

**ENGINEERING EVALUATION
EXXON MOBIL CORPORATION
1005 WEST EL CAMINO REAL, SUNNYVALE, CA 94087
PLANT NO. 21516; APPLICATION NO. 30465**

BACKGROUND

Cardno, on behalf of Exxon Mobil Corporation, has applied for a modification to an existing Permit to Operate (Application No. 24780, PO issued on 09/15/2015) for the following equipment:

**S-1: Soil Vapor Extraction System – 250 scfm vacuum blower abated by
A-1: SVE Abatement System consisting of Electric Catalytic Oxidizer, a Carbon Adsorption, two (200 lbs minimum capacity) Activated Carbon Vessels connected in series, or a Natural Gas Fired Thermal Oxidizer, Make: Intellishare Environmental, Model: TO-250, maximum firing rate: 750,000 Btu/hr**

The above equipment will be located at 1005 West El Camino Real, Sunnyvale, CA 94087. Soil vapor extraction will be accomplished by means of a regenerative vacuum blower (S-1) with a maximum flow rate of 250 scfm. The extracted vapors will be abated by three different means of abatement processes: two minimum 200-pound capacity GAC Adsorbers connected in series; electric catalytic oxidation and carbon adsorption; or a natural gas fired thermal oxidizer with a maximum firing rate of 750,000 Btu/hr.

The original Authority to Construct for S-1 and A-1 was issued on February 5, 2013 and the Permit to Operate was issued on September 17, 2015. Originally, Cardno planned to install a stationary treatment system based on the Corrective Action Plan (Cardno ERI, 2011), which was approved by the Santa Clara County Department of Environmental Health (DEH) in a letter dated July 27, 2011 (DEH, 2011). Subsequent to approval of the Corrective Action Plan (Cardno ERI, 2011), ExxonMobil attempted for several years to obtain access from the property owner to install the proposed treatment system. Ultimately, access was not obtained and the DEH agreed that periodic high-intensity treatment (HIT) events using a portable treatment system would suffice. The portable treatment system was permitted under its own portable system air permit.

Permit for Plant #21516 for the proposed stationary treatment system (S-1) was never used. The permit was maintained each year in the event that access would eventually be granted and a stationary system could be installed.

Access negotiations resumed in 2017. In 2019, the property owner finally agreed to the installation of a stationary system in a location that met the City of Sunnyvale ordinance requirements. Cardno has recently received approval from the City of Sunnyvale Planning Department to install a treatment system that includes a gas-fired thermal oxidizer. Cardno proposes that the thermal oxidizer will be able to remediate higher concentrations than a catalytic oxidizer.

There will be no change in the throughput at the source. The source and the abatement system will comply with the updated permit condition #25455 as shown below in the strikeout/underlined format. Application fees for the abatement device A-1 were charged per Regulation 3-302.3 since there is no modification to the source.

EMISSIONS CALCULATION

POC and NPOC Emissions from S-1 Soil Vapor Extraction System (from A/N 24780):

S-1 has an existing Permit to Operate (Application No. 24780). Emissions were calculated and accounted for when the source was issued an Authority to Construct and a Permit to Operate. Since the applicant has agreed to reduce the maximum flowrate from 350 scfm to 250 scfm, emission will be recalculated to reflect the change:

For a conservative estimate of annual emissions, the District staff assumed that the system is operated for the entire year with an inlet concentration corresponding to the initial soil concentration level. Generalized assumptions follow:

- Operating conditions: Pressure = 1 Atm; Inlet Temperature = 21 °C; 1 mole occupies 24.15 L
- Molecular weight of TPHg = 100 g/mole (value for “weathered gasoline”). Molecular weight for Benzene = 78 g/mole
- Influent values based on operational parameters of equipment and applicant supplied soil vapor test results from Application #24780: influent rate 250 scfm throughout; maximum influent concentration = 4500 ppmv VOC, 6.6 ppmv benzene; destruction efficiency = 98.5% throughout

