California Regional Water Quality Control Board
Central Valley Region
Katherine Hart, Chair

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Matthew Rodriquez
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22 November 2011

Arron Rambach, P.E.
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Environmental Engineering Office - South
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***NOTICE OF APPLICABILITY OF GENERAL ORDER NO. R5-2008-0149* – State of California – California Department of Transportation, Caltrans Headquarters Equipment Shop, 34th Street and Stockton Boulevard (3400 R Street), Sacramento, In-Situ Remediation of Petroleum Hydrocarbons, Sacramento County**

The State of California – California Department of Transportation (Caltrans) (Responsible Party) submitted a Notice of Intent (NOI), dated 2 August 2011 requesting coverage under General Order No. R5-2008-0149, General Waste Discharge Requirements for In-situ Groundwater Remediation at Sites with Volatile Organic Compounds, Nitrogen Compounds, Perchlorate, Pesticides, Semi-Volatile Compounds and/or Petroleum Compounds (General Order). The application fee was submitted on 18 August 2011, and supplemental information was submitted on 15 September 2011. Based on information in the submittals, it is our determination that this project meets the required conditions to operate under Order No. R5-2008-0149. All of the requirements contained in the General Order are applicable to your project. You are assigned Order No. R5-2008-0149-034.

Project Location:
The project is in the City of Sacramento in Sacramento County Assessor's Parcel No. 010-0071-027-0000.

Project Description:
Former operations of an underground tanks system at the Caltrans Headquarters Equipment Shop in Sacramento, in Sacramento County (site) caused pollution of the soil and groundwater. The primary pollutants of concern are petroleum hydrocarbon compounds, including total petroleum hydrocarbons as gasoline (TPH-G), total petroleum hydrocarbons as diesel (TPH-D), benzene, toluene, ethylbenzene, and total xylenes (BTEX). The site is currently occupied by the Caltrans Headquarters Equipment Shop and is used for fabricating, servicing, and repairing mobile equipment and vehicles for Caltrans operations. Multiple remedial technologies have been implemented at this site including soil vapor extraction and air sparging. The former remedial systems removed more than 15,850 pounds (~2,550 gallons) of petroleum hydrocarbons, but were shut-down in June 2010 due to diminishing effectiveness despite attempts at optimization. Significant concentrations of dissolved phase petroleum hydrocarbons remain within the source area.

Bench scale testing was conducted to determine if injection of a surfactant (Ivey-Sol™) and an oxidant could be effectively applied to the subsurface to destroy hydrocarbons without causing deleterious effects (i.e. metals mobilization or excessive increases in concentrations of salts). Bench scale testing called for analysis of two oxidants (alkaline-activated sodium persulfate and I-ROX). I-ROX was proposed as a non-salt containing alternative. Prior to bench scale testing, I-ROX testing was removed from the scope of work due to cost and because it is a new product that has not been fully established to mitigate petroleum hydrocarbons. Central Valley Water Board staff agreed with this change in scope of work prior to bench scale testing.

Results of bench scale testing showed that TPH-G, TPH-D and BTEX could be degraded by sodium persulfate. False positive detections of TPH-D were observed when Ivey-Sol™ (surfactant) was analyzed during bench scale testing. False positives during pilot testing would reduce the ability to measure the effectiveness of the sodium persulfate at destroying hydrocarbons during the pilot study. Therefore, in-situ surfactant flushing will not be implemented during this pilot study. Pilot testing will consist only of injection of sodium persulfate.

For this project, the Discharger submitted the following documents:

- *Alternative Remedial Options Work Plan* dated 20 August 2010.
- *Bench Test Scope of Work* dated 21 December 2010.
- *Groundwater Monitoring Report, Fourth Quarter 2010 and First Quarter 2011* dated 15 June 2011.
- *Notice of Intent* (NOI) dated 2 August 2011.
- Supplemental NOI information dated 13 September 2011 and 15 September 2011.

