

**DRAFT Engineering Evaluation  
Pacific Bell – Fairfield Data Center  
2525 North Watney Way  
Fairfield, CA 94533  
Plant No. 7519  
Application No. 31981 (OBC)**

**Project Description: New Emergency Backup IC Engine Generator to Replace the Existing S-5**

**BACKGROUND**

Montrose Environmental Solutions, on behalf of Pacific Bell, is requesting an Authority to Construct (ATC) and Permit to Operate (PTO) for the following equipment:

**S-12            Emergency Standby Engine-Generator Set: Diesel Engine, Make Caterpillar, Model 3516C, Family Name NCPXL78.1NZZ, Model Year 2022, Rated 2,937 BHP**

Abated by

**A-12            DPF+SCR (Combination <sup>1</sup>), Jonson Matthey, Model SCRT 16/16S8X8-2+1-BIEO-D14/26**

The stationary emergency diesel engine-generator sets will be located at Pacific Bell Fairfield Data Center, 2525 North Watney Way, Fairfield, CA 94533. This engine, will replace S-5, providing support to facility operations during emergencies as defined by Regulation 9-8-231. The engine will be able to operate unrestricted during emergency use events. However, the engines’ annual maintenance and testing hours will be limited in accordance with the California Air Resources Board (CARB) “*Air Toxic Control Measure for Stationary Compression Ignition Engines*” (ATCM) and District regulation 9-8-330.3.

The applicant has submitted supporting documents, which includes manufacturer specifications. Table 1 provides a summary of the information provided by the applicant.

<b>Table 1. Engine Specifications and Certified Emission Factors for S-12</b>			
<b>Engine Manufacturer</b>	Caterpillar		
<b>Model</b>	3516C		
<b>Model Year</b>	2022		
<b>Family Name</b>	NCPXL78.1NZZ		
<b>Engine Power Rating, hp (kW)</b>	2,937 (2,190)		
<b>Fuel Consumption, gal/hr</b>	138		
<b>Displacement, L (cu. in.)</b>	69 (4,210.64)		
<b>Abatement</b>	<b>Before <sup>1</sup></b>	<b>After <sup>2</sup></b>	<b>Abatement Efficiency, Calculated, %</b>
	g/bhp-hr	g/bhp-hr	
<b>Non-Methane Hydrocarbons (NMHC)</b>	0.23	0.14	
<b>NO<sub>x</sub></b>	4.57	0.50	87
<b>CO</b>	2.60	2.60	
<b>PM</b>	0.15	0.01	89
<b>Ammonia Slip (NH<sub>3</sub>)</b>		<b>10 ppmvd@15% O<sub>2</sub> <sup>3</sup></b>	

<sup>1</sup> The JM control system is comprised of an oxidation catalyst, SCR and DPF combination system, in order to comply with applicable BAAQMD BACT requirements (i.e., compliance with Tier 4 Final non-road compression-ignition engine emission standards).

<sup>1</sup> EPA Emission Tier 2

<sup>2</sup> EPA Emission Tier 4 except for PM which is a vendor-guaranteed emission rate and lower than the Tier 4 PM standard.

<sup>3</sup> Measurement unit for ammonia

### EMISSION CALCULATIONS

The criteria pollutants associated with the source are nitrogen oxide (NO<sub>x</sub>), carbon monoxide (CO), precursor organic compounds (POC), sulfur dioxide (SO<sub>2</sub>), and particulate matter (PM).

The proposed engine meets the Environmental Protection Agency (EPA) Tier 2 Interim emission standards, further equipped with the following abatement devices to achieve Tier 4 emissions standards: a catalyzed diesel particulate filter (DPF/C) and a selective catalytic reduction (SCR) system.

The engine will burn commercially available CARB ultra-low sulfur diesel fuel. The sulfur content of the diesel fuel shall not exceed 0.0015% by weight.

Table 2. New Source, S-12, Permitted Emissions Review						
Pollutant	Emission Rate (g/bhp-hr)	Daily Operating Hours <sup>1</sup> (hr/day)	Daily Emissions (lb/day)	Annual Operation <sup>2</sup> (hr/yr)	Annual Emissions (lb/yr)	Annual Emissions (ton/yr)
POC <sup>3</sup>	0.14	24	21.756	50	45.324	0.023
NO <sub>x</sub>	0.50	24	77.698	50	161.872	0.081
CO	2.60	24	404.032	50	841.733	0.421
PM <sup>4</sup>	0.01	24	1.554	50	3.237	0.002
SO <sub>2</sub>	0.0055	24	0.855	50	1.782	0.001

<sup>1</sup>Maximum daily operation is assumed to be 24 hours.

<sup>2</sup>Maximum annual operation is assumed to be 50 hours, per Regulation 9-8-330. Maximum annual operation will only include reliability-related activities as defined in Regulation 9-8-232.

<sup>3</sup>NMHC is assumed to be in the form of POC.

<sup>4</sup>PM is assumed to be in the form of particulate matter with a diameter of less than 10 μm (PM<sub>10</sub>).

<sup>5</sup>SO<sub>2</sub> emissions are based upon the Permit Handbook. The Permit Handbook suggests the use of EPA AP-42, Table 3.4-1. Assuming a sulfur content of 0.0015% (15 ppm), pursuant to the fuel requirements of CARB, the emission factor will be calculated as follows:

$$\text{SO}_2: 8.09\text{E-}3 \times (\% \text{ S in the fuel}) \times 5 = 8.09\text{E-}3 \times (0.0015) \times (453.6 \text{ g/lb}) = 0.0055 \text{ g/hp-hr}$$

### Plant Permitted Emissions Increase

The District tracks cumulative increase in emission from each facility. Table 4 summarizes the cumulative increase in criteria pollutant emissions that will result from this application assuming sources S-9, S-10, and S-11 will operate 32 hours/year (reduced from 41/42), and S-12 will operate 50 hours/year, for reliability-related testing.