Emissions of Precursor Organics:

$$4567.6 \times 10^{-6} \times 250 \frac{ft^3}{min} \times 1440 \frac{min}{day} \times \frac{28.32 L}{1 ft^3} \times \frac{1 mole}{24.15 L} \times \frac{100 g}{1 mole} \times \frac{1 lb}{454 g} \times (1 - 0.985) = 6.41 \frac{lb}{day} \text{ (abated)}$$

Table 1 – Estimated Emissions from S-1, based on a flowrate of 250 scfm

Pollutant	Influent Vapor Concentration (ppmv)	Influent Vapor Concentration ($\mu\text{g}/\text{m}^3$)	Unabated Daily Emissions (lb/day)	Abated Hourly Emissions (lb/hr)	Abated Daily Emissions (lb/day)	Abated Annual Emissions (lb/yr)
Ethylbenzene	20.832	92,000.00	2.07	1.29E-03	3.10E-02	11.32
Xylenes	92.845	410,000.0	9.21	5.76E-03	1.38E-01	50.45
Benzene	6.600	21,445.0	0.48	3.01E-04	7.23E-03	2.64
Toluene	83.489	320,000.0	7.19	4.49E-03	1.08E-01	39.37
TPH as Gasoline	4567.600	19,000,000.0	427.01	2.67E-01	6.41E+00	2337.86
MTBE	1.964	7200	0.16	1.01E-04	2.43E-03	0.89

Emissions from A-1, natural gas fired thermal oxidizer (new)

The combustion of fuel from thermal oxidizer (A-1) will result in secondary criteria pollutants of combustion. Although A-1 is not subject to BACT requirements when it is used to abate a source to meet BACT/TBACT requirements, it is subject to Reasonably Available Control Technology (RACT) for control of secondary pollutants per Regulation 2-2-102. The following are the required RACT levels for thermal oxidizers:

NO_x: 50 ppmv at 15% O₂ or 0.20 lb/MMBtu

CO: 350 ppmv at 15% O₂ or 0.80 lb/MMBtu

The vendor's guaranteed NO_x and CO emissions factors are 35 ppmv for NO_x and less than 50 ppmv for CO, both corrected to 3% oxygen. They equal 11.55 ppmv of NO_x and 16.5 ppmv of CO, corrected to 15% oxygen. Thus, the thermal oxidizer is expected to meet the RACT limits for NO_x and CO.

To be conservative, the RACT limits were used to calculate NO_x and CO emissions from A-1. The emission factors used to estimate PM₁₀, SO₂, and POC emission factors from the thermal oxidizer were based on AP-42, Table 1.4-2 (Natural Gas Combustion). The daily maximum emissions were calculated assuming 24 hr/day of operation. The emissions from A-1 are summarized in Table 1.

Table 2 – Estimated Emissions from A-1, natural-gas fired thermal oxidizer, 750,000 Btu/hr max. capacity

Pollutant	Emission Factor (lb/MMBtu)	Maximum Firing Rate (MMBtu/hr)	Maximum Hourly Emissions (lb/hr)	Maximum Daily Emissions (lb/day)	Maximum Annual Emissions (lb/yr)	Maximum Annual Emissions (TPY)
NO _x	0.20	0.75	0.15	3.60	1314	0.657
CO	0.80	0.75	0.60	14.40	5256	2.628
PM _{2.5}	0.0075	0.75	0.0056	0.14	49.28	0.025
PM ₁₀	0.0075	0.75	0.0056	0.14	49.28	0.025
SO ₂	0.0006	0.75	0.0005	0.01	3.94	0.002
POC	0.0054	0.75	0.0041	0.10	35.48	0.018

- Basis: Hourly emissions = emission factor * maximum firing rate
 Daily emissions = hourly emissions * 24 hr/day
 Annual emission = hourly emissions * 8760 hr/year
 Assuming all PM₁₀ emissions are PM_{2.5}.

PLANT CUMULATIVE INCREASE

Table 2 summarizes the cumulative increase in criteria pollutant emissions that will result at Plant No. 21516 from operation of A-1. There is no emission increase from S-1.

