Draft Engineering Evaluation
Millbrae Olympian
1009 El Camino Real, Millbrae, CA 94030-2013
Plant No. 102970
Application No. 679474

Background

On behalf of Mr. Rob Baker, Pangea Environmental Services has applied for an Authority to Construct for the following equipment:

S-2 Soil Vapor Extraction System
Make: TEFC, Model: MAX-PE 20hp Regenerative Blower
Maximum: 85 CFM, Abated by: A-1, Thermal/Catalytic Oxidizer

A-1 Thermal/Catalytic Oxidizer
Make: Eclipse Winnox, Model: WX0050,
Max Firing rate: 75000 BTU/hr powered by Natural Gas

S-2 will operate at 1009 El Camino Real, Millbrae, CA 94030-2013. This is not within an Overburdened Community (OBC) as defined in Regulation 2-1. The site is an operating gasoline service station located in a mixed commercial/residential area. The installation was approved in a San Mateo County Groundwater Protection Program letter dated September 27, 2021.

The objective of the Multi-phase Extraction (MPE) system is to remove residual hydrocarbons in the subsurface soil. MPE is a technology that extracts soil vapor through a high vacuum applied to the subsurface. The MPE system includes a 85-cfm, 20 hp vacuum blower and emissions will be abated by a thermal/catalytic oxidizer (A-1). Soil vapor will be extracted from up to eight site wells by applying vacuum to the well casings. After extraction from the wells, the soil vapor will pass through a vapor/liquid separator, where any moisture will be separated out and soil vapor will be routed to A-1 for abatement.

The catalytic oxidation system is capable of destroying 98.5% of VOCs. A-1 uses natural gas to operate and secondary emissions are expected.

The soil data used to calculate the VOC emissions is from the analytical report prepared by McCampbell Analytical, Inc. in January 2012.

Procedures are outlined in the conditions found below. The applicant will be required to provide written notification at the start of the operation. The applicant will be required to stay below the acute and chronic trigger levels of Regulation 2-5.

Emission Calculations

Main Emissions: SVE System - VOCs

Initial soil vapor data will be 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 are assumptions used to estimate emissions.

- Operating conditions: Pressure = 1 Atm; Inlet Temperature = 21^{O}C; 1 mole occupies 24.15 Liters (or 386.8 ft3/lb-mol)
- Toxic Air Contaminants (TAC) emissions will be based on soil vapor data submitted with this application summarized in Table 1 of the submittal package.

- The organic influent flow rate of 85 scfm.
- The system will be abated by a Thermal/Catalytic Oxidizer (A-1).

Table 1. SVE System Unabated Emissions for S-2						
Pollutant	CAS #	Unabated Emissions				
		Inlet Conc. (ug/m3)	Hourly Emission Rate (lb/hr)	Daily Emission Rate (lb/day)	Annual Emission Rate (lb/yr)	Annual Emission Rate (ton/yr)
Benzene	71-43-2	300000	9.5E-02	2.3E+00	8.4E+02	0.4180
Toluene	108-88-3	630000	2.0E-01	4.8E+00	1.8E+03	0.8778
Ethylbenzene	100-41-4	80000	2.5E-02	6.1E-01	2.2E+02	0.1115
Xylene	1330-20-7	330000	1.0E-01	2.5E+00	9.2E+02	0.4598

Table 2. SVE System Abated Emissions for S-2						
Pollutant	CAS #	Abated Emissions				
		Abatement Efficiency (%)	Hourly Emission Rate (lb/hr)	Daily Emission Rate (lb/day)	Annual Emission Rate (lb/yr)	Annual Emission Rate (ton/yr)
Benzene	71-43-2	98.5	1.4E-03	3.4E-02	1.3E+01	0.0063
Toluene	108-88-3	98.5	3.0E-03	7.2E-02	2.6E+01	0.0132
Ethylbenzene	100-41-4	98.5	3.8E-04	9.2E-03	3.3E+00	0.0017
Xylene	1330-20-7	98.5	1.0E-02	2.5E-01	9.2E+01	0.0460

Notes:

1. Influent data for all compounds was obtained from Samples 002A. This data will be used as the pre-abatement concentration.
2. Emissions will be abated by a thermal/catalytic oxidizer, A-1.
3. It is assumed that equipment will operate 24 hours a day, 365 days a year.

