DRAFT
ENGINEERING EVALUATION
CHANNING HOUSE
P#425-A#24340
850 WEBSTER STREET
PALO ALTO, CA 94301

Background:
Channing house has applied for an Authority to Construct and/or Permit to Operate the following equipment:

S-4 Emergency Standby Diesel Engine Generator Set: Diesel Engine Make: Cummins; Model: 175DSHAB; Rated Horsepower: 275 HP; Model Year: 2009
Abated by: A-1, Johnson Matthey CRT Diesel Particulate Filter

S-5 Boiler for Space Heating: Make: Lochinvar; Model: CBN0986M7; Maximum Firing rate: 0.985 MMBtu/hr (Exempt per Regulation 9, Rule 7-110.1)

S-6 Boiler for Space Heating: Make: Lochinvar; Model: CBN0986M7; Maximum Firing rate: 0.985 MMBtu/hr (Exempt per Regulation 9, Rule 7-110.1)

S-7 Boiler for Water Heating: Make: Lochinvar; Model: AWN286PMM7; Maximum Firing rate: 0.285 MMBtu/hr (Exempt per Regulation 9, Rule 7-110.1)

S-8 Boiler for Water Heating: Make: Lochinvar; Model: AWN286PMM7; Maximum Firing rate: 0.285 MMBtu/hr (Exempt per Regulation 9, Rule 7-110.1)

S-4 will be located at 850 Webster Street, in Palo Alto, California. The emission calculations are shown below in the emissions summary.

Boilers S-5, S-6, S-7, and S-8 are exclusively fired with natural gas. Therefore, all the boilers are exempt from permits per Regulation 2-1-114.2, and do not require any emission calculations or District conditions. The District is proposing to issue an exemption letter for these boilers.

Sources S-5, S-6, S-7, and S-8 are also exempt from Regulation 9, Rule 7 per Section 110.1.

> **9-7-110 Exemptions:** The requirements of this rule shall not apply to the following:
> **110.1** Boilers, steam generators and process heaters with a rated heat input of 2 million BTU/hour or less, if fired exclusively with natural gas, liquefied petroleum gas (LPG), or any combination thereof.

The above engine S-4 will provide emergency power (in the event of a blackout) for essential electrically powered equipment at the above site. The emergency engine must be periodically tested to ensure that it will generate electricity when needed.

Emission Summary:
<u>S-4 New Emergency Standby Diesel Engine Generator Set</u>

Annual Emissions

The 275 HP diesel engine is CARB Certified under EPA/CARB family ACEXL0540AAB. For this report, it is assumed that the emission value of Total Unburned Hydrocarbons (HC) is equivalent to the emission value of POC.

Table (1)

Emission Factors		
Component	Emission (g/kw·hr)	Emission (g/bhp·hr)
NOx	3.23	2.409
CO	1.9	1.417
POC	0.17	0.127
PM_{10}	0.18	0.134
SO_2*	0.0074	0.0055

**The emission factor for SO2 is from Chapter 3, Table 3.4-1 of the EPA Document AP-42, Compilation of Air Pollutant Emission Factors.*
SO_2 8.09E-3 (% S in fuel oil) lb/hp-hr = 8.09E-3 (0.0015% S) (454 g/lb) = 0.0055 g/hp-hr

Note: Engine will be fitted with Diesel Catalyzed Particulate Filter with 85% Efficiency. This filter will reduce the particulate emissions from 0.15 g/bhp-hr to 0.023 g/bhp-hr.

Maximum Emissions in Tons per year for testing:

Table (2)

Maximum Emissions in Tons per year						
Pollutant	g/hp-hr	hp	hr/yr	1 lb/453.6 g	lb/yr	TPY
NOx	2.409	275	11	0.0022	16.063	0.008
CO	1.417	275	11	0.0022	9.449	0.005
POC	0.127	275	11	0.0022	0.845	0.0004
PM_{10}	0.134	275	11	0.0022	0.895	0.0005
SO_2	0.0055	275	11	0.0022	0.037	0.00002

Note: Engine will be fitted with Diesel Catalyzed Particulate Filter with 85% Efficiency. This filter will reduce the particulate emissions from 0.134 g/bhp-hr to 0.02 g/bhp-hr.

Maximum Daily Emissions:
A full 24-hour day will be assumed since no daily limits are imposed on intermittent and unexpected operations. Check Table (3) for emissions per day.

Table (3)

Maximum Daily Emissions					
Pollutant	g/hp-hr	hp	hr/day	1 lb/453.6 g	lb/day
NOx	2.409	275	24	0.0022	35.046
CO	1.417	275	24	0.0022	20.616
POC	0.127	275	24	0.0022	1.845
PM_{10}	0.134	275	24	0.0022	1.953
SO_2	0.0055	275	24	0.0022	0.080

Plant Cumulative Increase: (tons/year):
The cumulative increase from the new engine S-4 is as shown in Table (4).

