Draft Engineering Evaluation
WellTest, Inc
Portable Sources, San Jose, CA 95112
Plant No. 19967
Application No. 722493
Project Description: Portable Soil Vapor Extraction System

Background

WellTest, Inc. has requested a modification to an existing Authority to Construct permit for a portable soil vapor extraction (SVE) unit to modify the equipment and operate within 1,000 feet of a K-12 school.

Current Equipment Descriptions

Current equipment descriptions associated with this project are described below.

S-8 Portable Soil Vapor Extraction System
Make: Rietschle, Model: VLR 400, Max. 275 cfm

Abated By

A-8 Granular Activated Carbon (GAC) Vessels
Two (2) 300-lb. Minimum Capacity GAC Vessels in Series (Total 600 lbs.)
(min. 90.0% abatement efficiency)

Modified Equipment Descriptions

The facility is proposing to operate at 2701 San Pablo Avenue, Oakland, CA 94612-1125. In order to address the high concentration of perchloroethylene (PCE) in the soil on site, the facility proposed a modification to the equipment descriptions.

Modified equipment descriptions associated with this project are described below.

S-8 Portable Soil Vapor Extraction System
Make: Rietschle, Model: VLR 400, Max. 150 cfm

Abated By

A-8 Permanganate-Infused Granular Activated Carbon (GAC) Vessels
Four (4) min. 300 lbs. to max. 400 lbs. Permanganate Infused GAC Vessels in Series (Total 1,200 to 1,600 lbs.)
Make: Carbon Activated Corporation or Equivalent, Model: COL-AA Kmn04 or equivalent
(min. 99.95% abatement efficiency)

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This site is a former dry cleaner. San Francisco Bay Regional Water Quality Control Board first identified this site as a potential contributor to soil vapor issues that led to the closure of McClymonds High School in 2020. Consequential investigation found elevated levels of perchloroethylene (PCE) related to former dry cleaner operations at the site.

Based on the 5-day pilot test, the facility was successful in abating 99.9997% of the PCE concentrations. Subsequent monitoring results showed that high levels of PCE were still present in the subsurface layer.

The facility is proposing to conduct a soil vapor extraction (SVE) operation in order to mitigate potential health risks on site.

The SVE system at this site will consist of one blower with the maximum flow rate of 150 cfm. A flow meter will be installed to ensure that the flow rate is not exceeded. The blower will be abated by three 300-lb. to 400-lb. permanganate-infused granular activated carbon (GAC) vessels (total 1,200 lbs. to 1,600 lbs.) in series.

Emission Calculations

Initial soil vapor data is used to estimate precursor organic compound (POC), non-precursor organic compound (NPOC), and toxic air contaminant (TAC) emissions. It is assumed that the equipment can operate 24 hours a day, 365 days a year. The following assumptions are used to estimate emissions.

- Operating conditions: Pressure = 1 Atm; Inlet Temperature = 21^{o}C; 1 mole occupies 24.15 Liters (or 386.8 ft3/pound-mol).
- Toxic Air Contaminants (TAC) emissions will be based on soil vapor data submitted with this application.
- There will be one SVE system.
- The organic influent flow rate of the SVE system (S-8) will be max. 150 scfm.
- The SVE system (S-8) will be abated by three 300-lb. to 400-lb. permanganate-infused granular activated carbon (GAC) vessels (total 1,200 lbs. to 1,600 lbs.) in series (A-8) pursuant to Regulation 8-47-301.
- The abatement efficiency of 99.95% was proposed by the applicant.
- Emissions are from pilot TO-15 tests completed in December 2024 and March 2025 by Catalyst Environmental Solutions.

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Unabated and abated emissions for the proposed SVE system (S-8) are shown in Table 1 below.

Table 1. Emissions [1] for the SVE System (S-8)						
Pollutant	**CAS #**	**Inlet Conc.** (ug/m3)	**Hourly** (pounds/hour)		**Annual** (pounds/year)	
			Unabated	**Abated [2]**	**Unabated**	**Abated [2]**
GRO C4-C12	N/A	8550545.3	4.8E+00	2.40E-03	4.2E+04	2.10E+01
1,1-difluoroethane	75-37-6	4.3	2.4E-06	1.21E-09	2.1E-02	1.06E-05
1,2,4-Trichlorobenzene	120-82-1	9500	5.3E-03	2.67E-06	4.7E+01	2.34E-02
Acetone	67-64-1	490000	2.8E-01	1.38E-04	2.4E+03	1.20E+00
Benzene	71-43-2	370	2.1E-04	1.04E-07	1.8E+00	9.10E-04
Ethyl chloride (chloroethane)	75-00-3	0.77	4.3E-07	2.16E-10	3.8E-03	1.89E-06
Chloroform	67-66-3	17	9.5E-06	4.77E-09	8.4E-02	4.18E-05
Chloromethane	74-87-3	1.9	1.1E-06	5.33E-10	9.3E-03	4.67E-06
Carbon disulfide	75-15-0	87	4.9E-05	2.44E-08	4.3E-01	2.14E-04
Freon 12 (Dichlorodifluoromethane)	75-71-8	3000	1.7E-03	8.42E-07	1.5E+01	7.38E-03
1,1-Dichloroethene	75-35-4	23000	1.3E-02	6.46E-06	1.1E+02	5.66E-02
1,2-Dichloroethene (cis)	156-59-2	390000	2.2E-01	1.09E-04	1.9E+03	9.59E-01
1,2-Dichloroethene (trans)	156-60-5	6700	3.8E-03	1.88E-06	3.3E+01	1.65E-02
Ethyl benzene	100-41-4	160	9.0E-05	4.49E-08	7.9E-01	3.93E-04
4-Ethyltoluene	622-96-8	83	4.7E-05	2.33E-08	4.1E-01	2.04E-04
n-Hexane	110-54-3	86000	4.8E-02	2.41E-05	4.2E+02	2.11E-01
Isopropyl alcohol (2-Propanol)	67-63-0	9.7	5.4E-06	2.72E-09	4.8E-02	2.38E-05
Methylene Chloride (dichloromethane)	75-09-2	350	2.0E-04	9.82E-08	1.7E+00	8.61E-04
Methyl-tert-butyl ether (MTBE)	1634-04-4	600	3.4E-04	1.68E-07	3.0E+00	1.48E-03
Styrene	100-42-5	1.7	9.5E-07	4.77E-10	8.4E-03	4.18E-06
Tetrachloroethene, Perchloroethylene (PCE), Tetrachloroethylene	127-18-4	6600000	3.7E+00	1.85E-03	3.2E+04	1.62E+01
Toluene	108-88-3	1600	9.0E-04	4.49E-07	7.9E+00	3.93E-03
1,1,1-Trichloroethane (Methyl Chloroform)	71-55-6	12000	6.7E-03	3.37E-06	5.9E+01	2.95E-02
Trichloroethene (TCE)	79-01-6	1200000	6.7E-01	3.37E-04	5.9E+03	2.95E+00
Freon 11 (Trichlorofluoromethane)	75-69-4	4.1	2.3E-06	1.15E-09	2.0E-02	1.01E-05
1,2,4-Trimethylbenzene	95-63-6	28000	1.6E-02	7.86E-06	1.4E+02	6.88E-02
1,3,5-Trimethylbenzene	108-67-8	240	1.3E-04	6.74E-08	1.2E+00	5.90E-04

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Vinyl acetate	108-05-4	3.6	2.0E-06	1.01E-09	1.8E-02	8.85E-06
Vinyl Chloride	75-01-4	17000	9.5E-03	4.77E-06	8.4E+01	4.18E-02
Xylenes	1330-20-7	19000	1.1E-02	5.33E-06	9.3E+01	4.67E-02

Notes:
1. It is assumed that equipment will operate 24 hours a day, 365 days a year.
2. 99.95% abatement efficiency by the GAC and Permanganate systems assumed for all pollutants.

