DRAFT

# Remedial Investigation Report Addendum

## USG Interiors Highway 99 Site

## Milton, Washington

Prepared for:
USG Corporation
550 West Adams Street
Chicago, Illinois 60661-3676

January 14, 2013

CDM Smith

A Report Prepared For :

USG Corporation
500 West Adams Street
Post Office Box 6721
Chicago, Illinois 60661-3676

**DRAFT**
**Remedial Investigation Report Addendum**
**USG Interiors highway 99 site**
**Milton, Washington**

January 14, 2013

Prepared by:
CDM Smith
14432 SE Eastgate Way, Suite 100
Bellevue, Washington 98007

CDM Project No. 19921.77628

# Table of Contents

## Appendices

# Section 1
# Introduction

This addendum presents the results of supplemental groundwater assessment conducted as part of the remedial investigation (RI) performed for USG Interiors (USG) at the former USG property located at 7110 Pacific Highway East in Milton, Washington. The site location is shown on **Figure 1.**

This addendum supplements the RI report dated July 11, 2012. After review of this report, the Washington Department of Ecology requested that USG perform additional groundwater assessment to further characterize the extent of arsenic exceeding the groundwater protection standard to the north, south, and east.

This addendum describes the results of this supplemental groundwater assessment but does not provide detailed descriptions of site history, regional and site surface water, geology, hydrogeology, or contaminant fate and transport. The reader should refer to the July 2012 RI for this information. All of the figures and tables are reprinted in this addendum.

## 1.1 Agreed Order

The RI was performed to satisfy the requirements of Agreed Order DE 84-506 (Order) between the Washington Department of the Ecology (Ecology) and USG. A final RI Work Plan dated March 5, 2010 was submitted to Ecology, which addressed comments from Ecology on CDM's draft RI Work Plan. The RI was conducted in accordance with the final Work Plan.

## 1.2 Site Location and Description

The USG Highway 99 site is located between Pacific Highway East and Interstate 5 in Milton, Washington. **Figure 2A** shows the entire groundwater investigation area for the RI. For clarity, the extent of the exploration points shown on **Figure 2A** is referred to as the "site" throughout this report. The majority of RI fieldwork occurred in the core investigation area shown on **Figure 2B,** which is used to illustrate the RI results.

Freeway Trailer and Kanopy Kingdom currently operate at the site; their business locations are shown on **Figure 2B**. Chain link fence separates each business and the western property line along Pacific Highway East.

## 1.3 Remedial Investigation Objectives

The RI was implemented to:

- Characterize arsenic in surface soil between the paved areas and Hylebos Creek.
- Characterize the extent of arsenic contamination in soil, groundwater, sediment, and surface water.
- Characterize the potential contaminant migration pathway of arsenic in soil and groundwater to Hylebos Creek.

- Gather additional environmental data affecting arsenic fate and transport to help select a cleanup action that will meet MTCA requirements.
- Evaluate exposure to terrestrial and ecological receptors.

# Section 2
# Field Investigation

This section describes the field work and investigation methods completed during this supplemental groundwater assessment. Field work included: locating underground utilities, drilling two new groundwater monitoring wells, and collecting groundwater samples from four groundwater monitoring wells.

The supplemental groundwater assessment was completed between November 20 and November 28, 2012. The purpose of the supplemental assessment was to define the limits of groundwater exceeding the groundwater protection standard to the north (MW-15), south (MW-16), and east (PD-209A and PD-211) of the core investigation area shown on **Figure 2B**. These groundwater monitoring wells are shown on **Figure 2A.** MW-15 and MW-16 are new monitoring wells installed for this assessment. PD-209A and PD-211 are existing wells installed as part of the B&L Landfill groundwater monitoring well network. Well logs for MW-15, MW-16, and PD-211 are provided in **Appendix A.** We were unable to locate a well log for PD-209A.

ESN Northwest drilled MW-15 and MW-16 using a DPT drill rig on November 20, 2012. The wells were constructed with a 1" milled slot PVC well screen. A filter pack consisting of #10-20 Colorado Silica Sand was placed in the annular space between the well screen and the borehole walls. The monitoring wells were completed with flush-mounted protective covers. **Table 1** provides well construction details.

MW-15 and MW-16 were developed and sampled on November 27, 2012. The wells were developed by pumping with a peristaltic pump until the turbidity was reduced. MW-15 pumped dry and the groundwater sample was collected on November 28 after the water level had recovered. Groundwater samples from PD-209A and PD-211 were collected on November 27. Groundwater purging and sampling procedures were consistent with those described in the July, 2012 RI report.

# Section 3
# Site Geologic and Hydrogeologic Findings

This supplemental groundwater assessment yielded no new site geologic or hydrogeologic findings, a complete discussion of these topics is provided in the July 2012 RI report. Geologic cross sections and the water table surface map from the RI report are reproduced here as **Figures 3, 4,** and **5. Table 2** provides water level measurements. **Table 3** groundwater parameters measurements from this supplemental groundwater assessment. **Tables 4** and **5** re-print surface water and hydrogeologic data from the RI report.

# Section 4
# Analytical Results

This section presents new groundwater data from the samples collected in November 2012.

## 4.1 Soil Results

No soil samples were submitted for laboratory or grain-size analysis as a part of the November 2012 supplemental assessment. For completeness, the following results are re-printed from the July 2012 RI report:

- Arsenic soil results are shown in **Table 6.**
- Isocontour maps of arsenic in site soil (**Figures 6** through **13**) were prepared using computer software and krieging methods. **Figures 6** through **13** show arsenic contours in soil at depths of 0 to 2, 4 to 6, 6 to 8, 8 to 10, 10 to 12, 12 to 14, 14 to 16, and 16 to 18 feet bgs, respectively. Note that the arsenic values shown in **Figure 13** are from saturated soil samples collected below the water table.

## 4.2 Groundwater Results

Groundwater samples collected in the November 2012 supplemental assessment were analyzed for total dissolved arsenic. The results are summarized in **Table 7**, along with analytical methods, reporting limits, and cleanup levels for arsenic**.** A Copy of the laboratory report for the supplemental groundwater assessment is included in **Appendix B**.

### 4.2.1 Arsenic Distribution and Geochemical Indicator Parameters

**Figure 14A** shows total dissolved arsenic concentration outside the core investigation area, including the results of samples collected in November 2012. **Figure 14B** is an isoconcentration map that shows the distribution of total dissolved arsenic in groundwater in the core investigation area. **Figures 15** through **19** are isoconcentration maps showing dissolved iron, arsenic (+3), arsenic (+5), and ORP in groundwater.

### 4.2.2 Analysis of Supplemental Groundwater Assessment Data

This section discusses arsenic results for the supplemental groundwater assessment. The July 2012 RI report analyses groundwater data from the core investigation area.

The objective of the supplemental groundwater assessment was to define the extent of arsenic exceeding the groundwater protection standard to the north, south, and east.

- South: The groundwater cleanup standard to the south was achieved with the sample collected from MW-15.
- North: The groundwater cleanup standard was not achieved in MW-16, the northernmost well drilled for the Highway 99 RI. The dissolved arsenic concentration in this well was 7.2 µg/L. Arsenic concentrations continued to attenuate to the north and these data do not indicate there is an additional arsenic source at the northern end of the site.

- East: The groundwater cleanup standard was exceeded in both of the B&L Landfill wells sampled for this supplemental assessment. Dissolved arsenic concentrations in these wells were 5.1 µg/L for PD-211 and 8.5 µg/L for PD-209A.

Arsenic is ubiquitous throughout Commencement Bay and the surrounding area as a result of the operation of a former Asarco smelter in Ruston. Arsenic sources in soil include fallout from the smelter plume, smelter slag from used as ballast in the many log yards, and smelter slag that was widely used as a fill material. Slag fill was observed in several soil samples collected for this RI.

