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Allterra Environmental, Inc.  
849 Almar Avenue, Suite C  
No. 281  
Santa Cruz, California 95060

**Client:** Manwel and Samira Shuwayhat  
**Project Location:** 160 Holmes Street, Livermore, California  
**Subject:** Work Plan for In-Situ Soil and Groundwater Remediation  
**Report Date:** January 28, 2011

To Whom It May Concern:

I have reviewed the report referenced above and approve its distribution to the necessary regulatory agencies. Should any of the regulatory agencies require it, "I declare, under penalty of perjury, that the information and/or recommendations contained in the attached proposal or report is true and correct to the best of my knowledge."

Sincerely,

  
\_\_\_\_\_  
Manwel Shuwayhat



**Work Plan for In-Situ Soil and Groundwater Remediation  
Fuel Leak Case No. RO0000324  
Livermore Gas and Mini-Mart  
160 Holmes Street, Livermore, California**

*Date:*  
January 28, 2011

*Prepared For:*  
Manwel and Samira Shuwayhat  
54 Wolfe Canyon Road  
Kentfield, California 94904

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January 28, 2010

Manwel and Samira Shuwayhat  
54 Wolfe Canyon Road  
Kentfield, California 94904

**Subject: Work Plan for In-Situ Soil and Groundwater Remediation for Fuel Leak Case No. RO0000324, Livermore Gas and Mini-Mart, 160 Holmes Street, Livermore, California**

Dear Mr. and Mrs. Shuwayhat:

On your behalf, Allterra Environmental, Inc. (Allterra) has prepared this *Work Plan for In-Situ Soil and Groundwater Remediation* for the property located at 160 Holmes Street in Livermore, California (Site). The purpose of the proposed work scope is to remediate hydrocarbon-impacted soil and groundwater in the defined source area beneath the Site. This work plan was prepared pursuant to recommendations made in Allterra's Interim Remedial Action Status Report dated December 10, 2010. All work will be conducted in accordance with Alameda County Environmental Health Services (ACEHS) and Regional Water Quality Control Board (RWQCB) guidelines, and Allterra field protocols presented in Appendix A.

#### **Site Location and Description**

The Site is located at the northeast intersection of Holmes Street and Second Street in Livermore, California (Figure 1). A gasoline fuel station currently occupies the Site and the surrounding area is primarily residential with scattered retail businesses along 1<sup>st</sup> and 2<sup>nd</sup> Streets. The approximate surface elevation at the Site is 465 feet above mean sea level (MSL) and the surface slightly slopes to the northwest. Pertinent site features, including the locations of the former underground storage tanks (USTs), existing monitoring and extraction wells, and previous soil borings, are presented on Figures 2 and 3.

#### **Site Geology and Hydrogeology**

Subsurface sediments encountered beneath the Site consist of primarily clayey sand and silty clay fill material from surface grade to approximately eight (8) feet below ground surface (bgs), underlain by fine-grained native material consisting of silty clay, sandy silt, and silty sand to approximately 28 feet bgs. A generally continuous coarse-grained deposit consisting of sandy gravel with varying amounts of silt and clay occurs from approximately 28 feet bgs to depths ranging from approximately 54 to 69 feet bgs, where a sandy to silty clay layer exists. The thickness of this clay layer has not been determined; however, a thickness of at least five feet was confirmed in previous boring MW-1B.

First-encountered groundwater beneath the Site has fluctuated between depths of approximately 28 and 44 feet bgs. The fluctuating groundwater elevation appears to be largely dependent upon regional factors including, but not limited to, regional groundwater pumping, seasonal drought conditions, and government managed groundwater recharge programs. Based on recent quarterly groundwater monitoring data, shallow groundwater generally flows to the northwest at an approximate gradient of 0.006 feet per foot (ft/ft).

## **Site Background**

### Previous Site Investigations

Extensive soil and groundwater investigation work has been performed at the Site since 2000, including the advancement of more than forty-three (43) soil borings and the installation of 19 monitoring wells on-site and off-site. Site investigation work has resulted in full characterization of the lateral and vertical extent of petroleum constituents in soil and groundwater beneath and downgradient of the Site. The locations of previous soil borings and monitoring wells are presented on Figures 2 and 3, and associated analytical data is presented in Tables 1 and 2.

In addition to characterizing the extent of petroleum-impacts, previous site investigation activities have identified a subsurface area of the Site containing the majority of high-level concentrations of petroleum constituents in soil and groundwater. The highest levels of soil and groundwater contamination were detected in samples collected from previous Geoprobe<sup>®</sup> borings installed the area between the northwestern fuel dispenser and USTs. This source area or “area of concern” is generally located between borings GP-8, GP-9, GP-14, and well EW-3 at depths between approximately 24 and 34 feet bgs. The area of concern has been the primary target for pilot scale remedial efforts conducted at the Site.

### Pilot Scale Remedial Activities in 2010

During second and fourth quarters of 2010, Allterra completed pilot scale soil vapor extraction (SVE) and groundwater extraction (GWE) from on-site extraction wells EW-1 and EW-3. The goal of the remedial effort was to use pilot scale equipment to initiate remediation of the area of concern. Data collected during pilot scale operations was used to evaluate remedial effectiveness and to determine the best approach for completing remediation in this area of the Site.

Pilot scale remediation activities varied from more SVE focused to GWE focused as groundwater elevations beneath the Site changed and remedial performance data was gathered. Pilot scale remediation was intended to include SVE only (based on a 20 foot drop in groundwater elevations observed from 2007 to 2009). However, as interim remediation commenced in early 2010, water elevations increased significantly and performing SVE was not technically feasible. Therefore, GWE was added to remedial operations to lower the water table and improve SVE performance. After the first month of operation, influent vapor levels for the SVE system dropped by an order of magnitude and the contaminant mass removal rate decreased. During this time, GWE contaminant mass removal rates were high and GWE influent levels were elevated, with TPHg levels up to 78,000 µg/L and MTBE levels up to 310,000 µg/L. In total, approximately 13 pounds of TPHg and 45 pounds of MTBE were removed from the subsurface through SVE and GWE activities in 2010.

During fourth quarter 2010, groundwater levels at the Site dropped slightly to approximately 27 feet bgs (as measured in EW-3). This drop in groundwater levels, as well as other potential factors, decreased the groundwater extraction flow rate from approximately 2 gallons per minute (gpm) to <0.5 gpm, which made GWE ineffective. The SVE system was tested again, however, SVE was also ineffective and indicated a very low SVE flow rate due to a saturated smear zone.

### **Proposed Groundwater Cleanup Levels**

The proposed corrective action described in this work plan is focused on treating contaminant mass in soil and groundwater in the area of concern to minimize continued degradation of groundwater, minimize future offsite migration of contaminants, and reduce contaminant concentrations to levels at which natural processes will provide further attenuation of contaminants to the ultimate cleanup goals.

The ultimate cleanup goals for groundwater quality at this Site are the San Francisco Bay Regional Water Quality Control Board (RWQCB) environmental screening levels (ESLs) when groundwater is a current or potential source of drinking water. These final screening levels generally use the most conservative published criterion and consider gross contamination, ecotoxicity, human health, vapor intrusion, and groundwater protection. The applicable groundwater ESLs for this Site are listed below:

TPHg	100 µg/L
TPHd	100 µg/L
Benzene	1.0 µg/L
Toluene	40 µg/L
Ethylbenzene	30 µg/L
Xylenes	20 µg/L
MTBE	5.0 µg/L
TBA	12 µg/L

To achieve the groundwater goals specified, active remedial efforts may cease once contaminant concentrations are reduced to levels at which natural attenuation will allow further reduction of concentrations to the ultimate cleanup levels within a reasonable timeframe.

### **Soil and Groundwater Remedial Evaluation**

Based on the results of extensive soil and groundwater investigation work and pilot scale remedial activities conducted at the Site, Allterra has determined that there is a localized hot spot of petroleum-impacted soil and groundwater in the vicinity of well EW-3 (area of concern) that requires further remediation to immediately reduce contaminant mass and ultimately attain the proposed groundwater cleanup goals for the Site. Allterra initially screened several potential remedial strategies and abatement technologies to address petroleum impacts in the area of concern. As a result of this initial screening, a remedial alternative using two innovative in-situ treatment products provided by Regenesys was selected as the preferred remedial alternative for this Site. These products are considered very safe and include the chemical oxidant RegenOx™ and the slow release technology known as Oxygen Release Compound Advanced (ORC Advanced™).

RegenOx™ is an in-situ chemical oxidation process using a solid oxidant complex (sodium percarbonate/catalytic formulation) and an activator complex (a composition of ferrous salt embedded in a micro-scale catalyst gel). RegenOx™ is an aggressive, fast acting oxidative technology capable of treating a broad range of soil and groundwater contaminants. It was engineered as an easily handled and applied high contaminant concentration mass reduction product that can be coupled with the less aggressive slow release technology known as ORC Advanced™ without negative effects on either products contaminant destructive ability or the soil/aquifer geochemistry. RegenOx™ was specifically designed to facilitate a seamless transition to “polishing” with passive in-situ bioremediation.

ORC Advanced™ is an innovative in-situ product designed to stimulate aerobic bioremediation through controlled release of oxygen within the subsurface. It offers maximum oxygen release for periods up to 12 months on a single injection ensuring long-term destruction of the remaining contaminants at the Site.

### **Proposed Scope of Work**

The following is a discussion of in-situ remedial activities proposed at the Site to immediately reduce contaminant mass, stabilize and reduce the size of the contaminant plume, satisfy requirements for low-risk case closure, and ultimately attain the proposed groundwater cleanup goals for the Site.

#### Permitting and Underground Utility Locating

Prior to drilling activities, a soil boring permit will be acquired from the Zone 7 Water Agency. A private utility locating contractor will be retained to identify underground utilities at each proposed boring location. Additionally, the Underground Service Alert (USA) will be notified at least 48 hours prior to the commencement of drilling activities to identify the public service utilities in the work area. Allterra field personnel will also hand clear each boring location to approximately 5 feet bgs to reduce the risk of encountering fuel dispenser piping.

#### Aquifer Volume Testing

Prior to the application of chemical oxidation material, an injection of clean, potable water into the subsurface will be performed at the Site to provide evidence of the shallow aquifer’s capacity to accept the designed volume of RegenOx™ and ORC Advanced™. The injection of clean water at a volume that is approximately 25% greater than the anticipated application volume of treatment material will be conducted outside of the desired onsite treatment area to avoid overloading the subsurface with clean water before applying RegenOx™ and ORC Advanced™.

#### Geoprobe® Drilling and Injection Activities

To facilitate in-situ treatment of petroleum-impacted soil and groundwater, Geoprobe® borings will be advanced in a grid pattern at approximately 30 to 40 locations in the area of concern beneath the Site. The proposed treatment area is shown on Figure 3. All of the borings will be advanced using a truck-mounted Geoprobe® rig equipped with 2-inch diameter push core drilling equipment. The RegenOx™ application process enables the two-part product to be combined, then pressure injected into the zone of contamination and moved out into the unsaturated zone and

aquifer media. Using the Geoprobe® rig and direct-injection techniques to ensure thorough distribution across heterogeneous soils, RegenOx™ will be delivered to the subsurface in a series of three injection events spaced one to two weeks apart. A total of approximately 10 to 15 injection points spaced 10 feet on center will be advanced during each injection event and the injection point locations will be offset by 5 feet from one injection event to the next. During each injection event, RegenOx™ will be injected into the subsurface at approximately 2-foot intervals throughout the ten-foot treatment zone from approximately 24 to 34 feet bgs. Detailed direct-push injection procedures are presented in Appendix B.

Additionally, along with or following the final RegenOx™ application, ORC Advanced™ will be injected into the treatment zone at a rate of approximately 4 pounds per vertical foot to ensure long-term treatment of remaining contaminants. Upon completion of drilling and injection activities, the borings will be backfilled to surface grade with neat cement containing 5% bentonite.

#### Data Collection and Monitoring

Allterra plans to implement a data collection program that will provide information that can be used to evaluate the effectiveness of in-situ remedial efforts. Data that will be collected includes the following:

- For the first month following remedial implementation, weekly groundwater samples and field parameter measurements (including dissolved oxygen) will be collected from select monitoring wells. These select wells will include EW-1, EW-3, MW-1A, MW-2A, and MW-7A/B.
- Monthly groundwater samples and field measurements will be collected from the select wells for three months after the first month. Samples will be collected from all monitoring wells quarterly thereafter.
- The current semi-annual groundwater monitoring program at the Site will be modified to include quarterly monitoring of all wells to evaluate groundwater quality under varying seasonal conditions and assess the efficiency of remedial efforts at the Site.
- If required, confirmatory soil samples may also be collected from the source area to evaluate contaminant mass removal in the smear zone. This sampling event would likely occur approximately one year after implementation of the in-situ Site remedy.

#### Laboratory Analysis

Groundwater samples will be submitted for chemical testing under chain-of-custody protocol to McCampbell Analytical, Inc., of Pittsburgh, California, a State of California certified laboratory (ELAP #1644). The samples will be analyzed for TPHg by EPA Method 8015C, and benzene, toluene, ethylbenzene, and xylenes (BTEX) and MTBE by EPA Method 8021B.

#### Waste Disposal

Soil cuttings generated during drilling will be temporarily stored on-site in labeled, DOT-approved 55-gallon drums. Soil drums will be sampled, analyzed, and profiled for disposal under waste manifest at an appropriate disposal facility.



Wastewater generated during drilling and aquifer testing activities will be temporarily stored on-site in labeled, DOT-approved 55-gallon drums pending disposal and/or treatment and permitted discharge to the sanitary sewer system.

### Health and Safety

During drilling and injection field activities, field personnel will wear modified Level D personal protective equipment (PPE) consisting of hardhats, chemical resistant gloves, safety goggles or face shield, NIOSH-approved dust and mist respirator, long sleeve clothing or Tyvek® suit, and steel-toed boots. Onsite health and safety issues will be the responsibility of the Project Manager and Site Health and Safety Officer and are summarized in Allterra's Site-Specific Health and Safety Plan (see Appendix C). The site Health and Safety Officer is responsible to inform all field personnel of current health and safety issues and will conduct daily health and safety tailgate meetings.

### **Reporting**

Upon completion of field activities, Allterra will prepare a technical report summarizing completed remedial activities, the results of weekly groundwater sampling, and our conclusions and recommendations regarding Site conditions and the need for additional remedial action. The report will also include an updated site map depicting the locations of the completed injection points and copies of the laboratory analytical reports.

### **Limitations**

The data, information, interpretation, and recommendations contained in this Work Plan are presented solely as preliminary to the existing environmental conditions at 160 Holmes Street. Site conditions can change over time; therefore, data, information, interpretation, and recommendations presented in this work plan are only applicable to the timeframe of this study. The conclusions and professional opinions presented herein were developed by Allterra in accordance with environmental principles and practices generally accepted at this time and location, no warranties are expressed or implied.



If you have any questions, please call Allterra at (831) 425-2608.

Sincerely,  
Allterra Environmental, Inc.



James Allen, R.E.A.II  
Project Manager



Joe Mangine, P.G. 8423  
Senior Geologist

Attachments:

Figure 1, Site Vicinity Map

Figure 2, Site Plan

Figure 3, Proposed Treatment Area

Table 1, Historical Soil Analytical Results

Table 2, Historical Groundwater Analytical Results

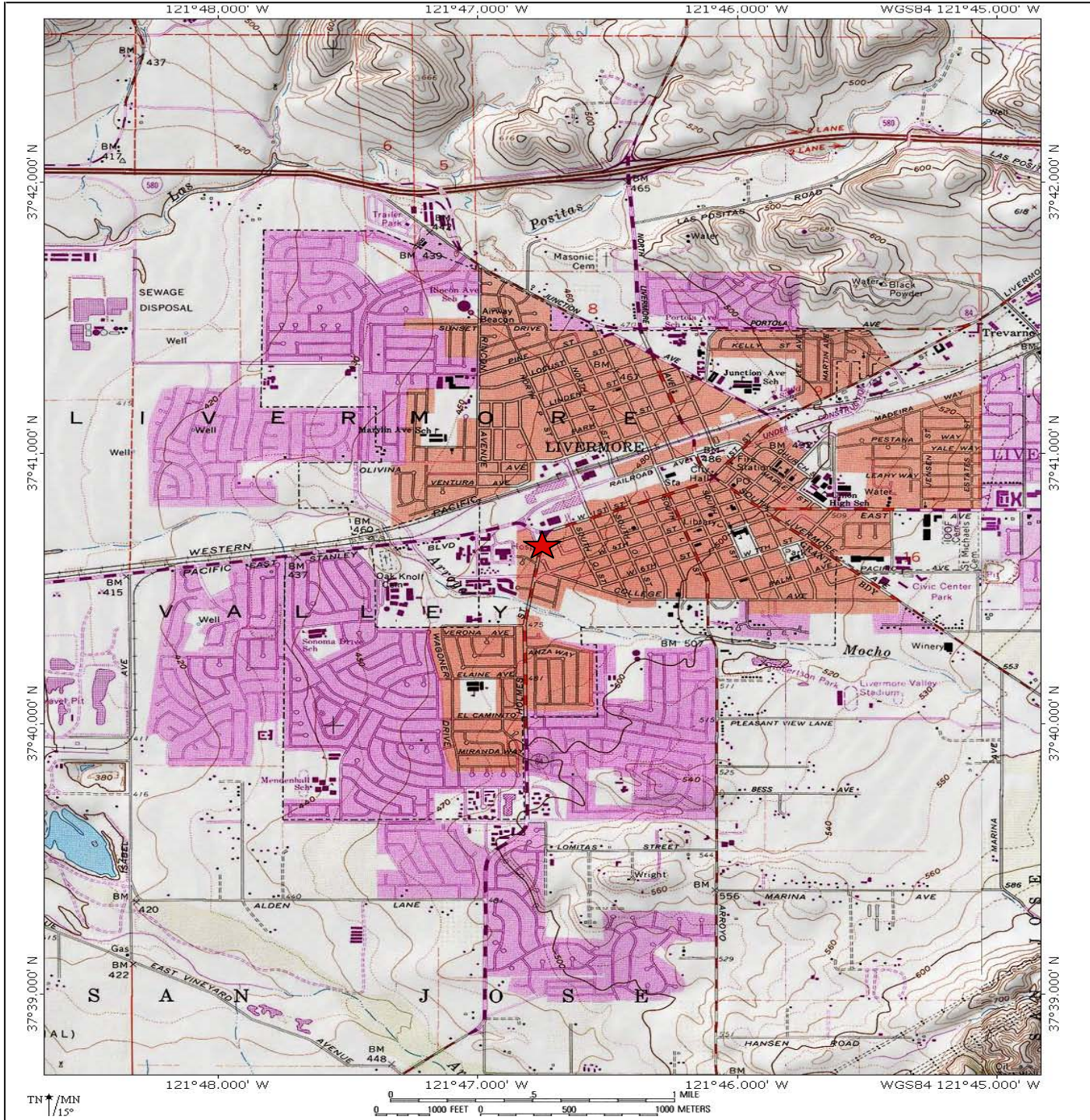
Appendix A: Site Investigation Field Protocol

Appendix B: Regensis Product Application Procedures

Appendix B: Site-Specific Health and Safety Plan

cc: Mr. Jerry Wickham, ACEHS

FIGURES 1 - 3



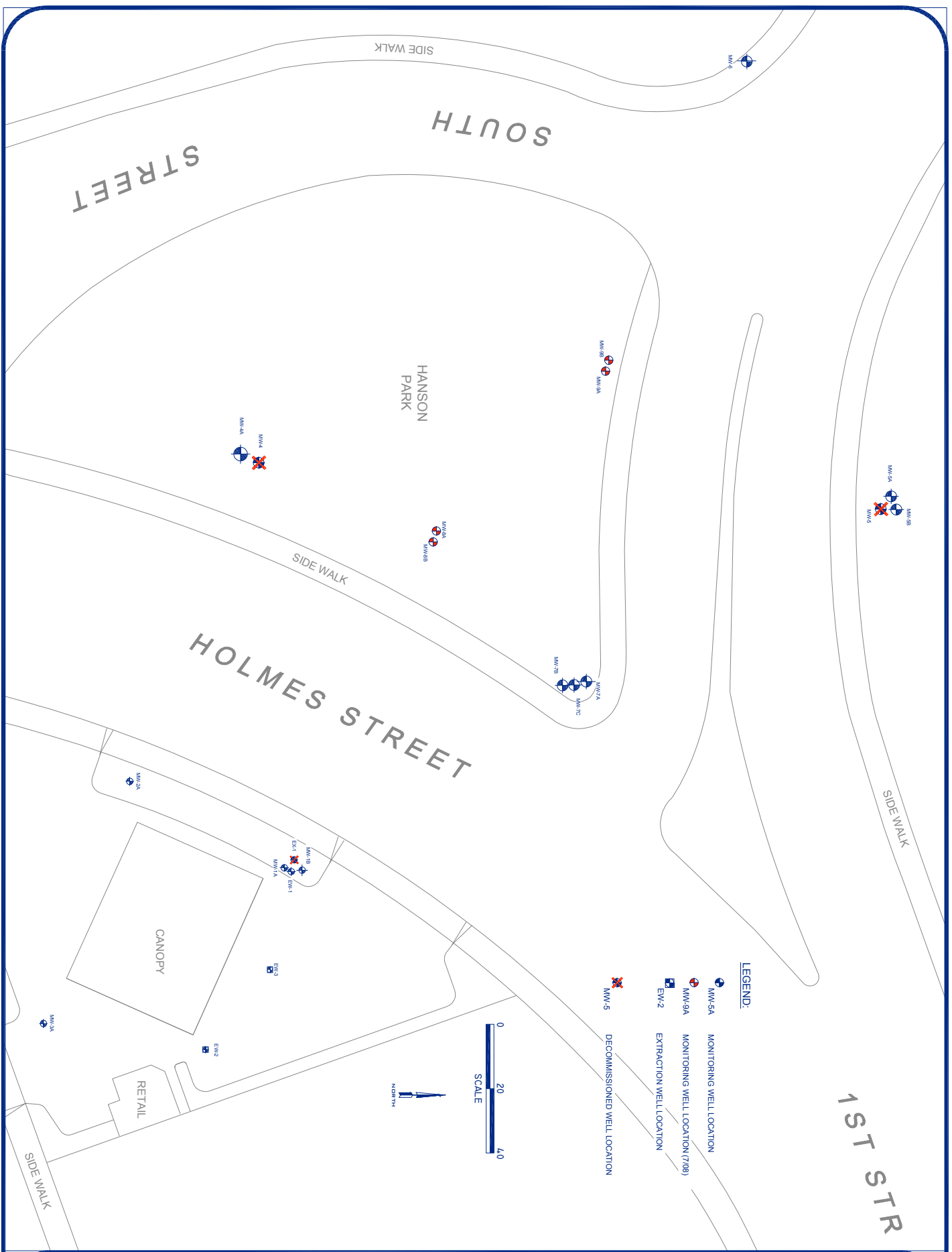
**Site Vicinity Map**  
 Livermore Gas and Minimart  
 160 Holmes Street  
 Livermore, California

