

**Engineering Evaluation  
CalClean, Inc.  
Plant No. 12568  
Application No. 23777**

***Background***

Cal Clean, Inc. has applied for a modification to an existing permit to operate for the following source:

**S-2 Portable Dual Phase Extraction System consisting of a 500 max scfm vacuum blower, and ancillary equipment, abated by A-2 Thermal/Catalytic Oxidizer, 400,000 Btu/hr**

This unit has been permitted under Plant 12568.

The portable soil vapor extraction unit will be operated at the following location:

**301 Payran Street, Petaluma, CA 94952**

This site is within 1000 feet of the outer boundary of

**Live Oak Charter School**  
100 Gness Concourse  
Petaluma, CA 94952.

Therefore, this application requires Public Notification per Reg. 2-1-412 to all schools within ¼ mile of the source. The permit conditions will be amended accordingly.

Other K-12 schools within ¼ mile of the site include the following:

**McKinley Elementary School**  
110 Ellis St  
Petaluma, CA

**San Antonio High School**  
500 Vallejo St.  
Petaluma, CA

**Valley Oaks Alternative High School**  
540 Vallejo St.  
Petaluma, CA

The following information is based on information provided by ECON Consulting to Sonoma County Department of Health Services. This site is located on the northeast corner of Payran

and E. D Street in Petaluma and was formerly Petaluma Fire Station #2. In 1987, a 5000 gallon underground gasoline storage tank was excavated and removed from the site. This tank replaced an older leaking underground storage tank. Soil from the excavation was previously aerated on site and disposed of offsite. Separate-phase hydrocarbons were observed floating on groundwater in the excavation. In February 1988, Total Petroleum Hydrocarbons as gasoline (TPHg), Benzene, Toluene, Ethylbenzene, and Total Zylenes (BTEX) were detected in soil and groundwater collected from the excavation. Starting in 1990, monitoring wells were installed. In March 1992, a groundwater treatment system was installed at the site. Additional monitoring wells were converted to extraction wells in June 1993. The system was decommissioned in 1996. Between January 2000 to present, additional wells were installed and groundwater and soil have been monitored.

Subsequent monitoring has shown lingering concentrations of petroleum hydrocarbons in groundwater beneath the site at levels exceeding cleanup goals, the Environmental Screening Levels established by the San Francisco Bay Regional Water Quality Board.

ECON is proposing to conduct dual phase extraction using five existing wells. The dual phase extraction will last for about 30 days, and may be conducted again based on subsequent monitoring results.

This portable soil vapor extraction unit consists of a regenerative vacuum blower, S-2, with a maximum capacity of 500 scfm. Soil vapor and Groundwater will be extracted with vapor abatement achieved by thermal/catalytic oxidation. Groundwater will be treated by liquid phase carbon or disposed of offsite. The thermal oxidizer is rated at 400,000 BTU/hr and uses propane or LPG as a supplemental fuel. The thermal oxidizer will be equipped with continuous temperature monitoring to ensure that BACT destruction efficiencies are met. Emission monitoring for operation of the equipment will be conducted according to established Source Test methodology. Procedures are outlined in the conditions.

The applicant will be conditioned to provide written notification at the start of each phase of abatement system operation. Operating conditions are worded to ensure that the requirements, and any expressed emission limits of that section are satisfied, through proper notification, source testing, and recordkeeping practices. Regarding emission limits, those of primary concern are the 10 tons per year limit for criteria pollutants, as well as the emission rates corresponding to the acceptable risk level shown in Regulation 2, Rule 5, Table 1.

In accordance with Regulation 2-1-413, the District may issue “a single portable permit which will allow the source to operate anywhere in the District, provided the APCO approves the permit, and the source meets the definition of portable equipment set forth in Section 2-1-220. For Portable Equipment per Regulation 2-1-220.4: “The equipment is not operated within 1000 feet of the outer boundary of any K-12 school site, unless the applicable notice requirements of Health and Safety Code Section 42301.6 have been met. This application satisfies the requirements of Regulation 2-1-220.4.