This area-wide source of soil contamination impacts groundwater quality. CDM Smith recently submitted to Ecology a study of arsenic concentrations in soil and groundwater in the vicinity of the Estes Express Lines Terminal Facility (aka USF Reddaway) in Tacoma (CDM Smith, 2012). In our view, arsenic concentrations in the range of 5.1 µg/L to 8.5 µg/L that are seen in monitoring wells MW-16, PD-209A and PD-211 are within the range of area-wide background concentrations and are not necessarily indicative of impact from the Highway 99 site.

## 4.3 Surface Water Results

No surface water samples were collected for this supplemental assessment. RI surface water results are re-printed in **Table 8**.

## 4.4 Sediment Results

No sediment samples were collected for this supplemental assessment. RI sediment results are presented in **Table 9.**

# Section 5
# Evaluation of Quality Control Data

Analytical reports and all available QC data were reviewed and evaluated to assess their overall quality and usability for the supplemental groundwater assessment samples. Based on these evaluations, no QC issues encountered were significant enough to warrant analytical data qualification. All data were determined to be usable for the intended project purposes.

# Section 6
# Site Conceptual Model

Arsenic geochemistry, fate and transport, and attenuation are discussed in the July 2012 RI report.

# Section 7
# Terrestrial Ecological Evaluation

A simplified terrestrial ecological evaluation (TEE) was conducted to assess the potential risk of exposure to wildlife from potential site contamination. The TEE is presented in the July 2012 RI report.

# Section 8
# Summary

Findings of the RI are summarized below.

- Based on our evaluation of the overall quality and usability of soil and groundwater samples, no QC issues encountered were significant enough to warrant analytical data of analytical reports and available QC data from the field investigation. All data were determined to be usable for the intended project purposes without qualification.
- Industrial waste containing arsenic was used as fill on the site from about 1971 to 1973. The majority of this fill was excavated and disposed off-site by USG in a 1984/1985 contaminant source removal action. Arsenic impacted native soil in the vicinity of 99-1 was also removed at this time.
- The site is underlain by fill, alluvium, and glacial deposits to a depth of at least 59 feet bgs. Fill included slag.
- Two aquifers were identified at the site: the Alluvial Aquifer and Glacial Aquifer.
- The Alluvial Aquifer is the uppermost aquifer at the site and is impacted by arsenic. There is a strong upward hydraulic gradient from the underlying Glacial Aquifer.
- The estimated average linear groundwater flow velocity in the Alluvial Aquifer is estimated to range from 2 to 20 feet/day.
- The distribution of residual arsenic in soil at the site reflects the results of the 1984/1985 contaminant source removal action. Arsenic concentrations are relatively low at ground surface. Soil excavated in 1984/1985 was restored with clean fill. The RI fully defined the lateral and vertical extent of arsenic exceeding MTCA soil cleanup levels.
- Arsenic concentrations in Alluvial Aquifer groundwater are highest at monitoring well 99-1. This well was drilled where the highest arsenic concentrations were encountered in fill and native soil during the 1984/1985 contaminant source removal action.
- Arsenic concentrations in groundwater attenuate significantly in all directions from 99-1. However, arsenic exceeds MTCA Method A groundwater cleanup levels to the north (Linwood Custom Homes) and east of Interstate 5. In our view, arsenic concentrations between 5.1 µg/L to 8.5 µg/L are within the range of area-wide background concentrations and are not necessarily indicative of impact from the Highway 99 site.
- Arsenic within the Alluvial Aquifer attenuates with depth. Arsenic in the underlying Glacial Aquifer exceeds MTCA Method A cleanup standards but this exceedence does not appear to be related site activities.

- Arsenic transport in the Alluvial Aquifer is at least 34 times slower than the groundwater velocity, resulting in long travel times for arsenic to migrate downgradient from the contaminant source area.
- Arsenic in the Alluvial Aquifer does not appear to be impacting Hylebos Creek water quality.
- Hylebos Creek sediment downgradient of the contaminant source area has arsenic exceeding ecological screening criteria
- The simplified TEE exposure analysis concluded that land use at the site and surrounding area makes substantial wildlife exposure unlikely.

# Section 9
# References


Anderson, M.A., J.F. Ferguson and J. Gavis. 1976. *Arsenate Adsorption on Amorphous Aluminum Hydroxides.* J. Colloid & Interface Sci. v. 54 p. 391-399.

Anderson, M.P., and Woessner, W.W. 1992. *Applied Groundwater Modeling – Simulation of Flow and Advective Transport.* San Diego: Academic Press, Inc.

CDM Smith 2012. *Arsenic Study. Estes Express Lines Terminal Facility (aka USG Reddaway). Tacoma, Washington. Voluntary Cleanup Program ID #SW1095.* Prepared for Mr. Eugene Radcliff, Washington Department of Ecology by CDM Smith. December 13, 2012.

Camp Dresser & McKee, Inc. (CDM) 2010. *Remedial Investigation Work Plan, USG Interiors Highway 99 Site, Milton, Washington.* Dated March 5, 2010.

Duel, L.E. and A. R. Swoboda. 1972. *Arsenic Solubility in a Reducted Environment*. Soil Sci. Soc. Am. Proc. 36:276-278.

Ecology. 1986. *Memorandum to the Project File*. By Dom Reale, Washington Department of Ecology. June 30, 1986

Frost, R.R. and R.A. Griffin. 1977. *Effect of pH on Adsorption of Arsenic and Selenium from Landfill Leachate by Clay Minerals*. Soil Sci. Soc. Am. J. v. 41 p. 53-57.

Hazen. 1911. *Discussion—Dams on sand foundations*. Transactions, American Society of Civil Engineers, v. 73, p. 199.

Hem, J.D. 1971. *Study and Interpretation of the Chemical Characteristics of Natural Water*. Second Edition. USGS Water Supply Paper 1473.

Hounslow, A.W. 1980. *Ground Water Geochemistry: Arsenic in Landfills*. Ground Water v. 18 n. 4 p. 331-333.

Parkhurst, D.L. and Appelo, C.A.J. 1999. *User's Guide to PHREEQC (Version 2)- A Computer Program for Speciation, Batch-Reaction, One-Dimensional Transport, and Inverse Geochemical Calculations*. USGS Water-Resources Investigations Report 99-4259.

Pierce, M.L. and C.B. Moore. 1982. *Adsorption of arsenite and arsenate on amorphous iron hydroxide*. Water Res. 16:1247-1253.

Root, R.A., Dixit, S., Campbell, K.M., Jew, A.D., Hering, J.G. and P.A. O'Day. 2007. *Arsenic sequestration by sorption processes in high-iron sediments*. Geochimica et Cosmochimica Acta. v. 71, p. 5782-5803.

Shnyukov, E.F. 1963. *Arsenic in the Cimmerian Iron Ores of the Azov-Black Sea Region.* Geochemistry (Geokhimiya), 87-93.

Stow, S.H. 1969. *The Occurrence of Arsenic and the Color-Causing Components in Florida Land-Pebble Phosphate Rock*. Economic Geology. V. 64, p. 667-671.

Stumm, W. and J.J. Morgan. 1981. *Aquatic Chemistry: An Introduction Emphasizing Chemical Equilibria in Natural Waters*. 2nd ed. John Wiley and Sons, NY.

Su, C. and R.W. Puls. 2004. *Significance of Iron (II,III) Hydroxycarbonate Green Rust in Arsenic Remediation using Zerovalent Iron in Laboratory Column Tests. Environ. Sci. Technol.* v. 38, p. 5224-5231.

TPCHD. 1993. *Hylebos Creek Water Quality Project. Final Report. Prepared for Tacoma-Pierce County Health Department Water Resources Section.* Prepared by Adolfson Associates, Inc. June 1993.

EPA, 1998. *Method 6200, Field Portable X-Ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment.* January 1998.

Washington Department of Ecology (Ecology). 2008. *Agreed Order DE 84-506 Between the Washington Department of the Ecology and USG.* August 17, 1984.

Whiting, K.S. 1992. *The Thermodynamics and Geochemistry of Arsenic, with Application to Subsurface Waters at the Sharon Steel Superfund Site at Midvale, Utah.* MS Thesis T-4128 Colorado School of Mines, Golden Colorado.