Figure 1

1/28/11

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General Notes  
Stamp

## 160 HOLMES STREET SOIL AND GROUNDWATER INVESTIGATION AND REMEDIATION PROJECT

PREPARED BY:  
**ALLTERRA**

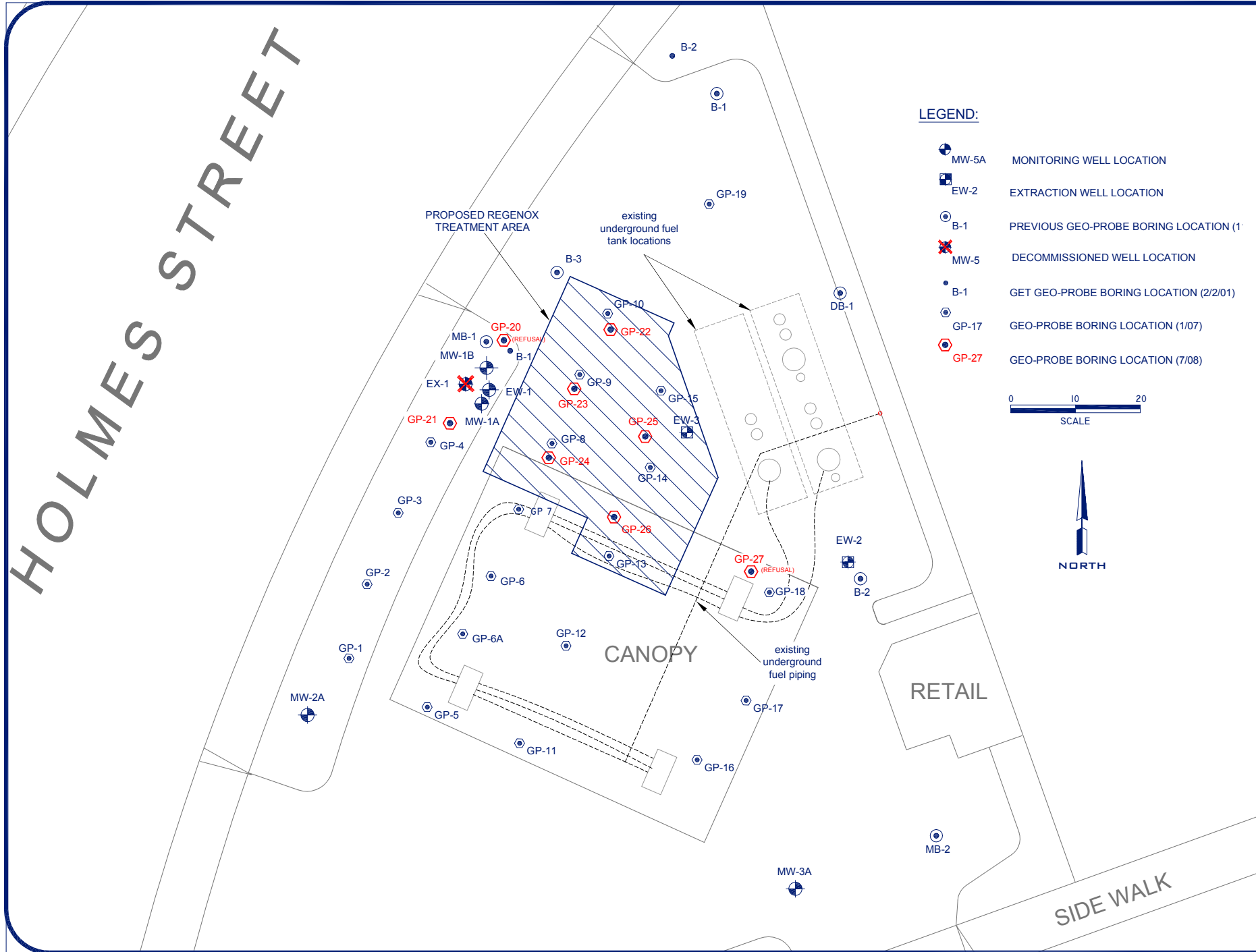
No.	Revision/Issue	Date
0	DRAFT/REVIEW	3/16

FOR INFORMATION ONLY  
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FIELD NOTES AND ADDRESS  
**SITE PLAN**  
 FIRST QUARTER 2010  
 GROUNDWATER MONITORING  
 REPORT

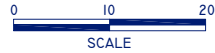
Sheet	160	Total	FIGURE
Date	3-16-10		<b>2</b>
Scale	see drawing		

# HOLMES STREET



**LEGEND:**

- MW-5A MONITORING WELL LOCATION
- EW-2 EXTRACTION WELL LOCATION
- B-1 PREVIOUS GEO-PROBE BORING LOCATION (1/07)
- MW-5 DECOMMISSIONED WELL LOCATION
- B-1 GET GEO-PROBE BORING LOCATION (2/2/01)
- GP-17 GEO-PROBE BORING LOCATION (1/07)
- GP-27 GEO-PROBE BORING LOCATION (7/08)



General Notes

stamp

160 HOLMES STREET  
SOIL AND GROUNDWATER INVESTIGATION  
AND REMEDIATION PROJECT



0	DRAFT/REVIEW	1/19
No.	Revision/Issue	Date

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PROPOSED TREATMENT AREA  
160 HOLMES STREET  
LIVERMORE, CALIFORNIA

Project	160	FIGURE <b>3</b>
Date	1-19-11	
Scale	see drawing	

FN/NAME

REV/DATE

USER

TABLES 1 - 2

**Table 1**  
**Historical Soil Analytical Data**  
160 Holmes Street, Livermore, California

Sample ID	Sample Depth (feet)	Sample Date	TPHg	TPHd	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE	Fuel Oxygenates				
										TAME	TBA	DIPE	ETBE	MTBE
T1-West	NA	4/5/99	<20	<1.0	<1.2	<1.2	<1.2	<1.2	24	--	--	--	--	--
T2-West	NA	4/5/99	<100	--	<6.2	<6.2	<6.2	<6.2	47	--	--	--	--	--
T3-West	NA	4/5/99	<200	--	<12	<12	<12	<12	41	--	--	--	--	--
T4-West	NA	4/5/99	<200	--	<12	<12	<12	<12	100	--	--	--	--	--
T1-East	NA	5/6/99	17	<1.0	<0.62	<0.62	<0.62	<0.62	7.7	--	--	--	--	--
T2-East	NA	5/6/99	31	--	<0.62	<0.62	<0.62	<0.62	28	--	--	--	--	--
T3-East	NA	5/6/99	<50	--	<3.1	<3.1	<3.1	<3.1	41	--	--	--	--	--
T4-East	NA	5/6/99	14	--	<0.62	<0.62	<0.62	<0.62	20	--	--	--	--	--
Dispenser 1	NA	5/20/99	49	--	0.015	0.084	0.033	0.041	<0.0050	--	--	--	--	--
Dispenser 2	NA	5/20/99	<1.0	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--	--
Dispenser 3	NA	5/20/99	6,500	--	<31	81	120	940	<31	--	--	--	--	--
Dispenser 4	NA	5/20/99	--	--	--	--	--	--	--	--	--	--	--	--
Dispenser 5	NA	5/20/99	32	--	0.040	0.62	0.29	3.0	<0.0050	--	--	--	--	--
Dispenser 6	NA	5/20/99	<1.0	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--	--
Diesel-D	NA	5/20/99	160	1,300	0.032	0.20	0.089	15	<0.62	--	--	--	--	--
MW-1	15	7/26/00	<10	--	<0.62	<0.62	<0.62	<0.62	0.93	--	--	--	--	--
MW-1	19	7/26/00	800	--	<6.2	36	18	100	21	--	--	--	--	--
MW-2	15	7/26/00	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.005	--	--	--	--	--
MW-2	20	7/26/00	1.1	--	0.0092	0.013	0.053	0.13	0.11	--	--	--	--	--
MW-3	15	7/26/00	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.005	--	--	--	--	--
MW-3	20	7/26/00	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.005	--	--	--	--	--
MB-1	18	11/11/05	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
MB-1	22	11/11/05	78	23	0.028	0.073	1.0	4.8	2.3	--	--	--	--	--
MB-1	26	11/11/05	110	18	0.27	0.51	2.0	1.7	14	--	--	--	--	--



**Table 1**  
**Historical Soil Analytical Data**  
160 Holmes Street, Livermore, California

Sample ID	Sample Depth (feet)	Sample Date	TPHg	TPHd	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE	Fuel Oxygenates				
										TAME	TBA	DIPE	ETBE	MTBE
MB-3	20	11/11/05	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
MB-3	28	11/11/05	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
MB-3	32	11/11/05	1,400	100	<0.5	5.0	20	67	<5.0	--	--	--	--	--
B-1	28	11/10/05	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
B-2	16	11/10/05	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
B-2	20	11/10/05	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
B-2	24	11/10/05	5.7	9.5	<0.005	0.018	0.076	0.25	1.7	--	--	--	--	--
B-2	28	11/10/05	11	2.4	0.075	0.073	0.26	0.14	7.2	--	--	--	--	--
B-3	16	11/10/05	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
B-3	20	11/10/05	<1.0	--	<0.005	0.0058	0.0071	0.024	<0.05	--	--	--	--	--
B-3	24	11/10/05	9.0	1.4	0.077	0.037	0.32	1.1	<1.0	--	--	--	--	--
B-3	28	11/10/05	48	6.1	0.053	0.20	0.53	0.49	<1.0	--	--	--	--	--
DB-1	26	11/10/05	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
MW-1B	61	2/23/06	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
MW-5B	55	2/27/06	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
MW-7C	70	2/27/06	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
EW-2	41.5	2/24/06	1.4	--	<0.005	<0.005	<0.005	<0.005	0.22	--	--	--	--	--
GP-1	8	1/10/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-1	24	1/10/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-1	28	1/10/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--

**Table 1**  
**Historical Soil Analytical Data**  
160 Holmes Street, Livermore, California

Sample ID	Sample Depth (feet)	Sample Date	TPHg	TPHd	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE	Fuel Oxygenates				
										TAME	TBA	DIPE	ETBE	MTBE
GP-2	8	1/10/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-2	24	1/10/07	51	--	<0.050	<0.050	0.13	0.20	<0.50	--	--	--	--	--
GP-3	8	1/10/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-3	24	1/10/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-3	28	1/10/07	100	--	<0.050	0.40	2.1	3.2	2.6	--	--	--	--	--
GP-4	8	1/10/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-4	16	1/10/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-4	28	1/10/07	13	--	0.021	0.096	0.24	0.32	4.4	--	--	--	--	--
GP-5	8	1/10/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-5	20	1/10/07	5.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-5	28	1/10/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-6	8	1/10/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	0.090	--	--	--	--	--
GP-6	18	1/10/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-6	24	1/10/07	<1.0	--	<0.005	<0.005	<0.005	0.013	0.11	--	--	--	--	--
GP-6	28	1/10/07	23	--	0.0057	0.021	0.052	0.16	0.056	--	--	--	--	--
GP-6A	4	1/11/07	11	--	<0.005	<0.005	0.0081	<0.005	<0.10	--	--	--	--	--
GP-6A	8	1/11/07	<1.0	--	<0.005	<0.005	<0.005	0.011	<0.10	--	--	--	--	--
GP-6A	16	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-6A	20	1/11/07	1.6	--	<0.005	<0.005	0.0052	0.0065	0.066	--	--	--	--	--
GP-6A	24	1/11/07	2.0	--	<0.005	0.013	0.0062	0.015	0.44	--	--	--	--	--
GP-6A	28	1/11/07	17	--	<0.010	<0.010	0.40	0.028	0.34	--	--	--	--	--
GP-7	4	1/11/07	2.0	--	<0.005	0.014	0.0080	0.092	0.086	--	--	--	--	--
GP-7	8	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-7	14	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	0.062	--	--	--	--	--

**Table 1**  
**Historical Soil Analytical Data**  
160 Holmes Street, Livermore, California

Sample ID	Sample Depth (feet)	Sample Date	TPHg	TPHd	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE	Fuel Oxygenates				
										TAME	TBA	DIPE	ETBE	MTBE
GP-8	8	1/10/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-8	24	1/10/07	30	--	0.030	0.19	0.46	2.4	9.6	--	--	--	--	--
GP-9	8	1/10/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-9	12	1/10/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-9	24	1/10/07	110	--	0.27	1.2	1.6	9.5	22	--	--	--	--	--
GP-10	21	1/10/07	35	--	0.033	0.35	0.56	3.6	1.5	--	--	--	--	--
GP-10	24	1/10/07	2.2	--	0.0081	0.011	0.023	0.12	3.9	--	--	--	--	--
GP-11	8	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-11	24	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-11	28	1/11/07	3.7	--	<0.005	<0.005	<0.005	<0.005	0.057	--	--	--	--	--
GP-12	8	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	0.072	--	--	--	--	--
GP-12	24	1/11/07	15	--	<0.005	<0.005	0.13	0.14	0.092	--	--	--	--	--
GP-12	28	1/11/07	11	--	0.0061	<0.005	0.47	0.014	0.36	--	--	--	--	--
GP-13	8	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-13	24	1/11/07	9.1	--	<0.005	<0.005	<0.005	0.014	<0.05	--	--	--	--	--
GP-13	28	1/11/07	100	--	0.17	0.39	2.6	6.7	8.9	--	--	--	--	--
GP-14	8	1/11/07	6.4	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-14	12	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-14	16	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-14	24	1/11/07	320	--	0.43	14	7.0	40	50	--	--	--	--	--
GP-14	28	1/11/07	120	--	0.47	3.3	2.0	11	140	--	--	--	--	--
GP-15	12	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	0.078	--	--	--	--	--
GP-15	19	1/11/07	1.5	--	<0.005	0.012	0.026	0.054	0.49	--	--	--	--	--
GP-15	24	1/11/07	1.6	--	<0.005	0.0077	0.015	0.11	0.40	--	--	--	--	--
GP-15	28	1/11/07	6.7	--	0.047	0.24	0.13	0.72	9.5	--	--	--	--	--

**Table 1**  
**Historical Soil Analytical Data**  
160 Holmes Street, Livermore, California

Sample ID	Sample Depth (feet)	Sample Date	TPHg	TPHd	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE	Fuel Oxygenates				
										TAME	TBA	DIPE	ETBE	MTBE
GP-16	8	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	0.061	--	--	--	--	--
GP-16	24	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	0.10	--	--	--	--	--
GP-16	28	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-17	8	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-17	24	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-17	28	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-18	8	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-18	16	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	0.070	--	--	--	--	--
GP-18	24	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-18	28	1/11/07	110	--	<0.010	0.16	0.37	1.3	0.20	--	--	--	--	--
GP-19	8	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-19	21	1/11/07	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
GP-19	24	1/11/07	5.8	--	<0.005	0.0072	0.12	0.23	0.074	--	--	--	--	--
GP-21	32	7/9/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.050	4.6	<0.050	<0.050	<0.050
GP-21	36	7/9/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.010	1.1	<0.010	<0.010	<0.010
GP-21	40	7/9/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.010	0.72	<0.010	<0.010	<0.010
GP-21	44	7/9/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.05	<0.005	<0.005	<0.005
GP-21	48	7/9/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.05	<0.005	<0.005	<0.005
GP-21	52	7/9/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.05	<0.005	<0.005	<0.005
GP-22	32	7/8/08	1.2	--	<0.005	<0.005	0.0059	<0.005	<0.05	<0.025	2.9	<0.025	<0.025	0.051
GP-22	36	7/8/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.050	3.6	<0.050	<0.050	<0.050
GP-22	40	7/8/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.010	1.3	<0.010	<0.010	<0.010
GP-22	44	7/8/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.05	<0.005	<0.005	<0.005
GP-22	47	7/8/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.05	<0.005	<0.005	<0.005

**Table 1**  
**Historical Soil Analytical Data**  
160 Holmes Street, Livermore, California

Sample ID	Sample Depth (feet)	Sample Date	TPHg	TPHd	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE	Fuel Oxygenates				
										TAME	TBA	DIPE	ETBE	MTBE
GP-23	32	7/7/08	56	--	0.093	0.089	0.73	0.61	7.0	<0.33	<3.3	<0.33	<0.33	8.5
GP-23	36	7/7/08	<1.0	--	<0.005	<0.005	0.010	0.0067	0.081	<0.050	3.0	<0.050	<0.050	0.063
GP-23	40	7/7/08	<1.0	--	<0.005	<0.005	0.0087	<0.005	<0.05	<0.005	0.34	<0.005	<0.005	0.010
GP-23	44	7/7/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.05	<0.005	<0.005	0.010
GP-23	50	7/7/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.05	<0.005	<0.005	<0.005
GP-24	32	7/7/08	<1.0	--	<0.005	<0.005	0.015	<0.005	0.12	<0.010	1.2	<0.010	<0.010	0.23
GP-24	36	7/7/08	<1.0	--	<0.005	<0.005	0.016	<0.005	<0.05	<0.025	1.7	<0.025	<0.025	<0.025
GP-24	40	7/7/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.010	0.91	<0.010	<0.010	0.088
GP-24	44	7/7/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.05	<0.005	<0.005	<0.005
GP-24	48	7/7/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.05	<0.005	<0.005	<0.005
GP-25	32	7/8/08	4.5	--	0.18	0.015	0.18	<0.005	3.3	<0.25	<2.5	<0.25	<0.25	2.8
GP-25	36	7/8/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.010	0.85	<0.010	<0.010	0.85
GP-25	40	7/8/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.05	<0.005	<0.005	0.014
GP-25	44	7/8/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.05	<0.005	<0.005	0.012
GP-25	50	7/8/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.05	<0.005	<0.005	0.015
GP-26	32	7/8/08	3.1	--	0.0074	0.015	0.082	0.012	4.6	<0.33	<3.3	<0.33	<0.33	5.1
GP-26	36	7/8/08	3.4	--	0.023	0.0087	0.053	0.010	1.7	<0.33	<3.3	<0.33	<0.33	2.0
GP-26	40	7/8/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.05	<0.005	<0.005	0.013
GP-26	44	7/8/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.05	<0.005	<0.005	0.0061
GP-26	48	7/8/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.05	<0.005	<0.005	0.010
MW-8B	28	7/16/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--
MW-8B	32	7/16/08	<1.0	--	<0.005	<0.005	<0.005	<0.005	<0.05	--	--	--	--	--

Notes:

-- : not analyzed

NA : not available

All results are in milligrams per kilogram (mg/kg)

TPHg was analyzed by EPA Method 8015CM

Benzene, toluene, ethylbenzene, xylenes, and MTBE were analyzed by EPA Method 8021B

MTBE, TAME, ETBE, TBA, and DIPE were analyzed by EPA Method 8260B

Refusal in borings GP-20 and GP-27 - no samples

TPHg: Total Petroleum Hydrocarbons as gasoline

MTBE = methyl tertiary butyl ether

TAME = tert-amyl methyl ether

TBA = tert-butyl alcohol

DIPE = di-isopropyl ether

ETBE = ethyl tert-butyl ether



**Table 2**  
**Historical Groundwater Analytical Results**  
160 Holmes Street, Livermore, California

Well ID	Date Collected	Groundwater Elevation (feet above MSL)	Total Petroleum Hydrocarbons (µg/L)		Aromatic Volatile Organic Compounds (µg/L)					Oxygenated Volatile Organics (µg/L)						Lead Scavengers (µg/L)		
			Gasoline	Diesel	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE (8021B)	TAME	TBA	DIPE	ETBE	MTBE	ethanol	methanol	EDB	1,2-DCA
MW-1A*	8/11/00	--	170,000	57,000	6,400	7,600	4,200	9,700	320,000	--	--	--	--	--	--	--	--	--
	10/19/00	443.09	170,000	17,000	8,400	3,200	2,700	10,000	200,000	--	--	--	--	--	--	--	--	--
	2/22/01	442.12	82,000	11,000	5,100	1,000	13,000	8,700	190,000	--	--	--	--	--	--	--	--	--
	5/30/01	DRY	not sampled - well dry							--	--	--	--	--	--	--	--	--
	11/14/01	DRY	not sampled - well dry							--	--	--	--	--	--	--	--	--
	5/7/02	DRY	not sampled - well dry							--	--	--	--	--	--	--	--	--
	9/11/02	438.87	130,000	NA	7,700	1,100	4,500	1,500	<5000	--	--	--	--	--	--	--	--	--
	12/1/02	437.48	NS	NS	NS	NS	NS	NS	NS	--	--	--	--	--	--	--	--	--
	3/14/03	442.40	180,000	3,800	7,100	3,200	4,300	6,000	220,000	--	--	--	--	--	--	--	--	--
	6/25/03	442.93	71,000	3,100	7,500	4,700	4,800	8,900	210,000	--	--	--	--	--	--	--	--	--
	9/16/03	440.12	37,000	3,600	4,600	220	3,600	930	150,000	--	--	--	--	--	--	--	--	--
	12/22/03	443.28	44,000	4,000	6,800	1,500	4,000	3,800	180,000	--	--	--	--	--	--	--	--	--
	3/10/04	447.58	72,000	3,100	6,000	11,000	3,900	10,000	260,000	--	--	--	--	--	--	--	--	--
	6/15/04	442.65	42,000	4,300	5,000	1,800	3,700	6,000	210,000	--	--	--	--	--	--	--	--	--
	9/17/04	439.42	24,000	2,900	2,800	<33	2,900	500	83,000	--	--	--	--	--	--	--	--	--
	12/10/04	442.85	31,000	2,700	4,600	190	4,400	2,800	200,000	--	--	--	--	--	--	--	--	--
	3/2/05	448.08	58,000	2,800	4,000	2,500	4,500	7,800	230,000	--	--	--	--	--	--	--	--	--
	5/27/05	446.61	79,000	4,600	4,300	6,200	5,100	13,000	240,000	--	--	--	--	--	--	--	--	--
	7/21/05	443.65	80,000	NS	4,300	5,300	5,400	14,000	300,000	--	--	--	--	--	--	--	--	--
	10/10/05	442.54	58,000	NS	4,300	240	5,600	8,300	170,000	--	--	--	--	--	--	--	--	--
	1/9/06	446.98	47,000	3,700	3,100	1,100	4,400	5,900	180,000	<2,500	<25,000	<2,500	<2,500	240,000	<250,000	<2,500,000	<2,500	<2,500
	4/6/06	449.43	18,000	1,900	1,200	280	2,400	2,200	110,000	<2,500	<25,000	<2,500	<2,500	87,000	<250,000	<2,500,000	<2,500	<2,500
	7/27/06	442.61	24,000	2,400	2,100	350	3,400	5,300	130,000	<5000	<50,000	<5000	<5000	160,000	--	--	--	--
	10/12/06	441.57	19,000	1,700	1,000	26	2,000	1,000	68,000	<1,200	<12,000	<1,200	<1,200	84,000	<120,000	<1,200,000	--	--
	1/3/07	444.03	27,000	2,300	1,300	53	2,500	1,900	120,000	<1,700	<1,7000	<1,700	<1,700	110,000	<170,000	<1,700,000	<1,700	<1,700
	4/13/07	441.79	28,000	3,000	1,600	74	3,700	1,800	190,000	<5,000	<50,000	<5,000	<5,000	200,000	<500,000	<5,000,000	<5,000	<5,000
	7/16/07	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	10/29/07	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/1/08	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
4/18/08	437.69	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
7/28/08	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
11/18/08	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
2/4/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
4/21/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
9/24/09	430.03	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
3/4/10	436.98	1,300	NA	140	<5.0	26	6.0	16,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/19/10	441.18	400	NA	1.2	1.3	<0.5	0.76	880	NA	NA	NA	NA	NA	NA	NA	NA	NA	
MW-1B	3/13/06	446.44	<50	<50	<0.5	<0.5	<0.5	<0.5	8.2	<0.5	<5.0	<0.5	<0.5	7.9	<50	<500	<0.5	<0.5
	4/6/06	449.43	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	1.0	<50	<500	<0.5	<0.5
	7/27/06	442.55	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	--	--	--	--
	10/12/06	441.51	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	--	--
	1/3/07	443.98	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	4/13/07	441.72	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	7/16/07	429.45	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	NA	NA	NA	NA
	10/29/07	417.70	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5