The NOI and Work Plan call for injection of sodium persulfate into the groundwater at four locations during one injection event. The sodium persulfate will be injected in 1-foot depth intervals from approximately 25 to 35 feet below ground surface. Up to a 20 percent concentration by weight of sodium persulfate solution will be injected into four direct push injection points, resulting in a 2 percent sodium persulfate concentration in the groundwater as follows:

- For each 1-foot injection interval within the vadose zone, approximately 396 gallons of an 8.0 percent by weight sodium persulfate solution will be injected.

- For each 1 foot injection interval within the saturated zone, approximately 159 gallons of a 20 percent by weight solution of sodium persulfate solution will be injected.

The total estimated amount of solution will vary depending on depth to water at the time of the injection event. It is estimated that approximately 8,256 gallons of water will be injected with the sodium persulfate into the subsurface.

The injection rate of the sodium persulfate will be gradually increased by slowly increasing pressure. Injection pressures are estimated to be less than 50 pounds per square inch (psi), and will not exceed 150 psi. Estimated injection rates are 1 to 5 gallons per minute.

There are 20 monitor wells associated with this site. The Monitoring and Reporting Program incorporated with this permit requires sampling of 9 of the 20 wells; monitoring and reporting of remaining site wells is under the direction of the lead regulatory agency, the Sacramento County Environmental Management Department. No additional groundwater monitoring wells are needed or anticipated at this time. Caltrans will be responsible for conducting groundwater sampling, and reporting of the results as described in the attached Monitoring and Reporting Program.

A contingency plan to address any unforeseen negative impacts is as follows:

1. The following wells are classified as compliance wells: MW-9, MW-10, MW-11, and MW-15. Wells MW-3 and MW-5 are classified as transition wells. Wells MW-3, MW-5, MW-6, and/or MW-11 will be utilized as groundwater extraction wells, if deleterious by-products above action levels are observed in compliance wells.

2. For the purposes of this contingency plan, an impact to water quality is defined as one of the constituents exceeding an action level. Background concentrations and action levels will be established by **20 November 2011**.

   If water quality concentrations exceed action levels in compliance wells, the well will be sampled during the next quarterly monitoring event and if concentrations still exceed action levels, groundwater extraction will be initiated as outlined below. Groundwater extraction will continue until concentrations in compliance wells reduce to less than action levels.

3. Groundwater extraction scenarios are dependent on which compliance well(s) exceed action levels and are as follows:

   a. If action levels are exceeded in cross-gradient well MW-15, groundwater extraction will be conducted at treatment area well MW-6 and/or transition well MW-5 until the concentrations in well MW-15 reduce to below action levels.

   b. If action levels are exceeded in down-gradient well MW-10, groundwater extraction will be conducted at transition zone well(s) MW-3 and/or MW-5 until concentrations reduce to below action levels.

   c. If action levels are exceeded in down-gradient well MW-9 or MW-11, groundwater extraction will be conducted at transition zone well MW-5 until concentrations reduce to below action levels.

4. Extraction wells may be modified based on field conditions and observations. The intent of groundwater extraction is to prevent off-site migration of impacted groundwater.

If the Responsible Party desires to modify the injectants and/or volume of injectants, a revised Notice of Intent must be submitted and a new Notice of Applicability issued prior to proceeding with the additional/modified injection.

The scope of work for this project is covered by the CEQA documentation for the General Order. Additional CEQA activities are not needed.

No comments were received on the draft Notice of Applicability and Monitoring and Reporting Program during the 30-day public comment period ending 20 November 2011.

General Information:

1. The project will be operated in accordance with the requirements contained in the General Order and in accordance with the information submitted in the Notice of Intent.

2. The required annual fee (as specified in the annual billing you will receive from the State Water Resources Control Board) shall be submitted until this Notice of Applicability is officially revoked.

3. The Responsible Party shall comply with the attached General Order No. R5-2008-0149, General Waste Discharge Requirements for In-situ Groundwater Remediation at Sites with Volatile Organic Compounds, Nitrogen Compounds, Perchlorate, Pesticides, Semi-Volatile Compounds and/or Petroleum Compounds.

4. Injection of materials other than sodium persulfate, into the subsurface is prohibited, unless analysis, as specified in Order No. R5-2008-0149, of the injectant is provided and approval is given by Board staff.

