# GROUNDWATER MONITORING WORK PLAN - FINAL
## Chelan Chevron Site
## (Cleanup Site ID: 6660)
## Chelan, Washington

**March 23, 2022**

**Prepared for:**
**Washington State Department of Ecology**
**1250 West Alder Street**
**Union Gap, Washington 98903**

**Prepared by:**
**Leidos, Inc.**
**11824 North Creek Parkway N, Suite 101**
**Bothell, Washington 98011**

**On Behalf of:**
**Resource Environmental, LLC**
**925 Salida Del Sol Drive**
**Paso Robles, California 93446**

leidos

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## TABLE OF CONTENTS



## FIGURES



## TABLES



## APPENDICES

**GROUNDWATER MONITORING WORK PLAN - FINAL**
**CHELAN CHEVRON SITE**

# 1. INTRODUCTION AND OBJECTIVES

Leidos, Inc. (Leidos), has prepared this work plan on behalf of Resource Environmental, LLC (RELLC), an environmental service provider to Chevron Environmental Management and Real Estate Company (Chevron), for groundwater monitoring activities to be conducted at the Chelan Chevron Site (the Site), in Chelan, Washington (Figure 1). This work is being performed in association with the requirements of Agreed Order No. DE 10629, which was entered into by Chevron and the Washington State Department of Ecology (Ecology) in June 2014 to enable selection of a cleanup action to address past releases of hazardous substances at the Site.

The objective of this work plan is to modify the current groundwater monitoring program to achieve better alignment with the Site data objectives, and to improve quality control and efficiency in groundwater monitoring data collection. It is expected that this work plan will be implemented on a trial basis during the 2022 calendar year, after which the results will be assessed to evaluate whether additional modifications are warranted.

# 2. BACKGROUND AND DATA OBJECTIVES

Current records for the Site indicate that groundwater monitoring activities have been performed on a generally continuous basis since 1992. During this period, the frequency of groundwater monitoring has varied, depending on the data needs for the Site. Groundwater monitoring activities have historically consisted of:

- Groundwater elevation gauging and light nonaqueous-phase liquid (LNAPL) gauging/bailing; and
- Groundwater sampling.

Going forward, historical and future groundwater monitoring results will be used to support the SRI and will be integral to evaluate progress made toward achievement of the site cleanup objectives.

## 2.1 PAST GROUNDWATER AND LNAPL GAUGING AND LNAPL RECOVERY

Groundwater elevation gauging has been performed to assess groundwater gradients and groundwater movement potential within two discrete water-bearing zones underlying the Site. The upper water-bearing zone has historically been referred to as the “shallow perched aquifer” or “shallow perched water-bearing zone” and the lower water-bearing zone has been referred to as the “deeper water-table aquifer”. These data are also compared with lake surface elevation data for Lake Chelan, which is supplied by the Chelan County Public Utilities District, to assess the potential for any hydraulic connection between the perched aquifer and Lake Chelan. Groundwater elevation data are also used, with groundwater sampling results, to assess changes in dissolved-phase concentrations of petroleum constituents in groundwater that may be associated with changes in groundwater elevation.

To date, LNAPL has been detected in 15 monitoring wells at the Site (Leidos, 2021). For these wells, groundwater elevation and LNAPL thickness data are also used to assess seasonal, and longer-term, changes in groundwater elevation and their impact on LNAPL occurrence and mobility, as well as changes in dissolved-phase concentrations of petroleum constituents in nearby groundwater.

Previously, LNAPL present in monitoring wells was routinely recovered by manual bailing to actively remove LNAPL from the Site, which was consistent with a component of the preferred alternative identified by the 2006 RI/FS Report (SAIC, 2006). This work was generally conducted on a monthly or quarterly basis but was later ceased in 2015 to facilitate LNAPL baildown testing that was conducted between 2015 and 2019 as part of the Supplemental Remedial Investigation (SRI). LNAPL bailing activities were not resumed after completion of the baildown testing activities, based on recommendations from Ecology to discontinue the use of absorbent socks and bailing methods to remove LNAPL (Ecology, 2016), apparently to facilitate further evaluation of diagnostic gauge plots of LNAPL and groundwater interface data for the Site.

## 2.2 PAST GROUNDWATER SAMPLING

Since 1992, groundwater sampling has been conducted to document the extent and concentrations of dissolved-phase petroleum impacts to groundwater at the Site. Past groundwater sampling has also been used to demonstrate that natural attenuation of these petroleum impacts is occurring (Leidos, 2018), and more recent sampling results have assisted in our identification of additional petroleum source areas impacting the Site.

Currently, groundwater sampling is performed to satisfy the following objectives:

1. Groundwater sampling results from monitoring well MW-23 are used to monitor for potential migration of dissolved-phase petroleum constituents in the westernmost portion of the Site;
2. Groundwater sampling results from monitoring wells MW-30, MW-31, and MW-37 are used to monitor for potential migration of dissolved-phase petroleum constituents to the deep water-table aquifer present beneath the Site;
3. Groundwater sampling results from monitoring wells MW-41, MW-42, and MW-43 are used to monitor for possible contributions of petroleum impacts from the active Shell and 76 service stations located to the east (upgradient) of the Site; and
4. Groundwater sampling results from 12 monitoring wells (MW-5, MW-6, MW-7, MW-8, MW-15, MW-17, MW-18, MW-28, MW-45, MW-46, RW-1, and RW-3) are currently used to monitor dissolved-phase petroleum constituent concentrations in portions of the shallow perched water-bearing zone that are known to be impacted.

Most recently, groundwater sampling was being performed on a semiannual basis at the 20 above-referenced monitoring well locations.

Groundwater sampling at the Site has been conducted using low-flow sampling techniques utilizing a bladder pump since 2004. Use of a bladder pump was required due to the depth to groundwater at the Site, which frequently exceeds the maximum depth that peristaltic pumps can be used (approximately 25 feet).

Currently, low-flow groundwater sampling is the most universally accepted procedure for collection of groundwater samples for environmental studies because it theoretically provides for collection of a very representative groundwater sample, while also minimizing purge-water waste generation. However, sample quality is still highly dependent on a technician's adherence to proper sampling procedures. Additionally, low-flow sampling with a bladder pump is highly susceptible to equipment cross-contamination issues, unless dedicated bladder pumps are used for each sampling well. However, use of dedicated bladder pumps is not common due to the associated capital costs.

# 3. PROPOSED SCOPE AND SCHEDULE FOR FUTURE GROUNDWATER MONITORING

The following subsections outline the proposed scope and schedule for future groundwater monitoring at the Site.

## 3.1 GROUNDWATER AND LNAPL GAUGING

There are no proposed changes to the scope or schedule for future groundwater elevation and LNAPL gauging activities. Gauging activities will continue to be conducted on a quarterly basis at 35 monitoring wells, as specified in Table 1[1]. Groundwater and LNAPL gauging will be performed as specified in the Sampling and Analysis Plan (SAP), which is included as Appendix A.

