# Technical Memorandum

**To**: Chris Maurer, Washington Department of Ecology

**From**: Janet Knox and Glen Wallace, Pacific Groundwater Group

**Re**: Scougal Rubber Remedial Action Update (VCP Site NW 1707)

**Date**: December 15, 2014

This technical memorandum summarizes the remedial actions conducted at Scougal Rubber between November 2013 and November 2014. Remedial action at the site focuses on reduction of chlorinated solvent concentrations in soil and groundwater. Previous remedial actions at the site are described in other documents, including:

- *Scougal Rubber Remedial Action Update (VCP Site NW 1707)* (PGG, 2009)
- *Scougal Rubber Remedial Action Update (VCP Site NW 1707)* (PGG, 2011)
- *Scougal Rubber Remedial Action Update (VCP Site NW 1707)* (PGG, 2012)
- *Scougal Rubber Remedial Action Update (VCP Site NW 1707)* (PGG, 2013)
- *Scougal Rubber Final Remedial Action Plan* (PGG, 2007)
- *Independent Remedial Action Report* (Retec, 2002)

The work was performed using generally accepted hydrogeologic practices at this time and in this vicinity, for exclusive application to the Scougal Rubber site and for the exclusive use of Scougal Rubber. This statement is in lieu of other warranties, express or implied.

## INTRODUCTION

Scougal Rubber is located in the Georgetown neighborhood of Seattle, Washington at 6239 Corson Avenue (Figure 1). Remedial efforts have been underway at the site for over 20 years and have been successful in significantly reducing contaminant concentrations (Table 1). Source area groundwater concentrations have decreased, but were above MTCA Method A cleanup levels in the most recent sampling event.

The Scougal property overlies fine to medium silty sands with scattered, discontinuous silt and gravel stringers. These soils are commonly observed throughout the lower Duwamish area. Depth to groundwater at the site is between 7 and 9 feet. The regional groundwater flow direction is to the southwest toward the Duwamish River, approximately 0.5 miles away (Retec, 2003). Soil cores collected in 2009 identified a 6- to 12-inch thick silt layer at approximately 16 feet below ground surface (bgs) that appears to be laterally continuous within at least the alleyway area of the site.

Petroleum- and chlorinated solvent-impacted soil was identified on the Scougal property in the late 1980s. This discovery led to remedial action at the site including removal of underground storage tanks, hotspot excavation, hydraulic containment, and operation of an air sparging soil vapor extraction (SVE) system (Retec, 2002). The SVE system was designed to reduce contaminant concentrations in soil and groundwater behind the Scougal main plant and beneath the Machinists Inc. property to the west. The SVE system was operated intermittently from 1994 through 1999.

Operation of the SVE system reduced groundwater concentrations by approximately 90 percent, and had inconsistent effectiveness in soil. In 1994, TCE (1,000 ug/L) and vinyl chloride (1,300 ug/L) concentrations at MW-14 exceeded cleanup levels. After operation of the SVE system, concentrations of TCE and vinyl chloride had decreased, but groundwater concentrations rebounded each time the system was shut down. The SVE system was effective at reducing contaminant mass, but soil and groundwater concentrations remained above cleanup levels.

Scougal Rubber contacted Pacific Groundwater Group (PGG) in 2006 to develop a plan to further reduce contaminant concentrations to below cleanup levels. PGG performed additional site investigation in 2006 as the basis for further remediation and found concentrations as high as TCE (110 ug/L) and vinyl chloride (33 ug/L) in groundwater.

PGG developed a Final Remedial Action Plan to address residual contamination. With that plan, Scougal Rubber chose to enter the Washington Department of Ecology's Voluntary Cleanup Program to receive Ecology's approval of the cleanup approach and to obtain a No Further Action (NFA) letter once the cleanup goals are achieved.

Upon review of the existing site documents and the Final Remedial Action Plan, Ecology provided approval of the plan on April 12, 2007. PGG then implemented the planned removal of shallow impacted soil, in-situ chemical oxidation with potassium permanganate, and confirmation sampling (PGG, 2009) All confirmation soil samples within the treatment area were non-detect for chlorinated solvents. Groundwater petroleum compound concentrations were reduced to below cleanup levels. Groundwater chlorinated ethene concentrations were reduced an additional 90 percent to approximately 1 percent of the pre-remediation (1993) levels. However, TCE and vinyl chloride concentrations remained above MTCA Method A cleanup values at the end of 2008. In 2009, PGG developed and implemented a targeted ozone injection system to further reduce concentrations. This system is described in the following sections.

## OZONE REMEDIATION

PGG designed and observed installation of an ozone remediation system in May-June 2009. A second phase of ozone sparge points was added in June 2010. Ozone was selected to address residual groundwater contamination because of the ability to distribute oxidant to soil and groundwater in areas with difficult access with minimal disturbance to site structures and manufacturing operations. The ozone system installation included (Figures 2 and 3):

- An H2O Engineering model OSU-52 cabinet capable of producing 2.7 pounds of ozone per day at a concentration of 3,570 ppm in a 90% oxygen stream.
- 8 soil injection points screened between 5 and 6.5 feet bgs
- 8 groundwater sparge points screened between 15 and 16.5 feet bgs (keyed to top of silt) with micro-bubble screens to enhance ozone dispersal.
- 3 groundwater sparge points screened between 18.5 and 20 feet bgs (below silt interval) with micro-bubble screens to enhance ozone dispersal.