Table 3. Facility Permitted Emissions Increase Review				
Pollutant	Existing <sup>1</sup> (ton/yr)	Existing <sup>2</sup> (tons/yr)	New <sup>3</sup> (ton/yr)	Total (ton/yr)
POC	0.076	0.065	0.023	0.088
NO <sub>x</sub>	1.697	1.424	0.081	1.505
CO	0.287	0.248	0.421	0.669
PM	0.071	0.058	0.002	0.060

SO <sub>2</sub>	0.003	0.002	0.001	0.003
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<sup>1</sup> Based on current 41/42 hours for maintenance, for S-9, S-10, and S-11.

<sup>2</sup> Based on current 32 hours for maintenance, for S-9, S-10, and S-11.

<sup>3</sup> Based on 50 hours for maintenance for S-12.

### Facility-Wide Potential to Emit

In accordance with the Air District Policy<sup>2</sup>, the standard potential to emit for emergency engines is based on 150 hr/yr operation (50 hr/yr non-emergency, plus 100 hr/yr emergency purposes).

The assumption of 100 hours per year of emergency operation is used to determine the applicability of certain District permitting regulations, such as New Source Review and Title V Major Facility Review. The District Policy is not used to determine the quantity of emission offsets required for a project that triggers New Source Review or for PSD. It is also not applicable for purposes of the Toxics New Source Review requirements of District Reg. 2-5 (per Regulation 2-5-111).

Potential to emit for the emergency engines of the related applications #28693 (sources S-9 and S-10) and #29828 (source S-11) is based on 132 hr/yr/engine operation (32 hr/yr non-emergency<sup>3</sup> plus 100 hr/yr emergency operations). Potential to emit the new engine S-12 however is based on 150 hr/yr operation (50 hr/yr non-emergency plus 100 hr/yr emergency operations). This facility has four more diesel engines S-1, S-2, S-4, S-5 which are permitted under Application #8482 but their emissions are not included in the permitted emissions. S-5 will be replaced by the new engine S-12. PTE emissions from engines S-1, S-2, and S-4, based on 120 hours for combined maintenance and emergency operations are also included in the potential to emit calculations. More details in Appendix A.

Table 4, below, shows the calculated facility-wide potential to emit based on District Policy.

<b>Table 4. Facility-Wide Potential to Emit Review for Offset</b>						
<b>Pollutant</b>	<b>Existing<sup>1</sup> (ton/yr)</b>	<b>Existing<sup>2</sup> (ton/yr)</b>	<b>New<sup>3</sup> (ton/yr)</b>	<b>Total (ton/yr)</b>	<b>Offset Limit (ton/yr)</b>	<b>Triggers? (Y/N)</b>
POC	0.290	0.321	0.069	0.680	> 35	N
NO <sub>x</sub>	5.349	6.264	0.243	11.856	> 35	N
CO	2.263	1.186	1.263	4.712	N/A	N/A
PM <sub>10</sub> /PM <sub>2.5</sub>	0.288	0.225	0.006	0.519	> 100	N
SO <sub>2</sub>	3.329	0.010	0.003	3.341	> 100	N

<sup>1</sup> PTE emissions from engines S-1, S-2, and S-4, based on 120 hours for combined maintenance and emergency operations.

<sup>2</sup> PTE emissions for 132 hours for combined maintenance and emergency operations for engines S-9 through S-11 and 150 hours for engine S-8.

<sup>3</sup> For the new engine S-12, based on 150 hours for maintenance and emergency operations.

### Grain Loading Rate

The grain loading rate calculation is required for determining the compliance of this application with BAAQMD Regulation 6, Rule 1 (refer to “Statement of Compliance” section, below).

$$[0.065 \text{ lb PM/hr} \times 7000 \text{ grain/lb}] / [60 \text{ min/hr} \times 6,687 \text{ DSCFM}] = 0.001 \text{ grain/dscf}$$

<sup>2</sup> BAAQMD Policy: Calculating Potential to Emit for Emergency Backup Power Generators. Approval date June 3, 2019. (Referred to as “District Policy” in this engineering evaluation).

<sup>3</sup> This project’s compliance with Regulation 2-5-302 project cancer risk limit of 6.0 in a million is contingent upon the facility accepting reduced operating limits for S-9, S-10, and S-11 of 32 hours/year each for reliability related testing. Plant has accepted this condition.

Assumptions:

- 0.065 lb PM/hr
- 7000 grain/lb standard conversion factor (AP-42 Appendix A, Page A-19)
- Per Form ICE, exhaust flow is ACFM = 15,292.8 cfm at T = 752.1°F dry. This is equivalent to 6,687 DSCFM.

$$DSCFM = ACFM \times [(460^\circ R + 70^\circ F) / (460^\circ R + \text{temp})] \times (\text{Actual P}/14.7 \text{ psi}) \times (1 - Bwo)$$

Where: Actual P = 14.7 psi, Bwo = 0% (fraction of water vapor)

**Toxic Air Contaminant Emissions**

Ammonia being a TAC, ammonia slip emissions from S-12 was estimated per information provided by the SCR vendor by assuming an ammonia slip of 10 ppmvd@15% O<sub>2</sub>.

$$\text{Hourly Emission (lb/hr)} = \text{Concentration} \times Q_{ds} \times (\text{Molar Volume}) \times (\text{Molecular Weight}) \times (60 \text{ min/hr})$$

Parameter	Value	Unit	Basis
Molar Volume, P/(RT) =	0.002584888	lb-mol/scf	
P =	14.7	psia	Standard atmospheric pressure
T =	70	degree F	Standard Temperature
R =	10.73	scf × psia/lb-mol × R	Ideal gas constant
Report Exhaust Flow Rate =	15,292.8	acfm	From Vendor Specification at 100% load
Exhausting Exhaust Temperature =	752.1	deg. F	From Vendor Specification at 100% load
Correspond Exhaust % water =	8	%	<b>Design (assumed): Specs (page 35)</b>
Q <sub>ds</sub> , Exhaust Flow Rate =	6152	dscfm	Corrected to dry basis and standard temperature
Corresponding Exhaust % O <sub>2</sub> =	9.6	%	<b>Design (assumed): Specs (page 35)</b>
Annual Operating Hours:	50	Hours/Year	Permit limit
Number of Engines:	1		

Table 5 summarizes TAC emissions for the project.