Organic emissions for the proposed SVE system (S-8) are shown in Table 2 below.

Table 2. Abated Organic Emissions for the SVE system (S-8)

Pollutant	Effluent Volumetric Concentration (ppmv)	Hourly Emission Rate (pound/hour)	Daily Emission Rate (pound/day)	Annual Emission Rate (pounds/year)	Annual Emission Rate (ton/year)
POC	7.8	0.003	0.070	25.4	0.013
NPOC	5.3	0.002	0.048	17.5	0.009
Total	13.1	0.005	0.118	42.9	0.022

Notes:
1. It is assumed that equipment will operate 24 hours a day, 365 days a year.
2. Non-Precursor Organic Compounds (NPOCs) have been determined based on Regulation 1-234 and 40 CFR 51.100(s)(1). NPOCs have negligible photochemical reactivity.
3. 99.95% abatement efficiency by the GAC and Permanganate systems is assumed.
4. The effluent volumetric concentrations are measured as methane.
5. The total effluent volumetric concentration will be used to set the Permanganate and GAC vessels breakthrough monitoring condition.

Health Risk Assessment

At first, the applicant proposed the following abatement efficiencies:
- 99.95% for perchloroethylene (PCE)
- 99.00 for trichloroethene (TCE) and vinyl chloride
- 98.50% for all other toxic air pollutants

Table 3 shows the potential emissions from S-8 at the abatement efficiencies initially proposed above.

At the given rates in Table 3, the project total PCE and TCE emissions exceeded the Chronic Trigger Levels in Regulation 2-5, Table 2-5-1. Consequently, the project was subject to a refined Health Risk Assessment (HRA).

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Table 3. Project Toxics Emissions Review - Regulation 2-5						
Pollutant	**CAS #**	**Hourly Emissions** (pound/hour)	**Acute Trigger Level** (pound/hour)	**Annual Emissions** (pound/year)	**Chronic Trigger Level** (pound/year)	**Exceeds A Trigger Level?**
GRO C4-C12	N/A	7.20E-02	N/A	6.31E+02	N/A	N/A
1,1-difluoroethane	75-37-6	3.62E-08	N/A	3.17E-04	N/A	No
1,2,4-Trichlorobenzene	120-82-1	8.00E-05	N/A	7.01E-01	N/A	No
Acetone	67-64-1	4.13E-03	N/A	3.61E+01	N/A	No
Benzene	71-43-2	3.12E-06	1.20E-02	2.73E-02	2.90E+00	No
Ethyl chloride (chloroethane)	75-00-3	6.48E-09	N/A	5.68E-05	1.20E+06	No
Chloroform	67-66-3	1.43E-07	6.60E-02	1.25E-03	1.50E+01	No
Chloromethane	74-87-3	1.60E-08	N/A	1.40E-04	N/A	No
Carbon disulfide	75-15-0	7.33E-07	2.70E+00	6.42E-03	3.10E+04	No
Freon 12 (Dichlorodifluoromethane)	75-71-8	2.53E-05	N/A	2.21E-01	N/A	No
1,1-Dichloroethene	75-35-4	1.94E-04	N/A	1.70E+00	2.70E+03	No
1,2-Dichloroethene (cis)	156-59-2	3.28E-03	N/A	2.88E+01	N/A	No
1,2-Dichloroethene (trans)	156-60-5	5.64E-05	N/A	4.94E-01	N/A	No
Ethyl benzene	100-41-4	1.35E-06	N/A	1.18E-02	3.30E+01	No
4-Ethyltoluene	622-96-8	6.99E-07	N/A	6.12E-03	N/A	No
n-Hexane	110-54-3	7.24E-04	N/A	6.34E+00	2.70E+05	No
Isopropyl alcohol (2-Propanol)	67-63-0	8.17E-08	1.40E+00	7.15E-04	2.70E+05	No
Methylene Chloride (dichloromethane)	75-09-2	2.95E-06	6.20E+00	2.58E-02	8.20E+01	No
Methyl-tert-butyl ether (MTBE)	1634-04-4	5.05E-06	N/A	4.43E-02	1.60E+02	No
Styrene	100-42-5	1.43E-08	9.30E+00	1.25E-04	3.50E+04	No
Perchloroethylene (PCE)	127-18-4	1.85E-03	8.80E+00	1.62E+01	1.40E+01	YES
Toluene	108-88-3	1.35E-05	2.20E+00	1.18E-01	1.60E+04	No
1,1,1-Trichloroethane (Methyl Chloroform)	71-55-6	1.01E-04	3.00E+01	8.85E-01	3.90E+04	No
Trichloroethene (TCE)	79-01-6	6.74E-03	N/A	5.90E+01	4.10E+01	YES
Freon 11 (Trichlorofluoromethane)	75-69-4	3.45E-08	N/A	3.02E-04	N/A	No
1,2,4-Trimethylbenzene	95-63-6	2.36E-04	N/A	2.07E+00	N/A	No
1,3,5-Trimethylbenzene	108-67-8	2.02E-06	N/A	1.77E-02	N/A	No
Vinyl acetate	108-05-4	3.03E-08	N/A	2.66E-04	7.70E+03	No
Vinyl Chloride (chloroethylene)	75-01-4	9.54E-05	8.00E+01	8.36E-01	1.10E+00	No
Xylenes	1330-20-7	1.60E-04	9.70E+00	1.40E+00	2.70E+04	No

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A refined HRA was completed for this project per the requirements of Section 2-5-401. The results from this HRA indicate that the project cancer risk is estimated at 6.0 in a million, the project chronic hazard index (HI) is estimated at 0.0070, and the project acute HI is estimated at 0.00014.

Section 2-5-302 states that the Air District shall deny an Authority to Construct or Permit to Operate for any new or modified source of TACs where the:

- project risk exceeds a cancer risk of 10.0 in a million for projects not located within an Overburdened Community (as defined in Section 2-1-243) or 6.0 in a million for project that are.; or
- chronic hazard index exceeds 1.0; or
- acute hazard index exceeds 1.0.

This project will be located within an Overburdened Community. In accordance with the Air District's Regulation 2-5-301, this source requires TBACT because the estimated source risk exceeds a cancer risk of 1.0 in a million. Since the estimated project cancer risk does not exceed 6.0 in a million and hazard indices do not exceed 1.0, this proposed project complies with the Air District's Regulation 2-5-302 project risk requirements, for projects located in an Overburdened Community, as defined in Regulation 2-1-243.