Woolsen, E.A., J.H. Axley, and P.C. Kearney. 1971. The *Chemistry and Phytotoxicity of Arsenic in Soils: I Contaminated Field Soils*. Soil Sci. Soc. Am. Proc. 35:938-943.

# Distribution

1 Copy

Wshington Department of Ecology
Toxics Cleanup Program
Post Office Box 47775
Olympia, Washington 98504-47775

Attention: Mr. Dominick Reale

1 Copy

USG Corporation
500 West Adams Street
Chicago, Illinois 60661-3676

Attention: Ms. Lanta Stevens

Quality Assurance/Technical Review by:

_____

Alan D. Carey, LHG
Project Managert

# Tables

**Table 1**
**Well Construction Details**
**Highway 99 Site**
USG Interiors
Milton, Washington

| Well I.D. | Northing [a] | Easting [a] | TOC Elevation (ft AMSL) [b] | Boring Total Depth (ft) | Screen Depth Interval (ft) | Casing Diameter (in) | Slot Size (in) | Screen Type | Drilled Date |
|---|---|---|---|---|---|---|---|---|---|
| MW-1 | 703059.65 | 1184681.28 | 23.02 | 19.0 | 13-18 | 2 | 0.01 | PVC | 05/05/10 |
| MW-2 | 702999.60 | 1184652.77 | 22.37 | 19.0 | 12-19 | 2 | 0.01 | PVC | 05/04/10 |
| MW-3 | 703045.13 | 1184763.71 | 20.22 | 21.0 | 14.7-19.7 | 2 | 0.01 | PVC | 05/07/10 |
| MW-4 | 702987.85 | 1184749.40 | 20.40 | 20.0 | 14-19 | 2 | 0.01 | PVC | 05/05/10 |
| MW-5 | 702934.84 | 1184745.18 | 19.07 | 20.0 | 14.5-19.5 | 2 | 0.01 | PVC | 05/06/10 |
| MW-6 | 702883.36 | 1184710.13 | 19.89 | 20.0 | 14.1-19.1 | 2 | 0.01 | PVC | 05/06/10 |
| MW-7 | 702969.79 | 1184715.93 | 21.06 | 39.0 | 25-30 | 2 | 0.01 | PVC | 05/05/10 |
| MW-8 | 702924.45 | 1184744.14 | 19.12 | 40.0 | 34.9-40.1 | 2 | 0.01 | PVC | 05/06/10 |
| MW-9 | 702988.01 | 1184715.80 | 20.87 | 59.0 | 43-48 | 2 | 0.01 | PVC | 05/04/10 |
| MW-10 | 702958.17 | 1184783.51 | 14.15 | 12.6 | 10.4-11.5 | 3/4 | 0.01 | Stainless Steel | 10/14/11 |
| MW-11 | 703185.90 | 1184844.31 | 15.41 | 10.5 | 9.3-10.5 | 3/4 | 0.01 | Stainless Steel | 10/14/11 |
| MW-12 | 703065.01 | 1184585.80 | 21.54 | 20.0 | 14-19 | 1 | 0.01 | Pre-pack PVC | 05/11/12 |
| MW-13 | 702495.10 | 1184478.55 | 22.16 | 16.0 | 10-15 | 1 | 0.01 | Pre-pack PVC | 05/11/12 |
| MW-14 | 703437.40 | 1184781.81 | 30.30 | 20.0 | 13-18 | 1 | 0.01 | Pre-pack PVC | 05/11/12 |
| MW-15 | | | | 12.0 | 7-12 | 1 | 0.01 | PVC | 11/20/12 |
| MW-16 | | | | 12.0 | 12-17 | 1 | 0.01 | PVC | 11/20/12 |
| PD-209A | 702899.19 | 1185072.73 | 17.13 | ~14 | UNK | 2 | UNK | PVC | UNK |
| PD-211 | 703281 | 1185150 | 16.77 | 20.0 | 6-16 | 2 | UNK | PVC | 08/18/08 |
| 99-1 | 702978.95 | 1184715.54 | 21.34 | 28.0 | 15-25 | 4 | 0.01 | PVC | 05/1985 |
| 99-2 | 703159.55 | 1184771.51 | 22.64 | 25.5 | 15-25 | 4 | 0.01 | PVC | 05/1985 |

Notes:
a) Washington State Plane North American Datum of 1983 (NAD 83), Zone 12, feet.
b) ft AMSL - feet above mean sea level. Elevations based on North American Vertical Datum of 1988 (NAVD 88).
TOC - Top of casing.
PVC - Polyvinylchloride.
UNK - Unknown.

**Table 3**
**Groundwater General Parameters**
**Hwy 99 Site**
USG Interiors
Milton, Washington

| Monitoring Well | Date Sampled | Time Sampled | Temperature (°C) | Specific Conductance (µs/cm) | pH | Turbidity (NTU) | Dissolved Oxygen (mg/L) | ORP (mV) | Appearance/ Odor |
|---|---|---|---|---|---|---|---|---|---|
| MW1 | 05/26/10 | 1435 | 12.72 | 318 | 6.73 | 5.79 | 0.25 | -11.7 | Clear, colorless/no odor |
| MW2 | 05/25/10 | 1445 | 13.28 | 331 | 6.79 | 0.57 | 0.22 | -35.4 | Clear, colorless/no odor |
| MW3 | 05/25/10 | 1615 | 12.53 | 449 | 6.73 | 16.6 | 0.20 | -82.8 | Yellow tint, slight turbidity/no odor |
| | 07/15/10 | 1430 | 13.01 | 460 | 6.66 | 3.3 | 0.13 | -107.4 | Slight yellowish color, clear, no odor |
| MW4 | 05/26/10 | 1310 | 12.22 | 633 | 6.48 | 5.68 | 0.26 | -0.7 | Clear, colorless/no odor |
| | 07/15/10 | 1305 | 13.51 | 664 | 6.61 | 0.00 | 0.15 | -91.5 | Clear, colorless, broken organic sheen /no odor |
| MW5 | 05/26/10 | 1025 | 11.79 | 394 | 6.74 | 4.58 | 0.30 | -67.1 | Clear, colorless/no odor |
| MW6 | 05/26/10 | 0915 | 12.66 | 456 | 6.68 | 8.96 | 0.39 | -54.5 | Clear, colorless/no odor |
| MW7 | 05/27/10 | 1045 | 13.28 | 420 | 6.99 | 10.15 | 0.21 | -8.3 | Clear, colorless/no odor |
| MW8 | 05/27/10 | 0940 | 12.05 | 419 | 7.00 | 8.62 | 0.27 | 16.3 | Clear, colorless/no odor |
| MW9 | 05/27/10 | 1200 | 13.35 | 265 | 7.72 | 9.86 | 0.19 | 68.2 | Clear, colorless/no odor |
| MW10 | 10/18/11 | 1335 | 13.44 | 349 | 6.88 | 49.8 | 0.47 | -94.0 | Clear, colorless/no odor |
| MW11 | 10/18/11 | 1225 | 13.90 | 670 | 6.48 | 12.8 | 0.16 | -129.9 | Clear, colorless/no odor |
| MW12 | 05/22/12 | 0950 | 11.91 | 188 | 6.67 | 26.9 | 2.00 | -75 | Clear, colorless, odorless, slight turbidity observable in bucket |
| MW13 | 05/22/12 | 1220 | 13.24 | 1024 | 6.56 | 84 | 0.98 | -102.1 | Clear, colorless, odorless, little bit swirled organic sheen |
| MW14 | 05/22/12 | 1440 | 12.21 | 1249 | 6.54 | 863 | 0.71 | -101.1 | Colorless, odorless, water in bucket is slightly muddy |
| MW-15 | 11/27/12 | 1400 | 13.10 | 363 | 7.40 | >1000 | 8.18 | -38.3 | Colorless/no odor/turbid |
| MW-16 | 11/28/12 | 1530 | 12.58 | 669 | 7.06 | 449 | 1.30 | -76.3 | Colorless/no odor/turbid |
| PD-209A | 11/27/12 | 1205 | 11.47 | 591 | 7.01 | 24.0 | 1.14 | -91.9 | Colorless/clear/no odor/small amount biomass |
| PD-211 | 11/27/12 | 1045 | 10.84 | 492 | 6.64 | 34.0 | 1.86 | -92.8 | Clear, colorless/no odor/small amount light-colored biomass |
| 99-1 | 05/26/10 | 1200 | 12.90 | 415 | 6.92 | 5.62 | 0.32 | -58.8 | Clear, colorless/no odor |
| | 07/15/10 | 1210 | 14.21 | 406 | 6.68 | 5.00 | 0.22 | -144.6 | Clear, slight yellowish color, odorless |
| 99-2 | 05/27/10 | 1310 | 13.24 | 1201 | 6.52 | 17.6 | 0.29 | -31 | Clear, slight yellowish color, broken organic sheen /no odor |

