

# DRAFT

## ENGINEERING EVALUATION

**Presentation High School**

**PLANT NO. 16995**

**APPLICATION NO. 12543**

### BACKGROUND

Presentation High School of San Jose, California is applying for an Authority to Construct and/or Permit to Operate for the following equipment:

**S-1 Cogeneration Plant: Natural Gas Engine; Make: General Motors; Model: TecoDrive 7400LE; Rated Horsepower: 108 HP; Abated by A-1 Catalytic Converter: Johnson Matthey Model CX 8-3**

The generator will be located at 2281 Plummer Avenue, San Jose, CA 95125. Since the plant itself, Presentation High School, is a large public school, this project will trigger the public notification process. Also, the project is within 0.25 miles of two schools: St. Christopher's Elementary School and Hidden Treasures Academy.

### EMISSIONS SUMMARY

Annual Emissions:

The manufacturer-supplied emission factors for S-1 (108 HP- diesel engine) are listed below, along with conservative estimates of abatement efficiencies for A-1 (Johnson Matthey CX8-3):

| Pollutant | Emission Factors (g/bhp-hr) | Abatement Efficiency | Abated Factors (g/bhp-hr) | Maximum Allowable Pre-BACT Emission Factors (g/bhp-hr) |
|-----------|-----------------------------|----------------------|---------------------------|--|
| NOx       | 13.40                       | 95%                  | 0.67                      | 1.75   |
| CO        | 16.90                       | 95%                  | 0.85                      | 1.75   |
| POC       | 3.00                        | 90%                  | 0.30                      | 1.75   |
| PM10      | negligible                  | n/a                  | n/a                       | 1.75   |

Since this engine is projected to meet BACT, the maximum allowable NOx, CO, and POC emissions will be used in the following calculations and permit conditions.

The emission factor for SO<sub>2</sub> is assumed to be 5.88E-4 lb/MMBtu, as provided by Chapter 3, Table 3.2-3 of the EPA Document AP-42, Uncontrolled Natural Gas Emission Factors for 4-Stroke Rich-Burn Engines. The abatement efficiencies are conservative figures specified by the CARB manual for Stationary Reciprocating Engines, Section 304.9.2 NSCR Catalyt.

The applicant has specified that S-1 will each be operated for 24 hours per day, seven days per week, 52 weeks per year, for a total of 8736 hours per year. The emissions per year released by one of those engines is as follows:

$$\begin{aligned} \text{NOx} &= (1.75 \text{ g/hp-hr}) (108 \text{ hp}) (8736 \text{ hr/yr}) (1\text{b}/454\text{g}) = 3637 \text{ lb/yr} = 1.818 \text{ TPY} \\ \text{CO} &= (1.75 \text{ g/hp-hr}) (108 \text{ hp}) (8736 \text{ hr/yr}) (1\text{b}/454\text{g}) = 3637 \text{ lb/yr} = 1.818 \text{ TPY} \\ \text{POC} &= (1.75 \text{ g/hp-hr}) (108 \text{ hp}) (8736 \text{ hr/yr}) (1\text{b}/454\text{g}) = 3637 \text{ lb/yr} = 1.818 \text{ TPY} \\ \text{PM}_{10} &= (0.0 \text{ g/hp-hr}) (108 \text{ hp}) (8736 \text{ hr/yr}) (1\text{b}/454\text{g}) = 0.0 \text{ lb/yr} = 0.0 \text{ TPY} \\ \text{SO}_2 &= (5.88\text{E-}4 \text{ lb/MMBtu})(0.97 \text{ MMBtu/hr})(8736 \text{ hr/yr}) = 5.00 \text{ lb/yr} = 0.002 \text{ TPY} \end{aligned}$$

### Maximum Daily Emissions:

A full 24-hour day will be assumed since no daily limits are imposed on intermittent and unexpected operations.