Between 2,000 and 2,500 lbs of ozone were delivered to groundwater sparge points[1] during ozone operations through November 2014.

## GROUNDWATER MONITORING

Groundwater samples were collected from MW-11, MW-12, MW-13 and MW-14 on November 25, 2014 to monitor remediation progress. As approved by Ecology under the Final Remedial Action Plan, MW-11, MW-12, and MW-14 are the compliance monitoring wells. MW-14 has been used as the performance location monitoring well because it had the highest historical TCE concentrations, and is located toward the down gradient end of the treatment area (the ozone radius of influence likely extended approximately 15-25 ft down gradient of MW-14). Performance monitoring results from the 2014 event are included in Table 2.

Pre-ozone-treatment groundwater concentrations at MW-14 were 19.0 ug/L (July, 2009). TCE concentrations decreased to below cleanup levels (5 ug/L) by September 2009 (4 ug/L). Vinyl chloride concentrations decreased to below cleanup levels by 2009. However, concentrations have subsequently fluctuated above and below cleanup levels. Results from the 2014 event were above cleanup levels, but generally support continued contaminant mass reduction within the treatment area. Ozone distribution was only partially effective prior to groundwater performance sampling due to clogging of 3 ozone injection screens. The screens will be cleared with citric acid.

[1] The ozone system had intermittent down time when oxygen was delivered to sparge points without ozone. For safety, when the cabinet detects a problem, ozone production to that point is discontinued.

### Sampling Methods

Groundwater samples were collected using a peristaltic pump and low flow methods to minimize volatilization. Samples were collected into laboratory-provided sample containers and placed in coolers with ice, and chain of custody was maintained.

## NEXT STEPS

Ozone treatment has reduced chlorinated ethene concentrations to below MTCA Method A groundwater cleanup levels several times during the course of the ozone treatment, followed by rebound to above MTCA cleanup levels. Ozone treatment is continuing to address residual concentrations. Groundwater monitoring will be continued in 2015.

### Attachments:

Table 1. Remedial Investigation and Action Timeline
Table 2. Groundwater Sampling Result Summary

Figure 1. Site Map and Ozone Sparge Point Locations
Figure 2. MW-14 Concentration Trends

Appendix A. Analytical Lab Report December 5, 2014

### References:

Pacific Groundwater Group, 2007. *Final Remedial Action Plan, Scougal Rubber*. January 17, 2007.

Pacific Groundwater Group, 2009. *Letter to Chris Maurer, Washington Department of Ecology, RE: Scougal Rubber Remedial Action Update (VCP Site NW 1707).* January 22, 2009.

Pacific Groundwater Group, 2011. *Letter to Chris Maurer, Washington Department of Ecology, RE: Scougal Rubber Remedial Action Update (VCP Site NW 1707).* September 20, 2011.

Pacific Groundwater Group, 2012. *Letter to Chris Maurer, Washington Department of Ecology, RE: Scougal Rubber Remedial Action Update (VCP Site NW 1707).* December 3, 2012.

Pacific Groundwater Group, 2013. *Letter to Chris Maurer, Washington Department of Ecology, RE: Scougal Rubber Remedial Action Update (VCP Site NW 1707).* November 13, 2013.

Retec, 2002. *Independent Remedial Action Report*. March 28, 2002. Retec Project Number SRC00-02417-400.

**cc:** Rob Anderson, Scougal Rubber Corporation

## Table 1. Remedial Investigation and Action Timeline

Scougal Rubber Corporation, Seattle, Washington

| Date | Location* | Event | Result | Reference |
|---|---|---|---|---|
| 1980s | AW, EW | Contamination identified on site | Contamination recognized; finding initiated remedial invesitgation and cleanup process. | Retec (2002) |
| 1992 | AW | UST removal, hotspot excavation | Bulk of contaminant mass removed; soil and groundwater impacts remained | Retec (2002) |
| 1994-1999 | AW | Air sparge and soil vapor extraction | Reduced contaminant mass; soil and groundwater remaiedn above cleanup levels | Retec (2002) |
| 2006 | AW | Soil and groundwater sampling | Contamination in alleyway area delinieated; provided baseline for remedial action | PGG (2006) |
| 2007 | AW | Soil hotspot excavation and permanganate application | Reduced soil VOC concentrations to non-detect; groundwater concentrations reduced by approximately 90% | PGG (2009) |
| 2008 | AW | Confirmation groundwater sampling | Groundwater rebound noted at MW-14 to above cleanup levels | PGG (2009) |
| 2009-2012 | AW | Ozone injection in two phases | Reduced groundwater VOC concentrations to near cleanup levels (ongoing) | Table 2 |
| 2009 | EW | Soil and groundwater sampling | Identified remaining soil hotspot; groundwater concentrations at EW and down gradient below cleanup levels | PGG (2011) |
| 2010 | EW | Permanganate application | Reduced soil VOC concentrations to non-detect | PGG (2011) |
| 2013 | PB | Paint Booth Investigation | Identified soil hotspot beneath building; GW below or near cleanup levels | PGG (2013) |