5. Failure to abide by the conditions of the General Order could result in an enforcement action as authorized by provisions of the California Water Code.

6. The Responsible Party will implement the final contingency plan, included as part of the Notice of Intent, within 30-days of it being triggered.

7. The Responsible Party shall comply with the attached Monitoring and Reporting Program, Order No. R5-2008-0149-034, and any revisions thereto as ordered by the Executive Officer.

If you have any questions regarding this matter, please call Vera Fischer at (916) 464-4792 or contact her at vfischer@waterboards.ca.gov.

original signed by Frederick J. Moss for

PAMELA C. CREEDON
Executive Officer

Attachment: General Order No. R5-2008-0149
Monitoring and Reporting Program No. R5-2008-0149-034

cc: Della Kramer, Regional Water Quality Control Board, Sacramento
Sue Erikson, Sacramento County Environmental Management, Sacramento
Heather Balfour, ERM-West, Inc., Sacramento
Craig Sanchez, ERM-West, Inc., Sacramento
Savarino Trust, Sacramento
Nathan Casebeer, Regional Water Quality Control Board, Sacramento

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. R5-2008-0149-034

FOR
IN-SITU GROUNDWATER REMEDIATION AT SITES WITH VOLATILE ORGANIC COMPOUNDS, NITROGEN COMPOUNDS, PERCHLORATE, PESTICIDES, SEMI-VOLATILE COMPOUNDS AND/OR PETROLEUM HYDROCARBONS

CALTRANS HEADQUARTERS EQUIPMENT SHOP
3400 R STREET, SACRAMENTO
SACRAMENTO COUNTY

This Monitoring and Reporting Program (MRP) describes requirements for monitoring a groundwater extraction and/or treatment system. This MRP is issued pursuant to Water Code Section 13267. The Discharger shall not implement any changes to this MRP unless and until a revised MRP is issued by the Executive Officer. As appropriate, Regional Board staff shall approve specific sample station locations prior to implementation of sampling activities.

All samples should be representative of the volume and nature of the discharge or matrix of material sampled. The time, date, and location of each sample shall be recorded on the sample chain of custody form.

GROUNDWATER MONITORING

1. As shown on Figure 1, there are 20 monitor wells associated with the site. This MRP requires sampling of 9 of the 20 wells; monitoring and reporting of remaining site wells is under the direction of the lead regulatory agency, the Sacramento County Environmental Management Department. The groundwater monitoring program for the wells shown in Table 1 and any treatment system wells installed subsequent to the issuance of this MRP, shall follow the schedule below. Monitoring wells with free phase petroleum product or visible sheen shall be monitored, at a minimum, for product thickness and depth to water. The volume of extracted groundwater, if applicable, shall also be provided in semi-annual monitoring reports. Sample collection and analysis shall follow standard EPA protocol.

2. The monitor wells, extraction wells and/or injection wells shall be sampled according to the schedule in Table 1 and the samples analyzed by the methods in Table 2, as follows:

Table 1: Sampling Frequency and Constituent Suite

Well Number[1]	Frequency	Constituent Suite(s)[2]	Monitoring Objective
MW-9 MW-10[3] MW-11[3] MW-15	Once within 6 months of treatment. Annually thereafter.	Suite A, Suite B	Compliance[4]

Table 1: Sampling Frequency and Constituent Suite (cont.)

Well Number[1]	Frequency	Constituent Suite(s)[2]	Monitoring Objective
MW-2 MW-4 MW-6	4 Weeks Post Injection Event	Suite A, Suite B	Treatment Zone[6]
	Quarterly[5]	Suite A, Suite B	
	Semi-Annually	Suite A, Suite B	
MW-3 MW-5	4 Weeks Post Injection Event	Suite A, Suite B	Transition Zone[7]
	Quarterly[5]	Suite A, Suite B	
	Semi-Annually[8]	Suite A, Suite B	

[1] Well numbers as shown on Figure 1.
[2] Constituent suite components listed in Table 2.
[3] Well MW-10 will only be sampled if changes in water quality parameters are detected in up-gradient transition zone well MW-3. Well MW-11 will only be sampled if changes in water quality parameters are detected in up-gradient transition zone well MW-5.
[4] Wells used to determine compliance with groundwater action levels.
[5] Quarterly sampling of wells for the first 2 quarters post injection, thereafter semi-annual sampling.
[6] Wells sampled to evaluate remedy effectiveness inside the treatment zone.
[7] Wells sampled to evaluate reduction of pollutants and by-products within the transition zone.
[8] Well MW-3 will be sampled annually unless changes in water quality parameters are observed; then well MW-3 shall be sampled semi-annually.