***Emission Calculations***

**S-1 Soil Vapor Extraction System**

This portable soil vapor extraction unit has an existing Permit to Operate (Plant # 12568, Source 2). The emission calculations from A/N 4918 are as follows:

For a conservative estimate of yearly emissions, we shall assume that the system is operated for an entire year with an inlet concentration corresponding to the soil concentration level as demonstrated in the most recent sample levels. Generalized assumptions follow:

Operating conditions: Pressure = 1 Atm; Inlet Temperature 21° ; 1 mole occupies 24.15L  
Molecular Weight of TPHg = 100 g/mole (value for “weathered gasoline”).  
Molecular Weight of Benzene = 78 g/mole

Influent values based on operational parameters of equipment and applicant supplied soil vapor test results: influent rate 500 scfm,  
Maximum influent TPHg concentration = 5000 ppmv VOC, 100 ppmv Benzene  
Destruction efficiency of Thermal/Catalytic Oxidizer 98.5%

**Emissions of Toxic Air Contaminants (benzene):**

The following emission calculations are based on worst case laboratory test data summarized in Table 6 submitted with the initial permit application for an average site.

$$100E-6 * 500 \text{ ft}^3/\text{min} * 1440 \text{ min}/1 \text{ day} * 28.32 \text{ L}/1 \text{ ft}^3 * 1 \text{ mole}/24.15 \text{ L} * 78/\text{mole} * 1 \text{ lb}/454\text{g} * (1 - 0.985) = 0.218 \text{ lb}/\text{day} \text{ (abated)}$$

Emissions from Laboratory Analysis of Vapor Samples from the Exhaust Stack at this site on 7/6/2004

$$0.032E-6 * 500 \text{ ft}^3/\text{min} * 1440 \text{ min}/1 \text{ day} * 28.32 \text{ L}/1 \text{ ft}^3 * 1 \text{ mole}/24.15 \text{ L} * 78/\text{mole} * 1 \text{ lb}/454\text{g} = 0.0046 \text{ lb}/\text{day} \text{ (abated)}$$
$$(0.0046 \text{ lb}/\text{day}) * 365 \text{ days}/\text{yr} = 1.7 \text{ lb}/\text{yr}$$

Reg 2-5-1 Chronic Trigger level for Benzene = 3.8 lb/year  
Acute (1-hr max) Trigger Level (lb/hr) = 2.9 lb/hr

**Results of Laboratory Analysis of Vapor Samples 7/6/2004**  
**Emissions from exhaust stack**

Stack effluent									Chronic
							Emissions	Emissions	Trigger
	ppm	cfm	MW	lb mole/385 ft3		min/day	lbs/day	lbs/yr	Level
									lbs/yr
<b>Benzene</b>	0.032	558	78.11	2.59E-03	1.00E-06	1440	5.21E-03	1.90E+00	3.80E+00
<b>Toluene</b>	0.026	558	92.14	2.59E-03	1.00E-06	1440	4.99E-03	1.82E+00	1.20E+04
<b>Ethylbenzene</b>	0.024	558	106.71	2.59E-03	1.00E-06	1440	5.34E-03	1.95E+00	4.30E+01
<b>Total Xylene</b>	0.024	558	106.16	2.59E-03	1.00E-06	1440	5.31E-03	1.94E+00	2.70E+04
<b>TRPH</b>	2.8	558	114.22	2.59E-03	1.00E-06	1440	6.67E-01	2.43E+02	
<b>Totals</b>							6.87E-01	2.51E+02	

The exhaust flow rate in cfm is 500 cfm inlet plus 58 cfm from combustion exhaust based on fuel usage of 0.4 MM Btu/hr.

***Total Potential VOC Emissions***

The maximum highest sample concentration level expected from one well is as follows:

$$5000E-6 * 500 \text{ ft}^3/\text{min} * 1440 \text{ min/day} * 28.32 \text{ L}/1 \text{ ft}^3 * 1 \text{ mole}/24.15\text{L} * 100 \text{ g}/\text{mole} * 1 \text{ lb}/454\text{g} * (1 - 0.985) = 13.9 \text{ lb/day (abated)}$$

$$13.9 \text{ lb/day} * 365\text{days}/\text{yr} = 5091 \text{ lbs}/\text{yr} \text{ or } 2.55 \text{ tons}/\text{yr abated}.$$

The concentration of TRPH after abatement for this site is:

$$2.8E-6 * 500 \text{ ft}^3/\text{min} * 1440 \text{ min/day} * 28.32 \text{ L}/1 \text{ ft}^3 * 1 \text{ mole}/24.15\text{L} * 100 \text{ g}/\text{mole} * 1 \text{ lb}/454\text{g} = 0.52 \text{ lb/day (abated)}$$

$$0.52 \text{ lb/day} * 365\text{days}/\text{yr} = 190 \text{ lbs}/\text{yr} \text{ or } 0.095 \text{ tons}/\text{yr abated}.$$