*For S-1:*

$$\begin{aligned} \text{NOx} &= (1.75 \text{ g/hp-hr}) (108 \text{ hp}) (24 \text{ hrs/day}) (1\text{b}/454\text{g}) = 9.99 \text{ lb/day} \\ \text{CO} &= (1.75 \text{ g/hp-hr}) (108 \text{ hp}) (24 \text{ hrs/day}) (1\text{b}/454\text{g}) = 9.99 \text{ lb/day} \\ \text{POC} &= (1.75 \text{ g/hp-hr}) (108 \text{ hp}) (24 \text{ hrs/day}) (1\text{b}/454\text{g}) = 9.99 \text{ lb/day} \\ \text{PM}_{10} &= (0.0 \text{ g/hp-hr}) (108 \text{ hp}) (24 \text{ hrs/day}) (1\text{b}/454\text{g}) = 0.0 \text{ lb/day} \\ \text{SO}_2 &= (5.88\text{E-}4 \text{ lb/MMBtu})(0.973 \text{ MMBtu/hr})(24 \text{ hr/day}) = 0.01 \text{ lb/day} \end{aligned}$$

### Plant Cumulative Increase: (tons/year)

| Pollutant        | Existing | New S-1 | Total |
|------------------|----------|---------|-------|
| NOx              | 0.000    | 1.818   | 1.818 |
| CO               | 0.000    | 1.818   | 1.818 |
| POC              | 0.000    | 1.818   | 1.818 |
| PM <sub>10</sub> | 0.000    | 0.000   | 0.000 |
| SO <sub>2</sub>  | 0.000    | 0.002   | 0.002 |
| NPOC             | 0.000    | 0.000   | 0.000 |

### Toxic Risk Screening Analysis (RSA):

Estimated toxic pollutant emissions at the exhaust stack for one engine are summarized in the table on the next page. The emission factors used in the emissions calculations were provided by AP-42 emission factors.

Basis:

- 8736 hr/yr operation (24 hours per day, 7 days per week, 52 weeks per year)
- Firing rate of 0.973 MMBtu/hr
- Emission factors from AP-42 Table 3.2-3 (Uncontrolled Natural Gas Emission Factors for 4-Stroke Rich-Burn Engines)
- Catalyst abatement efficiency of 50%