**Table 2**  
**Historical Groundwater Analytical Results**  
160 Holmes Street, Livermore, California

Well ID	Date Collected	Groundwater Elevation (feet above MSL)	Total Petroleum Hydrocarbons (µg/L)		Aromatic Volatile Organic Compounds (µg/L)					Oxygenated Volatile Organics (µg/L)						Lead Scavengers (µg/L)		
			Gasoline	Diesel	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE (8021B)	TAME	TBA	DIPE	ETBE	MTBE	ethanol	methanol	EDB	1,2-DCA
MW-1B cont.	2/1/08	431.12	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<2.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	4/18/08	437.67	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<2.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	7/29/08	--	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	11/18/08	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/4/09	418.19	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4/21/09	427.92	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/24/09	427.26	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	1.1	NA	NA	NA	NA
	3/4/10	437.61	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7/19/10	NC	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	MW- 2A*	8/11/00	NC	4,500	1,900	220	52	160	170	3,000	--	--	--	--	--	--	--	--
10/19/00		443.14	3,400	1,300	150	21	100	70	1,900	--	--	--	--	--	--	--	--	--
2/22/01		442.07	7,600	880	25	<10	69	25	2,200	--	--	--	--	--	--	--	--	--
5/30/01		DRY	not sampled - well dry							--	--	--	--	--	--	--	--	--
11/14/01		DRY	not sampled - well dry							--	--	--	--	--	--	--	--	--
5/7/02		438.24	400	86	5.4	<0.5	1.9	2.3	230	--	--	--	--	--	--	--	--	--
9/11/02		438.98	260	NA	1.3	<0.5	0.57	0.77	200	--	--	--	--	--	--	--	--	--
12/1/02		437.38	250	120	7.9	1.6	13	9.9	180	--	--	--	--	--	--	--	--	--
3/14/03		442.53	830	110	56	<0.5	<0.5	<1.0	1,200	--	--	--	--	--	--	--	--	--
6/25/03		442.97	260	180	0.92	2.9	3.1	8.1	2,000	--	--	--	--	--	--	--	--	--
9/16/03		440.24	420	260	3.6	3.4	5.2	2.4	1,300	--	--	--	--	--	--	--	--	--
12/22/03		443.36	240	120	0.82	3.1	7.8	3.9	1,400	--	--	--	--	--	--	--	--	--
3/10/04		447.63	280	210	9.4	4.2	14	11	1,400	--	--	--	--	--	--	--	--	--
6/15/04		442.76	150	150	2.1	2.4	2.2	1.3	1,500	--	--	--	--	--	--	--	--	--
9/17/04		439.50	61	70	<0.5	1.0	<0.5	<0.5	730	--	--	--	--	--	--	--	--	--
12/10/04		442.94	84	110	<0.5	1.2	<0.5	1.5	1,300	--	--	--	--	--	--	--	--	--
3/2/05		448.19	63	91	0.55	<0.5	0.63	0.51	1,000	--	--	--	--	--	--	--	--	--
5/27/05		446.65	270	59	14	3.9	19	6.8	1,100	--	--	--	--	--	--	--	--	--
7/21/05		444.48	280	NS	8.6	2.5	17	2.5	1,500	--	--	--	--	--	--	--	--	--
10/10/05		442.64	<50	NS	<.5	<.5	<.5	<.5	680	--	--	--	--	--	--	--	--	--
1/9/06		447.27	1,700	890	4.4	1.3	120	18	530	<10	330	<10	<10	590	<1000	<10,000	<10	<10
4/7/06		449.47	110	160	0.61	0.80	4.1	<0.5	270	<5.0	660	<5.0	<5.0	240	<500	<5,000	<5.0	<5.0
7/27/06		442.67	<50	120	<0.5	0.84	<0.5	<0.5	87	<5.0	870	<5.0	<5.0	110	--	--	--	--
10/12/06		441.59	<50	70	<0.5	<0.5	<0.5	<0.5	29	<5.0	480	<5.0	<5.0	30	<500	<5000	--	--
1/3/07		444.04	55	60	0.57	<0.5	<0.5	<0.5	8.5	<2.5	590	<2.5	<2.5	7.8	<250	<2,500	<2.5	<2.5
4/13/07		441.78	86	130	<0.5	0.60	<0.5	<0.5	16	<5.0	740	<5.0	<5.0	16	<500	<5,000	<5.0	<5.0
7/16/07		DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10/29/07		DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/1/08		DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4/18/08		437.68	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/28/08		DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
11/18/08		NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/4/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
4/21/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
9/24/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
3/4/10	439.82	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/20/10	439.09	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	



**Table 2**  
**Historical Groundwater Analytical Results**  
160 Holmes Street, Livermore, California

Well ID	Date Collected	Groundwater Elevation (feet above MSL)	Total Petroleum Hydrocarbons (µg/L)		Aromatic Volatile Organic Compounds (µg/L)					Oxygenated Volatile Organics (µg/L)						Lead Scavengers (µg/L)		
			Gasoline	Diesel	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE (8021B)	TAME	TBA	DIPE	ETBE	MTBE	ethanol	methanol	EDB	1,2-DCA
MW- 3A*	8/11/00	--	59	260	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	10/19/00	443.39	<50	<65	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	2/22/01	442.33	<50	100	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	5/30/01	DRY	not sampled - well dry							--	--	--	--	--	--	--	--	--
	11/14/01	DRY	not sampled - well dry							--	--	--	--	--	--	--	--	--
	5/7/02	DRY	not sampled - well dry							--	--	--	--	--	--	--	--	--
	9/11/02	439.23	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	12/1/02	437.66		NS						--	--	--	--	--	--	--	--	--
	3/14/03	442.80	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	6/25/03	443.25	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	9/16/03	440.51	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	12/22/03	443.47	<50	69	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	3/10/04	447.96	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	6/15/04	443.02	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	9/17/04	439.75	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	12/10/04	443.19	<50	<50	<0.5	<0.5	<0.5	<0.5	7.6	--	--	--	--	--	--	--	--	--
	3/2/05	448.51	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	5/27/05	446.95	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	7/21/05	444.74	<50	NS	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	10/10/05	442.90	<50	NS	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	1/9/06	447.60	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<5.0	<0.5	<50	<500	<0.5	<0.5
	4/7/06	449.82	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	7/27/06	442.94	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	--	--	--	--
	10/12/06	441.85	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	--	--
	1/3/07	444.32	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	4/13/07	442.06	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	7/16/07	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10/29/07	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
2/1/08	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
4/18/08	437.98	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
7/28/08	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
11/18/08	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
2/4/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
4/21/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
9/24/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
3/4/10	437.89	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/19/10	439.29	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
MW-4**	11/14/01	431.31	510	90	4.0	<0.5	<0.5	<0.5	14	--	--	--	--	--	--	--	--	
	5/7/02	438.40	150	<50	3.5	0.5	<0.5	<0.5	48	--	--	--	--	--	--	--	--	
	9/11/02	438.49	<50	NA	<0.5	<0.5	<0.5	<0.5	15	--	--	--	--	--	--	--	--	
	12/1/02	436.76	<50	<50	<0.5	<0.5	<0.5	<0.5	24	--	--	--	--	--	--	--	--	
	3/14/03	442.01	<50	<50	<0.5	<0.5	<0.5	<0.5	<1.0	--	--	--	--	--	--	--	--	
	6/25/03	442.43	<50	<50	<0.5	<0.5	<0.5	<0.5	<1.0	--	--	--	--	--	--	--	--	
	9/16/03	439.76	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	
	12/22/03	442.73	<50	69	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	
3/10/04	446.95	<50	<50	<0.5	<0.5	<0.5	<0.5	37	--	--	--	--	--	--	--	--	--	

**Table 2**  
**Historical Groundwater Analytical Results**  
160 Holmes Street, Livermore, California

Well ID	Date Collected	Groundwater Elevation (feet above MSL)	Total Petroleum Hydrocarbons (µg/L)		Aromatic Volatile Organic Compounds (µg/L)					Oxygenated Volatile Organics (µg/L)						Lead Scavengers (µg/L)		
			Gasoline	Diesel	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE (8021B)	TAME	TBA	DIPE	ETBE	MTBE	ethanol	methanol	EDB	1,2-DCA
MW-4** cont.	6/15/04	442.20	<50	<50	<0.5	<0.5	<0.5	<0.5	7.4	--	--	--	--	--	--	--	--	--
	9/17/04	439.03	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	12/10/04	442.42	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	3/2/05	447.55	<50	<50	<0.5	<0.5	<0.5	<0.5	14	--	--	--	--	--	--	--	--	--
	5/27/05	446.01	<50	<50	<0.5	<0.5	<0.5	<0.5	9.6	--	--	--	--	--	--	--	--	--
	7/21/05	443.90	<50	NS	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	10/10/05	442.30	<50	NS	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	1/9/06	446.61	<50	<50	<0.5	<0.5	<0.5	<0.5	0.86	<0.5	<5.0	<0.5	<5.0	0.86	<50	<500	<5.0	<5.0
MW-4A	3/13/06	445.87	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	0.70	<50	<500	<0.5	<0.5
	4/7/06	448.77	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<5.0	1.1	<50	<500	<0.5	<0.5
	7/28/06	442.09	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	3.0	--	--	--	--
	10/13/06	441.06	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	2.0	<50	<500	--	--
	1/4/07	443.44	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	0.79	<50	<500	<0.5	<0.5
	4/13/07	441.18	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	0.51	<50	<500	<0.5	<0.5
	7/16/07	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	10/29/07	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/1/08	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	4/18/08	437.05	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	7/28/08	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	11/18/08	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/4/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	4/21/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	9/24/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3/4/10	439.30	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/20/10	440.71	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
MW-5**	11/14/01	429.71	<50	<66	<0.5	<0.5	<0.5	<0.5	8.2	--	--	--	--	--	--	--	--	--
	5/7/02	436.75	140	<50	<0.5	<0.5	<0.5	<0.5	110	--	--	--	--	--	--	--	--	--
	9/11/02	436.66	<50	NA	<0.5	<0.5	<0.5	<0.5	6.3	--	--	--	--	--	--	--	--	--
	12/1/02	435.15	73	<50	<0.5	<0.5	<0.5	<0.5	160	--	--	--	--	--	--	--	--	--
	3/14/03	440.39	110	<50	<0.5	<0.5	<0.5	<0.5	170	--	--	--	--	--	--	--	--	--
	6/25/03	440.64	<50	<50	<0.5	<0.5	<0.5	<0.5	89	--	--	--	--	--	--	--	--	--
	9/16/03	437.82	630	<50	<0.5	3.5	<0.5	2.6	1500	--	--	--	--	--	--	--	--	--
	12/22/03	440.97	<0.5	<50	<0.5	<0.5	<0.5	<0.5	630	--	--	--	--	--	--	--	--	--
	3/10/04	445.43	57	<50	<0.5	<0.5	<0.5	<0.5	1100	--	--	--	--	--	--	--	--	--
	6/15/04	440.45	<50	<50	<0.5	<0.5	<0.5	<0.5	750	--	--	--	--	--	--	--	--	--
	9/17/04	436.97	<50	<50	<0.5	<0.5	<0.5	<0.5	780	--	--	--	--	--	--	--	--	--
	12/10/04	440.72	<50	<50	<0.5	<0.5	<0.5	<0.5	120	--	--	--	--	--	--	--	--	--
	3/2/05	446.09	<50	<50	<0.5	<0.5	<0.5	<0.5	320	--	--	--	--	--	--	--	--	--
	5/27/05	444.50	<50	<50	<0.5	<0.5	<0.5	<0.5	120	--	--	--	--	--	--	--	--	--
	7/21/05	442.10	<50	NS	<0.5	<0.5	<0.5	<0.5	97	--	--	--	--	--	--	--	--	--
	10/10/05	441.30	<50	NS	<0.5	<0.5	<0.5	<0.5	41	--	--	--	--	--	--	--	--	--
1/9/06	445.12	<50	<50	<0.5	<0.5	<0.5	<0.5	37	<0.5	<5.0	<0.5	<5.0	<5.0	<50	<500	<0.5	<0.5	

**Table 2**  
**Historical Groundwater Analytical Results**  
160 Holmes Street, Livermore, California

Well ID	Date Collected	Groundwater Elevation (feet above MSL)	Total Petroleum Hydrocarbons (µg/L)		Aromatic Volatile Organic Compounds (µg/L)					Oxygenated Volatile Organics (µg/L)						Lead Scavengers (µg/L)		
			Gasoline	Diesel	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE (8021B)	TAME	TBA	DIPE	ETBE	MTBE	ethanol	methanol	EDB	1,2-DCA
MW-5A	3/13/06	444.48	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	4/7/06	447.29	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	7/28/06	440.24	<50	62	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	--	--	--	--
	10/13/06	439.06	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	6.3	<0.5	<0.5	0.61	<50	<500	--	--
	1/4/07	442.11	<50	320	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	4/16/07	439.87	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	7/16/07	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	10/29/07	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/1/08	430.61	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<2.0	<0.5	<0.5	1.3	<50	<500	<0.5	<0.5
	4/18/08	436.51	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	7/28/08	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	11/18/08	464.64	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/4/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	4/21/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	9/24/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3/4/10	435.87	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/20/10	440.07	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
MW-5B	3/13/06	444.46	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	0.69	<50	<500	<0.5	<0.5
	4/7/06	447.15	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	0.98	<50	<500	<0.5	<0.5
	7/28/06	440.50	<50	<50	<0.5	<0.5	<0.5	<0.5	6.8	<0.5	6.3	<0.5	<0.5	0.61	--	--	--	--
	10/13/06	439.42	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	3.6	<50	<500	--	--
	1/4/07	442.15	<50	89	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	1.3	<50	<500	<0.5	<0.5
	4/16/07	439.26	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	1.5	<50	<500	<0.5	<0.5
	7/17/07	428.09	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	1.4	NA	NA	NA	NA
	10/29/07	416.69	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	2/1/08	431.34	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<2.0	<0.5	<0.5	1.9	<50	<500	<0.5	<0.5
	4/18/08	435.82	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<2.0	<0.5	<0.5	1.5	<50	<500	<0.5	<0.5
	7/29/08	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	11/18/08	412.94	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<2.0	<0.5	<0.5	1.2	<50	<500	<0.5	<0.5
	2/4/09	416.96	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4/22/09	427.59	<50	NA	<0.5	<0.5	<0.5	<0.5	48	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/24/09	424.86	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<2.0	<0.5	<0.5	1.3	<50	<500	<0.5	<0.5
3/4/10	435.62	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/19/10	439.19	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
MW-6	11/14/01	430.25	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	5/7/02	437.12	<50	<67	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	9/11/02	437.10	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	12/1/02	435.36	<50	<50	<0.5	<0.5	<0.5	<0.5	<1.0	--	--	--	--	--	--	--	--	--
	3/14/03	440.67	<50	<50	<0.5	<0.5	<0.5	<1.0	<1.0	--	--	--	--	--	--	--	--	--
	6/25/03	441.05	<50	<50	<0.5	<0.5	<0.5	<1.0	<1.0	--	--	--	--	--	--	--	--	--
	9/16/03	438.36	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	12/22/03	441.54	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--

**Table 2**  
**Historical Groundwater Analytical Results**  
160 Holmes Street, Livermore, California

Well ID	Date Collected	Groundwater Elevation (feet above MSL)	Total Petroleum Hydrocarbons (µg/L)		Aromatic Volatile Organic Compounds (µg/L)					Oxygenated Volatile Organics (µg/L)						Lead Scavengers (µg/L)		
			Gasoline	Diesel	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE (8021B)	TAME	TBA	DIPE	ETBE	MTBE	ethanol	methanol	EDB	1,2-DCA
MW-6 cont.	3/10/04	445.48	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	6/15/04	440.82	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	9/17/04	437.57	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	12/10/04	441.04	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	3/2/05	446.09	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	5/27/05	444.56	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	7/21/05	442.53	<50	NS	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	10/10/05	441.92	<50	NS	<0.5	<0.5	<0.5	<0.5	<5.0	--	--	--	--	--	--	--	--	--
	1/9/06	445.14	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<5.0	0.86	<50	<500	<0.5	<0.5
	4/6/06	447.13	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<5.0	<0.5	<50	<500	<0.5	<0.5
	7/28/06	440.68	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	--	--	--	--
	10/13/06	439.77	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	--	--
	1/4/07	442.10	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	4/16/07	439.73	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	7/16/07	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	10/29/07	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/1/08	431.08	<50	<50	<0.5	<0.5	<0.5	0.91	<5.0	<0.5	<2.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	4/18/08	435.93	<50	<50	<0.5	<0.5	<0.5	0.91	<5.0	<0.5	<2.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	7/28/08	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	11/18/08	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2/4/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
4/22/09	425.42	<50	NS	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
9/24/09	425.87	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<2.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5	
3/4/10	438.11	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/19/20	439.48	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
MW-7A	3/13/06	445.85	6,200	1,800	140	21	200	560	6,900	<100	4400	<100	<100	6,300	<10,000	<100,000	<100	<100
	4/7/06	448.71	5,300	1,700	130	26	330	420	5,900	<100	7,500	<100	<100	6,600	<10,000	<100,000	<100	<100
	7/28/06	441.92	2,200	470	28	18	60	0.85	240	<25	4,700	<25	<25	240	--	--	--	--
	10/12/06	440.82	6,500	2,400	83	38	300	160	980	<17	4,700	<10	<17	1200	<1700	<17,000	--	--
	*** 11/21/06	NM	1,400	NA	25	17	65	<0.5	45	<10	1,400	<10	<10	42	<1,000	<10,000	<10	<10
	1/4/07	443.52	1,000	440	12	18	48	8.3	75	<5.0	1,100	<5.0	<5.0	73	<500	<5000	<5.0	<5.0
	4/16/07	441.27	520	470	17	5.6	2.6	0.88	140	<12	2,500	<12	<12	170	<1,200	<12,000	<12	<12
	7/16/07	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	10/29/07	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/1/08	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	4/18/08	437.16	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	7/28/08	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	11/18/08	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/4/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	4/21/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	9/24/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3/4/10	439.02	83	NA	<0.5	0.81	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/19/10	440.54	680	NA	<0.5	10	4.9	4.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	

**Table 2**  
**Historical Groundwater Analytical Results**  
160 Holmes Street, Livermore, California

Well ID	Date Collected	Groundwater Elevation (feet above MSL)	Total Petroleum Hydrocarbons (µg/L)		Aromatic Volatile Organic Compounds (µg/L)					Oxygenated Volatile Organics (µg/L)						Lead Scavengers (µg/L)			
			Gasoline	Diesel	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE (8021B)	TAME	TBA	DIPE	ETBE	MTBE	ethanol	methanol	EDB	1,2-DCA	
MW-7B	3/13/06	445.64	230	<50	1.8	4.7	<0.5	2.2	1,500	<50	7300	<50	<50	1,300	<5,000	<50,000	<50	<50	
	4/7/06	448.54	81	<50	1.9	1.6	1.1	0.58	1,000	<50	9,200	<50	<50	930	<5,000	<50,000	<50	<50	
	7/28/06	441.67	150	<50	<0.5	1.9	<0.5	<0.5	1,500	<50	16,000	<50	<50	1,900	--	--	--	--	
	10/12/06	440.65	110	<50	<0.5	1.3	<0.5	<0.5	900	<17	15,000	<17	<17	860	<1700	<17,000	--	--	
	***	11/21/06	NM	61	NA	<0.5	0.76	<0.5	<0.5	740	<50	10,000	<50	<50	680	<5,000	<50,000	<50	<50
	1/4/07	443.21	91	<50	<0.5	2.1	<0.5	<0.5	200	<50	11,000	<50	<50	180	<5000	<50,000	<50	<50	
	4/16/07	440.98	94	<50	<0.5	2.6	<0.5	<0.5	35	<50	10,000	<50	<50	<50	<5000	<50,000	<50	<50	
	7/17/07	428.99	<50	<50	0.61	0.63	<0.5	<0.5	13	<17	4,000	<17	<17	<17	--	--	--	--	
	10/29/07	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/1/08	431.55	420	<50	0.77	17	<0.5	0.97	45	<25	4000	<25	<25	49	<2500	<25000	<25	<25	
	4/18/08	436.87	650	100	3.4	15	8.3	<0.5	150	<25	3800	<25	<25	140	<2500	<25000	<25	<25	
	7/28/08	--	<50	<50	<0.5	0.56	<0.5	<0.5	17	<5.0	760	<5.0	<5.0	22	<500	<5000	<5.0	<5.0	
	11/18/08	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/4/09	418.74	620	NA	<0.5	23	<0.5	2.7	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4/21/09	428.56	170	NA	2.1	5.8	<0.5	0.78	190	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/24/09	426.13	<50	NA	<0.5	1.8	<0.5	<0.5	210	<5.0	470	<5.0	<5.0	220	<500	<5000	<5.0	<5.0	
3/4/10	436.76	140	NA	<0.5	2.1	<0.5	<0.5	25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/19/10	440.34	74	NA	<0.5	1.3	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
MW-7C	3/13/06	445.34	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	0.60	<50	<500	<0.5	<0.5	
	4/7/06	448.21	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5	
	7/28/06	441.24	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	--	--	--	--	
	10/13/06	440.65	89	<50	<0.5	1.4	<0.5	<0.5	900	<17	12,000	<17	<17	820	<1700	<17,000	--	--	
	***	11/21/06	NM	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	24	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	1/4/07	442.86	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	24	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5	
	4/16/07	440.66	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5	
	7/17/07	428.69	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	--	--	--	--	
	10/29/07	417.14	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<5.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5	
	2/1/08	431.39	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<2.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5	
	4/18/08	436.64	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<2.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5	
	7/28/08	--	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<2.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5	
	11/18/08	415.77	97	<50	<0.5	<0.5	<0.5	<0.5	<90	<1.0	<4.0	<1.0	<1.0	<1.0	<100	<1000	<1.0	<1.0	
	2/4/09	417.50	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	4/22/09	428.41	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	9/24/09	425.90	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<2.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5	
3/4/10	438.73	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA		
7/19/10	440.01	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA		
MW-8A	7/28/08	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
	11/18/08	NC	67	<50	<0.5	2.6	<0.5	1.6	<5.0	<0.5	<2.0	<0.5	<0.5	4.9	<50	<500	<0.5	<0.5	
	2/4/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
	4/21/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
	9/24/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
	3/4/10	NC	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	7/20/10	NC	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	