Notes:
°C - degrees Celsius.
µs/cm - microsiemens per centimeter.
mg/L - milligram per liter.
mV - millivolts.
NTU - nephelometric turbidity units.

**Table 8**
**Analytical Results - Groundwater**
**Highway 99 Site**
USG Interiors
Milton, Washington

| Analyte | Sample I.D. and Sample Date | | | | | |
|---|---|---|---|---|---|---|
| | USGHWY99-MW1-05/10 | USGHWY99-MW2-05/10 | USGHWY99-MW3-05/10 | USGHWY99-MW4-05/10 | USGHWY99-MW0-05/10* | USGHWY99-MW5-05/10 |
| | 05/25/10 | 05/25/10 | 05/25/10 | 05/26/10 | 05/26/10 | 05/26/10 |
| **Dissolved Metals (µg/L)** | | | | | | |
| **EPA Methods 200.8/7060A/6010B** | | | | | | |
| Arsenic (7060A) | 630 | 34 | 780 ** | 1,030 ** | 1,060 ** | 1,090 |
| Iron | 4,290 | 1,560 | 29,900 ** | 31,500 ** | 32,000 ** | 5,070 |
| **Total Metals (µg/L)** | | | | | | |
| **EPA Method 200.8/7090A/6010B** | | | | | | |
| Arsenic (200.8) | -- | 64.2 | -- | -- | -- | -- |
| Arsenic (7060A) | -- | 79 | -- | -- | -- | -- |
| Calcium | 27,100 | 21,200 | 30,200 | 45,300 | 43,500 | 26,900 |
| Iron | 6,660 | 2,970 | 22,100 | 9,980 | 9,670 | 11,800 |
| Magnesium | 14,600 | 13,700 | 16,300 | 25,300 | 24,000 | 17,300 |
| Potassium | 2,830 | 3,120 | 4,910 | 6,240 | 5,840 | 3,860 |
| Sodium | 10,500 | 11,800 | 15,700 | 21,700 | 20,500 | 15,500 |
| **Arsenic Speciation (µg/L)** | | | | | | |
| Arsenic (III) | 455 | 45.9 | 267 | 1,350 | 1,260 | 1,410 |
| Arsenic (V) | 33.5 | 2.27 | 19.2 | 29.8 | 24.9 | 36.6 |
| **Conventionals** | | | | | | |
| Alkalinity (SM 2320; mg/L $CaCO_3$) | 152 | 142 | 175 | 264 | 269 | 178 |
| Carbonate (SM 2320; mg/L $CaCO_3$) | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Bicarbonate (SM 2320; mg/L $CaCO_3$) | 152 | 142 | 175 | 264 | 269 | 178 |
| Hydroxide (SM 2320; mg/L $CaCO_3$) | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Total Dissolved Solids (EPA 260.1; mg/L) | -- | -- | -- | | | |
| Total Suspended Solids (EPA 160.2; mg/L) | 2.7 | 5.7 | 24.4 | 11.6 | 10.3 | 28.5 |
| Chloride (EPA 300.0; mg/L) | 4.4 | 6.7 | 5.2 | 9.6 | 10.0 | 7.6 |
| N-Nitrate (EPA 300.0; mg-N/L) | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| N-Nitrite (EPA 300.0; mg-N/L) | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Sulfate (EPA 300.0; mg/L) | 2.8 | 6.5 | 14.7 | 2.5 | 2.6 | <0.1 |
| Chemical Oxygen Demand (EPA 410.4; mg/L) | 28.7 | 9.34 | 55.4 | 30.3 | 29.4 | 11.2 |
| Total Organic Carbon (EPA 415.1; mg/L) | 12.4 | 2.71 | 19.9 | 11.1 | 11.2 | 5.05 |

**Table 8**
**Analytical Results - Groundwater**
**Highway 99 Site**
USG Interiors
Milton, Washington

| | Sample I.D. and Sample Date | | | | | |
|---|---|---|---|---|---|---|
| | USGHWY99-MW6-05/10 | USGHWY99-MW7-05/10 | USGHWY99-MW8-05/10 | USGHWY99-MW9-05/10 | USGHWY99-99-1-05/10 | USGHWY99-99-2-05/10 |
| **Analyte** | 05/26/10 | 05/27/10 | 05/27/10 | 05/27/10 | 05/26/10 | 05/27/10 |
| **Dissolved Metals (µg/L)** | | | | | | |
| **EPA Methods 200.8/7060A/6010B** | | | | | | |
| Arsenic (7060A) | 310 | 10 | 13 | 44 | 2,490 ** | 410 |
| Iron | 6,200 | 1,800 | 980 | <50 | 6,340 ** | 45,700 |
| **Total Metals (µg/L)** | | | | | | |
| **EPA Method 200.8/7090A/6010B** | | | | | | |
| Arsenic (200.8) | -- | -- | 14 | -- | 2,220 | -- |
| Arsenic (7060A) | -- | -- | 15 | -- | 2,430 | -- |
| Calcium | 35,300 | 17,600 | 21,400 | 11,000 | 35,600 | 86,900 |
| Iron | 14,400 | 7,400 | 4,870 | 290 | 4,840 | 57,200 |
| Magnesium | 20,200 | 14,400 | 12,900 | 8,230 | 16,900 | 53,900 |
| Potassium | 3,490 | 6,000 | 7,640 | 6,590 | 4,290 | 7,510 |
| Sodium | 14,300 | 36,400 | 35,300 | 28,500 | 17,900 | 31,700 |
| **Arsenic Speciation (µg/L)** | | | | | | |
| Arsenic (III) | 351 | -- | -- | -- | 1,780 | 310 |
| Arsenic (V) | 16.5 | -- | -- | -- | 132 | 37.7 |
| **Conventionals** | | | | | | |
| Alkalinity (SM 2320; mg/L $CaCO_3$) | 207 | 196 | 205 | 118 | 193 | 561 |
| Carbonate (SM 2320; mg/L $CaCO_3$) | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Bicarbonate (SM 2320; mg/L $CaCO_3$) | 207 | 196 | 205 | 118 | 193 | 561 |
| Hydroxide (SM 2320; mg/L $CaCO_3$) | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Total Dissolved Solids (EPA 260.1; mg/L) | | | | | | |
| Total Suspended Solids (EPA 160.2; mg/L) | 41.5 | 22.2 | 18.1 | 4.3 | 9.9 | 50 |
| Chloride (EPA 300.0; mg/L) | 7.3 | 5.6 | 6.3 | 5.4 | 7.4 | 9.6 |
| N-Nitrate (EPA 300.0; mg-N/L) | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| N-Nitrite (EPA 300.0; mg-N/L) | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.5 |
| Sulfate (EPA 300.0; mg/L) | <0.1 | <0.1 | 0.2 | 7.5 | 1.6 | <0.1 |
| Chemical Oxygen Demand (EPA 410.4; mg/L) | 20.5 | 10.9 | 7.75 | 6.48 | 7.43 | 62.7 |
| Total Organic Carbon (EPA 415.1; mg/L) | 9.27 | 4.17 | 3.83 | <1.50 | 4.83 | 25.3 |