Table 2: Analytical Methods

Constituent	Method [1]	Maximum Practical Quantitation Limit (ug/L) [2]
Suite A		
TPH-Gasoline	EPA 8260B or 8015	50
TPH-Diesel	EPA 8260B or 8015	50
BTEX[3]	EPA 8260	0.5
Suite B		
Metals, Dissolved[4]	EPA 6010 or 6020	Various
Hexavalent Chromium	EPA 7199	1.0
Total Dissolved Solids	EPA 160.1	10,000
Sulfate[4]	EPA 375.2 or 375.4 or 300.0	250,000
Sodium	EPA 6010 or 6020	1,000

[1] Or an equivalent EPA Method that achieves the same or lower Practical Quantitation Limit.
[2] All concentrations between the Method Detection Limit and the Practical Quantitation Limit shall be reported as trace.
[3] BTEX = benzene, toluene, ethylbenzene, and total xylenes
[4] Metals include: Barium, Cadmium, Calcium, total Chromium, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Silica, Sodium, Vanadium, and Zinc.
[5] 250,000 ug/l maximum practical quantitation limit based on Water Quality Objective.

FIELD SAMPLING

3. In addition to the above sampling and analysis, field sampling and analysis shall be conducted each time a monitoring well or injection well is sampled. The sampling and analysis of field parameters shall be as specified in Table 3.

Table 3: Field Sampling Requirements

Parameters	Units	Type of Sample
Groundwater Elevation	Feet, Mean Sea Level	Measurement +/-0.01 ft.
Oxidation-Reduction Potential	Millivolts	Grab
Electrical Conductivity	uhmos/cm	Grab
Dissolved Oxygen	mg/L	Grab
pH	pH Units (to 0.1 units)	Grab

4. Field test instruments (such as those used to test pH and dissolved oxygen) may be used provided that:
   (a) The operator is trained in proper use and maintenance of the instruments;
   (b) The instruments are calibrated prior to each monitoring event;
   (c) Instruments are serviced and/or calibrated by the manufacturer at the recommended frequency; and
   (d) Field calibration reports are submitted as described in item (b) of the "Reporting" section of this MRP.

DISCHARGE MONITORING

5. The Discharger shall monitor during the injection event the discharge of water and amendments that are injected into the groundwater according to the requirements specified in Table 4. Each amendment addition shall be recorded individually, along with information regarding the time period over which the amendment was injected into the subsurface.

Table 4: Discharge Monitoring Requirements

Parameters	Units	Type of Sample
Injected Volume	Pounds of oxidant per gallon of water per day	Measured

ESTABLISHMENT OF BACKGROUND CONCENTRATION VALUES

The Discharger shall establish baseline concentrations for the constituents listed on Table 2 (see above) by **20 November 2011**.

REPORTING

6. When reporting the data, the Responsible Party shall arrange the information in tabular form so that the date, the constituents, and the concentrations are readily discernible. The data shall be summarized in such a manner as to illustrate clearly the compliance with this Order. In addition, the Responsible Party shall notify the Regional Board within 48 hours of any changes in scheduled injection and/or monitoring events. The results of any monitoring done more frequently than required at the locations specified in the Monitoring and Reporting Program shall also be reported to the Regional Board.

7. As required by the California Business and Professions Code Sections 6735, 7835, and 7835.1, all reports shall be prepared by a registered professional or their subordinate and signed by the registered professional.

8. The Discharger shall submit semi-annual electronic data reports, which conform to the requirements of the California Code of Regulations, Title 23, Division 3, Chapter 30. The semi-annual reports shall be submitted electronically over the internet to the Geotracker database system by the **1st day of the second month following the end of each half of the year (i.e., by 1 February and 1 August**) until such time as the Executive Officer determines that the reports are no longer necessary.