Table 5. TAC Emissions for the Diesel Engine Generator S-12 (Abated)						
Pollutant	Emission Factor (g/bhp-hr)	Hourly Emission (lb/hr)	Acute Toxic Trigger Level (lb/hr)	Annual Emissions <sup>1</sup> (lb/yr)	Chronic Toxic Trigger Level (lb/yr)	HRA Required? (Y/N)
Diesel PM	0.01 <sup>2</sup>	0.065	N/A	3.237	0.26	Y
Ammonia	-	0.311	7.1	15.533	7.70E+03	N

<sup>1</sup>Based on 50 hours per year, annual operation for maintenance

<sup>2</sup> Vendor guaranteed PM emission factor

**STATEMENT OF COMPLIANCE**

**Regulation 2, Rule 1**

**CEQA (Section 2-1-311):** The installation and operation of S-12, Emergency Standby Diesel Engine, is for the purpose of providing power to the facility in the event of an emergency. Because S-12 is subject to BACT, the Air District does not consider this project approval to be ministerial. However, pursuant to the statutory exemption set forth in Article 18, Section 15269(c) of the 2023 CEQA Statutes and Guidelines, the installation and operation of S-12 is exempt from CEQA requirements because it is a specific action

necessary to prevent or mitigate an emergency. Per Air District Regulation 2-1-312.9, any project which is exempt from CEQA review pursuant to the State CEQA Guidelines is exempt from CEQA review. Therefore, CEQA review is not required for this project.

**Public Notice, Schools (Section 2-1-412):** A new or modified source located within 1,000 feet of the outer boundary of a K-12 school, or within an Overburdened Community as defined in Section 2-1-243, and results in the increase in emissions of a toxic air contaminant in Table 2-5-1 of *Regulation 2, Rule 5 New Source Review of Toxic Air Contaminants, requiring a Health Risk Assessment*, shall prepare and distribute a public notice in accordance with subsections 412.1 and 412.2 of *Regulation 2, Rule 1 General Requirements*.

This application proposes a new source of TACs which is not located within 1,000 feet of the outer boundary of the nearest K-12 school (with more than 12 children enrolled) but is within an Overburdened Community. Therefore, public notification pursuant to Reg. 2-1-412 is triggered.

**This section needs to be updated with the results from the public notice.**

### **Regulation 2 – Permits, Rule 2 – New Source Review**

**Best Available Control Technology Requirement, BACT (Section 2-2-301):** In accordance with Regulation 2-2-301, 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<sub>x</sub>, CO, SO<sub>2</sub>, or PM<sub>10</sub>.

Based on the emission calculations in Table 2, BACT is triggered for POC, NO<sub>x</sub> and CO because the maximum daily emissions exceed 10 lbs/day.

Per Air District Regulation 2-2-202, BACT is defined as the most stringent emissions limitation, control device, or control technique that (1) has been achieved in practice at other similar sources and/or (2) is technologically feasible and cost-effective. To determine what level of control constitutes BACT for the emergency standby diesel engine, the BAAQMD reviewed available control technologies that can be effective at controlling POC, NO<sub>x</sub> and CO from these sources.

#### **Control Technology Review**

POC, NO<sub>x</sub> and CO emissions from the emergency standby diesel engines can be controlled by improving the engine design, burning clean fuel, or installing abatement devices. The first two result in lower emissions and the third removes the generated emissions.

**Clean Fuel Technology:** The use of diesel fuel with a low nitrogen content reduces the amount of NO<sub>x</sub> formed during combustion. The less nitrogen available in the fuel, the less that can be converted to NO<sub>x</sub> upon combustion. Diesel fuel producers are not required to remove nitrogen from the fuel specifically for NO<sub>x</sub> reduction purposes. However, they are required to remove sulfur to comply with regulatory mandates, and the hydro-treating technique they use to remove the sulfur also removes most of the nitrogen. As a result, using ultra-low-sulfur diesel fuel (ULSD) will provide benefits in reducing NO<sub>x</sub> 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.

**Combustion Technologies:** POC, NO<sub>x</sub> and CO emissions can be minimized by optimizing the engine's combustion process using techniques such as injection timing 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. The end user can reduce emissions by using the cleanest engines 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 engines that will be

used for this project, the most stringent level of emissions control that can be achieved, unabated, is Tier 2.<sup>4</sup>

**Post-Combustion Technologies:** Currently, the most effective and prevalent post combustion technologies used to abate POC, NO<sub>x</sub> and CO rely on the use of catalysts. For NO<sub>x</sub> reduction, catalytic technology can come in the form of a selective catalytic reduction unit, lean-NO<sub>x</sub> catalyst, or NO<sub>x</sub> adsorber. POC and CO reduction is typically achieved through an oxidation catalyst. For each of these technologies, the catalyst is used to lower the heat of reaction that is required for the breakdown and/or conversion of the target pollutants. For emergency standby engines, the catalyst would not reach its effective temperature during short-duration operations associated with periodic testing and maintenance, which is primarily how these engines will be operated.

Tier 4 Final standards are the most stringent emission levels commonly achieved by diesel-fired IC engines of various ratings and generally require the use of add-on controls, such as diesel particulate filters (DPFs) and selective catalytic reduction (SCR). For most bhp ranges, the Tier 4 Final standards reduce NO<sub>x</sub> and PM emissions by at least 90% compared to the applicable Tier 2 and Tier 3 standards. Therefore, the use of a Tier 4F engine is achieved in practice.