**Table 8**
**Analytical Results - Groundwater**
**Highway 99 Site**
USG Interiors
Milton, Washington

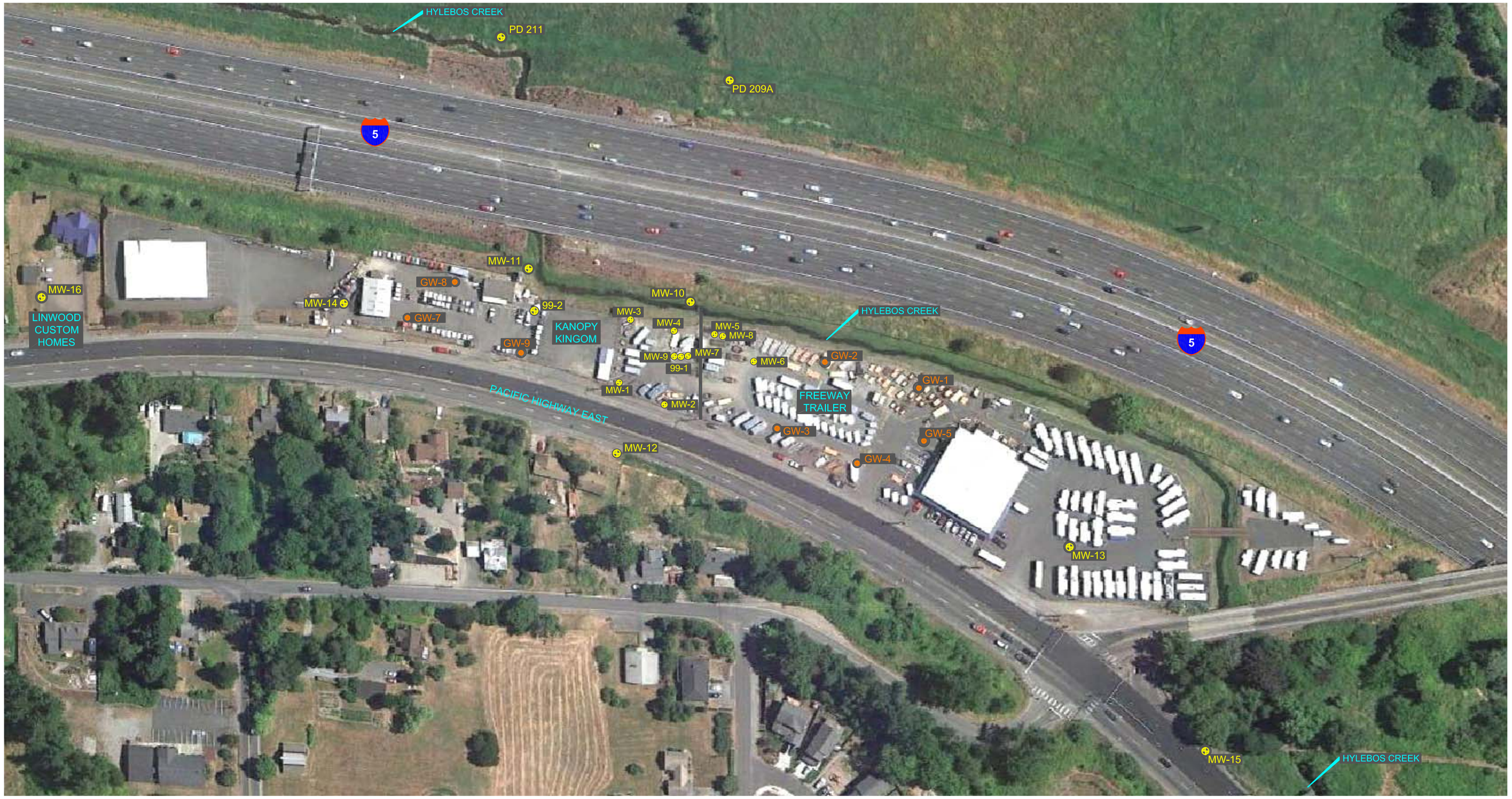
| | Sample I.D. and Sample Date | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GW-1 | GW-2 | GW-3 | GW-4 | GW-5 | GW-6 | GW-7 | GW-8 | GW-9 | MW10-10/11 | MW11-10/11 | MW12-05/12 | MW13-05/12 | MW14-05/12 |
| **Analyte** | 04/07/11 | 04/07/11 | 04/07/11 | 04/07/11 | 04/07/11 | 04/07/11 | 04/07/11 | 04/07/11 | 04/07/11 | 10/18/11 | 10/18/11 | 05/22/12 | 05/22/12 | 05/22/12 |
| **Dissolved Metals (µg/L)** | | | | | | | | | | | | | | |
| **EPA Method 6020** | | | | | | | | | | | | | | |
| Arsenic | 55 | 2.4 | 38 | 120 | 21 | 19 | <2 | 340 | 2.1 | 366 | 23.5 | 2.1 | 14.3 | 10.3 |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Total Metals (µg/L)** | | | | | | | | | | | | | | |
| **EPA Method 200.8/7090A/6010B** | | | | | | | | | | | | | | |
| Arsenic (200.8) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic (7060A) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Calcium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Magnesium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Potassium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Sodium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Arsenic Speciation (µg/L)** | | | | | | | | | | | | | | |
| Arsenic (III) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic (V) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Conventionals** | | | | | | | | | | | | | | |
| Alkalinity (SM 2320; mg/L $CaCO_3$) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Carbonate (SM 2320; mg/L $CaCO_3$) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Bicarbonate (SM 2320; mg/L $CaCO_3$) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Hydroxide (SM 2320; mg/L $CaCO_3$) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Dissolved Solids (EPA 260.1; mg/L) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Suspended Solids (EPA 160.2; mg/L) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chloride (EPA 300.0; mg/L) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| N-Nitrate (EPA 300.0; mg-N/L) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| N-Nitrite (EPA 300.0; mg-N/L) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Sulfate (EPA 300.0; mg/L) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chemical Oxygen Demand (EPA 410.4; mg/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Organic Carbon (EPA 415.1; mg/L) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

**Table 8**
**Analytical Results - Groundwater**
**Highway 99 Site**
USG Interiors
Milton, Washington

| Analyte | Sample I.D. and Sample Date | | | | |
|---|---|---|---|---|---|
| | MW-15 | MW-16 | PD-209A | PD-211 | PD-311*** |
| | 11/27/12 | 11/28/12 | 11/27/12 | 11/27/12 | 11/27/12 |
| **Dissolved Metals (µg/L)** | | | | | |
| **EPA Method 6020** | | | | | |
| Arsenic | 0.8 | 7.2 | 8.5 | 5.1 | 4.6 |
| Iron | -- | -- | -- | -- | -- |
| **Total Metals (µg/L)** | | | | | |
| **EPA Method 200.8/7090A/6010B** | | | | | |
| Arsenic (200.8) | -- | -- | -- | -- | -- |
| Arsenic (7060A) | -- | -- | -- | -- | -- |
| Calcium | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- |
| Magnesium | -- | -- | -- | -- | -- |
| Potassium | -- | -- | -- | -- | -- |
| Sodium | -- | -- | -- | -- | -- |
| **Arsenic Speciation (µg/L)** | | | | | |
| Arsenic (III) | -- | -- | -- | -- | -- |
| Arsenic (V) | -- | -- | -- | -- | -- |
| **Conventionals** | | | | | |
| Alkalinity (SM 2320; mg/L $CaCO_3$) | -- | -- | -- | -- | -- |
| Carbonate (SM 2320; mg/L $CaCO_3$) | -- | -- | -- | -- | -- |
| Bicarbonate (SM 2320; mg/L $CaCO_3$) | -- | -- | -- | -- | -- |
| Hydroxide (SM 2320; mg/L $CaCO_3$) | -- | -- | -- | -- | -- |
| Total Dissolved Solids (EPA 260.1; mg/L) | -- | -- | -- | -- | -- |
| Total Suspended Solids (EPA 160.2; mg/L) | -- | -- | -- | -- | -- |
| Chloride (EPA 300.0; mg/L) | -- | -- | -- | -- | -- |
| N-Nitrate (EPA 300.0; mg-N/L) | -- | -- | -- | -- | -- |
| N-Nitrite (EPA 300.0; mg-N/L) | -- | -- | -- | -- | -- |
| Sulfate (EPA 300.0; mg/L) | -- | -- | -- | -- | -- |
| Chemical Oxygen Demand (EPA 410.4; mg/L | -- | -- | -- | -- | -- |
| Total Organic Carbon (EPA 415.1; mg/L) | -- | -- | -- | -- | -- |

Notes:
*USGHWY-MW0-05/10 is a duplicate of USGHWY-MW4-05/10.
** Value from re-sampling on 7/15/10.
*** PD-311 is a duplicate of PD-211.
mg/L - milligrams per liter.
µg/L - micrograms per liter.
-- not analyzed.
< - analyte not detected at or greater than the listed concentration.

