

**Draft Engineering Evaluation
City of Petaluma, Plant # 20955
Application Number 28526
301 Payran Street, Petaluma, CA 94952**

BACKGROUND

Edd Clark & Associate, on behalf of the City of Petaluma has applied for an Authority to Construct for soil remediation at the site located at 301 Payran Street, Petaluma, CA 94952. The soil vapor extraction (SVE) system consists of following SVE:

**S-1 Soil Vapor Extraction System, Travaini TRO-400S, 400 cfm, abated by A-1,
A-1 Thermal Catalytic Oxidizer, TA040, Natural gas, 0.47 MMBtu/hr**

Edd Clark & Associate has applied to operate the system to remediate soil impacted by VOCs leaked from underground storage tanks at the above referenced site. Soil vapor extraction will be accomplished by means of a regenerative vacuum blower (S-1, Travaini TRO 400S) with a maximum capacity of 400 cfm. Vapor abatement will be achieved by a thermal catalytic oxidizer. Emission monitoring for operation of the equipment will be conducted according to established Source Test methodology.

This location is within 1,000 feet of the outer boundary of Live Oak Charter School at 100 Gness Concourse Dr., Petaluma, CA 94952. Therefore, public notice is required per District Regulation 2-1-412.

EMISSION CALCULATIONS

Volatile Organic Compounds

For a conservative estimate of yearly emissions, we shall assume that the system is operated for an entire year within an inlet concentration corresponding to the initial soil concentration level. The soil vapor pilot test results from SVE S-1 inlet indicated Total Petroleum Hydrocarbon (TPH), Benzene, Toluene, Ethylbenzene, and Xylene were detected in soil at the area S-1 will be working. There are secondary emissions for the operation of the natural gas fired thermal catalytic oxidizer. The calculation for S-1 along with the basis is presented as follows:

Basis:

1. Operating conditions: Pressure = 1 atm; Inlet Temperature = 21°C; 1 mole occupies 24.15L
2. Influent values based on operational parameters of equipment and applicant supplied soil vapor test results: influent rate = 400 scfm for S-1.
3. Compounds detected at this site at S-1 inlet include Total Petroleum hydrocarbon (TPH), Benzene, Toluene, Ethylbenzene, and Xylene.
4. Based on the soil vapor test results, maximum influent concentration = 12,000,000 µg/m³ TPH, 35,000 µg/m³ Benzene, 85,000 Toluene, 13,000 µg/m³ Ethylbenzene, and 77,000 µg/m³ xylene;
5. Thermal catalytic oxidizer abatement efficiency = 98.5%

Unabated emissions of the Toxic Air Contaminants Benzene, Toluene, Ethylbenzene, and Xylene from SVE S-1:

$$TPH = \left(\frac{12000000 \text{ ug}}{\text{m}^3}\right) \left(\frac{1 \text{ g}}{10^6 \text{ ug}}\right) \left(\frac{400 \text{ ft}^3}{\text{min}}\right) \left(\frac{1440 \text{ min}}{\text{day}}\right) \left(\frac{\text{m}^3}{35.32 \text{ ft}^3}\right) \left(\frac{1 \text{ lb}}{453.6 \text{ g}}\right) = 431.5 \left(\frac{\text{lb}}{\text{day}}\right)$$

$$\text{benzene} = \left(\frac{35000 \text{ ug}}{\text{m}^3}\right) \left(\frac{1 \text{ g}}{10^6 \text{ ug}}\right) \left(\frac{400 \text{ ft}^3}{\text{min}}\right) \left(\frac{1440 \text{ min}}{\text{day}}\right) \left(\frac{\text{m}^3}{35.32 \text{ ft}^3}\right) \left(\frac{1 \text{ lb}}{453.6 \text{ g}}\right) = 1.259 \left(\frac{\text{lb}}{\text{day}}\right)$$

$$\text{toluene} = \left(\frac{85000 \text{ ug}}{\text{m}^3}\right) \left(\frac{1 \text{ g}}{10^6 \text{ ug}}\right) \left(\frac{400 \text{ ft}^3}{\text{min}}\right) \left(\frac{1440 \text{ min}}{\text{day}}\right) \left(\frac{\text{m}^3}{35.32 \text{ ft}^3}\right) \left(\frac{1 \text{ lb}}{453.6 \text{ g}}\right) = 3.056 \left(\frac{\text{lb}}{\text{day}}\right)$$