Table 3 summarizes organic compounds emissions based on the data in Table 2 considering an abatement efficiency of 98%.

Table 3. Organic Emissions Review for S-2					
Pollutant	Effluent Volumetric Concentration (ppmv)	Hourly Emission Rate (lb/hr)	Daily Emission Rate (lb/day)	Annual Emission Rate (lb/yr)	Annual Emission Rate (ton/yr)
POC	72.4	1.5E-02	3.7E-01	1.3E+02	0.3108
NPOC	0	0.0E+00	0.0E+00	0.0E+00	0.0000
Total	72.4	1.5E-02	3.7E-01	1.3E+02	0.3108

The annual emissions rates will be used to set up the limits in the conditions of this application. Also, the effluent volumetric concentration will be used to monitor the abatement equipment.

Secondary Emissions: Thermal/Catalytic Oxidizer

The catalytic oxidizer is expected to emit secondary emissions of NOx, POC, CO, PM, SO_2, and TACs from the combustion of natural gas as well as the oxidation of VOCs. The burner for the thermal oxidizer has a maximum heat input rating of 0.75 MMBTU/hr. Emission factors from the Environmental Protection Agency (EPA) AP-42 Chapter 1.4 "Natural Gas Combustion" were used to calculate emission rates of natural gas TACs, POC, particulate matter (PM), and sulfur dioxide (SO_2). Emissions of NOx and CO were

calculated using the exhaust volumetric concentrations as provided by the manufacturer. The emission factor for NOx is 50 ppmv and for CO is 50 ppmv at 15% O_2.

Table 4. Secondary Emissions – Catalytic Oxidizer (A-1)							
Pollutant		Emission Factor (lb/MMscf natural gas)	Emission Factor (lb/MMscf exhaust)	Hourly Emission Rate (lbs/hr)	Daily Emission Rate (lbs/day)	Annual Emission Rate (lbs/yr)	Annual Emission Rate (TPY)
Criteria Pollutants	NO_x	--	18.99	1.4E-03	3.4E-02	1.2E+01	0.0061
	POC	5.50	-	4.0E-04	9.7E-03	3.5E+00	0.0018
	CO	--	11.56	8.5E-04	2.0E-02	7.4E+00	0.0037
	PM_{10}	7.60	-	5.6E-04	1.3E-02	4.9E+00	0.0024
	$PM_{2.5}$	7.60	-	5.6E-04	1.3E-02	4.9E+00	0.0024
	SO_2	0.60	-	4.4E-05	1.1E-03	3.9E-01	0.0002
TAC	Toluene	3.4E-03	-	2.5E-07	6.0E-06	2.2E-03	0.0000
	Benzene	2.1E-03	-	1.5E-07	3.7E-06	9.4E-02	0.0000
	Formaldehyde	7.5E-02	-	5.5E-06	1.3E-04	3.3E+00	0.0017

Basis:

- A-1 is powered by Natural Gas with a Heat Content of 1020 BTU/ft^3 and it is expected to operate continuously.
- A-1 heat input is 0.075 MMBTU/hr
- A-1 Emission Factors are from US EPA AP-42 Ch. 1.4 except for NOx and CO.
- NOx and CO emission factors were calculated based on data provided by the applicant.
- HCl emissions are not expected since there aren't chlorinated compounds detected in the analytical report.

Cumulative Increase

Table 5. Cumulative Increase			
Pollutant	Current Permitted Emissions, Post 4/5/1991 (ton/yr)	Application New Emissions Increase (ton/yr)	New Cumulative Increase (ton/yr)
NO_x	0.0000	0.0061	0.0061
POC	0.2210	0.3126	0.3345
CO	0.0000	0.0037	0.0037
$PM_{2.5}$	0.0000	0.0024	0.0024
PM_{10}	0.0000	0.0024	0.0024
SO_2	0.0000	0.0002	0.0002

Toxic Risk Screening

At the given rates in Table 2 and 4, the emissions for benzene exceed the chronic trigger levels in Regulation 2-5, Table 2-5-1. Consequently, the project is subject to a refined Health Risk Assessment (HRA). Table 6 and 7 show the in detail the TACs emissions.