Table 3 - Plant Cumulative Emissions Increase, Post 4/5/91

Pollutant	Existing Cumulative Emissions, Post 4/5/91 (TPY)	New Increase with This Application (TPY)	Cumulative Emissions (TPY)
NO _x	0.000	0.657	0.657
CO	0.000	2.628	2.628
PM ₁₀	0.000	0.025	0.025
PM _{2.5}	0.000	0.025	0.025
POC	1.604	0.018	1.622
SO ₂	0.000	0.002	0.002

HEALTH RISK ANALYSIS

Per District policy “Emission Factors for Toxic Air Contaminants from Miscellaneous Natural Gas Combustion Sources”, when site specific or source category specific emission factors are not available, the toxic air contaminant (TAC) emission factors delineated in the policy shall be used to calculate TAC emissions from miscellaneous natural gas combustion sources.

There were no other related projects permitted in the last 3 years.

Table 4 - Toxic Air Contaminant Emissions from S-1 and A-1, combined

Pollutant	Maximum Hourly Emissions (lb/h)	Acute Trigger Level (lb/h)	Maximum Annual Emissions (lb/yr)	Chronic Trigger Level (lb/yr)	HRA Required? (Y/N)
Ethylbenzene	1.29E-03	-	11.32	3.30E+01	N
Xylenes	5.76E-03	4.90E+01	50.45	2.70E+04	N
TPH as Gasoline	2.67E-01	-	2337.86	-	N
MTBE	1.01E-04	-	0.886	1.60E+02	N
Benzene	3.03E-04	6.00E-02	2.65	2.90E+00	N
Formaldehyde	5.51E-05	1.20E-01	4.83E-01	1.40E+01	N
Toluene	4.50E-03	8.20E+01	39.40	1.20E+04	N

Based on calculations presented in Table 4, emissions of TACs for S-1 and A-1 do not exceed acute or chronic trigger levels set forth in Table 1 of Regulation 2-5; therefore, a toxic risk screen is not required.

STATEMENT OF COMPLIANCE

The owner/operator of S-1 is expected to comply with Regulation 8-47-301, "Emission Control Requirements, Specific compounds", and Regulation 8-47-302, "Organic compounds", since S-1 will be abated by A-1. The emissions from S-1 will be required to be vented to A-1 at all times of operation.

BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

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, nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxides (SO₂), particulate matter less than 10 micrometer (PM₁₀) and particulate matter less than 2.5 micrometer (PM_{2.5}).

Based on the emission calculations in application #24780, S-1 is not subject to BACT, since the potential to emit for all criteria pollutants is less than 10 pounds per day for S-1.

OFFSETS

Offset must be provided for any new or modified source at a facility that will have the potential to emit more than 10 tons per year of NO_x or POC, as specified in Regulation 2-2-302; and more than 100 tons per year of PM_{2.5}, PM₁₀ or sulfur dioxide, as specified in Regulation 2-2-303. Table 3 above summarizes increases in criteria pollutant emissions at the plant. Offsets are not applicable to this application, since the emissions of any criteria pollutants do not exceed 10 tons/yr. Thus, this facility is not subject to Regulations 2-2-302 and 2-2-303.

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

This project is considered to be ministerial under the District's CEQA 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 as described in the District's Permit Handbook Chapter 9.2 (Soil Vapor Extraction) and therefore is not discretionary as defined by CEQA.

SCHOOL NOTIFICATION (REGULATION 2-1-412)

A new or modified source located within 1,000 feet of the outer boundary of a K-12 school site which results in an increase of emissions from toxic air contaminants is subject to the public notice requirement. The outer boundary of the nearest K-12 school, Sunnysvale Christian School, is approximately 454 feet from the location of this project as shown in the attached Google Earth image. Thus, this project is subject to the public notification requirements of Regulation 2-1-412. A public notice was prepared and will be sent to the parents or guardians of children enrolled in the above referenced school, and to each address within a radius of 1,000 feet of the source.

