

# Engineering Evaluation

Fire Station #16

Plant # 20698

Application Number 23694

## *Background*

On behalf of the Fire Station #16, RRM has applied for an Authority to Construct a soil vapor extraction system. The vapors will be abated by either carbon canisters in series or a thermal/catalytic oxidizer. The vapor extraction unit consists of vacuum blower (S-1) with a maximum capacity of 400 scfm. Any liquid phase wastewater that is collected from the air/water separator will be collected in 55 gallon drums and disposed off-site for treatment. Emission monitoring for operation of the equipment will be conducted according to established Source Test methodology. Procedures are outlined in the conditions

The applicant will be conditioned to provide written notification at the start of each phase of abatement. Emission monitoring for operation of the Therm-Ox, and the Cat-Ox will be conducted according to established Source Test methodology. Procedures are outlined in the conditions found below. The Carbon unit influent and effluent VOC concentrations will be monitored with a portable flame-ionization detector (OVA-FID) on a schedule reflecting current loading rates and predicted Carbon capacity. To ensure proper operation of equipment and verify attainment of steady-state conditions, Carbon performance will be monitored daily for the first five days. RRM may then elect to change their monitoring schedule based on measured influent concentrations and calculated carbon loading. Monitoring schedule changes will be allowed only after District review of concentration measurements and subsequent receipt of District approval.

The Therm-Ox and Cat-Ox will be equipped with continuous temperature monitoring to ensure that BACT destruction efficiencies are met. The abatement system would use natural gas and not be electrical. Thus, emissions from the abatement source also need to be calculated.

This source is located within 1,000 feet of the outer boundary of several schools and as such this application requires Public Notification via Reg. 2-1-412. A Public Notice was prepared and sent out to the home address of the students of the schools and to each address within a radius of 1,000 feet of the source. This Evaluation Report was posted on the District Webpage along with the Public Notice. A phone line was set-up at the District to receive public comments. One comment from the public was sent via email and the District responded via email as well.

## *Emission Calculations*

The facility will first use the thermal/catalytic oxidizer prior to switching over to carbon treatment in the vapor phase. For a conservative estimate of yearly emissions, we shall assume that the system is operated for an entire year within an inlet concentration corresponding to the initial soil concentration level.

Generalized assumptions follow:

- \* Operating conditions: Pressure = 1 Atm; Inlet Temperature = 21°C; 1 mole occupies 24.15L
- \* Molecular weight of TPHg = 102 g/mole (value for "weathered gasoline"). Molecular weight of Benzene = 78 g/mole.
- \* Influent values based on operational parameters of equipment: influent rate = 400 scfm (maximum); maximum influent concentration = 1250 ppmv POC, 6.36 ppmv benzene destruction efficiency = 97% for throughout.

**A/N 23694**

MW TPH                      102                      COA =                      8.99E-05    lb-l-min/μg-ft3-day

efficiency 97.00%  
 air flow rate 400  
 days/yr 365

Soil Vapor Extraction System

Compounds	MW	(µg/m <sup>3</sup> )	(µg/l)	unabated lbm/day	abated lbm/yr	abated tons/yr	Trigger Level lbm/yr
TPH	102	4400000	4400	158.21806	1732.488	0.866244	
Benzene	78.11	20300	20.3	0.7299606	<b>7.993069</b>	0.003997	3.8
Toluene	92.1402	167000	167	6.0050946	65.75579	0.032878	1.20E+04
Ethylbenzene	106.167	83300	83.3	2.9953556	32.79914	0.0164	43
Total Xylenes	106.167	759700	759.7	27.317787	299.1298	0.149565	2.70E+04
MTBE	88.15	4500	4.5	0.1618139	1.771862	0.000886	210.00

Thermal Oxidizer

Operating Time 8760  
 MM Btu/hr 1.5

AP-42 Table 1.4.2

	lb/MM BTU	lb/hr	lbm/day	lbm/yr	tons/yr
NOX	0.2	0.3	7.2	2628	1.314
CO	0.8	1.2	28.8	10512	5.256
PM-10	0.0075	0.01125	0.27	98.55	0.049275
SO2	0.0006	0.0009	0.0216	7.884	0.003942
POC	0.0054	0.0081	0.1944	70.956	0.035478

**Emission calculations from abatement equipment (Thermal/Catalytic Oxidizer) A-1**

Emission Factors are Taken From AP-42 Table 1.4-2 Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion. AP-42 Chapter 1.4 Natural Gas Combustion: RACT emissions for NOx is 0.20 lb/MMBTU and RACT emissions for CO is 0.80 lb/MMBTU. Facility is complying with RACT requirements per April 13, 1999 District Policy. Memo included in evaluation.