Permit conditions will require the emissions to be monitored with an FID. However, FID is unable to speciate pollutants. In order to ensure that PCE is continuously abated by 99.95%, the permit conditions will require that all pollutants be abated by 99.95%. The facility agreed to the minimum abatement efficiency requirement of 99.95% for all pollutants.

This project had already passed the HRA at the less stringent abatement efficiencies of 99.95% for PCE, 99.00% for TCE and vinyl chloride, and 98.5% for all other pollutants. Increasing the abatement efficiency to 99.95% for all pollutants will only reduce the project cancer risk and the project chronic hazard index.

Therefore, this project complies with the Air District's Regulation 2-5-302 project risk requirements,
for projects located in an Overburdened Community, as defined in Regulation 2-1-243.

Best Available Control Technology for Toxics (TBACT)

Section 2-5-301 requires Best Available Control Technology for Toxics (TBACT) for any source where the estimated cancer risk is greater than 1.0 in a million.

This project triggers TBACT because the estimated source risk is a cancer risk greater than 1.0 in a million.

A TBACT analysis for mitigating tetrachloroethylene emissions from soil vapor extraction operations was conducted (see discussion in Appendix A) and the most stringent TBACT available

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was determined to be meeting a minimum abatement efficiency of 99.9 percent or an exhaust concentration of 1.0 parts per million by volume (ppmv) of tetrachloroethylene.

The applicant proposed a more stringent control technology than TBACT. Per information provided by the applicant, they proposed abatement system that will be able to meet a minimum abatement efficiency of 99.95 percent. Therefore, the applicant meets both "achieved-in-practice" and "technologically feasible and cost-effective" TBACT.

A permit condition will be imposed requiring that tetrachloroethylene emissions be abated by a minimum of 99.95 percent or an exhaust concentration of 1.0 ppmv.

Cumulative Increase

Cumulative emissions for the facility are shown in Table 4 below.

Table 4. Cumulative Increase

Pollutant	Current Permitted Emissions, Post 4/5/1991 (tons/year)	Application New Emissions Increase (tons/year)	New Cumulative Increase (tons/year)
POC	0.181	-0.168	0.013
NPOC	0.000	0.009	0.009

Current Permitted Emissions (Post 4/5/1991) is obtained from the most recent application for the facility, Application 30992. The Authority to Construct permit for Project 30992 was issued on 08/12/21.

Offsets

Pursuant to Regulation 2-2-302, offsets must be provided for any new or modified source at a site that emits, or is permitted to emit, more than 10 tons per year of precursor organic compounds (POCs) or nitrogen oxides (NO_X). Furthermore, pursuant to Regulation 2-2-303 offsets must be provided for any new or modified source at a major site with a cumulative increase that exceeds 1.0 ton per year of PM_{10}, $PM_{2.5}$, or sulfur dioxide (SO_2).

The site is not expected to have a PTE greater than 10 tons per year of POC or NO_X, nor is the site a major site of PM_{10}, $PM_{2.5}$, and SO_2. Therefore, the requirements of Regulations 2-2-302 and 2-2-303 do not apply.

Best Available Control Technology (BACT)

In accordance with Regulation 2-2-301, Best Available Control Technology (BACT) is triggered for any new or modified source with the potential to emit 10.0 pounds or more per highest day of

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POC, NPOC, nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxides (SO_2), particulate matter less than 10 micrometer (PM_{10}) and particulate matter less than 2.5 micrometer ($PM_{2.5}$).

NPOC and POC emissions are expected to be below 10.0 pounds per day for the SVE system (S-8). Therefore, BACT is not required.

California Environmental Quality Act (CEQA)

CEQA Guidelines § 15330 provides a categorical exemption for minor cleanup actions costing $1 million or less to minimize the release or threat to release hazardous substances. This permit application is for the purpose of mitigating the release of toxic air contaminants into the air. The facility verified in their email correspondence on May 27, 2025 that the proposed soil vapor extraction operation cost is estimated at $550,000 and will not exceed $1 million. Therefore, § 15330 exemption applies to this project.

CEQA Guidelines § 15308 provides a categorical exemption for actions taken by regulatory agencies to assure maintenance and protection of the environment. San Francisco Bay Regional Water Quality Control Board (Water Board) first required environmental investigation at the site for possible subsurface pollution from volatile organic compounds associated with former dry-cleaning operations in 2020 under Section 13267 of the California Water Code. The site also had reasonable potential to be contributing to the detections of perchloroethylene (PCE) in groundwater and soil vapor at McClymonds High School, located hydraulically downgradient from the site. Consequential investigation found elevated levels of PCE related to former dry cleaner operations at the site. As a response to the finding of the investigation required by the Water Board, the facility has proposed the portable soil vapor extraction operation at this site in order to mitigate the potential health impacts to the residents at the site. Therefore, § 15308 exemption applies to this project.

Therefore, this project is classified as categorically exempt from CEQA. Further, based on the review of the permit application materials, including Appendix H, environmental information form, the project will not have any significant environmental impacts, and cumulative impacts from successive projects of the same type in the same place will not result in significant environmental impacts.

Compliance

This project is located within 1,000 feet of the following K-12 school with more than 12 students enrolled:

- McClymonds High School (2607 Myrtle St, Oakland, CA 94607)

Therefore, this project is subject to the school public noticing requirement of the California Health & Safety Code and Regulation 2-1-412.

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In addition, this project is located within the boundaries of an Overburdened Community (OBC) as defined in Regulation 2-1-243 and required an HRA.

Therefore, this also project triggers OBC public notification per Regulation 2-1-412.

A public notice was prepared and sent to all addresses within 1,000 feet of the proposed source and parents and guardians of students of the aforementioned school.

All comments will be responded to in the same manner they are received.

Regulation 8-47-301 requires that any soil vapor extraction operation which emits benzene, vinyl chloride, tetrachloroethene, methylene chloride, and/or trichloroethene shall be vented to a control device which reduces emissions to the atmosphere by at least 90 percent by weight. The facility has proposed installing activated carbon vessels and permanganate vessels with at least 99.95 percent abatement efficiency to reduce emissions. Therefore, this project complies with the requirements of this rule.

The facility is required to keep the pertinent records per condition #100657 pursuant to Regulation 8-47-501.

Prevention of Significant Deterioration (PSD), New Source Performance Standards (NSPS), and National Emission Standards for Hazardous Air Pollutants (NESHAPS) are not triggered.

Permit Conditions

Modified Permit Condition # 27434 for S-6 though S-~~8~~ 7 and A-6 through A-~~8~~7.

1. The operator/operator of the Portable Soil Vapor Extraction Systems (S6 through ~~S8~~S7) shall provide written notification to the Engineering Division at least 3 days prior to startup of operation at any new location. The notification shall include:

    a. Application Number 30992 and Plant Number 19967.
    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 through 12 school, or indication that the distance is greater than 1,000 feet.

