

Draft Engineering Evaluation Report
Pangea Environmental Services, Inc, Plant #23297
505 So Van Ness Ave, San Francisco, CA
Application #27520

Background

Pangea Environmental Services, Inc (“Applicant”) has requested an Authority to Construct and Permit to Operate for a soil vapor extraction operation, located at 505 So Van Ness, Ave, San Francisco (Plant #23297). The purpose of this project is to remediate residual concentrations of petroleum hydrocarbons in the gasoline range, and benzene, toluene, ethylbenzene, and xylene (BTEX) compounds in the site subsurface and groundwater. The site is an operating gasoline service station located in a mixed commercial/residential area.

S-1, Soil Vapor Extraction System, 400 scfm maximum; abated by A-1 Electric Catalytic Oxidizer/High Vacuum System, Mako Industries, 400 CFM Makocat (HV)

The applicant has proposed to install and operate a dual-phase extraction (DPE) system that will simultaneously extract soil vapor and groundwater under high vacuum in the same process stream. The DPE system will include the following:

- 400 cfm, 25 hp liquid ring blower
- A water knockout vessel
- Electric catalytic oxidizer for emission abatement

Soil vapor and groundwater will be extracted from ten site wells by applying vacuum to the well casings through a 1.5 inch diameter hose inserted through a rubber coupling installed on top of each of the well heads. After extraction from the wells, the soil vapor/groundwater process stream will pass through a vapor/liquid separator, where ground water will be separated out and soil vapor will be routed to a catalytic oxidizer for abatement.

Emissions

The District performed emission calculations based on laboratory test data provided by the applicant, documented by samples submitted to McCampbell Analytical, Inc. The following is the resulting potential to emit for this operation.

TABLE 1
Criteria Pollutant Emissions For S-1 Abated by A-1

Source	POC
S-1 (lb/day)	2.5
S-1 (lb/year)	896
S-1, TPY	0.448

TABLE 2
 Toxic Pollutant Emissions for S-1 Abated by A-1

Pollutant Name	Influent Vapor Load μg/m ³	Uncontrolled Emissions Pounds/Hour	Abated Emissions Pounds/Hour	Abated Emissions Pounds/Year
Benzene	1.6E6	2.39	0.0359	314.2
Toluene	2.3E6	3.44	0.0516	451.7
Ethyl Benzene	1.3E5	0.19	0.0029	25.5
Xylene	5.3E5	0.79	0.0119	104.1

Cumulative Increase

The District tracks increases in emissions from each facility. These cumulative emissions were reset on April 5, 1991 for all facilities. The emissions summarized above will be added to the cumulative emission increases for this facility, as shown below.

TABLE 3
 Cumulative Emission Increases, Plant #23297 (tons per year)

Pollutant	Existing (New Plant)	Proposed Project	Post-Project
PM ₁₀	0	0	0.000
POC	0	0.448	0.448
NO _x	0	0	0.000
SO ₂	0	0	0.000
CO	0	0	0.000

Statement of Compliance

Regulation 1: General Provisions and Definitions

All sources are subject to Regulation 1, Section 301, which prohibits discharge of air contaminants resulting in public nuisance. The proposed soil vapor extraction operation is not expected to be a source of public nuisance.

Regulation 2, Rule 1: California Environmental Quality Act (CEQA) Requirements

District Regulation 2, Rule 1, Section 310 specifies that all proposed new and modified sources subject to District permit requirements must be reviewed in accordance with the California Environmental Quality Act (CEQA) requirements, except for ministerial projects or projects exempt from CEQA under Section 2-1-312. The engineering review for this project requires only the application of standard permit conditions and standard emission factors in accordance with Permit Handbook Chapter 9.2, Soil Vapor Extraction. Therefore, this application is considered to be ministerial and is exempt from CEQA review.

Regulation 2, Rule 1: School Public Notice Requirements

The public notification requirements of Regulation 2-1-412 apply to modifications which result in any increase in toxic air contaminant or hazardous air contaminant emissions at facilities within 1,000 feet of the boundary of a K-12 school. The project is within 1,000 feet of the boundary of a K-12 school and therefore is subject to the public notification requirements of Reg. 2-1-412. Notifications have been distributed to parents or guardians of students enrolled at Marshall Elementary School and St. Charles School, and all residential and business neighbors within 1,000 feet of the proposed new source.

Regulation 2, Rule 2: Best Available Control Technology (BACT) Requirements

Under Regulation 2, Rule 2, any new source which results in an increase of 10 lbs/day or more of any criteria pollutant must be evaluated for adherence to BACT control technologies. As shown in Table 1, the emissions will not exceed 10 pounds/day for any pollutant. Therefore, BACT is not required.

Regulation 2, Rule 2: Offsets

The cumulative emission increases for this site and this application are summarized below.