**Table 2**  
**Historical Groundwater Analytical Results**  
160 Holmes Street, Livermore, California

Well ID	Date Collected	Groundwater Elevation (feet above MSL)	Total Petroleum Hydrocarbons (µg/L)		Aromatic Volatile Organic Compounds (µg/L)					Oxygenated Volatile Organics (µg/L)						Lead Scavengers (µg/L)		
			Gasoline	Diesel	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE (8021B)	TAME	TBA	DIPE	ETBE	MTBE	ethanol	methanol	EDB	1,2-DCA
MW-8B	7/28/08	--	<50	<50	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<2.0	<0.5	<0.5	2.5	<50	<500	<0.5	<0.5
	11/18/08	NC	<50	120	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<2.0	<0.5	<0.5	5.1	<50	<500	<0.5	<0.5
	2/4/09	NC	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4/22/09	NC	50	NA	<0.5	<0.5	<0.5	<0.5	1300	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/24/09	NC	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	<0.5	<2.0	<0.5	<0.5	<0.5	<50	<500	<0.5	<0.5
	3/4/10	NC	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7/20/10	NC	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-9A	7/28/08	DRY	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	11/18/08	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/4/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	4/21/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	9/24/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	3/4/10	NC	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7/20/10	NC	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-9B	7/29/08	--	<50	63	<0.5	<0.5	<0.5	<0.5	100	<10	2,800	<10	<10	160	<1000	<10,000	<10	<10
	11/18/08	NC	<50	1000	<0.5	<0.5	<0.5	<0.5	7.0	<0.5	4.6	<0.5	<0.5	7.5	<50	<500	<0.5	<0.5
	2/4/09	NC	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4/22/09	NC	<50	NA	<0.5	<0.5	<0.5	<0.5	470	NA	NA	NA	NA	NA	NA	NA	NA	NA
	9/24/09	NC	<50	NA	<0.5	<0.5	<0.5	<0.5	5.4	<0.5	<2.0	<0.5	<0.5	7.2	<50	<500	<0.5	<0.5
	3/4/10	NC	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
	7/20/10	NC	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
EX-1**	11/14/01	431.89	13,000	2,000	180	1,000	330	3,200	2,200	--	--	--	--	--	--	--	--	--
	5/7/02	437.72	7,700	560	320	<25	66	150	6,200	--	--	--	--	--	--	--	--	--
	9/11/02	NC	2,800	NA	32	<13	14	<13	2,500	--	--	--	--	--	--	--	--	--
	12/1/02	437.32	3,000	100	81	<0.5	44	<1.0	4,800	--	--	--	--	--	--	--	--	--
	3/14/03	442.28	750	50	<0.5	<0.5	7.7	13	1,200	--	--	--	--	--	--	--	--	--
	6/25/03	442.89	120	<50	3.2	3.7	4.2	7.6	260	--	--	--	--	--	--	--	--	--
	9/16/03	440.65	170	<50	0.5	1.5	<0.5	0.9	1,600	--	--	--	--	--	--	--	--	--
	3/10/04	447.31	NS	NS	NS	NS	NS	NS	NS	--	--	--	--	--	--	--	--	--
	6/15/04	442.82	NS	NS	NS	NS	NS	NS	NS	--	--	--	--	--	--	--	--	--
	9/17/04	439.39	NS	NS	NS	NS	NS	NS	NS	--	--	--	--	--	--	--	--	--
	12/10/04	NC	NS	NS	NS	NS	NS	NS	NS	--	--	--	--	--	--	--	--	--
	3/2/05	NC	NS	NS	NS	NS	NS	NS	NS	--	--	--	--	--	--	--	--	--
	5/27/05	446.62	NS	NS	NS	NS	NS	NS	NS	--	--	--	--	--	--	--	--	--
	7/21/05	443.75	<50	NS	<0.5	<0.5	<0.5	<0.5	610	--	--	--	--	--	--	--	--	--
10/10/05	442.57	<50	NS	<0.5	<0.5	<0.5	<0.5	31	--	--	--	--	--	--	--	--	--	
1/9/06	447.25	580	55	40	25	45	43	4,200	<170	<1,700	<170	<170	5,200	<170,000	<17,000	<170	<170	
EW-1	3/13/06	446.47	210	120	5.0	4.1	7.5	12	3,400	<50	<100	<50	<50	2,300	<5,000	<50,000	<50	<50
	4/7/06	449.46	1,900	190	66	170	110	380	7,900	<100	<1000	<100	<100	6,400	<10,000	<100,000	<100	<100
	7/27/06	441.60	280	100	7.4	5.5	12	28	8,400	<500	<5,000	<500	<500	12,000	--	--	--	--
	10/12/06	441.94	2,100	130	86	19	100	310	2,400	<50	1,400	<50	<50	2,800	<5,000	180,000	--	--

**Table 2**  
**Historical Groundwater Analytical Results**  
160 Holmes Street, Livermore, California

Well ID	Date Collected	Groundwater Elevation (feet above MSL)	Total Petroleum Hydrocarbons (µg/L)		Aromatic Volatile Organic Compounds (µg/L)					Oxygenated Volatile Organics (µg/L)						Lead Scavengers (µg/L)		
			Gasoline	Diesel	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE (8021B)	TAME	TBA	DIPE	ETBE	MTBE	ethanol	methanol	EDB	1,2-DCA
EW-1 cont.1	1/4/07	444.00	1,600	150	56	27	110	240	5,000	<50	2,900	<50	<50	4,900	<5,000	<50,000	<50	<50
	4/13/07	441.76	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	7/16/07	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	10/29/07	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/1/08	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	4/18/08	437.62	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	7/28/08	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	11/18/08	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/4/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	4/21/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	9/24/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3/4/10	NC	440.00	4,400	NA	460	<25	380	<25	31,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/20/10	441.10	400	NA	4.4	6.6	1.8	4.4	590	NA	NA	NA	NA	NA	NA	NA	NA	NA	
EW-2	3/13/06	446.81	<250	69	<2.5	<2.5	<2.5	<2.5	5,400	<100	<1,000	<100	<100	5,100	<10,000	<100,000	<100	<100
	4/7/06	449.79	470	160	15	2.5	24	13	2,000	<50	<500	<50	<50	1,800	<5,000	<50,000	<50	<50
	7/27/06	442.89	260	350	2.2	1.7	6.1	3.0	8,700	<500	<5,000	<500	<500	12,000	--	--	--	--
	10/12/06	444.51	110	<50	2.0	1.0	3.1	3.9	620	<12	<120	<12	<12	680	<1200	<12,000	--	--
	1/4/07	444.33	<500	<50	5.3	<5.0	16	7.1	4,500	<50	<500	<50	<50	4,200	<5000	<50,000	<50	<50
	4/13/07	442.06	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	7/16/07	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	10/29/07	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/1/08	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	4/18/08	437.95	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	7/28/08	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	11/18/08	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/4/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	4/21/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	9/24/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3/4/10	NC	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
7/20/10	441.54	<50	NA	<0.5	<0.5	<0.5	<0.5	<5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	
EW-3	11/18/08	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	2/4/09	NC	<10,000	NA	<100	<100	<100	<100	420,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4/21/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
	9/24/09	NC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	
	3/4/10	NC	140,000	NA	240	900	320	28,000	340,000	NA	NA	NA	NA	NA	NA	NA	NA	
7/20/10	NC	23,000	NA	240	940	760	3,100	150,000	NA	NA	NA	NA	NA	NA	NA	NA		
Exxon1	2/26/99	30	100,000		6,100	16,000	2,500	11,000	60,000	--	--	--	--	--	--	--	--	
B1	2/2/01	30	650,000	13,000	6,300	10000.0	<2,500	12,000	290,000	--	--	--	--	--	--	--	--	
B2	2/2/01	30	56	<0.5	<0.5	<0.5	<0.5	<0.5	47	--	--	--	--	--	--	--	--	
B3	2/2/01	30	6,200	NA	<50	<50	<50	<50	3,800	--	--	--	--	--	--	--	--	
B4	2/2/01	30	12,000	NA	<50	<50	<50	<50	6,000	--	--	--	--	--	--	--	--	
B5	2/2/01	30	<25,000	960	<250	<250	<250	<250	16,000	--	--	--	--	--	--	--	--	



**Table 2**  
**Historical Groundwater Analytical Results**

160 Holmes Street, Livermore, California

Well ID	Date Collected	Groundwater Elevation (feet above MSL)	Total Petroleum Hydrocarbons (µg/L)		Aromatic Volatile Organic Compounds (µg/L)					Oxygenated Volatile Organics (µg/L)						Lead Scavengers (µg/L)		
			Gasoline	Diesel	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE (8021B)	TAME	TBA	DIPE	ETBE	MTBE	ethanol	methanol	EDB	1,2-DCA
MB-1-A	11/10/01	28	21,000	4,300	970	<25	3,300	1200	NA	<2,500	<25,000	<2,500	<2,500	100,000	--	--	--	--
MB-1-B	11/10/01	50	470	210	7.8	0.97	31	48	NA	<25	<250	<25	<25	1,500	--	--	--	--
MB-1-C	11/10/01	70	990	NA	17	1.3	89	160	NA	<25	<250	<25	<25	1,200	--	--	--	--
MB-2-A	11/9/01	28	<50	<50	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<5.0	<0.5	<0.5	<0.5	--	--	--	--
MB-2-B	11/10/01	50	<50	<50	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<5.0	<0.5	<0.5	<0.5	--	--	--	--
MB-3-A	11/10/01	28	40,000	41,000	120	130	1,700	2,800	NA	<50	2,500	<50	<50	<4,500	--	--	--	--
MB-3-B	11/13/01	50	1,400	210	0.93	9.3	14	27	NA	<50	6,200	<50	<50	190	--	--	--	--
MB-3-C	11/13/01	70	930	260	1.7	3.8	33	100	NA	<100	16,000	<100	<100	330	--	--	--	--
DB-1-A	11/9/01	28	160	NA	<0.5	<0.5	<0.5	<0.5	NA	<1.7	<17	<1.7	<1.7	86	--	--	--	--
DB-2-A	11/10/01	28	<50	<50	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<5.0	<0.5	<0.5	<0.5	--	--	--	--
DB-3-A	11/13/01	28	<50	51	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<5.0	<0.5	<0.5	<0.5	--	--	--	--
DB-4-A	11/13/01	28	<50	57	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<5.0	<0.5	<0.5	<0.5	--	--	--	--
DB-5-A	11/10/01	28	<50	910	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<5.0	<0.5	<0.5	<0.5	--	--	--	--
B-1-A	11/9/01	28	<50	230	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<5.0	<0.5	<0.5	28	--	--	--	--
B-2-A	11/9/01	28	25,000	6,200	900	<50	2,000	2,600	NA	<1,700	<17,000	<1,700	<1,700	80,000	--	--	--	--
B-3-A	11/9/01	28	42,000	14,000	530	140	2,400	7,800	NA	<500	<5,000	<500	<500	19,000	--	--	--	--
HP-1-A	11/13/01	28	<50	NA	<0.5	<0.5	<0.5	0.80	NA	<50	24	<50	<50	12	--	--	--	--
GP-1	1/10/07	28	270	--	<0.5	<0.5	2.6	0.85	61	--	--	--	--	--	--	--	--	--
GP-2	1/10/07	28	2,000	--	61	46	93	280	2,600	--	--	--	--	--	--	--	--	--
GP-3	1/10/07	28	11,000	--	38	27	1,100	980	37,000	--	--	--	--	--	--	--	--	--
GP-4	1/10/07	28	20,000	--	820	260	1,400	3,200	35,000	--	--	--	--	--	--	--	--	--
GP-5	1/10/07	28	4,100	--	64	6.6	13	550	780	--	--	--	--	--	--	--	--	--
GP-6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
GP-6A	1/11/07	28	11,000	--	360	150	1,500	480	6,100	--	--	--	--	--	--	--	--	--
GP-7	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
GP-8	1/10/07	28	61,000	--	2,800	490	2,600	4,400	190,000	--	--	--	--	--	--	--	--	--
GP-9	1/10/07	28	100,000	--	5,600	3,400	3,500	24,000	260,000	--	--	--	--	--	--	--	--	--
GP-10	1/10/07	28	44,000	--	2,400	590	3,600	3,300	92,000	--	--	--	--	--	--	--	--	--
GP-11	1/11/07	28	550	--	1.4	1.3	2.1	36	110	--	--	--	--	--	--	--	--	--
GP-12	1/11/07	28	15,000	--	68	20	1,800	94	6,600	--	--	--	--	--	--	--	--	--
GP-13	1/11/07	28	88,000	--	5,100	<50	5,500	7,400	87,000	--	--	--	--	--	--	--	--	--
GP-14	1/11/07	28	210,000	--	11,000	26,000	4,600	21,000	1,500,000	--	--	--	--	--	--	--	--	--
GP-15	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
GP-16	1/11/07	28	160	--	5.2	3.2	18	7.5	210	--	--	--	--	--	--	--	--	--
GP-17	1/11/07	28	460	--	7.7	4.8	8.0	7.4	790	--	--	--	--	--	--	--	--	--
GP-18	1/11/07	28	35,000	--	250	72	2,800	380	13,000	--	--	--	--	--	--	--	--	--
GP-19	1/11/07	28	430	--	8.9	1.6	24	31	430	--	--	--	--	--	--	--	--	--
GP-21	7/9/08	52	<50	--	<0.5	<0.5	0.73	3.3	9.2	<0.5	4.5	<0.5	<0.5	7.9	--	--	--	--
GP-22	7/8/08	47	<50	--	<0.5	<0.5	<0.5	0.55	8.3	<0.5	31	<0.5	<0.5	8.7	--	--	--	--
GP-23	7/7/08	50	220	--	7.1	9.1	7.0	30	61	<2.5	<10	<2.5	<2.5	76	--	--	--	--
GP-24	7/7/08	48	800	--	4.3	0.89	39	180	1,100	<50	<200	<50	<50	1300	--	--	--	--
GP-25	7/8/08	50	210	--	4.9	18	7.2	19	63	<2.5	<10	<2.5	<2.5	69	--	--	--	--
GP-26	7/8/08	48	<50	--	1.6	<0.5	2.6	5.1	<50	<0.5	2.2	<0.5	<0.5	24	--	--	--	--

**Table 2**  
**Historical Groundwater Analytical Results**

160 Holmes Street, Livermore, California

Well ID	Date Collected	Groundwater Elevation (feet above MSL)	Total Petroleum Hydrocarbons (µg/L)		Aromatic Volatile Organic Compounds (µg/L)					Oxygenated Volatile Organics (µg/L)						Lead Scavengers (µg/L)	
			Gasoline	Diesel	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE (8021B)	TAME	TBA	DIPE	ETBE	MTBE	ethanol	methanol	EDB

Notes:  
 Samples analyzed for TPHg and TPHd by EPA Method 8015Cm, BTEX by EPA Method 8021B, MTBE by EPA Method 8021B and/or 8260B, and the fuel oxygenates DIPE, ETBE, TAME, EDB, 1,2-DCA, ethanol, methanol, and TBA by EPA Method 8260B.  
 µg/L = micrograms per liter  
 NA = Not Analyzed  
 NM = Not Monitored  
 NS = Not Sampled  
 1,2-DCA = 1,2-Dichloroethane  
 \* = Well MW-1 renamed MW-1A, well MW-2 renamed MW-2A, Well MW-3 renamed MW-3A in February 2006  
 \*\* = Well destroyed in February 2006  
 \*\*\* = Anomalous data observed in MW-7C from October 12, 2006 sample. Therefore, wells MW-7A, MW-7B, and MW-7C were resampled on November 21, 2006.

MTBE = methyl tertiary butyl ether  
 DIPE = Di-isoprpropyl Ether  
 ETBE = Ethyl tert-Butyl Ether  
 TAME = tert-Amyl Methyl Ether  
 TBA = tert-Butanol  
 EDB = 1,2-Dibromoether  
 No samples were collected from Borings GP-20 and GP-27  
 -- = Not Analyzed

**APPENDIX A**  
**Allterra's Site Investigation Field Protocol**

## APPENDIX A

### Allterra's Site Investigation Field Protocol

**Geoprobe Boring Installations and Sampling:** A truck-mounted Geoprobe rig hydraulically pushes a 4-foot steel core barrel (usually 2.5-inch diameter) equipped with an acetate liner into undisturbed soil. Four-foot core soil samples are collected in the acetate liner. The core barrel is extracted from the boring and the liner is removed. Soil samples from the necessary depth is cut from the acetate liner and capped with Teflon® sheets and plastic caps. The sample is labeled and stored on ice in an ice chest. The remainder of the acetate liner is then cut open and examined for lithology according to the Unified Soil Classification System. Job location, boring location, boring name, date, soil types, observations and activities are recorded on the boring logs. A portion of each sample is field screened using portable photo-ionization detector (PID). The core barrel is decontaminated between each boring. If groundwater samples are not necessary, the hole is filled with a cement grout and bentonite mixture from the bottom of the boring to surface grade.

Once the borings are advanced to the necessary depth, water samples are collected using a clean stainless steel bailer. If the boring does not stay open, a temporary well casing and screen is lowered into the boring to aid in water sample collection. Recovered water is transferred into labeled sample containers placed on ice. After the water samples are collected, the temporary well casing and screen are removed from the boring and is filled with a cement grout and bentonite mixture from the bottom of the boring to surface grade.

**Soil Gas Sampling:** Using a Geoprobe drill rig, a two-inch diameter vapor probe will be driven to depths of five and fifteen feet bgs by advancing two separate boreholes. A Post Run Tubing System (PRT) will be used allowing to the collection of soil vapor samples at the desired sampling depth without the time-consuming complications associated with rod leakage and contamination. O-ring connections will enable the PRT system to deliver a vacuum-tight seal that prevented sample contamination from up hole, and will assure that the sample is taken from the desired depth at the bottom of the hole. The sample is drawn through the point holder, through the adapter, and into the sample tubing. The tubing is initially purged using a designated purge canister; subsequently, the purge canister is closed and the vapors are collected in the sample canister. The internal surfaces of the stainless steel canisters will be passivated using the "Summa" process and are therefore referred to as Summa Canisters.

URS uses 5-micron (or a 7-micron, depending) particulate filters to prevent particulate matter from entering the canisters and to increase canister fill times. A vacuum gage will be used to measure the initial vacuum of the canister before sampling and the final vacuum upon completion. The gages typically have ranges from 0 to 30 inches of mercury (in. Hg). The canisters vacuums are used to draw the sample, which is referred to as passive sampling (instead of using pumps). After confirming an initial pressure of -30 in. Hg, the canister is left open until the pressure increases to approximately -5 in. Hg. The filled canister is sealed with a brass cap, placed into the original shipping container, and shipped to a state-certified analytical laboratory, using Chain-of-Custody procedures.

**Monitoring Well Installation/Construction and Soil Sampling:** A truck-mounted, hollow-stem auger drill rig is used to drill boreholes for monitoring wells. The borehole diameter is a minimum of 4-inches larger than the outside diameter of the casing when installing well screen. The hollow-stem auger provides minimal interruption of drilling while permitting soil sampling at desired intervals. An Allterra geologist or engineer will continuously log each borehole during drilling and will constantly check drill cuttings for indications of both the first recognizable occurrence of groundwater and volatile organic compounds using a portable photoionization detector (PID).

During drilling, soil samples are collected in 2-inch by 6-inch brass sleeves. Three brass tubes are placed in an 18-inch long split-barrel (spoon) sampler of the appropriate inside-diameter. The split-barrel sampler is driven its entire length using a 140-pound hammer, or until refusal. The sampler is extracted from the borehole and the bottom brass sleeve is capped with Teflon® sheets and plastic caps, labeled, and stored on ice. The two other brass sleeves are used for soil lithology classification (according to the Unified Soil Classification System) and field screening using a PID.

All soil borings not converted into monitoring wells are backfilled with a mixture of neat cement with 5% bentonite powder to surface grade.

Monitoring wells are constructed with blank and factory-perforated Schedule 40 polyvinyl chloride (PVC). The perforated interval consists of slotted casing, generally with 0.02-inch wide by 1.5-inch long slots, with 42 slots per foot. A threaded PVC cap is secured to the bottom of the casing. After setting the casing inside the hollow-stem auger, sand or gravel filter material is poured into the annular space to fill from boring bottom to generally 1 to 2 feet above the screened interval. A 1- to 2-foot thick bentonite seal is set above this sand/gravel pack. Neat cement containing approximately 5% bentonite is then tremmied into the annular space from the top of the bentonite plug to approximately 0.5 feet below ground surface. A traffic-rated well box is installed around each wellhead.

**Monitoring Well Development:** After installation, the wells are thoroughly developed to remove residual drilling materials from the wellbore and fine material from the filter pack. Typically, 10 well volumes are removed from the well and field parameters, such as pH, temperature, and conductivity, are recorded between each well volume. Well development techniques used may include surging, swabbing, bailing, and/or pumping. All development water is collected either in drums or tanks for temporary storage, and properly disposed of pending laboratory analytical results. Following development, the well is typically allowed to stand undisturbed for a minimum of 48 hours before its first sampling.

**Well Monitoring and Sample Collection:** A Teflon bailer or submersible pump was used to purge a minimum of three well volumes of groundwater from each well. After each well volume is purged, field parameters such as pH, temperature, and conductivity are recorded. Wells are purged until field parameters have stabilized or a maximum of 10 well volumes of groundwater have been removed. If the well yield is low and the well was dewatered, the well is allowed to recharge to 80% of its original volume prior to sample collection. Field parameter measurements and pertinent qualitative observations, such as groundwater color and odor, are recorded in Groundwater Sampling Field Logs. Groundwater samples are collected in appropriate bottles and stored on ice for delivery, under chain-of-custody documentation, to a state-certified laboratory for analysis.

