



# **PERIODIC REVIEW REPORT FINAL**

**D-Street Petroleum  
Facility Site ID#: 1207**

**3<sup>rd</sup> to 7<sup>th</sup> and D Street  
Tacoma, Washington 98421**

**Southwest Region Office**

**TOXICS CLEANUP PROGRAM**

**July 2014**

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## 1.0 INTRODUCTION

This document is a review by the Washington State Department of Ecology (Ecology) of post-cleanup conditions and monitoring data to ensure that human health and the environment are being protected at the D Street Petroleum site (Site). Cleanup at this Site was implemented under the Model Toxics Control Act (MTCA) regulations, Chapter 173-340 Washington Administrative Code (WAC).

Cleanup activities at this Site are being conducted under a Consent Decree (CD) entered into with Ecology in 1991. The cleanup actions have resulted in concentrations of petroleum hydrocarbons remaining at the Site in soil and groundwater that exceed MTCA Method A and/or other applicable State and/or Federal cleanup levels. The MTCA Method A cleanup levels for soil were established under WAC 173-340-740(2). The groundwater cleanup levels were established based on the protection of surface water under WAC 173-201 and/or the United States Environmental Protection Agency (USEPA) Water Quality Criteria. WAC 173-340-420 (2) requires that Ecology conduct a periodic review of a site every five years under the following conditions:

- (a) Whenever the department conducts a cleanup action.
- (b) Whenever the department approves a cleanup action under an order, agreed order or consent decree.
- (c) Or, as resources permit, whenever the department issues a no further action (NFA) opinion.
- (d) And one of the following conditions exists:
  - 1. Institutional controls or financial assurance are required as part of the cleanup.
  - 2. Where the cleanup level is based on a practical quantitation limit.
  - 3. Where, in the department's judgment, modifications to the default equations or assumptions using site-specific information would significantly increase the concentration of hazardous substances remaining at the site after cleanup or the uncertainty in the ecological evaluation or the reliability of the cleanup action is such that additional review is necessary to assure long-term protection of human health and the environment.

When evaluating whether human health and the environment are being protected, the factors the department shall consider include [WAC 173-340-420(4)]:

- (a) The effectiveness of ongoing or completed cleanup actions, including the effectiveness of engineered controls and institutional controls in limiting exposure to hazardous substances remaining at the Site.
- (b) New scientific information for individual hazardous substances of mixtures present at the Site.
- (c) New applicable state and federal laws for hazardous substances present at the Site.
- (d) Current and projected Site use.
- (e) Availability and practicability of higher preference technologies.

- (f) The availability of improved analytical techniques to evaluate compliance with cleanup levels.

The department shall publish a notice of all periodic reviews in the Site Register and provide an opportunity for public comment.

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## **2.0 SUMMARY OF SITE CONDITIONS**

### **2.1 Site History**

The D Street Petroleum property is located in the City of Tacoma in Pierce County, Washington (Vicinity Map - Appendix 6.1). Mobil Oil (Mobil), Shell Oil (Shell) and Union Oil Company of California (Unocal) entered into a CD No. 91-2-2012-1 with Ecology in 1991. Continuing remedial activities [monitored natural attenuation (MNA)] and long term groundwater monitoring are currently being conducted at the Site.

Mobil, Shell, and Unocal have operated petroleum bulk storage and distribution facilities at the Site. Globe Machinery Corporation owned and operated a manufacturing facility on the property formerly owned by Shell, located at the Site. British Petroleum (BP) purchased the Mobil property in 1989, although, Mobil agreed to assume liability for investigations and cleanup actions related to the releases occurring prior to the transfer of ownership.

The Site has been used for bulk storage of petroleum products since the 1920s. Seepage of petroleum product from the Site into the Thea Foss Waterway was observed beginning in 1971.

The Site currently includes an area used for bulk petroleum storage and distribution by Phillips 66 [formerly Exxon/Mobil, BP, Unocal/76 Products, and Tosco property], and another area used for manufacturing by Globe Machine Manufacturing (formerly Shell property). Another portion of the Site, currently owned by Targa, is inactive except for a pump station operated by Olympic Pipeline Company.

### **2.2 Site Investigations and Remedial Activities**

In the early 1970s, Mobil installed an interceptor drain along its property boundary adjacent to the waterway. Approximately 5,000 gallons of product were pumped from the drain during the first year of operation. In 1988, Mobil, Shell, and Unocal entered into Order on Consent No. 88-S345 with Ecology to conduct additional remedial actions at the Site. Phase I of the Order consisted of free product recovery from groundwater, a Site Assessment, and an evaluation of remedial solutions. Between 1971 and 1988, the property owners made several efforts to rectify the problem of contamination at the Site, including:

- Deployment of retaining booms in the Thea Foss Waterway in front of the property owned by Shell and Unocal.
- Removal of petroleum product from groundwater by pumping from extraction wells at Unocal, Mobil, and Shell.
- Removal of petroleum product from two product removal trenches installed on the Site parallel with and adjacent to the Thea Foss Waterway shoreline.
- Installation of a network of approximately 78 monitoring wells on the Site.

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Free petroleum product remained floating on groundwater in 1988. Groundwater sampling results indicated the presence of petroleum constituents dissolved in the groundwater, including benzene, toluene, ethylbenzene, xylenes (BTEX), polynuclear aromatic hydrocarbons (PAHs), and lead. The approximate extent of floating product and groundwater investigation results are available as Appendix 6.3.

Geologic logs of monitoring wells indicated that an “Upper Sand Unit” water table zone present at the Site was separated from a “Lower Sand Unit” water table zone by an aquitard. Water level measurements indicated that groundwater in the Upper Sand Unit beneath the Site flows toward the Thea Foss Waterway but is also very flat with little appreciable hydraulic gradient in the interior of the Site.

A Remedial Investigation report was prepared in late 1989 and early 1990. The results of soil sample showed a maximum BTEX and TPH concentrations of 130 milligram per kilogram (mg/Kg), 620 mg/Kg, 350 mg/Kg 1,700 mg/Kg and 29,000 mg/Kg respectively. Low levels of metals were detected in soil samples. Complete soil sample results are available as Appendix 6.4.

The extent of free product was determined to be predominately between D Street and the Thea Foss Waterway. A dissolved benzene plume was present in the Upper Sand Unit in this area; the plume also extended along East 7<sup>th</sup> Street toward East F Street. In 1991, Mobil, Shell and Unocal entered into a CD to complete remedial efforts at the Site. The CD included a Final Cleanup Action Plan (CAP). The CAP contained remedial actions that included the following:

- The treatment system was expanded. This includes free product recovery, groundwater extraction, and soil vapor extraction.
- Groundwater continued to be monitored for fluctuations in the free product lens and migration between the Upper and Lower Sand Units.
- Treated water was discharged into the Thea Foss Waterway under a National Pollutant Discharge Elimination System (NPDES) permit.
- A horizontal barrier (cap) was constructed in areas where needed to reduce infiltration of surface runoff into contaminated soils and to reduce the potential for short circuiting of the soil vapor extraction system.
- Soil vapor concentrations, point groundwater concentrations, system influent concentrations, and system discharge rates are monitored to determine the effectiveness of the remedial action.
- Confirmation monitoring is to be performed at the points of compliance.

In September 1992, approximately 17,500 gallons of an ethanol fuel blend was released at the Site from an Aboveground Storage Tank (AST). This release occurred prior to implementation of additional remedial actions stipulated in the CD. It was estimated that the benzene content of the released ethanol blend was between 0.006% and 0.015% by volume. The release occurred in an area where free phase product had been previously observed.

## 2.3 Cleanup Levels

Cleanup levels for the Site were established in the CAP that was issued as part of the CD in 1991.

- Groundwater in the Upper Sand Unit** – Groundwater cleanup levels in this unit were based on the protection of adjacent surface water. Since it was determined that the maximum amount of groundwater present in near shore surface water was 25%, the applicable surface water cleanup levels were elevated by a factor of 4 when applying them to groundwater concentrations at the Site. The surface water cleanup levels for the state are provided in the Water Quality Standards of the State of Washington (WAC 173-201-047), or, if not listed in the Water Quality Standards, are given in the USEPA's Quality Criteria for Water, 1986 (EPA 440/5-85-001).

**Table 2-1: Groundwater Cleanup Levels**

Analyte	Surface Water Cleanup Level (mg/L)	Factor Applied to Account for 25% Dilution	Groundwater Cleanup Level (mg/L)
Benzene	0.040	4 X	0.16
Toluene	5.0	4 X	20.0
Ethylbenzene	0.430	4 X	1.7
Total Xylenes	*	.....	.....
Non-carcinogenic PAHs	0.35	4 X	1.4
Benzo(a)anthracene	0.00013	None	0.00013
Chrysene	0.0015	None	0.0015
Benzo(b)fluoranthene	0.00018	None	0.00018
Benzo(k)fluoranthene	0.00017	None	0.00017
Benzo(a)pyrene	0.0002	None	0.0002
Dibenzo(a,h)anthracene	0.0003	None	0.0003
Indeno(1,2,3-cd)pyrene	0.00043	None	0.00043
TPH (Oil & Grease)	15	None	15
Total Lead	0.006	3.67	0.022

Note:

mg/L - milligrams per liter

\* Not applicable. Insufficient data to estimate acute or chronic criteria for aquatic life – MTCA

Method B calculation set concentration above 230 mg/L.

- **Groundwater in the Lower Sand Unit** – Groundwater cleanup levels for the Lower Sand Unit were not set in the CAP, but were expected to be the same as those for the Upper Sand Unit unless it was later determined that groundwater in the Lower Sand Unit was shown to be a potential drinking water source. In that case, different cleanup levels would be appropriate.
- **Soil** – Soil cleanup levels were based on MTCA Method A cleanup levels for Industrial soils.

**Table 2-2: Soil Cleanup Levels**

Analyte	Cleanup Level (mg/Kg)
Benzene	0.5
Toluene	40
Ethylbenzene	20
Total Xylenes	20
Non-carcinogenic PAHs	NA
Carcinogenic PAHs	20
TPH-G	100
Total Lead	1,000

Note:

mg/Kg - milligrams per kilogram

The points of compliance included the following:

- **Groundwater** – Points of compliance for the Upper Sand Unit were monitored by wells placed as close as practical to the Thea Foss Waterway, within the groundwater but inland from the area of seawater dilution, and at selected upland locations throughout the Site. The wells were placed upland of the location where groundwater is discharged to surface water. Groundwater points of compliance for the Lower Sand Unit were not assigned at the time of the CD.
- **Surface Water** – Points of compliance were monitoring wells set upland of the Site's bank riprap, as close as practicably be possible to the Thea Foss Waterway.
- **Soil** – Points of compliance were monitored by samples collected throughout the Site.



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In 2001, environmental consultants for the liable parties completed an assessment of the Lower Sand Unit. This assessment determined that the Lower Sand Unit was saline and would never be used as a source of drinking water. For these reasons, the consultants recommended that the groundwater and soil cleanup levels for the Lower Sand Unit be the same as those for the Upper Sand Unit.

## **2.4 Remedial Activities**

By November 1992, portions of the selected remedial alternative had been installed, including 25 groundwater recovery wells, three surface water monitoring wells, and several soil vapor extraction trenches. Additionally, asphalt paving was placed in several areas to minimize surface water infiltration and vapor short circuiting.

By the end of the third quarter of 1997, a total of approximately 99,900 gallons of product had been recovered from wells and recovery trenches and approximately 28,400 gallons of product had been recovered from the soil vapor extraction system. In 2006, it was estimated that the system had recovered a total of 101,800 gallons of petroleum hydrocarbons with the majority of this recovery (i.e., 100,400 gallons) occurring between 1988 and 1992.

Based on an assessment of the Lower Sand Unit conducted in 2001, it was determined that remediation of groundwater and soils in the Lower Sand Unit and the aquitard would not be required.

In the second quarter of 2003, the soil vapor extraction system was expanded to address contamination in the area of the 1992 ethanol blend release that was not being successfully remediated with the original system. This expansion consisted of the addition of groundwater and vapor extraction from seven recovery wells, vapor extraction from six existing recovery/monitoring wells in the area of the 1992 ethanol blend release, and updating of the recovery equipment.

In the third quarter of 2003, extraction from the original 25 recovery wells was discontinued, since petroleum hydrocarbon concentrations in groundwater sampled from the majority of wells within the radius of influence or downgradient of the recovery wells had not exceeded the Site cleanup levels since January of that year. Since system deactivation, petroleum hydrocarbon concentrations in groundwater in this area have remained below Site cleanup levels.

In October 2006, Ecology approved a plan by the liable parties' environmental consultant to conduct a pilot study to determine whether monitored natural attenuation (MNA) at the Site was a feasible alternative to the current operating treatment system. During this study, groundwater extraction and treatment and subsurface vapor extraction could be suspended for a three-month period and contaminant concentrations would be monitored monthly to determine whether relying solely on natural attenuation would be sufficient treatment to protect the adjacent surface water.

The recovery system was shut down in October 2006 to begin the three month MNA pilot study. The study concluded that anaerobic biodegradation of remaining petroleum contamination was likely occurring at the Site and that source control was complete. The study also concluded that MNA as a corrective measure would be protective of human health and the environment. This study indicated that it was expected that groundwater cleanup levels would be reached in all wells by March 2012, with the exception of well RW-5R. After the system was shut down in October 2006, it never re-started.

## 2.5 Groundwater Monitoring

Currently, the groundwater monitoring schedule for the Site is as follows:

- **Upper Sand Unit** – Sampling of groundwater from 16 wells on a quarterly basis with sampling of an additional 5 wells on an annual basis.
- **Lower Sand Unit** – Sampling of groundwater from three wells on a quarterly basis with sampling of an additional two wells on an annual basis.
- **Surface Water** – Sampling of water from six surface water monitoring wells on a quarterly basis with sampling of one additional well on an annual basis.

On June 12 through 14, 2012, the latest reported date of quarterly monitoring, no free product was observed in any of the wells monitored. A total of 16 monitoring wells were monitored in the Upper Sand Unit, three from the Lower Sand Unit, and six surface water monitoring wells.

During this round of monitoring, the benzene and ethylbenzene concentrations exceeded their respective cleanup levels in three wells and one well respectively. TPH-G and TPH-D concentrations were detected between 0.15 mg/L and 6.0 mg/L and 0.8 mg/L and 9.2 mg/L respectively; all from the Upper Sand Unit. However, no cleanup levels have been established for these parameters at the Site. No cleanup levels were exceeded in groundwater from surface water monitoring wells, however, benzene concentration (0.15 mg/L) was exceeded its surface water cleanup level (0.04 mg/L) in one of the Lower Sand Unit monitoring well. Detailed groundwater monitoring results are available as Appendix 6.5.

The CD does not include the current groundwater cleanup levels for all the parameters presented in Table 830-1 of MTCA. However, the potentially liable persons (PLPs) are voluntarily monitoring for TPH-G, TPH-D, TPH-O (Heavy Oil) and BTEX. To date, results of none of these parameters exceeded the MTCA Method A cleanup levels in any of the surface water point of compliance wells. To meet the requirements of Table 830-1 of MTCA, the PLPs have agreed to monitor for BTEX, TPH-G, TPH-D, TPH-O, Hexane, Naphthalene and lead in sentinel and surface water compliance wells (Dominick Reale e-mail of February 24, 2014 to Craig Riley) for four quarters starting from March 2014 sampling round. Ecology will evaluate these results and make a determination whether to reopen the CD at this time to include the current TPH cleanup levels as appropriate.

## **2.6 Restrictive Covenant**

Institutional controls were not specifically included with the CD; however, the CD stipulated that a Restrictive Covenant (RC) may be required based on the Site's cleanup levels or the levels achieved after completion of the cleanup. A review of Pierce County records confirmed that a RC has not been recorded at the Site to date.

Following the completion of cleanup activities, an RC will be required for the Site if contamination remains at the Site above MTCA Method A, MTCA Method B and/or other applicable cleanup levels.

## **3.0 PERIODIC REVIEW**

### **3.1 Effectiveness of completed cleanup actions**

Based upon the site visit conducted on October 14, 2013, Site access is controlled and is restricted from the general public. The Site surface consists of asphalt, with several buildings scattered across the property. The Site is used for supporting bulk petroleum sales and distribution. Monitoring wells described on Site maps were observed to be present and intact on and around the Site. The Site use and asphalt cap continue to eliminate, direct human exposure pathways (ingestion, contact) to contaminated soils and groundwater. A photo log is available as Appendix 6.6.

The post source removal groundwater monitoring results indicated that the remediation efforts at the Site are being effective. Remedial activities have removed over a total of 100,000-gallons of petroleum product through the product removal and soil vapor extraction system at the Site. With the exception of the area near the 1992 ethanol blend release, benzene contamination at the Site has been reduced in nearly all wells to concentrations below cleanup levels in groundwater. The remaining residual contamination is being remediated under an on-going MNA. Though there are minor exceedances of benzene and ethylbenzene in the upland wells, they are not impacting the Thea Foss Water Way. As a result the implemented remedy is likely being protective of human health and the environment.

### **3.2 New scientific information for individual hazardous substances for mixtures present at the Site**

Cleanup levels at the Site were based on regulatory standards rather than calculated risk for chemicals and/or media. These standards were sufficient to be protective of Site-specific conditions.

### **3.3 New applicable state and federal laws for hazardous substances present at the Site**

#### **3.3.1 Modified Cleanup Levels**

WAC 173-340-702(12) (c) provides that,

“A release cleaned up under the cleanup levels determined in (a) or (b) of this subsection shall not be subject to further cleanup action due solely to subsequent amendments to the provision in this chapter on cleanup levels, unless the department determines, on a case-by-case basis, that the previous cleanup action is no longer sufficiently protective of human health and the environment.”

Groundwater cleanup standards at the Site are based upon surface water cleanup standards. Soil cleanup standards are based upon MTCA Method A Industrial cleanup levels. Changes to cleanup standards in both media are available in the table below:

#### Site Cleanup Levels

Compound	Original Groundwater CUL (mg/L)	Current Groundwater CUL (mg/L)
<b>Benzene</b>	0.16	0.204
<b>Toluene</b>	20	20
<b>Ethylbenzene</b>	1.7	1.7
<b>Total Xylenes</b>		
<b>Non-cPAHs</b>	1.4	9.4
<b>Benzo(a)anthracene</b>	0.00013	0.00003
<b>Chrysene</b>	0.0015	0.00002
<b>Benzo(b)fluoranthene</b>	0.00018	0.00004
<b>Benzo(k)fluoranthene</b>	0.00017	0.00003
<b>Benzo(a)pyrene</b>	0.0002	0.00002
<b>Dibenzo(a,h)anthracene</b>	0.0003	0.00003
<b>Ideno(1,2,3-cd)pyrene</b>	0.00043	0.00003
<b>TPH (Oil &amp; Grease)</b>	15	None

Changes to the cleanup standards have not resulted in the need to alter remedial actions being conducted at the Site at this time. However, as discussed in section 2.5, the PLPs will monitor for additional parameters as required by Table 830-1 of MTCA for the next four rounds of quarterly monitoring. Based on these results, Ecology will determine whether the CD needs to be reopened at this time to include the current TPH cleanup levels.

### 3.3.2 Residual Saturation

WAC 173-340-747(10) provides that,

“To ensure the soil concentrations established under one of the methods specified in subsections (4) through (9) of this section will not cause an exceedance of the groundwater cleanup level established under WAC 173-340-720, the soil concentrations must not result in the accumulation of nonaqueous phase liquid in groundwater. To determine if this criterion is met....residual saturation screening levels must be established and compared with the soil concentrations”

A residual saturation screening level of 1,000 mg/Kg has been established for weathered gasoline. It is possible that soil contamination remains at the Site above this concentration. Based on the screening level and the close proximity of soil contamination to the groundwater table, soil concentrations at the Site may not be protective of groundwater. However, groundwater monitoring at the Site has shown a continued decrease in contamination, indicating

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residual soil contamination is not contributing to groundwater contamination. This indicates that residual soil contamination does not pose a significant threat to groundwater quality.

### **3.3.3 Soil to Vapor Pathway**

WAC 173-340-740(C) (II) provides that,

“The soil to vapor pathway shall be evaluated for volatile organic compounds (VOCs) whenever soil gasoline range organics and/or other the VOC concentrations are significantly higher than a concentration derived for protection of groundwater for drinking water beneficial use under WAC 173-340-747(6) using the default assumptions, or where soil diesel concentrations are higher than 10,000 mg/Kg; WAC 173-340-740(3)(B)(iii)(C). ”

Additionally, current WAC 173-340-747(2) (b) provides that,

“To ensure that the criterion in (a) of this subsection is met, the soil concentration shall not result in the accumulation of non-aqueous phase liquid on or in groundwater. To determine if this criterion is met, one of the methodologies specified in subsection (10) of this section shall be used.”

Therefore, because soil concentrations of TPH-G may exceed the previously discussed residual saturation screening level of 1,000 mg/Kg for weathered gasoline, there is some potential for the accumulation of non-aqueous phase liquid and vapor intrusion at the Site. However, low level VOC concentrations in the groundwater and the lack of a sensitive receptor building; it is not critical that the vapor pathway be evaluated.

## **3.4 Current and projected site use**

The Site currently is used for bulk petroleum storage and distribution by Phillips 66, for manufacturing by Globe Machine Manufacturing, and as a pump station operated by Olympic Pipeline Company. Change in Site use is not likely in the near future. This use does not have a negative impact on the risk posed by hazardous substances contained at the Site.

## **3.5 Availability and practicability of higher preference technologies**

The remedy implemented at the Site has included several different remedial technologies. Monitoring of the recovery system and groundwater indicates that no measurable free product has been observed in any of the well since 2005, except for monitoring well MW-2 and well RW-24 in which 0.04-foot of product and an oil sheen were observed respectively during the Fourth-Quarter 2013 sampling event at the Site. The levels of contaminants in groundwater have been largely reduced to levels below the cleanup standards, and contamination is not reaching the Thea Foss Waterway. Currently, the recovery system is not active and ongoing remediation is being accomplished via MNA. These remedial efforts continue to be protective of human health and the environment.

### **3.6 Availability of improved analytical techniques to evaluate compliance with cleanup levels**

The analytical methods used at the time of the remedial actions were capable of detection below Site cleanup levels. The presence of improved analytical techniques would not affect decisions or recommendations made for the site.

## **4.0 CONCLUSIONS**

- The cleanup actions being conducted at the Site appear to be successfully remediating contamination at the Site. If these remedial actions are continued, the current and future conditions are likely to be protective of human health and the environment.
- Institutional Controls and a RC have not been required or recorded for the Site. These are likely to be necessary at the completion of cleanup activities.
- Soil and groundwater cleanup levels have not been met at the Site.
- Groundwater monitoring continues at the Site.
- MNA may be a viable alternative to additional active remediation at the Site.

Based on this periodic review, Ecology has determined that the implemented remedy for the source removal and on-going MNA for addressing the remaining residual contamination is and will likely be protective of human health and the environment at this time. However, to meet the current requirements of Table 830-1 of MTCA, the PLPs are analyzing for additional parameters for four consecutive quarters. Ecology will consider these results in evaluating the on-going MNA at the Site. In addition, all the groundwater results will be considered in evaluating the protectiveness of the remedy during the next periodic review. It is the property owner's responsibility to continue to inspect the Site to assure that the integrity of the asphalt cap is maintained.

### **4.1 Next Review**

The next review for the site will be scheduled five years from the date of this periodic review. In the event that additional cleanup actions or institutional controls are required, the next periodic review will be scheduled five years from the completion of those activities.



## 5.0 REFERENCES

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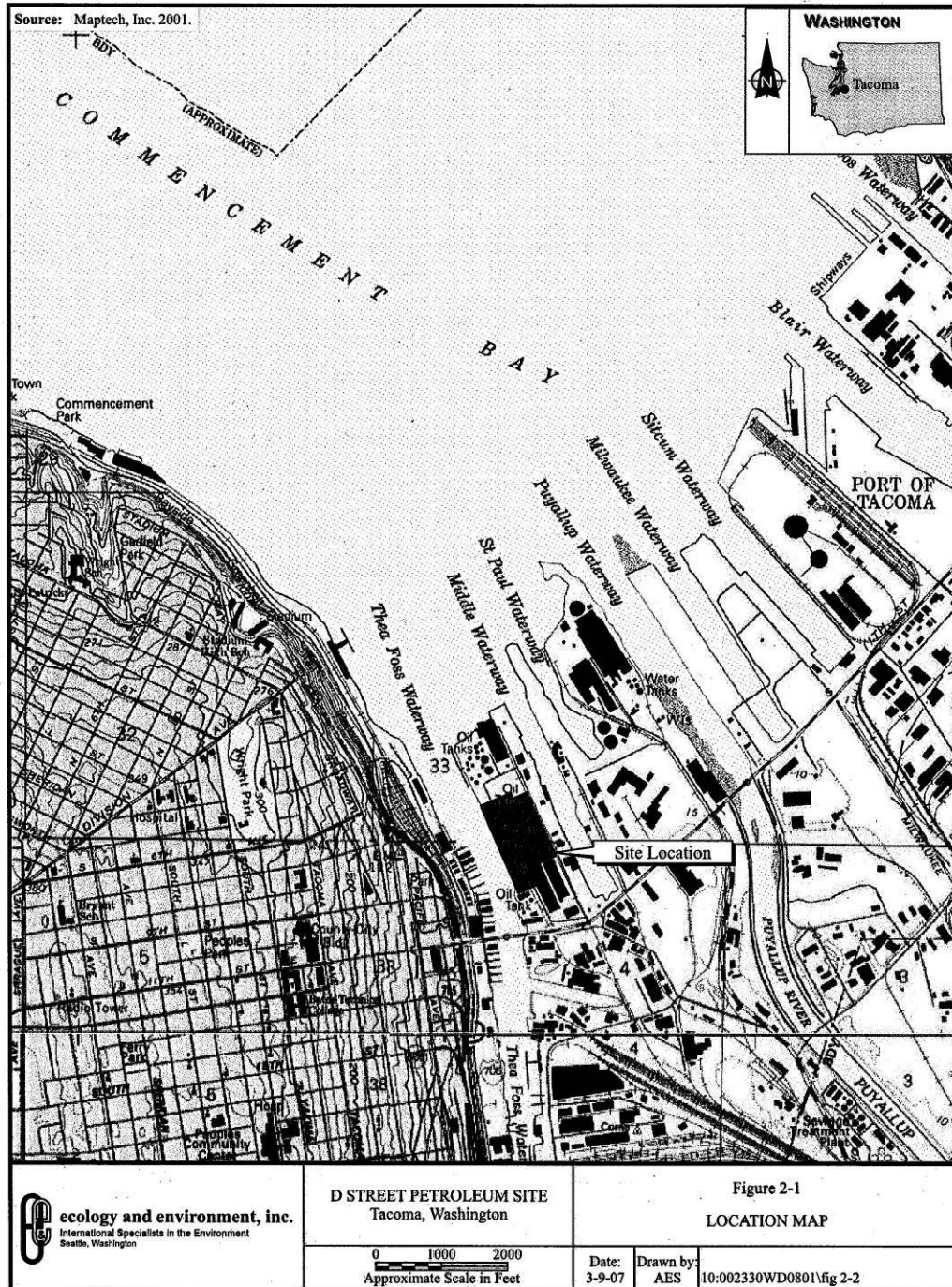
Ecology. Dominick Reale’s e-mail of February 24, 2014 to Craig Riely of URS Corporation regarding “D Street Petroleum Site Analytical Request.”

Ecology. October 14, 2013 Site Visit.

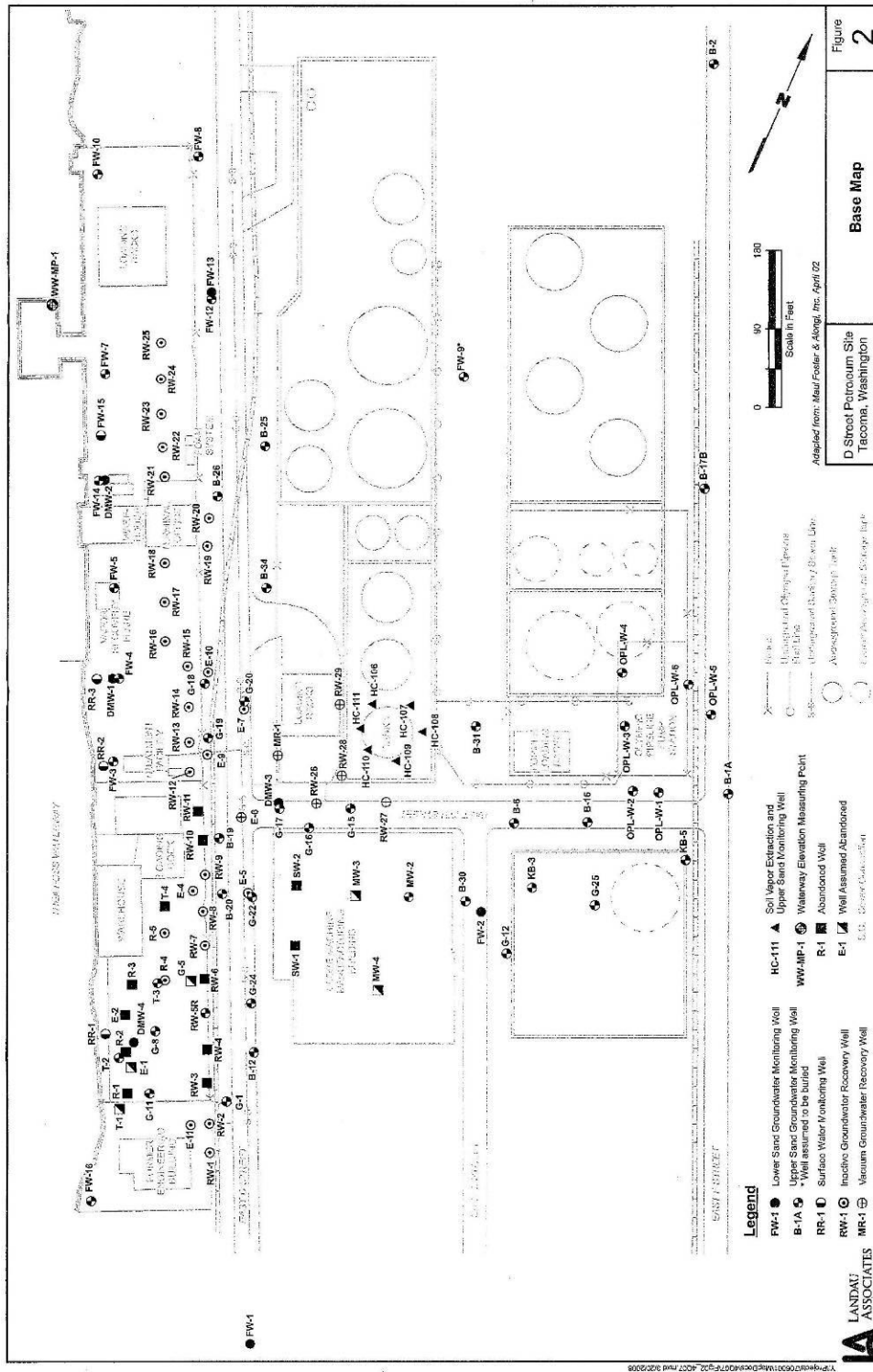
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## **6.0 APPENDICES**

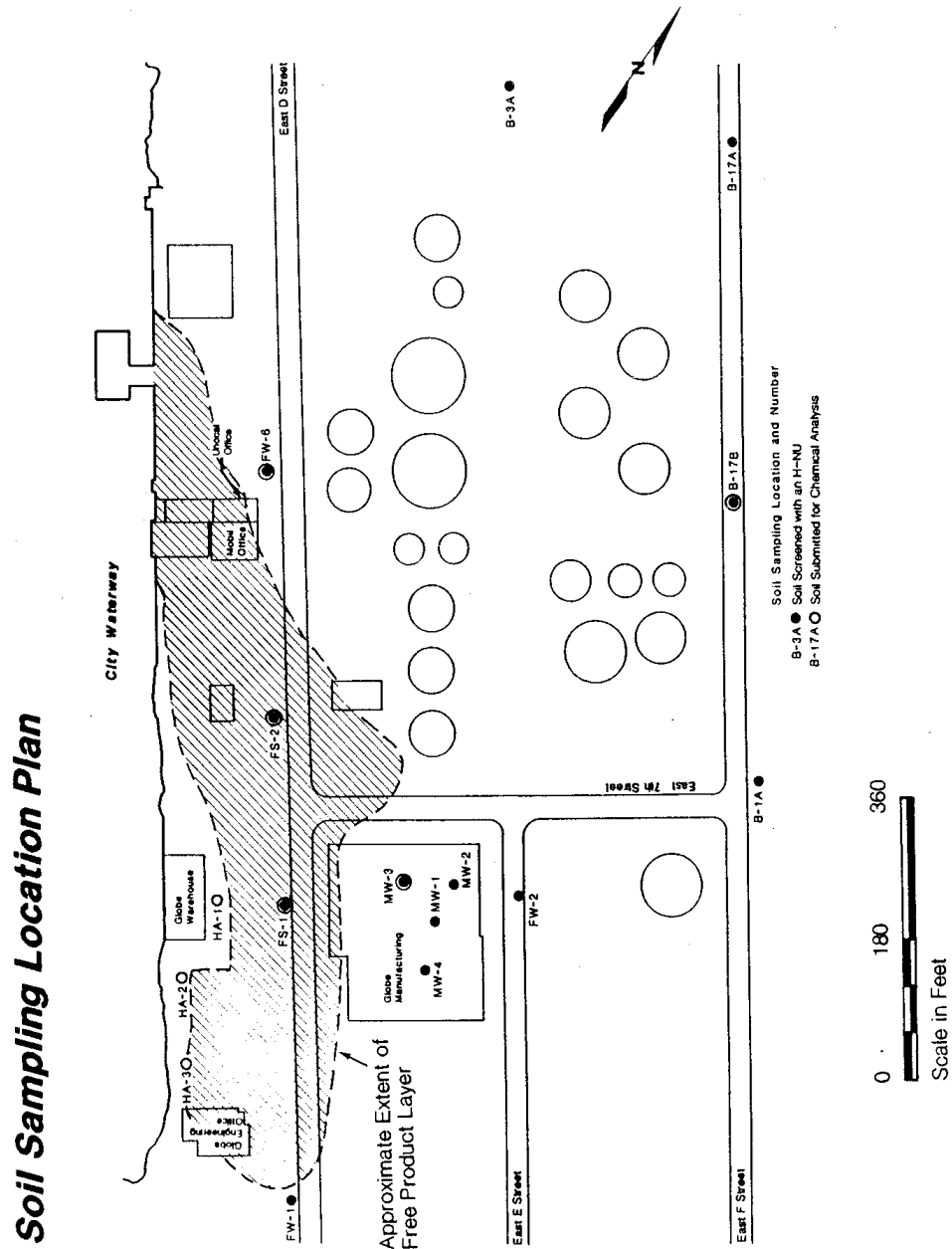
## 6.1 Vicinity Map



## 6.2 Site Plan



## 6.3 Extent of Free Product and Groundwater Results



**HARTCROWSER**  
J-2300-04 12/89  
Figure 3-4

Hart Crowser  
J-2300-02

Table 4-2 - Summary of Groundwater Constituent Concentrations

Parameter	Detection Frequency	Maximum Detected Value in ppm	Minimum Value in ppm
<b>Volatile Organic Compounds</b>			
Acetone	1/13	0.011	0.005 U
1,1,1-Trichloroethane	1/13	0.007	0.001 U
Trichloroethene	1/13	0.007	0.001 U
Tetrachloroethene	1/13	0.002	0.001 U
Benzene	16/30	32	0.001 U
Toluene	13/30	35	0.001 U
Ethylbenzene	12/28	5.7	0.0003 J
Xylenes	14/30	25	0.001 U
<b>Semivolatile Organic Compounds</b>			
Phenol	9/28	0.093	0.001 U
2-methylphenol	1/28	0.047	0.001 U
4-Methylphenol	4/28	0.2	0.0006 M
2,4-Dimethylphenol	4/28	0.062	0.002 U
Benzoic Acid	1/28	0.97	0.01 U
Napthalene	12/32	0.76	0.001 U
2-Methylnapthalene	10/28	2.6	0.001 U
Acenaphthene	4/32	0.1	0.0006 J
Dibenzofuran	2/28	0.02	0.0005 J
Fluorene	4/32	0.12	0.0008 J
pentachlorophenol	1/28	0.0015 J	0.0015 J
benanthrene	8/32	0.5	0.0008 J
Fluoranthene	5/32	0.012	0.0003 M
Pyrene	4/32	0.05	0.0004 J
Benzo(a)Anthracene	2/32	0.001	0.0007 J
bis(2-Ethylhexyl)phthalate	11/28	0.1 B	0.001 U
Chrysene	2/32	0.002	0.001 U
Di-n-Octyl Phthalate	3/28	0.0024	0.001 U
Benzo(b)Fluoranthene	2/32	0.0032	0.001 U
Benzo(k)Fluoranthene			
Benzo(a)Pyrene	2/32	0.0008 J	0.0006 M
Indeno(1,2,3-cd)Pyrene	1/32	0.0009 J	0.0009 J
Benzo(ghi)Perylene	1/32	0.001	0.001 U
<b>Metals</b>			
Arsenic	5/13	0.15	0.005 U
Copper	10/13	0.007	0.001 U
Nickel	4/13	0.027	0.002 U
Cadmium	1/13	0.003	0.001 U
Lead	4/13	0.021	0.005 U
Chromium	4/13	0.004	0.001 U
Zinc	13/13	0.04	0.002
<b>Data Reporting Qualifiers</b>			
U Indicates compound was analyzed for but not detected at the given detection limit.			
J Indicates an estimated value when the result is less than the specified detection limit.			
M Indicates an estimated value of a tentatively identified compound.			
B This flag is used when the analyte was detected in the method blank as well as a sample.			

Hart Crowser  
J-2300-02

Table 4-3 - Summary of BTEX Concentrations in Groundwater

Monitoring Well Number	Concentrations in ppm			
	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES
<b>Upper Sand Unit</b>				
B-1A	0.001 U	0.001 U	0.001 U	0.002 U
B-3A	0.001 U	0.001 U	0.001 U	0.002 U
B-17A	0.001 U	0.001 U	0.001 U	0.002 U
B-17B	0.26	0.0037	0.0003 J	0.001 U
B-25	0.95	0.81	0.72	7.8
B-32	0.001 U	0.001 U	0.001 U	0.002 U
G-1	32	32	4.6	23
G-1 (Duplicate)	31	35	5.7	25
G-12	0.001 U	0.001 U	0.001 U	0.002 U
G-12	0.001 U	0.001 U	0.001 U	0.001 U
G-14	7.3	0.22	1.2	0.93
G-17	31	25	3.4	17
G-18	13	0.21	1.3	5.6
G-18 (Duplicate))	15	0.1 U	1	3.7
G-22	31	29	3.5	19
G-23	20	18	2	13
MW-1	0.001 U	0.001 U	0.001 U	0.001 U
MW-2	0.005	0.001 U	0.001	0.005
MW-3	0.001 U	0.001 U	0.001 U	0.001 U
MW-4	0.001 U	0.003 U	0.001 U	0.005 U
SW-1	2.8	4.9	2	12
SW-2	0.88	1.6	0.74	4.1
W-5	0.54	0.062 J	0.055 J	0.67
W-6	0.001 U	0.001 U	0.001 U	0.002 U
FW-8	0.0015	0.0019	0.001	0.0059
FW-9	0.001 U	0.001 U	0.001 U	0.002 U
FW-10	0.001 U	0.001 U	0.001 U	0.002 U
FW-12	0.065	0.0006	0.03	0.0005 U
<b>Lower Sand Unit</b>				
FW-1	0.001 U	0.001 U	0.001 U	0.002 U
QFW-1 (Duplicate)	0.001 U	0.001 U	0.001 U	0.002 U
FW-2	0.001 U	0.001 U	0.001 U	0.002 U
FW-6	0.64	0.003	0.007	0.006
FW-13	0.056	0.0005 U	0.0005 U	0.0008

Data Reporting Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.  
J Indicates an estimated value.

## 6.4 Soil Investigation Results

Hart Crowser  
J-2300-02

Table 4-1 - Summary of Soil Constituent Concentrations

Parameter	Detection Frequency	Maximum Value in ppm	Minimum Value in ppm
<b>Volatile Organic Compounds</b>			
Benzene	8/10	130	0.0007 J
Toluene	6/10	620 B	0.0009 U
Ethylbenzene	7/10	350	0.0009 U
Xylenes	8/10	1700	0.002 U
Total Petroleum Hydrocarbons	26/30	29000	2.0 U
<b>EP Toxicity Metals</b>			
Arsenic	0/9	---	0.2 U
Barium	4/9	0.1	0.1 U
Cadmium	0/9	---	0.01 U
Chromium	0/9	---	0.1 U
Lead	0/9	---	0.1 U
Mercury	0/9	---	0.1 U
Selenium	0/9	---	0.005 U
Silver	0/9	---	0.2 U
<b>Total Metals</b>			
Arsenic	1/1	1.2	1.2
Chromium	1/1	10	10
Copper	1/1	11	11
Lead	0/1	---	10 U
Nickel	1/1	5	5
Zinc	1/1	20	20
<b>Data Reporting Qualifiers</b>			
U Indicates compound was analyzed for but not detected at the given detection limit.			
J Indicates an estimated value when the result is less than the specified detection limit.			
B This flag is used when the analyte was detected in the method blank as well as a sample.			



## 6.5 Groundwater Monitoring Results – Second Quarter 2012

Table 2  
Summary of Groundwater Analytical Results  
Second Quarter 2012  
D Street Petroleum Site

				TPH-G NWTPH-Gx	TPH-D NWTPH-Dx (a)	
				Gasoline Range Hydrocarbons	Diesel Range Hydrocarbons	Light Oil Range Hydrocarbons
Surface Water Cleanup Standards				---	---	---
Groundwater Cleanup Standards				---	---	---
Sample ID	Lab ID	Date Collected				
Upper Sand Unit	B-19	580-33471-1	6/13/2012	0.15 J	0.8 J	0.24 UJ
	B-25	580-33410-2	6/12/2012	2.9	1.0	0.24 U
	B-31	580-33410-4	6/12/2012	1.2	0.57	0.24 U
	B-34	580-33471-15	6/14/2012	2.4	5.6	0.3
	E-21	580-33471-17	6/14/2012	0.530	4.3 J	0.4
	E-21-DUP	580-33471-18	6/14/2012	0.5	7.4 J	1.5
	FW-5R	580-33471-3	6/13/2012	1.2 J	6.8 J	0.6 J
	FW-5R-DUP	580-33471-4	6/13/2012	1.500 J	7.1 J	0.9 J
	FW-14	580-33471-5	6/13/2012	0.050 UJ	0.12 UJ	0.24 UJ
	G-6	580-33471-6	6/13/2012	6.0 J	1.8 J	0.24 UJ
	G-16	580-33410-3	6/12/2012	0.056	0.17	0.24 U
	G-18	580-33471-7	6/13/2012	1.600 J	1.1 J	0.2 UJ
	HC-111	580-33471-8	6/13/2012	5.10 J	9.2 J	1.7 J
	RW-2	580-33471-22	6/14/2012	0.96	0.41 J	0.24 UJ
	RW-5R	580-33471-23	6/14/2012	2.2	0.59	0.24 U
	RW-6	580-33471-12	6/13/2012	2.30 J	2.70 J	0.46 J
	T-2	580-33471-13	6/13/2012	0.91 J	0.43 J	0.24 UJ
	T-3	580-33471-14	6/13/2012	0.72 J	0.58 J	0.24 UJ
Surface Water Compliance	RR-1	580-33471-9	6/13/2012	0.050 UJ	0.14 J	0.24 UJ
	RR-2	580-33471-19	6/14/2012	0.130	0.12 U	0.24 U
	RR-3	580-33471-20	6/14/2012	0.050 U	0.12 U	0.24 U
	RR-4	580-33471-10	6/13/2012	0.050 UJ	0.12 UJ	0.24 UJ
	RR-5	580-33471-21	6/14/2012	0.530	0.25	0.24 U
	RR-6	580-33471-11	6/13/2012	0.050 UJ	0.12 UJ	0.24 UJ
Lower Sand Unit	DMW-2	580-33471-16	6/14/2012	1.00	0.84	0.24 U
	DMW-4	580-33471-2	6/13/2012	0.16 J	0.3 J	0.24 UJ
	FW-13	580-33410-1	6/12/2012	0.200	0.12 U	0.24 U

**Notes:**

All results in milligrams per liter (ppm)

NA = Not analyzed

U = Not detected

J = The analyte is present in the sample; the reported concentration is an estimate.

UJ = The analyte was not detected in the sample; the reported sample detection limit is an estimate.

Y = The chromatographic response resembles a typical fuel pattern.

Wells E-22, FW-5R, FW-14, and T-2 are sentinel wells.

(a) All samples analyzed using sulfuric acid/silica gel cleanup procedure (EPA 8260C).

**Bold** Indicates an exceedance of surface water cleanup levels

**Bold** Indicates an exceedance of groundwater cleanup levels

Table 2  
Summary of Groundwater Analytical Results  
Second Quarter 2012  
D Street Petroleum Site

				BTEX EPA 8260B					
				Benzene	Toluene	Ethylbenzene	m-Xylene & p-Xylene	o-Xylene	Xylenes (total)
Surface Water Cleanup Standards				0.04	5	0.43	--	--	--
Groundwater Cleanup Standards				0.16	20	1.7	--	--	--
Sample ID	Lab ID	Date Collected							
Upper Sand Unit	B-19	580-33471-1	6/13/2012	0.0140 J	0.0010 UJ	0.001 UJ	0.0020 UJ	0.0010 UJ	0.0020 UJ
	B-25	580-33410-2	6/12/2012	0.21	0.0050	0.0080	0.0110	0.0010 U	0.0110
	B-31	580-33410-4	6/12/2012	0.0010 U	0.0010 U	0.0028	0.0020 U	0.0011	0.0011
	B-34	580-33471-15	6/14/2012	0.60	0.0044	0.0037	0.0020 U	0.0010 U	0.0020 U
	E-21	580-33471-17	6/14/2012	0.0010 U	0.0010 U	0.0026	0.0020 U	0.0010 U	0.0020 U
	E-21-DUP	580-33471-19	6/14/2012	0.001 U	0.0010 U	0.0023	0.0020 U	0.0010 U	0.0020 U
	FW-5R	580-33471-3	6/13/2012	0.016 J	0.0010 UJ	0.0010 UJ	0.0020 UJ	0.0010 UJ	0.0020 UJ
	FW-5R-DUP	580-33471-4	6/13/2012	0.0170 J	0.0010 UJ	0.0010 UJ	0.0020 UJ	0.0010 UJ	0.0020 UJ
	FW-14	580-33471-5	6/13/2012	0.0010 UJ	0.0010 UJ	0.0010 UJ	0.0020 UJ	0.0010 UJ	0.0020 UJ
	G-8	580-33471-6	6/13/2012	0.0035 J	0.0020 J	0.64 J	0.0051 J	0.0014 J	0.0065 J
	G-16	580-33410-3	6/12/2012	0.0010 U	0.0010 U	0.0010 U	0.0020 U	0.0010 U	0.0020 U
	G-18	580-33471-7	6/13/2012	0.0010 UJ	0.0010 UJ	0.0057 J	0.0020 UJ	0.0010 UJ	0.0020 UJ
	HC-111	580-33471-8	6/13/2012	1.6 J	0.0150 J	0.430 J	0.170 J	0.034 J	0.204 J
	RW-2	580-33471-22	6/14/2012	0.0010 U	0.0010 U	0.0037	0.0020 U	0.0010 U	0.0020 U
	RW-5R	580-33471-23	6/14/2012	0.023	0.0010 U	0.120	0.0020 U	0.0010 U	0.0020 U
	RW-8	580-33471-12	6/13/2012	0.025 J	0.0022 J	0.0054 J	0.0020 J	0.0010 UJ	0.0020 J
	T-2	580-33471-13	6/13/2012	0.0010 UJ	0.0010 UJ	0.0010 UJ	0.0020 UJ	0.0010 UJ	0.0020 UJ
	T-3	580-33471-14	6/13/2012	0.0010 J	0.0010 UJ	0.0010 UJ	0.0020 UJ	0.0010 UJ	0.0020 UJ
Surface Water Compliance	RR-1	580-33471-9	6/13/2012	0.0010 UJ	0.0010 UJ	0.0010 UJ	0.0020 UJ	0.0010 UJ	0.0020 UJ
	RR-2	580-33471-19	6/14/2012	0.0010 U	0.0010 U	0.0010 U	0.0020 U	0.0010 U	0.0020 U
	RR-3	580-33471-20	6/14/2012	0.0010 U	0.0010 U	0.0010 U	0.0020 U	0.0010 U	0.0020 U
	RR-4	580-33471-10	6/13/2012	0.0010 UJ	0.0010 UJ	0.0010 UJ	0.0020 UJ	0.0010 UJ	0.0020 UJ
	RR-5	580-33471-21	6/14/2012	0.0010 U	0.0010 U	0.0010 U	0.0020 U	0.0010 U	0.0020 U
	RR-6	580-33471-11	6/13/2012	0.0010 UJ	0.0010 UJ	0.0010 UJ	0.0020 UJ	0.0010 UJ	0.0020 UJ
Lower Sand Unit	DMW-2	580-33471-16	6/14/2012	0.1500	0.0012	0.0010 U	0.0020 U	0.0010 U	0.0020 U
	DMW-4	580-33471-2	6/13/2012	0.0010 UJ	0.0010 UJ	0.0010 UJ	0.0020 UJ	0.0010 UJ	0.0020 UJ
	FW-13	580-33410-1	6/12/2012	0.0010 U	0.0010 U	0.0010 U	0.0020 U	0.0010 U	0.0020 U

Notes:

All results in milligrams per liter (ppm)

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(a) All samples analyzed using sulfuric acid/silica gel cleanup procedure (EPA 8260C).

**Bold** indicates an exceedance of surface water cleanup levels.

**Bold** indicates an exceedance of groundwater cleanup levels.

## 6.6 Photo log

**Photo 1: D Street Facility – from the north**



**Photo 2: Treatment System – from the northeast**





**Photo 3: D Street Facility – from the southeast during Landau sampling event**



**Photo 4: South End of Site – from the south**