## 3.2 LNAPL RECOVERY

For monitoring wells containing measurable LNAPL thickness, Leidos proposes to reinstate LNAPL bailing activities on an annual basis. Performance of LNAPL recovery on an annual frequency will provide further active removal of LNAPL during completion of the SRI and Supplemental Feasibility Study process, while also providing additional data regarding LNAPL recovery back to equilibrium conditions in each of the monitoring wells containing LNAPL.

LNAPL recovery will be conducted at all monitoring wells containing measurable LNAPL, as specified in the SAP.

## 3.3 GROUNDWATER SAMPLING AND ANALYSIS

Groundwater sampling will continue to be conducted on a semiannual basis at the monitoring wells identified in Table 1. On the Chelan Chevron service station property, the number of monitoring wells to be sampled will be decreased from five to three, because data from multiple monitoring well locations is not required for the western portion of that property. Modifications to the groundwater sample collection and laboratory analytical methods are proposed, as further discussed in the following subsections.

Groundwater sampling field events are expected to be conducted during the first and third quarter of each calendar year.

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[1] Groundwater monitoring activities are no longer conducted at monitoring well MW-29 due to the location of this well in the south-bound travel lane of N. Sanders Street.

### 3.3.1 Groundwater Sample Collection

The groundwater sample collection method will be modified to use HydraSleeve Speedbag™ grab samplers (Speedbag Samplers), instead of collecting samples by low-flow sampling procedures using a bladder pump. The use of Speedbag Samplers is expected to improve the quality control of groundwater sample collection by eliminating the need for in-field decontamination of the bladder pump between sampling locations. Similar to low-flow sampling with a bladder pump, use of the Speedbag Samplers will allow collection of a sample from a targeted sampling depth that is representative of groundwater in the formation at equilibrium conditions.

Collection of groundwater samples using Speedbag Samplers will be performed as specified in the SAP.

### 3.3.2 Laboratory Analysis

Groundwater samples will be submitted to Pace Analytical for the following analyses:

- Total petroleum hydrocarbons as gasoline-range organics (GRO) by Method NWTPH-Gx;
- Total petroleum hydrocarbons as diesel-range organics (DRO) and total petroleum hydrocarbons as heavy-oil-range organics (HRO) by Method NWTPH-Dx without silica gel cleanup **(analysis for DRO and HRO by Method NWTPH-Dx with silica gel cleanup will no longer be performed)**;
- Benzene, toluene, ethylbenzene, and xylenes (BTEX) and ethylene dichloride (EDC) by USEPA Method 8260;
- Ethylene dibromide (EDB) by USEPA Method 8011; and
- Total lead by USEPA Method 6010.

Groundwater samples collected from monitoring wells MW-17, MW-46, and RW-1 will also be analyzed for tetrachloroethylene (PCE) and its daughter products trichloroethylene (TCE), and vinyl chloride by USEPA Method 8260[2].

Duplicate groundwater samples will be collected at a rate of one per sampling event and submitted for the above-referenced analyses to ensure QA/QC. Additional QA/QC samples will include one trip blank to accompany each sample cooler, and equipment rinse samples to verify equipment decontamination procedures. Equipment rinse sampling will be performed by collecting laboratory-supplied distilled water that has been used as the final rinse following equipment decontamination procedures. Equipment rinse samples will be collected at a rate of one per sampling equipment type used. Trip blank and equipment rinse QA/QC samples will be submitted for the following analysis:

- GRO by Ecology NWTPH-Gx;
- BTEX, MTBE, and EDC by USEPA Method 8260; and

[2] Laboratory analysis for PCE, TCE, and vinyl chloride will be limited to two rounds of groundwater sampling if the results of both rounds indicate that none of these analytes have been detected above their respective laboratory reporting limits, as specified in the QAPP (Appendix B).

- EDB by USEPA Method 8011.

# 4. REFERENCES

Ecology (2016). "Chelan Chevron Site Characterization Review." memorandum from C. San Juan to J. Mefford, May 18.

Leidos (2018). "Groundwater Monitoring Summary Report, December 2015 – December 2017, Chelan Chevron." June 22.

Leidos (2021). "2020 Groundwater Monitoring Summary Report, Chelan Chevron Site." August 27.

SAIC (2006). "Final Remedial Investigation / Feasibility Study Report, Chelan Service Station No. 9-6590." December.

**LIMITATIONS**

This technical document was prepared on behalf of RELLC and is intended for its sole use and for use by the local, state, or federal regulatory agency that the technical document was sent to by Leidos. Any other person or entity obtaining, using, or relying on this technical document hereby acknowledges that they do so at their own risk, and Leidos shall have no responsibility or liability for the consequences thereof.

Site history and background information provided in this technical document are based on sources that may include interviews with environmental regulatory agencies and property management personnel and a review of acquired environmental regulatory agency documents and property information obtained from RELLC and others. Leidos has not made, nor has it been asked to make, any independent investigation concerning the accuracy, reliability, or completeness of such information beyond that described in this technical document.

Recognizing reasonable limits of time and cost, this technical document cannot wholly eliminate uncertainty regarding the vertical and lateral extent of impacted environmental media.

Opinions and recommendations presented in this technical document apply only to site conditions and features as they existed at the time of Leidos site visits or site work and cannot be applied to conditions and features of which Leidos is unaware and has not had the opportunity to evaluate.

All sources of information on which Leidos has relied in making its conclusions (including direct field observations) are identified by reference in this technical document or in appendices attached to this technical document. Any information not listed by reference or in appendices has not been evaluated or relied on by Leidos in the context of this technical document. The conclusions, therefore, represent our professional opinion based on the identified sources of information.