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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 Engineering Division. If the startup is delayed more than 5 days, written notification must be resubmitted.
[Basis: Regulation 2-1-413]

2. The owner/operator of S6 through ~~S8~~ S7 shall not operate or retain the sources at any single location for a period in excess of 12 consecutive months, following the date of initial operation. If the portable sources remain at any fixed location for more than 12 months, the multi location permit will automatically revert to a conventional permanent location permit and will lose its portability.
[Basis: Regulations 2-1-403 and 2-1-413]

3. The owner/operator shall operate S6 through ~~S8~~S7, at all times in conformance with the eligibility requirements set forth in Regulation 2-1-413 for portable equipment.
[Basis: Regulation 2-1-413]

4. The owner/operator shall not operate S6 through ~~S8~~ S7 within 1,000 feet of the outer boundary of any other K-12 school, unless the applicable requirements of the California Health and Safety Code Section 42301.6 have been met. This will require the submittal of an application for a revised Permit to Operate.
[Basis: Regulation 2-1-413.3]

5. The owner/operator shall abate the precursor organic compound (POC)/non-precursor organic compound (NPOC) emissions from the portable soil vapor extraction systems (S6~~,~~ and S7~~, S8~~) with the respective Activated Carbon Vessels (A6 and~~,~~ A7~~, A8~~7), each consisting of a minimum of two (2) 300 lb activated carbon vessels in series, during all periods of operation.
[Basis: Regulation 8, Rule 47, Toxics]

6. The influent vapor flow rate for each Portable SVE (S6~~,~~ and S7~~, S8~~) shall not exceed 275 standard cubic feet per minute (scfm).
[Basis: Cumulative Increase, Toxics]

7. In no event shall the toxic air contaminant (TAC) emissions to the atmosphere from S6 and S7~~S6, S7, or S8~~ exceed the trigger levels listed in District Regulation 2-5, Table 2-5-1.
[Basis: Regulation 8, Rule 47, Toxics]

8. Upon initial start-up and start-up at any new location, the owner/operator shall take air samples from S6 through ~~S8~~ S7 for laboratory analysis using EPA Method TO-15. The air samples shall be taken at the following locations:

   a. At the inlet to the first carbon vessel in series.
   b. At the outlet of the carbon vessel that is last in series prior to venting to the atmosphere.

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The owner/operator shall use the results from the laboratory report to calculate TAC emissions emitted to the atmosphere, using the maximum design flowrate of S6 and S7~~S6 through S8~~. The owner/operator shall submit the laboratory report and calculated TAC emissions within 21 days of the initial startup and startup at any new location, to demonstrate compliance with Part 7 of this condition.
[Basis: Regulation 2-1-403]

9. During operation of A6 through ~~A8~~A7, the owner/operator shall monitor with a 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 last carbon vessel in series, prior to venting to the atmosphere.

   [Basis: Regulations 1-523 and 2-1-403]

10. The owner/operator shall conduct monitoring on a daily basis in accordance with Part 9 of this condition. 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 11, and 12 of this condition.

    a. If the owner/operator can demonstrate two (2) weeks of consecutive daily monitoring readings less than or equal to 10% of the inlet stream, the monitoring frequency may be reduced to weekly.
    b. After the monitoring frequency has been reduced to weekly, if the owner/operator can demonstrate one (1) month of consecutive weekly monitoring readings less than or equal to 10% of the inlet stream, the monitoring frequency may be reduced to once every two (2) weeks.
    c. After the monitoring frequency has been reduced to once every two (2) weeks, if the owner/operator can demonstrate one (1) month of consecutive bi-weekly readings less than or equal to 10% of the inlet stream, the monitoring frequency may be reduced to monthly.
    d. If any subsequent results from monitoring exceed 10% of the inlet stream, the owner/operator shall revert to daily monitoring. If monitoring reverts back to daily, the owner/operator may reduce the monitoring frequency in accordance with Parts 10a through 10c of this condition.

    [Basis: Cumulative Increase, Toxics, and Regulations 1-523 and 2-1-403]

11. The second to last carbon vessel shall be immediately changed out with unspent carbon upon breakthrough, defined as the detection at its outlet in excess of the higher of the following limits:

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a. 10 % of the inlet stream concentration to the carbon bed.
b. 35 ppmv (measured as methane).

[Basis: Cumulative Increase and Regulations 1-523 and 2-1-403]

12. The last carbon vessel shall be immediately changed out with unspent carbon upon detection at its outlet of 10.5 ppmv or greater (measured as methane).
[Basis: Cumulative Increase and Regulations 1-523 and 2-1-403]

13. The owner/operator of S6 and S7~~S6 through S8~~ shall maintain the following information for each month of operation:

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. Benzene, 1,2-Dichloroethane, Ethylbenzene, Tetrachloroethylene, Toluene, Xylenes (total), and other measured toxic air contaminant emissions in pounds.
d. The number of carbon vessels removed from service.

Such records shall be retained and made available for inspection by the District for two (2) years following the date the data is recorded.

[Basis: Recordkeeping]

14. Within 30 days after the end of every calendar year, the operator of S6 and S7~~S6 through S8~~ shall provide the assigned Plant Engineer in the Engineering 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 (4) quarters (indicated in cubic feet).
c. Benzene, 1,2-Dichloroethane, Ethylbenzene, Tetrachloroethylene, Toluene, Xylenes (total), and other measured toxic air contaminant emissions for the previous four (4) quarters (indicated in pounds).

[Basis: Regulation 1-523]

15. The owner/operator of S6 through S8 shall report any noncompliance 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: Regulation 2-1-403]

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16. The owner/operator of S6 ~~through S8~~and S7 shall maintain a file containing all measurements, records and other data that are required to be collected pursuant to the various provisions of this condition. All measurements, records and data required to be maintained by the operator shall be retained for at least two (2) years following the date the data is recorded. [Basis: Regulation 1-523]

17. Upon final completion of the remediation project, the operator of S6 and S7~~S6 through S8~~ shall notify the Engineering Division within two weeks of decommissioning the operation. [Basis: Regulation 2-1-403]

Permit Condition # 100657 for S-8 and A-8.

1. The operator/operator of the Portable Soil Vapor Extraction (SVE) System shall provide written notification to the Engineering Division at least 3 days prior to startup of operation at any new location.

   The notification shall include:

   a. Application Number 722493 and Plant Number 19967.

   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 through 12 school, or indication that the distance is greater than 1,000 feet.

   f. A verification that the source will not be operating within an overburdened community as defined in Regulation 2, Rule 1, Section 243 per the following Air District webpage:

   https://www.baaqmd.gov/about-air-quality/interactive-data-maps

   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 Engineering Division. If the startup is delayed more than 5 days, written notification must be resubmitted.

   [Basis: Regulation 2-1-413]

2. The owner/operator of S-8 shall not operate or retain the sources at any single location for a period in excess of 12 consecutive months, following the date of initial operation. If the portable sources remain at any fixed location for more than 12 months, the multi-location

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permit will automatically revert to a conventional permanent location permit and will lose its portability. [Basis: Regulations 2-1-403 and 2-1-413]

3. The owner/operator shall operate S-8, at all times in conformance with the eligibility requirements set forth in Regulation 2-1-413 for portable equipment.
   [Basis: Regulation 2-1-413]

4. The owner/operator shall not operate S-8 within 1,000 feet of the outer boundary of any K through 12 school or within an overburdened community as defined in Regulation 2, Rule 1, Section 243, unless the applicable requirements of the California Health and Safety Code Section 42301.6 and Regulation 2, Rule 1, Section 412 have been met. This will require the submittal of an application for a revised Permit to Operate.