	<b>Fuel Input</b> <u>Table 1.4-2</u>	<u>Table 1.5-1</u>
NOx		0.20 lb/MMBTU
CO		0.80 lb/MMBTU
POC	5.5 lb/MMscf	0.0054 lb/MMBTU
PM10	7.6 lb/MMscf	0.0075 lb/MMBTU
SO2	0.6 lb/MMscf	0.0006 lb/MMBTU

Hours of Operation = 24 hr/yr  
 Heating Value = 1020 BTU/scf  
 Heat Input = 1.5 MMBtu/hr

Emissions from Abatement Device Thermal/Cat Oxidizer A-1:

$\text{NO}_x = 0.2 \text{ lb/MMBTU (1.5 MMBTU/hr)(8760 hr/yr) = 2628 lbm/yr or 1.314 TPY}$   
 $\text{CO} = 0.80 \text{ lb/MMBTU (1.5 MMBTU/hr)(8760 hr/yr) = 10,512 lbm/yr or 5.256 TPY}$   
 $\text{POC} = 0.0056 \text{ lb/MMBTU (1.5 MMBTU/hr)(8760 hr/yr) = 70.956 lbm/yr or 0.03548 TPY}$   
 $\text{PM}_{10} = 0.0075 \text{ lb/MMBTU (1.5 MMBTU/hr)(8760 hr/yr) = 98.55 lbm/yr or 0.04928 TPY}$   
 $*\text{SO}_2 = 0.00059 \text{ lb/MMBTU (0.5 MMBTU/hr)(8760 hr/yr) = 7.884 lbm/yr or 0.00394 TPY}$

<i>Compound</i>	<i>Tons/yr</i>
<i>POCs</i>	<i>0.902</i>

***Cumulative Increase- tons/yr***

	<i>Current</i>	<i>Total</i>
<i>POCs</i>	<i>0</i>	<i>0.902</i>
<i>NOX</i>	<i>0</i>	<i>1.314</i>
<i>CO</i>	<i>0</i>	<i>5.256</i>
<i>PM-10</i>	<i>0</i>	<i>0.049</i>
<i>SO2</i>	<i>0</i>	<i>0.0039</i>

Emissions from the storage drums are exempt as the drum is closed and hauled offsite for disposal and the capacity is less than 260 gallons and aqueous phase is less than 1% (wt) organic compounds. Exempt per 2-1-123.1 and per 2-1-123.2.

***Toxics***

Emissions of these toxic compounds do warrant a Toxic Risk Screen Analysis, however, the facility has accepted a limit for benzene to not exceed trigger level, and they are stating that the concentration will be much lower as it will be diluted with other wells and air. The facility will be in compliance with Regulation 2 Rule 5 Table 2-5-1 and they are utilizing TBACT. A condition limit of benzene will also be included in the condition. Facility has agreed not to exceed toxic trigger level for benzene, the limit will be set for benzene at 3.8 lbs/yr or 0.01 lbs/day. The Toxics Section has recommended the issuing of this A/C with this compound emission limit.

***New Source Review***

This proposed project will not emit over 10 lbs per highest day and is therefore not required to implement BACT. For Soil Vapor Extraction operations, BACT is defined as attainment of set destruction efficiencies corresponding to set influent concentration values. Operation of the Carbon vessels will be conditioned to ensure attainment of the following required destruction efficiencies:  $\geq 98.5\%$  if inlet POC  $\geq 2000$ ;  $\geq 97\%$  if inlet POC  $\leq 2000$  to  $>200$  ppmv;  $\geq 90\%$  if inlet POC  $<200$  ppmv. Both the thermal/catalytic oxidizer and carbon units which run in series will have an abatement efficiency greater than 90% the facility would be in compliance with BACT guidelines.