# Figures:


Chelan Chevron Site
232 East Woodin Avenue
Chelan, Washington

FIGURE 1
Site Map

FILE NAME: Chelan_Site Map_2021.dwg

DATE: 08/09/2021

# Tables:

# Table 1
# Monitoring Wells Details Summary
# Chelan Chevron Site

| Monitoring Well ID | Well Casing Diameter (inches) | Boring Depth (feet bgs) | Top of Screen Depth (feet bgs) | Bottom of Screen Depth (feet bgs) | Length of Screened Interval (feet) | Screen Slot Size (inches) | Installation Date | Gauging | | LNAPL Recovery | Groundwater Sample Collection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | GW Only | GW/LNAPL | | |
| MW-2 | 4 | 30 | 14.5 | 24.5 | 10 | 0.020 | 12/1987 | Q | | | |
| MW-5 | 2 | 36 | 15 | 35 | 20 | 0.020 | 1/7/1992 | Q | | | S |
| MW-6 | 2 | 35.6 | 15 | 35 | 20 | 0.020 | 1/7/1992 | Q | | | |
| MW-7 | 2 | 35.1 | 15 | 35 | 20 | 0.020 | 1/6/1992 | | Q | A | S |
| MW-8 | 2 | 35.4 | 15 | 35 | 20 | 0.020 | 1/6/1992 | Q | | | S |
| MW-9 | 2 | 41.5 | 15 | 40 | 25 | 0.010 | 6/1/2001 | | Q | A | |
| MW-10 | 2 | 41.5 | 15 | 40 | 25 | 0.010 | 6/1/2001 | | Q | A | |
| MW-12 | 2 | 37 | 17 | 37 | 20 | 0.010 | 9/20/2001 | | Q | A | |
| MW-15 | 2 | 41.5 | 20 | 40 | 20 | 0.010 | 11/15/2001 | | Q | A | S |
| MW-16 | 2 | 51.5 | 25 | 50 | 25 | 0.010 | 11/15/2001 | | Q | A | |
| MW-17 | 2 | 41.5 | 20 | 40 | 20 | 0.010 | 6/12/2002 | Q | | | S |
| MW-18 | 2 | 41.5 | 20 | 40 | 20 | 0.010 | 6/12/2002 | Q | | | S |
| MW-19 | 2 | 41.5 | 20 | 40 | 20 | 0.010 | 6/13/2002 | | Q | A | |
| MW-21 | 2 | 41.5 | 15 | 40 | 25 | 0.010 | 3/3/2003 | | Q | A | |
| MW-22 | 2 | 41.5 | 15 | 40 | 25 | 0.010 | 3/3/2003 | | Q | A | |
| MW-23 | 2 | 41.5 | 15 | 40 | 25 | 0.010 | 3/3/2003 | Q | | | S |
| MW-25 | 4 | 51.5 | 20 | 50 | 30 | 0.010 | 3/3/2003 | | Q | A | |
| MW-27 | 2 | 41.5 | 15 | 40 | 25 | 0.010 | 3/3/2003 | | Q | A | |
| MW-28 | 2 | 41.5 | 15 | 40 | 25 | 0.010 | 3/3/2003 | Q | | | S |
| MW-29 | 2 | 41.5 | 15 | 40 | 25 | 0.010 | 3/3/2003 | Not Monitored due to Location in Right-of-Way | | | |
| MW-30 | 2 | 96.5 | 75 | 95 | 20 | 0.010 | 3/3/2003 | Q | | | S |
| MW-31 | 2 | 96.5 | 75 | 95 | 20 | 0.010 | 3/3/2003 | Q | | | S |
| MW-36 | 2 | 51.5 | 24.5 | 49.5 | 25 | 0.010 | 6/26/2003 | | Q | A | |
| MW-37 | 2 | 96 | 73.25 | 93.25 | 20 | 0.010 | 6/26/2003 | Q | | | S |
| MW-38 | 2 | 46 | 21 | 46 | 25 | 0.010 | 11/14/2016 | Q | | | S |
| MW-39 | 2 | 45 | 17 | 42 | 25 | 0.010 | 11/4/2016 | Q | | | S |
| MW-40 | 2 | 44 | 19 | 44 | 25 | 0.010 | 11/2/2018 | Q | | | S |
| MW-41 | 2 | 35 | 15 | 35 | 20 | 0.010 | 11/3/2018 | Q | | | S |
| MW-42 | 2 | 35 | 15 | 35 | 20 | 0.010 | 11/3/2018 | Q | | | S |
| MW-43 | 2 | 35 | 15 | 35 | 20 | 0.010 | 11/6/2018 | Q | | | S |
| MW-44 | 2 | 50 | 14 | 39 | 25 | 0.010 | 11/13/2018 | | Q | A | |
| MW-45 | 2 | 38 | 18 | 38 | 20 | 0.010 | 11/14/2018 | Q | | | S |
| MW-46 | 2 | 45 | 18 | 38 | 20 | 0.010 | 11/17/2018 | Q | | | S |
| RW-1 | 4 | 50 | 30 | 50 | 20 | 0.010 | 11/10/2018 | | Q | A | S |
| RW-2 | 4 | 49 | 24 | 49 | 25 | 0.010 | 11/9/2018 | | Q | A | |
| RW-3 | 4 | 50 | 15 | 40 | 25 | 0.010 | 11/7/2018 | Q | | | |

**Notes:**

A = Performed on an annual basis (when LNAPL is present)

Q = Performed on a quarterly basis

S = Performed on a semiannual basis (when sufficient water is present and LNAPL is not present)

# Appendix A:
# Sampling and Analysis Plan

**APPENDIX A**
**SAMPLING AND ANALYSIS PLAN**

**TABLE OF CONTENTS**



**ATTACHMENTS**

# APPENDIX A
# SAMPLING AND ANALYSIS PLAN

## 1 INTRODUCTION AND OBJECTIVES

This Sampling and Analysis Plan (SAP) has been prepared by Leidos for groundwater monitoring activities to be conducted at the Chelan Chevron Site (the Site) in Chelan, Washington.

The objective of the SAP is to establish and document procedures to facilitate consistent collection of groundwater monitoring data for the Site.

## 2 GENERAL FIELD AND SAMPLING PROCEDURES

### 2.1 HEALTH AND SAFETY

Groundwater monitoring and sampling field activities for the Site shall be performed according to the requirements of the current site-specific health and safety plan (HASP) for this scope of work. The Leidos Project Manager will ensure that field staff have been provided the most up-to-date HASP prior to the start of any field activities at the Site.

### 2.2 FIELD DOCUMENTATION

Field personnel will maintain detailed records of all field activities. These records will consist of information recorded in the field notebook, and other field forms.

A bound field notebook will be maintained by the Field Manager to provide a daily record of events. At the beginning of each daily entry, the following will be recorded:

- Date;
- Time;
- Weather and other site conditions;
- Field personnel present;
- List of on-site visitors and equipment; and
- Initials of the person making the entry.

Field notebook entries will be recorded in as much detail as necessary so that essential information is properly documented. All documentation in field notebooks will be in ink. If an error is made, corrections will be made by crossing a line through the error and entering the correct information. Corrections will be dated and initialed. No entries will be obliterated or rendered unreadable.

If sample locations cannot be indicated on field maps, a sample drawing of the location (not to scale) will be included in the notebook to provide an illustration of all sampling points relative to surrounding features.

The cover of each notebook used will contain:

- Project ID and book number;
- Start date and (eventually) end date; and
- A list of personnel that are authorized to record entries into the notebook.

Daily activities will be summarized in the field notebook. Entries in the notebook may include the following information for each sample date:

- Site identification;
- Location of sampling points;
- Description of sampling points;
- References to photographs (if applicable) and brief sketch of sampling points;
- Sample identification number;
- Number of samples collected;
- Time of sample collection;
- Reference to sample location map;
- Number of QA/QC samples collected and their labeled identifier;
- Sampler's name;
- Field observations;
- Sample distribution (i.e., split samples, analytical lab); and
- Any field measurements made that are not on field forms (e.g., PID readings).