   [Basis: Regulation 2-1-413.3]

5. The owner/operator shall not operate S-8 within an overburdened community as defined in Regulation 2, Rule 1, Section 243, unless the applicable requirements of the Regulation 2, Rule 1, Section 412 have been met. This will require the submittal of an application for a revised Permit to Operate.

6. The influent vapor flow rate shall not exceed 150 standard cubic feet per minute from the blower of the Portable Soil Vapor Extraction System (S-8) system.
   [Basis: Cumulative Increase, Regulation 2-5]

7. The owner/operator of S-8 shall abate all precursor organic compound (POC) and non-precursor organic compound (NPOC) emissions from each Portable Soil Vapor Extraction System with the permanganate vessel and granular activated carbon vessel (GAC) during all periods of operation as follows:

   S-8 Portable SVE system shall be abated by four (4) min. 300-lb. to max. 400-lb. permanganate-infused granular activated carbon (GAC) vessels (total 1,200 lbs. to 1,600 lbs.) in series (A-8).
   [Basis: Regulations 8-47-301 and 8-47-302 and Regulation 2-5]

8. The owner/operator of the abatement system (A-8) shall maintain the abatement efficiency at a minimum of 99.95 percent by weight for total organics (sum of POC and NPOC) or a maximum outlet total organics (sum of POC and NPOC) concentration of 1.0 ppmv (measured as methane).
   [Basis: Cumulative Increase, Regulations 8-47-301 and 8-47-302, and Regulation 2-5]

9. The owner/operator of S-8 shall abate perchloroethylene / tetrachloroethylene (PCE) emissions by a minimum of 99.95 percent by weight or a maximum exhaust concentration of 1.0 ppmv as tetrachloroethylene.
   [Basis: Regulation 2-5, TBACT]

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10. In no event shall the owner/operator of S-8 emit more than 17 pounds perchloroethylene / tetrachloroethylene (PCE) emissions in any consecutive twelve-month period.
[Basis: Regulations 8-47-301, 8-47-302, Regulation 2-5]

11. Except for perchloroethylene (PCE), the owner/operator of S-8 shall not emit any toxic air contaminant in quantities that exceed the trigger levels listed in Air District Regulation 2-5, Table 2-5-1.
[Basis: Regulation 2-5]

12. The owner/operator shall not emit from the SVE system (S-8) more than 26 pounds of precursor organic compounds (POC) and 18 pounds of non-precursor organic compounds (NPOC) per 12-month consecutive period. [Basis: Cumulative Increase]

13. Upon initial start-up at any new location, the owner/operator shall take air samples from the SVE system (S-8) for laboratory analysis using EPA Method TO-15. The air samples shall be taken at the following locations:
a. At the inlet to the first vessel in series.
b. At the outlet of the last vessel in series prior to venting to the atmosphere.
[Basis: Regulation 2-1-403, Regulation 2-5, Regulation 8-47-301]

14. The owner/operator shall use the results from the laboratory report from Part 15 to calculate the following:
    a. POC and NPOC emissions to demonstrate compliance with Part 12.
    b. Total organics (POC and NPOC) abatement efficiency and PCE abatement efficiency or outlet total organics (POC and NPOC) concentration and PCE concentration of the SVE system (S-8) to demonstrate compliance with Parts 8 and 9.
    c. TAC emissions emitted to the atmosphere, using the maximum permitted flowrate of the SVE system (S-8).

    The owner/operator shall submit the laboratory report, abatement efficiency, outlet POC concentration, and calculated POC, NPOC, TAC emissions within 21 days of the initial startup and startup at any new location, to demonstrate compliance with Parts 8 through 12 of this condition.
    [Basis: Regulation 2-1-403, Regulation 2-5]

15. During operation of the abatement device (A-8), the owner/operator shall monitor with a 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 first vessel in series of A-8.
    b. At the inlet to the second vessel in series of A-8.
    c. At the inlet to the third vessel in series of A-8.
    d. At the outlet of the last vessel in series of A-8, prior to venting to the atmosphere.
    [Basis: Cumulative Increase, Regulation 2-5, Regulation 8-47, Regulation 2-1-403]

16. 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

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carbon change-out necessary to maintain compliance with Parts 6 through 12 of this condition and shall be conducted on a daily basis.

a. If the owner/operator can demonstrate one (1) month of consecutive daily monitoring readings where the sum of monitoring results of the SVE system (S-8) is lower than 1.0 ppmv, measured as methane, the monitoring frequency may be reduced to weekly.

b. After the monitoring frequency has been reduced to weekly, if the owner/operator can demonstrate one (1) month of consecutive weekly monitoring readings of the SVE system (S-8) is lower than 1.0 ppmv, measured as methane, the monitoring frequency may be reduced to once every two (2) weeks.

c. After the monitoring frequency has been reduced to once every two (2) weeks, if the owner/operator can demonstrate one (1) month of consecutive bi-weekly readings where the monitoring results of the SVE system (S-8) is lower than 1.0 ppmv, measured as methane, the monitoring frequency may be reduced to monthly.

If any subsequent results from monitoring where the sum of monitoring results of the portable SVE system (S-8) exceed 1.0 ppmv, measured as methane, the owner/operator shall revert to daily monitoring. If monitoring reverts back to daily, the owner/operator may reduce the monitoring frequency in accordance with Parts 16(a) through (c) of this condition.
[Basis: Cumulative Increase, Toxics, and Regulations 8-47 and 2-1-403]

17. The owner/operator shall maintain the following information for each month of operation:
    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. Total throughput of soil vapor from the portable SVE system (S-8) in standard cubic feet.

    Such records shall be retained and made available for inspection by the Air District for two (2) years following the date the data is recorded.
    [Basis: Recordkeeping]

18. During the operation of the abatement devices, the first vessel of each abatement system (A-8) shall be immediately changed out with unspent permanganate infused granular activated carbon upon breakthrough, defined as the detection at the outlet of the permanganate vessel in excess of the higher of the following limits:
    a. 0.05 % of the inlet stream concentration to the first carbon bed.
    b. 1.0 ppmv (measured as methane).
    [Basis: Cumulative Increase, TBACT, Regulation 8-47]

19. During the operation of the abatement devices, the second vessel of each abatement system (A-8) shall be immediately changed out with unspent permanganate infused granular activated carbon upon breakthrough, defined as the detection at the outlet of the permanganate vessel in excess of the higher of the following limits:
    a. 0.05 % of the inlet stream concentration to the first carbon bed.