* Location Acronyms: AW- Alleyway; EW- East Warehouse; PB Paint Booth Area

**Table 2. Groundwater Sampling Result Summary**

Scougal Rubber Corporation, Seattle, Washington

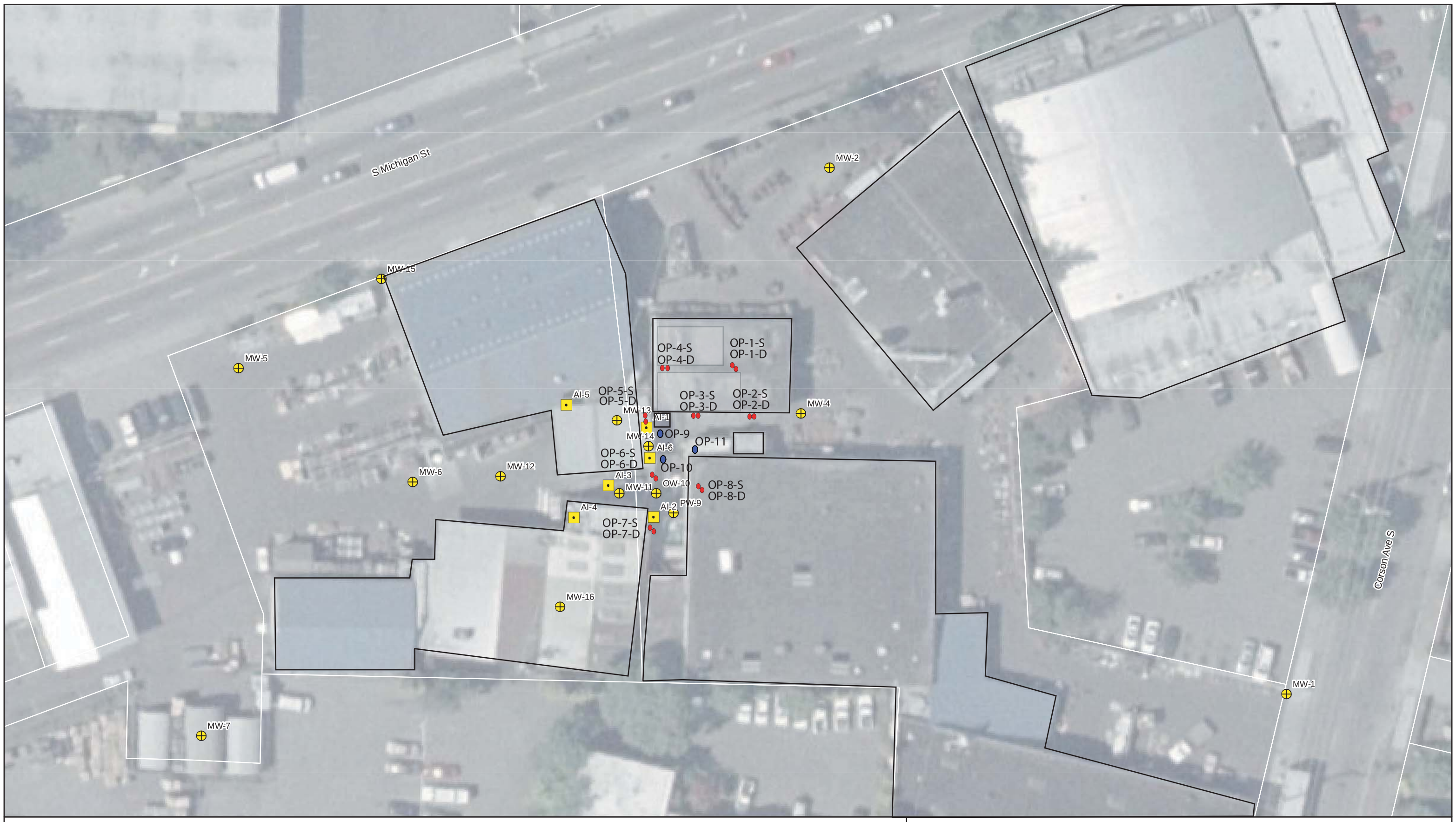
| Sample Location | Date | Tetrachloroethene | Trichloroethene | cis-1,2-Dichloroethene | Vinyl Chloride |
|---|---|---|---|---|---|
| ***Pre-Permanganate Concentrations*** | | | | | |
| MW-11 | 8/3/2006 | 0.3 | **9.4** | 8.7 | U 0.2 |
| MW-12 | 8/3/2006 | U 1 | 0.2 | 0.4 | **0.7** |
| MW-13 | 8/3/2006 | U 1 | **46** | 11 | **2.6** |
| MW-14 | 8/3/2006 | 4.1 | **110** | 26 | **33** |
| MW-4 | 8/3/2006 | 0.2 | 3.3 | U 1 | U 0.2 |
| OW-10 | 8/3/2006 | U 1 | **9.6** | 18 | **3.5** |
| ***Post-Permanganate Concentrations*** | | | | | |
| MW-11 | 6/10/2008 | U 1 | **10** | 3.7 | U 0.2 |
| MW-12 | 6/10/2008 | U 1 | U 1 | U 1 | U 0.2 |
| MW-14 | 6/10/2008 | U 1 | **13** | 3.7 | **15** |
| MW-11 | 9/5/2008 | U 1 | **13** | 2.9 | U 0.2 |
| MW-12 | 9/5/2008 | U 1 | U 1 | U 1 | **1** |
| MW-14 | 9/5/2008 | U 1 | **14** | 3.4 | **25** |
| ***Ozone Install Reconnaissance Samples*** | | | | | |
| OP-10 | 6/29/2010 | U 1 | U 1 | U 1 | U 0.2 |
| OP-11 | 6/29/2010 | U 1 | U 1 | U 1 | **0.51** |
| OP-9 | 6/29/2010 | U 1 | U 1 | U 1 | **0.7** |
| ***Ozone Operational Data*** | | | | | |
| MW-11 | 1/23/2009 | U 1 | **12** | U 1 | U 0.2 |
| MW-12 | 1/23/2009 | U 1 | U 1 | U 1 | U 0.2 |
| MW-14 | 1/23/2009 | 1.6 | **41** | 1.3 | **13** |
| MW-14 | 7/20/2009 | 0.8 | **19** | 5.8 | **9.2** |
| MW-14 | 9/23/2009 | U 0.2 | 4 | 1.7 | 1.9 |
| MW-14 | 12/4/2009 | 0.3 | 3.7 | 1.3 | **0.5** |
| MW-14 | 1/22/2010 | 0 | 1.4 | 1.8 | **1** |
| MW-14 | 3/10/2010 | 0 | 2.3 | 2.3 | **5.7** |
| MW-14 | 4/22/2010 | U 1 | 1.6 | U 1 | U 0.2 |
| MW-11 | 5/24/2010 | U 1 | U 1 | U 1 | U 0.2 |