**BACT Analysis for S-12**

The proposed engine is an emergency standby engine with a rated power output exceeding 1,000 bhp. Post-combustion control technologies have been achieved in practice. Other facilities operating similar emergency backup engines have achieved emissions rates equivalent to EPA’s Tier 4 standards, which are the most stringent standards achievable by any engines that are available on the market today. These control technologies are therefore required as BACT. S-12 will be required by CARB regulations to use ULSD fuel, and will be required by BAAQMD permit conditions to utilize post-combustion technologies to meet the EPA Tier 4 emissions standards for the applicable pollutants. Therefore, S-12 complies with the BACT requirements under Regulation 2-2-301 for all applicable pollutants.

According to the emission data submitted to EPA for the engine family for S-12, and the expected abatement efficiencies of the post-combustion control devices, the abated POC, NO<sub>x</sub> and CO emission rates comply with the applicable BACT emission limits shown below. However, because the engine is not certified to meet Tier 4 standard for POC, and NO<sub>x</sub> by EPA, source testing will be required to verify compliance. To prevent engine tuning to reduce NO<sub>x</sub> emissions at the expense of increasing CO emissions, source testing will also be required for CO. These source testing requirements will be outlined in the permit conditions for the new engine.

<b>Table 6. Analysis of BACT Requirements</b>				
<b>Pollutant</b>	<b>BACT Requirement</b>	<b>Engine Data</b>		<b>In Compliance?</b>
	For engines at Rated Power > 1000 bhp.	<b>Rated Power</b>	<b>Emission Factor</b>	<b>Yes/NO</b>
POC	0.14 g /bhp-hr	2,937 bhp	0.14 g /bhp-hr	Yes
NO <sub>x</sub>	0.50 g /bhp-hr		0.50 g/bhp-hr	Yes
CO	2.6 g/bhp-hr		0.11 g/bhp-hr	Yes

<sup>4</sup> EPA’s diesel emission tiers range from Tier 0 through Tier 4. The Tier 4 standards require catalytic control devices, which are addressed below. See California Air Resources Board, Non-Road Diesel Engine Certification Tier Chart, available at: <https://ww2.arb.ca.gov/resources/documents/non-road-diesel-engine-certification-tier-chart-pdf>.

**Offset Requirements for POC and NO<sub>x</sub> (Section 2-2-302):** Pursuant to Regulation 2-2-302, offsets must be provided for any new or modified source at a facility that emits, or is permitted to emit, more than 10 tons per year of POC or NO<sub>x</sub>. If the facility will have the potential to emit more than 10 tons per year but less than 35 tons per year of NO<sub>x</sub> 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 District's Small Facility Banking Account unless the applicant owns offsets pursuant to Regulation 2-2-302.1.2. If a facility emits or will be permitted to emit 35 tons per year or more, the facility must provide the offsets at a 1.15 to 1.0 ratio.

As shown in Table 3, the facility permitted emissions for NO<sub>x</sub> and POC each do not exceed 10 tons per year. Therefore, offsets are not required for the NO<sub>x</sub> or POC emission increases from S-12.

**Offset Requirements for PM<sub>2.5</sub>/PM<sub>10</sub> and SO<sub>2</sub> (Section 2-2-303):** Pursuant to Regulation 2-2-303, offsets must be provided for any new or modified source with a cumulative increase that exceeds 100 tons per year of PM<sub>2.5</sub>/PM<sub>10</sub> or SO<sub>2</sub>. Since potential to emit PM<sub>2.5</sub>/PM<sub>10</sub> or SO<sub>2</sub> at this facility are each below 100 ton/yr, this engine is not subject to the offset requirements of Regulation 2-2-303.

**Prevention of Significant Deterioration (PSD) (2-2-304 through 307):** These sections establish standards for PSD BACT requirements, PSD source impact analysis requirements, and PSD additional impacts analysis requirements.

This facility will not emit 100 tons or more per year of any PSD pollutant and, therefore, is not a major PSD facility and is not subject to any of the PSD requirements in Regulations 2-2-304 through 2-2-307 per Regulation 2-2-224.

**NAAQS Protection Requirement (2-2-308):** Per Regulation 2-2-308, if a project will result in a significant net increase in emissions of CO, NO<sub>2</sub>, SO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, or lead, the applicant must demonstrate that the emissions will not cause or contribute to any exceedance of the National Ambient Air Quality Standards for these pollutants.

This project will not involve any significant net emissions increases, as defined in Regulation 2-2-227.2.

**Publication of Notice and Opportunity for Public Comment (2-2-404):** If an application involves a major facility, a PSD project, or an increase in CO, NO<sub>x</sub>, SO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, VOC, or lead in an amount that is significant as defined in Regulation 2-2-227.2, the BAAQMD must prepare and distribute a public notice and provide an opportunity for public comment in accordance with Regulation 2-2-404 (Publication of Notice and Opportunity for Public Comment).

This application does not involve a major facility or PSD project, and it will not increase emissions above any of the significance levels defined in Regulation 2-2-227.2.

## **Regulation 2 – Permits, Rule 5 – Toxic Air Pollutants (Health Risk Assessment)**

This rule requires that any new or modified source of toxic air contaminant (TAC) emissions subject to Authority to Construct or Permit to Operate requirements shall be evaluated for potential public exposure and health risk and meet the applicable standards and administrative requirements, as specified in Sections 300 and 400, respectively.

The proposed engine will emit diesel exhaust particulate matter and their SCR abatement devices will emit ammonia, both of which are TACs under BAAQMD Regulations. BAAQMD Regulation 2, Rule 5 specifies that diesel exhaust particulate matter will be used as a surrogate for all TAC emissions from diesel-fueled compression-ignition internal combustion engines, as this is the principal driver of the health risk associated with this type of equipment.