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b. 1.0 ppmv (measured as methane).
[Basis: Cumulative Increase, TBACT, Regulation 8-47]

20. During the operation of the abatement devices, the third vessel of each abatement system (A-8) shall be immediately changed out with unspent permanganate infused granular activated carbon upon breakthrough, defined as the detection at the outlet of the permanganate vessel in excess of the higher of the following limits:
a. 0.05 % of the inlet stream concentration to the first carbon bed.
b. 1.0 ppmv (measured as methane).
[Basis: Cumulative Increase, TBACT, Regulation 8-47]

21. During the operation of the abatement devices, the last vessel of each abatement system (A-8) shall be immediately changed out with unspent permanganate infused granular activated carbon upon breakthrough, defined as the detection at the outlet of the permanganate vessel in excess of the higher of the following limits:
a. 0.05 % of the inlet stream concentration to the first carbon bed.
b. 1.0 ppmv (measured as methane).
[Basis: Cumulative Increase, TBACT, Regulation 8-47]

22. The owner/operator shall report any noncompliance 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: Regulation 2-1-403]

23. 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 condition. All measurements, records and data required to be maintained by the operator shall be retained for at least two (2) years following the date the data is recorded.
[Basis: Regulation 8-47]

24. Within 30 days after the end of every calendar year, the operator of S-8 shall provide the assigned Plant Engineer in the Engineering 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 (4) quarters (indicated in cubic feet).
c. Tetrachloroethylene, trichloroethene, vinyl chloride, and other measured toxic air contaminant emissions for the previous four (4) quarters (indicated in pounds).
[Basis: Regulation 1-523]

25. Upon final completion of each remediation project, the operator shall notify the Engineering Division within two weeks of decommissioning the operation.
[Basis: Regulation 2-1-403]

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End of Conditions

Recommendation

The Air 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 Air 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 will be located within 1,000 feet of a K-12 school and within an Overburdened Community and required a Health Risk Assessment which triggers public notification requirements per Regulation 2-1-412. After the comments are received from the public and reviewed, the Air District will make a final determination on the permit.

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

S-8 Portable Soil Vapor Extraction System
Make: Rietschle, Model: VLR 400, Max. 150 cfm

Abated By

A-8 Permanganate-Infused Granular Activated Carbon (GAC) Vessels
Four (4) min. 300 lbs. to max. 400 lbs. Permanganate Infused GAC Vessels in Series (Total 1,200 to 1,600 lbs.)
Make: Carbon Activated Corporation or Equivalent, Model: COL-AA Kmn04 or equivalent
(min. 99.95% abatement efficiency)

Youjin Kim, Air Quality Engineer
May 30, 2025

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Appendix A

TBACT Determination

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Per Section 2-5-205, TBACT is defined as the most stringent of the following emission controls, provided that under no circumstances shall the controls be less stringent than the emission control required by any applicable provision of federal, State or Air District laws, rules, regulations or requirements:

- the most effective emission control device or technique which has been successfully utilized for the type of equipment comprising such a source; or
- the most stringent emission limitation achieved by an emission control device or technique for the type of equipment comprising such a source; or
- any control device or technique or any emission limitation that the Air District has determined to be technologically feasible for the type of equipment comprising such a source, while taking into consideration the cost of achieving emission reductions, any non-air quality health and environmental impacts, and energy requirements; or
- the most stringent emission control for a source type or category specified as Maximum Achievable Control Technology (MACT) by the United States Environmental Protection Agency (EPA) or specified in an Air Toxics Control Measure by the California Air Resources Board.

These requirements are generally categorized as either technologically feasible (considering costs) or achieved-in-practice.

Because achieved-in-practice is required regardless of cost considerations and what may be technologically feasible should be more stringent, an evaluation for what has been achieved-in-practice is first conducted.

Achieved-in-Practice Evaluation

To understand what has been achieved in practice for controlling chlorinated volatile organic compounds including tetrachloroethene (PCE), trichloroethene (TCE), and vinyl chloride (VC) emissions from soil vapor extraction, the following sources of information were reviewed:

- Air District BACT/TBACT Workbook,
- Air District-issued Permits to Operate,
- Regulations (Air District, other California air districts),
- California Air Resources Board (CARB) BACT Clearinghouse, and
- U.S. EPA RACT/LAER/BACT Clearinghouse.

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BACT / TBACT Workbook

The BACT Workbook's Section 9 pertains to soil/water remediation sources and includes a section for:

- "Soil Vapor Extraction", Document # 151A.1, dated 06/16/95.

The determinations listed for POC and NPOC and emissions are shown in Table A-1.

Table A-1. *BACT/TBACT Workbook POC and NPOC Determinations for Soil Vapor Extraction*

Pollutant	Achieved in Practice [1]	Typical Technology
POC	≤ 10 parts per million by volume (ppmv) at outlet of control device; or ≥ 98.5% capture/destruction efficiency	Two or more activated carbon canisters in series or thermal oxidizer
NPOC	≤ 10 ppmv at outlet of control device; or ≥ 95% capture/destruction efficiency	Two or more activated carbon canisters in series or thermal oxidizer

Note:
1. These are listed as technology feasible. However, the guideline was published in 1995 and a review of Air District issued permits identified that these limits have been imposed with compliance demonstrated through initial and on-going monitoring.

Air District-Issued Permits to Operate

A review of Air District-issued Permits to Operate (via a search for "tetrachloroethylene" within issued permit conditions) was conducted and identified seventy (71) soil remediation permits with tetrachlorethylene limits. Of these, non-soil vapor extraction sources were excluded as well as any sources that have not yet been constructed. Table A-2 lists identified tetrachloroethylene limits for soil vapor extraction (SVE) operations.

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Table A-2. *Air District Permits for Soil Vapor Extraction Operations with Tetrachloroethylene Limits*

Plant	Facility	Application	Capacity (SCFM)	Limit	Abatement	
					Technology	Efficiency
21398	Snow Cleaners, Inc	25084	100	0.109 lb/day	2 (2000 lbs) Carbon Vessels, 3 (400 lbs) Potassium Permanganate Vessels	99.0%
24365	Posada De Colores-The Unity Council	29807	225	0.28 ppmv (1), (2)	2 (350 lbs) Carbon Vessels	90.0%
24476	Pangea Environmental Services Inc	30024	180	0.7 ppmv (1), (2)	2 (200 lbs) Carbon Vessels	90.0%
24482	Filice Lansford Development Corporation	30048	800	0.08 ppmv (1), (2)	2 (3000 lbs) Carbon Vessels	98.5%
24517	Advanced Geo Inc	30098	250	0.68 ppm (1)	2 (1000 lbs) Carbon Vessels	98.5%
24580	RRM, Inc	30241	95	0.65 ppmv (1), (2)	2 (200 lbs) Carbon Vessels	90.0%
24719	KIMCO Realty	30560	1000	192 lbs/year	2 (10,000 lbs) Carbon Vessels	90.0%
25063	Campus Bay Soil Vapor Extraction System	31369	450	0.35 ppmv (1)	1 (1000 lbs) Zeolite Vessel 2 (1000 lbs) Carbon Vessels	90.0%
24836	Bassier-Haynes Building	30867	360	0.16 ppmv (1), (2)	2 (200 lbs) Carbon Vessels	90.0%
Multiple	Multiple (22 facilities identified)	Multiple	65 to 500	0.049 lb/day (2)	2 (200 lbs) Carbon Vessels	90.0%
Multiple	Multiple (9 facilities identified)	Multiple	50 to 1850	0.082 lb/day (2)	2 (200 lbs) Carbon Vessels	90.0%

Notes:
1. Concentration limit is "as tetrachloroethylene".
2. Limit imposed to avoid Regulation 2, Rule 5 requirements based on the annual chronic threshold for tetrachloroethylene in Regulation 2, Rule 5 at the time the permit was issued.