| MW-12 | 5/24/2010 | U 1 | U 1 | U 1 | U 0.2 |
| MW-14 | 5/24/2010 | U 1 | 3.1 | U 1 | **1.5** |
| MW-14 | 9/15/2010 | U 1 | U 1 | U 1 | U 0.2 |
| MW-14 | 10/14/2010 | U 1 | 0.89 J | U 1 | **1.1** |
| MW-14 | 3/9/2011 | 0.39 J | 1.6 | 0.12 J | 0.08 J |
| MW-14 | 5/6/2011 | 0.18 J | 1.9 | 0.34 J | 0.15 J |
| MW-14 | 7/15/2011 | U 0.11 | 0.49 J | U 1 | 0.1 UJ |
| MW-11 | 9/16/2011 | U 0.5 | 2.6 | U 1 | U 0.2 |
| MW-12 | 9/16/2011 | U 0.5 | U 0.5 | U 1 | **0.89** |
| MW-14 | 9/16/2011 | U 0.5 | 2.8 | U 1 | **0.69** |
| MW-11 | 11/23/2011 | U 0.12 | 2.5 | U 1 | **U 0.2** |
| MW-12 | 11/23/2011 | U 0.12 | 0.22 J | U 1 | **0.32** |
| MW-13 | 11/23/2011 | 0.24 J | **8.4** | 3.3 | **0.6** |
| MW-14 | 11/23/2011 | 0.3 J | 4.2 | 1.5 | **2.1** |
| MW-11 | 6/14/2013 | U 1 | **6.8** | U 1 | U 0.2 |
| MW-12 | 6/14/2013 | U 1 | U 1 | U 1 | U 0.2 |
| MW-13 | 6/14/2013 | U 1 | **11** | U 1 | **0.32** |
| MW-14 | 6/14/2013 | U 1 | **5** | U 1 | **0.44** |
| MW-11 | 11/25/2014 | U 1 | U 1 | U 1 | U 0.2 |
| MW-12 | 11/25/2014 | U 1 | U 1 | U 1 | U 0.2 |
| MW-13 | 11/25/2014 | U 1 | **6.2** | 2.8 | **0.29** |
| MW-14 | 11/25/2014 | U 1 | 3.9 | U 1 | U 0.2 |
| ***East Warehouse Reconnaissance Samples*** | | | | | |
| SR-18 | 5/1/2009 | U 1 | U 1 | U 1 | U 0.2 |
| SR-19 | 5/1/2009 | U 1 | U 1 | U 1 | U 0.2 |
| SR-20 | 5/1/2009 | U 1 | U 1 | U 1 | U 0.2 |
| SR-21 | 5/1/2009 | U 1 | 1.1 | U 1 | U 0.2 |
| SR-22 | 5/1/2009 | U 1 | 1.1 | U 1 | U 0.2 |
| SR-23 | 5/1/2009 | U 1 | U 1 | 1.4 | U 0.2 |
| ***Paint Booth Building Reconnaissance Samples*** | | | | | |
| SR-27 | 5/14/2013 | U 1 | 2.7 | U 1 | U 0.2 |
| SR-28 | 5/14/2013 | U 1 | **5.9** | U 1 | U 0.2 |
| SR-31 | 5/14/2013 | U 1 | 3.5 | U 1 | U 0.2 |
| *MTCA Method A table values* | | *5* | *5* | *80* | *0.2* |