The engines meet the EPA Tier 4 emission standards with a vendor guaranteed PM emission factor of 0.01 g/bhp-hr. Using this for the engine, a 50 hours per year limit for reliability-related activities, results in an estimated total annual particulate matter emission of 3.237 pounds/year, which is greater than the Regulation 2, Rule 5 chronic toxic trigger level of 0.26 pounds/year.

Pursuant to Regulation 2-5-110, the application is subject to the provisions of this rule since the increase in diesel exhaust PM emissions from the project is above the trigger level listed in Table 2-5-1 of this regulation. Regulation 2-5 requires that the cumulative impacts from all related projects permitted within the last three years be included in the risk screening analysis.

This application has two related applications. Table 7 below, summarizes emissions for this project.

<b>Table 7. TAC Emissions for Applications</b>						
<b>Application Number</b>	<b>Source Number</b>	<b>Rated Output [bhp]</b>	<b>Annual Operating Time [hrs/yr]</b>	<b>Emission Factors [g/bhp-hr]</b>	<b>Abatement Efficiency [%]</b>	<b>PM Emissions [lb/yr]</b>
New: 31981	S-12	2,937	50	0.01	93	3.237
Related: 29828	S-11	2,937	32	0.0895	0	18.544
Related: 28693	S-10	2,937	32	0.0895	0	18.544
Related: 28693	S-9	2,937	32	0.0895	0	18.544
<b>Total Project</b>						<b>58.869</b>
<b>HRA Trigger</b>						<b>0.26</b>

Previously, operating hours for the existing engines S-9 thru S-11 had to be reduced (to 41/42 hrs/yr each) to meet the 10 in a million-cancer risk limit. Cancer risk was 9.7 in a million for S-9, S-10, and S-11 at the reduced operating hours. Since this facility is located within an OBC and is now subject to a 6 in a million, cancer risk limit, it was expected that further reduction of the operating hours for the existing engines was needed for this project to pass.

A revised health risk assessment (HRA) was completed for this permit application to identify the maximum operating limits for the three existing engines (S-9, S-10 & S-11) in order for this project to comply with Regulation 2-5-302. This analysis estimates the incremental health risk resulting from toxic air contaminant (TAC) emissions from non-emergency operation of a new standby generator diesel engine (S-12). Since three other diesel engines (S-11 [A#29828], S-10 & S-9 [A#28693]) were permitted for this facility within the past five years, their emissions were included as part of this project.

It was determined that, this project's compliance with Regulation 2-5-302 project cancer risk limit of 6.0 in a million is contingent upon the facility accepting reduced operating limits for S-9, S-10, and S-11 of 32 hours/year each for reliability related testing.

Results from this revised HRA indicate that the project cancer risk is estimated at 5.9 in a million, the project chronic hazard index (HI) is estimated at 0.0046, and the project acute HI is estimated at 0.0036. In accordance with the District's Regulation 2-5-301, the new source (S-12) does not require TBACT because the estimated source risk does not exceed a cancer risk of 1.0 in a million and/or a chronic HI of 0.20. Since the estimated project cancer risk does not exceed 6.0 in a million and hazard indices do not exceed 1.0, this project complies with the District's Regulation 2-5-302 project risk requirements, for projects located in an Overburdened Community, as defined in Regulation 2-1-243.

**Regulation 2 – Permits, Rule 6 – Major Facility Review**

Regulation 2 Rule 6 implements the operating permit requirements of Title V of the federal Clean Air Act as amended in 1990. The rule applies to major facilities, Phase II acid rain facilities, subject solid waste incinerator facilities and any facility in a source category designated by the Administrator of the EPA in a rulemaking as requiring a Title V permit. The rule also provides a mean by which facilities can avoid the Title V or other requirements by limiting their potential to emit. A major facility is defined in Section 2-6-



212 as one that has the potential to emit 100 tons per year of any regulation air pollutant as defined in Section 2-6-222, or that has the potential to emit 10 tons per year of a single hazardous air pollutant or 25 tons per year or more of a combination of hazardous air pollutants.

The project's potential to emit criteria pollutants was calculated in accordance with District Policy and presented in Table 4. Table 4 shows facility wide PTE based on 132/150 hours annual operation (for both emergency and non-emergency operation), for all sources. As seen emissions are below the 100 tons per year per pollutant threshold for a major facility.

In addition, the potential to emit toxics was calculated in accordance with Regulation 2 Rule 5 and presented previously in Table 6; emissions are well below 10 tons per year single HAP threshold for a major facility.

The facility is not a Phase II Acid Rain Facility (2-6-217) or a subject solid waste incinerator facility (Section 2-6-229), or a facility defined in a source category defined by EPA requiring a Title V permit. Therefore, Title V requirements, as implemented by Regulation 2, Rule 6, are not triggered.

### **Regulation 2 – Particulate Matter, Rule 1 – General Requirements**

**Ringelmann No. 1 Limitation (6-1-301):** Except as provided in Sections 6-1-303, 6-1-304 and 6-1-306, a person shall not emit from any source for a period or periods aggregating more than three minutes in any hour, a visible emission which is as dark or darker than No. 1 on the Ringelmann Chart, or of such opacity as to obscure an observer's view to an equivalent or greater degree.

Since source S-12 is EPA-certified engine with DPF abatement and is expected to emit low amount of PM<sub>10</sub>, it is expected to comply with *Regulation 6-1-301* pending a regular inspection.

**Opacity Limitation (6-1-302):** Except as provided in Sections 6-1-303, 6-1-304 and 6-1-306, a person shall not emit from any source for a period or periods aggregating more than three minutes in any hour an emission equal to or greater than 20% opacity as perceived by an opacity-sensing device, where such device is required by BAAQMD regulations.

Since source S-12 is EPA-certified engine with abatement and is expected to emit low amounts of PM<sub>10</sub>, they are expected to comply with Regulation 6-1-302 pending a regular inspection.