Table (4)

Plant Cumulative Increase			
Pollutant	Existing tons/yr.	New tons/yr.	Total Increase
NOx	0.00	0.008	0.008
CO	0.00	0.005	0.005
POC	0.00	0.0004	0.0004
PM10	0.00	0.0005	0.0005
SO_2	0.00	0.00002	0.00002
NPOC	0.00	0.000	0.000

Toxic Risk Screening:
The emissions of toxic diesel particulate exceed the District Risk Screening Trigger level, as shown below in Table (5). A Risk Screening Analysis has been performed.

Table (5)

Toxic Emission Of Diesel Particulate						
Source	PM_{10} Emission Factor (g/HP-hr)	HP	Annual Usage (Hours/year)	Diesel Exhaust Particulate Emissions (lb/year)	Trigger Level (lb/yr)	Risk Screen Required? (Yes/No)
4	0.134	275	11	0.894	0.58	Yes

Calculation:
PM_{10} from CARB Certified levels 0.18 (g/kW-hr) / 1.341 (hp/kW) = 0.134 (g/hp-hr)
Diesel Exhaust Particular Emission (lb/yr.) = PM_{10} (g/hp-hr) * HP * Annual Usage (hr/yr)
= 0.134 * 275* 11
= 405.35 g/yr / 453.6 g/lb
= 0.894 lb/yr

Since the engine meets Best Available Control Technology for Toxics (TBACT) requirements (emission level of 0.15 g/hp-hr or less), the maximum acceptable cancer risk is up to 10 in a million. The engine, S-4, was evaluated together with the existing engine, S-3. Results from the health risk screening analysis show that for 50 hours of operation per year for S-4 and 33 hours of operation for S-3, excluding periods when operation is required due to emergency conditions, the risk to the maximally exposed nearest receptor is 360 in a million. In accordance with the District's Risk Management Regulation 2, Rule 5, this risk level is not acceptable.

To meet the maximum acceptable cancer risk of 10 in a million, applicant has agreed to install a Diesel Catalyzed Particulate Filter with 85% Efficiency, limit the reliability-related testing of S-3 to 12 hours per year, and limit the reliability-related testing of S-4 to 11 hours per year. The resulting testing emissions would be 0.299 lb PM/yr. The maximum cancer risk for this facility will be 9.7 in a million. This risk level is considered acceptable.

Public Notification:
Since this plant is located within 1000 ft. of Addison Elementary School, public notification is required.

Statement of Compliance:
S-4 is subject to the 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 9-1 is expected since diesel fuel with a 15 ppm by weight sulfur is mandated for use in California. Like all sources, S-4 is subject to Regulation 6 ("Particulate and Visible Emissions"). This engine is not expected to produce visible emissions or fallout in violation of this regulation and it is assumed to comply with Regulation 6 pending a regular inspection.

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.

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, NOx, CO, SO_2 or PM_{10}.

Based on the emission calculations above, the owner/operator of S-4 is subject to BACT for NOx and CO, since the maximum daily emissions of these pollutants exceed 10 lbs/day. Please refer to the discussion on "Daily Emissions" on page 2 of this evaluation. BACT 1 levels do not apply for 'engines used exclusively for emergency use during involuntary loss of power' as per

Reference b, Document 96.1.3, Revision 6 dated 4/13/2009 of the BAAQMD BACT Guidelines for IC Engines. Hence, the owner/operator has to the meet BACT 2 limits presented below in Table (6).

Table (6)

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guideline

Source:	**IC Engine – Compression Ignition: Stationary Emergency, non-Agricultural, non-direct drive fire pump**	**Revision:**	**6**
		Document #:	**96.1.3**
Class:	**> 50 BHP Output**	**Date:**	**04/13/2009**

Determination

Pollutant	**BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice**	**TYPICAL TECHNOLOGY**
NOx	1. n/s[d] 2. Current tier[a,b] standard for NOX at applicable horsepower rating	1. n/s[d] 2. Any engine certified or verified to achieve the applicable standard.[a,b]
CO	1. n/s[d] 2. The more stringent of either 2.75 g/bhp-hr [319 ppmvd @ 15% O_2][c or the current Tiera,b standard.	1. n/s[d] 2. Any engine certified or verified to achieve the applicable standard.