**Bold** indicates exceedance of MTCA Method A table value.

U indicates non-detect at the shown reporting limit.

J indicates an estimated value. J-flag values occur where concentrations are reported between the method detection limit and reporting limit.

All Results ug/L.




## Well

- Air Sparging Well
- Monitoring Well
- Ozone Sparge Points (June 2009)
- Ozone Sparge Points (June 2010)

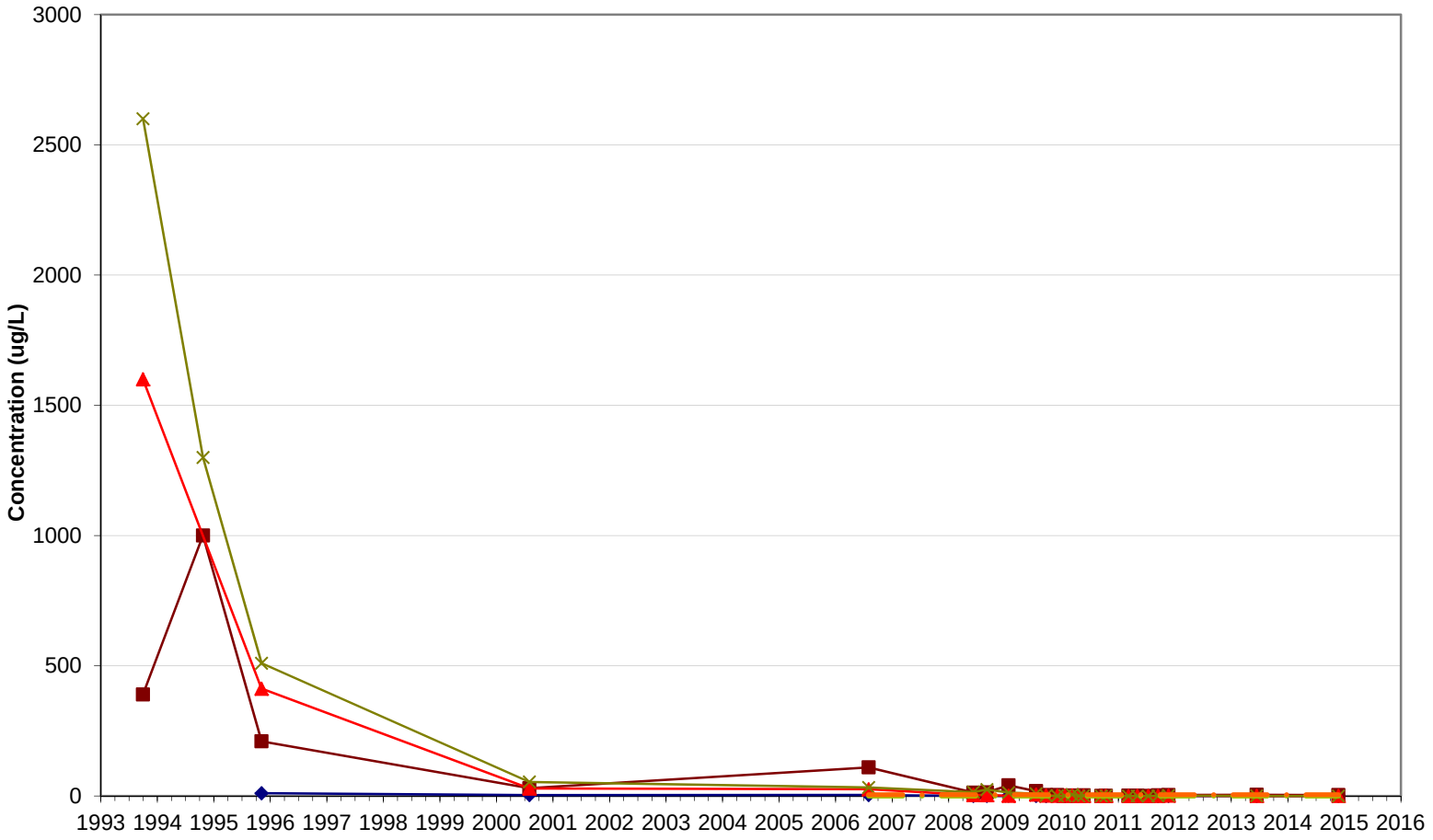
0 Feet 100

N

**Figure 1. Site Map and Ozone Sparge Point Locations**
Scougal Rubber Corporation
Seattle, Washington

JK0605 / 2-27-09

PgG




Note: MTCA Method A threshold lines may be difficult to see due to plot concentration range.