$$\text{ethylbenzene} = \left(\frac{13000 \text{ ug}}{\text{m}^3}\right) \left(\frac{1 \text{ g}}{10^6 \text{ ug}}\right) \left(\frac{400 \text{ ft}^3}{\text{min}}\right) \left(\frac{1440 \text{ min}}{\text{day}}\right) \left(\frac{\text{m}^3}{35.32 \text{ ft}^3}\right) \left(\frac{1 \text{ lb}}{453.6 \text{ g}}\right) = 0.467 \left(\frac{\text{lb}}{\text{day}}\right)$$

$$\text{xylene} = \left(\frac{77000 \text{ ug}}{\text{m}^3}\right) \left(\frac{1 \text{ g}}{10^6 \text{ ug}}\right) \left(\frac{400 \text{ ft}^3}{\text{min}}\right) \left(\frac{1440 \text{ min}}{\text{day}}\right) \left(\frac{\text{m}^3}{35.32 \text{ ft}^3}\right) \left(\frac{1 \text{ lb}}{453.6 \text{ g}}\right) = 2.769 \left(\frac{\text{lb}}{\text{day}}\right)$$

Table 1. POC Emissions from SVE (S-1)

	Influent vapor concentration [µg/m³]	Influent vapor concentration [ppmv]	Unabated Emission [lb/day]	Abated Emission [lb/hr]	Abated Emission [lb/day]	Abated Emission [lb/yr]	Abated Emission [ton/yr]	Chronic Trigger Level [lb/yr]	Acute Trigger Level [lb/hr]	HRA required?
TPH	12,000,000	2885	431.5	0.270	6.472	2362	1.181	NA	NA	NO
benzene	35,000	11	1.259	0.001	0.019	7	0.003	2.9	0.06	Yes
toluene	85,000	22	3.056	0.002	0.046	17	0.008	12000	82	NO
ethyl benzene	13,000	3	0.467	0.000	0.007	3	0.001	33	N/A	NO
xylene	77,000	18	2.769	0.002	0.042	15	0.008	27000	49	NO
		Total POC	439	0.274	6.586	2404	1.202			

Secondary Emissions:

From District’s Permit Handbook Chapter 9.2, Reasonably Available Control Technology (RACT) for thermal oxidation:

NO_x = 0.2 lb/MMBTU

CO = 0.8 lb/MMBTU

The thermal oxidizer is expected to comply with RACT standards. The annual emission from the proposed oxidizer (0.47 MMBTU/hr):

Es = F x B x H

Where:

Es = Annual emissions for abatement device (lbs/yr)

F = Emission Factor of Criteria Pollutant (lb/MMBTU)

B = Maximum Firing Rate of Burner in Abatement Device (MMBTU/hr)

H = Maximum Number of Hours the oxidizer will operate = (24 hr/day x 365 day/yr = 8760 hrs/yr)

Table 2 presents the criteria pollutant emissions from A-1, thermal oxidizer, due to natural gas combustion. The emission factors are from the Permit Handbook.

Table 2. Secondary Emissions from the natural gas thermal oxidizer

Pollutant	Emission Factors (lb/MMBtu)	Maximum Firing Rate (MMBtu/hr)	Hours	Annual Emission (lb/yr)	Annual Emission (ton/yr)
NOx	0.2	0.47	8760	823.4	0.412
CO	0.8	0.47	8760	3293.8	1.647
PM10	0.075	0.47	8760	308.8	0.154
SO2	0.0006	0.47	8760	2.470	0.001
POC	0.0054	0.47	8760	22.233	0.011

Plant Cumulative Increase

There is no historic emission data for the working site of 301 Payran Street, Petaluma, CA 94952. Table 3 presents the cumulative increase from the SVE with thermal oxidizer:

Table 3. Cumulative Emission Increase

Pollutant	Existing (ton/yr)	New Increase with this application (ton/yr)	Total (ton/yr)
POC	0	1.213	1.213
NOx	0	0.412	0.412
CO	0	1.647	1.647
PM10	0	0.154	0.154
SO2	0	0.001	0.001

COMPLIANCE DETERMINATION

Toxics

Of the VOCs detected, benzene, toluene, ethylbenzene, and xylene are listed in the Toxic Air Contaminants (TACs) list of Regulation 2-5, Table 2-5-1. With abatement of 98.5%, benzene emissions exceed the chronic trigger level of Table 2-5-1. Therefore, a health risk analysis is required. A Health Risk Screen was performed for this application to determine the risk to the maximally exposed industrial residential, and student receptors.