**Sample Identification and Chain-Of-Custody Procedures:** Each sample container submitted for analysis is labeled to identify the job number, date, time of sample collection, a sample number unique to the sample, any in-field measurements made, sampling methodology, name(s) of on-site personnel, and any other pertinent field observations also recorded on the field excavation or boring log. During shipment, the person with custody of the samples will relinquish them to the next person by signing the chain-of-custody form(s) and noting the date and time.

**Equipment Decontamination:** All drilling, sampling, well construction, and well development equipment is cleaned in a solution of laboratory grade detergent and distilled water or steam cleaned before use at each sampling point.

**Field Personnel:** During groundwater sampling activities, sampling personnel will wear pertinent attire to minimize risks to health and safety. Field personnel will also use a pair of clean, powderless, surgical gloves for each successive sampling point. Used surgical gloves will be placed into waste drums for future disposal.

**Waste Disposal:** Soil generated during drilling will be stored in DOT-approved 55-gallon waste drums pending proper disposal. Water generated during well development, purging, and sampling activities will be placed into DOT-approved 55-gallon waste drums pending disposal and/or permitted discharge to the sanitary sewer.

APPENDIX B  
Regenesis Product Application Procedures

## **RegenOx™ *In Situ* Chemical Oxidation Application Instructions**

### **Using Direct-Push Injection (Step-by-Step Procedures)**

RegenOx™ is the new generation of chemical oxidation. RegenOx™ is a proprietary (patent-applied-for) *in situ* chemical oxidation process using a solid oxidant complex (sodium percarbonate/catalytic formulation) and an activator complex (a composition of ferrous salt embedded in a micro-scale catalyst gel). RegenOx™ with its catalytic system has very high activity, capable of treating a very broad range of soil and groundwater contaminants including both petroleum hydrocarbons and chlorinated solvents.

#### **Instructions**

- 1) Prior to the installation of RegenOx™, any surface or overhead impediments should be identified as well as the location of all underground structures. Underground structures include but are not limited to utility lines; tanks; distribution piping; sewers; drains; and landscape irrigation systems. The planned installation locations should be adjusted to account for all impediments and obstacles. These considerations should be part of the SSHP or HASP.
- 2) Pre-mark the installation locations, noting any points that may have different vertical application requirements or total depth.
- 3) Set up the direct push unit over each point and follow the manufacturer standard operating procedures (SOP) for the direct push equipment. Care should be taken to assure that probe holes remain in the vertical.
- 4) For most applications, Regenesis suggests using 1.5-inch O.D./0.625-inch I.D drive rods. However, some applications may require the use of 2.125-inch O.D./1.5-inch I.D. or larger drive rods.
- 5) Advance drive rods through the surface pavement, as necessary, following SOP.
- 6) Push the drive rod assembly with an expendable tip to the desired maximum depth. Regenesis suggests pre-counting the number of drive rods needed to reach depth prior to starting injection activities.
- 7) After the drive rods have been pushed to the desired depth, the rod assembly should be withdrawn three to six inches. Then the expendable tip can be dropped from the drive rods, following SOP. If an injection tool was used instead of an expendable tip, the application of material can take place without any preliminary withdrawal of the rods.

- 8) In some cases, introduction of a large column of air prior to RegenOx™ application may be problematic because the air can block water flow to the treatment area. This is particularly the case in deep injections (>50 ft) with large diameter rods (>1.5-inch O.D.). To prevent the injection of air into the aquifer during RegenOx™ application, as well as to prevent problems associated with heaving sands, fill the drive rods with water, or the RegenOx™ mixture prior dropping the expendable tip or exposing the injection tool.
- 9) The RegenOx™ percent of the oxidizer in solution should range between 3% to 5%. Although solutions up to 8% may be used, this will likely increase the difficulty of injection due to reactivity. Solutions with greater than 8% oxidizer in solution will result in excess reaction and flocculation prior to injection and are not typically recommended

Measure the appropriate quantity of RegenOx™ Oxidizer for one to four vertical foot of injection into a 55 gallon drum or mixing tank. The volume of water per injection location can be calculated from the following formula:

$$\frac{\text{RegenOx Oxidizer lbs/foot}}{(8.34 \text{ lbs/gal water})(\% \text{ RegenOx\_Oxidizer solids})} [1 - (\% \text{ RegenOx\_Oxidizer solids})]$$

Tighter formations (clays and silts), and even some fine sand formations will likely require higher oxidant percentages since less volume can be injected per location. The following are guides to various RegenOx™ mixing ratios based on the above equation.

- to make a roughly 3% oxidant solution for every 10 lbs of oxidant and 10 lbs of activator (20 lbs total RegenOx™), use 38 gallons of water.
  - to make a roughly 4% oxidant solution for every 10 lbs of oxidant and 10 lbs of activator (20 lbs total RegenOx™), use 28 gallons of water.
  - to make a roughly 5% oxidant solution for every 10 lbs of oxidant and 10 lbs of activator (20 lbs total RegenOx™), use 22 gallons of water.
- 10) Pour the pre-measured quantity of RegenOx™ Oxidizer into the pre-measured volume of water to make the desired target % oxidant in solution. NOTE: always pour the Oxidizer into water, do not pour water into the Oxidizer. Mix the water and oxidant with a power drill and paint stirrer or other mechanical mixing device to ensure that the Oxidizer has dissolved in the water.



- 11) Pour the applicable quantity of the pre-mixed RegenOx™ Activator into the oxidant:water solution. Mix the Oxidant and Activator using a power drill paint stirrer or other mechanical mixing device for at least 5 minutes until a homogenous mixture is formed. After mixing the RegenOx™ mixture should be injected into the subsurface as soon as possible.
- 12) Do not mix more RegenOx™ material than will be used over roughly 1 to 4 feet of injection so as to minimize potential above ground reaction/flocculation prior to injection.

Transfer the contents of the mixing tank to the pump using gravity feed or appropriate transfer pump. (See Section 9.2: Pump Selection) For some types of pumps, it may be desirable to perform a volume check prior to injecting RegenOx™

- 13) Connect the delivery hose to the pump outlet and the delivery sub-assembly. Circulate RegenOx™ through the hose and the delivery sub-assembly to displace air in the hose. NOTE: an appropriately sized pressure gauge should be placed between the pump outlet and the delivery sub-assembly in order to monitor application pump pressure and detect changes in aquifer backpressures during application.
- 14) Connect the sub-assembly to the drive rod. After confirming that all of the connections are secure, pump the RegenOx™ through the delivery system to displace the water/fluid in the rods.
- 15) Slowly withdraw the drive rods. Commonly RegenOx™ injection progress at 1-foot intervals. However, continuous injection while slowly withdrawing single lengths of drive rod (3 or 4 feet) is an acceptable option. The pre-determined volume of RegenOx™ should be pumped into the aquifer across the desired treatment interval.
- 16) Remove one section of the drive rod. The drive rod may contain some residual RegenOx™. Place the RegenOx™-filled rod in a clean, empty bucket and allow the RegenOx to drain. Eventually, the RegenOx™ should be returned to the RegenOx™ pump hopper for reuse.
- 17) Monitor for any indications of aquifer refusal. This is typically indicated by a spike in pressure as indicated or (in the case of shallow applications) RegenOx™ “surfacing” around the injection rods or previously installed injection points. At times backpressure caused by reaction off-gassing will impede the pumps delivery volume. This can be corrected by bleeding the pressure off using a pressure relief/bypass valve (placed inline between the pump discharge and the delivery sub-assembly) and then resume pumping. If aquifer acceptance appears to be low, as indicated by high back pressure, allow sufficient time for the aquifer to equilibrate prior to removing the drive rod.



## REGENESIS

- 18) Repeat steps 13 through 23 until treatment of the entire contaminated vertical zone has been achieved. It is recommended that the procedure extend to the top of the capillary fringe/smear zone, or to the top of the targeted treatment interval.
- 19) Install an appropriate seal, such as bentonite, above the RegenOx™ material through the entire vadose zone. Prior to emplacing the borehole seal, we recommend placing clean sand in the hole to the top of the RegenOx™ treatment zone (especially important in holes that stay open). Bentonite chips or granular bentonite should be placed immediately above the treatment zone, followed by a cement/bentonite grout to roughly 0.5 feet below ground surface. Quick-set concrete should then be used as a surface seal.
- 20) Remove and clean the drive rods as necessary.
- 21) Finish the borehole at the surface as appropriate (concrete or asphalt cap, as needed). We recommend a quick set concrete to provide a good surface seal with minimal set up time.
- 22) A proper borehole and surface seal assures that the RegenOx™ remains properly placed and prevents contaminant migration from the subsurface. Each borehole should be sealed immediately following RegenOx™ application to minimize RegenOx™ surfacing during the injection process. If RegenOx™ continues to “surface” up the direct push borehole, an appropriately sized (oversized) disposable drive tip or wood plug/stake can be used to plug the hole until the aquifer pressures equilibrates and the RegenOx™ stops surfacing. If wells are used for RegenOx™ injection the RegenOx™ injection wells and all nearby groundwater monitoring wells should be tightly capped to reduce potential for surfacing through nearby wells.
- 23) Periodically compare the pre- and post-injection volumes of RegenOx™ in the holding tank or pump hopper using the pre-marked volume levels. Volume level may not be present on all tanks or pump hoppers. In this case, volume level markings can be temporarily added using known amounts of water and a carpenter’s grease pencil (Kiel crayon).
- 24) Move to the next probe point, repeating steps 8 through 29. We recommend that the next RegenOx™ injection point be as far a distance as possible within the treatment zone from the previous RegenOx™ injection point. This will further minimize RegenOx™ surfacing and short circuiting up an adjacent borehole. When possible, due to the high volumes of liquid being injected, working from the outside of the injection area towards the center will limit expansion of the plume.

## **Pump Selection**

Regenesis has evaluated a number of pumps and many are capable of delivering RegenOx™ to the subsurface at a sufficient pressure and volumetric rate. However, even though a number of the evaluated pumps may be capable of delivering the RegenOx™ to the subsurface based on adequate pressures and delivery rates, each pump has its own set of practical issues that may make it more or less difficult to manage in a field setting.

In general, Regenesis strongly recommends using a pump with a pressure rating of 200 pounds per square inch (psi) in sandy soil settings, and 800 psi in silt, clay or weathered bedrock settings. Any pump under consideration should have a minimum delivery rate of 5 gallons per minute (gpm). A lower gpm rated pump may be used; however, they are not recommended due to the amount of time required to inject the volume of liquids typically associated with a RegenOx™ injection (i.e. 1,000 lbs of RegenOx™ [500 lbs Oxidant/500 lbs Activator] require roughly 1,100 gallons of water to make a 5% Oxidant solution).

Quite often diaphragm pumps are used for the delivery of chemical oxidants. Generally, these pumps operate pressures from 50-150 psi. Some of these pumps do not have the pressure head necessary to overcome the back pressure encountered in silt and clay lenses. In these cases the chemical oxidant thus ends up being delivered to the surrounding sands (the path of least resistance) and is not delivered to soil with residual adsorbed contamination. The use of a positive displacement pump such as a piston pump or a progressing cavity pump is may be superior because these pumps have the pressure necessary to overcome the resistance of low permeability soils. NOTE: be aware that application at pressures that are too high may over-consolidate the soil and minimize the direct contact of the oxidant. The key is to inject at a rate and pressure that maximizes the radius of influence without causing preferential flow. This can be achieved by injecting at the minimum pressure necessary to overcome the particular pressures associated with your site soil conditions.

Whether direct injection or wells are used, it is best to start by injecting RegenOx™ outside the contaminated area and spiral laterally inwards toward the source. Similarly, RegenOx™ should be applied starting vertically at the bottom elevation of contamination, through the layer of contamination, and a couple of feet above the layer of contamination. The reagents can be pushed out from the well bore with some water.

## **Pump Cleaning**

For best results, flush all moving parts and hoses with clean water at the end of the day; flush the injection system with a mixture of water and biodegradable cleaner such as Simple Green.

**For more information or technical assistance please call Regenesis at 949-366-8000**



February 26, 2007

## **RegenOx and ORC *Advanced* Simultaneous Application**

RegenOx™ is a two part chemical oxidant capable of treating a broad range of soil and groundwater contaminants. RegenOx was designed as an easily handled and applied high-contaminant-concentration mass reduction technology. RegenOx is an aggressive fast acting oxidative technology that can be coupled with a less aggressive slow release technology like Oxygen Release Compound Advanced (ORC *Advanced*) without negative effects on either products contaminant destructive ability or the aquifer/soil geochemistry.

ORC *Advanced*™ is a state-of-the-art innovative product designed to stimulate aerobic bioremediation through controlled release of oxygen within the subsurface. It offers unparalleled, maximum oxygen release for periods up to 12 months on a single injection and is specifically designed to minimize oxygen waste while maximizing contaminant remediation.

### **Preliminary Aquifer Volume Testing**

Prior to application of the RegenOx + ORC *Advanced* material, it is critical that a clear water injection be performed at the site. The injection a non-reactive (clear water) material at a volume that is approximately 25% greater than the anticipated application volume of RegenOx will provide good evidence of the aquifers capacity to accept the designed volume of RegenOx + ORC-*Advanced*.

### **RegenOx Solution Mixing Calculation**

RegenOx s a two part product, the RegenOx Part A is an oxidant and the Part B is an activator. Depending on the relative aquifer capacity (effective pore volume) of the target zone soil matrix a RegenOx solution should be applied as a solution ranging from 3-5% by weight. The volume of water required to make a 3-5% RegenOx solution can be calculated using the formula provided below (a detailed discussion on RegenOx Mixing Instructions is attached).

Volume of water (gallons/vertical foot of injection):

$$\frac{\text{RegenOx Oxidizer lbs/foot}}{(8.34 \text{ lbs/gal water})(\% \text{ RegenOx\_Oxidizer solids})} [1 - (\% \text{ RegenOx\_Oxidizer solids})]$$

### **Quick Reference Solution Estimates**

- Approximate 3% oxidant solution: 10 lbs of Part A oxidant mixed with 39 gallons of water.
- Approximate 4% oxidant solution: 10 lbs of Part A oxidant mixed with 29 gallons of water.
- Approximate 5% oxidant solution: 10 lbs of Part A oxidant mixed with 23 gallons of water.

### **ORC *Advanced* Solutions Mixing Calculation**

ORC *Advanced* can be mixed in to a slurry solution ranging from 15-35% by weight with water. This slurry is well documented in the literature. For a detailed discussion of these techniques please see the ORC/ORC *Advanced* mixing instructions available on the Regenesiis website ([www.regenesis.com](http://www.regenesis.com)).

NOTE: for this coupled technology application we strongly recommend that ORC-A be applied as an amendment to the site specific design volume of RegenOx material. This will ensure that the more reactive RegenOx material is applied in a stable and format that will facilitate optimal oxidative contaminant destruction.

### **RegenOx + ORC-A Solution Mixing & Application**

A solution ranging from 3-5% RegenOx solution can be easily mixed directly together with the recommended quantity of ORC *Advanced* and injected simultaneously as described below:

1. Prepare the site specific designed RegenOx Part A solution (3-5% solution).
2. Open the 5-gallon bucket and remove the pre-measured bag of ORC *Advanced* (each bag contains 25 lbs of ORC *Advanced*).
2. Measure and pour the ORC *Advanced* powder into the previously prepared RegenOx solution.
3. Use an appropriate mixing device to thoroughly mix the ORC *Advanced* into the RegenOx solution. A hand-held drill with a "jiffy mixer" or a stucco mixer on it may be used in conjunction with a small paddle to scrape the bottom and sides of the container. Standard environmental slurry mixers may also be used, following the equipment instructions for operation.
4. Transfer the contents of the mixing tank to the pump hopper using a gravity drain or a sump pump.
5. For some types of pumps (e.g. piston pumps), it may be desirable to perform a volume check prior to injecting RegenOx/ORC *Advanced*. Determining the volume displaced per pump stroke can be accomplished in two easy steps.
  - a) Determine the number of pump strokes needed to deliver 3 gallons of RegenOx/ORC *Advanced* (use a graduated bucket for this)
  - b) Divide the resulting 3 gallons by the results from the first step to determine the number of gallons of RegenOx/ORC *Advanced* delivered by each pump stroke.
6. Connect the delivery hose to the pump outlet and the delivery sub-assembly. Circulate RegenOx/ORC *Advanced* through the hose and the delivery sub-assembly to displace air in the hose.
7. Connect the sub-assembly to the drive rod. After confirming that all of the connections are secure, pump the RegenOx/ORC *Advanced* through the delivery system to displace the water/fluid in the rods.

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8. Slowly withdraw the drive rods. Commonly RegenOx/ORC *Advanced* injection progress at 1-foot intervals. However, continuous injection while slowly withdrawing single lengths of drive rod (3 or 4 feet) is an acceptable option. The pre-determined volume of RegenOx/ORC *Advanced* should be pumped into the aquifer across the desired treatment interval.
9. Remove one section of the drive rod. The drive rod may contain some residual RegenOx/ORC *Advanced* solution. Place the RegenOx/ORC *Advanced*-filled rod in a clean, empty bucket and allow the RegenOx/ORC *Advanced* to drain. Eventually, the RegenOx/ORC *Advanced* should be returned to the pump hopper for reuse.
10. Observe any indications of aquifer refusal. This is typically indicated by a high-pitched squeal in the pump's hydraulic system or (in the case of shallow applications) RegenOx/ORC *Advanced* "surfacing" around the injection rods or previously installed injection points. At times backpressure caused by gassing will impede pump movement. This can be corrected by bleeding the pressure off using a pressure relief/bypass valve (placed inline between the pump discharge and the delivery sub-assembly) and then resume pumping. If aquifer acceptance appears to be low, allow enough time for the aquifer to equilibrate prior to removing the drive rod.
11. Repeat steps 1 through 11 until treatment of the entire contaminated vertical zone has been achieved. It is recommended that the procedure extend to the top of the capillary fringe/smear zone, or to the top of the targeted treatment interval.
12. Install an appropriate seal, such as bentonite, above the RegenOx/ORC *Advanced* material through the entire vadose zone. Prior to emplacing the borehole seal, we recommend placing clean sand in the hole to the top of the RegenOx/ORC *Advanced* treatment zone (especially important in holes that stay open). Bentonite chips or granular bentonite should be placed immediately above the treatment zone, followed by a cement/bentonite grout to roughly 0.5 feet below ground surface. Quick-set concrete should then be used as a surface seal.
13. Remove and clean the drive rods as necessary.
14. Finish the borehole at the surface as appropriate (concrete or asphalt cap, if necessary). We recommend a quick set concrete to provide a good surface seal with minimal set up time.
15. A proper borehole and surface seal assures that the RegenOx/ORC *Advanced* remains properly placed and prevents contaminant migration from the surface. Each borehole should be sealed immediately following RegenOx/ORC *Advanced* application to minimize RegenOx/ORC *Advanced* surfacing during the injection process. If RegenOx/ORC *Advanced* continues to "surface" up the direct push borehole, an appropriately sized (oversized) disposable drive tip or wood plug/stake can be used to plug the hole until the aquifer equilibrates and the RegenOx/ORC *Advanced* stops surfacing. If wells are used for RegenOx/ORC *Advanced* injection the injection wells and all nearby groundwater monitoring wells should be tightly capped to reduce potential for surfacing through nearby wells.
16. Periodically compare the pre- and post-injection volumes of RegenOx/ORC *Advanced* in the pump hopper using pre-marked volume levels. Volume level indicators are not on all pump hoppers. In

this case, volume level markings can be temporarily added using known amounts of water and a carpenter's grease pencil (Kiel crayon). We suggest marking the water levels in 3-gallon increments.

17. Move to the next probe point, repeating steps 1 through 17. We recommend that the next RegenOx/ORC *Advanced* injection point be as far a distance as possible within the treatment zone from the previous RegenOx/ORC *Advanced* injection point. This will further minimize RegenOx/ORC *Advanced* surfacing and short circuiting up an adjacent borehole. When possible, due to the high volumes of liquid being injected, working from the outside of the injection area towards the center will limit expansion of the plume.

### **Pump Information**

Regenesis has evaluated a number of pumps that are capable of delivering RegenOx/ORC *Advanced* to the subsurface at a sufficient pressure and volumetric rate. Although a number of pumps may be capable of delivering the RegenOx/ORC *Advanced* to the subsurface at adequate pressures and volume, each pump has a set of practical issues that make it difficult to manage in a field setting. In general, Regenesis strongly recommends using a pump with a minimum pressure rating of 200 pounds per square inch (psi) in sandy formations or 800 psi in silt, clay or weathered bedrock formations, and a minimum delivery rate of 5 gallons per minute (gpm). A lower gpm rated pump can be used; however, they are not recommended due to the amount of time required to inject the volume of liquids typically associated with a RegenOx/ORC *Advanced* injection.

### **Pump Cleaning**

For best results, use a hot water pressure washer (150 - 170 °F or 66 - 77 °C) to clean equipment and rods periodically throughout the day. Internal pump mechanisms and hoses can be easily cleaned by circulating hot water and a biodegradable cleaner such as Simple Green through the pump and delivery hose. Further cleaning and decontamination (if necessary due to subsurface conditions) should be performed according to the equipment supplier's standard procedures and local regulatory requirements.

### **Personal Protective Equipment**

Personnel working with or in areas of potential contact with RegenOx/ORC *Advanced* should be required at a minimum to be fitted with modified Level D personal protective equipment:

- Eye protection – Wear well sealed goggles or a face shield (face shield recommended for full face protection)
- Head – Hard hat when required
- Respiratory – Use dust respirator approved by NIOSH/MSA
- Hands – Wear neoprene gloves
- Feet – Wear steel toe shoes with chemical resistant soles or neoprene boots
- Clothing – Wear long sleeve shirts and long pant legs. Consider using a Tyvek® body suit, Carhartt® coverall or splash gear

### **Typical Installation Equipment**

- Direct push rig
- Drive Rods (typically 1 ½-inch O.D.) & Injection Tooling with fluid deliver sub-assembly
- Injection Pump rated for 5 gpm @ 200 psi for sandy formations and 800 psi for silt and clay formations (Geoprobe DP-800, Yamada, Moyno, Rupe Models 9-1500 and 9-1600, Wilden, etc.)
- Injection hosing and a pressure relief valve with a bypass
- Clear hosing between mixing tank/drum and pump
- Pressure gauges
- Power drill paint stirrer (3-inch diameter or smaller propeller tip)
- Plastic bucket lid puller tool/opener tool
- 5-amp sump pump (such as Little Giant ) and hose
- Three to four 55-gallon drums or similarly sized mixing tanks for RegenOx and ORC *Advanced* mixing
- Sand, bentonite chips, granular bentonite, cement, hydraulic cement, and quick-set concrete for closing and sealing temporary injection holes
- Wood plugs or similar for temporarily sealing injection holes prior to grout sealing
- Access to water
- Access to electricity



APPENDIX C  
Site-Specific Health and Safety Plan



**Site-Specific Health and Safety Plan  
160 Holmes Street, Livermore, California**

*Date:  
January 28, 2011*

*Prepared For:*  
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## **Introduction**

The purpose of this Site-Specific Health and Safety Plan (HASP) is to ensure that all individuals engaged in site activities do so in a safe manner and in compliance with EPA, state and local regulations. The primary regulatory documents with which site personnel need to comply are OSHA 29 CFR, Part 1910, and the California Administrative Code, Title 8. In addition, all site work will comply with Allterra Environmental, Inc.'s (Allterra) Health and Safety Program and all supporting Standard Operating Procedures (SOPs). This HASP may be modified during field activities, if necessary, as more information and site-specific data are obtained.