**Figure 2a. MW-14 Concentration Trends**
Scougal Rubber Corporation
Seattle, Washington

PgG

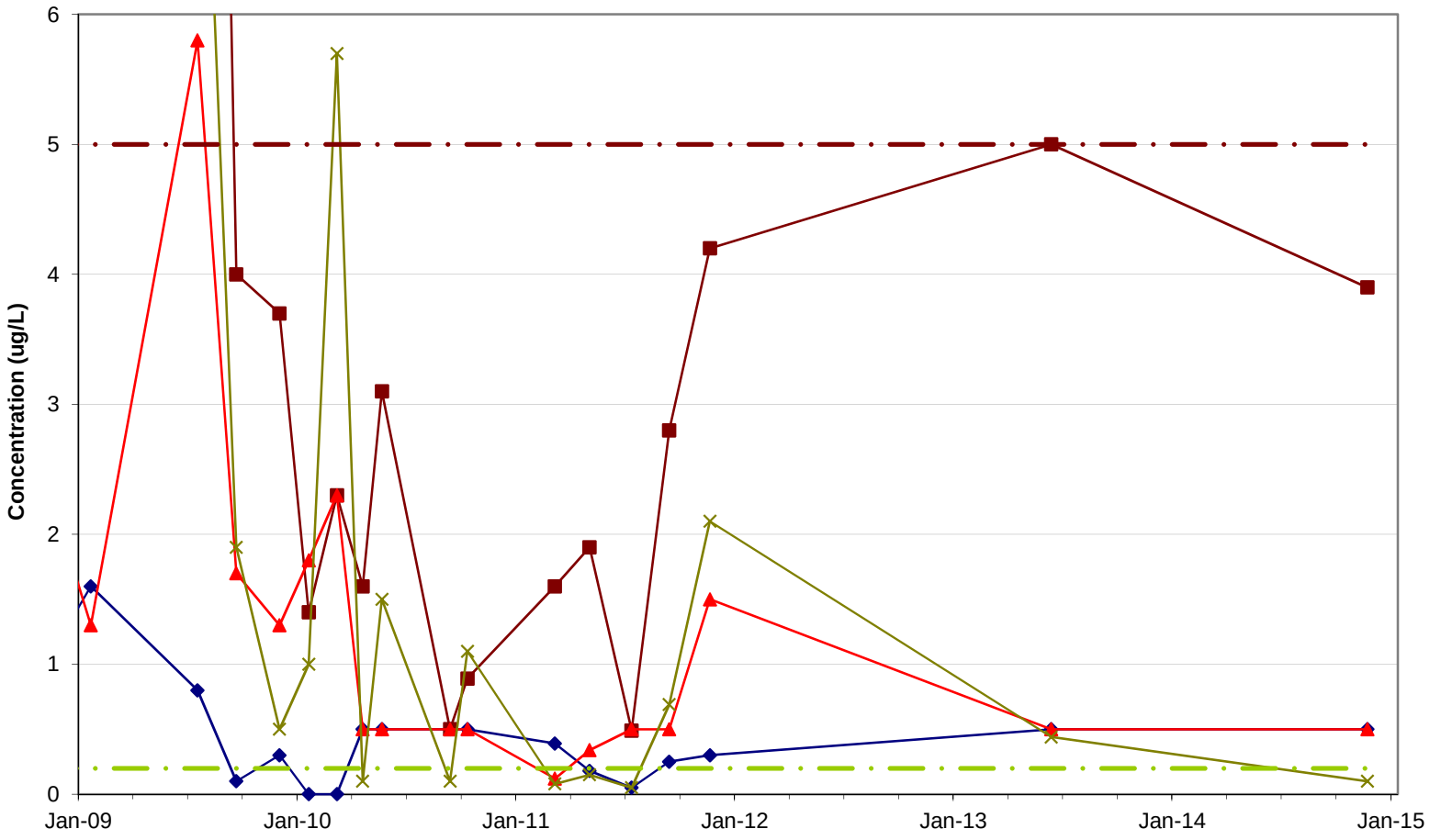



**Figure 2b. MW-14 Concentration Trends**
Scougal Rubber Corporation
Seattle, Washington

PgG

# APPENDIX A

## ANALYTICAL LAB REPORT, 2014

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
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December 5, 2014

Glen Wallace, Project Manger
Pacific Groundwater Group
2377 Eastlake Ave East
Seattle, WA 98102

Dear Mr. Wallace:

Included are the results from the testing of material submitted on November 26, 2014 from the Scougal Rubber, F&BI 411450 project. There are 8 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
PGG1205R.DOC

## CASE NARRATIVE

This case narrative encompasses samples received on November 26, 2014 by Friedman & Bruya, Inc. from the Pacific Groundwater Group Scougal Rubber, F&BI 411450 project. Samples were logged in under the laboratory ID's listed below.

| Laboratory ID | Pacific Groundwater Group |
|---|---|
| 411450 -01 | MW-11 |
| 411450 -02 | MW-12 |
| 411450 -03 | MW-13 |
| 411450 -04 | MW-14 |

All quality control requirements were acceptable.

## Analysis For Volatile Compounds By EPA Method 8260C

| | | | |
|---|---|---|---|
| Client Sample ID: | MW-11 | Client: | Pacific Groundwater Group |
| Date Received: | 11/26/14 | Project: | Scougal Rubber, F&BI 411450 |
| Date Extracted: | 11/26/14 | Lab ID: | 411450-01 |
| Date Analyzed: | 11/26/14 | Data File: | 112619.D |
| Matrix: | Water | Instrument: | GCMS9 |
| Units: | ug/L (ppb) | Operator: | SP |

| Surrogates: | % Recovery: | Lower Limit: | Upper Limit: |
|---|---|---|---|
| 1,2-Dichloroethane-d4 | 101 | 85 | 117 |
| Toluene-d8 | 98 | 93 | 107 |
| 4-Bromofluorobenzene | 100 | 76 | 126 |

| Compounds: | Concentration ug/L (ppb) |
|---|---|
| Vinyl chloride | <0.2 |
| Chloroethane | <1 |
| 1,1-Dichloroethene | <1 |
| Methylene chloride | <5 |
| trans-1,2-Dichloroethene | <1 |
| 1,1-Dichloroethane | <1 |
| cis-1,2-Dichloroethene | <1 |
| 1,2-Dichloroethane (EDC) | <1 |
| 1,1,1-Trichloroethane | <1 |
| Trichloroethene | <1 |
| Tetrachloroethene | <1 |

