

**Engineering Evaluation: Soil Vapor Extraction
BSREP II Station (c/o PES Environmental)
301 12th Street, Oakland, CA
Application No. 30324; Plant No. 24621**

Background

On behalf of BSREP II Station on 12th LLC, PES Environmental has applied for an authority to construct to install a soil vapor extraction (SVE) system at the site located at 301 12th Street, CA.

S-1 Soil Vapor Extraction System consisting of a 360 max scfm Blower abated by;

A-1 (2) 2000 lb capacity Granulated Activated Carbon (GAC) Adsorption vessels arranged in series

The proposed SVE unit consists of a vacuum blower (S-1) with a maximum capacity 360 scfm. Soil vapor will be extracted with vapor abatement achieved by two 2,000 lb carbon vessels in series. 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 the operation. Procedures are outlined in the conditions found below. The Carbon unit influent and effluent VOC concentrations will be monitored with a portable photoionization detector (PID) on a schedule reflecting current loading rates and predicted Carbon capacity. Monitoring schedule changes will be allowed only after District review of concentration measurements and subsequent receipt of District approval.

Emission Calculations

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. Generalized assumptions follow:

- Operating conditions: Pressure = 1 Atm; Inlet Temperature = 21°C; 1 mole occupies 24.15L
- Maximum flow rate capacity of 360 cfm is used in the calculations. Expected concentrations of organic compounds at the proposed site can be seen in Table 1. These concentrations were taken from laboratory analysis reports done on soil vapor samples at the facility.
- Applicant has committed to an overall abatement efficiency of 99.1 % for A-1 (2) – 2,000 lb GAC Adsorbers in series. This efficiency will be enforced with an effluent threshold placed in the permit conditions.
- Effluent vapor will be monitored with a PID. The vapor will be measured as isobutylene. The threshold for the effluent is based on total concentration (ppmv) of the effluent organic mixture in Table 1. Equation 1 was used to calculate the organic mixture correction factor to isobutylene as seen in Table 2.

$$CF \text{ Mixture} = 1 / \left(\frac{X_1}{CF_1} + \frac{X_2}{CF_2} + \frac{X_3}{CF_3} + \dots + \frac{X_i}{CF_i} \right) \quad (1)$$

$$X_i = \frac{X_i \text{ moles per day}}{\text{Total Moles per day}} \quad (2)$$

X_i is the mole fraction of the individual compounds in the mixture and CF_i is the correction factor for each compound with reference to isobutylene. *Correction factors in RAE PID Handbook were used.

*https://www.raesystems.com/sites/default/files/content/resources/pid_handbook_1002-02.pdf

Table 1 – Emissions from S-1 SVE System

Compound	Influent vapor concentration [µg/m ³]	Influent vapor concentration [ppmv]	Effluent vapor concentration [ppmv]	Unabated Emission [lb/day]	Abated Emission [lb/day]	Abated Emission [lb/yr]
PCE	122,400	17.74	0.160	3.952	0.036	13.0
TCE	128,800	17.65	0.159	4.158	0.037	13.7
Cis 1-2 Dichloroethane	87,095	21.60	0.194	2.812	0.025	9.24
Benzene	20	0.01	0.000	0.001	0.000	0.00
Ethylbenzene	203	0.05	0.000	0.007	0.000	0.02
Xylene	1,411	0.32	0.003	0.046	0.000	0.15
Chloroform	472	0.10	0.001	0.015	0.000	0.05
TPH	100,000	27.16	0.244	3.229	0.029	10.6

Table 2 – S-1 Correction Factor Calculation

	Molecular Weight (MW) [g/mol]	Unabated Emission [lb/day]	Unabated Emission [Gram/day]	Unabated Emission [moles/day]	Mole Fraction X _i	CF	CF Mixture
PCE	165.8	4.0	1794	10.82	0.21	0.57	0.70
TCE	175.4	4.2	1888	10.76	0.21	0.5	
Cis 1-2 Dichloroethane	97.0	2.8	1277	13.17	0.26	0.8	
Benzene	78.11	0.001	0	0.00	0.000	0.53	
EthylBenzene	106.17	0.0	3	0.03	0.001	0.52	
Xylene	106.16	0.0	21	0.19	0.004	0.49	
Chloroform	119.38	0.0	7	0.06	0.001	1	
TPH	88.5	3.2	1466	16.56	0.32	1	
			Total	51.6			

Table 3 – S-1 Corrected Effluent

Compound	CF Mix	Uncorrected Effluent (ppmv)	*Corrected Effluent (ppmv)
Total VOC	0.70	0.76	1.10

$$*Corrected\ Effluent = \frac{Uncorrected\ Effluent}{CF\ Mix}$$

Table 4 – S-1 Criteria Organic Emissions (TPY)

Compound	lb/day	lb/yr	TPY
NPOCs	0.036	13.0	0.006
POCs	0.092	33.7	0.017

Per Regulation 1-234 and 40 CFR 51.100(s)(1), PCE has been determined to have negligible photochemical reactivity and is a non-precursor organic compound (NPOC). All other compounds in Table 1 are precursor organic compounds (POC).