### 2.3 SAMPLE CONTAINER PREPARATION

All sample collection containers used to implement the SAP will be laboratory cleaned as specified in the Quality Assurance Project Plan (QAPP) provided in Appendix B. The container type and preservative requirements will follow the specifications of the QAPP.

### 2.4 PROCEDURES TO PREVENT CROSS-CONTAMINATION

Personnel collecting environmental monitoring data and/or samples will take the following precautions to minimize sample contamination or cross-contamination between samples:

- New nitrile gloves will be used at each monitoring/sampling location.
- Sampling personnel will not touch the inside of sampling containers.
- Only equipment that has been properly decontaminated according to the procedures specified by the SAP, or new unwrapped equipment, will be used for environmental sample collection.

Immediately following the collection of the sample, the container will be sealed and the sample will be labeled and entered in the field notebook.

The sample will be preserved (if required) according to the directions of the QAPP.

## 3 GROUNDWATER AND LNAPL GAUGING PROCEDURES

In order to minimize variables that may impact groundwater and LNAPL fluid measurements, all fluid gauging activities should be completed within one workday, or alternatively, within the shortest timeframe practicable.

### 3.1 PRE-FIELD ACTIVITIES

The following pre-field activities will be completed prior to mobilization to the field for groundwater and LNAPL gauging:

- Past groundwater monitoring results for the Site will be reviewed and used to determine the sequence in which the monitoring wells will be gauged. Wells will be gauged from "cleanest to dirtiest" in order to minimize the potential for cross-contamination between monitoring well locations. The well list will include other well construction data, such as well depth and well screen interval that may assist the groundwater monitoring field activities.
- Electronic water level meters, oil-water interface probes, and PIDs to be used in the field will be checked to confirm proper function and battery power. Equipment with rechargeable batteries will be confirmed to be fully charged prior to field mobilization.

## 3.2 IN-FIELD PROCEDURES

1. Upon arrival at each sampling location, the time, general site conditions, monitoring well conditions, and other applicable field observations will be recorded.
2. The well box will be opened, and if necessary, accumulated surface water will be removed using a hand pump, disposable cup, or similar suitable device.
3. The locking well cap will be removed. Immediately following removal of the well cap, the following fluid interface measurements will be collected:
    - For wells that have not historically contained LNAPL, a previously decontaminated electronic water-level meter will be used to measure the depth-to-water (DTW) to the nearest 0.01 of a foot, relative to the marked reference point on the well casing. The measurement and time of measurement will be recorded.
    - For wells that have historically contained LNAPL, a previously decontaminated oil-water interface probe will be used to measure the depth-to-product (DTP) and DTW to the nearest 0.01 foot, relative to the marked reference point on the well casing. The measurements and time of measurement will be recorded.
4. Following these initial measurements, the well will be left open for a period of at least 5 minutes to allow fluid levels in the well to equilibrate with atmospheric conditions. After this time has elapsed, the fluid interface measurements will be repeated, and the new measurements will be compared to the previous measurements. This process will be repeated until the fluid interface measurements from two successive readings do not vary by more than 0.01 foot. All measurements, and the time of each measurement, will be recorded. The final fluid interface measurement(s) will be considered as the stabilized DTW (and DTP if applicable) measurement(s) for the monitoring well.
5. For monitoring wells that will not be bailed or sampled during the current monitoring event, the electronic water-level meter or oil-water interface probe will be used to measure the approximate bottom depth of the well. If noted, qualitative observations regarding the bottom condition of the well (such as a soft or hard bottom, or the presence of sediment on retrieved meter probe) will be recorded.

6. Following completion of groundwater/LNAPL gauging measurements, the monitoring well will be resealed and securely closed. If necessary, the locking well cap or well lock will be replaced.

# 4 LNAPL RECOVERY PROCEDURES

When conducted, LNAPL recovery activities will be performed in conjunction with groundwater and LNAPL gauging procedures described in Section 3.

## 4.1 RECOVERY FIELD EVENT SCHEDULING

Petroleum LNAPL is highly volatile and potentially flammable. Many of the monitoring wells containing LNAPL at the Chelan Chevron Site are located in close proximity to sidewalks, parking areas, and other public spaces. Therefore, when possible, LNAPL sampling activities should be performed during off-peak hours to minimize public exposure to these activities.

## 4.2 LNAPL RECOVERY BAILING

1. Approximately 6-mil thick Visqueen or equivalent plastic sheeting (approximately 25 square feet) will be placed over the monitoring well location and secured along the perimeter with sandbags or similar heavy objects. A hole (approximately 8 to 10 inches in diameter will be cut into the sheeting to allow access to the monitoring well. A stockpile of oil absorbent pads and heavy-duty paper towels will be placed nearby to address LNAPL drips from bailing and measuring equipment during the recovery process.
2. DTP and DTW measurements will be made as specified in Section 3.2 of the SAP to determine the beginning LNAPL thickness in the well.
3. LNAPL will be bailed from the well using a new or dedicated polyethylene bailer. Bailing will continue until no visible LNAPL, or until a minimal stable thickness, remains in the bailer. Bailed LNAPL and groundwater removed from the well will be placed into a translucent graduated bucket and allowed to divide into separate liquid phases. The approximate total volume of each liquid phase removed from the well (LNAPL and/or groundwater) will be recorded.
4. Following the completion of bailing activities, DTP and DTW measurements will be made again as specified in Section 3.2 of the SAP to determine the final LNAPL thickness in the well.
5. Following completion of the final LNAPL thickness measurements, the monitoring well will be resealed and securely closed. If necessary, the locking well cap or well lock will be replaced. If present, liquids on the Visqueen sheeting will be mopped up using absorbent pads or paper towels prior to demobilization from the sampling site.
6. Bailed LNAPL/groundwater fluids will be transferred to a bung-top, DOT-approved steel 55-gallon storage drum, which will be contained in a secondary storage containment basin on the Chelan Chevron service station property. The

drum will be properly labeled and managed according to the RELLC approved waste management plan for the project.

# 5 GROUNDWATER SAMPLING PROCEDURES

## 5.1 GROUNDWATER SAMPLE IDENTIFICATION AND LABELING

The sample designation protocols will be adhered to during the sample collection procedures to maintain sample data integrity. Each sample will be identified in the logbook and on the sample container label. The sample label will include the following information:

- Sampler's initials;
- Sample location number;
- Site identifier (WA02 for the Chelan Chevron Site);
- Date of sample collection; and
- Time of sample collection.

