Later), 9-8-501 (Initial Demonstration of Compliance) and 9-8-503 (Quarterly Demonstration of Compliance). However, S-1 is subject to the monitoring and record keeping requirements of Regulation 9-8-530 (Emergency Standby Engines, Monitoring and Recordkeeping). The requirements of this Regulation are included in the permit conditions below.

S-1 is also subject to and expected to comply with Regulation 9-8-330 (Emergency Standby Engines, Hours of Operation) since non-emergency hours of operation will be limited in the permit conditions to 50 hours per year.

California Environmental Quality Act (CEQA):

This application is considered ministerial under the District's proposed CEQA guidelines (Regulation 2-1-312) and therefore is not subject to CEQA review.

OFFSETS

Offsets must be provided for any new or modified source at a facility that emits more than 10 tons/yr. of POC or NO_x. Based on the emission calculations in Table 1, offsets are not required for this application per Regulation 2-2-302 (Offset Requirements, Precursor Organic Compounds and Nitrogen Oxides).

The New Source Performance Standard (NSPS) in 40 CFR 60, Subpart JJJJ does apply. The engine will comply with the following limits in Table 1 for emergency spark-ignited engines over 130 hp:

NO_x: 2.0 g/hp-hr
CO: 4.0 g/hp-hr
VOC: 1.0 g/hp-hr

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANT (NESHAP):

S-1 is subject to the Reciprocating Internal Combustion Engine (RICE) NESHAP (40 CFR Part 63.6590(c)(1), because S-1 is located at an area source of HAP emissions. A new RICE at an area source that is subject to and in compliance with the Part 60 Subpart JJJJ NSPS requirements has no further requirements under Subpart ZZZZ pursuant to 40 CFR Part 63.6590(c).

PREVENTION OF SIGNIFICANT DETERIORATION (PSD): does not apply.

PUBLIC NOTIFICATION

The project is within 1,000 feet of Thurgood Marshall Academic High School and therefore is subject to the public notification requirements of Regulation 2-1-412.

PERMIT CONDITIONS

Conditions for S-1 Emergency Standby Natural Gas Engine Generator Set, at Plant 24953:

COND# 27196

1. The owner or operator shall operate the stationary emergency standby engine only to mitigate emergency conditions or for reliability-related activities (maintenance and testing). Operating while mitigating emergency conditions and while emission testing to show compliance with this part is unlimited. Operating for reliability-related activities is limited to 50 hours per year.

(Basis: Emergency Standby Engines, Hours of Operation Regulation 9-8-330)

2. The Owner/Operator shall equip the emergency standby engine(s) with: a non-resettable totalizing meter that measures hours of operation or fuel usage.

(Basis: Emergency Standby Engines, Monitoring and Record keeping 9-8-530)

3. **The Owner/Operator shall not operate unless the natural gas fired engine is equipped with a Catalytic Converter/Silencer Unit**

(Basis: Cumulative Increase)

4. Records: The Owner/Operator shall maintain the following monthly records in a District-approved log for at least 24 months from the date of entry. 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 (maintenance and testing).
 - b. Hours of operation for emission testing.
 - c. Hours of operation (emergency).
 - d. For each emergency, the nature of the emergency condition.
 - e. Fuel usage or operating hours for engine.

(Basis: Emergency Standby Engines, Monitoring and Recordkeeping 9-8-530)

RECOMMENDATION

The 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 District, state and federal air quality-related regulations. The preliminary recommendation is to issue an Authority to Construct for the equipment listed below. However, the proposed source will be located within 1000 feet of a school which triggers the public notification requirements of District Regulation 2-1-412. After the comments are received and reviewed, the District will make a final determination on the permit.

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

S-1 Emergency Standby Generator Set: Natural Gas Engine Make: Generac; Model: SG080; 1.12 MMBtu; Model Year 2020; Rated Horsepower: 132 Hp ; equipped with an Integral Three-way Catalyst

EXEMPTIONS

None.

By: _____

Date: 06/09/2021

Sheryl Wallace
Senior Air Quality Technician