**Visible Particles (Section 6-1-305):** A person shall not emit particles which are large enough to be visible as individual particles at the emission point or of such size and nature as to be visible individually as incandescent particles.

Since source S-12 is EPA-certified engine with abatement and is expected to emit low amounts of PM<sub>10</sub>, it is not expected to produce visible emissions or fallout in violation of this regulation and will be assumed to comply with Regulation 6-1-305 pending a regular inspection.

**Particulate Weight Limitation (Section 6-1-310):** A person shall not emit from any source particulate matter in excess of 0.0903 grains/dscf of exhaust gas volume <sup>5</sup>.

The PM emission rate from engine S-12 is 0.01 grams/bhp-hr, which results in an outlet grain loading of about 0.001 grains/dscf based on the engine specifications (2,937 bhp, 15,292.8 acfm exhaust flow, and 752.1° F emissions stack temperature). Grain loading for the project is much less than the 0.0903 grains/dscf limit and comply with *Regulation 6-1-310.1*. Note that the TSP concentration limits set forth in Regulation 6-1-301.2 do not apply because the PTE for PM per source is below the 1000 kg per year applicability threshold.

### **Regulation 9 – Inorganic Gaseous Pollutants, Rule 1: Sulfur Dioxide**

Source S-12 is subject to the following sections of Regulation 9, Rule 1 and will comply with all sections by burning Ultra Low Sulfur Diesel with a sulfur content of 15 ppm, which results in less than 1 ppmv of SO<sub>2</sub> in the exhaust gas.

<sup>5</sup> This number changes with DSCFM, according to Regulation 6-1 (Table 6-1-310.2).

**Limitations on Ground Level Concentrations (Section 9-1-301):** Sulfur Dioxide emissions shall not result in ground level concentrations more than 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.

**General Emission Limitation (Section 9-1-302):** A gas stream containing Sulfur Dioxide shall not contain sulfur dioxide more than 300 ppm (dry).

**Fuel Burning (Section 9-1-304):** The sulfur content of liquid fuel burned shall not exceed 0.5% by weight.

**Regulation 9 – Inorganic Gaseous Pollutants, Rule 8: NO<sub>x</sub> and CO from Stationary Internal Combustion Engines**

**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.

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

S-12 is subject to the requirements of Regulation 9-8-330 which limit reliability related operation of the engines to 50 hours per year.

Permit Conditions for S-12 will include an operating limit that complies with this standard.

**Monitoring and Records (Section 9-8-500)**

S-12 is subject to the reporting requirements of Sections 502 and 530

Permit Conditions for S-12 will include reporting requirements that meet this standard.

**Regulation 10 – Standards of Performance for New Stationary Source**

**New Source Performance Standard (NSPS):** According to §60.4200(a)(2)(i), the engine is subject to the requirements of 40 CFR Part 60 Subpart IIII, “Standards of Performance of Stationary Compression Ignition Internal Combustion Engines.”

In accordance with §60.4202(a)(2), the emission standards must meet those established in 40 CFR 89.112 and 40 CFR 89.113.

Using the conversion factor of 1.341 hp per 1 kW, the rated power for the proposed 2,9637 BHP engine in metric units becomes 2,190 kW.

Pursuant to 40 CFR 89.112, Tier 2 engines with a rated power at or greater than 560 kW must meet the emission standards of Table 8.

Table 8. Standards/Review for Engines with Rated Power > 560 kW		
Pollutant	NSPS Emission Standard (g/kW-hr)	EPA Certified Emission Rate for S-12 (g/kW-hr)
NO <sub>x</sub> + NMHC	6.4	5.33
CO	3.5	0.9
PM	0.20	0.12

As seen, this engine will meet the emission standards of 40 CFR 89.112. In addition, the engine are expected to meet the opacity standards of Table 8, identified in 40 CFR 89.113.

Table 9. 40 CFR 89.113 Opacity Standards	
Mode	Opacity (%)
Acceleration	20
Lugging	15

Peak (During acceleration or lugging modes)	50
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§60.4206 requires that the owner/operator of a stationary CI ICE meet the applicable emission standards specified in §60.4205 over the entire life of the engine.

The owner/operator is expected to comply with this requirement.

§60.4207 specifies fuel requirements that must be met for owners/operators of a stationary CI ICE engine subject to Subpart III. Effective October 1, 2010, engines with a displacement less than 30 L/cylinder that use diesel fuel must meet the requirements of 40 CFR 80.510(b) for nonroad diesel fuel. 40 CFR 80.510(b) specifies standards of 15 ppm maximum sulfur content for nonroad diesel fuel and a cetane index of 40 or aromatic content of 35%.

The owner/operator is expected to comply with this requirement because CARB allows only ultra-low sulfur diesel to be used for stationary engines in California.

§60.4209 specifies the monitoring requirements for owner/operators of stationary CI ICEs: emergency engines not meeting emission standards must be equipped with a non-resettable hour meter prior to startup, and DPFs (if equipped) must be installed with a backpressure monitor that notifies the owner/operator when high backpressure limit is approached. In addition, monitoring requirements of §60.4211 must be met (see next subsection, below).

Source S-12 meets the standards applicable to emergency engines and will be equipped with a non-resettable hour meter prior to startup of the engines (even though they are not specifically required to do so per this section). Also, the engine DPF will be installed with a backpressure monitor. Standard permit conditions will be imposed to ensure compliance with these requirements.

§60.4211 requires (a) owners/operators operate and maintain the engine and control device according to manufacturer's emission-related written instructions, change only those emission-related settings that are permitting by the manufacturer, and meet the requirements of 40 CFR 89, 94, and/or 1068 if applicable. In addition, §60.4211(c) requires owner/operators of 2007 model year and later CI ICEs complying with §60.4205(b) standards to purchase a certified engine, installed and configured according to the manufacturer's emission-related specifications. Lastly, §60.4211(f) specifies emergency engine operation for non-emergency purposes are limited to 50 hours per year (up to 100 hours per year for certain situations) and emergency use is unlimited.