Groundwater samples will be designated with the number corresponding to the monitoring well ID number, the sample matrix ("W" for water), and the date that the sample was collected. Sample names will be created using the following format:

- MW-##-W-YYMMDD

QA/QC samples such as equipment rinse blanks, trip blanks, and duplicate samples will be labeled with unique sample identifiers and the date at which the sample was collected. A record of the QA/QC samples collected will be kept in the field notebook along with the COC. The following format will be used for QA/QC samples:

Equipment Rinse Blanks

- ER-#-W-YYMMDD

Trip Blanks

- TB-#-W-YYMMDD

Duplicate Samples

- DUP-#-W-YYMMDD

## 5.2 GROUNDWATER SAMPLE COLLECTION USING A HYDRASLEEVE SPEEDBAG™ GRAB SAMPLER

The following procedure applies specifically to groundwater sample collection performed using the HydraSleeve Speedbag™ grab sampler (Speedbag Sampler). The Speedbag Sampler was designed to allow immediate deployment and collection of a groundwater sample from a discrete sampling zone without waiting for well re-stabilization.

### 5.2.1 Required Supplies and Equipment

The following additional supplies and equipment will be necessary for groundwater sampling using a Speedbag Sampler:

- HydraSleeve 900 milliliter (ml) Speedbag Sampler – GSH510 (one per well to be sampled). Speedbag samplers are disposable (one-time use) sampling devices.
- HydraSleeve stainless steel spring clip – GSH300 (can be decontaminated between sampling locations and reused).
- HydraSleeve 8-ounce bottom weight – GSW305-C (can be decontaminated between sampling locations and reused).
- 1/4-inch diameter, or similar, braided nylon bailer cord.

### 5.2.2 Speedbag Sample Collection Procedure

1. Date and time of arrival at the sampling location, general site conditions, monitoring well conditions, and other applicable field observations will be recorded.
2. The well box will be opened, and if necessary, accumulated surface water will be removed using a hand pump, disposable cup, or equivalent device.
3. DTW measurements will be made as specified in Section 3.2 of the SAP to determine the stabilized DTW measurement for the monitoring well.
4. The monitoring well depth and screen interval specifications will be checked by review of well construction records and recent monitoring results. The target sampling depth will be determined by calculating the approximate midpoint of the saturated interval present in the screened interval.
    - For monitoring wells with screen intervals that are not completely submerged, the target sampling depth will be:

      ***(Depth to Bottom of Well Screen + Stabilized DTW)/2***

    - For monitoring wells with screen intervals that are completely submerged, the target sampling depth will be:

      ***(Depth to Bottom of Well Screen +Depth to Top of Well Screen)/2***

5. Sample bottles will be checked for conformance with the QAPP and labeled.
6. A new, unused, Speedbag Sampler will be removed from the manufacturer's packaging and assembled with a GSH300 stainless steel spring clip and GSW305-C 8-ounce bottom weight per the manufacturer's directions.
7. A new, or dedicated, length of approximately 1/4-inch braided nylon bailer cord (tether) will be securely attached to the stainless-steel spring clip. The tether should be long enough to reach the target sampling depth, with 5 to 10 feet of additional length to secure the upper end above the ground surface.
8. Using an appropriate measuring device, the Speedbag Sampler and tether assembly will be measured to locate the point on the tether that is equal in distance from the Speedbag Sampler check valve as the target sample depth. The tether will be marked or knotted at this point to create a depth reference point for the sample collection.

9. The Speedbag Sampler will be carefully lowered into the well casing to the desired sampling depth. During the lowering process, care will be taken to avoid quickly pulling up on, or raising, the tether, which could cause the Speedbag Sampler check valve to open.
10. Upon reaching the target sampling depth, the Speedbag Sampler will be cycled up and down (1 to 2 feet) 3 to 5 times. This cycling method will result in a sample interval from the top of the cycle to check valve at its resting point (see attached manufacturer's instructions for additional details).
11. The Speedbag Sampler will be retrieved from the monitoring well.
12. The Speedbag Sampler will be pierced using the discharge tube provided by the manufacturer to allow transfer of the sample to the sample bottles (see attached sample discharge procedure for additional details). Sample bottles will be filled in the following order:
    - 40 milliliter (mL) vials preserved with hydrochloric acid (HCL) for GRO analysis;
    - 40 mL vials preserved with HCL for BTEX analysis;
    - 40 mL vials preserved with HCL for DRO/HRO analysis;
    - 40 mL vials preserved with sodium thiosulfate for EDB analysis; and
    - 250 mL bottle preserved with nitric acid for total lead analysis.
13. Following sample completion, the monitoring well will be resealed and securely closed.

# 6 FIELD EQUIPMENT DECONTAMINATION PROCEDURES

Field equipment used during field monitoring and sampling activities will be decontaminated prior to use and between sample collection events to reduce the potential for the introduction of contamination and cross-contamination in accordance with the guidelines and procedures set forth in this document. These procedures are necessary to ensure quality control in decontamination of field equipment and to serve as a means to identify and correct potential errors in sample collection and sample handling procedures.

The decontamination fluids generated during decontamination procedures will be treated as though they are contaminated and will be contained in 55-gallon drums, marked and secured until a proper disposal method is developed and implemented based on analytical test results.

Decontamination of all non-disposable field sampling equipment, field instruments and sample containers will be conducted in a thorough and step-wise manner as described below. New, disposable nitrile gloves will be worn when handling clean sampling equipment and monitoring well construction materials to ensure that the equipment is not cross-contaminated.

### 6.1 MONITORING AND SAMPLING EQUIPMENT

All non-disposable sampling equipment will be decontaminated between each monitoring or sampling location. The decontamination procedure is provided as follows:

- Scrub with Liquinox and water to remove any visible dirt;
- Rinse thoroughly with potable water;
- Rinse with distilled water; and
- Store in a clean area or seal in a clean container or in aluminum foil.

## 7 INVESTIGATION-DERIVED WASTE MANAGEMENT PROCEDURES

This section provides an overview of the investigation-derived waste (IDW) management procedures for groundwater monitoring at the Site. Additional details regarding IDW management and disposal for the Site can be found in the RELLC approved waste management plan for the project.

### 7.1 ANTICIPATED IDW STREAMS

Groundwater monitoring activities at the Site are expected to generate the following regulated IDW streams.

- Petroleum Contact Water – PCW may be generated during monitoring well bailing or sampling activities, and in association with equipment decontamination procedures.
- LNAPL Waste – LNAPL waste may be generated by LNAPL recovery activities.

Non-regulated IDW will also be generated, including used monitoring and sampling supplies such as nitrile gloves, plastic sheeting, bailers/samplers, and related disposable items.

### 7.2 ON-SITE CONTAINERIZATION AND STORAGE

All regulated IDW will be containerized in 55-gallon Department of Transportation (DOT) approved drums.