Prior to beginning any work on-site, an approved copy of this HASP shall be provided to all employees and subcontractors by the Project Manager. Each subcontractor will be responsible for providing his own HASP. Allterra retains the right to review and approve each subcontractor's HASP prior to the beginning of field work.

## **Purpose and Objectives**

The purpose of this HASP is to provide guidelines and procedures to ensure the health and physical safety of those persons working at the site. While it may be impossible to eliminate all risks associated with site work, the goal is to provide state-of-the-art precautionary and responsive measures for the protection of on-site personnel, the general public and the environment. The HASP objectives are as follows:

- a. Ensure the safety of all site personnel;
- b. Protect the public and the environment; and
- c. Adhere to Allterra's health and safety policies and procedures.

## **Implementation**

This HASP, and any additional HASP, will be reviewed by all site personnel prior to their scheduled field work. Whenever the HASP is revised or amended, personnel will be instructed of changes and new procedures.

The HASP will be implemented in the field by Allterra's Health and Safety Coordinator and/or designated Site Safety Officer (SSO).

## **Background and Site Description**

The subject site is located on the southwest corner of Holmes Street and Second Street at 160 Holmes Street in Livermore, California. The site currently operates as a service station and convenience store.

## **Proposed Work**

Allterra has proposed to conduct in-situ soil and groundwater remediation within the source area at the subject site. This work includes using a truck-mounted Geoprobe® rig equipped with 2-inch diameter push core drilling equipment to inject the chemical oxidant RegenOx™ and the slow release technology known as Oxygen Release Compound Advanced (ORC Advanced™) into the subsurface onsite.

**Job Hazard Assessment**  
**Chemical Health Hazards**

<b>Chemical</b>	<b>PEL/Ceiling/ IDLH</b>	<b>Known Concentrations in Soil, Water, Air, Etc.</b>	<b>Signs/Symptoms</b>
Benzene	1.0 ppm	Soil = 0.47 ppm Water = 11,000 ppb	Irritation of eyes, nose, and respiratory systems. Headache, giddiness, fatigue, anorexia, staggered gait, and dermatitis
Toluene	100 ppm	Soil = 81 ppm Water = 26,000 ppb	Irritation of eyes and mucous membrane, headache, dermatitis, narcosis, and coma.
Ethylbenzene	300 ppm	Soil = 120 ppm Water = 5,500 ppb	Irritation of eyes and mucous membrane, headache, dermatitis, narcosis, and coma.
Xylenes	100 ppm	Soil = 940 ppm Water = 28,000 ppb	Irritation of eyes, nose, and throat, excitement, drowsiness, headache, dizziness, nausea, vomiting, anorexia, staggered gait, and dermatitis.
Gasoline	300 ppm	Soil = 6,500 ppm Water = 210,000 ppb	Skin irritant, disturbance of eyes. Deep burning in the throat and respiratory track and bronchopneumonia. Repeated chronic dermal contact may result in drying of skin, lesions and other dermatological conditions.
Diesel	100 mg/m <sup>3</sup>	Soil = 1,300 ppm Water = 57,000 ppb	Irritation to skin. Prolonged breathing at high vapor concentrations can cause central nervous system effects
Methyl Tertiary Butyl Ether	50 ppm	Soil = 140 ppm Water = 1,500,000 ppb	Minor skin and eye irritant, Inhalation of vapor can irritate respiratory tract. Central nervous system effects may include headache, dizziness, loss of balance and coordination. May also cause nausea and vomiting if ingested.
RegenOx™ (Sodium Percarbonate)	NA	NA	Inhalation exposure causes irritation to respiratory tract, including mucus membranes, nose and throat. Ingestion is associated with nausea and diarrhea. Eye contact causes irritation, redness, and pain. May also cause slight skin irritation.
ORC Advanced™ (Calcium Hydroxide Oxide)	NA	NA	Irritating to mucous membranes and eyes. Risk of skin irritation, sore throat, and nose bleeds with extended exposure. Ingestion is associated with nausea and vomiting.

Physical Hazards

Hazard	Mitigation Measure
Drilling Equipment Hazard	Heavy equipment will be in good working order and operated in accordance with recognized industry standards. Strive to keep a safe distance from heavy machinery so that you would not be in the path of a moving part if it were to swing suddenly. Always be aware of the movement of machinery around you. Approach vehicles from the driver's side. Make sure you are seen by the vehicle operator. Make eye contact.
Trip/Fall Hazard	Good housekeeping and shoes with traction will be worn.

Fire and Explosion Hazards

List Flammable or combustible materials kept on-site. Keep ignition sources away from the following materials.

Flammable (Flash Point < 100 °F)	Combustible (Flash Point < 200 °F)
Gasoline (43 °F)	Diesel (130 °F)

Flammability will be monitored by LEL meter.

List all oxidizers kept on-site: RegenOx™ (see Chemical Health Hazards)

Type and location of Fire Extinguisher: ABC fire extinguisher will be located in the support zone in the truck or outside.

Other Hazards

Noise:

Activities likely to generate noise exceeding 85 Db: drilling Use hearing protection during these activities.

Heat Stress

*Symptoms:* Heat Cramps: Muscular pains and spasms.  
 Heat Exhaustion: Cool, pale, moist skin; dilated pupils, headache, sweating, nausea, dizziness, vomiting, near normal body temperature.  
 Heat Stroke: Hot, red skin; small pupils; high body temperature; reduced sweating

*Mitigation:* Cool place for breaks (in the shade or in trucks)  
 Whenever ambient temperatures exceed 80 °F, or whenever semi-permeable or impermeable protective clothing is worn and ambient temperatures exceed 70 °F, monitoring the worker may include:

Calculate the workers heart rate at the beginning of the rest period. If the heart rate exceeds 110 beats/min shorten the next work cycle. If the heart

rate still exceeds 110 beats/min during the next rest period, shorten the work cycle by 1/2 and continue monitoring.

Take frequent breaks in shaded areas. Remove PPE during breaks and provide plenty of drinking water. Record the time and duration of all breaks. Heat stroke victims must receive emergency medical care.

           *Hypothermia/ Frostbite*

*Symptoms:* Hypothermia: Shivering, apathy, loss of consciousness, decreasing pulse and breathing rate.  
 Frostbite: White, then greyish yellow processing to greyish blue skin. Cold numb body parts.

*Mitigation:* Wear multi-layer cold weather clothing. Take frequent breaks in a warm sheltered area. Provide warm drinks. For frostbite victims, warm the injured part gradually, do not rub the affected area. Warm hypothermia victims and transport to emergency medical care.

**Exposure Monitoring**

All samples will be recorded in the exposure log. Copies of the exposure log are filed in the job file. All sampling instruments will be calibrated per the manufacturer’s instructions on a daily basis.

Monitoring Equipment	Hazard Monitored	Sample Location	Sample Frequency	Action Level	Action
PID	Volatile organic vapors	To be determined	Hourly	300 ppm	Use of a respirator while working

**Personal Protective Equipment**

As a minimum, modified Level D protection is required on all Allterra worksites. During site-specific drilling and injection field activities, field personnel will wear modified Level D personal protective equipment (PPE) consisting of hardhats, chemical resistant gloves, safety goggles or face shield, NIOSH-approved dust and mist respirator, long sleeve clothing or Tyvek® suit, and steel-toed boots. For each task on this project, we have identified additional protective garments required, and included the conditions (exposure levels, etc.) under which the level of PPE would be modified in the table below.

Task(s)	Condition	Garment(s)
All	At all times	Level D = steel-toe boots, safety glasses, and hard hat
Injection Activities	At all times	Level D + safety goggles or face shield, NIOSH-approved dust and mist respirator, and long sleeve clothing or Tyvek® suit
Other		

**Site Control and Communication**

The site will be secured as follows: Traffic safety equipment and caution tape.

Work Zones will be marked as follows: Marked with florescent or caution tape and traffic safety equipment. Exclusion Zone is within 15 feet of machinery. Only essential personnel will be allowed into an Exclusion Zone. When practical, 25 to 75 feet of space surrounding Exclusion Zones will be designated as Contamination Reduction Zones. Support Zone is all other area.

On-site communication:      Radio                    \_\_\_\_\_  
     Verbal                      X    
     Hand Signals            X    
     Other                     \_\_\_\_\_

Off-site communication:      Radio                    \_\_\_\_\_  
     Telephone                X    
     Other                     \_\_\_\_\_

The specific signal for an emergency is: Waving both arms overhead

The specific signal for an evacuation is: Wave personnel toward assembly point

Evacuation assembly point is: To be designated prior to work so a head count can be taken in the event of an evacuation.

**Sanitation and Decontamination**

As required, all equipment (trucks, field equipment, heavy machinery, etc.) shall be decontaminated prior to exiting the work zone. Personnel decontamination shall be conducted as needed in accordance with the health and safety section of this plan. All waste soils removed during drilling activities will be placed into drums and will remain on site pending disposal.

Personal decontamination procedure: *Hands and face must be clean prior to eating, drinking, or smoking.*

Location of Wash Water:                    *Support Zone, or to designated prior to work start.*

Location of toilet:                            *Support Zone, or to designated prior to work start.*

Location of drinking water:                *Support Zone, or to designated prior to work start.*

Equipment Decontamination Procedures:    *Steam cleaned or washed with Alconox.*

Materials to be disposed of as Hazardous Waste:    *Personal Protective Equipment.*

This hazard assessment is based on available information concerning chemical hazards suspected to be present at the site. The work to be performed will be conducted in accordance with EPA and CAL-OSHA regulations and Monterey County requirements.

### **Emergency Services**

If an emergency should occur on-site, the Emergency System (911) should be activated. Two-way communication between the site and the emergency trauma center will be maintained via a portable cellular telephone. Emergency telephone numbers shall be posted on-site and a portable telephone unit made immediately available at all times. These numbers shall include the following:

#### **Emergency**

Ambulance	911
Police	911
Poison Control	(800) 662-9886
Pleasanton Urgent Care Medical Center	(925) 462-9300

#### **Non Emergency**

Alameda County Fire Department #8	(925) 551-6868
Livermore Police Department	(925) 371-4900
National Response Center	(800) 424-8802

### **Emergency/Contingency Plans and Procedures**

From the Site, head northeast on Holmes Street and turn right onto 1<sup>st</sup> Street. Continue on 1<sup>st</sup> Street and turn left onto P Street. Continue on P Street and turn left onto Portola Avenue. Continue on Portola Avenue and take the I-580 west on ramp towards Oakland. Continue on I-580 west for approximately 5 miles and take the Santa Rita Road/Tassajara Road Exit (Exit #47). Turn left onto Santa Rita Road and continue south for approximately 1.0 mile. Arrive at Urgent Care at 3128 Santa Rita Road in Pleasanton, California.

### **Key Safety Personnel and Responsibilities**

#### Project Manager

The Allterra Project Manager is the SSO. The SSO will ensure that site personnel have proper protective equipment available, that specific site hazards are noted, and that personnel have knowledge of the nearest hospital location. The site safety officer can stop work at the site upon determination that an eminent health or safety hazard exists. If a stop-work order is issued, Allterra will take appropriate steps to remedy the situation and resume site activities. Allterra's Project Manager is responsible for directing all project operations. The Project Manager is also responsible for ensuring that the safety personnel are given free access to all relevant site information that could impact health and safety. The project manager will remain in view of all field activities, and he will inform site personnel of a change in activities.

#### Employees

All Allterra employees working at the site are responsible for reading and understanding the HASP. Other subcontractors at the site are responsible for providing their own HASPs, which



must incorporate, at a minimum, Allterra's HASP. As described above, Allterra's SSO has the authority to ensure that subcontractor employees are following the Allterra HASP provisions.

**Site Safety Briefing Procedures (Tailgate Meeting):**

All field personnel from Allterra and the subcontractors must attend a safety orientation meeting prior to commencing field activities. The meeting will be scheduled and conducted by the SSO and is to include an overview of the site history, the potentially hazardous compounds, their potential mode of ingress into the body, protective equipment requirements, and emergency response equipment. All individuals who do not have respirators and who may be required to wear them, will not be allowed on the site until they are provided with and fit tested for respirators by their respective employers.

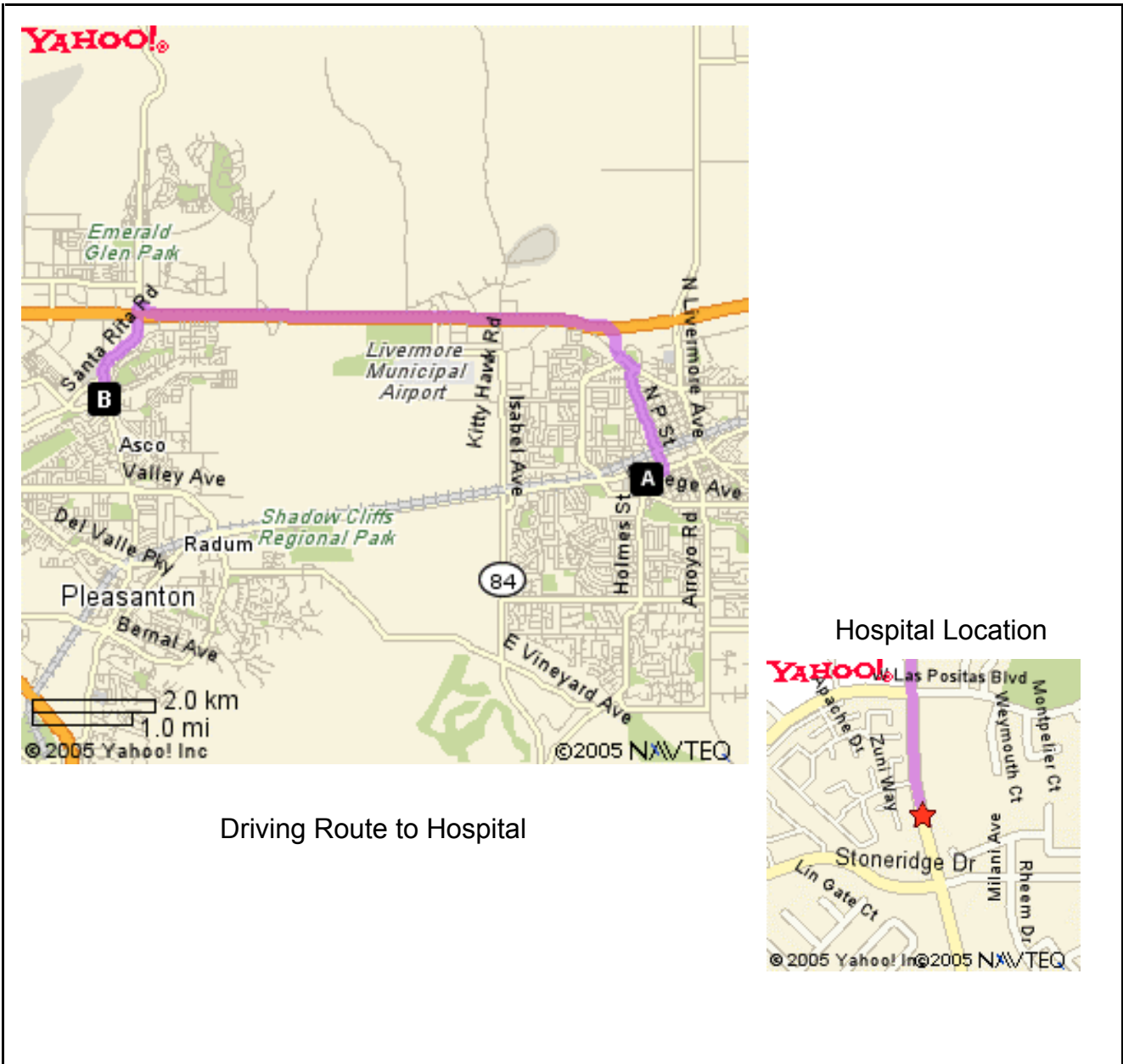
A tailgate meeting will be held every morning before the start of field work and is to be attended by all personnel onsite. The purpose of the meeting is to discuss the days work, potential hazards, and specific health and safety procedures to be utilized during the day.

**Sign-Off**

I have read the HASP and fully understand the hazards associated with the following job:  
160 Holmes Street, Livermore, California

I will comply with the minimum safety requirements set forth in the HASP. I agree to notify the responsible employee of Allterra should any unsafe acts be witnessed by me while I am on-site.

<b>Print Name</b>	<b>Signature</b>	<b>Date</b>



**Hospital Location Map**  
160 Holmes Street, Livermore, California

# Material Safety Data Sheet



GASOLINE, UNLEADED



## 1. Product and company identification

- Product name** : GASOLINE, UNLEADED
- Synonym** : Regular, Unleaded Gasoline (US Grade), Mid-Grade, Plus, Super, WinterGas, SummerGas, Supreme, SuperClean WinterGas, RegularClean, PlusClean, Premium, marked or dyed gasoline, TQRUL, transitional quality regular unleaded, BOB, Blendstock for Oxygenate Blending
- Code** : W102E, SAP: 102 to 117
- Material uses** : Unleaded gasoline is used in spark ignition engines including motor vehicles, inboard and outboard boat engines, small engines such as chain saws and lawn mowers, and recreational vehicles.
- Manufacturer** : PETRO-CANADA  
P.O. Box 2844  
150 – 6th Avenue South-West  
Calgary, Alberta  
T2P 3E3
- In case of emergency** : Petro-Canada: 403-296-3000  
Canotec Transportation: 613-996-6666  
Poison Control Centre: Consult local telephone directory for emergency number(s).

## 2. Hazards identification

- Physical state** : Clear liquid.
- Odour** : Gasoline
- WHMIS (Canada)** :    
Class B-2: Flammable liquid  
Class D-2A: Material causing other toxic effects (Very toxic).  
Class D-2B: Material causing other toxic effects (Toxic).
- OSHA/HCS status** : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
- Emergency overview** : **WARNING!**  
FLAMMABLE LIQUID AND VAPOUR. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER. CONTAINS MATERIAL WHICH CAN CAUSE HERITABLE GENETIC EFFECTS.  
Flammable liquid. Irritating to eyes, respiratory system and skin. Keep away from heat, sparks and flame. Avoid exposure - obtain special instructions before use. Do not breathe vapour or mist. Avoid contact with eyes, skin and clothing. Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure. Contains material which can cause heritable genetic effects. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.
- Routes of entry** : Dermal contact. Eye contact. Inhalation. Ingestion.
- Potential acute health effects**
- Inhalation** : Inhalation of this product may cause respiratory tract irritation. Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
- Ingestion** : Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.

## 2 . Hazards identification

- Skin** : Irritating to skin.
- Eyes** : Irritating to eyes.
- Potential chronic health effects**
- Chronic effects** : This product contains an ingredient or ingredients, which have been shown to cause chronic toxic effects. Repeated or prolonged exposure to the substance can produce blood disorders.
- Carcinogenicity** : Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.
- Mutagenicity** : Contains material which can cause heritable genetic effects.
- Teratogenicity** : No known significant effects or critical hazards.
- Developmental effects** : No known significant effects or critical hazards.
- Fertility effects** : No known significant effects or critical hazards.
- Medical conditions aggravated by over-exposure** : Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation. Repeated skin exposure can produce local skin destruction or dermatitis.

See toxicological information (section 11)

## 3 . Composition/information on ingredients

<u>Name</u>	<u>CAS number</u>	<u>%</u>
Gasoline	86290-81-5	85-100
Ethanol	64-17-5	0.1-1
Benzene	71-43-2	0.5-1.5
Toluene	108-88-3	15-40*

\*Montreal: may vary from 3-40%

\*Edmonton: may vary from 1-5%

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

## 4 . First-aid measures

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.
- Notes to physician** : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

## 5 . Fire-fighting measures

- Flammability of the product** : Flammable liquid (NFPA) .
- Extinguishing media**
- Suitable** : Use dry chemical, CO<sub>2</sub>, water spray (fog) or foam.
- Not suitable** : Do not use water jet.
- Special exposure hazards** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
- Products of combustion** : Carbon oxides (CO, CO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), polynuclear aromatic hydrocarbons, phenols, aldehydes, ketones, smoke and irritating vapours as products of incomplete combustion.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.
- Special remarks on fire hazards** : Extremely flammable in presence of open flames, sparks, shocks, and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. Rapid escape of vapour may generate static charge causing ignition. May accumulate in confined spaces.
- Special remarks on explosion hazards** : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Containers may explode in heat of fire. Vapours may form explosive mixtures with air.

## 6 . Accidental release measures

- Personal precautions** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).
- Environmental precautions** : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
- Methods for cleaning up**
- Small spill** : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.
- Large spill** : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

## 7 . Handling and storage

- Handling** : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapour or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical

## 7 . Handling and storage

(ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by earthing and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

### Storage

- : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Ensure the storage containers are grounded/bonded.

## 8 . Exposure controls/personal protection

Ingredient	Exposure limits
Gasoline	<b>ACGIH TLV (United States).</b> TWA: 300 ppm 8 hour(s). STEL: 500 ppm 15 minute(s).
Ethanol	<b>ACGIH TLV (United States).</b> STEL: 1000 ppm 15 minute(s).
Benzene	<b>ACGIH TLV (United States). Absorbed through skin.</b> TWA: 0.5 ppm 8 hour(s). STEL: 2.5 ppm 15 minute(s).
Toluene	<b>ACGIH TLV (United States).</b> TWA: 20 ppm 8 hour(s).

### Consult local authorities for acceptable exposure limits.

#### Recommended monitoring procedures

- : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

#### Engineering measures

- : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapour or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

#### Hygiene measures

- : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

#### Personal protection

##### Respiratory

- : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.