References

a	Current tier standard (listed on reverse side): The current CARB or EPA off-road tier standard for the pollutant of concern within the appropriate horsepower range. Where NMHC + NOx is listed (with no individual standards for NOx or NMHC) as the standard, the portions may be considered 95% NOx and 5% NMHC. For the purposes of determining BACT NMHC = POC. Any engine which has been certified or demonstrated to meet the current year tier standard may be considered a current certified engine for that pollutant.
b	For pollutants NOx, POC and CO, an engine which does not meet the current EPA or CARB off-road tier standard may represent BACT2, providing 1) the engine met the most stringent EPA Tier Standard in effect at the time of installation (Tier 1 minimum) or 2) the engine met the most stringent EPA Tier Standard in effect prior to the Tier change for that horsepower rating with the permit application submitted within 6 months of the effective date of the Tier change. [Source: California Health & Safety Code Section 93116.3(b) (7)]
c	Previous BACT determination dated 01/11/02.
d	Cost effectiveness analysis must be based on lesser of 50 hr/yr or as limited by toxic risk screen.

Following is a comparison of the current tier standard and the CARB certified emissions. For NMHC + NOx and CO the emission limits set by BACT 2 are met, as shown in Table (7) below.

Table (7)

Analysis of BACT2 Limits			
Pollutant	CARB Certified Engine Emission (g/hp-hr)	Emission Limits as set by BACT 2 for Tier III Engine (g/hp-hr)	Have the limits been met?
NMHC +NOx	2.536	3.0	YES
CO	1.417	2.6	YES

Since CARB certification data was used to establish the NMHC + NOx and CO emission factors, the BACT 2 emission limits have not been incorporated into the permit conditions and are assumed to be complied with through the design standards demonstrated by the CARB certification testing.

Offsets: Offsets must be provided for any new or modified source at a facility that emits more than 10 tons/yr of POC or NOx. Based on the emission calculations above, offsets are not required for this application.

PSD does not apply.

New Source Performance Standard (NSPS):
The engine is subject to 40 CFR 60, Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engine because it was manufactured after April 1, 2006, as required by Section 60.4200(a)(2)(i).

The engine at source S-4 has a total displacement of 7.42 liters (543 cu in) and has 6 cylinders, so each cylinder has a volume of less than 10 liters. The engine is a 2009 model year tier III engine and is not a fire pump. Section 60.4205(b) requires the engine to comply with the emission standards in Section 60.4202, which refers to 40CFR89.112 and 40CFR89.113 for all the pollutants. For engines less than 600 hp, these standards are:

NMHC+NOx: 3.0 g/hp-hr
CO: 2.6 g/hp-hr
PM: 0.15 g/hp-hr
20% opacity during acceleration mode
15% opacity during lugging mode
50% opacity during peaks in acceleration or lugging mode

The engine will comply with the above standards.

The engine has a diesel particulate filter. However, since the engine meets the NSPS PM standard without the filter, it is not subject to the backpressure monitor requirement in Section 60.4209(b) or the notification requirements of 60.4214(c).

Sections 60.4206 and 60.4211(a) 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(a) requires that by October 1, 2007, the owner/operator must use fuel that complies with 40 CFR 80.510(a). This means that the fuel must have sulfur content of 500 parts per million (ppm) maximum, a cetane index of 40 or a maximum aromatic content of 35 volume percent. The owner/operator is expected to comply with this requirement because CARB diesel is required to be used in California

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 sulfur content of 15 parts per million (ppm) maximum, and the same cetane index or aromatic content as above. The owner/operator is expected to comply with this requirement because CARB diesel is required to be used in California.

Section 60.4209(a) requires a non-resettable hour meter. This requirement is already in the standard permit conditions.

The engine will comply with the requirements of Section 60.4211(c) because this engine is certified in accordance with 40 CFR Part 89.

The engine will comply with the requirement in Section 60.4211(e) to run for less than 100 hours per year for maintenance checks and readiness testing, and the prohibition of running for any

reason other than emergency operation, maintenance, and testing because it is limited by permit condition to 50 hours per year for reliability testing and otherwise may only operate for emergencies.

The owner/operator is not required to perform tests in accordance with Section 60.4212 or 60.4213.

Section 60.4214 states that owner/operator do not have to submit an initial notification to EPA for emergency engines.

The owner/operator is required to comply with certain sections of 40 CFR 60, Subpart A, General Provisions. The owner/operator is expected to comply with this requirement.

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 Engine, because per Section 63.6590, engines that are subject to NSPS Subpart IIII are not subject to the NESHAPS.

Airborne Toxic Control Measure (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:

"Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations.

Diesel PM – General Requirements

1. Meet 0.15 g/bhp-hr PM standard
2. Operate 50 hours per year, or less, for maintenance and testing (except emergency use and emissions testing)

HC, NOx, NMHC+NOx, CO

1. Meet standards for off-road engines of the same model year and horsepower rating as specified in the OFF-Road Compression Ignition Engine Standards;
   Or if no standards have been established
2. Meet the Tier 1 standards for an off-road engine for the same maximum rated power.

This emergency standby diesel engine (S-4) is in compliance with the above ATCM requirements. The diesel engine will operate for no more than 11 hours per year for maintenance and reliability testing. Engine meets all the ATCM requirements.