- PCW will be placed in new, bung-top polyethylene drums. These drums will be stored in, or next to, the fenced storage area on the Chelan Chevron service station property. If PCW drums are expected to remain on-site during an extended period of below-freezing temperatures, these drums will be over-packed or stored in a secondary containment structure. **Based on previous investigation results, PCW is expected to be managed as non-hazardous waste material.**
- LNAPL waste will be placed in new, bung-top steel drums. LNAPL waste drums will be placed in a secondary containment container located on the Chelan Chevron service station property. **Based on previous investigation results, LNAPL waste is expected to be managed as a hazardous waste material.**

Each drum will be labeled immediately before waste is first placed into the container. The following information, at a minimum, will be written in indelible, waterproof ink on each label: container number, date of generation, facility address, generator contact information, and a brief description of the contents of the container. Each drum will be secured after every addition of waste and prior to departing the Site on each workday.

## 7.3 IDW DISPOSAL

Regulated IDW will be treated or disposed of offsite at a facility that is permitted to handle such waste. Regulated IDW will generally be disposed of soon after each monitoring or sampling event. However, PCW may be accumulated at the Site over the course of several field events if the quantities generated are minimal. LNAPL waste will be disposed of following completion of each annual LNAPL recovery event.

Non-regulated IDW, such as nitrile gloves, plastic sheeting, and bailers will be bagged and disposed as standard municipal waste.

# Attachments:
# Manufacturer's Instructions for Speedbag Sampler

SpeedBags are designed to allow a passive sample to be taken immediately after deployment, without waiting for the well to re-stabilize after installing the sampler.

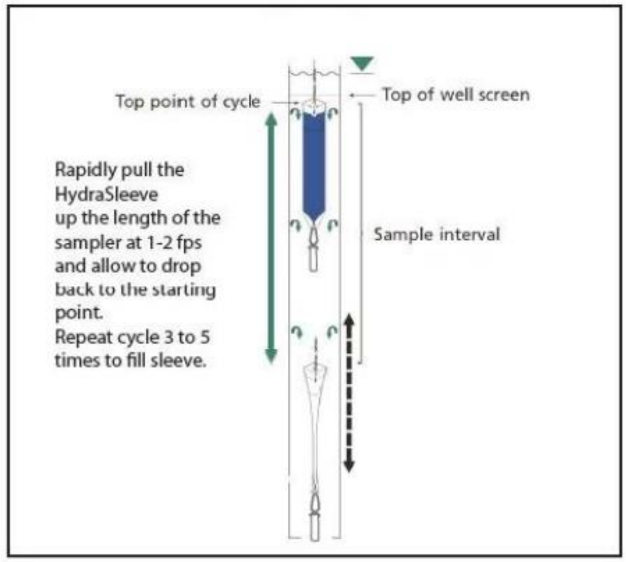
1. SpeedBag Specifications:
   a. GSH510: 37 inches long and 1.75" O.D. when full; they will hold approximately 900 mls of sample volume. **Must have 8 ft of saturated screen / Needs 8 oz bottom weight GSW305-C / Spring Clip GSH300
   b. GSH515: 30 inches long and 1.50" O.D. when full; they will hold approximately 500 mls of sample volume. **Must have 6 ft of saturated screen / Needs 5 oz bottom weight GSW304-C / Spring Clip GSH300
2. Results confirm that the SpeedBag can be deployed and recovered in a 2-inch schedule 40 well without waiting for the well to re-stabilize and will collect a formation quality sample from the well screen. Tests show that the SpeedBag will displace 1 inch of water when it is placed in the 2-inch, schedule 40 well (empty).
3. The SpeedBag collects a core sample of the column of water in well. As with the HydraSleeve, the water that first enters the SpeedBag will be at the bottom of the sleeve while the water that enters the SpeedBag at the top of the pull-stroke will be at the top of the SpeedBag. Sample water does not mix within the sleeves. Decant from the bottom for sinking contaminants; and from the middle or top for others.
4. IMPORTANT INFORMATION: **The SpeedBag will require an additional step when retrieving from the well. While the hole above the check valve allows water to flow past while the bag is being installed, it also does not allow for immediate full opening of the check valve on retrieval. To pop open the check valve, please be sure to pull up hard 1 to 2 feet once on the tether, let the assembly drop back down to the starting point, and then quickly recover the SpeedBag through the well screen to the surface. See attached page with instructions.**
5. **Basically: When using the SpeedBag you must pull up hard 1 to 2 feet once on the tether to pop open the check valve; let the assembly drop back down to the starting point, and then quickly recover through the well screen to the surface.**
6. A 900 mls sample can be collect from any open well ( 2-inch schedule 80 and larger)**remember to oscillate the Speedbag several times when using these in wells that are larger than 2-inch diameter.
7. These are not intended for any top weighted configurations.
8. **Must use a Spring Clip. GSH300**

**CYCLING THE SLEEVE**

Pull the sampler upward at about 1 to 2 feet or the length of the sampler and let it drop back to the starting point. Repeat the cycle 3 to 5 times.

This method provides a shorter sampling interval than the continuous pull method (above), and usually reduces the turbidity levels of the sample below that of numerous rapid, short cycles.

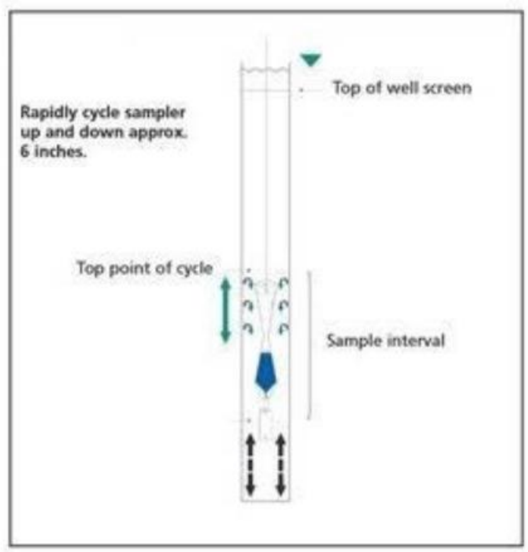
The sample comes from the top of the cycle to the check valve at it's resting point




**RAPID, SHORT CYCLES**

Cycle the HydraSleeve up and down using rapid, short strokes (6-inch cycle at a minimum of 1 cycle per second) 5 to 8 times. This method provides the shortest sampling interval. Dye studies have shown that when using this method the sample flows into the check valve from along the length of the sampler and immediately above the check valve.

