

**RECEIVED**

By loprojectop at 9:31 am, May 10, 2006

Mr. Jerry Wickham  
Hazardous Materials Specialist  
Alameda County Health Care Services Agency  
Environmental Health Services  
Environmental Protection  
1131 Harbor Bay Parkway, Suite 250  
Alameda, CA 94502

RE: Eagle Gas Station  
4301 San Leandro Street  
Oakland, California 94601  
LOP StID# 2118  
Fuel Leak Case No. R00000096  
USTCF Claim No. 014551  
Clearwater Group Project # ZP046

Dear Mr. Wickham,

As the legally authorized representative of the above-referenced project location I have reviewed the following lists of reports prepared by my consultant of record, Clearwater Group, Inc. I declare, under penalty of perjury, that the information and/or recommendations contained in each report listed below are true and correct to the best of my knowledge.

- *Recommendations for Interim Site Remediation* dated June 13, 2005.
- *Soil and Groundwater Investigation Work Plan* dated August 10, 2005.
- *3) Response to Comments (RTC)* dated October 6, 2005.
- *4) Notice for Interim Remediation Groundwater Treatment Pilot* dated November 1, 2005.
- *Workplan for Ozone Bench Test* dated December 19, 2005.
- *Request for Extension of the Interim Remediation Start-up Report* dated January 11, 2006.
- *Activity Status Report/Request for Extension of the Soil and Groundwater Investigation Report* on March 1, 2006.
- *Bench Test for Using Advanced Oxidation - A Summary Report* dated March 22, 2006.
- *Groundwater Monitoring Reports First Quarter through Fourth Quarter 2005.*

Sincerely,



Mr. Muhammad Jamil

**Clearwater Group**  
[www.clearwatergroup.com](http://www.clearwatergroup.com) [augerpro@sbcglobal.net](mailto:augerpro@sbcglobal.net)  
707 View Point Road, Mill Valley, CA 94941  
Tel: 415-381-5195; Fax: 415-381-5816; Cell: 510-590-1098

December 19, 2005

**RECEIVED**

*By lopprojectop at 9:31 am, May 10, 2006*

Dr. Jimmy Ho  
Clearwater Group  
229 Tewksbury Ave.  
Pt. Richmond, CA 94801

**Re: WORKPLAN FOR OZONE BENCH TEST**  
Eagle Gas Site  
4301 San Leandro Street  
Oakland, California

Dear Dr. Ho:

Based on our discussions, I have prepared this Workplan for Ozone Sparging Bench Test for the above-mentioned site. The study is intended to evaluate the effectiveness of using advanced oxidation technology to treat groundwater containing high concentrations of MTBE and TBA extracted from the subject site. Groundwater samples collected previously during the pilot test will be used during the bench testing.

#### **OBJECTIVE**

The objectives of the study are to evaluate:

- 1) The efficiency of treating groundwater using ozone and hydrogen peroxide on methyl tertiary butyl ether (MTBE), Tert-butyl Alcohol (TBA), total petroleum hydrocarbons in the gasoline range (TPHg), and benzene, toluene, ethylbenzene, xylene (BTEX); and
- 2) The potential for by product generation from ozone sparging.

#### **MATERIALS**

Approximately 20 gallons of extracted groundwater is available for the bench test. Only 15 gallons of water will be used. If the data or information suggests that additional bench testing to be performed the other 5 gallons will be available for use in testing. Five gallons of water will be placed in a pail. Each pail will be sealed with a lid. A Pilot Scale Ozone Treatment System (PSOTS) manufactured by Ozotech, Inc. will be used to generate ozone. The groundwater treatment protocol is listed below.

## Clearwater Group

[www.clearwatergroup.com](http://www.clearwatergroup.com) [augerpro@sbcglobal.net](mailto:augerpro@sbcglobal.net)

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### GROUNDWATER TREATMENT

The groundwater samples will be treated with sparged ozone and hydrogen peroxide. The samples will be analyzed after a set sparge time, which is representative of the appropriate ozone dosing and the expected retention time of the full-scale system at 5, 15, 20, and 30 minutes.

