

DRAFT

Engineering Evaluation Pacific States Environmental Contractors Plant No. 19559 Application No. 20111

Pacific States Environmental Contractors has applied for an authority to construct and permit to operate the following equipment located at **95 John Street, Tomales, CA 94971**.

- S-1 Soil Vapor Extraction system consisting of a Rotron Regenerative Blower, Model DR6, 225 cfm abated by**
- A-1 SVE Abatement System consisting of Carbon Adsorption System, Carbtrol, Two-2,000 lb carbon capacity vessels containing granulated activated carbon connected in series or a Catalytic Oxidizer.**

Background

This site was formerly a creamery. A 550-gallon gasoline underground storage tank and a 3,200-gallon furnace oil underground storage tank were removed from the site in September 1995. Soil samples taken during the storage tank removal showed petroleum hydrocarbons. The San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) required remediation of groundwater impact at this site. Air sparging with ozone has occurred at this site since October 2008. The following maximum concentrations in groundwater were reported from testing in July 2003: TPH-gasoline – 12,000 µg/L, Benzene 64 µg/L, Ethyl Benzene 340 µg/L, Toluene 210 µg/L, Xylene – 320 µg/L. The Contamination Reduction Plan, developed by Pacific States environmental Contractors, Inc dated November 11, 2004, recommended both air sparging and soil vapor extraction to remove residual petroleum hydrocarbons from both the groundwater and the vadose zone soil.

The project will include two horizontal soil vapor extraction lines, with a 225 cfm blower exhausting the vapor through an air/water separator to two – 2000 lb carbon adsorption vessels. If the system produces water, then extracted water will be stored onsite and disposed of quarterly at a disposal facility. Vapor condensate will be collected in a liquid/vapor separator tank with a 7 gallon capacity. This separator tank has a capacity of less than 260 gallons and is exempt from permit requirements according to 2-1-123.1.

The process includes both air sparging and soil vapor extraction to remove residual product from both the groundwater and the vadose zone. Air sparging is intended to volatilize lower weight petroleum hydrocarbons and to provide oxygen for enhanced biological degradation. Ozone is added to the sparging air for in-situ chemical oxidation. The process consists of a combination of in-situ air stripping, where dissolved contaminants are extracted from the groundwater into air bubbles, and chemical oxidation. The extracted contaminants are chemically oxidized in-situ

within a gas/gas reaction in the presence of ozone containing gas bubbles. The high residual concentration of oxygen also supports enhanced biodegradation to remove contaminants.

The air/ozone flow rates are 130 scfh or approximately 2 to 3 cfm. The concentration of ozone is 1750 ppmv. The maximum ozone emissions are less than 1 lb/day before accounting for reaction with soil organic compounds. Therefore this process is exempt from permit requirements by Regulation 2-1-128.17, Exemption, Miscellaneous Equipment.

The permit conditions for the SVE abatement system will include the option to switch from carbon adsorption to catalytic oxidation. The applicant will be conditioned to provide written notification at the start of either abatement system. The carbon unit influent and effluent VOC concentrations will be monitored with a portable flame-ionization detector (OVA-FID) on a schedule reflecting current loading rates and predicted carbon capacity. To ensure proper operation of equipment and to verify attainment of steady-state conditions, carbon performance will be monitored weekly for the initial period. The owner/operator may then elect to change their monitoring schedule based on measured influent concentrations and calculated carbon loading. Monitoring schedule changes will be allowed only after District review of concentration measurements and subsequent receipt of District approval. If a catalytic oxidizer is subsequently used, it will be required to achieve a minimum abatement efficiency of 98.5% for inlet POC concentrations equal or above 2000 ppmv. A minimum operating temperature of 600 degrees Fahrenheit must be maintained, and the unit must be equipped with continuous measuring and temperature recording instrumentation.

This source is located within 1000 feet of a school: **Tomales Elementary School, 40 John Street, Tomales, CA 94971**; therefore, this application requires Public Notification per Reg. 2-1-412. A Public Notice was prepared and sent out to the home address of the students of the school and to each address within a radius of 1,000 feet of the source.