Permit Conditions:

Condition #22811 for S-4 Emergency Standby Diesel Engine Generator Set, at Plant #425

1. The owner/operator shall not exceed 11 hours per year per engine for reliability-related testing. [Basis: "Regulation 2-5]

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: "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/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)].

Condition #25348 for S-4, Engine, and A-1, Particulate Filter

1. The owner/operator shall ensure that the diesel engine S-4 is abated by the properly operated and properly maintained diesel particulate filter Johnson Matthey CRT, A-1, whenever the engine is in operation. (Basis: Regulation 2, Rule 5)

2. The owner/operator shall ensure that A-1, Diesel Particulate Filter Johnson Matthey CRT, is maintained and operated in accordance with CARB Executive Order DE-08-009-04 (Basis: Regulation 2, Rule 5)

Following is the existing permit condition for S-3, Engine. The condition will be amended to include only the part pertaining to A-3, Diesel Particulate Filter. To replace the deleted sections, standard condition 22812 will be imposed. This condition contains standard language that requires compliance with the CARB ATCM.

Condition # 19782 ----------

S-3 Emergency Generator Set; Diesel Engine Turbocharged; Make: Cummins; Model: CTA8.3-G2; Rated Horsepower: 277 HP; Maximum Firing Rate: 1,988,100 Btu/hr.
A-3 Diesel Particulate Filter: Make: BugTrap; Part #5512.

1. Deleted Application 24340~~Hours of Operation: The owner/operator shall operate the emergency standby engine (S-3) only to mitigate emergency conditions or for reliability- related activities. Operating for reliability-related activities shall not exceed 33 hours in any calendar year. Operation while mitigating emergency conditions is unlimited. [Basis: Toxic Risk Screening Analysis]~~

~~"Emergency Conditions" is defined as any of the following: [Basis: Reg. 9-8-231]~~
~~a. Loss of regular natural gas supply.~~
~~b. Failure of regular electric power supply.~~
~~c. Flood mitigation.~~
~~d. Sewage overflow mitigation.~~
~~e. Fire.~~
~~f. Failure of a primary motor, but only for such time as needed to repair or replace the primary motor.~~

~~"Reliability-related activities" is defined as any of the following: [Basis: Reg. 9-8-232]~~
~~a. Operation of an emergency standby engine to test its ability to perform for an emergency use, or~~
~~b. Operation of an emergency standby engine during maintenance of a primary motor.~~

2. The owner/operator shall ensure that the particulate matter emissions from S-3 shall be abated by A-3 Diesel Particulate Filter at all times of operation. [Basis: Toxic Risk Screening Analysis, Best Available Control Technology for Toxics]

3. Deleted Application 24340~~The owner/operator shall equip the emergency standby engine with either: [Basis: Reg. 9-8-530]~~
~~a. a non-resettable totalizing meter that measures the hours of operation for the engine.~~
~~b. a non-resettable fuel usage meter.~~

4. Deleted Application 24340~~Records: The owner/operator shall maintain the following monthly records in a District-approved log for at least 2 years and shall be made available for District inspection upon request: [Basis: Reg. 9-8- 530, Reg. 1-441]~~
~~a. Hours of operation (total).~~
~~b. Hours of operation (emergency).~~
~~c. For each emergency, the nature of the emergency condition.~~

Condition 22812 for S-3, Engine

1. The owner/operator shall not exceed 12 hours per year per engine for reliability-related testing. [Basis: "Regulation 2-5]

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:
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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 2-1-412.6. After the comments are received and reviewed, the District will make a final determination on the permit.

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

S-4 Emergency Standby Diesel Engine Generator Set: Diesel Engine Make: Cummins; Model: 175DSHAB; Rated Horsepower: 275 HP; Model Year: 2009
Abated by: A-1, Johnson Matthey CRT Diesel Particulate Filter.

S-5 Boiler for Space Heating: Make: Lochinvar; Model: CBN0986M7; Maximum Firing rate: 0.985 MMBtu/hr (Exempt per Regulation 9, Rule 7-110.1)

S-6 Boiler for Space Heating: Make: Lochinvar; Model: CBN0986M7; Maximum Firing rate: 0.985 MMBtu/hr (Exempt per Regulation 9, Rule 7-110.1)

S-7 Boiler for Water Heating: Make: Lochinvar; Model: AWN286PMM7; Maximum Firing rate: 0.285 MMBtu/hr (Exempt per Regulation 9, Rule 7-110.1)

S-8 Boiler for Water Heating: Make: Lochinvar; Model: AWN286PMM7; Maximum Firing rate: 0.285 MMBtu/hr (Exempt per Regulation 9, Rule 7-110.1)

By:_____ Date:_____
Madhav Patil

Air Quality Engineering