

ENGINEERING EVALUATION
131 Steuart St Foundation
Plant: 20620
Application: 23054

131 Steuart St, San Francisco, CA 94105

BACKGROUND

131 Steuart St Foundation has applied to obtain an Authority to Construct (AC) for the following equipment:

S-1 Emergency Standby Fire Pump Engine
John Deere, Model Year: 2010, Model: JUAH-UFAD5G
101BHP, 1.11 MMBTU/hr

The Emergency Diesel Fire Pump (S-1) is equipped with the best available control technology (BACT) for minimizing the release of air borne criteria pollutants and harmful air toxins due to fuel combustion. The criteria pollutants are nitrogen oxides (NO_x), carbon monoxide (CO), precursor organic compounds (POC) from unburned diesel fuel, sulfur dioxide (SO₂) and particulate matter (PM₁₀). POC is also denoted as NMHC non-methane hydrocarbon. All of these pollutants are briefly discussed on the District's web site at www.baaqmd.gov.

The engine meets the Environmental Protection Agency and California Air Resources Board (EPA/CARB) Tier 3 Off-road standard. The engine will burn commercially available California low sulfur diesel fuel. The sulfur content of the diesel fuel will not exceed 0.0015% by weight.

EMISSIONS

Basis (per engine):

101 hp output rating

50 hr/yr operation for testing and maintenance

8.1 gallons/hr max fuel use rate

NMHC + NO_x, CO and PM₁₀ emission factors provided by John Deere Power Systems for the Fire Pump Driver (Model JUAH-UFAD5G)

POC is assumed to be 5% of NMHC + NO_x

NO_x is assumed to be 95% of NMHC + NO_x

SO₂ emissions are quantified based on the full conversion of 0.0015 wt% (~ 15 ppm) sulfur in the ULS diesel fuel.

The SO₂ emission factor was derived from EPA AP-42, Table 3.4-1.

Annual Emissions:

Annual emissions are calculated based on the number of hours per year of operation for testing and maintenance.

Daily Emissions:

Daily emissions are calculated to establish whether a source triggers the requirement for BACT (10 lb/highest day total source emissions for any class of pollutants). 24-hr/day of operation will be assumed since no daily limits are imposed on intermittent and unexpected operations.

Table 1

Pollutant	Emission Factor (g/kw-hr)	Emission Factor (g/hp-hr)	Annual Emissions (lb/yr)	Annual Emissions (TPY)	Max. Daily (lb/day)
NMHC+NO _x	3.9	2.91			
NO _x	3.71	2.76	30.74	0.0154	14.76
POC	0.20	0.15	1.62	0.0008	0.78
CO	0.7	0.52	5.81	0.0029	2.79
PM ₁₀	0.15	0.112	1.24	0.0006	0.60
SO ₂		0.001515	0.08	0.00004	0.04
		*lb SO ₂ /MMBTU			

PLANT CUMULATIVE INCREASE

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

Table 2

Pollutant	Current Emissions (since April 5, 1991) (TPY)	Increase with this application (TPY)	Cumulative Emissions (Current + Increase) (TPY)
NO _x	0.000	0.017	0.017
POC	0.000	0.001	0.001
CO	0.000	0.003	0.003
PM ₁₀	0.000	0.001	0.001
SO ₂	0.000	0.000	0.000

TOXIC RISK SCREENING ANALYSIS

This application required a Toxics Risk Screen because the diesel particulate emissions are greater than the toxic trigger level.

<u>Toxic Pollutant Emitted</u>	<u>Emission Rate (lb/yr)</u>	<u>Risk Screening Trigger (lb/yr)</u>
PM ₁₀ (Diesel Particulate)	1.24	0.34

S-1 meets Best Available Control Technology for toxics (TBACT) since the diesel particulate emissions are less than 0.15 g/bhp-hr. For an engine that meets the TBACT requirement, it must also pass the toxic risk screening level of less than ten in a million. Estimates of residential risk assume exposure to annual average toxic air contaminant concentrations occur 24 hours per day, 350 days per year, for a 70-year lifetime. Risk estimates for offsite workers assume exposure occurs 8 hours per day, 245 days per year, for 40 years. Risk estimates for students assume a higher breathing rate, and exposure is assumed to occur 10 hours per day, 36 weeks per year, for 9 years.