Emission Calculations:

S-1 Soil Vapor Extraction System

For a conservative estimate of yearly emissions, assume that the system is operated for an entire year with an inlet concentration corresponding to the soil concentration level as demonstrated by the most recent vapor sample levels, documented by samples submitted to TestAmerica Lab, Inc. Generalized assumptions follow:

Operating conditions: Pressure = 1 Atm; Inlet Temperature 21° 1 mole occupies 24.15L
Molecular Weight of Total Petroleum Hydrocarbons = 100 g/mole.

Influent values based on operational parameters of equipment and applicant supplied soil vapor test results: influent rate 225 cfm, maximum influent Gasoline Range Organics (GRO) C5-C12 concentration = non-detectable. Reporting Limit = 2.0 ppmv

Destruction efficiency of Carbon Adsorption or electric Catalytic Oxidation equals at least 98.5%

Emissions of Toxic Air Contaminants: The following emission calculations are based on laboratory test data summarized in Table 1 of the permit application,

e.g. Benzene - vapor sample showed non-detectable level. Reporting Limit = 0.50 µg/L
 $<0.50 \mu\text{g/L} (\text{gm}/1\text{E}06 \mu\text{g})(1\text{lb}/453.6 \text{ gm})(28.317 \text{ L}/\text{ft}^3) = 3.12\text{E}-8 \text{ lb}/\text{ft}^3$
 $3.12\text{E}-8 \text{ lb}/\text{ft}^3 (225 \text{ ft}^3/\text{min}) (1440 \text{ min}/\text{day})(365 \text{ days}/\text{yr}) (1-0.985) = 5.54\text{E}-2 \text{ lb}/\text{yr abated}$
 $1.52\text{E}-4 \text{ lbs}/\text{day abated}$

Reg 2-5-1 Chronic Trigger level for Benzene = 6.4 lb/year

Table 1 Toxic and POC Emissions

	ug/L	ft3/min	lb/gm	g/ug	min/day	L/ft ³	lb/day	lb/day	lb/yr	lb/yr abated	Trigger Level lbs/yr
	RL							98.5%	unabated	98.5%	
Benzene	0.5	225	2.20E-03	1.00E-06	1440	28.317	1.01E-02	1.52E-04	3.69E+00	5.54E-02	6.4
Toluene	0.5	225	2.20E-03	1.00E-06	1440	28.317	1.01E-02	1.52E-04	3.69E+00	5.54E-02	1.20E+04
Total xylenes	1	225	2.20E-03	1.00E-06	1440	28.317	2.02E-02	3.03E-04	7.38E+00	1.11E-01	2.70E+04
Ethylbenzene	0.5	225	2.20E-03	1.00E-06	1440	28.317	1.01E-02	1.52E-04	3.69E+00	5.54E-02	7.70E+04
MTBE	5	225	2.20E-03	1.00E-06	1440	28.317	1.01E-01	1.52E-03	3.69E+01	5.54E-01	3.60E+02
	ppmv	mole/L	ft3/min	lb/gm	g/mole	min/day	L/ft ³	lb/day	lb/day	lb/yr	lb/yr abated
	RL								98.5%	unabated	98.5%
Gasoline Range Organics ppmv	2.00E-06	0.0414	225	2.20E-03	1.00E+02	1440	28.32	1.67E-01	2.51E-03	6.11E+01	9.17E-01
Air sparge – Ozone	1.75E-03	0.0414	2	2.20E-03	4.80E+01	1440	28.32	6.25E-01		2.28E+02	

Total Potential VOC Emissions

The highest sample concentration levels from one well are as follows:

e.g. Gasoline Range Organics C5-C12 = non-detect; Reporting Limit = 2.0 ppmv
 $(2.0\text{E}-06)(1\text{lb}/453.6 \text{ gm})(28.317 \text{ L}/\text{ft}^3)(225 \text{ ft}^3/\text{min})(1440\text{min}/\text{day})(1 \text{ mole}/24.15\text{L})(100 \text{ g}/\text{mole}) = 1.67 \text{ E}-01 \text{ lbs}/\text{day unabated}$
 $1.67\text{E}-01 (365 \text{ days}/\text{yr}) (1-0.985) = 0.917 \text{ lb}/\text{yr abated}$
 $2.51\text{E}-03 \text{ lbs}/\text{day abated}$

Secondary emissions:

There are no secondary emissions for the operation of an electric catalytic oxidizer or a carbon adsorption system.