# Figures




REFERENCE: GOOGLE EARTH PRO, 2012, IMAGE DATE AUGUST 20, 2011

LEGEND:

MW-12 MONITORING WELL

GW-3 PHASE 2 DPT BORING

NOTE:

MONITORING WELL MW-14 WAS DRILLED AT THE LOCATION OF GW-6

N

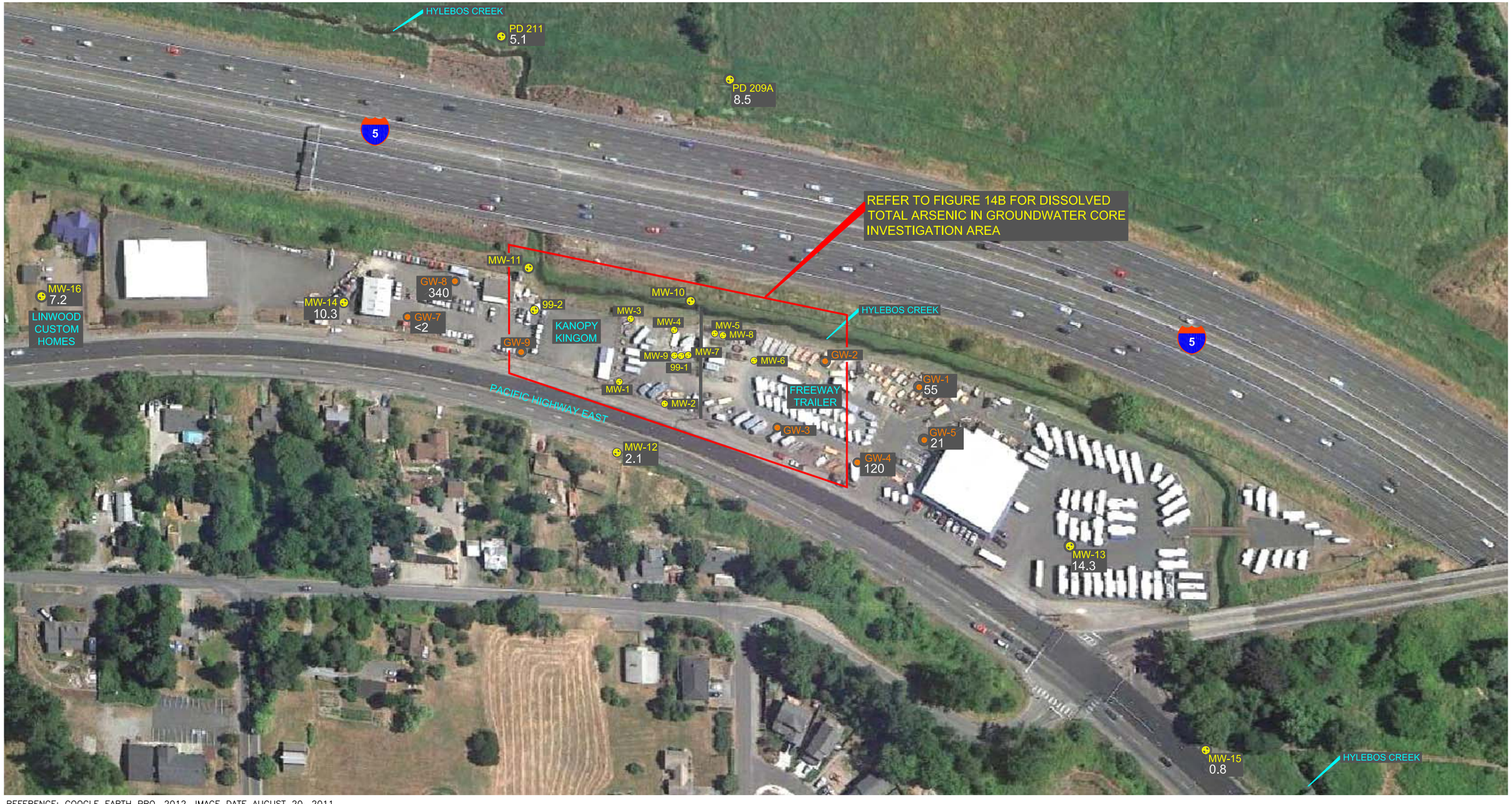
1" = 120'

60 0 120

CDM Smith

USG INTERIORS
HIGHWAY 99 SITE
MILTON, WASHINGTON

Figure No. 2A
Site Plan




REFERENCE: GOOGLE EARTH PRO, 2012, IMAGE DATE AUGUST 20, 2011

LEGEND:

MW-12 2.1 — MONITORING WELL AND DISOLVED TOTAL ARSENIC CONCENTRATION (ug/L)

GW-1 55 — PHASE 2 DPT BORING AND DISOLVED TOTAL ARSENIC CENCENTRATION (ug/L)

NOTE:

MONITORING WELL MW-14 WAS DRILLED AT THE LOCATION OF GW-6

N

1" = 120'

60 0 120

CDM Smith

USG INTERIORS
HIGHWAY 99 SITE
MILTON, WASHINGTON

Figure No. 14A
Dissolved Total Arsenic in Groundwater

LEGEND

MW–7 ⊕ MONITORING WELL LOCATION
A9 ⊙ SOIL BORING LOCATION
GP6 ● PHASE 1 DPT BORING JUNE 2006
SED–6C △ SEDIMENT SAMPLE LOCATION
SW 6 □ SURFACE WATER SAMPLE
E8 ○ SURFACE SOIL SAMPLE LOCATION
PHASE 2 DPT BORING APRIL 2011
– – – FENCE
——— TOPOGRAPHIC ELEVATION CONTOUR LINE

5

HYLEBOS CREEK

KANOPY KINGDOM

FREEWAY AUTO

FREEWAY TRAILER

CENTERLINE PACIFIC HIGHWAY E.