Based on 50 hours per year of engine operation, the emergency generator passed the Health Risk Screening Analysis (HRA) conducted on March 29th, 2011 by the District's Toxic Evaluation Section. The sources pose no significant toxic risk, since the increased cancer risk to the maximally exposed receptor (resident) is 1.7 in a million with a hazard index for of 0.0006. The increased cancer risk to workers is 0.8 in a million with a hazard index of 0.0006. The risk cancer risk for students attending Youth Chance High School at 169 Steuart Street and Marin Day School at 220 Spear Street is 0.2 in a million with a hazard index of 0.0002. The source is not located near students. In accordance with the District's Regulation 2, Rule 5, this risk level is considered acceptable, as it has been determined that the engine meets the current TBACT standards.

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.

Based on the emission calculations above, the owner/operator of S-1 is subject to BACT for the following pollutants: NO_x. The BACT/TBACT Workbook does not address direct-drive emergency standby fire pump engines. A search of the CARB BACT Clearinghouse, EPA Clearinghouse, and SCAQMD for emergency standby fire pump engines with a rated power between 100-175 bhp, yielded a NO_x BACT determination by SCAQMD of 3.0g/bhp-hr. The CARB Stationary Diesel ATCM Section 93115.6(a)(4) requires new direct-drive emergency standby fire pump engines to meet Tier 2 off-road emission standards until 3 years after Tier 3 standards are applicable. In this case, for engines between 100 and 175 bhp, Tier 3 standards for fire pumps will be applicable on January 1, 2010. NSPS Subpart III Table 4 contains emission standards for Stationary Fire Pump Engines and is more lenient than the CARB Stationary Diesel ATCM for pre-Tier 3 engines; however, the effective dates for Tier 3 standards are the same for NSPS and CARB. Since CARB Stationary Diesel ATCM requirements are stricter than current BACT determinations and applicable NSPS, it is proposed that BACT for direct-drive emergency standby fire pump engines be compliance with the CARB Stationary Diesel ATCM. This engine complies with the proposed BACT since it is certified to Tier 3 emission standards.

OFFSETS

Table 3 summarizes the increase in criteria pollutant emissions that will result from the operation of S-1.

Table 3

Pollutant	Current plant emissions (TPY)	Increase in plant emissions associated with this application (TPY)	Cumulative emissions (Current + Increase) (TPY)	Regulation 2-2-302 and 2-2-303 Offset Triggers (TPY)
NOx	0.000	0.017	0.017	> 10; < 35
POC	0.000	0.001	0.001	> 10; < 35
CO	0.000	0.003	0.003	NA
PM10	0.000	0.001	0.001	> 1*
SO2	0.000	0.000	0.000	> 1*

*Applies to major facilities with a cumulative increase, minus contemporaneous emission reduction credits, in excess of 1 ton/year since April 5, 1991.

It can be seen from Table 3 above that S-1 does not trigger any offset. Therefore, offsets are not warranted for any emission.

NSPS

40 CFR 60, Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines applies to stationary fire pump engines that were manufactured as a certified National Fire Protection Association (NFPA) fire pump engine after July 1, 2006.

Table 3 to Subpart IIII of Part 60—Certification of stationary fire pump engines is required for engines greater than 750 hp beginning in 2008, engines between 175 and 750 (inclusive) beginning in 2009, engines = 100hp and less than 175 hp beginning in 2010, and engines less than 100 hp beginning in 2011. Per 60.4202(d), owners and operators of fire pump engines with a displacement of less than 30 liters per cylinder must comply with the emission standards in Table 4 to Subpart IIII of Part 60, for all pollutants.