| Compound                   | AP-42 Factor<br>(lb/MMBtu) | IC Engine Emissions |           | Abated<br>Emissions (lb/yr) | BAAQMD<br>Trigger (lb/yr) | RSA<br>Triggered? |
|----------------------------|----------------------------|---------------------|-----------|-----------------------------|---------------------------|-------------------|
|                            |                            | (lb/day)            | (lb/year) |                             |                           |                   |
| 1,1,2,2-Tetra chloroethane | 2.53E-05                   | 5.91E-04            | 2.15E-01  | 1.08E-01                    | 3.30E+00                  | No                |
| 1,1,2-Trichloroethane      | 1.53E-05                   | 3.57E-04            | 1.30E-01  | 6.50E-02                    | 1.20E+01                  | No                |
| 1,1-Dichloroethane         | 1.13E-05                   | 2.64E-04            | 9.61E-02  | 4.80E-02                    | 1.20E+02                  | No                |
| 1,2-Dichloroethane         | 1.13E-05                   | 2.64E-04            | 9.61E-02  | 4.80E-02                    | 1.20E+02                  | No                |
| 1,2-Dichloropropane        | 1.30E-05                   | 3.04E-04            | 1.11E-01  | 5.53E-02                    | 1.20E+02                  | No                |
| 1,3-Butadiene              | 6.63E-04                   | 1.55E-02            | 5.64E+00  | 2.82E+00                    | 1.10E+00                  | Yes               |
| 1,3-Dichloropropane        | 1.27E-05                   | 2.97E-04            | 1.08E-01  | 5.40E-02                    | 1.20E+02                  | No                |
| Acetaldehyde               | 2.79E-03                   | 6.52E-02            | 2.37E+01  | 1.19E+01                    | 7.20E+01                  | No                |
| Acrolein                   | 2.63E-03                   | 6.14E-02            | 2.24E+01  | 1.12E+01                    | 3.90E+00                  | Yes               |
| Benzene                    | 1.58E-03                   | 3.69E-02            | 1.34E+01  | 6.72E+00                    | 6.70E+00                  | Yes               |
| Butyr/isobutyraldehyde     | 4.86E-05                   | 1.13E-03            | 4.13E-01  | 2.07E-01                    | n/a                       | No                |
| Carbon Tetrachloride       | 1.77E-05                   | 4.13E-04            | 1.50E-01  | 7.52E-02                    | 4.60E+00                  | No                |
| Chlorobenzene              | 1.29E-05                   | 3.01E-04            | 1.10E-01  | 5.48E-02                    | 1.40E+04                  | No                |
| Chloroform                 | 1.37E-05                   | 3.20E-04            | 1.16E-01  | 5.82E-02                    | 3.60E+01                  | No                |
| Ethane                     | 7.04E-02                   | 1.64E+00            | 5.98E+02  | 2.99E+02                    | n/a                       | No                |
| Ethylbenzene               | 2.48E-05                   | 5.79E-04            | 2.11E-01  | 1.05E-01                    | n/a                       | No                |
| Ethylene Dibromide         | 2.13E-05                   | 4.97E-04            | 1.81E-01  | 9.05E-02                    | 2.70E+00                  | No                |
| Formaldehyde               | 2.05E-02                   | 4.79E-01            | 1.74E+02  | 8.71E+01                    | 3.30E+01                  | Yes               |
| Methanol                   | 4.12E-05                   | 9.62E-04            | 3.50E-01  | 1.75E-01                    | 1.20E+05                  | No                |
| Methylene Chloride         | 4.12E-05                   | 9.62E-04            | 3.50E-01  | 1.75E-01                    | 1.90E+02                  | No                |
| Naphthalene                | 9.71E-05                   | 2.27E-03            | 8.25E-01  | 4.13E-01                    | 2.70E+02                  | No                |
| PAH                        | 2.74E-06                   | 6.40E-05            | 2.33E-02  | 1.16E-02                    | n/a                       | No                |
| Styrene                    | 1.19E-05                   | 2.78E-04            | 1.01E-01  | 5.06E-02                    | 1.40E+05                  | No                |
| Toluene                    | 5.58E-04                   | 1.30E-02            | 4.74E+00  | 2.37E+00                    | 3.90E+04                  | No                |
| Vinyl Chloride             | 7.18E-06                   | 1.68E-04            | 6.10E-02  | 3.05E-02                    | 2.50E+00                  | No                |
| Xylene                     | 1.95E-04                   | 4.55E-03            | 1.66E+00  | 8.29E-01                    | 5.80E+04                  | No                |

As can be seen, four compounds listed in the table above exceed toxic trigger levels. Hence, toxic risk screening analysis **is** required.

Per the attached 7/19/04 memo from Irma Salinas, results from the health risk screening analysis indicate that the incremental cancer risks from the operation of S-1 for the maximally exposed receptors are as follows:

| Receptor                   | Cancer Risk in a Million | Chronic Hazard Index |
|----------------------------|--------------------------|----------------------|
| Residential                | 5.900                    | 0.10                 |
| Presentation H.S.          | 0.520                    | 0.20                 |
| St. Christopher Elementary | 0.550                    | 0.20                 |
| Hidden Treasures Academy   | 0.066                    | 0.03                 |

These calculations were done for 8760 hours of operation per year. Since S-1 is considered TBACT, in accordance with the District's Toxic Risk Management Policy, the project meets the District's standard of 10 in a million.

The ISCST3 air dispersion computer model was used to estimate annual average ambient air concentrations. Stack and building parameters for the analysis were based on information provided by the applicant. Estimates of residential risk assume continuous 70-year exposure to annual average TAC concentrations. Off-site workers estimates assume exposure occurs for 46 years out of a 70-year lifetime. The off-site worker adjustment factor is:

$$(46 \text{ years}/70 \text{ years}) = 0.657 * \text{residential risk}$$

Estimates of risk to students assume exposure occurs at a higher breathing rate of 581 L/kg-day compared to 286 L/kg-day for residents during 180 school days per year out of 261 weekdays per year and for 9 years out of a 70-year lifetime. The student adjustment factor is:

$$(581 \text{ L/kg-day} / 286 \text{ L/kg-day}) / (180 \text{ days} / 261 \text{ days}) * (9 \text{ years} / 70 \text{ years}) = 0.180$$

\* residential risk

## **PUBLIC COMMENT**

The project is within 1000 feet of two public schools and therefore subject to the public notification requirements of Reg. 2-1-412. The public notice was posted on the Internet and mailed to all Parents or Guardians with children enrolled at Presentation High School, St. Christopher's Elementary School, and Hidden Treasures Academy. It was also mailed to all residential neighbors located within 1000 feet of the proposed new source of pollution. Please see the attached documentation for comments received via email and phone.