Based on the information submitted, this operation is in compliance with Regulation 8-47-301, Emission Control Requirements, Specific compounds, and 8-47-302, Organic compounds. The POC emissions will be vented through an abatement system at all times of operation. Emissions of the thermal/cat oxidizer is in compliance with Reg 2-2-112 as RACT is being used RACT. RACT for  $\text{NO}_x$  is 0.20 lb/MMBTU and for CO it is 0.8 lb/MMBTU. Emission factors were taken from AP-42 Table 1.4-2. In addition, the facility is complying with Reg 2-2-212, as cumulative emissions for the abatement device are included in plant emissions.

Based on the information submitted, this operation is in compliance with Regulation 8-47-301, Emission Control Requirements, Specific compounds, and 8-47-302, Organic compounds. The POC emissions will be vented through soil vapor extraction abatement equipment at all times of operation.

### ***Offsets***

Offsets are not applicable for this application, as emissions do not exceed 10 tons/yr. Facility not subject to Reg 2-2-302.

### ***CEQA***

The project is considered to be ministerial under the Districts proposed CEQA Regulation 2-1-311 and therefore is not subject to CEQA review. The engineering review for this project requires only the application of standard permit conditions and standard emission factors and therefore is not discretionary as defined by CEQA. This project is in compliance with Chapter 9.2 of the permit handbook for soil treatment systems.

### ***Compliance***

Based on the information submitted, this operation is expected to be in compliance with Regulation 8-47-301, Emission Control Requirements, Specific compounds, and 8-47-302, Organic compounds. The POC emissions will be vented through a Thermal/Cat Ox or Carbon adsorption system at all times of operation.

The storage drums will have a capacity less than 260 gallons. This results in emissions being below the trigger level and the facility meets the exemption criteria of Regulation 2-1-123.1 (Tank less than 260 gallons capacity) and Regulation 2-1-123.2 (aqueous solution contains less than 1% (wt) organic compounds).

This project is within 1,000 ft from the nearest public school and is therefore subject to the public notification requirements of Regulation 2-1-412.

PSD, NSPS, and NESHAPS are not triggered.

### ***Recommendation***

Recommend that a conditional Authority to Construct be issued for source:

- S-1: Soil Vapor Extraction System with unit consisting of a 400 max scfm vacuum blower, and ancillary equipment, abated by A-1, SVE Abatement System, consisting of either a thermal/catalytic oxidizer or a minimum of two 200 lb capacity Carbon Adsorption Vessels arranged in series

And recommend that a C/E be issued for:

***Enclosed Storage Drums less than 260 gallons exempt per 2-1-123.1 and 2-1-123.2***

### ***Conditions for S-1:***

1. The owner/operator shall abate the Precursor Organic Compound (POC) emissions from Source S-1 Soil Vapor Extraction System by A-1, SVE Abatement System, consisting of either a thermal/catalytic Oxidizer, or two (200 lbs minimum capacity) Activated Carbon Vessels arranged in series during all periods of operation. Start-up and subsequent operation of each abatement device shall take place only after written notification of same has been received by the District's Engineering Division. The owner/operator shall operate the sources such that the soil vapor flow rate from S-1 SVE system shall not exceed 400 scfm [basis: Cumulative Increase, Regulation. 8-47-301 and 302, TBACT]