PERMIT CONDITION

Permit Condition #25455

Revised Permit Condition #25455 for S-1 and A-1 for Application #30465

1. The owner/operator of S-1 shall abate the Precursor Organic Compound (POC) emissions from Source S-1 by A-1, SVE Abatement System, consisting of either an Electric Catalytic Oxidizer, a Natural-Gas Fired Thermal Oxidizer, or two (200 lbs minimum capacity) Activated Carbon Vessels during all periods of operation. Start-up and subsequent operation of each abatement device shall take place only after written notification of same has been received by the District's Engineering Division. The owner/operator shall operate the sources such that the soil vapor flow rate from S-1 shall not exceed ~~350~~ 250 scfm. [Basis: Cumulative Increase, Regulation 8-47-301 and 302, TBACT]
2. The owner/operator of S-1 shall operate A-1 Thermal/Electric Catalytic Oxidizer such that the POC abatement efficiency shall be maintained at a minimum of 98.5% by weight for inlet POC concentrations greater than or equal to 2000 ppmv (measured as hexane). For inlet concentrations below 2000 ppmv and greater than or equal to 200 ppmv, a minimum abatement efficiency of 97% shall be maintained by the owner/operator. For inlet concentrations below 200 ppmv, a minimum abatement efficiency of 90% shall be maintained by the owner/operator of S-1. The minimum abatement efficiency shall be waived if outlet POC concentrations are shown to be less than 10 ppmv (measured as hexane). In no event shall the owner/operator of S-1 emit benzene emissions to the atmosphere exceeding ~~3.8~~ 2.9 pounds per year or ~~0.04~~ 0.0079 pounds per day. [Basis: Cumulative Increase, Regulation. 2-5, TBACT]
3. While operating the Electric Catalytic Oxidizer, the owner/operator of S-1 shall not operate A-1 below a minimum operating temperature of 600 degrees Fahrenheit. While operating the Thermal Oxidizer, the owner/operator of S-1 shall not operate A-1 below a minimum operating temperature of 1400 degrees Fahrenheit. [Basis: Cumulative Increase, Regulation 2-5, TBACT]
4. To determine compliance with part 3, the owner/operator of S-1 shall equip the A-1 Thermal/Electric Catalytic Oxidizer with continuous measuring and temperature recording instrumentation. The owner/operator of S-1 shall collect and maintain the temperature data from the temperature recorder in a file which shall be available for District inspection for a period of at least 2 years following the date on which such data are recorded. [Basis: Regulation 1-523]
5. To determine compliance with part 3, within ten days after start-up of the Thermal Oxidizer, and within ten days after start-up of the Electric Catalytic Oxidizer, the owner/operator of ~~this source~~ S-1 shall:
 - a. Analyze inlet gas stream to determine the flow rate and concentration of POC present.
 - b. Analyze exhaust gas to determine the flow rate, and the concentration of benzene and POC present.
 - c. Calculate the benzene emission rate in pounds per day based on the exhaust gas analysis and the operating exhaust flow rate. The owner/operator of S-1 shall decrease the soil vapor flow rate, if necessary, to demonstrate compliance with part 2.
 - d. Calculate the POC abatement efficiency based on the inlet and exhaust gas analysis. For the purpose of determining compliance with part 2, the owner/operator of S-1 shall report the POC concentration as hexane.

- e. Submit to the District's Engineering Division the test results and emission calculations within one month from the testing date. The owner/operator of S-1 shall analyze samples according to modified EPA test methods 8015 and 8020 or their equivalent to determine the concentrations of POC and benzene.

[Basis: Cumulative Increase, Regulation 2-5, TBACT]

6. The owner/operator of ~~this source~~ S-1 shall maintain the following records for each month of operation of the Thermal Oxidizer or the Electric Catalytic Oxidizer:
 - a. Days and hours of operation.
 - b. Each emission test, analysis or monitoring results logged in for the day of operation they were taken.
 - c. Total throughput of soil vapor from source S-1 in Standard Cubic Feet.