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. Benzene emissions from the SVE system at this site are limited to 0.0175 lbs/day or 6.4 lbs/year.

New Source Review

This proposed project unabated has the potential to emit over 10 lbs per highest day. For Soil Vapor Extraction operations, BACT is defined as attainment of set destruction efficiencies corresponding to set influent concentration values. Operation of carbon adsorption vessels or an electric catalytic oxidizer will be conditioned to meet BACT standards. 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 emissions shall be vented at all times of operation to a carbon adsorption system or a catalytic oxidizer, which will reduce emissions by at least 90 percent by weight.

Vapor condensate will be collected in a liquid/vapor separator tank. The tank has a total volume of 7 gallons capacity. This separator tank has a capacity of less than 260 gallons and is exempt from permit requirements according to 2-1-123.1.

The air sparge process, which includes injecting ozone into the sparge wells, is exempt from permit requirements by Regulation 2-1-128.17, Exemption, Miscellaneous Equipment. The maximum ozone emissions from this process are less than 1 lb/day.

Recommendation:

Recommend that a conditional Permit to Operate be issued for:

S-1 Soil Vapor Extraction System, Rotron Blower, Model DR6, 225 cfm, abated by A-1 SVE Abatement System including Carbon Adsorption, consisting of a minimum of two-200 lb-vessels holding granular activated carbon connected in series or an Electric Catalytic Oxidizer.

Permit Conditions

Condition #24312

1. The owner/operator shall abate the Precursor Organic Compound (POC) emissions from Source S-1 by A-1 SVE Abatement System, consisting of either two (200 lbs minimum capacity) Activated Carbon Vessels arranged in series or a Catalytic Oxidizer, 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 225 cfm. In no event shall the owner/operator emit benzene emissions to the atmosphere exceeding 0.0175 pounds per day. [basis: Cumulative Increase, Regulation. 8-47-301 and 302, TBACT]
2. During operation of the A-1 Activated Carbon Vessels, the owner/operator of this source 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]

3. The owner/operator shall record these monitor readings in a monitoring log at the time they are taken. The owner/operator shall use the monitoring results to estimate the frequency of carbon change-out necessary to maintain compliance with parts 4 and 5, and shall be conducted on a weekly basis. The owner/operator of this source 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 prior to a change to the monitoring schedule. [basis: Cumulative Increase, Regulation 2-5, TBACT]
4. The owner/operator 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]

5. The owner/operator 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]
6. The owner/operator of this source 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 result 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.
 - e. Total throughput of groundwater through Source S-1 in thousands of gallons.The owner/operator shall retain and make available for inspection by the District such records for two years following the date the data is recorded. [basis: Regulation 1-523]
7. The owner/operator shall operate the A-1 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). [basis: Cumulative Increase, Regulation 2-5, TBACT]
8. While operating the Catalytic Oxidizer, the owner/operator shall not operate A-1 below a minimum operating temperature of 600 degrees Fahrenheit. [basis: Cumulative Increase, Regulation 2-5, TBACT]
9. To determine compliance with part 8, the owner/operator shall equip the A-1 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]
10. To determine compliance with part 7, within ten days after start-up of the 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 and the total organic emissions 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 1.
 - d. Calculate the POC abatement efficiency based on the inlet and exhaust gas analysis. For the purpose of determining compliance with part 7, 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]

11. The owner/operator of this source shall maintain the following records for each month of operation of the Catalytic Oxidizer:

- a. Days and hours of operation.
- b. Each emission test, analysis or monitoring result 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]

12. 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]

13. 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]

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]

By _____ Date 5/5/09

Judith A. Cutino, PE
Air Quality Engineer