9. Hard copies of semi-annual reports shall be submitted to the Regional Board by the **1st day of the second month following the end of each half of the year (by 1 February and 1 August**). Each semi-annual report shall include the following minimum information:

   (a) a description and discussion of the groundwater sampling event and results, including trends in the concentrations of pollutants and groundwater elevations in the wells, how and when samples were collected, and whether the pollutant plume(s) is delineated;

   (b) field logs that contain, at a minimum, water quality parameters measured before, during, and after purging, method of purging, depth of water, volume of water purged, etc.;

   (c) groundwater contour maps for all groundwater zones, if applicable;

   (d) pollutant concentration maps for all groundwater zones, if applicable;

   (e) a table showing well construction details such as well number, groundwater zone being monitored, coordinates (longitude and latitude), ground surface elevation, reference elevation, elevation of screen, elevation of bentonite, elevation of filter pack, and elevation of well bottom;

   (f) a table showing historical lateral and vertical (if applicable) flow directions and gradients;

   (g) cumulative data tables containing the water quality analytical results and depth to groundwater;

(h) a copy of the laboratory analytical data report, which may be submitted in an electronic format;

(i) the status of any ongoing remediation, including an estimate of the cumulative mass of pollutant removed from the subsurface, system operating time, the effectiveness of the remediation system, and any field notes pertaining to the operation and maintenance of the system; and

(j) if applicable, the reasons for and duration of all interruptions in the operation of any remediation system, and actions planned or taken to correct and prevent interruptions.

10. An Annual Report shall be submitted to the Regional Board by **1 February** of each year. This report shall contain an evaluation of the effectiveness and progress of the investigation and remediation, and may be substituted for the second semi-annual monitoring report. The Annual Report shall contain the following minimum information:

(a) both tabular and graphical summaries of all data obtained during the year;

(b) groundwater contour maps and pollutant concentration maps containing all data obtained during the previous year;

(c) a discussion of the long-term trends in the concentrations of the pollutants in the groundwater monitoring wells;

(d) an analysis of whether the pollutant plume is being effectively treated;

(e) a description of all remedial activities conducted during the year, an analysis of their effectiveness in removing the pollutants, and plans to improve remediation system effectiveness;

(f) an identification of any data gaps and potential deficiencies/redundancies in the monitoring system or reporting program; and

(g) if desired, a proposal and rationale for any revisions to the groundwater sampling plan frequency and/or list of analytes.

11. A letter transmitting the monitoring reports shall accompany each report. Such a letter shall include a discussion of requirement violations found during the reporting period, and actions taken or planned for correcting noted violations, such as operation or facility modifications. If the Discharger has previously submitted a report describing corrective actions and/or a time schedule for implementing the corrective actions, reference to the previous correspondence will be satisfactory. The transmittal letter shall contain the penalty of perjury statement by the Discharger, or the Discharger's authorized agent, as described in the Standard Provisions General Reporting Requirements Section B.3.

The Discharger shall implement the above monitoring program on the first day of the month following adoption of this Order.

Ordered by: *original signed by Frederick J. Moss*
PAMELA C. CREEDON, Executive Officer