Such records shall be retained and made available for inspection by the District for two years following the date the data is recorded. [Basis: Regulation 1-523]

7. During operation of the Activated Carbon Vessels, the owner/operator of ~~this source~~ S-1 shall monitor with a photo-ionization detector (PID), flame-ionization detector (FID), or other method approved in writing by the District's Source Test Manager at the following locations:
 - a. At the inlet to the second to last carbon vessel in series.
 - b. At the inlet to the last carbon vessel in series.
 - c. At the outlet of the carbon vessel that is last in series prior to venting to the atmosphere.

When using an FID to monitor breakthrough, readings may be taken with and without a carbon filter tip fitted on the FID probe. Concentrations measured with the Carbon filter tip in place shall be considered methane for the purpose of these permit conditions. [Basis: Cumulative Increase, Regulation 2-5, TBACT]

8. The owner/operator of S-1 shall record these monitor readings in a monitoring log at the time they are taken. The owner/operator of S-1 shall use the monitoring results to estimate the frequency of Carbon change-out necessary to maintain compliance with parts 9 and 10, and shall be conducted on a daily basis. The owner/operator of ~~this source~~ S-1 may propose for District review, based on actual measurements taken at the site during operation of the source, that the monitoring schedule be changed based on the decline in organic emissions and/or the demonstrated breakthrough rates of the carbon vessels. Written approval by the District's Engineering Division must be received by the owner/operator of S-1 prior to a change to the monitoring schedule. [Basis: Cumulative Increase, Regulation 2-5, TBACT]

9. The owner/operator of S-1 shall immediately change out the second to last Carbon vessel with unspent carbon upon breakthrough, defined as the detection at its outlet of the higher of the following:

- a. 10 % of the inlet stream concentration to the carbon bed.
- b. 10 ppmv (measured as hexane).

[Basis: Cumulative Increase, Regulation 2-5, TBACT]

10. The owner/operator of S-1 shall immediately change out the last carbon vessel with unspent Carbon upon detection at its outlet of 10 ppmv (measured as hexane). [Basis: Cumulative Increase, Regulation 2-5, TBACT]

11. The owner/operator of ~~this source~~ S-1 shall maintain the following information for each month of operation of the Activated Carbon Vessels:

- a. Hours and time of operation.
- b. Each emission test, analysis or monitoring results logged in for the day of operation they were taken.
- c. The number of Carbon vessels removed from service.
- d. Total throughput of soil vapor from source S-1 in Standard Cubic Feet.

Such records shall be retained and made available for inspection by the District for two years following the date the data is recorded. [Basis: Regulation 1-523]

12. The owner/operator of S-1 shall report any non-compliance with these conditions to the Compliance and Enforcement Division at the time that it is first discovered. The owner/operator of S-1 shall detail the corrective action taken and include the data showing the exceedance as well as the time of occurrence in the submittal. [Basis: Cumulative Increase, Regulation 2-5, TBACT]
13. The owner/operator of S-1 shall maintain a file containing all measurements, records and other data that are required to be collected pursuant to the various provisions of this conditional Authority to Construct/Permit to Operate. All measurements, records and data required to be maintained by the owner/operator of S-1 shall be retained for at least two years following the date the data is recorded. [Basis: Regulation 1-523]
14. Upon final completion of the remediation project, the owner/operator of Sources S-1 shall notify the Engineering Division within two weeks of decommissioning the operation. [Basis: Cumulative Increase, Regulation 2-5, TBACT]

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 /Permit to Operate for the equipment listed below. However, the proposed source will be located within 1,000 feet of a school, which triggers the public notification requirements of District Regulation 2-1-412. After the comments are received and reviewed, the District will make a final determination on the permit.

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

S-1: Soil Vapor Extraction System – 250 scfm vacuum blower abated by

A-1: SVE Abatement System consisting of Electric Catalytic Oxidizer, a Carbon Adsorption, two (200 lbs minimum capacity) Activated Carbon Vessels connected in series, or a Natural Gas Fired Thermal Oxidizer, Make: Intellishare Environmental, Model: TO-250, maximum firing rate: 750,000 Btu/hr

Prepared by:

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