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Regulations

A review of California air district regulations was conducted to identify those districts that have adopted rules addressing organic emissions from soil vapor extraction operations. Table A-3 includes the rules within those air districts that are relevant to soil vapor extraction.

Table A-3. *California Air District Regulations Applicable to Soil Vapor Extraction Operations*

Agency	Regulation / Rule	Applicable Compounds	Limit / Requirement
Amador County Air Pollution Control District	Regulation 9, Rule 903 (Contaminated Soil Remediation) (June 28, 1994)	Organic Compounds	Abated by at least 90 percent by weight
Antelope Valley Air Quality Management District	Regulation 11, Rule 1166 (Volatile Organic Compound Emissions from Decontamination of Soil) (July 14, 1995)	Volatile Organic Compounds	Implement soil decontamination measures, which result in BACT during all segments
Bay Area Air Quality Management District	Regulation 8, Rule 47 (Air Stripping and Soil Vapor Extraction Operations) (June 15, 2005)	Benzene, Vinyl Chloride, Perchloroethylene, Methylene Chloride, and/or Trichloroethylene	Abate by at least 90 percent by weight
		Organic Compounds (greater than 15 pounds per day)	Abate by at least 90 percent by weight
Butte County Air Quality Management District	Regulation 2, Rule 237 (Soil Decontamination) (August 22, 2002)	Volatile Organic Compounds	Installation and operation of a VOC collection and control system for on-site treatment of contaminated soil
Eastern Kern Air Pollution Control District	Regulation 4, Rule 414.2 (Soil Decontamination (Volatile Organic Compounds)) (May 06, 1999)	Volatile Organic Compounds	Installation and operation of a VOC collection and control system for on-site treatment of contaminated soil
Imperial County Air Pollution Control District	Regulation 4, Rule 412 (Soil Decontamination Operations) (January 16, 2001)	Reactive Organic Compounds	ROC abatement efficiency of at least 90 percent

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Agency	Regulation / Rule	Applicable Compounds	Limit / Requirement
Modoc County Air Pollution Control District	Regulation 8, Rule 8.2 (Aeration of Contaminated Soil and Removal of Underground Storage Tanks) (May 1, 1989)	Organic Compounds (excluding methane, carbon monoxide, carbonic acid, metallic carbides or carbonates and ammonium carbonate)	Combined collection and destruction efficiency of 90 percent
Northern Sierra Air Quality Management District	Regulation 9, Rule 906 (Aeration of Contaminated Soil) (May 13, 1992)	Organic Compounds	Reduction by at least 90 percent
Siskiyou County Air Pollution Control District	Regulation 8, Rule 8.2 (Aeration of Contaminated Soil and Removal of Underground Storage Tanks) (January 24, 1989)	Organic Compounds	Reduction by a combined collection and destruction efficiency of 90 percent by weight
South Coast Air Quality Management District	Regulation 11, Rule 1166 (Volatile Organic Compound Emissions from Decontamination of Soil) (May 11, 2011)	Volatile Organic Compounds	Implement soil decontamination measures, which result in BACT during all segments
Tehama County Air Pollution Control District	Regulation 6, Rule 6.2 (Aeration of Contaminated Soil) (February 1, 1994)	Organic Compounds	Combined collection and destruction efficiency of 90% by weight.
Ventura County Air Pollution Control District	Regulation 4, Rule 74.29 (Soil Decontamination Operations) (July 1, 2018)	Reactive Organic Compounds	100 ppmv, as methane

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CARB BACT Clearinghouse

A review of the CARB BACT Clearinghouse resulted in the following determinations for controlling organic emissions from soil vapor extraction operations. Determinations from the Air District are not shown in the table below.

Table A-4. *BACT Determinations from other California Air Districts for Organic Compounds for Soil Remediation / Soil Vapor Extraction*

Agency	Source Category	Document	Achieved in Practice
Sacramento Metro Air Quality Management District	Soil Vapor Extraction with VOC < 10 lbs/day	Determination Number: 287 Dated: 07/06/2021	9.9 lb/day, and VOC ≤ 10 ppmv: no % control required VOC < 200 ppmv: at least 90% control VOC ≥ 200 ppmv and < 2,000 ppmv: at least 97% control VOC ≥ 2000 ppm: at least 98.5% control
San Joaquin Valley Unified Air Pollution Control District	Soil Remediation Operation – Carbon Adsorption	Guideline: 2.1.3 Dated: 09/15/1993	VOC 95% control efficiency for uncontrolled emissions over 2 lbs/day
South Coast Air Quality Management District	Soil Vapor Extraction – Thermal/Catalytic Oxidation (Natural Gas – burner only)	No Identification Dated: 02/01/2019	No entry for organic compounds.

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U.S. EPA RACT/LAER/BACT Clearinghouse

A review of the U.S. EPA RACT/LAER/BACT Clearinghouse resulted in the following comparable determinations:

Table A-5. *EPA RACT/LAER/BACT Determinations for Organic Compounds for Soil Remediation / Soil Vapor Extraction*

RBLC ID	Date	Company / Facility	Process	Abatement / Mitigation Measure		Emission Limit	
			Equipment	Technology / Measure	Abatement Efficiency (percent)	Limit 1	Limit 2
CA-0435	01/15/1991	Tetra Tech inc.	Soil Vapor Extraction System (350 SCFM)	Thermal Oxidizer, AIREX	97.000	1.0000 pounds/day	None
CA-0469	09/27/1990	Thorne Environmental, inc.	Soil Vapor Extraction System (350 SCFM)	Thermal Oxidizer	95.000	5.000 pounds/day	None
CA-0474	11/15/1990	Thorne Environmental, inc.	Extraction System, Soil Gasoline Vapor (350 SCFM)	Thermal Oxidizer	97.000	None	None
CA-0475	11/15/1990	Thorne Environmental, inc.	Extraction System, Soil Gasoline Vapor (350 SCFM)	Thermal Oxidizer	97.000	None	None
CA-0476	12/04/1990	Applied Consultants	Extraction System, Soil Gasoline Vapor (400 SCFM)	Thermal Oxidizer	95.000	5.0000 pounds/day	None
CA-0477	08/09/1991	Park Environmental corp.	Extraction System, Soil Vapor (312 SCFM)	Regenerative Thermal Ox. Retox	99.000	None	None
CA-0480	06/07/1991	Arco Products Company	Extraction Operation, In-Situ Soil Vapor (200 SCFM)	Thermal Oxidizer	98.000	2.0000 lbs/day	None
CA-0482	07/29/1991	V.R. Systems, Inc.	Extraction System, Soil Vapor (Vent Test) (250 SCFM)	Internal Combustion Engine, Vent to Engine	99.800	0.2100 pound/day	None
CA-0483	07/29/1991	V.R. Systems, Inc.	Extraction System, Soil Vapor (Vent Test) (250 SCFM)	Internal Combustion Engine, Vent to Engine	99.800	0.2100 pound/day	None
CA-0547	12/17/1992	Chevron (service station #99702)	Soil Remediation (200 SCFM)	Thermal Oxidizer (501,000 scfm)	99.000	4.9000 pounds/day	None
MI-0071	01/28/1988	Yale Rubber Manufacturing Co.	Cleanup, Soil (250 CFM)	Carbon Adsorption - Regenerable	99.990	0.0260 pound/hour	0.11 tons/year
						5.0000 ppmv	None

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Most Stringent Achieved-In-Practice Determinations

Comparing the determinations listed in **Tables A-1** through **A-5**, the most stringent determinations are provided in **Table A-6** below.