18 November 2011
(Date)

CAD File:	Drawn By:	Date:	Project No.
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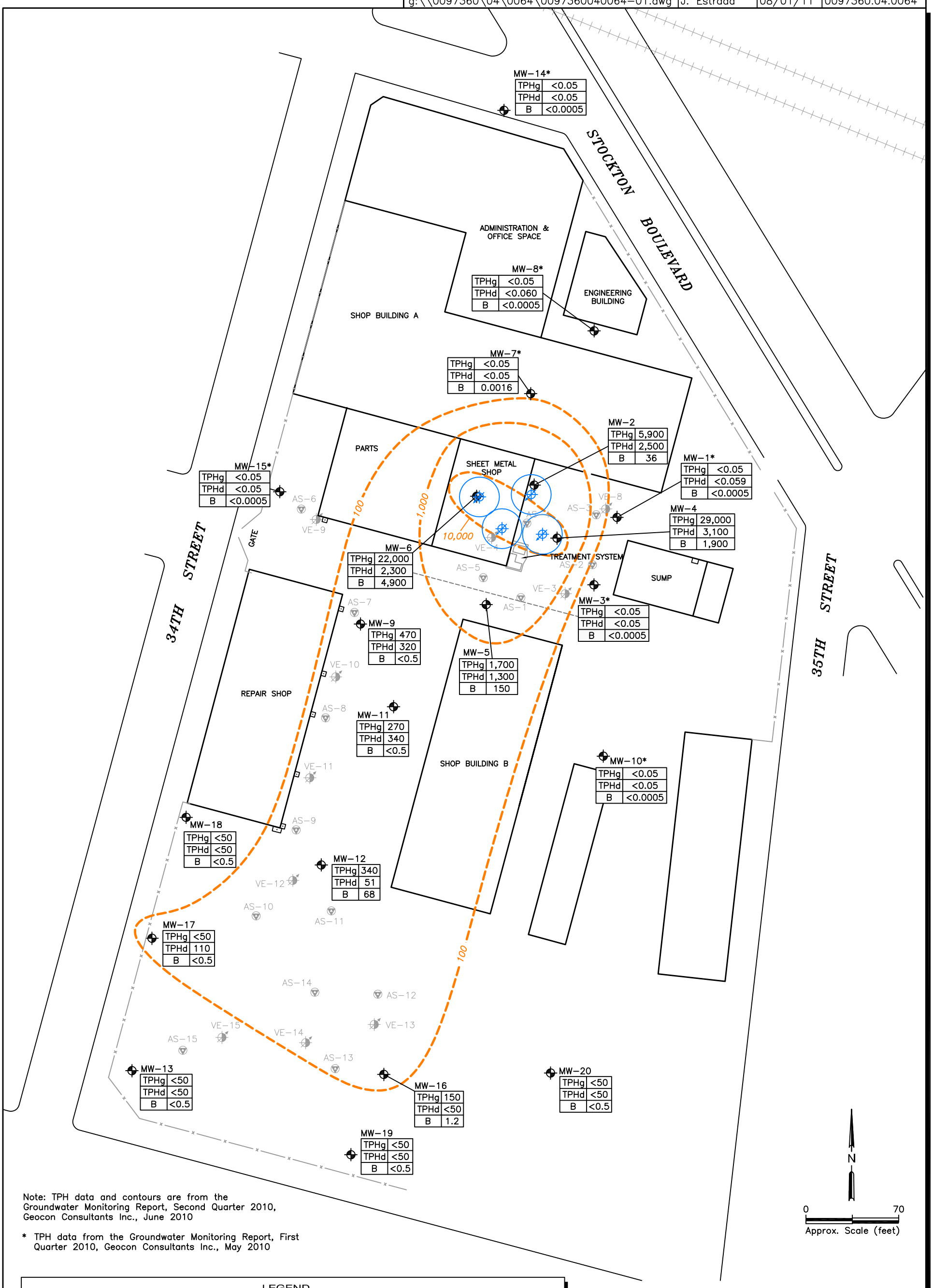

Note: TPH data and contours are from the Groundwater Monitoring Report, Second Quarter 2010, Geocon Consultants Inc., June 2010

* TPH data from the Groundwater Monitoring Report, First Quarter 2010, Geocon Consultants Inc., May 2010

LEGEND

- Proposed Injection Point
- Air Sparge Well
- Monitoring Well
- Vapor Extraction Well
- Fence
- Railroad Track
- Radius of Influence (15 ft.)

TPHg – Total Peetroleum Hydrocarbons as Gasoline
TPH – Total Peetroleum Hydrocarbons as Diesel
B – Benzene
NS – Not Sampled

TPHg 150
TPHd <50
B 1.2

Concentration in Groundwater (µg/L), May 2010

100 — Total Petroleum Hydrocarbons Concentration as TPHg or TPHd Contour in Groundwater (µg/L)

Figure 3

Proposed Injection Points
Caltrans HQ Equipment Shop
34th Street & Stockton Boulevard
Sacramento, California

ERM 08/11