Engineering Evaluation
Arrow Rentals; Plant No. 19257
Application No. 18736

Background

Arrow Rentals has applied for an authority to construct for soil remediation at the site located at 187 N L Street, Livermore, California. Soil vapor extraction will be accomplished by means of a regenerative vacuum blower (S-1) with a maximum capacity of 300 scfm. The vacuum unit is also equipped with a water knockout vessel, inlet filter, dilution air valve, recirculation valve, and flow indicators. Vapors from air stripper (S-2) will be combined with S-1 vapors for treatment by abatement device A-1. Vapor abatement will be achieved by Carbon Adsorption (Carbon). This Carbon adsorption system will consist of two 200 pound capacity activated carbon vessels connected in series.

The applicant will be conditioned to provide written notification at the start of operation. 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. Arrow Rentals 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.

This source is located within 1,000 feet of the outer boundary of Sonrise Christian Academy, 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.

Emission Calculations

S-1: Soil Vapor Extraction System

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^{o}C; 1 mole occupies 24.15L
* Molecular weight of TPHg = 100 g/mole (value for "weathered gasoline"). Molecular weight of Benzene = 78 g/mole.
* Influent values based on operational parameters of equipment and applicant supplied soil vapor test results: influent rate 300 scfm throughout; maximum influent concentration = 1176 ppmv VOC, 4.2 ppmv benzene; destruction efficiency = 99.0% throughout.

Emissions of Precursor Organics:

$$1176E\text{-}6 * \frac{300\ ft^3}{min} * \frac{1440\ min}{1\ day} * \frac{28.32L}{1\ ft^3} * \frac{1\ mole}{24.15L} * \frac{100g}{mole} * \frac{1\ lb}{454g} * (1 - 0.99) = \mathbf{1.312\ lb/day}\ \text{(abated)}$$

Emissions of Toxic Air Contaminants (benzene):

$$4.2E\text{-}6 * \frac{300\ ft^3}{min} * \frac{1440\ min}{1\ day} * \frac{28.32L}{1\ ft^3} * \frac{1\ mole}{24.15L} * \frac{78g}{mole} * \frac{1\ lb}{454g} * (1 - 0.99) = \mathbf{0.0036\ lb/day}\ \text{(abated)}$$

Emissions of Toxic Air Contaminants (S-1):

	(ppmv)		Emission (lb/day) (unabated)	Emission (lb/day) (with abated)	Emission (lb/yr) (with abated)
Benzene	4.16	4.16E-06	0.36	0.0036	1.33
Toluene	6.13	6.13E-06	0.63	0.0063	2.31
Ethyl-benzene	9.06	9.06E-06	1.08	0.0108	3.93
Xylenes	9.36	9.36E-06	3.34	0.0334	12.18

S-2: Ground Water Treatment System

Assumptions:

* Contaminant concentrations in ground water: 4.9 ppmw POC, 0.01 ppmw benzene. (Based on groundwater sampling results provided by Arrow Rentals.)
* Emission factors based on manufacturer guarantees. Limiting factor is the pump capacity of 25 gal/min. Liquid phase hydrocarbon removal efficiency of stripper = 100%. Liquid flow rate = 25 gal/min.

Emissions of Precursor Organics (S-2):

$$4.9E\text{-}6 * \frac{25\ gal}{min} * \frac{1440\ min}{1\ day} * \frac{8.337\ \#}{1\ gal} * (1.0) * (1 - 0.99) = \mathbf{0.0147\ lb/day}\ (abated)$$

Emissions of Toxic Air Contaminants (benzene) (S-2):

$$0.01E\text{-}6 * \frac{25\ gal}{min} * \frac{1440\ min}{1\ day} * \frac{8.337\ \#}{1\ gal} * (1.0) * (1 - 0.99) = \mathbf{0.00004\ lb/day}\ (abated)$$

Emissions of Toxic Air Contaminants (S-2):

	(ppmw)		Emission (lb/day) (unabated)	Emission (lb/day) (with abated)	Emission (lb/yr) (with abated)
Benzene	0.0135	1.35E-08	0.004	0.00004	0.015
Toluene	0.0235	2.35E-08	0.007	0.00007	0.03
Ethyl-benzene	0.04	4.00E-08	0.012	0.00012	0.04
Xylenes	0.124	1.24E-07	0.04	0.00037	0.14