2. The owner/operator shall operate A-1 Thermal 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). In no event shall the owner/operator emit benzene emissions to the atmosphere exceeding 0.01 pounds per day or 3.8 pounds per year for Source S-1. [basis: Cumulative Increase, Regulation 2-5, TBACT]
3. While operating as a Thermal Oxidizer, the minimum operating temperature of A-1 shall not be less than 1400 degrees Fahrenheit. While operating as a Catalytic Oxidizer, the minimum operating temperature of A-1 shall not be less than 600 degrees Fahrenheit. The District may adjust this minimum temperature, if source test data demonstrates that an alternate temperature is necessary for or capable of maintaining compliance with Part 2 above. [basis: Cumulative Increase; Regulation 2-5, TBACT]
4. To determine compliance with Condition Number 3, the Thermal/Catalytic Oxidizer shall be equipped with continuous measuring and temperature recording instrumentation. The temperature data collected from the temperature recorder shall be maintained 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]
5. To determine compliance with Condition 2, within ten days after start-up of the Thermal Oxidizer, and within ten days after start-up of the Catalytic Oxidizer, the operator of these sources shall:
  - a. Analyze inlet gas stream to determine the flow rate and concentration of POC present.
  - b. Analyze exhaust gas to determine the flow rate, and the concentration of Benzene and POC present.
  - c. Calculate the Benzene emission rate in pounds per day based on the exhaust gas analysis and the operating exhaust flow rate. The soil vapor flow rate shall be decreased, if necessary, to demonstrate compliance with Condition 2.
  - d. Calculate the POC abatement efficiency based on the inlet and exhaust gas analysis. For the purpose of determining compliance with condition 2, the POC concentration shall be reported as hexane.
  - e. Submit to the District's Engineering Division the test results and emission calculations within one month from the testing date. Samples shall be analyzed according to modified EPA test methods 8015 and 8020 or their equivalent to determine the concentrations of POC and Benzene.[basis: Cumulative Increase, Regulation 2-5, TBACT]
6. The operator of this source shall maintain the following records for each month of operation of the Thermal/Catalytic Oxidizer:
  - a. Days and hours 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-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. During operation of the Activated Carbon Vessels, the owner/operator of this source shall monitor with a photo-ionization detector (PID), flame-ionization detector (FID), or other method approved in writing by the District's Source Test Manager at the following locations:
- At the inlet to the second to last Carbon vessel in series.
  - At the inlet to the last Carbon vessel in series.
  - At the outlet of the Carbon vessel that is last in series prior to venting to the atmosphere.

When using an FID to monitor breakthrough, readings may be taken with and without a Carbon filter tip fitted on the FID probe. Concentrations measured with the Carbon filter tip in place shall be considered methane for the purpose of these permit conditions. [basis: Cumulative Increase, Regulation 2-5, TBACT]

8. 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 10 and 11, and shall be conducted on a daily basis. The owner/operator of this source may propose for District review, based on actual measurements taken at the site during operation of the source, that the monitoring schedule be changed based on the decline in organic emissions and/or the demonstrated breakthrough rates of the carbon vessels. Written approval by the District's Engineering Division must be received by the owner/operator prior to a change to the monitoring schedule. [basis: Cumulative Increase, Regulation 2-5, TBACT]
9. The owner/operator shall immediately change out the second to last Carbon vessel with unspent carbon upon breakthrough, defined as the detection at its outlet of the higher of the following:
- 10 % of the inlet stream concentration to the carbon bed.
  - 10 ppmv (measured as hexane).
- [basis: Cumulative Increase, Regulation 2-5, TBACT]
10. The owner/operator shall immediately change out the last Carbon vessel with unspent Carbon upon detection at its outlet of 10 ppmv (measured as hexane). [basis: Cumulative Increase, Regulation 2-5, TBACT]
11. The owner/operator of this source shall maintain the following information for each month of operation of the Activated Carbon Vessels:
- Hours and time of operation.
  - Each emission test, analysis or monitoring results logged in for the day of operation they were taken.
  - The number of Carbon vessels removed from service.
  - Total throughput of soil vapor from source S-1 in Standard Cubic Feet.

The owner/operator shall retain and make available for inspection by the District such records for two years following the date the data is recorded. [basis: Regulation 1-523]

12. The owner/operator shall report any non-compliance with these conditions to the Compliance and Enforcement Division at the time that it is first discovered. **The owner/operator shall detail the corrective action taken and include the data showing the exceedance as well as the time of occurrence in the submittal.** [basis: Cumulative Increase, Regulation 2-5, TBACT]
13. The owner/operator shall maintain a file containing all measurements, records and other data that are required to be collected pursuant to the various provisions of this conditional Authority to Construct/Permit to Operate. All measurements, records and data required to be maintained by the owner/operator shall be retained for at least two years following the date the data is recorded. [basis: Regulation 1-523]

14. Upon final completion of the remediation project, the owner/operator of Sources S-1, shall notify the Engineering Division within two weeks of decommissioning the operation. [basis: Cumulative Increase, Regulation 2-5, TBACT]

by \_\_\_\_\_  
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