***Table A-6**. Most Stringent Achieved-In-Practice Determinations for Tetrachloroethylene Emissions*

Application or RBLC	**Capacity** (SCFM)	**Limit**	**Concentration** [1] (ppmv)	**Equivalent Concentration** [2] (ppmv)	**Abatement Efficiency** (percent)
25084	100	0.109 lb/day	1.76	0.67	99.0
29807	225	0.28 ppmv [3], [4]	0.28	0.28	90.0
30024	180	0.7 ppmv [3], [4]	0.7	0.7	90.0
30048	800	0.08 ppmv [3], [4]	0.08	0.08	98.5
30098	250	0.68 ppm [3]	0.68	0.68	98.5
30241	95	0.65 ppmv [3], [4]	0.65	0.65	90.0
30560	1000	192 lbs/year	0.85	0.85	90.0
31369	450	0.35 ppmv [3]	0.35	0.35	90.0
30867	360	0.16 ppmv [3], [4]	0.16	0.16	90.0
Multiple	65 to 500	0.049 lb/day	0.15 to 1.58	0.30	90.0
Multiple	50 to 1850	0.082 lb/day	0.08 to 2.88	0.51	90.0
CA-0482	250	0.2100 lb/day	1.36	1.37	99.800
CA-0483	250	0.2100 lb/day	1.36	1.37	99.800
MI-0071	250	0.0260 lb/hour	4.03	3.88	99.990

Notes:

1. Tetrachloroethylene (165.82 lb/lb-mol molar mass) concentration limit or equivalent concentration derived from mass-based limit of equipment in application or RBLC entries.
2. Equivalent concentration of limit of equipment in Application 31556 (maximum exhaust flow rate of 260 SCFM).
3. Concentration limit is "as tetrachloroethylene". Mass emissions estimated using a molar mass of 165.82 lb/lb-mol for tetrachloroethylene and assuming continuous operation (24 hours per day, 8,760 hours per year).
4. Emission limit imposed to avoid Regulation 2, Rule 5 requirements.

Compliance with the limits listed in Table A-2 is demonstrated via required organic compounds concentration measurements of the exhaust streams from each carbon vessel using a portable vapor analyzer, either a photoionization detector (PID) or a flame ionization detector (FID). However, the accuracy of these instruments varies by the specific instrument model used. For example, for the low concentration range (less than 1,000 ppm) the commonly used instruments have an accuracy of +/- 2 ppm or +/- 10% of the reading, whichever is greater (PID MiniRAE 2000); +/- 2.5 ppm or +/- 25% of the reading, whichever is greater (FID TVA-1000); and +/- 1.0 ppm or +/- 10% of the reading, whichever is greater (FID TVA-2020). A portable analyzer that is accurate enough to reliably report readings below 1.0 ppm has not been identified.

Therefore, for comparison purposes, all concentration limits less than 1.0 ppm are assumed to be reliably measured at 1.0 ppm with a portable organic analyzer.

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Portable vapor analyzers respond to different compounds with differing levels of sensitivity. To calibrate each instrument, a standard calibration gas is used (methane for FIDs, isobutylene for PIDs).

To determine an instrument reading for a compound other than the one used in the calibration gas, the reading must be adjusted using a response factor that is specific to the compound of interest and the concentration range of interest.

Response Factor Multiplier = (Actual Concentration) / (Measured Response)

This equation may be adjusted to determine the actual concentration of a compound from an instrument measured response (instrument reading) and the instrument's response factor multiplier for that compound.

Actual Concentration = (Response Factor Multiplier) x (Measured Response)

The portable vapor analyzers models that are frequently used include the PID MiniRae 2000, PID TVA-1000B, FID TVA-1000B, and FID TVA-2020.

For the low concentration range (less than 10 ppm), the PID MiniRae (calibrated with isobutylene) has a response factor multiplier for tetrachloroethylene of either 0.69 (if using the 9.8 eV lamp), 0.57 (if using the 10.6 eV lamp), or 0.31 (if using the 11.7 eV lamp)[1]. The PID TVA-1000B has a multiplier of 0.738 and the FID TVA-1000B has a multiplier of 0.974[2]. A response factor for tetrachloroethylene has not been published for the FID TVA-2020.

Due to the wider range of organic compounds that may be detected with an FID and the more approximate response of an FID to tetrachloroethylene, in particular, an FID will be required to be used for ongoing compliance demonstrations.

Actual Concentration = (0.974) x (1 ppm as methane) = 0.974 ppm tetrachloroethylene

The highest abatement efficiency listed in Table A-7 is associated with determination MI-0071 at 99.99 percent. However, the emission limit corresponds to a concentration of approximately 4 ppm.

The most stringent emission limit and abatement efficiency are associated with EPA determinations CA-0482 and CA-0482 at 99.80 percent abatement.

Reducing tetrachloroethylene emissions by 99.80 percent or an exhaust outlet concentration less than 1.0 ppm is determined to be achieved-in-practice.

[1] RAE Systems, Inc. Technical Note TN-106. *Correction Factors, Ionization Energies, and Calibration Characteristics*. Revised 08/2010.
[2] Thermo Environmental Instruments, Inc. TVA-1000. Toxic Vapor Analyzer. *Response Factors*. 8/23/00.

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Technologically Feasible

The following control technologies and mitigation measures have been found technically feasible for abating organic compound emissions from soil vapor extraction operations:

- Combustion
    - Internal combustion engine
    - Incinerator
    - Flare
- Oxidation
    - Thermal oxidizer
    - Catalytic oxidizer
- Adsorption

Combustion and Oxidation

The off gas from soil vapor extraction may be sent to a combustion device (internal combustion engine, incinerator, flare) or an oxidation device (thermal oxidizer, regenerative thermal oxidizer, catalytic oxidizer). However, these mitigation techniques are not recommended for the destruction of chlorinated compounds because they operate at temperatures that are conducive to forming chlorinated dioxins/furans.

Adsorption

The use of adsorbent media (activated carbon, potassium permanganate) is already proposed by the applicant. Meeting a minimum abatement efficiency of 99.8 percent or an exhaust concentration of less than 1.0 ppm has been deemed achieved-in-practice.

The applicant proposed a more stringent control technology than TBACT. Per information provided by the applicant, they proposed abatement system that will be able to meet a minimum abatement efficiency of 99.95 percent. Therefore, the applicant meets "achieved-in-practice" TBACT.

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