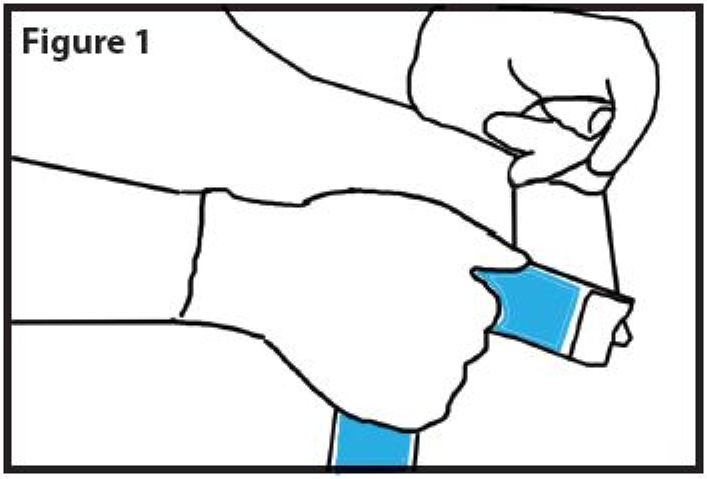
The sample interval is from the top of the cycle to the check valve at it's resting point



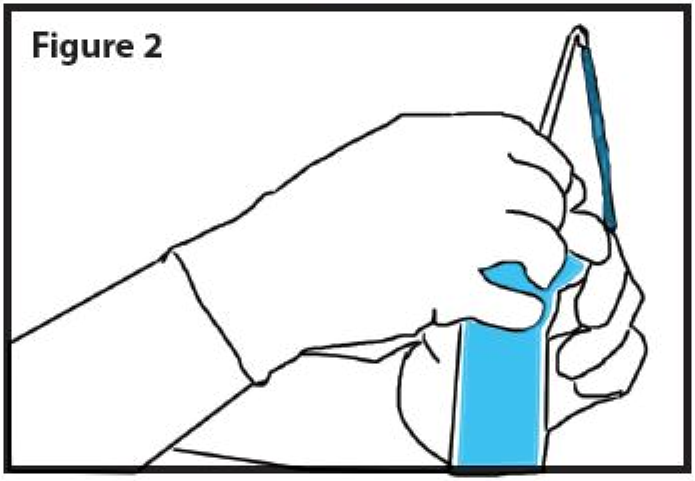
## Sample Discharge

The best way to remove a sample from the HydraSleeve with the least amount of aeration and agitation is with the short plastic discharge tube (included).

First, squeeze the full sampler just below the top to expel water resting above the flexible check valve. (**Fig. 1, top right**) Fold the stiffeners over to make sure all of the water is off the top of the check valve.

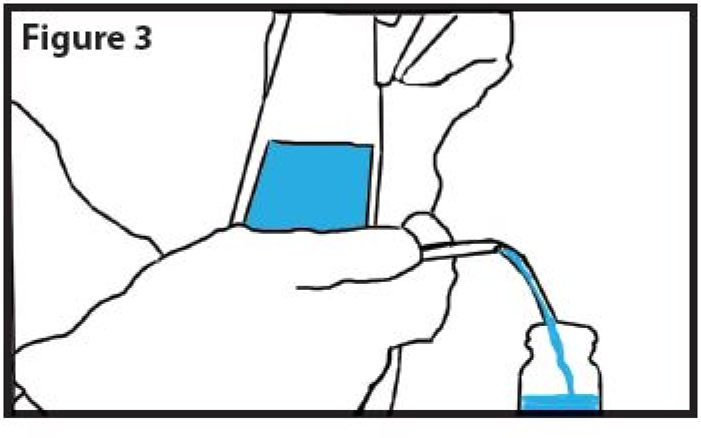



Then, push the pointed discharge tube through the outer polyethylene sleeve as desired but at least 3-4 inches below the white reinforcing strips. (**Fig. 2, middle right**)




***Note: For some contaminants (VOC's/sinkers) the best location for discharge is the middle to bottom of the sampler. This would be representative of the deeper portion of the well screen.***

Discharge the sample into the desired container. (**Fig. 3, bottom right**)




Raising and lowering the bottom of the sampler or pinching the sample sleeve just below the discharge tube will control the flow of the sample. The sample sleeve can also be squeezed, forcing fluid up through the discharge tube, similar to squeezing a tube of toothpaste. With a little practice, and using a flat surface to set the sample containers on, HydraSleeve sampling becomes a one-person operation.

# Appendix B:
# Quality Assurance Project Plan

# APPENDIX B
# QUALITY ASSURANCE PROJECT PLAN

## TABLE OF CONTENTS



## TABLES

# APPENDIX B
# QUALITY ASSURANCE PROJECT PLAN

## 1 INTRODUCTION AND OBJECTIVES

This Quality Assurance Project Plan (QAPP) has been prepared by Leidos for groundwater monitoring activities to be conducted at the Chelan Chevron Site (the Site) in Chelan, Washington.

The objective of the QAPP is to establish the practices and procedures necessary to ensure that groundwater monitoring data collected are of the type and quality needed for the project. The quality of data collected for the project must be documented in order to ensure that the data is scientifically and legally defensible.

## 2 PROJECT ORGANIZATION AND RESPONSIBILITY

Leidos is the lead project consultant, involved with sample collection and data generation. Key roles on this project are as follows:

**Project Manager – Leidos.** The project manager is responsible for the successful completion of all aspects of this project, including day-to-day management, production of reports, liaison with party and regulatory agencies, and coordination with the project team members. The project manager is also responsible for resolution of non-conformance issues, is the lead author on project plans and reports, and will provide regular, up-to-date progress reports and other requested information to the project team and Ecology. The project manager is responsible for developing the data quality objectives, selecting analytical methods, coordinating with the analytical laboratory, overseeing laboratory performance, and approving quality assurance (QA)/quality control (QC) procedures.

**Field Manager – Leidos.** The field manager is responsible for overseeing the field sampling program outlined in the work plan, including collecting representative samples and ensuring that they are handled properly prior to transfer of custody to the project laboratory. The field manager will manage procurement of necessary field supplies and assure that monitoring equipment is operational and calibrated in accordance with the specifications.

**Laboratory Project Manager.** The laboratory project manager is responsible for ensuring that all laboratory analytical work complies with project requirements and acting as a liaison with the project manager and field manager to fulfill project needs on the analytical laboratory work. This responsibility also applies to analyses that the laboratory subcontracts to another laboratory.

## 3 QUALITY ASSURANCE/QUALITY CONTROL FIELD PROCEDURES

The following QA/QC procedures will be utilized to ensure that accurate, reproducible, and defensible data is collected.

### 3.1 FIELD MONITORING EQUIPMENT CALIBRATION

All instruments and equipment used during sampling and analysis will be operated, calibrated, and maintained according to the manufacturer's guidelines. Operation, calibration, and maintenance will be performed by personnel properly trained in these procedures. Documentation of all routine and special maintenance and calibration conducted during the duration of the field activities will be recorded in the project logbook.

When used, photo-ionization detector (PID) calibration will be checked daily in the field in accordance with the manufacturer's recommended procedure using a laboratory-certified isobutylene gas standard. Calibration checks will be performed as necessary in the field using the calibration gas to verify that the instrument remains properly calibrated throughout the day.

### 3.2 SAMPLE COLLECTION

The specific methods for sample container size and type, sample preservation requirements and holding times are determined by the contact laboratory chosen for the project. The laboratory will provide the sample containers. Leidos will verify that the laboratory has supplied the proper containers and that they are shipped in sealed boxes.