Table 6. Project Acute Emissions Review - Regulation 2-5				
Pollutant	CAS #	Hourly Emission Rate (lb/hr)	Acute Trigger Level (lb/hr)	Exceeds Acute Trigger Level?
Benzene	71-43-2	1.4E-03	6.0E-02	No

DRAFT

Toluene	108-88-3	3.0E-03	8.2E+01	No
Ethylbenzene	100-41-4	3.8E-04	N/A	No
Xylene	1330-20-7	1.0E-02	9.7E+00	No
Formaldehyde	50-00-5	5.5E-06	1.2E-01	No

Table 7. Project Chronic Emissions Review - Regulation 2-5

Pollutant	CAS #	Annual Emission Rate (lb/yr)	Chronic Trigger Level (lb/yr)	Exceeds Chronic Trigger Level?
Benzene	71-43-2	1.3E+01	2.9E+00	Yes
Toluene	108-88-3	2.6E+01	1.6E+04	No
Ethylbenzene	100-41-4	3.3E+00	3.3E+01	No
Xylene	1330-20-7	9.2E+01	2.7E+04	No
Formaldehyde	50-00-5	3.3E+00	1.4E+01	No

Results from this revised HRA indicate that the project cancer risk is estimated at 0.83 in a million, the project chronic hazard index (HI) is estimated at 0.023, and the project acute HI is estimated at 0.026. In accordance with the District's Regulation 2-5-301, this proposed new source does not trigger TBACT because the estimated source risk is not a cancer risk greater than 1.0 in a million or a chronic HI greater than 0.20. Since the estimated project cancer risk does not exceed 10 in a million and hazard indices do not exceed 1.0, this project complies with the District's Regulation 2-5-302 project risk requirements, for projects not located in an Overburdened Community, as defined in Regulation 2-1-243.

Offsets

Pursuant to Regulation 2-2-302, offsets must be provided for any new or modified source at a facility 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 facility with a cumulative increase that exceeds 1.0 ton per year of PM_{10}, $PM_{2.5}$, or sulfur dioxide (SO_2).

The facility is not expected to have a PTE greater than 10 tons per year of POC. 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 pounds or more per highest day of 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 lb/day for S-2. Therefore, BACT is not required.

Reasonably Achievable Control Technology (RACT)

In accordance with Regulation 2-2-102, Reasonably Achievable Control Technology (RACT) is required to control secondary emissions from abatement devices.

The following are the required RACT levels for thermal oxidizers:

Pollutant	ppmv @ 15% O_2	lb/MMBTU
NO_x	40	0.15
CO	230	0.51

DRAFT

A-1 falls under this category, and according to the applicant provided data, NOx emissions are 40 ppmv and CO emissions are 50 ppmv @ 15% O_2, therefore comply with the current RACT guidelines.

California Environmental Quality Act (CEQA)

This permit application is not subject to CEQA because the evaluation is a ministerial action (Public Resources Code Section 21080(b)(1) and CEQA Guidelines Section 15268(a)) conducted using the fixed standards and objective measurements outlined in standard air permitting/engineering reference materials including, but not limited to: permitting handbooks, permitting manuals, permitting guidance documents, source test/lab sampling results, and emissions factor clearinghouses. Therefore, the applicant was not required to submit any CEQA-related information.

Statement of Compliance

Regulation 2-1-243 Public Notice. Prior to approving an application for an authority to construct or permit to operate, a public notice, fully describing the potential emissions, shall be prepared for the following cases:

(i) A new or modified source located within 1000 feet of the outer boundary of a K-12 school site and which results in the increase in emissions of any substance into the ambient air which has been identified by the California Air Resources Board or the APCO as a toxic air contaminant or a hazardous air contaminant or which is on the list required to be prepared pursuant to subdivision (a) of Section 25532 or Section 44321 subsections(a) to (f) inclusive of the Health and Safety Code.