TABLE 4
Offsets Calculation (tons per year)

Pollutant	Current Balance tons/year	Application Increases tons/year	New Balance tons/year	Offsets Required tons/year
PM ₁₀	0.000	0.000	0.000	0
POC	0.000	0.448	0.448	0
NPOC	0.000	0.000	0.000	0
NO _x	0.000	0.000	0.000	0
SO ₂	0.000	0.000	0.000	0
CO	0.000	0.000	0.000	0

The offset requirements for precursor organic compounds (POC) and nitrogen oxides (NO_x) are found in Regulation 2-2-302. Under Regulation 2-2-302, POC and NO_x emission offsets are required for new or modified sources at a facility which emits or will be permitted to emit 10 tons per year or more on a pollutant specific basis. If the facility emits or will be permitted to emit less than 35 tons of POC or NO_x per year, the emission offsets may be provided by the District's Small Facility Banking Account. If the facility will be permitted to emit more than 35 tons/year of POC or NO_x, the site is responsible for providing the required offsets at a ratio of 1.15 to 1.0.

Since the criteria pollutant emissions from this site are less than the offset threshold for each pollutant, offsets are not required.

Regulation 2, Rule 5: Health Risk Assessment Requirements

This soil vapor extraction project will emit the following toxic air contaminants: benzene, toluene, ethylbenzene, and xylene (BTEX). Regulation 2-5-401 requires a health risk screening analysis if any toxic air contaminant exceeds a trigger level from Table 2-5-1. The toxic emissions from this project are compared to the risk screening trigger levels in the following table.

TABLE 5
 Toxic Pollutant Emissions
 Chronic Emissions

Pollutant Name	Project Emissions lb/yr	Chronic Trigger Level (lb/yr)	Chronic Emissions > Trigger Level?
Benzene	314.2	3.80	YES
Toluene	451.7	12,000.00	NO
Ethyl Benzene	25.5	43.00	NO
Xylene	104.1	27,000.00	NO

Acute Emissions

Pollutant Name	Project Emissions lb/hr	Acute Trigger Level (lb/hr)	Acute Emissions > Trigger Level?
Benzene	0.0359	2.90E+00	NO
Toluene	0.0516	8.20E+01	NO
Ethyl Benzene	0.0029	N/A	NO
Xylene	0.0119	4.90E+01	NO

From Table 2-5-1, benzene has a chronic trigger level of 3.80 pounds/year. Based on the proposed operating rate of 8,760 hours/year, S-1 will emit 314.2 pounds/year of benzene, which exceeds the chronic trigger level. Therefore, this project requires a health risk screening analysis.

The District conducted a risk screen for this project using ISCST3 air dispersion computer model to estimate annual average ambient air concentrations. The District ran the model using Mission Bay meteorological data and elevated terrain.

Initially, the applicant proposed to have a stack height of 13 feet. The estimated health risks for this project with a stack height of 13 feet are: a maximum project cancer risk of 28 in a million and a maximum project chronic hazard index of 0.37. This proposed project would not comply with the Regulation 2-5-302 project cancer risk requirement, because the estimated cancer risk would exceed 10 in a million.

In order to reduce the estimated project cancer risk to no more than 10 in a million, the applicant should consider the following project modifications:

- Reduce emissions by 65%
- Increase the stack height from 13 feet to at least 24 feet

After notification of the above initial health risk assessment results, the applicant proposed to increase the stack height to at least 24 feet. The revised estimated health risks for this permit application are presented in the table below.

TABLE 6
 Summary of Source and Project Health Risks
 (Based on a Revised Project Stack Height of 24 feet)

Receptor	Cancer Risk	Chronic Non-cancer Hazard Index
Resident	8.7 in a million	0.057
Worker	9.4 in a million	0.12
Student	0.12 in a million	0.0018

Since the maximum cancer risk will exceed 1 in a million, Regulation 2-5-301 requires that S-1 be equipped with TBACT. From the BACT/TBACT Workbook (Document # 151A.1), TBACT is the same as BACT for POC emissions. The POC BACT requirements for soil vapor extraction operations are presented in Table 7. The most stringent BACT1 requirements are: an outlet concentration less than 10 ppmv or a capture/destruction efficiency greater than 98.5%. S-1 is abated by an electric catalytic oxidizer (A-1) with a capture/destruction efficiency of 98.5%. Therefore, this project satisfies the TBACT requirement.