Per the attached 11/13/2017 memo from the Toxic Evaluation Section, results from the health risk screening analysis indicate that the project cancer risk to the maximally exposed worker receptor is 0.47 in a million and the chronic hazard index is 0.028. The project cancer risk to the maximally exposed residential receptor is 0.19 in a million and the chronic hazard index is 0.001. The project cancer risk to the student receptor is 0.83 in a million and the chronic hazard index is 0.028. The maximum project acute hazard index is estimated at 0.011. In accordance with the District's Regulation 2, Rule 5, this source is in compliance with the Regulation 2-5-302 project risk requirements. Although this project does not trigger TBACT, the abatement system employed would satisfy TBACT criteria for this type of source.

New Source Review

BACT

This proposed project will not emit over 10 lbs per highest day and is therefore not required to implement BACT; however, it is achieved in practice. For Soil Vapor Extraction operations, BACT is defined as attainment of set adsorption/destruction efficiencies corresponding to set influent concentration values. Operation of the thermal catalytic oxidizer will be conditioned to ensure attainment of the following required destruction efficiencies: $\geq 98.5\%$ if inlet POC ≥ 2000 ; $\geq 97\%$ if inlet POC ≥ 2000 to < 200 ppmv; $\geq 90\%$ if inlet POC < 200 ppmv.

Offsets

Offsets are not applicable for this application, as emissions do not exceed 10 tons/yr. Facility not subject to Reg 2-2-302.

CEQA

The project is considered to be ministerial under the Districts proposed 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 and therefore is not discretionary as defined by CEQA. This project is in compliance with Chapter 9.2 of the permit handbook.

Compliance

District Rules and Regulations Applicable Requirements: Soil vapor extraction operations are subject to Regulation 8-47 (Air Stripping and Soil Vapor Extraction Operations). Based on the information submitted, this operation is expected to be in compliance with Regulation 8-47-301, Emission Control Requirements, Specific compounds, and 8-47-302, Organic. The POC emissions will be vented through a thermal catalytic oxidizer system at all times of operation, which will achieve above 90% reduction efficiency.

Prevention of Significant Deterioration, New Source Performance Standards, and National Emissions Standards for Hazardous Air Pollutants are not triggered.

This initial operation site for this project is located less than 1,000 feet from the nearest K-12 school and is therefore subject to the public notification requirements of Regulation 2-1-412. A public notice was prepared and sent to all addresses within 1,000 feet of the SVE system and parents and guardians of students of the following school(s):

Live Oak Charter School
100 Gness Concourse Drive
Petaluma, CA 94952

Permit Conditions

Condition #26627, setting out the operating conditions and recordkeeping requirements for operations at Source S-1 shall be made part of the source's authority to construct/permit to operate.

RECOMMENDATION

The District has reviewed 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. 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. 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 for the following equipment:

- S-1 Soil Vapor Extraction System, Travaini TRO-400S, 400 cfm, abated by A-1,**
- A-1 Thermal Catalytic Oxidizer, TA040, Natural gas, 0.47 MMBtu/hr**

Davis Zhu
Air Quality Engineer

Date

COND# 26627-----

1. The owner/operator shall vent Source S-1 at all times to abatement device A-1, a Thermal Catalytic Oxidizer. Influent vapor flow shall not exceed 400 scfm. [Basis: Cumulative Increase, Regulation 2-5]
2. The owner/operator shall operate A-1 Thermal 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. 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 emit more than 0.02 lb/day of benzene, 0.01 lb/day of ethyl benzene, 0.05 lb/day of toluene, 0.04 lb/day of xylene, or 6.6 lb/day of total precursor organic compound (POC) emissions. [basis: Cumulative Increase, Regulation 2-5, TBACT]
3. While operating the A-1 Thermal/Catalytic Oxidizer in thermal mode, the owner/operator shall not operate A-1 below a minimum operating temperature of 1400 degrees Fahrenheit. While operating the A-1 Thermal/Catalytic Oxidizer in catalytic mode, the owner/operator shall not operate A-1 below a minimum operating temperature of 600 degrees Fahrenheit. [basis: Cumulative Increase, Regulation 2-5, TBACT]
4. To determine compliance with part 3, the owner/operator shall equip the A-1 Thermal Catalytic Oxidizer with continuous measuring and temperature recording instrumentation. The owner/operator 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 Catalytic Oxidizer, the owner/operator of this source 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 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 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 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 shall maintain the following records for each month of operation of the Thermal 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. The owner/operator shall use a portable analyzer to take NO_x and CO emission reading during the start-up. The result shall be submitted to the Engineering Division within 30 days of start-up.
8. The owner/operator 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 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]
9. The owner/operator 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 shall be retained for at least two years following the date the data is recorded. [Basis: Regulation 1-523]
10. Upon final completion of the remediation project, the operator of Sources S-1 shall notify the Engineering Division within two weeks of decommissioning the operation. [Basis: Cumulative Increase, Regulation 2-5, TBACT]