## Analysis For Volatile Compounds By EPA Method 8260C

| | | | |
|---|---|---|---|
| Client Sample ID: | MW-12 | Client: | Pacific Groundwater Group |
| Date Received: | 11/26/14 | Project: | Scougal Rubber, F&BI 411450 |
| Date Extracted: | 11/26/14 | Lab ID: | 411450-02 |
| Date Analyzed: | 11/26/14 | Data File: | 112620.D |
| Matrix: | Water | Instrument: | GCMS9 |
| Units: | ug/L (ppb) | Operator: | SP |

| Surrogates: | % Recovery: | Lower Limit: | Upper Limit: |
|---|---|---|---|
| 1,2-Dichloroethane-d4 | 99 | 85 | 117 |
| Toluene-d8 | 97 | 93 | 107 |
| 4-Bromofluorobenzene | 99 | 76 | 126 |

| Compounds: | Concentration ug/L (ppb) |
|---|---|
| Vinyl chloride | <0.2 |
| Chloroethane | <1 |
| 1,1-Dichloroethene | <1 |
| Methylene chloride | <5 |
| trans-1,2-Dichloroethene | <1 |
| 1,1-Dichloroethane | <1 |
| cis-1,2-Dichloroethene | <1 |
| 1,2-Dichloroethane (EDC) | <1 |
| 1,1,1-Trichloroethane | <1 |
| Trichloroethene | <1 |
| Tetrachloroethene | <1 |

# FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

## Analysis For Volatile Compounds By EPA Method 8260C

| | | | |
|---|---|---|---|
| Client Sample ID: | MW-13 | Client: | Pacific Groundwater Group |
| Date Received: | 11/26/14 | Project: | Scougal Rubber, F&BI 411450 |
| Date Extracted: | 11/26/14 | Lab ID: | 411450-03 |
| Date Analyzed: | 11/26/14 | Data File: | 112621.D |
| Matrix: | Water | Instrument: | GCMS9 |
| Units: | ug/L (ppb) | Operator: | SP |

| Surrogates: | % Recovery: | Lower Limit: | Upper Limit: |
|---|---|---|---|
| 1,2-Dichloroethane-d4 | 103 | 85 | 117 |
| Toluene-d8 | 100 | 93 | 107 |
| 4-Bromofluorobenzene | 101 | 76 | 126 |

| Compounds: | Concentration ug/L (ppb) |
|---|---|
| Vinyl chloride | 0.29 |
| Chloroethane | <1 |
| 1,1-Dichloroethene | <1 |
| Methylene chloride | <5 |
| trans-1,2-Dichloroethene | <1 |
| 1,1-Dichloroethane | <1 |
| cis-1,2-Dichloroethene | 2.8 |
| 1,2-Dichloroethane (EDC) | <1 |
| 1,1,1-Trichloroethane | <1 |
| Trichloroethene | 6.2 |
| Tetrachloroethene | <1 |

## Analysis For Volatile Compounds By EPA Method 8260C

| | | | |
|---|---|---|---|
| Client Sample ID: | MW-14 | Client: | Pacific Groundwater Group |
| Date Received: | 11/26/14 | Project: | Scougal Rubber, F&BI 411450 |
| Date Extracted: | 11/26/14 | Lab ID: | 411450-04 |
| Date Analyzed: | 11/26/14 | Data File: | 112622.D |
| Matrix: | Water | Instrument: | GCMS9 |
| Units: | ug/L (ppb) | Operator: | SP |

| Surrogates: | % Recovery: | Lower Limit: | Upper Limit: |
|---|---|---|---|
| 1,2-Dichloroethane-d4 | 100 | 85 | 117 |
| Toluene-d8 | 99 | 93 | 107 |
| 4-Bromofluorobenzene | 100 | 76 | 126 |

| Compounds: | Concentration ug/L (ppb) |
|---|---|
| Vinyl chloride | <0.2 |
| Chloroethane | <1 |
| 1,1-Dichloroethene | <1 |
| Methylene chloride | <5 |
| trans-1,2-Dichloroethene | <1 |
| 1,1-Dichloroethane | 1.5 |
| cis-1,2-Dichloroethene | <1 |
| 1,2-Dichloroethane (EDC) | <1 |
| 1,1,1-Trichloroethane | <1 |
| Trichloroethene | 3.9 |
| Tetrachloroethene | <1 |

# FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

## Analysis For Volatile Compounds By EPA Method 8260C

| | | | |
|---|---|---|---|
| Client Sample ID: | Method Blank | Client: | Pacific Groundwater Group |
| Date Received: | Not Applicable | Project: | Scougal Rubber, F&BI 411450 |
| Date Extracted: | 11/26/14 | Lab ID: | 04-2377 mb |
| Date Analyzed: | 11/26/14 | Data File: | 112611.D |
| Matrix: | Water | Instrument: | GCMS9 |
| Units: | ug/L (ppb) | Operator: | SP |

| Surrogates: | % Recovery: | Lower Limit: | Upper Limit: |
|---|---|---|---|
| 1,2-Dichloroethane-d4 | 102 | 85 | 117 |
| Toluene-d8 | 98 | 93 | 107 |
| 4-Bromofluorobenzene | 100 | 76 | 126 |

| Compounds: | Concentration ug/L (ppb) |
|---|---|
| Vinyl chloride | <0.2 |
| Chloroethane | <1 |
| 1,1-Dichloroethene | <1 |
| Methylene chloride | <5 |
| trans-1,2-Dichloroethene | <1 |
| 1,1-Dichloroethane | <1 |
| cis-1,2-Dichloroethene | <1 |
| 1,2-Dichloroethane (EDC) | <1 |
| 1,1,1-Trichloroethane | <1 |
| Trichloroethene | <1 |
| Tetrachloroethene | <1 |