GATE

MW–1 MW–2 MW–3 MW–4 MW–5 MW–6 MW–7 MW–8 MW–9 MW–10 MW–11 MW–12
99–1 99–2
GP1 GP2 GP3 GP4 GP5 GP6 GP7 GP8
GW–2 GW–3 GW–4 GW–9
SW 2 SW 3 SW 4 SW 5 SW 6
SED–1C SED–1B SED–2C SED–2B SED–3C SED–3B SED–4C SED–4B SED–5C SED–5B SED–6C SED–6B SED–7C SED–7B
A4 A5 A6 A7 A8 A9 B2 B3 B4 B5 B6 B7 B8 C2 C4 C5 C7 C8 C9 C10 D1 D2 D3 D4 D5 D6 D7 D8 D9 E3 E4 E5 E6 E7 E8 GP9

TOTAL ARSENIC GRADIENT IN GROUNDWATER (ug/L)

600
500
400
300
200
100
0

1" = 40'
20 0 40

P:\19921\77628\Hylebros Creek\EXPANDED SITE\ FIG–14B 01/11/13 09:59 riehlepj XREFS: HC–11X17BD, HC–SITEBASE, FIG–14 PARTS

CDM Smith

USG INTERIORS/HIGHWAY 99 SITE
MILTON, WASHINGTON

Figure No. 14B
Dissolved Total Arsenic in Groundwater

# Appendix A
# Boring Logs and Well Construction Logs

FLOYD | SNIDER
strategy • science • engineering

# Boring Location: PD-211

**Drill Date:** August 18, 2008
**Logged By:** Lisa Meoli
**Drilled By:** Cascade Drilling
**Drill Type:** Geoprobe/Direct Push
**Sample Method:** Dual Tube
**Boring Diameter:** 2 inches
**Boring Depth (ft bgs):** 20.0 FT BGS
**Groundwater ATD (ft bgs):** 6 FT BGS

**Ground Surf Elev. & Datum:** 13.99 FT, NAVD 88
**Coordinate System:** NAD 83/98
**Latitude/Northing:** 703281
**Longitude/Easting:** 1185150
**Casing Elevation:** 16.77, FT NAVD 88

**Client:** B&L Custodial Trust
**Project:** B&L RIM
**Task Number:**
**Site Location:** B&L Woodwaste
Pierce County, WA

**Remarks:**

| SAMPLE ID | DRIVEN / RECOVERED | DEPTH FT BGS | USCS SYMBOL | SOIL DESCRIPTION AND OBSERVATIONS | WELL COMPLETION DETAIL (If Applicable) |
|---|---|---|---|---|---|
| | | 0–5 | | No recovery from ground surface to 5.5 FT BGS. | TOC; Concrete Surface Seal; Bentonite Seal; PVC Riser Pipe; Top of Sand Pack |
| | | 6–8 | ML-SM | Silty organic material with vegetation and roots. Grades to dark gray clayey SILT to silty SAND, very fine. | Top of Screen |
| | | 9–12 | SP | Dark gray, wet, SAND, fine<br>Grades to Dark gray, wet, SAND, fine to medium.<br>Grades to dark brown, wet, poorly-graded SAND, fine to medium, with red and white specks. | Sand Pack; PVC Screen |
| | | 15–16 | SM | Dark gray, wet, silty SAND, fine. | |
| | | 16–17 | ML | Dark gray, wet, clayey SILT (Aquitard material). | |
| | | 17–18 | PT | Dark brown, wet PEAT. | |
| | | 18–19 | ML | Gray, dry, clayey SILT with some vegetation | |
| | | 19–20 | ML-PT | Dark brown, interbedded PEAT and SILT. | |
| | | 20 | | Bottom of Excavation: 20.0 FT BGS | |

**Notes:**
FT BGS = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
= denotes groundwater table

# SOIL CLASSIFICATION LEGEND

| MAJOR DIVISIONS | | | | TYPICAL NAMES |
|---|---|---|---|---|
| COARSE GRAINED SOILS More than half is larger than No. 200 sieve | GRAVELS More than half coarse fraction is larger than No. 4 sieve size | Clean gravels with little or no fines | GW | Well graded gravels, gravel-sand mixtures |
| | | | GP | Poorly graded gravels, gravel-sand mixtures |
| | | Gravel with over 12% fines | GM | Silty gravels, gravel-sand-silt mixtures |
| | | | GC | Clayey gravels, gravel-sand-clay mixtures |
| | SANDS More than half coarse fraction is smaller than No. 4 sieve size | Clean sands with little or no fines | SW | Well graded sands, gravelly sands |
| | | | SP | Poorly graded sands, gravelly sands |
| | | Sands with over 12% fines | SM | Silty sand, sand-silt mixtures |
| | | | SC | Clayey sands, sand-clay mixtures |
| FINE GRAINED SOILS More than half is smaller than No. 200 sieve | SILTS AND CLAYS Liquid limit less than 50 | | ML | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity |
| | | | CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays |
| | | | OL | Organic clays and organic silty clays of low plasticity |
| | SILTS AND CLAYS Liquid limit greater than 50 | | MH | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts |
| | | | CH | Inorganic clays of high plasticity, fat clays |
| | | | OH | Organic clays of medium to high plasticity, organic silts |
| HIGHLY ORGANIC SOILS | | | PT | Peat and other highly organic soils |

## SAMPLE TYPE SYMBOLS

- Disturbed bag or jar sample
- Std. Penetration Test (2.0" OD)
- Type U Ring Sampler (3.25" OD)
- California Sampler (3.0" OD)
- Undisturbed Tube Sample
- Grab Sample
- Core Run
- Non-standard Penetration Test (with split spoon sampler)

## CONTACT BETWEEN UNITS

- Change in geologic unit
- Soil type change within geologic unit
- Obscure or gradational change

## DESCRIPTORS FOR SOIL STRATA AND STRUCTURE (ENGLISH/METRIC)

| General Thickness or Spacing | | Structure | | General Attitude | |
|---|---|---|---|---|---|
| Parting: | less than 1/16 in. (1/6 cm) | Pocket: | Erratic, discontinuous deposit of limited extent | Near horizontal: | 0 to 10 deg. |
| Seam: | 1/16 to 1/2 in. (1/6 to 1 1/4 cm) | Lens: | Lenticular deposit | Low angle: | 10 to 45 deg. |
| Layer: | 1/2 to 12 in. (1 1/4 to 30 1/2 cm) | Varved: | Alternating seams of silt and clay | High angle: | 45 to 80 deg. |
| Stratum: | > 12 in. (30 1/2 cm) | Laminated: | Alternating seams | Near Vertical: | 80 to 90 deg. |
| Scattered: | < 1 per ft. (30 1/2 cm) | Interbedded: | Alternating layers | | |
| Numerous: | > 1 per ft. (30 1/2 cm) | | | | |

## MOISTURE DESCRIPTION

Dry - Free of moisture, dusty

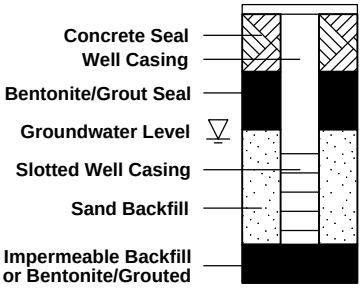
Moist - Damp but no visible free water

Wet - Visible free water, saturated

## STRUCTURE DESCRIPTION (cont.)

| | |
|---|---|
| Fractured | Breaks easily along definite fractured planes |
| Slickensided | Polished, glossy, fractured planes |
| Blocky, Diced | Breaks easily into small angular lumps |
| Sheared | Disturbed texture, mix of strengths |
| Homogeneous | Same color and appearance throughout |

## WELL COMPLETIONS




## RELATIVE DENSITY OR CONSISTENCY VS. SPT N-VALUE

| COARSE GRAINED | | | FINE GRAINED | | |
|---|---|---|---|---|---|
| Density | N (blows/ft) | Approx. Relative Density (%) | Consistency | N (blows/ft) | Approx. Undrained Shear Str. (psf) |
| Very Loose | 0 to 4 | 0 - 15 | Very Soft | 0 to 2 | <250 |
| Loose | 4 to 10 | 15 - 35 | Soft | 2 to 4 | 250 - 500 |
| Medium Dense | 10 to 30 | 35 - 65 | Medium Stiff | 4 to 8 | 500 - 1000 |
| Dense | 30 to 50 | 65 - 85 | Stiff | 8 to 15 | 1000 - 2000 |
| Very Dense | Over 50 | 85 - 100 | Very Stiff | 15 to 30 | 2000 - 4000 |
| | | | Hard | over 30 | >4000 |

## PHYSICAL PROPERTY TEST

| | |
|---|---|
| AL - | Atterberg Limits |
| FC - | Fines Content |
| GSD - | Grain Size Distribution |
| MC - | Moisture Content |
| MD - | Moisture Content/Dry Density |
| Comp - | Compaction Test (Proctor) |
| SG - | Specific Gravity |
| CBR - | California Bearing Ratio |
| RM - | Resilient Modulus |
| Perm - | Permeability |
| TXP - | Triaxial Permeability |
| Cons - | Consolidation |
| Chem - | Analytical Chemical Analysis |
| Corr - | Corrosion |
| VS - | Vane Shear |
| DS - | Direct Shear |
| UC - | Unconfined Compression |
| TX - | Triaxial Compression |
| UU - | Unconsolidated, Undrained |
| CU - | Consolidated, Undrained |
| CD - | Consolidated, Drained |

**Notes:**

1. Sample descriptions in this report are based on visual field and laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates, and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual classification methods in accordance with ASTM D 2488 were used as an identification guide. Where laboratory data are available, soil classifications are in general accordance with ASTM D 2487.