Total Benzene Emissions (S-1) & (S-2):

0.0036 lb/day (S-1) + 0.00004 lb/day (S-2) = **0.0036 lb/day**

Highest Daily Emissions	=	***1.327 lb/day***
Annual Average	=	***1.327 lb/day***
RFP	=	***0.242 tons/yr***

Toxics

The applicant would like to keep the benzene emissions below the trigger levels listed in Regulation 2-5, Table 2-5-1. Therefore the emissions of toxic substances (Benzene) are not considered sufficient to warrant a Risk Screen Analysis. Benzene trigger = 0.018 lb/day. In accordance with the District's Regulation 2-5, the impact is then insignificant since this risk is within the threshold of 10 in a million as required for sources implementing TBACT; therefore, the Toxics Section has recommended the issuing of this A/C with a Benzene emission limit of 0.018 lb/day.

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 carbon vessels will be conditioned to ensure attainment of an outlet concentration not to exceed 10 ppmv POC. Offsets need not be imposed as annual emissions will not exceed 10 tons.

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 Chapters 9.1 & 9.2 of the permit handbook.

Compliance

Based on the information submitted, this operation is expected to be in compliance with Regulation 8-47-301, Emission Control Requirements, Specific compounds, and 8-47-302, Organic compounds. The POC emissions will be vented through a Carbon adsorption system at all times of operation. This project is within 1,000 feet from the nearest public school and is therefore subject to the public notification requirements of Regulation 2-1-412.

Recommendation

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

S-1: Soil Vapor Extraction System consisting of a 300 max scfm vacuum blower, and ancillary equipment, abated by A-1, SVE Abatement System, at least two (200 lb minimum capacity) Carbon Adsorption Vessels arranged in series.

S-2: Groundwater Treatment System consisting of a 25 gpm max capacity Air Stripper, and ancillary equipment, abated by A-1, SVE Abatement System, at least two (200 lb minimum capacity) Carbon Adsorption Vessels arranged in series.

Conditions

1. Precursor Organic Compound (POC) emissions from Sources S-1 and S-2 shall be abated by A-1, at least two (200lb minimum capacity) activated carbon vessels arrange 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. Soil Vapor flow rate from S-1 shall not exceed 300 scfm. Groundwater flow rate into S-2 shall not exceed 25 gpm. [basis: Reg. 8-47-301,2]

2. For each of the first three days of operation of the air stripper, at least one influent groundwater sample shall be collected and analyzed. At least one sample shall be collected and analyzed thereafter for each calendar month of operation. Samples shall be collected in accordance with the Regional Water Quality Control Board's analytical methods. [basis: Reg. 8-47-601]

3. During operation of the Activated Carbon Vessels, the operator of this source shall monitor with a photo-ionization detector (PID), flame-ionization detector (FID), or other method approved in writing by the District's Source Test Manager at the following locations:

    a. At the inlet to the second to last Carbon vessel in series.
    b. At the inlet to the last Carbon vessel in series.
    c. 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.

4. These monitor readings shall be recorded in a monitoring log at the time they are taken. The monitoring results shall be used to estimate the frequency of Carbon change-out necessary to maintain compliance with conditions number 10 and 11, and shall be conducted on a daily basis. The 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 operator prior to a change to the monitoring schedule.

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

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

6. The last Carbon vessel shall be immediately changed out with unspent Carbon upon detection at its outlet of 10 ppmv (measured as hexane).

7. The operator of this source shall maintain the following information for each month of operation of the Activated Carbon Vessels:

    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. The number of Carbon vessels removed from service.
    d. Total throughput of soil vapor from source S-1 in Standard Cubic Feet.
    e. Total throughput of groundwater through Source S-2 in thousands of gallons.

    Such records shall be retained and made available for inspection by the District for two years following the date the data is recorded. [basis: Reg. 1-523]

8. Any non-compliance with these conditions shall be reported to the Compliance and Enforcement Division at the time that it is first discovered. **The submittal shall detail the corrective action taken and shall include the data showing the exceedance as well as the time of occurrence.**

9. The 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 operator shall be retained for at least two years following the date the data is recorded. [basis: Reg. 1-523]

10. Upon final completion of the remediation project, the operator of Sources S-1 and S-2 shall notify the Engineering Division within two weeks of decommissioning the operation.

by_____ date 1/21/09

Flora Chan
Air Quality Engineer I