The owner/operator is expected to comply with the compliance requirements outlined in §60.4211. As previously discussed, the applicable requirements of 40 CFR 98 are met. The proposed engine is part of certified EPA Engine Family NCPXL78.1NZS. Due to the CARB ATCM limiting non-emergency use to 50 hours per year, the 100 hours per year provision does not apply.

§60.4214 specifies notification, reporting and recordkeeping requirements for owners/operators of CI ICEs.

The proposed engine S-12 is not subject to initial notification requirements of §60.4214(b) because it is an emergency engine and meets the standards applicable to non-emergency engines in the applicable model year. Per §60.4214(b), the owner/operator will be required to keep records of any corrective action taken after the backpressure monitor has notified the owner or operator that the high backpressure limit of the engine is approached. The owner/operator will be expected to comply with the annual reporting requirements of §60.4214(d) if triggered.

§60.4218 specifies the general provisions in 40 CFR 60.1 to 60.19 applicable.

The owner/operator is expected to comply with these provisions.

#### **Regulation 11 – National Emission Standards for Hazardous Air Pollutants (NESHAP)**

There are no subparts under 40 CFR Part 61 that apply to ICEs. Therefore, this regulation does not apply to the proposed source in this application.

40 CFR Part 63 Subpart ZZZZ establishes NESHAPs for Stationary Reciprocating Internal Combustion Engines (RICEs). Both area and major sources of RICEs are subject to Subpart ZZZZ. The proposed data center constitutes an area source of HAPs because the potential to emit any single/combined HAP are below the 10/25 tons per year threshold for major sources. The proposed source S-12 is new stationary RICE CI at an area source subject to (and compliant with) regulations under 40 CFR Part 60 Subpart III. Therefore, per 40 CFR 63.6590(c)(1), no further requirements apply for the proposed engine under Subpart ZZZZ.

**Other Regulations**

The BAAQMD is charged with enforcing the requirements of California’s Air Toxic Control Measure for Stationary Compression Ignition Engines *Title 17, California Code of Regulations, Section 93115* for the purpose of reducing diesel particulate matter (PM) and criteria pollutant emissions from stationary diesel-fueled compression ignition (CI) engines.

***Airborne Toxic Control Measure (ATCM) for Emergency Standby Diesel-Fueled CI Engines (>50 bhp)***

**Subsection 93115.6(a)(3)(A)(1)(a)** sets forth Emission Standards for new stationary emergency standby diesel fueled compression ignition engines with maximum engine power greater than 750 HP.

This generator is subject to and meets the requirement of this section of the ATCM as shown in Table 10.

<b>Engine Emission Rates vs. ATCM Standards</b>	<b>Power Rating (bhp)</b>	<b>Model Year</b>	<b>PM (g/bhp-hr)</b>	<b>NMHC+NO<sub>x</sub> (g/bhp-hr)</b>	<b>CO (g/bhp-hr)</b>
ATCM	HP > 750	2008+	0.15	4.8	2.6
Engine S-12	2,937	2022	0.09	3.97	0.67

<sup>1</sup> <https://ww2.arb.ca.gov/sites/default/files/classic/diesel/documents/finalreg2011.pdf>

**Subsection 93115(a)(3)(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, Part 60, Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines*.

This generator has been certified to meet EPA Tier 2 standards (and with addition of the SCR system meets EPA Tier 4 standards) and meets 40 CFR Part 60 Subpart IIII; therefore, it complies with this section of the ATCM.

**Subsection 93115(a)(3)(A)(1)(c)** limits the non-emergency operation of 50 hours/year for maintenance and testing.

Permit Conditions for the generator will limit non-emergency operation to 50 hours/year and as such, will comply with this section of the ATCM.

**PERMIT CONDITIONS**

Source S-12 is subject to Permit Conditions # 22850 and #27925, as seen below.

**Permit Condition #22850**

1. The owner/operator shall not exceed 50 hours per year per engine for reliability-related testing. [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 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]

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

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

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/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, 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 #27925

Permit Condition #27925 applies to S-12 Stationary Diesel Engine abated by SCR and DPF

Tier 2 Engines, equipped with add-on SCR and DPF; ST for NOx/POC/CO and PM

1. The owner/operator shall ensure the engine is abated at all times of operation by an approved Selective Catalytic Reduction (SCR) System and Diesel Particulate Filter (DPF) equipped with a backpressure monitor or other approved Diesel Exhaust Particulate Matter Abatement System. The engine, SCR System, and DPF with backpressure monitor or other approved system shall be installed, maintained, and operated in accordance with the manufacturer specifications and/or best modern practices.

[Basis: Cumulative Increase, Title 17 CCR Section 93115.6(a)(3), 40 CFR 1039.101, BACT, TBACT]

2. The owner/operator shall take all corrective actions recommended by the manufacturer in response to backpressure monitor notifications.

[Basis: Cumulative Increase, Title 17 CCR Section 93115.6(a)(3), 40 CFR 1039.101, BACT, TBACT]

3. The owner/operator shall ensure urea injection commences as soon as the SCR catalyst bed reaches minimum operating temperature as specified by the manufacturer.

[Basis: Cumulative Increase, Title 17 CCR Section 93115.6(a)(3), 40 CFR 1039.101, BACT, TBACT]

4. The owner/operator shall ensure engine emissions do not exceed an ammonia (NH<sub>3</sub>) slip of 10 ppmv, dry @ 15% O<sub>2</sub> from the SCR system. If deemed necessary to demonstrate compliance with Regulation 2, Rule 5, the Air District may require a source test to determine compliance with this emission limit.