2. Dual symbols are used to indicate gravel and sand units with 5 to 12 percent fines.

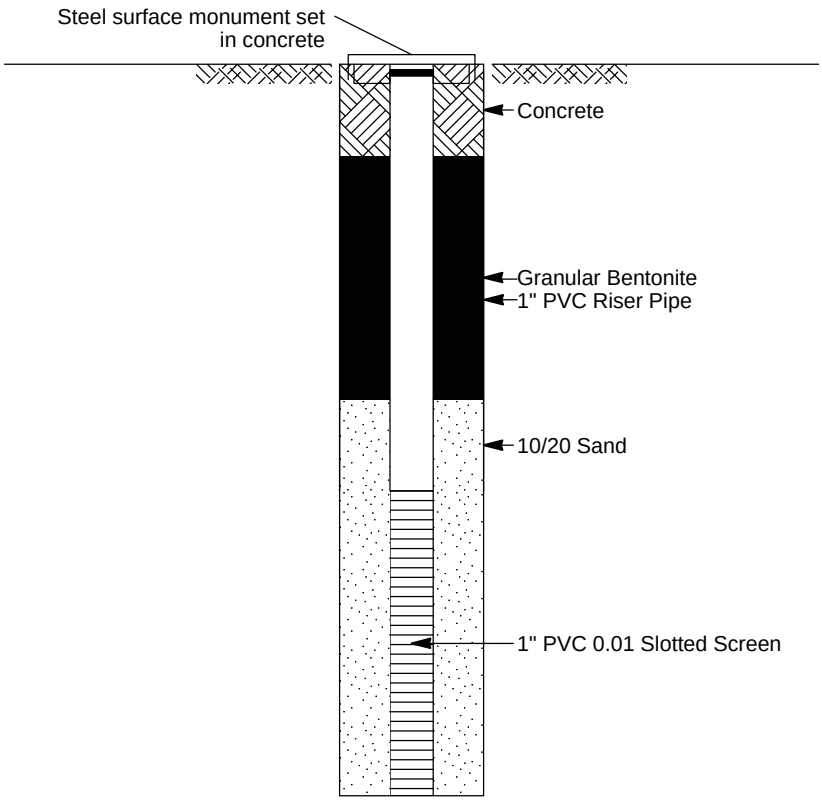
3. WOR = weight of rod.

CDM Smith

USG Interiors Inc.
Highway 99
Milton, Washington

Project No: 19921-77628 Figure: 1

SOIL CLASSIFICATION/LEGEND 19921-77628-MW15-MW16-NOV 2012.GPJ CDM_BLLV.GDT 1/14/13 REV.




MONITORING WELL CONSTRUCTION 19921-77628-MW15-MW16-NOV 2012.GPJ CDM_BLLV.GDT 1/11/13 REV.

CDM Smith

TYPICAL MONITORING WELL CONSTRUCTION

USG Interiors Inc.
Highway 99
Milton, Washington

Project No: 19921-77628 Figure: 2
1 of 1

# Boring Log MW-15

| Other Tests | Sample No. | Moisture Content (%) | Dry Density (pcf) | OVM (ppm) | Penetration Resistance (blows / foot) | Depth (feet) | Sample | USCS | Symbol | DESCRIPTION | Elev. (feet) | Well or Piezometer Completion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 0 | | | | 3" Asphalt. | | |
| | | | | | | | | SM | | Gravelly, Silty SAND (SM), brown, fine to coarse sand, with fine to coarse gravel and silt, dense, moist (Fill). | | |
| | | | | | | 2 | | | | | | |
| | | | | | | | | | | Sandy SILT (ML), light brown with fine sand and some fine gravel, stiff, wet. | | |
| | | | | | | 4 | | ML | | | | |
| | | | | | | 6 | | | | | | |
| | | | | | | | | | | Silty SAND (SM), brown, fine to coarse sand with silt and some fine to coarse gravel, dense, saturated. | | |
| | | | | | | 8 | | | | | | |
| | | | | | | | | SM | | Increasing silt, becomes wet. | | |
| | | | | | | 10 ▽ | | | | Becomes saturated at 10 ft bgs. | | |
| | | | | | | | | | | Increasing fine gravel, decreasing silt. | | |
| | | | | | | 12 | | | | Boring terminated at 12 ft bgs. Groundwater encountered at 10 ft bgs. | | |
| | | | | | | 14 | | | | | | |
| | | | | | | 16 | | | | | | |
| | | | | | | 18 | | | | | | |
| | | | | | | 20 | | | | | | |

Location: _____
Surface Elevation: _____
Logged By: AW

Drill Rig: Track Mounted DPT
Equipment/Hammer: 2" Macrocore/NA
Date Completed: 11-20-12

USG Interiors Inc.
Highway 99
Milton, Washington

CDM Smith

Boring Log MW-15
Project No: 19921-77628

Figure: 3
1 of 1

LOG OF BORING WITH WELL 19921-77628-MW15-MW16-NOV 2012.GPJ CDM_BLLV.GDT 1/14/13 REV.

# Boring Log MW-16

| Other Tests | Sample No. | Moisture Content (%) | Dry Density (pcf) | OVM (ppm) | Penetration Resistance (blows / foot) | Depth (feet) | Sample | USCS | Symbol | DESCRIPTION | Elev. (feet) | Well or Piezometer Completion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 0 | | ML | | Sandy SILT (ML), light-brown, with fine sand, stiff, moist, organic material (rootlets), (Fill). | | |
| | | | | | | 2 | | | | | | |
| | | | | | | 4 | | SP-SM | | Slightly Silty SAND (SP-SM), tan and olive-gray, poorly graded medium sand, note pieces of mineral wool insulation. | | |
| | | | | | | 6 | | | | | | |
| | | | | | | 8 | | | | Becomes dark gray with increased mineral wool insulation, slag noted. | | |
| | | | | | | 10 | | | | | | |
| | | | | | | 12 | | | | Becomes saturated at 12 ft bgs. | | |
| | | | | | | 14 | | ML | | Clayey SILT (ML), gray, some fine sand and fine to coarse gravel, stiff, wet, rootlets present, medium plasticity. | | |
| | | | | | | 16 | | | | Becomes hard. | | |
| | | | | | | 18 | | SM | | Silty SAND (SM), gray, fine to medium sand, saturated. | | |
| | | | | | | | | ML | | Sandy SILT (ML), gray, some fine sand and fine to coarse rounded gravel, stiff, wet. | | |
| | | | | | | 20 | | | | Boring terminated at 10 ft bgs. Groundwater encountered at 12 ft bgs. | | |

Location: _____
Surface Elevation: _____
Logged By: AW

Drill Rig: Track Mounted DPT
Equipment/Hammer: 2" and 3" Macrocore/NA
Date Completed: 11-20-12

CDM Smith

USG Interiors Inc.
Highway 99
Milton, Washington

Boring Log MW-16
Project No: 19921-77628

Figure: 4
1 of 1

LOG OF BORING WITH WELL 19921-77628-MW15-MW16-NOV 2012.GPJ CDM_BLLV.GDT 1/14/13 REV.

# Appendix B
# Analytical Laboratory Reports – Supplemental Groundwater Assessment