Date of Report: 12/05/14
Date Received: 11/26/14
Project: Scougal Rubber, F&BI 411450

## QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR VOLATILES BY EPA METHOD 8260C

Laboratory Code: 411426-01 (Matrix Spike)

| Analyte | Reporting Units | Spike Level | Sample Result | Percent Recovery MS | Acceptance Criteria |
|---|---|---|---|---|---|
| Vinyl chloride | ug/L (ppb) | 50 | <0.2 | 99 | 61-139 |
| Chloroethane | ug/L (ppb) | 50 | <1 | 97 | 68-126 |
| 1,1-Dichloroethene | ug/L (ppb) | 50 | <1 | 95 | 71-123 |
| Methylene chloride | ug/L (ppb) | 50 | <5 | 94 | 61-126 |
| trans-1,2-Dichloroethene | ug/L (ppb) | 50 | <1 | 92 | 72-122 |
| 1,1-Dichloroethane | ug/L (ppb) | 50 | <1 | 93 | 79-113 |
| cis-1,2-Dichloroethene | ug/L (ppb) | 50 | <1 | 95 | 73-119 |
| 1,2-Dichloroethane (EDC) | ug/L (ppb) | 50 | <1 | 94 | 78-113 |
| 1,1,1-Trichloroethane | ug/L (ppb) | 50 | <1 | 95 | 79-116 |
| Trichloroethene | ug/L (ppb) | 50 | <1 | 96 | 75-109 |
| Tetrachloroethene | ug/L (ppb) | 50 | <1 | 90 | 72-113 |

Laboratory Code: Laboratory Control Sample

| Analyte | Reporting Units | Spike Level | Percent Recovery LCS | Percent Recovery LCSD | Acceptance Criteria | RPD (Limit 20) |
|---|---|---|---|---|---|---|
| Vinyl chloride | ug/L (ppb) | 50 | 101 | 106 | 73-132 | 5 |
| Chloroethane | ug/L (ppb) | 50 | 98 | 103 | 68-126 | 5 |
| 1,1-Dichloroethene | ug/L (ppb) | 50 | 97 | 102 | 75-119 | 5 |
| Methylene chloride | ug/L (ppb) | 50 | 97 | 102 | 63-132 | 5 |
| trans-1,2-Dichloroethene | ug/L (ppb) | 50 | 94 | 98 | 76-118 | 4 |
| 1,1-Dichloroethane | ug/L (ppb) | 50 | 95 | 101 | 80-116 | 6 |
| cis-1,2-Dichloroethene | ug/L (ppb) | 50 | 97 | 103 | 81-111 | 6 |
| 1,2-Dichloroethane (EDC) | ug/L (ppb) | 50 | 97 | 98 | 79-109 | 1 |
| 1,1,1-Trichloroethane | ug/L (ppb) | 50 | 96 | 102 | 80-116 | 6 |
| Trichloroethene | ug/L (ppb) | 50 | 99 | 104 | 77-108 | 5 |
| Tetrachloroethene | ug/L (ppb) | 50 | 95 | 98 | 78-109 | 3 |

# Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

411450

# SAMPLE CHAIN OF CUSTODY

ME 11/26/14 V3

Page _____ of _____

Send Report To Glen Wallace
Company Pacific Groundwater
Address 2377 Eastlake Ave E
City, State, ZIP Seattle, WA 98102
Phone # 206 329 0141 Fax # 206 329 6968

SAMPLERS (signature)

PROJECT NAME/NO. Scougal Rubber

PO#

REMARKS

TURNAROUND TIME
☒ Standard (2 Weeks)
☐ RUSH _____
Rush charges authorized by _____

SAMPLE DISPOSAL
☐ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

| Sample ID | Lab ID | Date Sampled | Time Sampled | Sample Type | # of containers | ANALYSES REQUESTED: TPH-Diesel | TPH-Gasoline | BTEX by 8021B | VOCs by8260 | SVOCs by 8270 | HFS | cHVOCs 8260 | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 11/25/14 | | GW | | | | | | | | | | | | | | |
| MW-11 | 01 A-D | | 13:00 | | 4 | | | | | | | X | | | | | | |
| MW-12 | 02 | | 13:45 | | 4 | | | | | | | X | | | | | | |
| MW-13 | 03 | | 12:20 | | 4 | | | | | | | X | | | | | | |
| MW-14 | 04 | | 14:45 | | 4 | | | | | | | X | | | | | | |
| | | | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | Samples received at 3 °C | | | | | |
| | | | | | | | | | | | | | | | | | | |


*Friedman & Bruya, Inc.*
*3012 16th Avenue West*
*Seattle, WA 98119-2029*
*Ph. (206) 285-8282*
*Fax (206) 283-5044*


| | SIGNATURE | PRINT NAME | COMPANY | DATE | TIME |
|---|---|---|---|---|---|
| Relinquished by: | | Travis Klaas | PGW | 11/26/14 | 1115 |
| Received by: | | James Bruya | F&B | 11/26 | 1115 |
| Relinquished by: | | | | | |
| Received by: | | | | | |

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