(ii) A new or modified source located within an Overburdened Community as defined in Section 2-1-243 and for which a Health Risk Assessment is required pursuant to Section 2-5-401

The project does not operate within an Overburdened Community (OBC) as defined in Regulation 2-1-412 and triggers an HRA, but it is within 1000 ft of the K-12 School with 13 or more students below:

-St. Dunstan School, 1150 Magnolia Ave, Millbrae, CA 94030

Therefore, the project is subject to the public noticing requirement of the California Health & Safety Code and Regulation 2-1-412. A public notice was prepared and sent to all addresses within 1,000 feet of the proposed source(s) and parents and guardians of students of the aforementioned school. All comments will be responded to in the same manner they were received after the public comment period has ended.

Regulation 8-47-301, 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 will use a catalytic oxidizer (A-1) with an abatement efficiency of 98.5% to abate emissions from S-2.

Regulation 8-47-501 Recordkeeping. The facility is required to keep the pertinent records per condition #100333 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) do not apply to this project.

Permit Conditions

DRAFT

Permit Condition #100333 for S-2

1. The influent vapor flow rate shall not exceed 85 scfm from the blower of S-2. [Basis: Cumulative Increase, Regulation 2-5].

2. In no event shall the benzene emissions to the atmosphere from S-2 exceed 12.6 pounds per 12-month consecutive period. [Basis: Regulations 8-47-301 and 8-47-302 and Toxics].

3. In no event shall the total toxic air contaminant (TAC) emissions to the atmosphere from S-2 (except for benzene) exceed the trigger levels listed in District Regulation 2-5, Table 2-5-1. [Basis: Regulations 8-47-301 and 8-47-302 and Toxics].

4. The owner/operator shall not emit from S-2 more than 134.2 pounds of precursor organic compounds (POC) and 134.2 pounds of non-precursor organic compounds (NPOC) per 12-month consecutive period. [Basis: Cumulative Increase]

5. The total organics (sum of POC and NPOC) abatement efficiency of A-1 shall be maintained at either a minimum of 98.5% by weight or an outlet concentration of less than or equal to 2 ppmv (measured as methane). [Basis: TBACT, Toxics]

6. The owner/operator shall abate the precursor organic compound (POC)/non-precursor organic compound (NPOC) emissions from the soil vapor extraction system with a Catalytic Oxidizer (A-1) during all periods of operation maintaining a minimum operating temperature of 600 degrees Fahrenheit. The Air District may adjust this minimum temperature, if source test data demonstrates that an alternative temperature is necessary for or capable of maintaining compliance with Part 2 of these conditions. [Basis: Cumulative Increase; Regulations 8-47-301 and 8-47-302 and Regulation 2-5]

7. To determine compliance with the temperature requirement in these permit conditions, the owner/operator shall equip A-1 with a temperature measuring device capable of continuously measuring and recording the temperature in A-1. 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 one which such data is recorded. [Basis: Regulation 1-523]

8. Upon initial start-up, the owner/operator shall take air samples from S-__ for laboratory analysis. The air samples shall be taken at the following locations:

    a. At the inlet to the catalytic oxidizer
    b. At the outlet of the catalytic oxidizer, prior to venting to the atmosphere [Basis: Regulation 2-1-403]

9. The owner/operator shall use the results from the laboratory report to calculate the following:
    a. Organics (POC and NPOC) emissions to demonstrate compliance with Part 4.
    b. Organics (POC and NPOC) abatement efficiency or outlet Organics (POC and NPOC) concentration of the SVE system (S-__) to demonstrate compliance with Part 5.
    c. TAC emissions emitted to the atmosphere, using the maximum permitted flow rate of The SVE system (S-).

DRAFT

10. 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, to demonstrate compliance with Parts 1 through 8 of this condition. [Basis: Regulation 2-1-403, Regulation 2-5].

11. 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 source S-2 in standard cubic feet.

    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]

12. 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]

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 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]

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

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 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 which triggers the public notification requirements of 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 issuance of an Authority to Construct and/or a Permit to Operate for the following equipment:

S-2 Soil Vapor Extraction System
Make: TEFC, Model: MAX-PE 20hp Regenerative Blower
Maximum: 85 CFM, Abated by: A-1, Thermal/Catalytic Oxidizer

A-1 Thermal/Catalytic Oxidizer
Make: Eclipse Winnox, Model: WX0050,
Max Firing rate: 75000 BTU/hr powered by Natural Gas

DRAFT

By Isis Virrueta,
Air Quality Engineer II
July 2025

DRAFT