TABLE 7
 BACT for Soil Vapor Extraction
 (Document # 151A.1)

Pollutant	BACT1	Typical Technology	BACT2	Typical Technology
POC	<10 ppmv at outlet of control device; or >98.5% capture/destruction efficiency	Two or More Activated Carbon Canister in Series or Thermal Oxidizer	<10 ppmv at outlet of control device; or >98.5% capture/destruction efficiency if inlet VOC >2000 ppmv; or >97% capture/destruction efficiency if inlet VOC >200 to <2000 ppmv; or >90% capture/destruction efficiency if inlet VOC <200 ppmv	Two or More Activated Carbon Canisters in Series or Thermal Oxidizer or Catalytic Oxidizer

This revised project results in maximum project cancer risk of 9.4 in a million and a revised chronic hazard index of 0.12. Since the revised project health risks do not exceed 10 in a million cancer risk and do not exceed 1.0 chronic hazard index, and the SVE operation will comply with TBACT, this project, with a stack height of at least 24 feet, will satisfy all of the Regulation 2-5-302 project risk limits.

**Major Facility Review, Regulation 2, Rule 6
40 CFR Part 70, State Operating Permit Programs (Title V)**

The Title V federal permitting requirements of 40 CFR Part 70 have been codified and are enforced through District Regulation 2, Rule 6. This regulation applies to major facilities, Phase II acid rain facilities, subject solid waste incinerator facilities, and other designated facilities. This facility is not a Phase II acid rain facility, subject solid waste incinerator, or other designated source category. It is not a major facility since the potential emissions are less than the major source thresholds for regulated air pollutants and hazardous air pollutants. This facility is not subject to Regulation 2, Rule 6 or 40 CFR, Part 70.

Regulation 8, Rule 47, "Air Stripping and Soil Vapor Extraction Operations"

Regulation 8-47-301 requires any air stripping and soil vapor extraction operations which emit benzene, vinyl chloride, perchloroethylene, methylene chloride and/or trichloroethylene to be vented to a control device which reduces emissions to the atmosphere by at least 90 percent by weight. The proposed electric catalytic oxidizer will reduce emissions by at least 90 percent by weight.

Regulation 8-47-501 requires any person subject to the requirements of this Rule shall keep records of any vapor monitoring results that have been collected to monitor the performance of a control device. Such records shall be retained for a minimum of two years from the date of entry and be made available to District staff upon request. Recordkeeping requirements will be placed on the permit to ensure compliance.

Permit Conditions

Condition #26233 identifies operating and recordkeeping requirements for S-1 and A-1, and Condition #26233 shall be part of the source's Authority to Construct.

CONDITION #26233

1. The owner/operator shall abate the Precursor Organic Compound (POC) emissions from Source S-1 by A-1, SVE Abatement System, consisting of a Catalytic Oxidizer during all periods of operation. The owner/operator shall operate the source such that the soil vapor flow rate from S-1 shall not exceed 400 scfm. [Basis: Cumulative Increase, Regulation 8-47-301, TBACT]
2. The owner/operator shall ensure that the exhaust stack height is at least 24 feet. [Basis: Regulation 2-5-302]
3. The owner/operator shall operate A-1 Electric 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 2-5-301: TBACT]

4. While operating as a 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]
5. To determine compliance with part #4, 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]
6. 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]
7. To determine compliance with part #3, 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, ethylbenzene, toluene and xylenes and POC present.
 - c. Calculate the benzene, ethylbenzene, toluene and xylene emission rates 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 Condition #2, the owner/operator shall report the POC concentration as hexane.
 - e. Submit to the District's Engineering Division the test results and emission calculations within one month from the testing date. The owner/operator shall analyze samples according to modified EPA test methods 8015 and 8020 or their equivalent to determine the concentrations of POC and benzene, ethylbenzene, toluene and xylene. [Basis: Cumulative Increase, Regulation 2-5, TBACT]

8. The owner/operator shall report any non-compliance with this condition to the Director of the Compliance & Enforcement Division at the time that it is discovered. The submittal shall detail the corrective action taken and shall include the data showing the exceedance as well as the time of occurrence. [Basis: Cumulative Increase, Regulation 2-5]
9. The owner/operator shall maintain a file containing all measurements, records and other data that are required to be collected pursuant to the various provisions of this conditional Authority to Construct/Permit to Operate. All measurements, records and data required to be maintained by the owner/operator shall be retained for at least two years following the date the data is recorded. [Basis: Regulation 1-523]
10. Upon final completion of the remediation project, the owner/operator of Source S-1 shall notify the Engineering Division within two weeks of decommissioning the operation. [Basis: Cumulative Increase, Regulation 2-5]

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 sources will be located within 1,000 feet of the boundary of a K-12 school, which triggers the public notification requirements of District Regulation 2-1-412. After the comments are received and reviewed, the District will make a final determination on the permit.

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

S-1, Soil Vapor Extraction System, 400 scfm maximum; abated by A-1 Electric Catalytic Oxidizer/High Vacuum System, Mako Industries, 400 CFM Makocat (HV)

Stanley Tom, P.E.
Air Quality Engineer

Date