Compounds	Lbm/day	Lbm/year	tons/year
POC	13.9	5091	2.5

**Secondary emissions:**

From Permit Handbook:

RACT for thermal and catalytic oxidizers have been established as:

NO<sub>x</sub> = 0.2 lb/MMBTU  
 CO = 0.8 lb/MMBTU

Emission factors from AP-42, Table 1.4-2 (Natural Gas Combustion)

PM10 = 0.00745 lb/MMBTU  
 SO<sub>2</sub> = 0.00059 lb/MMBTU  
 POC = 0.00539 lb/MMBTU

With these emission factors, the annual emissions from the thermal/catalytic oxidizer can be calculated using the following equation:

$$Es = F \times B \times H$$

Where:

- Es = Annual emissions of 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  
 (ie 24 hr/day x 365 day/yr = 8760 hrs/yr)

	<b>F</b>	<b>B</b>	<b>H</b>	<b>Es</b>		
Pollutant	lb/MMBTU	MMBTU	hrs	lb/yr	tons/yr	lb/day
				F x B x H		
NO <sub>x</sub>	0.2	0.4	8760	700.8	0.350	1.92
CO	0.8	0.4	8760	2803.2	1.402	7.68
PM10	0.00745	0.4	8760	26.105	0.01305	0.0715
SO <sub>2</sub>	0.00059	0.4	8760	2.067	0.0010	0.00567
POC	0.00539	0.4	8760	18.89	0.009	0.0517

**Cumulative Increases**

This portable SVE was previously permitted with Application #4918. However, the combustion emissions from the thermal oxidizer were not included in the Emissions Summary. Therefore, these secondary emissions will be added to the emission inventory for this source with this

application. The expected POC emissions from the SVE are limited by the benzene condition limit.

### ***Toxic Substances***

The emissions of toxic substances listed above will be below the trigger levels listed in Regulation 2, Rule 5, Table 2-5-1. Therefore the emissions of toxic substances are not considered sufficient to warrant a Risk Screen Analysis. In accordance with the District's Regulation 2-5, the impact is then insignificant since the risk is within the threshold of 10 in a million as required for sources implementing TBACT. Therefore, the Toxics Section recommends issuance of the Permit to Operate with a Benzene emission limit of 3.8 lbs/year.

### ***New Source Review***

This proposed project will emit over 10 lbs per highest day if unabated, and therefore, BACT is required. For Soil Vapor Extraction operations, BACT is defined as attainment of set destruction efficiencies corresponding to set influent concentration values. Operation of carbon vessels will be conditioned to ensure attainment of an outlet concentration not to exceed 10 ppmv NPOC. Operation of the Thermal/Catalytic Oxidizer is conditioned to ensure attainment of the following required destruction efficiencies:  $\geq 98.5\%$  if inlet POC  $\geq 2000$ ;  $\geq 97\%$  if inlet POC  $\geq 200$  to  $\geq 2000$ ;  $\geq 90\%$  if inlet POC  $< 200$  ppmv.

Offsets are not required as annual emissions will not exceed 10 tons.

### ***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 Chapters 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 Requirement, Specific Compounds. The benzene, ethylbenzene, toluene and xylene emissions shall be vented through a Thermal Oxidizer/Catalytic Oxidizer at all times of operation.

***Recommendation:***

Recommend that the conditions be changed for the following source:

**S-2 Portable Dual Phase Extraction System consisting of a 500 max scfm vacuum blower, and ancillary equipment, abated by A-2 Thermal/Catalytic Oxidizer, 400,000 Btu/hr**

COND# 19779 -----

1. The operator of this source shall notify the District at least 3 days prior to start-up of operation at any new location. The notification shall include:

- a. Application Number (4918 and 23777) and Plant Number 12568
- b. Street address, including zip code, for the location where the equipment will be operated.
- c. The name and telephone number of a contact person where the equipment will be operated.
- d. The date of initial start-up and estimated duration of operations at that location.
- e. The distance from the source to the outer boundary of the nearest K-12 school, or indication that the distance is greater than 1500 feet.

In the event that the start-up is delayed less than 5 days, the operator may provide telephone notice of said change to the assigned Plant Engineer in the Permit Services Division. If the start-up is delayed more than 5 days, written notification must

be resubmitted.