Cumulative Increase

Table 5- Plant Cumulative Emissions

Compound	Current Permitted Emissions, Post 4/5/91 (TPY)	New Emission Increase with A/N 30206 (TPY)	Cumulative Emissions (TPY)
NPOCs	0	0.006	0.006
POCs	0	0.017	0.017

Toxic Risk Screening

Table 6 – S-1 Regulation 2 Rule 5 HRA Trigger Levels

Toxic Pollutant	Abated Emission (lb/hr)	Abated Emission (lb/yr)	Acute Trigger lb/hr	Chronic Trigger lb/yr	HRA required
PCE	1.48E-03	1.30E+01	4.40E+01	1.40E+01	N
TCE	1.56E-03	1.37E+01	-	41	N
Cis 1-2 Dichloroethane	1.05E-03	9.24E+00	-	-	N
Benzene	2.43E-07	2.13E-03	0.006	2.9	N
Ethyl Benzene	2.46E-06	2.15E-02	-	33	N
Xylene	1.71E-05	1.50E-01	49	2.70E+04	N
Chloroform	5.71E-06	5.01E-02	0.33	15	N
TPH	1.21E-03	1.06E+01	-	-	N

With abatement of 99.1% and maximum influent flow rate of 360 cfm, emissions will not exceed toxic trigger levels in Table 2.5.1.

New Source Review

The proposed project will not emit more than 10 lb/day of any criteria pollutant. Facility not subject to Reg 2-2-301. 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

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 compounds. The VOC emissions will be vented through a Carbon adsorption system at all times of operation. Adsorption efficiency and influent flow rates will be enforced by the permit conditions outlined below.

This project is within 1,000 ft from the nearest public school and is therefore subject to the public notification requirements of Regulation 2-1-412. PSD, NSPS, and NESHAPS are not triggered.

Permit Conditions

Permit Condition # XXXXX

1. The owner/operator shall abate the Precursor Organic Compounds (POCs) and Non-Precursor Organic Compounds (NPOCs) emissions from Source S-1 by A-1 SVE Abatement System, consisting of 2 total 2,000 pound Activated Carbon Vessels arranged in series, during all periods of operation. Influent vapor flow shall not exceed 360 scfm. In no event shall the Toxic Air Contaminants (TACs) emissions to the atmosphere from S-1 exceed the respective chronic trigger levels in District's Regulation 2-5, Table 2-5-1. [Basis: Cumulative Increase, Regulation 2-5].
2. 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 the last carbon vessel in each series.
 - b. At the inlet to the last carbon vessel in each series.
 - c. At the outlet of the carbon vessel that is last in each 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 purposes of these permit conditions. [Basis: Cumulative Increase, Regulation 2-5, TBACT]

3. The owner/operator shall log the flow rate of influent vapor flow with these monitor readings at the time they are taken.

4. 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 conditions number 4 and 5, and shall be conducted on a daily basis for the first week of operation. After demonstrating continuous compliance for the first week, the owner/operator may switch to monitoring to a weekly schedule. 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]
5. 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 vessel.
 - b. 10 ppmv or greater (measured as isobutylene)[Basis: Cumulative Increase, Regulation 2-5, TBACT]
6. The owner/operator shall immediately change out the last carbon vessel in each series with unspent Carbon upon detection at each outlet of 1.10 ppmv (measured as isobutylene). [Basis: Cumulative Increase, Regulation 2-5, TBACT]
7. The owner/operator of this source shall maintain the following records for each month of operation of the source:
 - a. The hours and times of operation.
 - b. Each monitor reading or analysis result for the day of operation they are taken.
 - c. The number of carbon beds removed from service.
 - d. Total throughput of soil vapor from source S-1 in Standard Cubic Feet.All measurements, records and data required to be maintained by the owner/operator shall be retained and made available for inspection by the District for at least two years following the date the data is recorded. [Basis: Regulation 1-523]
8. 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]
9. The owner/operator if 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 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 Source 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 for the equipment listed below. However, the proposed source is located within 1000 feet of a school, which triggers the public notification requirements of District Regulation 2-1-412.6. After the comments are received from the public 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 an Authority to Construct for the following source:

S-1 Soil Vapor Extraction System consisting of a 360 max scfm Blower abated by;

A-1 (2) 2000 lb capacity Granulated Activated Carbon (GAC) Adsorption vessels arranged in series

by _____
Ali Roohani

June 15, 2020