## 8 . Exposure controls/personal protection

- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.  
Recommended: polyvinyl alcohol (PVA), Viton. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.
- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

## 9 . Physical and chemical properties

- Physical state** : Clear liquid.
- Flash point** : Closed cup: -50 to -38°C (-58 to -36.4°F) [Tagliabue.]
- Auto-ignition temperature** : 257°C (494.6°F) (NFPA)
- Flammable limits** : Lower: 1.3% (NFPA)  
Upper: 7.6% (NFPA)
- Colour** : Clear to slightly yellow or green, undyed liquid. May be dyed red for taxation purposes.
- Odour** : Gasoline
- Odour threshold** : Not available.
- pH** : Not available.
- Boiling/condensation point** : 25 to 220°C (77 to 428°F) (ASTM D86)
- Melting/freezing point** : Not available.
- Relative density** : 0.685 to 0.8 kg/L @ 15°C (59°F)
- Vapour pressure** : <107 kPa (<802.5 mm Hg) @ 37.8°C (100°F)
- Vapour density** : 3 to 4 [Air = 1] (NFPA)
- Volatility** : Not available.
- Evaporation rate** : Not available.
- Viscosity** : Not available.
- Pour point** : Not available.
- Solubility** : Hydrocarbon components virtually insoluble in water. Soluble in alcohol, ether, chloroform and benzene. Dissolves fats, oils and natural resins.

## 10 . Stability and reactivity

- Chemical stability** : The product is stable.
- Hazardous polymerisation** : Under normal conditions of storage and use, hazardous polymerisation will not occur.
- Materials to avoid** : Reactive with oxidising agents, acids and interhalogens.
- Hazardous decomposition products** : May release CO<sub>x</sub>, NO<sub>x</sub>, phenols, polycyclic aromatic hydrocarbons, aldehydes, ketones, smoke and irritating vapours when heated to decomposition.

## 11 . Toxicological information

### Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Gasoline	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	13600 mg/kg	-
Ethanol	LD50 Dermal	Rabbit	>15800 mg/kg	-
	LD50 Oral	Mouse	3450 mg/kg	-
	LC50 Inhalation Vapour	Rat	8850 mg/m <sup>3</sup>	4 hours
Benzene	LD50 Dermal	Rabbit	>8240 mg/kg	-
	LD50 Oral	Rat	930 mg/kg	-
	LC50 Inhalation Vapour	Rat	13228 ppm	4 hours
Toluene	LD50 Dermal	Rabbit	12125 mg/kg	-
	LD50 Oral	Rat	636 mg/kg	-
	LC50 Inhalation Vapour	Rat	7585 ppm	4 hours

**Conclusion/Summary** : Not available.

### Chronic toxicity

**Conclusion/Summary** : Not available.

### Irritation/Corrosion

**Conclusion/Summary** : Not available.

### Sensitiser

**Conclusion/Summary** : Not available.

### Carcinogenicity

**Conclusion/Summary** : Not available.

### Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Gasoline	A3	2B	-	-	-	-
Ethanol	A3	-	-	-	-	-
Benzene	A1	1	A	+	Proven.	+
Toluene	A4	3	D	-	-	-

### Mutagenicity

**Conclusion/Summary** : Not available.

### Teratogenicity

**Conclusion/Summary** : There is a wealth of information about the teratogenic hazards of Toluene in the literature; however, based upon professional judgement regarding the body of evidence, WHMIS classification as a teratogen is not warranted.

### Reproductive toxicity

**Conclusion/Summary** : Not available.

## 12 . Ecological information

**Environmental effects** : No known significant effects or critical hazards.

### Aquatic ecotoxicity

**Conclusion/Summary** : Not available.

### Biodegradability

**Conclusion/Summary** : Not available.




## 13 . Disposal considerations

**Waste disposal** : The generation of waste should be avoided or minimised wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

## 14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
<b>TDG Classification</b>	UN1203	GASOLINE	3	II		-
<b>DOT Classification</b>	Not available.	Not available.	Not available.	-		-

PG\* : Packing group

## 15 . Regulatory information

### United States

**HCS Classification** : Flammable liquid  
Irritating material  
Carcinogen

### Canada

**WHMIS (Canada)** : Class B-2: Flammable liquid  
Class D-2A: Material causing other toxic effects (Very toxic).  
Class D-2B: Material causing other toxic effects (Toxic).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

### International regulations

**Canada inventory** : All components are listed or exempted.

**United States inventory (TSCA 8b)** : All components are listed or exempted.

**Europe inventory** : All components are listed or exempted.

## 16 . Other information

**Label requirements** : FLAMMABLE LIQUID AND VAPOUR. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER. CONTAINS MATERIAL WHICH CAN CAUSE HERITABLE GENETIC EFFECTS.

**Hazardous Material Information System (U.S.A.)** :

Health	*	2
Flammability		3
Physical hazards		0
Personal protection		H

## 16 . Other information

National Fire Protection Association (U.S.A.) :



References : Available upon request.  
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Date of printing : 4/21/2010.

Date of issue : 9 April 2010

Date of previous issue : No previous validation.

Responsible name : Product Safety - RS

Indicates information that has changed from previously issued version.

For Copy of (M)SDS : Internet: [www.petro-canada.ca/msds](http://www.petro-canada.ca/msds)

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

For Product Safety Information: (905) 804-4752

### Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

## MATERIAL SAFETY DATA SHEET

### 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

#### Product Identification

Product Name: Methyl Tert-Butyl Ether  
 Product Number(s): 40900-01  
 Synonyms: MTBE; tert-Butyl methyl ether; Methyl-1,1-dimethylethyl ether; Methoxy-2-methyl propane  
 CAS Number: 1634-04-4

#### Company Identification

Company Name: Johann Haltermann, Ltd.  
 Company Address: 16717 Jacintoport Blvd.  
 Houston, TX 77015 USA  
 Product Information: 281-452-5951 Fax: 281-457-1128  
 24 HR Emergency Assistance: 832-376-2026  
 24 HR CHEMTREC: 800-424-9300

### 2. COMPOSITION/INFORMATION ON INGREDIENTS

#### Component Listing

Chemical Name	CAS #	Amount
METHYL TERT-BUTYL ETHER	1634-04-4	>99 %

(See section 8 for exposure guidelines)

(See section 15 for regulatory information)

#### HAZARDS DISCLOSURE:

This product contains hazardous materials as defined by the OSHA Hazard Communication Standard 29 CFR 1910.1200.

As defined under SARA 311 and 312, this product contains materials that are designated as the following hazards: Acute Chronic Fire

### 3. HAZARDS IDENTIFICATION

#### EMERGENCY OVERVIEW:

Flammable liquid.  
May be harmful if ingested or inhaled.  
Irritating to eyes and skin.  
May be harmful to aquatic organisms.

**NFPA Rating:**

Health:	2
Flammability:	3
Reactivity:	0

**POTENTIAL HEALTH EFFECTS****EYE:**

Contact with eyes may cause redness and pain.

**SKIN:**

Contact with this material may cause dry skin and redness.

**INHALATION:**

Inhalation of this material may cause dizziness, drowsiness, headache, weakness, and unconsciousness.

**INGESTION:**

Ingestion of this material may cause abdominal pain, nausea, vomiting, dizziness, drowsiness, headache, weakness, and unconsciousness.

**SUBCHRONIC EFFECTS:**

This substance is irritating to the skin.

Swallowing the liquid may cause aspiration in to the lungs with the risk of chemical pneumonitis.

Exposure far above the OEL may result in a lowering of consciousness.

**CARCINOGENICITY INFORMATION:**

MTBE is listed by IARC as " Not classifiable as to its carcinogenicity to humans" (Category 3).

**REPRODUCTIVE EFFECTS:**

No information available on reproductive effects.

**TARGET ORGANS:**

Target organs include: eyes, skin, respiratory system, GI tract, central nervous system.

## 4. FIRST AID MEASURES

**EYE CONTACT FIRST AID:**

After initial flushing, remove contacts if possible and continue flushing.

Get medical attention.

**SKIN CONTACT FIRST AID:**

Remove contaminated clothing and shoes.

Wash affected area immediately with large amounts of soap and water.

Seek medical attention if irritation develops or persists.

**INHALATION FIRST AID:**

If inhaled, remove to fresh air and rest.

If not breathing, give artificial respiration or give oxygen by trained personnel.

Refer for medical attention.

**INGESTION FIRST AID:**

If swallowed, do NOT induce vomiting.

Rinse mouth. Give slurry of activated charcoal in water to drink.

Call a physician or poison control center immediately.

**NOTES TO PHYSICIAN:**

Swallowing this liquid may cause aspiration into the lungs with the risk of chemical pneumonitis.

## 5. FIRE FIGHTING MEASURES

**FLAMMABLE PROPERTIES:**

FLASH POINT:	-28 °C
AUTOIGNITION TEMPERATURE:	375 °C
LOWER FLAMMABLE LIMITS:	1.6 % by volume in air
UPPER FLAMMABLE LIMITS:	15.1 % by volume in air

**EXTINGUISHING MEDIA:**

Use water spray to cool fire exposed containers.

Use powder, AFFF, foam, or carbon dioxide when fighting fires involving this material.

**FIRE FIGHTING INSTRUCTIONS:**

Evacuate non-emergency personnel to a safe area.

As in any fire, wear self-contained breathing apparatus pressure-demand (OSHA/NIOSH approved or equivalent) and full protective gear.

**COMBUSTION PRODUCTS:**

In the case of fire, oxides of carbon, hydrocarbons, fumes and smoke may be produced.

**MISCELLANEOUS:**

The vapor is heavier than air and may travel along the ground; distant ignition is possible.

## 6. ACCIDENTAL RELEASE MEASURES

**SAFEGUARDS (PERSONNEL):**

Eliminate all sources of ignition - heat, sparks, flame, electricity, impact and friction.  
Wear appropriate personal protective equipment.  
Ventilate spill area.

**INITIAL CONTAINMENT:**

Eliminate all sources of ignition - heat, sparks, flame, electricity, and impact.  
Collect leaking and spilled material in sealable containers as far as possible.  
Absorb remaining liquid with inert material and remove to safe place.

**LARGE SPILLS PROCEDURE:**

Stop the source of the leak or release.

Clean up spills as soon as possible, observing precautions in Exposure Controls/Personal Protection section.  
Contain liquid to prevent further contamination of soil, surface water, or groundwater.

**MISCELLANEOUS:**

Notify local, state, and federal authorities as required by law.

## 7. HANDLING AND STORAGE

**HANDLING (PERSONNEL):**

Ground and bond containers when transferring material.  
Do not inhale or ingest.  
Avoid contact with eyes, skin, and clothing.  
Wash thoroughly after handling.

**HANDLING (PHYSICAL ASPECTS):**

Avoid contact with strong oxidizing agents and strong acids.  
Eliminate all sources of ignition - heat, sparks, flame, electricity, impact and friction.  
To reduce explosion hazard, use closed system, ventilation, explosion-proof electrical equipment and lighting.  
Do NOT use compressed air for filling, discharging, or handling.

**STORAGE PRECAUTIONS:**

Store in a cool, fireproof, well ventilated area separated from strong oxidants and strong acids.  
Eliminate leaks which could enter the environment and lead to bioaccumulation.

**MISCELLANEOUS:**

Prevent build up of electrostatic charges (by grounding, etc).

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**ENGINEERING CONTROLS:**

Use only with adequate ventilation.

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

**EYE/FACE PROTECTION REQUIREMENTS:**

Chemical goggles are recommended to avoid contact with eyes.

**SKIN PROTECTION REQUIREMENTS:**

Where contact is likely, wear chemical resistant gloves, a chemical suit, rubber boots, and chemical safety goggles.

**RESPIRATORY PROTECTION REQUIREMENTS:**

When there is potential for airborne exposures in excess of applicable limits, wear NIOSH/MSHA approved respiratory protection.

**EXPOSURE GUIDELINES:**

Compound Name	CAS #	Exposure Guidelines
METHYL TERT-BUTYL ETHER	1634-04-4	ACGIH TWA: 50 ppm

## 9. PHYSICAL AND CHEMICAL PROPERTIES

Form:	Liquid	
Color:	Colorless	
Odor:	Ethereal	
Boiling Point:	55.0	°C
Melting Point:	-109	°C
Vapor Pressure:	250	mm Hg at 25° C
Solubility in water:	4.2	g/100 mL at 20° C
Specific Gravity:	0.7	(water = 1)

## 10. STABILITY AND REACTIVITY

**STABILITY:**

This compound is stable at ambient conditions.

**POLYMERIZATION:**

Hazardous polymerization will not occur.

**INCOMPATIBILITY WITH OTHER MATERIALS:**

MTBE reacts violently with strong oxidants causing a fire hazard. MTBE decomposes on contact with acids.

**DECOMPOSITION:**

In the case of a fire, oxides of carbon, hydrocarbons, fumes, and smoke may be produced.

**CONDITIONS TO AVOID:**

Keep away from all sources of ignition including static electricity.

Prevent build-up of electrostatic charge by grounding.

## 11. TOXICOLOGICAL INFORMATION

### TOXICOLOGICAL DATA:

Compound Name	CAS #	TEST - SPECIES - RESULT
METHYL TERT-BUTYL ETHER	1634-04-4	Oral LD50 - Rat: 4 gm/kg

## 12. ECOLOGICAL INFORMATION

### ENVIRONMENTAL HAZARDS:

This material may be harmful to the environment. Bioaccumulation may occur.

### ENVIRONMENTAL FATE:

According to the National Library of Medicine's Hazardous Substances Data Bank:

"If released to air, a vapor pressure of 250 mm Hg at 25 deg C indicates methyl t-butyl ether will exist solely as a vapor in the ambient atmosphere. Vapor-phase methyl t-butyl ether will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals and nitrate radicals; half-lives for these reactions in air are estimated to be 5.5 and 50 days, respectively. Direct photolysis is not expected to be an important removal process since aliphatic ethers do not absorb light in the environmental spectrum. If released to soil, methyl t-butyl ether is expected to have very high mobility based upon a Koc of 6 calculated from a soil/water partition coefficient of 0.0925. Volatilization from moist soil surfaces is expected to be an important fate process based upon a Henry's Law constant of  $5.87 \times 10^{-4}$  atm-cu m/mole. Methyl t-butyl ether may potentially volatilize from dry soil surfaces based upon its vapor pressure. If released into water, methyl t-butyl ether is not expected to adsorb to suspended solids and sediment in the water column based upon the Koc. Volatilization from water surfaces is expected to be an important fate process based upon this compound's Henry's Law constant. Estimated volatilization half-lives for a model river and model lake are 4.1 hours and 4.1 days, respectively. A BCF of 1.5 in Japanese carp suggests bioconcentration in aquatic organisms is low. Methyl t-butyl ether is not expected to undergo hydrolysis in the environment due to the lack of hydrolyzable functional groups. In general, most studies have indicated that methyl t-butyl ether is difficult to biodegrade."

### ECOLOGICAL DATA:

Compound Name	CAS #	TEST-SPECIES-RESULTS
METHYL TERT-BUTYL ETHER	1634-04-4	N.D.

N.D. - No data available

## 13. DISPOSAL CONSIDERATIONS

### WASTE DISPOSAL:

Recover or recycle if possible.

It is the responsibility of the waste generator to determine the physical characteristics and toxicity of the material generated in order to properly designate the waste classification and disposal methods in compliance with applicable regulations.

Treat or dispose of waste material in accordance with all local, state/provincial, and national requirements.



**CONTAMINATED MATERIALS:**

Treat or dispose of contaminated material in accordance with all local, state/provincial, and national requirements.

**CONTAINER DISPOSAL:**

Follow all MSDS/label precautions even after container is emptied because they may retain product residues.

**14. TRANSPORTATION INFORMATION**

**PRODUCT LABEL:** Methyl Tert-Butyl Ether  
**D.O.T. SHIPPING NAME:** Methyl Tert-Butyl Ether  
**UN NUMBER:** UN 2398  
**PRODUCT RQ (LBS):** 1000  
**D.O.T. PLACARD:** Flammable  
**PACKAGE CLASS:** II

**15. REGULATORY INFORMATION****REGULATORY DISCLOSURES:**

This material or all of its components are listed on the Inventory of Existing Chemical Substances under the Toxic Substance Control Act (TSCA) or are exempt from reporting.

This material or all of its components are listed on the Canadian Domestic Substances List (DSL).

**FEDERAL REGULATORY LISTS:**

Compound Name	CAS #	SARA 313	CERCLA	RCRA	CAA
METHYL TERT-BUTYL ETHER	1634-04-4	313	1,000	N.L.	N.L.

N.L. - Not listed on regulatory list

**CALIFORNIA REGULATIONS:**

This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

**PENNSYLVANIA REGULATIONS:**

The following product components are cited on the Pennsylvania Hazardous Substances List and/or the Pennsylvania Environmental Hazardous Substances List, and are present at levels which require reporting.

To the best of our knowledge, this product does not contain any components cited on the Pennsylvania Special Hazardous Substances List.

Compound Name	CAS #	LISTING	AMOUNT
METHYL TERT-BUTYL ETHER	1634-04-4	PA RTK	>99 %

**ADDITIONAL STATE REGULATIONS:**

Components of this product are found on the following state lists.

Compound Name	CAS #	STATE LISTS
METHYL TERT-BUTYL ETHER	1634-04-4	DE, MN, NJ, NY, WI

**CANADIAN REGULATIONS:**

WHMIS INFORMATION: The Canadian Workplace Hazardous Materials Information System (WHMIS) classification for this product is:

B2 - Flammable liquid with a flash point of <37.8° C (100° F).

D2B - Eye or skin irritant.

Compound Name	CAS #	REPORTING LIMIT (%)
METHYL TERT-BUTYL ETHER	1634-04-4	N.L.

Refer elsewhere in the MSDS for specific warnings and safe handling information.

Refer to the employer's workplace education program.

CPR STATEMENT: This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

**16. OTHER INFORMATION**

REASON FOR ISSUE: New MSDS  
 PREPARED BY: PH  
 APPROVED BY: JJ  
 TITLE: E, H & S Specialist  
 APPROVAL DATE: November 23, 2009  
 SUPERSEDES DATE: New

\*\*\*\*\*

This information is furnished without warranty, expressed or implied except that it is accurate to the best knowledge of Johann Haltermann, Ltd.. The data on this sheet are related only to the specific material herein. Johann Haltermann, Ltd. assumes no responsibility for the use or reliance upon these data.

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END OF MSDS

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## Regen OX – Part A (Oxidizer Complex)

### Material Safety Data Sheet (MSDS)

Last Revised: October 1, 2007

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#### Section 1 – Supplier Information and Material Identification

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**Supplier:**



**REGENESIS**

1011 Calle Sombra  
San Clemente, CA 92673  
Telephone: 949.366.8000  
Fax: 949.366.8090  
E-mail: info@regenesis.com

Chemical Description: A mixture of sodium percarbonate [2Na<sub>2</sub>CO<sub>3</sub>·3H<sub>2</sub>O<sub>2</sub>], sodium carbonate [Na<sub>2</sub>CO<sub>3</sub>], sodium silicate and silica gel.

Chemical Family: Inorganic Chemicals

Trade Name: Regen Ox – Part A (Oxidizer Complex)

Product Use: Used to remediate contaminated soil and groundwater (environmental applications)

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#### Section 2 – Chemical Information/Other Designations

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<u>CAS No.</u>	<u>Chemical</u>	<u>Percentage</u>
15630-89-4	Sodium Percarbonate	60 -100 %
5968-11-6	Sodium Carbonate Monohydrate	10 – 30 %
7699-11-6	Silicic Acid	< 1 %
63231-67-4	Silica Gel	< 1 %

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#### Section 3 – Physical Data

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**Form:** Powder

**Color:** White

**Odor:** Odorless

**Melting Point:** NA

**Boiling Point:** NA

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**Section 3 – Physical Data (cont)**


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<b>Flammability/Flash Point:</b>	NA
<b>Vapor Pressure:</b>	NA
<b>Bulk Density:</b>	0.9 – 1.2 g/cm <sup>3</sup>
<b>Solubility:</b>	Min 14.5g/100g water @ 20 °C
<b>Viscosity:</b>	NA
<b>pH (3% solution):</b>	≈ 10.5
<b>Decomposition Temperature:</b>	Self-accelerating decomposition with oxygen release starts at 50 °C.

---

**Section 4 – Reactivity Data**


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<b>Stability:</b>	Stable under normal conditions
<b>Conditions to Avoid/Incompatibility:</b>	Acids, bases, salts of heavy metals, reducing agents, and flammable substances
<b>Hazardous Decomposition Products:</b>	Oxygen. Contamination with many substances will cause decomposition. The rate of decomposition increases with increasing temperature and may be very vigorous with rapid generation of oxygen and steam.

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**Section 5 – Regulations**


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<b>TSCA Inventory Listed:</b>	Yes
<b>CERCLA Hazardous Substance (40 CFR Part 302)</b>	
<b>Listed Substance:</b>	<i>No</i>
<b>Unlisted Substance:</b>	<i>Yes</i>
<b>SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know</b>	
<b>Extremely Hazardous Substance:</b>	No
<b>WHMIS Classification:</b>	C, D2B
<b>Canadian Domestic Substance List:</b>	Appears

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**Section 6 – Protective Measures, Storage and Handling**

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**Technical Protective Measures**

**Storage:** Oxidizer. Store in a cool, well ventilated area away from all sources of ignition and out of the direct sunlight. Store in a dry location away from heat and in temperatures less than 40 °C.

Keep away from incompatible materials and keep lids tightly closed. Do not store in improperly labeled containers.

Protect from moisture. Do not store near combustible materials. Keep containers well sealed.

Store separately from reducing materials. Avoid contamination which may lead to decomposition.

**Handling:** Avoid contact with eyes, skin and clothing. Use with adequate ventilation.

Do not swallow. Avoid breathing vapors, mists or dust. Do not eat, drink or smoke in the work area.

Label containers and keep them tightly closed when not in use.

Wash hands thoroughly after handling.

**Personal Protective Equipment (PPE)**

**Engineering Controls:** General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Avoid creating dust or mists. Maintain adequate ventilation at all times. Do not use in confined areas. Keep levels below recommended exposure limits. To determine actual exposure limits, monitoring should be performed on a routine basis.

**Respiratory Protection:** For many conditions, no respiratory protection is necessary; however, in dusty or unknown conditions or when exposures exceed limit values a NIOSH approved respirator should be used.

**Hand Protection:** Wear chemical resistant gloves (neoprene, rubber, or PVC).

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### Section 6 – Protective Measures, Storage and Handling (cont)

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<b>Eye Protection:</b>	Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles.
<b>Skin Protection:</b>	Try to avoid skin contact with this product. Chemical resistant gloves (neoprene, PVC or rubber) and protective clothing should be worn during use.
<b>Other:</b>	Eye wash station.
<b>Protection Against Fire &amp; Explosion:</b>	Product is non-explosive. In case of fire, evacuate all non-essential personnel, wear protective clothing and a self-contained breathing apparatus, stay upwind of fire, and use water to spray cool fire-exposed containers.