Ozone will be generated and sparged using an Ozotech Model X-1 PSOTS ozone generator having a capacity to generate approximately 0.55 pounds per day (10.378 grams per hour at an ozone concentration of 2.37%). The unit has a six-liter oxygen concentrator. The outflow pressure is approximately 9 psi. Hydrogen peroxide is also used together with ozone to perform advanced oxidation.

### TEST PREPARATION

The Ozone Bench Test will be prepared as follows:

- Turn on the PSOTS and warm up the ozone generator for approximately 30 minutes until the ozone generation rate including airflow and ozone concentration reading is stabilized;
- Sample the 5-gal pail with three VOAs before ozone sparging. Measure water quality parameters such as temperature, pH, conductivity, DO, ORP, and dissolved ozone;
- Connect a 6  $\mu$  ceramic ozone diffuser with a FEP or Teflon-coated ozone resistant tubing to the ozone generator after the ozone generator is stabilized;

### PROCEDURES

#### TEST 1: OZONE SPARGING

- Insert the ozone diffuser into the 5-gal pail and use a PVC or glass rod to mix the ozone sparged groundwater;
- Measure water characteristics such as temperature, pH, conductivity, DO, ORP, and dissolved ozone. Measure these parameters every 5 minutes; and
- Collect samples for the analytical laboratory to be measured for TPH-g, BTEX, MTBE, and TBA at 5, 15, 20, and 30. The total hydrocarbon mass removed by ozone stripping will then be estimated by plotting the concentrations against the cumulative amount of ozone sparged into the sample.

**TEST 2: OZONE SPARGING WITH HYDROGEN PEROXIDE DRIP, W/O pH ADJUSTMENT**

- Insert the ozone diffuser into the 5-gal pail;
- Add 1 ml of 20% hydrogen peroxide solution into pail near the ozone diffuser. **Do not adjust pH;**
- Using a PVC or glass rod to mix the ozone sparged groundwater;
- Measure water characteristics such as temperature, pH, conductivity, DO, ORP, and dissolved ozone. Measure these parameters every 5 minutes; and
- Collect samples for the analytical laboratory to be measured for TPH-g, BTEX, MTBE, and TBA at 5, 15, 20, and 30 minutes. The total hydrocarbon mass removed by ozone stripping will then be estimated by plotting the concentrations against the cumulative amount of ozone sparged into the sample.

**TEST 3: OZONE SPARGING WITH HYDROGEN PEROXIDE DRIP, ADJUSTMENT OF pH TO 3**

- Insert the ozone diffuser into the 5-gal pail;
- Add 1 ml of 20% hydrogen peroxide solution into pail near the ozone diffuser; and **adjust pH to 3;**
- Using PVC or glass rod to mix the ozone sparged groundwater;
- Measure water characteristics such as temp, pH, conductivity, DO, ORP, and dissolved ozone. Measure these parameters every 5 minutes; and
- Collect samples for the analytical laboratory to be measured for TPH-g, BTEX, MTBE, and TBA at 5, 15, 20, and 30 minutes. The total hydrocarbon mass removed by ozone stripping will then be estimated by plotting the concentrations against the cumulative amount of ozone sparged into the sample.

Sincerely,

Jim Jacobs, P.G.  
Chief Hydrogeologist

**SAMPLE DATA TABLE**

**Sample #** \_\_ **Date:**                      **Start time:**                      **Finish time:**

**Adjustment of pH:**                      **Scientist:**

0	DO / ORP	Ozone	pH	Temp/Cond
5				
10				
15				
20				
25				
30				

Times Collected

Lab Analysis

5	MTBE, TBA, TPH-g, BTEX
15	MTBE, TBA, TPH-g, BTEX
20	MTBE, TBA, TPH-g, BTEX
30	MTBE, TBA, TPH-g, BTEX