All samples (with the exception of trip blanks) will be prepared and sealed in the field. Sample collection procedures, locations and protocols will be documented in a bound field notebook.

### 3.3 SAMPLE IDENTIFIERS AND LABELS

Sample identifiers and labels will be assigned by the sampling team as described in the SAP. The unique sample identifier will be clearly written on the sample label affixed to each sample container. Sample labels will be affixed to each sample container in such a way so as to not obscure any QA/QC lot numbers on the containers. Sample information will be printed clearly on each label. Field identification will be sufficient to enable cross-reference with the project field book.

### 3.4 QA/QC SAMPLING

QC data are necessary to determine precision and accuracy and to demonstrate the absence of interference and/or contamination of sampling equipment glassware and reagents, etc. Specific QC requirements for laboratory analyses will be the responsibility of the project laboratory. Field QC will include the following:

- **Trip Blanks** are blank samples prepared to assess ambient transport conditions. The contract laboratory will prepare the trip blanks. The blanks will be handled like a sample, with a field label, and shipped to the laboratory for analyses. One trip blank will accompany each sample cooler containing samples for volatile constituent analysis.
- **Equipment Rinsate Blanks** are blank samples designed to demonstrate that sampling equipment has been properly prepared and cleaned before field use and that cleaning procedures between samples are sufficient to minimize cross contamination. Rinsate blanks will be collected at a rate of one blank per sample collection method, or sampling equipment type, per field mobilization event.
- **Field Duplicate** samples consist of a set of two samples collected independently of one another at the same sampling location during the same sampling event. Field duplicate

samples will be submitted as blind samples to the laboratory. Field duplicates are designed to assess actual field variability, as compared to analytical duplicate or matrix spike/duplicate analyses which measure laboratory variability. Field duplicate samples will be collected at a rate of one for each 20 samples.

### 3.5 SAMPLE STORAGE

Samples will be stored per the requirements specified in attached Table B-1.

Samples that are required to be stored at 4°C will be stored in an ice chest while at the Site and during transportation to the laboratory. Samples will be sub-packed by sample location in new Ziploc plastic bags.

### 3.6 CHAIN OF CUSTODY RECORDS AND PROCEDURES

The primary objective of the chain of custody (COC) protocol is to provide an accurate written record that can trace the possession and handling of a sample from collection to the completion of all required analyses. A sample is in custody if it is in someone's possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel only.

The COC record will be fully completed in the field and signed by the sample collector.

### 3.7 CUSTODY SEALS

Custody seals will be used on all coolers and sample shipping containers. At least one seal will be affixed to each container, across the base of the lid. Seals will be signed and dated prior to use. Clear packing tape will be placed over each seal to ensure that seals are not accidentally broken during shipment.

### 3.8 FIELD CUSTODY PROCEDURES

The following guidance will be used to ensure proper control of samples while in the field:

- As few persons as possible will handle samples.
- The sample collector is personally responsible for the care and custody of samples collected until they are transferred to another authorized person or dispatched properly under COC protocols.
- The sample collector will record sample data in the field logbook.

When transferring custody (i.e., releasing samples to a shipping agent), the following will apply:

- The coolers in which the samples are packed will be sealed and accompanied by COC records. Separate COC records will accompany each shipment.
- When transferring custody of samples between individuals, the individuals relinquishing and receiving them (aside from commercial carrier) must sign, date and note the time on the COC record. This record documents sample custody transfer.
- When transferring custody of samples to a commercial carrier (e.g., FedEx or UPS) the individual relinquishing them must sign, date and note the time on the COC record and

record the method of shipment, name of courier, and shipment tracking information on the COC record.

- All shipments will be accompanied by COC records identifying their contents. The original record will accompany the shipment. The other copies will be provided to the Project Manager and copies will be retained in the project files.

# 4 LABORATORY ANALYTICAL METHODS

Table B-1 provides a summary of the laboratory analytical methods, associated sample containers, and storage requirements for samples to be collected in association with this QAPP.

## TABLE B-1
## Analytical Methods Details Summary for Groundwater Samples

| Analyte | Analytical Method | Laboratory Reporting Limit[1] (µg/L) | Method A Clean-Up Level (µg/L) | Sample Container / Preservative | Standard No. of Containers | Minimum No. of Containers | Sample Storage & Shipping Requirement | Holding Time |
|---|---|---|---|---|---|---|---|---|
| **Total Petroleum Hydrocarbons** | | | | | | | | |
| GRO | NWTPH-Gx | 100 | 800/1,000[2] | 40-mL VOA vial (HCL preserved) | 3 | 1 | Chill to 4°C | 14 days |
| DRO and HRO | NWTPH-Dx | 200 - DRO<br>250 - HRO | 500 | 40-mL VOA vial (HCL preserved) | 2 | 1 | Chill to 4°C | 14 days |
| **VOCs and Petroleum Fuel Additives/Blending Compounds** | | | | | | | | |
| Benzene | USEPA 8260 | 0.04 | 5 | 40-mL VOA vial (HCL preserved) | 3 | 1 | Chill to 4°C | 14 days |
| Ethylbenzene | | 0.1 | 700 | | | | | |
| Toluene | | 0.2 | 1,000 | | | | | |
| Total Xylenes | | 0.26 | 1,000 | | | | | |
| MTBE | | 0.04 | 20 | | | | | |
| EDC | | 0.1 | 5 | | | | | |
| PCE | | 0.1 | 5 | | | | | |
| TCE | | 0.04 | 5 | | | | | |
| Vinyl Chloride | | 0.1 | 0.2 | | | | | |
| EDB[3] | USEPA 8011 | 0.02<br>(MDL = 0.005360) | 0.01 | 40-mL VOA vial (sodium thiosulfate preserved) | 2 | 1 | Chill to 4°C | 14 days |
| **Metals** | | | | | | | | |
| Total Lead | USEPA 6010 | 5.00 | 15 | 250-mL bottle (nitric acid preserved) | 1 | 0.5 | Chill to 4°C | 6 months |

**Notes:**
DRO = Diesel-range hydrocarbons
EDB = Ethylene dibromide
EDC = Ethylene dichloride
GRO = Gasoline-range hydrocarbons
HCL = Hydrochloric acid
HRO = Heavy-oil-range hydrocarbons
MDL = Method detection limit
MTBE = Methyl tert-butyl ether
µg/L = Micrograms per liter
PCE = Tetrachloroethylene
TCE = Trichloroethylene
USEPA = United States Environmental Protection Agency
VOCs = Volatile organic compounds
[1] = Laboratory Reporting Limits provided by Pace Analytical Laboratories for the analytes listed
[2] = Benzene present/benzene absent
[3] = Laboratory reporting limit for this analyte is not low enough to demonstrate compliance with Method A clean-up level; therefore, estimated values reported down to the method detection limit will be used.