[Basis: Regulation 2, Rule 5]

5. The owner/operator shall ensure engine emissions do not exceed the following limits:

NO<sub>x</sub>: 0.50 g/bhp-hour

POC: 0.14 g/bhp-hour

CO: 2.60 g/bhp-hour

PM: 0.01 g/bhp-hour

[Basis: BACT, Cumulative Increase, and HRA]

6. To demonstrate compliance with Part 5, the owner/operator shall conduct an initial Air District-approved source test within 60 days of startup and once every three years thereafter at the normal or expected load during emergency operation using Air District approved source test methods. The owner/operator shall document urea usage (gallons per minute) and average kW during all tests, preferably as digital records. The owner/operator shall submit the source test results to the Air District's Source Test Section no later than 60 days after source test completion.

[Basis: BACT and Cumulative Increase]

7. The owner/operator shall comply with all applicable testing, sampling port location and safe access requirements as specified in Volume IV of the Air District's Manual of Procedures. The owner/operator shall notify the Air District's Source Test Section, in writing, of the source test protocols, sampling port locations, layout, access and projected test dates at least 30 days prior to testing. The following test methods shall be used for each pollutant:

PM (filterable)      EPA Method 5 or Air District-approved equivalent

NO<sub>x</sub>                      EPA Method 7E or Air District-approved equivalent

POC                      EPA Method 25A and EPA Method 18 or Air District-approved equivalent

CO                        EPA Method 10 or Air District-approved equivalent.

[Basis: Regulation 2-1-403]

8. To determine compliance with the above conditions, the owner/operator shall maintain the following records in an Air District-approved log and shall make these records available to Air District staff upon request. All records shall be retained 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 Synthetic Minor Operating

Permit). These recordkeeping requirements shall not replace the recordkeeping requirements contained in any applicable Air District or state regulations.

- a. Source Test Notifications
- b. All source test reports
- c. Engine serial number and source number for each source test
- d. Engine load percentage
- e. Engine, SCR, and DPF maintenance records
- f. SCR system owner's manual or manufacturer's specifications
- g. DPF owner's manual or manufacturer's specifications
- h. All backpressure and corrective actions
- i. SCR urea injection rate (gpm)

[Basis: BACT, Cumulative Increase, Recordkeeping]

### **RECOMMENDATION**

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 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 source which triggers an HRA will be located in within an Overburdened Community, which triggers the public notification requirements of District Regulation 2-1-412. 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 issuance of an Authority to Construct/Permit to Operate for the following source:

**S-12                    Emergency Standby Engine-Generator Set: Diesel Engine, Make Caterpillar, Model 3516C, Family Name NCPXL78.1NZZ, Model Year 2022, Rated 2,937 BHP**

Abated by

**A-12                    DPF+SCR (Combination <sup>6</sup>), Jonson Matthey, Model SCRT 16/16S8X8-2+1-BIEO-D14/26**

By: Sadegh Sadeghipour, Air Quality Engineer

Date: 7/28/2023

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<sup>6</sup> The JM control system is comprised of an oxidation catalyst, SCR and DPF combination system, in order to comply with applicable BAAQMD BACT requirements (i.e., compliance with Tier 4 Final non-road compression-ignition engine emission standards).

## Appendix A

### Facility Potential To Emit Calculations

Sources	Application #	Conditions #1	Conditions #2	
S-1	8482	22820		2,286 bhp
S-2	8482	22820		2,286 bhp
S-4	8482	22820		2,286 bhp
<b>S-5</b>	<b>8482</b>	<b>22820</b>		<b>2,286 bhp</b>
S-8	18756	22850		PO: 3/10/2011
S-9 and S-10	28693	22841		PO: 7/22/2019
S-11	29828	22842	19533, 27027	PO: 2/15/2023

EPA AP-42, Table 3.4-1		lb/bhp-hr	0.000705	0.013	0.0055	0.0007	0.00809							
	Power	Permitted based on Maintenance Hours, TPY						PTE based on Maintenance and Emergency Hours, TPY						
	bhp	Hours	POC	NOX	CO	PM	SO <sub>2</sub>	Hours	POC	NOX	CO	PM	SO <sub>2</sub>	
S-1	2,286	20	0.016	0.297	0.126	0.016	0.185	120	0.097	1.783	0.754	0.096	1.110	
S-2	2,286	20	0.016	0.297	0.126	0.016	0.185	120	0.097	1.783	0.754	0.096	1.110	
S-4	2,286	20	0.016	0.297	0.126	0.016	0.185	120	0.097	1.783	0.754	0.096	1.110	
S-5	2,286	<b>Will be replaced by S-12</b>												
<b>Total</b>			0.048	0.892	0.377	0.048	0.555		0.290	5.349	2.263	0.288	3.329	

Source	A/ N	Permitted based on Maintenance Hours, TPY						Permitted based on Maintenance Hours, TPY						PTE based on Maintenance and Emergency Hours, TPY					
		Hours	POC	NOX	CO	PM	SO <sub>2</sub>	Hours	POC	NOX	CO	PM	SO <sub>2</sub>	Hours	POC	NOX	CO	PM	SO <sub>2</sub>
S-8	18756	50	0.025	0.473	0.109	0.013	0	50	0.025	0.473	0.109	0.013	0.000	150	0.075	1.419	0.327	0.039	0.000
S-9, S-10	28693	41	0.051	1.003	0.178	0.046	0.002	32	0.040	0.783	0.139	0.036	0.002	132	0.164	3.229	0.573	0.148	0.006
S-11	29828	42	0.026	0.514	0.091	0.012	0.001	32	0.020	0.392	0.069	0.009	0.001	132	0.082	1.615	0.286	0.038	0.003
S-12	31981	50	0.023	0.081	0.421	0.002	0.001	50	0.023	0.081	0.421	0.002	0.001	150	0.069	0.243	1.263	0.006	0.003
<b>Total</b>			0.125	2.071	0.799	0.073	0.004		0.108	1.728	0.738	0.060	0.003		0.390	6.507	2.449	0.231	0.013