



engineering | architecture | environmental | surveying  
landscape architecture | planning | economic development

1695 Bellevue Street  
Green Bay, WI 54311-4251  
920-491-9081  
800-472-7372  
FAX 920-491-9020  
www.cedarcorp.com

## **Site Investigation Work Plan**

For

**Former Johnson Cleaners**

**102/104 S. Knowles Ave.**

**New Richmond, WI**

BRRTS #02-56-584077

DNR FID# 656045500

February 2020

Prepared by:

Cedar Corporation

604 Wilson Ave

Menomonie, WI

CC Project #J6204-0002

# Table of Contents

Description	Page
A. INTRODUCTION .....	1
B. SITE DESCRIPTION.....	2
B.1. Location and Land Use .....	2
B.2. Impact to Receptors .....	2
B.3. Impact to Public or Private Water Supplies .....	2
C. TOPOGRAPHY AND GEOLOGY .....	2
C.1. Surface Water Drainage .....	2
C.2. Regional Soils and Bedrock Geology .....	2
C.3. Regional Hydrogeology .....	2
D. SCOPE OF WORK.....	3
E. SOIL EVALUATION.....	3
E.1. Soil Screening .....	3
E.2. Soil Sampling .....	4
F. GROUNDWATER EVALUATION .....	4
F.1. Monitoring Well Construction.....	5
F.2. Monitoring Well Development.....	5
F.3. Groundwater Sampling .....	5
G. ANALYTICAL PROCEDURES .....	5
H. INVESTIGATIVE WASTES .....	6
I. SCHEDULE.....	6

## FIGURES

Figure 1 – Proposed Soil Boring/Monitoring Well Locations

## APPENDICES

Appendix A - Standard Operating Procedures

Appendix B – Indoor Air Sampling Results

## **A. INTRODUCTION**

To assess the environmental conditions at the site, additional subsurface investigation has been requested by the Wisconsin Department of Natural Resources (WDNR) on the former Johnson Cleaners property. Additional work is needed to determine the degree and extent of petroleum impacts to the property.

### **Site**

Former Johnson Cleaners  
102-104 S. Knowles Avenue  
New Richmond, WI 54017  
WDNR BRRTS #02-56-584077

### **Legal Description:**

W 70' of Lot 10, Block 9, Gridley Addition.  
PID: 261-1059-80-000

### **Contact**

William Johnson, Michael Johnson  
320 S. Green Avenue  
New Richmond, WI 54017  
Phone: 612-819-7304

### **Consultant Contact**

Cedar Corporation  
Contact: Matt Taylor  
604 Wilson Avenue  
Menomonie, WI 54751  
Phone: 715-235-9081

### **Regulatory Representative**

Candace Sykora  
WisDNR  
890 Spruce Street  
Baldwin, WI 54002  
Phone: 715-684-2914, x.134

To determine the degree and extent of environmental impacts at this location in accordance with the WDNR Spill Statute 292.11 and Wis. Adm. Code NR700 and NR 749, an environmental investigation will be necessary. This work plan is meant to identify the procedures, sample locations, and protocols needed to define the extent and magnitude of soil, vapor and groundwater impacts, if present, at the former Johnson Cleaners site for William Johnson (RP).

The RP will conduct this phase of investigation and prepare a Site Investigation Report and, if warranted, a Remedial Action Plan in accordance with Wis. Adm. Code NR716 and NR722. If further investigations are not necessary, appropriate remedial actions that will satisfy the requirements of Wis. Adm. Code NR722.07 and NR140.24(2), Wis. Adm. Code will be presented.

The RP will evaluate remediation alternatives in terms of successfully restoring the subsurface environment and protecting potential receptors.

The investigation will focus on identifying the extent of petroleum impacts to groundwater through the construction of 4 monitoring wells (1 on the source property, 3 off-site in the City of Richmond rights-of-way (Figure 1). All work will be completed within existing Wis. Adm. Code NR 500, NR 600, and NR 700.

## **B. SITE DESCRIPTION**

### **B.1. Location and Land Use**

The project area consists of the former Johnson Cleaners property located at 102-104 S. Knowles Avenue, New Richmond WI. The property was historically operated as a gas station and subsequently a dry cleaner facility.

### **B.2. Impact to Receptors**

The potential for environmental impacts was reviewed as required by NR716.07. Based on the results of the Phase II and the type of material released, it does appear there is a potential for impacts to regional groundwater.

### **B.3. Impact to Public or Private Water Supplies**

The depth to regional groundwater is estimated to be 14 feet bgs (below ground surface). The potential from the release to impact the groundwater is considered high. There is one municipal well (City of New Richmond Well #2) in close proximity to the release, though the well is in a presumed side- or up-gradient location relative to the site.

## **C. TOPOGRAPHY AND GEOLOGY**

### **C.1. Surface Water Drainage**

The site is situated on a relatively flat area near the intersection of S. Knowles Ave and E. 1st Street in downtown New Richmond, WI. Surface water at the site discharges to City storm sewer.

### **C.2. Regional Soils and Bedrock Geology**

The majority of the subsurface underlying the site is composed of sand with gravel or fill. The Bedrock Geology of Wisconsin Map indicates Ordovician Age dolomite of the Prairie du Chien Group underlies the sands. Bedrock is anticipated to be approximately 20 feet.

### **C.3. Regional Hydrogeology**

Groundwater flow observed as flowing north-northwest toward the Willow River. Groundwater was encountered at approximately 14 feet bgs during a Phase II Environmental Site Assessment completed in May 2019.

## **D. SCOPE OF WORK**

The following scope of work is proposed:

- Collect indoor air samples using SUMMA canisters to evaluate whether previously reported levels of subslab TCE impact indoor air quality. This portion of the scope of work has been completed, and results of the indoor air sampling are included in Appendix B.
- Advance 4 soil borings using hollow-stem auger drilling methods. Continuous split-spoon sampling will be conducted in each of the borings. The anticipated depth for borings where monitoring wells are proposed is 20 feet below ground surface (bgs).
- Conduct field screening and logging of soils during drilling activities. In addition, soil samples will be collected for laboratory analysis. Proposed sampling intervals and parameters are discussed in Section E.2.;
- Construct monitoring wells in all four of the proposed boring locations. Details regarding the construction of the wells can be found in Section F.1.;
- Develop four monitoring wells, protocol discussed in Section F.2.;
- Sample cuttings from drilling activities for waste disposal characterization;
- Collect groundwater elevation data and samples for laboratory analysis. Two-four rounds of groundwater sampling are proposed (8-16 samples);
- Evaluate indoor air quality off-site as needed;
- Prepare and submit a Site Investigative Report following NR 716.15, including tabulated sample results as well as groundwater flow and isoconcentration maps.

## **E. SOIL EVALUATION**

During the completion of each borehole soil samples will be collected for laboratory analysis, documentation of physical characteristics, and field screening. Soil boring logs will be completed for each soil boring and will include field screening results and intervals collected for laboratory analysis. Soil sampling will be conducted using those protocols outlined in Appendix A – Standard Operating Procedures. The investigation will include the construction and sampling of approximately four hollow-stem auger borings at the site to a depth of 20 feet bgs. Borings will be completed at locations shown on Figure 1. (Boring locations off-site were approved by the City of New Richmond Park Board on Dec. 11, 2019.)

### **E.1. Soil Screening**

Soil samples will be collected continuously from the ground surface to the base of each borehole. Soil samples will be logged for geological description, field screened for volatile compounds, and split for laboratory analyses as needed to define the extent and degree of

contamination. If the extent of contamination extends beyond the proposed scope, Cedar Corporation will confer with the RP and WDNR prior to proceeding.

Soil samples will be retrieved from the boring and immediately prepared for field screening and/or laboratory analysis. All samples will be field screened using accepted and regularly used methods. Field screening will employ the standard "headspace" method wherein a measure of total volatile organic compounds is made using a photoionization detector (PID) with a 10.6 eV ionization lamp (Appendix A). Headspace readings will be noted on the boring logs.

The proposed location of soil borings/samples is indicated on Figure 1.

Soil samples will be collected for field screening where odor suggests contamination is present. If no indications of contamination are observed, soil samples will be collected at a minimum of:

- one sample in the upper 4 feet of depth and,
- one sample at the soil/groundwater interface.

## **E.2. Soil Sampling**

Laboratory analyses will be employed to document the extent and magnitude of soil contamination. These analyses will be performed by a third party subcontracted analytical laboratory certified by the WDNR under Wis. Adm. Code NR 149. The methods employed shall be according to the procedures specified in Wis. Adm. Code NR 716.13 and "SW-846: Test Methods for Evaluating Solid Waste," and all subsequent updates published by the United States Environmental Protection Agency (U.S. EPA) WDNR.

A minimum of two soil samples from each boring will be laboratory analyzed. In view of the nature of the identified environmental impacts, the WDNR has determined that soil and groundwater samples be tested for the compounds listed in this work plan.

It is anticipated that two-three soil samples will be collected for laboratory analyses from each borehole (8-12 samples total) at the following intervals:

- Within the upper 0-4 feet;
- At the highest field screening result, or, midpoint of the boring if signs of contamination are observed;
- At the soil/groundwater interface.

## **F. GROUNDWATER EVALUATION**

Monitoring wells will be constructed in all four anticipated soil borings in accordance with WDNR Admin. Code NR 141. Proposed well locations are presented on Figure 1. Anticipated depth to groundwater is approximately 14 feet bgs. Screened intervals will be across the water table. Screens that are 10 feet in length will be utilized.

### **F.1. Monitoring Well Construction**

Well construction material will consist of 2-inch diameter, schedule-40 PVC well casing and screen. Well screen slot size will be 0.010 inches (10-slot). Filter pack material will be well-graded clean sand compatible with the size of the well screen (e.g., Red Flint #40). Bentonite seal will be placed above the filter pack and consist of bentonite chips added to the annulus.

### **F.2. Monitoring Well Development**

Monitoring wells will be developed to facilitate collection of a sediment-free sample and to improve hydraulic connection with the surrounding aquifer. Development will be initially conducted using a bailer to remove sediment. Surging will be conducted slowly to flush the filter pack of fine sediment. It is anticipated that a submersible pump will be utilized to continue development after using a bailer. During development, Cedar Corporation personnel will monitor turbidity and other water quality parameters, if warranted. Well development will proceed until 10 well casing volumes have been removed, or, if development results in wells going dry, wells will be pumped dry and allowed to recharge three times.

Water levels will be measured using a water level indicator prior to and after development, as well as before subsequent sampling efforts are conducted.

### **F.3. Groundwater Sampling**

Following development, two rounds of groundwater sampling will be conducted for laboratory analysis. It is anticipated that groundwater samples will be collected using a bailer. Prior to sample collection, monitoring wells will be purged allowing new water to flow into the screened interval. Groundwater samples collected during the investigation will be analyzed for VOCs.

These analyses will be performed by a third party subcontracted analytical laboratory certified by the WDNR under Wis. Adm. Code NR 149. The methods employed shall be according to the procedures specified in Wis. Adm. Code NR 140 and all subsequent updates published by the United States Environmental Protection Agency (U.S. EPA) WDNR.

## **G. ANALYTICAL PROCEDURES**

Soil and groundwater samples collected for laboratory analysis are sealed in laboratory-provided, clean glass jars having a Teflon lined septum. For VOCs analyses, approximately 10 grams of soil are preserved in methanol in 40 ml capacity sample containers. Each soil sample includes additional soil collected in 4 oz. sample jars to determine dry weight. Approximately 40 ml of groundwater are preserved in hydrochloric acid in 40 ml capacity sample containers. All samples to be sent to a laboratory for analysis will be properly labeled. Each label will include:

- Sample identification number;
- Time and date of acquisition;
- Sample location;
- Analyses required;

- