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SUBSURFACE INVESTIGATION REPORT
December 19, 2005

Time Oil Company Facility No. 01-443 – Bill's Tire
4910 Leary Avenue Northwest
Seattle, Washington 98107

INTRODUCTION

This Subsurface Investigation Report presents the results of supplemental soil and groundwater sampling conducted on October 24, 2005, at the above-referenced property (the property, Figure 1) or in the adjacent right-of-ways (ROWs). The work described herein is supplemental to the removal of one hydraulic lift, one 125-gallon used-oil underground storage tank (UST), two single-wall, riveted steel USTs (500 and 650 gallons), and approximately 1,200 tons of petroleum-impacted soil between March 2001 and July 2004. Significant property features are illustrated on Figure 2. Previous environmental work at the property has been documented in the following reports:

- *UST Removal Site Assessment* (GeoEngineers, 2001;
- *Site Assessment Report (*GeoEngineers, 2001a);
- *Subsurface Assessment Report* (GeoEngineers, 2002);
- *UST Removal and Remedial Excavation Report* (GeoEngineers, 2004); and
- *Groundwater Monitoring and Monitoring Well Installation Report* (GeoEngineers, 2005).

The results of previous environmental work have identified the presence of ethylene dichloride (EDC) in groundwater in the vicinity of monitoring well MW-3, located in the Leary Avenue Northwest ROW.

Investigation Objectives

The purpose of this subsurface investigation was to address Ecology concerns that a magnetic anomaly in the 17th Avenue Northwest ROW may represent a source of the EDC that was detected during the groundwater monitoring program. This Subsurface Investigation Report includes the following:

- Summary results of the subsurface investigation;
- Background information, including a description of the property and adjacent right-of-ways;
- Description of investigation activities; and
- Conclusions and a list of the supporting tables, figures, and appendices attached with this report.

SUMMARY RESULTS OF THE SUBSURFACE INVESTIGATION

Following is a summary of the subsurface conditions, nature and extent of constituents of interest at the property and adjacent ROWs. Additional details are provided in later sections of this report.

Stratigraphy: The property and adjacent ROWs are underlain by glacial till consisting of very dense, silty sand with gravel to the depths explored by Sound Environmental Strategies (SES) and others, to maximum depths of 36.5 feet below ground surface (bgs).

Hydrogeology: Monitoring wells MW-1A, MW-2, MW-3, MW-4 and MW-5A intersect a distinct water-bearing zone (WBZ) observed at approximately 25 feet bgs at the time of drilling. Groundwater stabilizes at depths of 9 to 10 feet bgs in the monitoring wells, which are screened from 15 to 35 feet bgs. The groundwater flow direction is reportedly towards the southwest (GeoEngineers, 2005). SES borings encountered light groundwater seepage characterized by very poor recharge rates between 15 and 16 feet bgs.

Constituents of Interest: Concentrations of constituents of interest in soil and groundwater are tabulated on Tables 1 through 4, attached, and summarized below:

Summary of Analytical Results

Analyte(s)	Analytical Method	Contaminants of Concern	Concentrations in Soil (mg/kg)		Concentrations in Groundwater (µg/L)	
			Minimum	Maximum	Minimum	Maximum
Gasoline-Range Petroleum Hydrocarbons (GRPH)	NWTPH-Gx	GRPH	ND	**118** (P-3-16)	86.0 (P-6)	**28,500** (P-4)
Diesel- and Oil-Range Petroleum Hydrocarbons (DRPH and ORPH)	NWTPH-Dx	DRPH	ND	ND	250 (P-3)	630 (P-5)
		ORPH	ND	56 (P-3-16)	ND	ND
BTEX	EPA Method 8260B	Benzene	ND	**2.00** (P-2-16)	ND	**352** (P-2)
		Toluene	ND	ND	ND	59.5 (P-4)
		Ethylbenzene	ND	0.546 (P-3-14)	ND	688 (P-4)
		Total Xylenes	ND	4.30 (P-3-14)	ND	**3,683** (P-4)
Selected Oxygenates	EPA Method 8260B	MTBE	ND	ND	ND	ND
		EDB	ND	ND	ND	ND
		EDC	ND	ND	ND	**15.9** (P-6)
Total Lead	EPA 6010/7000	Total Lead	ND	12.4 (P-1-7)	NA	NA

RED BOLD text signifies a concentration that exceeds its respective MTCA Method A cleanup level for unrestricted land use.
µg/L = micrograms per liter

Media of Concern: Soil and groundwater.

Extent of Contamination: Historically, the maximum concentrations of EDC in groundwater recur at monitoring well MW-3. Detectable concentrations of EDC were encountered in groundwater samples collected to the north, south, east, and west of monitoring well MW-3 beneath the Leary Avenue Northwest ROW, but diminish rapidly in each direction. Concentrations of GRPH and BTEX extend southwest into the Leary Avenue Northwest ROW.

Nature of Release: The sources of GRPH and BTEX in soil and groundwater are attributed to the three former UST systems at the property which were removed from the site along with

approximately 1,223 tons of petroleum-contaminated soil. The source of EDC in groundwater remains unknown.

SITE LOCATION AND DESCRIPTION

The property consists of a 5,700-square foot, triangle-shaped parcel occupied by a vacant former service station and tire store building. It is located in the Ballard neighborhood of Seattle on the northwest corner of the intersection of 17th Avenue Northwest and Leary Avenue Northwest. Land use in the area is predominately commercial and light industrial area. The property is level and surfaced with asphalt concrete. Adjacent ROWs are surfaced with asphalt or Portland cement concrete.

PROJECT BACKGROUND

One hydraulic lift, one 125-gallon used-oil UST, two single-wall riveted steel USTs (500 and 650 gallons), and approximately 1,223 tons of associated petroleum-impacted soil were removed from the property in March 2001 and July 2004. The larger USTs were reportedly abandoned prior to the purchase of the site by Time Oil in 1957. During the 2004 UST removal activities a geophysical survey identified a magnetic anomaly in the 17th Avenue Northwest ROW. The anomaly appeared to be consistent with the presence of an UST. The City was notified of the anomaly, but would not allow excavation in the ROW.

Previous site assessment activities include a GeoProbe® investigation and a soil boring and monitoring well installation program that resulted in five existing monitoring wells. Groundwater monitoring has been conducted since 2001. As shown in Table 4, the results of 13 sampling events confirmed concentrations of gasoline-range petroleum hydrocarbons and benzene in groundwater above MTCA Method A cleanup levels in only one of five wells (well MW-5), which was abandoned and replaced with well MW-5A in 2004 following remedial excavations at the property. No concentrations of petroleum hydrocarbons or BTEX constituents in excess of the MTCA Method A cleanup levels have been detected in groundwater samples collected from replacement well MW-5A (Figure 2), or any other existing monitoring well at the site since the remediation efforts were completed in 2004.

During the groundwater monitoring program, EDC was detected in monitoring wells MW-3, MW-4 and MW-5/MW-5A. Monitoring well MW-3 is the only sample location where EDC was detected above MTCA Method A cleanup levels. Concentrations of EDC in groundwater have consistently ranged between 32.2 µg/L and 45.8 µg/L at monitoring well MW-3.

GeoEngineers conducted an investigation in an effort to identify possible source(s) for the EDC and concluded that "*…it is our opinion that the EDC in groundwater beneath the site is not a result of past site activities, given that EDC was not used as a gasoline additive during the period of gasoline sales. Based on the analytical results, EDC was not detected in site soils; therefore it is likely that impact to groundwater beneath the site is from an unknown source, located upgradient from the site. Given the age of the sewer located adjacent to the site along Leary Way, we believe that the impact is a result of leaks in the sewer system.*" (GeoEngineers, 2004).

Soil containing concentrations of petroleum hydrocarbons and associated BTEX constituents in excess of MTCA Method A cleanup criteria remain beneath the property and adjacent ROWs following the remedial excavation activities. GRPH and BTEX are the contaminants of concern (COC) beneath the southern portion of the property (former UST and pump island location) and

ORPH is the COC beneath the northern portion of the property in the vicinity of the former hydraulic hoist and used oil UST (Figure 2).

PRE-INVESTIGATION ACTIVITIES

Time Oil Company authorized SES to establish the schedule and coordinate with the various subcontractors who were to provide services on the project. Subcontractors included a utility locating service, concrete coring contractor, a drilling contractor, an EPA-accredited analytical laboratory, and a waste disposal company to collect and dispose of investigation-derived waste (soil cuttings and purge water from temporary wells). Prior to conducting the fieldwork, public and private utility locates were performed, a Traffic Control Plan and Health and Safety Plan were prepared, and a Street Use Permit was obtained from the City of Seattle.

INVESTIGATION RESULTS

SES personnel mobilized to the field on October 24 and 25, 2005, and oversaw the advancement of six soil borings at the locations shown in Figure 2. The work included using push probe technology to provide access to subsurface soil and groundwater for sampling and analyses, preparing logs of each soil boring, and documenting the investigation findings in this report.

Soil borings P-1 through P-6 were advanced to depths ranging from 15 to 22 feet bgs. Soil borings P-1 and P-2 were advanced within five feet to the north and south of the magnetic anomaly, respectively. Soil borings P-3 through P-6 were advanced to the west and southwest of the magnetic anomaly in a hydrogeologic down-gradient position. Relatively undisturbed soil samples were obtained from the borings at continuous intervals from the ground surface to the bottom of the boring using disposable Teflon® sleeves inside a hollow, stainless-steel, split-spoon soil sampler. Selected portions of each recovered soil core sample were placed in a plastic bag so that the presence or absence of volatile organic compounds could be quantified using a photo-ionization detector. Intervals of each recovered soil core sample selected for potential laboratory chemical analysis were placed into laboratory-prepared glassware in accordance with EPA Method 5035A. Soil characteristics including texture, color, relative density, and moisture content were recorded on boring logs. The soil conditions were classified using the Unified Soil Classification System (USCS). The depths of any changes in lithologies and first-encountered groundwater were also noted on the boring logs.

Upon completion of each soil boring, temporary wells were installed in each borehole. The temporary wells were constructed from one-inch diameter, polyvinyl chloride (PVC) slotted pipe. Reconnaissance groundwater samples were collected using a peristaltic pump with dedicated, polyethylene tubing to prevent cross-contamination between borings. Water samples were pumped directly from the polyethylene tubing into laboratory-prepared glass containers appropriate for each analysis to be performed.

Groundwater and selected soil samples were submitted to North Creek Analytical of Bothell, Washington for the analyses listed on Table A. The analytical results are tabulated in Table 1 and 2, and are summarized in Figures 3 and 4. Boring logs and laboratory analytical reports are attached to this report in Appendix A and Appendix B, respectively.

INVESTIGATION-DERIVED WASTE

Soil cuttings, and purge water were contained in two, labeled, 16-gallon drums and stored on-property pending disposal at a permitted facility.

CONCLUSIONS

Based on a review of the historical data, observations of subsurface conditions, and current analytical results, SES makes the following conclusions:

- EDC has not been detected in on-property or adjacent off-property soil.
- The distribution of EDC in groundwater displays an inverse relationship with the distribution of GRPH and BTEX compounds. For example, no detectable concentrations of EDC were present in the groundwater sample collected at soil boring P-3, where the GRPH concentration was 10,300 µg/L. Similarly, the highest concentrations of EDC in groundwater recur at monitoring well MW-3, where GRPH has not been detected.
- The radial distribution of EDC in groundwater in the immediate vicinity of off-property monitoring well MW-3 is not consistent with the leading edge of the southwestward distribution of GRPH and BTEX in groundwater.
- This investigation has not identified a direct pathway of contamination from the magnetic anomaly to the soil or groundwater. GRPH, BTEX compounds, and EDC have not been detected in vadose zone soil collected between the magnetic anomaly and the groundwater table.
- Vertical and lateral distributions of GRPH, BTEX and EDC in soil and groundwater suggest that the magnetic anomaly is not a logical source of the contamination beneath the property or in the adjacent right-of-way.
- The source of the EDC release appears to be separate from the source of the GRPH and BTEX release. The source of the EDC release has not been confirmed.

REFERENCES

GeoEngineers, Inc., February 10, 2005, *Groundwater Monitoring and Monitoring Well Installation Report*.

GeoEngineers, Inc., October 25, 2004, *UST Removal and Remedial Excavation Report*.

GeoEngineers, Inc., April 2, 2002, *Subsurface Assessment Report*.

GeoEngineers, Inc., May 17, 2001, *UST Removal Site Assessment*.

GeoEngineers, Inc., April 4, 2001a, *Site Assessment Report.*

CLOSING

SES trusts that the information presented in this Subsurface Investigation Report meets Time Oil Company objectives. If you have question or require additional information please do not hesitate to contact the undersigned at 206.306.1900.

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Attachments:
Figure 1 – Site Location Plan
Figure 2 – Exploration Location Plan
Figure 3 – GRPH and EDC in Soil
Figure 4 – GRPH and EDC in Groundwater
Table 1 – Soil Analytical Results
Table 2 – Soil Analytical Results – Polynuclear Aromatic Hydrocarbons
Table 3 – Groundwater Analytical Results
Table 4 – Historical Concentrations of GRPH, BTEX, EDC, and EDB in Soil
Table 5 – Historical Concentrations of GRPH, BTEX, and EDC in Groundwater
Appendix A – Boring Logs
Appendix B – Laboratory Analytical Reports

FIGURES

TABLES

APPENDIX A

Boring Logs

APPENDIX B

Laboratory Analytical Reports