2. This equipment shall not remain at any single location for a period in excess of 12 consecutive months, following the date of initial operation except as allowed under Section 2-1-220.10. If this portable equipment remains at any fixed location for more than 12 months, the portable permit will automatically revert to a conventional permanent location permit and will lose its portability. [Basis: Regulation 2-1-220.2]
3. This portable equipment, S-2, shall operate at all times in conformance with the eligibility requirements set forth in Regulation 2-1-220 for portable equipment.
4. This equipment is not to be operated within 1000 feet of the outer boundary of any K-12 school. Such operation will require the submittal of an application for a revised permit to operate so that the applicable requirements of the California Health and Safety Code Section 42301.6 may be met. These notification requirements have been satisfied for operation at 301 Payran St., Petaluma, CA 94952
5. This equipment shall be used exclusively for the removal of non-chlorinated volatile organic compounds associated with petroleum products from extracted soil vapor. This shall be demonstrated by onsite sampling required in condition 10 below.
6. Precursor Organic Compound (POC) emissions from Source S-2 shall be abated by Abatement device A-2, Dual-mode oxidizer, during all periods of operation. Soil vapor flow rate shall not exceed 500 scfm. [Basis: Regulation 8-47-301.1,2]



7. The POC abatement efficiency of abatement device A-2 shall be maintained at a minimum of 98.5% by weight for inlet POC concentrations greater than or equal to 2000 ppmv (measured as C6). For inlet concentrations below 2000 ppmv and greater than or equal to 200 ppmv, a minimum abatement efficiency of 97% shall be maintained. For inlet concentrations below 200 ppmv, a minimum abatement efficiency of 90% shall be maintained. The minimum abatement efficiency shall be waived if outlet POC concentrations are shown to be less than 10 ppmv (measured as C6). In no event shall benzene emissions to the atmosphere exceed 3.8 pounds per year.

8. While operating as a thermal oxidizer, the minimum operating temperature of A-2 shall not be less than 1400 degrees Fahrenheit. While operating as a catalytic oxidizer, the minimum operating temperature of A-2 shall not be less than 600 degrees Fahrenheit.

9. To determine compliance with Condition Number 8, the dual-mode oxidizer shall be equipped with continuous measuring and temperature recording instrumentation. The temperature data collected from the temperature recorder shall be maintained 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.

10. To determine compliance with Condition 7, within 24 hours after start-up of the thermal/catalytic oxidizer at any new location, and within 24 hours of conversion from thermal to catalytic mode at an existing location, the operator of this source shall:

a. Analyze the inlet gas to determine

the vapor 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 soil vapor flow rate shall be decreased, if necessary, to demonstrate compliance with Condition 7.

d. Calculate the POC abatement efficiency based on the inlet and outlet gas sampling analysis. For the purpose of determining compliance with condition 7, the POC concentration shall be reported as hexane.

e. Submit to the District's Permit Services Division the test results and emission calculations within one month from the testing date.

Samples shall be analyzed according to modified EPA test methods 8015 and 8021 or their equivalent to determine the concentrations of POC and benzene.

11. Within 30 days from the completion of each treatment operation at a given location, the operator of this source shall provide the assigned Plant Engineer in the Permit Services Division with a summary showing the following information:

a. The dates and total number of days that the equipment was at that location and the dates, and total number of days that the equipment was operated at that location.

b. A summary of the abatement efficiency and benzene emission rate

as determined and reported in the start-up sampling report required by condition 10e above.

c. The results of any additionally performed emission test, analysis, or monitoring result logged in for the day of operation they were taken.

d. The total throughput of contaminated soil vapor processed by S-2 at that location (indicated in cubic feet).

e. The total emissions of benzene at that location based on the sampling results required by conditions 10 above (indicated in pounds).

12. Within 30 days after the end of every calendar year, the operator of this source shall provide the assigned Plant Engineer in the Permit Services Division a year end summary showing the following information:

a. The location(s) at which the equipment was operated including the dates operated at each location.

b. The total throughput of contaminated soil vapor for the previous four quarters (indicated in cubic feet).

c. The total benzene emissions for the previous four quarters (indicated in pounds). [Basis: Regulation 1-523]

13. The 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 Permit to Operate. All measurements, records and data required to be maintained by the operator shall be retained for at least two years following the date the data is recorded. [Basis: Regulation 1-523]

14. Any non-compliance with these conditions

shall be reported to the Compliance and Enforcement Division at the time that it is first discovered. The submittal shall detail the corrective action taken and shall include the data showing the exceedance as well as the time of occurrence.

By \_\_\_\_\_ Date \_\_\_\_\_

Judith A. Cutino, PE  
Senior Air Quality Engineer