## **STATEMENT OF COMPLIANCE**

S-1 is not subject to the emission rate limits or record keeping requirements of Regulation 9, Rule 8 ("NO<sub>x</sub> and CO from Stationary Internal Combustion Engines"), in accordance with the exemption in 9-8-110.1 for engines with an output rating less than 250 hp. Like all sources, S-1 is subject to Regulation 6 ("Particulate and Visible Emissions"). Because it uses natural gas fuel, S-1 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 pending a regular inspection.

This application is considered to be ministerial under the District's proposed CEQA guidelines (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.

### ***Best Available Control Technology:***

BACT is not triggered, since maximum daily emissions for each criteria pollutant do not exceed 10 lbs/day as calculated on page 2.

### ***Offsets:***

Offsets must be provided for any new or modified source at a facility that emits more than 10 tons/yr of POC or NO<sub>x</sub>. Based on the emission calculations above, offsets are not required for this application.

PSD, NSPS, and NESHAPS do not apply.

**PERMIT CONDITIONS**

Conditions for S-1 Natural Gas Cogeneration Plant  
Application #12543, Plant #16995, Presentation High School:

**PC #21692**

1. The owner/operator of S-1 shall fire the engines exclusively with PUC quality natural gas at a firing rate not to exceed 0.98 MMBtu/hr.  
(basis: Cumulative Increase, BACT)
2. The owner/operator of the S-1 cogeneration plant may operate up to 8,736 hours per calendar year.
3. The owner/operator shall not operate engine S-1 unless NO<sub>x</sub>, CO and POC emissions are abated by the properly operated and maintained Three-Way NSCR System.  
(basis: Cumulative Increase, BACT)
4. The owner/operator of S-1 shall not exceed the following emissions limits:

|                 |               |
|-----------------|---------------|
| NO <sub>x</sub> | 1.75 g/bhp-hr |
| CO              | 1.75 g/bhp-hr |
| POC             | 1.75 g/bhp-hr |

  
(basis: Cumulative Increase and BACT)
5. The owner/operator of S-1 shall retain all source test records on-site for two years, from the date of entry, and make them available for inspection by District staff upon request.  
(basis: BACT, Cumulative Increase, Reg. 9-8-530: Record keeping)
6. The owner/operator shall equip S-1 with either:
  - a) a non-resettable totalizing meter that measures hours of operation for the engine;  
or
  - b) a non-resettable fuel usage meter, the maximum hourly fuel rate shall be used to convert fuel usage to hours of operation.  
(basis: Reg. 9-8-530: Record keeping, Cumulative Increase)
7. To determine compliance with the above conditions, the owner/operator shall maintain the following records and provide all of the data necessary to evaluate compliance with the above conditions. A monthly log of usage shall indicate the following:
  - a) Hours of operation (total)
  - b) Hours of operation (emergency)
  - c) For each emergency, the nature of the emergency condition

The owner/operator shall record all records in a District-approved log. The owner/operator shall retain the records on-site for two years, from the date of entry, and make them available for inspection by District staff upon request.

These record-keeping requirements shall not replace the record-keeping requirements contained in any applicable District Regulations.  
(basis: Cumulative Increase, Regulation 1-441, Reg. 9-8-530: Record keeping)

**RECOMMENDATION**

Issue an Authority to Construct to Presentation High School for:

**S-1 Cogeneration Plant: Natural Gas Engine; Make: General Motors; Model: TecoDrive 7400LE; Rated Horsepower: 108 HP; Abated by A-1 Catalytic Converter: Johnson Matthey Model CX 8-3**

**EXEMPTIONS**

None.

By: \_\_\_\_\_

Roy Lo  
Air Quality Engineering Intern

Date: \_\_\_\_\_