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### Section 7 – Hazards Identification

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#### Potential Health Effects

<b>Inhalation:</b>	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat.
<b>Eye Contact:</b>	Causes irritation, redness and pain.
<b>Skin Contact:</b>	Causes slight irritation.
<b>Ingestion:</b>	May be harmful if swallowed (vomiting and diarrhea).

---

### Section 8 – Measures in Case of Accidents and Fire

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<b>After Spillage/Leakage:</b>	Eliminate all ignition sources. Evacuate unprotected personnel and never exceed any occupational exposure limit. Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory.
<b>Extinguishing Media:</b>	Water
<b>First Aid</b>	
<b>Eye Contact:</b>	Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist.
<b>Inhalation:</b>	Remove affected person to fresh air. Seek medical attention if the effects persist.
<b>Ingestion:</b>	If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. <b>Do Not</b> induce vomiting.

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**Section 8 – Measures in Case of Accidents and Fire (cont)**

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**Skin Contact:** Wash affected areas with soap and a mild detergent and large amounts of water.

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**Section 9 – Accidental Release Measures**

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**Precautions:**

**Cleanup Methods:** Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory.

---

**Section 10 – Information on Toxicology**

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**Toxicity Data**

**LD50 Oral (rat):** 2,400 mg/kg  
**LD50 Dermal (rabbit):** Min 2,000 mg/kg  
**LD50 Inhalation (rat):** Min 4,580 mg/kg

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**Section 11 – Information on Ecology**

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**Ecology Data**

**Ecotoxicological Information:** NA

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**Section 12 – Disposal Considerations**

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**Waste Disposal Method**

**Waste Treatment:** Dispose of in an approved waste facility operated by an authorized contactor in compliance with local regulations.

**Package (Pail) Treatment:** The empty and clean containers are to be recycled or disposed of in conformity with local regulations.

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### Section 13 – Shipping/Transport Information

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<b>D.O.T. Shipping Name:</b>	Oxidizing Solid, N.O.S. [A mixture of sodium percarbonate [2Na <sub>2</sub> CO <sub>3</sub> ·3H <sub>2</sub> O <sub>2</sub> ], sodium carbonate [Na <sub>2</sub> CO <sub>3</sub> ], sodium silicate and silica gel.]
<b>UN Number:</b>	1479
<b>Hazard Class:</b>	5.1
<b>Labels:</b>	5.1 (Oxidizer)
<b>Packaging Group:</b>	III

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### Section 14 – Other Information

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<b>HMIS<sup>®</sup> Rating</b>	Health – 1 (slight)	Reactivity – 1 (slight)
	Flammability – 0 (none)	Lab PPE – goggles, gloves, and lab coat

HMIS<sup>®</sup> is a registered trademark of the National Painting and Coating Association.

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### Section 15 – Further Information

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**The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.**



## Regen OX – Part B (Activator Complex)

### Material Safety Data Sheet (MSDS)

Last Revised: November 7, 2005

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#### Section 1 – Supplier Information and Material Identification

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**Supplier:**



### REGENESIS

1011 Calle Sombra  
San Clemente, CA 92673  
Telephone: 949.366.8000  
Fax: 949.366.8090  
E-mail: info@regenesis.com

**Chemical Description:** A mixture of sodium silicate solution, silica gel and ferrous sulfate

**Chemical Family:** Inorganic Chemicals

**Trade Name:** Regen Ox – Part B (Activator Complex)

**Product Use:** Used for environmental remediation of contaminated soils and groundwater

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#### Section 2 – Chemical Information/Other Designations

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<u>CAS No.</u>	<u>Chemical</u>
1344-09-8	Silicic Acid, Sodium Salt, Sodium Silicate
63231-67-4	Silica Gel
7720-78-7	Ferrous Sulfate
7732-18-5	Water

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#### Section 3 – Physical Data

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**Form:** Liquid

**Color:** Blue/Green

**Odor:** Odorless

**Melting Point:** NA

**Boiling Point:** NA

**Flammability/Flash Point:** NA

**Vapor Pressure:** NA

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**Section 3 – Physical Data ( cont)**


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<b>Specific Gravity</b>	1.39 g/cm <sup>3</sup>
<b>Solubility:</b>	Miscible
<b>Viscosity:</b>	NA
<b>pH (3% solution):</b>	11
<b>Hazardous Decomposition Products:</b>	Oxides of carbon and silicon may be formed when heated to decomposition.

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**Section 4 – Reactivity Data**


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<b>Stability:</b>	Stable under normal conditions.
<b>Conditions to Avoid:</b>	None.
<b>Incompatibility:</b>	Avoid hydrogen fluoride, fluorine, oxygen difluoride, chlorine trifluoride, strong acids, strong bases, oxidizers, aluminum, fiberglass, copper, brass, zinc, and galvanized containers.

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**Section 5 – Regulations**


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<b>TSCA Inventory Listed:</b>	Yes
<b>CERCLA Hazardous Substance (40 CFR Part 302)</b>	
<b>Listed Substance:</b>	<i>No</i>
<b>Unlisted Substance:</b>	<i>Yes</i>
<b>SARA, Title III, Sections 302/303 (40 CFR Part 355) – Emergency Planning and Notification</b>	
<b>Extremely Hazardous Substance:</b>	No
<b>SARA, Title III, Sections 311/312 (40 CFR Part 370) – Hazardous Chemical Reporting: Community Right-To-Know</b>	
<b>Hazard Category:</b>	Acute
<b>SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know</b>	
<b>Extremely Hazardous Substance:</b>	No

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**Section 6 – Protective Measures, Storage and Handling**

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**Technical Protective Measures**

**Storage:** Keep in a tightly closed container (steel or plastic) and store in a cool, well ventilated area away from all incompatible materials (acids, reactive metals, and ammonium salts). Store in a dry location away from heat and in temperatures less than 24 °C. Do not store in aluminum, fiberglass, copper, brass, zinc or galvanized containers.

**Handling:** Avoid contact with eyes, skin and clothing. Avoid breathing spray mist. Use with adequate ventilation.  
Do not use product if it is brownish-yellow in color.

**Personal Protective Equipment (PPE)**

**Engineering Controls:** General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Safety shower and eyewash station should be within direct access.

**Respiratory Protection:** Use NIOSH-approved dust and mist respirator where spray mist exists. Respirators should be used in accordance with 29 CFR 1910.134.

**Hand Protection:** Wear chemical resistant gloves.

**Eye Protection:** Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles.

**Skin Protection:** Try to avoid skin contact with this product. Gloves and protective clothing should be worn during use.

**Other:**

**Protection Against Fire & Explosion:** Product is non-explosive and non-combustible.

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## Section 7 – Hazards Identification

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### Potential Health Effects

<b>Inhalation:</b>	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat.
<b>Eye Contact:</b>	Causes irritation, redness and pain.
<b>Skin Contact:</b>	Causes irritation. Symptoms include redness, itching and pain.
<b>Ingestion:</b>	May cause irritation to mouth, esophagus, and stomach.

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## Section 8 – Measures in Case of Accidents and Fire

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<b>After Spillage/Leakage (small):</b>	Mop up and neutralize liquid, then discharge to sewer in accordance with local, state and federal regulations.
<b>After Spillage/Leakage (large):</b>	Keep unnecessary personnel away; isolate hazard area and do not allow entrance into the affected area. Do not touch or walk through spilled material. Stop leak if possible without risking injury. Prevent runoff from entering into storm sewers and ditches that lead to natural waterways. Isolate the material if at all possible. Sand or earth may be used to contain the spill. If containment is not possible, neutralize the contaminated area and flush with large quantities of water.
<b>Extinguishing Media:</b>	Material is compatible with all extinguishing media.
<b>Further Information:</b>	
<b>First Aid</b>	
<b>Eye Contact:</b>	Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist.
<b>Inhalation:</b>	Remove affected person to fresh air. Give artificial respiration if individual is not breathing. If breathing is difficult, give oxygen. Seek medical attention if the effects persist.
<b>Ingestion:</b>	If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. <b><u>DO NOT</u></b> induce vomiting.
<b>Skin Contact:</b>	Wash affected areas with soap and a mild detergent and large amounts of water. Remove contaminated clothing and shoes.

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**Section 9 – Accidental Release Measures**

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**Precautions:**

**PPE:** Wear chemical goggles, body-covering protective clothing, chemical resistant gloves, and rubber boots (see Section 6).

**Environmental Hazards:** Sinks and mixes with water. High pH of this material may be harmful to aquatic life. Only water will evaporate from a spill of this material.

**Cleanup Methods:** Pick-up and place in an appropriate container for reclamation or disposal. US regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities.

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**Section 10 – Information on Toxicology**

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**Toxicity Data**

**Sodium Silicate:** When tested for primary eye irritation potential according to OECD Guidelines, Section 405, a similar sodium silicate solution produced corneal, iridal and conjunctival irritation. Some eye irritation was still present 14 days after treatment, although the average primary irritation score has declined from 29.7 after 1 day to 4.0 after 14 days. When tested for primary skin irritation potential, a similar sodium silicate solution produced irritation with a primary irritation index of 3 to abraded skin and 0 to intact skin. Human experience confirms that irritation occurs when sodium silicates get on clothes at the collar, cuffs, or other areas where abrasion may exist.

The acute oral toxicity of this product has not been tested.

**Ferrous Sulfate:** LD50 Oral (rat): 319 mg/kg not a suspected carcinogen.

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### Section 11 – Information on Ecology

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#### Ecology Data

**Ecotoxicological Information:** Based on 100% solid sodium silicate, a 96 hour median tolerance for fish of 2,320 mg/l; a 96 hour median tolerance for water fleas of 247 mg/L; a 96 hour median tolerance for snail eggs of 632 mg/L; and a 96 hour median tolerance for Amphipoda of 160 mg/L.

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### Section 12 – Disposal Considerations

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#### Waste Disposal Method

**Waste Treatment:** Neutralize and landfill solids in an approved waste facility operated by an authorized contactor in compliance with local regulations.

**Package (Pail) Treatment:** The empty and clean containers are to be recycled or disposed of in conformity with local regulations.

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### Section 13 – Shipping/Transport Information

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**D.O.T.** This product is not regulated as a hazardous material so there are no restrictions.

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### Section 14 – Other Information

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<b>HMIS<sup>®</sup> Rating</b>	Health – 2 (moderate)	Reactivity – 0 (none)
	Flammability – 0 (none)	Lab PPE – goggles, gloves, and lab coat
	Contact – 1 (slight)	

HMIS<sup>®</sup> is a registered trademark of the National Painting and Coating Association.

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### Section 15 – Further Information

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**The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.**

Oxygen Release Compound – Advanced (ORC *Advanced*<sup>TM</sup>)  
MATERIAL SAFETY DATA SHEET (MSDS)

Last Revised: March 13, 2007

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Section 1 - Material Identification

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Supplier:



**REGENESIS**

1011 Calle Sombra  
San Clemente, CA 92673

Phone: 949.366.8000

Fax: 949.366.8090

E-mail: [info@regenesis.com](mailto:info@regenesis.com)

**Chemical Description:** A mixture of Calcium OxyHydroxide [CaO(OH)<sub>2</sub>] and Calcium Hydroxide [Ca(OH)<sub>2</sub>].

**Chemical Family:** Inorganic Chemical

**Trade Name:** Advanced Formula Oxygen Release Compound  
(ORC *Advanced*<sup>TM</sup>)

**Chemical Synonyms** Calcium Hydroxide Oxide; Calcium Oxide Peroxide

**Product Use:** Used to remediate contaminated soil and groundwater (environmental applications)

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Section 2 – Composition

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<u>CAS No.</u>	<u>Chemical</u>
682334-66-3	Calcium Hydroxide Oxide [CaO(OH) <sub>2</sub> ]
1305-62-0	Calcium Hydroxide [Ca(OH) <sub>2</sub> ]
7758-11-4	Dipotassium Phosphate (HK <sub>2</sub> O <sub>4</sub> P)
7778-77-0	Monopotassium Phosphate (H <sub>2</sub> KO <sub>4</sub> P)

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**Section 3 – Physical Data**

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<b>Form:</b>	Powder
<b>Color:</b>	White to Pale Yellow
<b>Odor:</b>	Odorless
<b>Melting Point:</b>	527 °F (275 °C) – Decomposes
<b>Boiling Point:</b>	Not Applicable (NA)
<b>Flammability/Flash Point:</b>	NA
<b>Auto- Flammability:</b>	NA
<b>Vapor Pressure:</b>	NA
<b>Self-Ignition Temperature:</b>	NA
<b>Thermal Decomposition:</b>	527 °F (275 °C) – Decomposes
<b>Bulk Density:</b>	0.5 – 0.65 g/ml (Loose Method)
<b>Solubility:</b>	1.65 g/L @ 68° F (20° C) for calcium hydroxide.
<b>Viscosity:</b>	NA
<b>pH:</b>	11-13 (saturated solution)
<b>Explosion Limits % by Volume:</b>	Non-explosive
<b>Hazardous Decomposition Products:</b>	Oxygen, Hydrogen Peroxide, Steam, and Heat
<b>Hazardous Reactions:</b>	None



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**Section 4 – Reactivity Data**

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<b>Stability:</b>	Stable under certain conditions (see below).
<b>Conditions to Avoid:</b>	Heat and moisture.
<b>Incompatibility:</b>	Acids, bases, salts of heavy metals, reducing agents, and flammable substances.
<b>Hazardous Polymerization:</b>	Does not occur.

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**Section 5 – Regulations**

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**TSCA Inventory List:** Listed

**CERCLA Hazardous Substance (40 CFR Part 302)**

**Listed Substance:** No

**Unlisted Substance:** Yes

**Reportable Quantity (RQ):** 100 pounds

**Characteristic(s):** Ignitibility

**RCRA Waste Number:** D001

**SARA, Title III, Sections 302/303 (40 CFR Part 355 – Emergency Planning and Notification)**

**Extremely Hazardous Substance:** No

**SARA, Title III, Sections 311/312 (40 CFR Part 370 – Hazardous Chemical Reporting: Community Right-To-Know)**

**Hazard Category:** Immediate Health Hazard  
Fire Hazard

**Threshold Planning Quantity:** 10,000 pounds

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**Section 5 – Regulations (cont)**

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**SARA, Title III, Section 313 (40 CFR Part 372 – Toxic Chemical Release Reporting: Community Right-To-Know**

**Extremely Hazardous Substance:**

No

**WHMIS Classification:**

C

Oxidizing Material  
Poisonous and Infectious  
Material

D

Material Causing Other Toxic  
Effects –  
Eye and Skin Irritant

**Canadian Domestic Substance List:**

Not Listed

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**Section 6 – Protective Measures, Storage and Handling**

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**Technical Protective Measures**

**Storage:**

Keep in tightly closed container. Store in dry area, protected from heat sources and direct sunlight.

**Handling:**

Clean and dry processing pipes and equipment before operation. Never return unused product to the storage container. Keep away from incompatible products. Containers and equipment used to handle this product should be used exclusively for this material. Avoid contact with water or humidity.

**Section 6 – Protective Measures, Storage and Handling (cont)**

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**Personal Protective Equipment (PPE)**

Calcium Hydroxide

ACGIH® TLV® (2000)

5 mg/m<sup>3</sup> TWA

OSHA PEL

**Engineering Controls:**

Total dust–15 mg/m<sup>3</sup> TWA

Respirable fraction–

5 mg/m<sup>3</sup> TWA

NIOSH REL (1994)

5 mg/m<sup>3</sup>

**Respiratory Protection:**

For many conditions, no respiratory protection may be needed; however, in dusty or unknown atmospheres use a NIOSH approved dust respirator.

**Hand Protection:**

Impervious protective gloves made of nitrile, natural rubber or neoprene.

**Eye Protection:**

Use chemical safety goggles (dust proof).

**Skin Protection:**

For brief contact, few precautions other than clean clothing are needed. Full body clothing impervious to this material should be used during prolonged exposure.

**Other:**

Safety shower and eyewash stations should be present. Consultation with an industrial hygienist or safety manager for the selection of PPE suitable for working conditions is suggested.

**Industrial Hygiene:**

Avoid contact with skin and eyes.

**Protection Against Fire & Explosion:**

NA

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**Section 7 – Hazards Identification**

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**Emergency Overview:**

Oxidizer – Contact with combustibles may cause a fire. This material decomposes and releases oxygen in a fire. The additional oxygen may intensify the fire.

**Potential Health Effects:**

Irritating to the mucous membrane and eyes. If the product splashes in ones face and eyes, treat the eyes first. Do not dry soiled clothing close to an open flame or heat source. Any

## Regenesis - ORC Advanced MSDS

clothing that has been contaminated with this product should be submerged in water prior to drying.

- Inhalation:** High concentrations may cause slight nose and throat irritation with a cough. There is risk of sore throat and nose bleeds if one is exposed to this material for an extended period of time.
- Eye Contact:** Severe eye irritation with watering and redness. There is also the risk of serious and/or permanent eye lesions.
- Skin Contact:** Irritation may occur if one is exposed to this material for extended periods.
- Ingestion:** Irritation of the mouth and throat with nausea and vomiting.

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### Section 8 – Measures in Case of Accidents and Fire

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- After Spillage/Leakage/Gas Leakage:** Collect in suitable containers. Wash remainder with copious quantities of water.
- Extinguishing Media:** See next.
- Suitable:** Large quantities of water or water spray. In case of fire in close proximity, all means of extinguishing are acceptable.
- Further Information:** Self contained breathing apparatus or approved gas mask should be worn due to small particle size. Use extinguishing media appropriate for surrounding fire. Apply cooling water to sides of transport or storage vessels that are exposed to flames until the fire is extinguished. Do not approach hot vessels that contain this product.
- First Aid:** After contact with skin, wash immediately with plenty of water and soap. In case of contact with eyes, rinse immediately with plenty of water and seek medical attention. Consult an ophthalmologist in all cases.

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### Section 8 – Measures in Case of Accidents and Fire

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- Eye Contact:** Flush eyes with running water for 15 minutes, while keeping the eyelids wide open. Consult with an ophthalmologist in all cases.
- Inhalation:** Remove subject from dusty environment. Consult with a physician in case of respiratory symptoms.

## Regenesis - ORC Advanced MSDS

<b>Ingestion:</b>	If the victim is conscious, rinse mouth and administer fresh water. DO NOT induce vomiting. Consult a physician in all cases.
<b>Skin Contact:</b>	Wash affected skin with running water. Remove and clean clothing. Consult with a physician in case of persistent pain or redness.
<b>Special Precautions:</b>	Evacuate all non-essential personnel. Intervention should only be done by capable personnel that are trained and aware of the hazards associated with this product. When it is safe, unaffected product should be moved to safe area.
<b>Specific Hazards:</b>	<u>Oxidizing substance.</u> Oxygen released on exothermic decomposition may support combustion. Confined spaces and/or containers may be subject to increased pressure. If product comes into contact with flammables, fire or explosion may occur.

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### Section 9 – Accidental Release Measures

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<b>Precautions:</b>	Observe the protection methods cited in Section 3. Avoid materials and products that are incompatible with product. Immediately notify the appropriate authorities in case of reportable discharge (> 100 lbs).
<b>Cleanup Methods:</b>	Collect the product with a suitable means of avoiding dust formation. All receiving equipment should be clean, vented, dry, labeled and made of material that this product is compatible with. Because of the contamination risk, the collected material should be kept in a safe isolated place. Use large quantities of water to clean the impacted area. See Section 12 for disposal methods.

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### Section 10 – Information on Toxicology

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#### Toxicity Data

<b>Acute Toxicity:</b>	Oral Route, LD <sub>50</sub> , rat, > 2,000 mg/kg (powder 50%) Dermal Route, LD <sub>50</sub> , rat, > 2,000 mg/kg (powder 50%) Inhalation, LD <sub>50</sub> , rat, > 5,000 mg/m <sup>3</sup> (powder 35%)
<b>Irritation:</b>	Rabbit (eyes), severe irritant

## Regenesis - ORC Advanced MSDS

<b>Sensitization:</b>	No data
<b>Chronic Toxicity:</b>	In vitro, no mutagenic effect (Powder 50%)
<b>Target Effects:</b>	<b>Organ</b> Eyes and respiratory passages.

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### Section 11 – Information on Ecology

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#### Ecology Data

	10 mg Ca(OH) <sub>2</sub> /L: pH = 9.0
	100 mg Ca(OH) <sub>2</sub> /L: pH = 10.6
<b>Acute Exotoxicity:</b>	Fishes, Cyprinus carpio, LC <sub>50</sub> , 48 hrs, 160 mg/L Crustaceans, Daphnia sp., EC <sub>50</sub> , 24 hours, 25.6 mg/L (Powder 16%)
<b>Mobility:</b>	Low Solubility and Mobility  Water – Slow Hydrolysis. Degradation Products: Calcium Hydroxide
<b>Abiotic Degradation:</b>	Water/soil – complexation/precipitation. Carbonates/sulfates present at environmental concentrations. Degradation products: carbonates/sulfates sparingly soluble
<b>Biotic Degradation:</b>	NA (inorganic compound)
<b>Potential for Bioaccumulation:</b>	NA (ionizable inorganic compound)

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### Section 11 – Information on Ecology (cont)

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	Observed effects are related to alkaline properties of the product. Hazard for the environment is limited due to the product properties of:
<b>Comments:</b>	<ul style="list-style-type: none"><li>• No bioaccumulation</li><li>• Weak solubility and precipitation as carbonate or sulfate in an aquatic environment.</li></ul> Diluted product is rapidly neutralized at environmental pH.
<b>Further Information:</b>	NA

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**Section 12 – Disposal Considerations**

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**Waste Disposal Method:** Consult current federal, state and local regulations regarding the proper disposal of this material and its emptied containers.

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**Section 13 – Shipping/Transport Information**

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**D.O.T Name:** **Shipping** Oxidizing Solid, N.O.S [A mixture of Calcium OxyHydroxide [CaO(OH)<sub>2</sub>] and Calcium Hydroxide [Ca(OH)<sub>2</sub>].

**UN Number:** 1479

**Hazard Class:** 5.1

**Label(s):** 5.1 (Oxidizer)

**Packaging Group:** II

**STCC Number:** 4918717

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**Section 14 – Other Information**

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**HMIS<sup>®</sup> Rating** Health – 2 Reactivity – 1  
Flammability – 0 PPE - Required

HMIS<sup>®</sup> is a registered trademark of the National Painting and Coating Association.

**NFPA<sup>®</sup> Rating** Health – 2 Reactivity – 1  
Flammability – 0 OX

NFPA<sup>®</sup> is a registered trademark of the National Fire Protection Association.

**Reason for Issue:** Update toxicological and ecological data

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**Section 15 – Further Information**

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