Owner or operator of a CI fire pump engine that is manufactured prior to the model years in Table 3 to Subpart IIII of Part 60 (explained in the paragraph above) must comply with the emission standards specified in §60.4205(c) and demonstrate compliance according to one of the methods specified in paragraphs (1) through (5) below:

- (1) Purchasing an engine certified according to 40 CFR part 89 or 40 CFR part 94, as applicable, for the same model year and maximum engine power. The engine must be installed and configured according to the manufacturer's specifications.
- (2) Keeping records of performance test results for each pollutant for a test conducted on a similar engine. The test must have been conducted using the same methods specified in this subpart and these methods must have been followed correctly.
- (3) Keeping records of engine manufacturer data indicating compliance with the standards.
- (4) Keeping records of control device vendor data indicating compliance with the standards.
- (5) Conducting an initial performance test to demonstrate compliance with the emission standards according to the requirements specified in §60.4212, as applicable.

The owner or operator of a CI fire pump engine that is manufactured during or after the model year that applies to their fire pump engine power rating in Table 3 to Subpart IIII of Part 60 must comply with the emission standards specified in §60.4205(c) and must comply by purchasing an engine certified to the emission standards in §60.4205(c) for the same model year and maximum (or in the case of fire pumps, NFPA nameplate) engine power. The engine must be installed and configured according to the manufacturer's specifications.

This is engine is model year 2010 and between 100 and 175 hp. It complies with Tier 3 emission standards and therefore complies with option (1) above and is compliant with NSPS requirements.

Table 4 to Subpart III of Part 60—Emission Standards for Stationary Fire Pump Engines

Maximum engine power	Model year(s)	NMHC + NO _x g/kW-hr (g/bhp-hr)	CO	PM
KW<8 (HP<11)	2010 and earlier	10.5 (7.8)	8.0 (6.0)	1.0 (0.75)
	2011+	7.5 (5.6)		0.40 (0.30)
8=KW<19 (11=HP<25)	2010 and earlier	9.5 (7.1)	6.6 (4.9)	0.80 (0.60)
	2011+	7.5 (5.6)		0.40 (0.30)
19=KW<37 (25=HP<50)	2010 and earlier	9.5 (7.1)	5.5 (4.1)	0.80 (0.60)
	2011+	7.5 (5.6)		0.30 (0.22)
37=KW<56 (50=HP<75)	2010 and earlier	10.5 (7.8)	5.0 (3.7)	0.80 (0.60)
	2011+ ¹	4.7 (3.5)		0.40 (0.30)
56=KW<75 (75=HP<100)	2010 and earlier	10.5 (7.8)	5.0 (3.7)	0.80 (0.60)
	2011+ ¹	4.7 (3.5)		0.40 (0.30)
75=KW<130 (100=HP<175)	2009 and earlier	10.5 (7.8)	5.0 (3.7)	0.80 (0.60)
	2010+ ²	4.0 (3.0)		0.30 (0.22)
130=KW<225 (175=HP<300)	2008 and earlier	10.5 (7.8)	3.5 (2.6)	0.54 (0.40)
	2009+ ³	4.0 (3.0)		0.20 (0.15)
225=KW<450 (300=HP<600)	2008 and earlier	10.5 (7.8)	3.5 (2.6)	0.54 (0.40)
	2009+ ³	4.0 (3.0)		0.20 (0.15)
450=KW=560 (600=HP=750)	2008 and earlier	10.5 (7.8)	3.5 (2.6)	0.54 (0.40)
	2009+	4.0 (3.0)		0.20 (0.15)
KW>560 (HP>750)	2007 and earlier	10.5 (7.8)	3.5 (2.6)	0.54 (0.40)
	2008+	6.4 (4.8)		0.20 (0.15)

1)For model years 2011–2013, manufacturers, owners and operators of fire pump stationary CI ICE in this engine power category with a rated speed of greater than 2,650 revolutions per minute (rpm) may comply with the emission limitations for 2010 model year engines.

2)For model years 2010–2012, manufacturers, owners and operators of fire pump stationary CI ICE in this engine power category with a rated speed of greater than 2,650 rpm may comply with the emission limitations for 2009 model year engines.

3)In model years 2009–2011, manufacturers of fire pump stationary CI ICE in this engine power category with a rated speed of greater than 2,650 rpm may comply with the emission limitations for 2008 model year engines.

NESHAP

This engine is not subject to the emission or operating limitations in 40 CFR 63, Subpart ZZZZ, National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines, because it is an emergency stationary reciprocating internal combustion engine (40 CFR 63.6600(c)).

CARB STATIONARY DIESEL ENGINE ATCM

The State Office of Administrative Law approved the Airborne Toxic Control Measure (ATCM) on November 8, 2004. State law requires the local Air Districts to implement and enforce the requirements of the ATCM. Effective January 1, 2005, there is a prohibition on the operation of new diesel emergency standby engines greater than 50 bhp unless the following operating requirements and emission standards are met:

The CARB Stationary Diesel ATCM Section 93115.6(a)(4) requires new direct-drive emergency standby fire pump engines to meet Tier 2 off-road emission standards until 3 years after Tier 3 standards are applicable to off-road engines. Tier 3 standards are applicable for fire pump engines until 3 years after Tier 4 standards are applicable to off-road engines.

The emergency standby diesel engine (S-1) is in compliance with the above ATCM requirements. The diesel engine will operate for no more than 50 hours per year for maintenance and reliability testing. The engine is subject to the Tier 3 off-road CI engine standards for PM, HC, NOx, NMHC+NOx and CO. As shown in the Table 4, the engine meets these requirements.

Table 4. ATCM Tier 3 Compliance

	CARB Certified g/bhp-hr	ATCM Tier 3 g/bhp-hr
NMHC+NOx	2.91	3.0
NOx	N/A	N/A
NMHC (POC)	N/A	N/A
CO	0.52	3.7
PM	0.112	0.22

STATEMENT OF COMPLIANCE

S-1 will be operated as an emergency standby engine and therefore is not subject to the emission rate limits in Regulation 9, Rule 8 ("NOx and CO from Stationary Internal Combustion Engines"). S-1 is exempt from the requirements of Sections 9-8-301 through 305, 501 and 503 per Reg. 9-8-110.5 (Emergency Standby Engines). S-1 is subject to and expected to comply with 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**. S-1 is also subject to and expected to comply with monitoring and record keeping requirements of Regulation 9-8-530 and the SO2 limitations of 9-1-301 (ground-level concentration) and 9-1-304 (0.5% by weight in fuel). Regulation 9-8-530 requirements are incorporated into the proposed permit conditions. Compliance with Regulation 9, Rule 1 is very likely since diesel fuel with a 0.0015% by weight sulfur is mandated for use in California. Like all combustion sources, S-1 is subject to Regulation 6, Rule 1 ("Particulate Matter"). Regulation 6-1-303.1 limits opacity from internal combustion engines to Ringelmann 2. This engine is not expected to produce visible emissions or fallout in violation of this regulation and will be assumed to be in compliance with Regulation 6-1.

This application is considered to be ministerial under the District's Regulation 2-1-311 and therefore is not subject to CEQA review. The engineering review for this project requires only the application of standard permit conditions and standard emission factors in accordance with Permit Handbook Chapter 2.3.

This facility is within 1,000 feet from the nearest school and therefore is subject to the public notification requirements of Regulation 2-1-412.

Public Notice will be prepared and sent to all residents, business, the students and parents within 1000ft of the following schools:

Marin Day School
220 Spear Street
San Francisco, CA 94105

Youth Chance High School
169 Steuart Street
San Francisco, CA 94105

PSD is not triggered.

PERMIT CONDITIONS

CONDITION 22850

1. Operating for reliability-related activities is limited to 50 hours per year per engine.
[Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(2)(A)(3) or (e)(2)(B)(3)]
2. 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 hours while mitigating emergency conditions or while emission testing to show compliance with District, state or Federal emission limits is not limited.
[Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(2)(A)(3) or (e)(2)(B)(3)]
3. 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: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(4)(G)(1)]
4. 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: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(4)(I), (or Regulation 2-6-501)]
5. 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: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(2)(A)(1)] or (e)(2)(B)(2)]

RECOMMENDATION

Issue an Authority to Construct to **131 Steuart St Foundation** for:

S-1 Emergency Standby Fire Pump Engine
John Deere, Model Year: 2010, Model: JUAH-UFAD5G
101BHP, 1.11 MMBTU/hr

Yu Zhang Liu
Air Quality Engineer Intern
Engineering Division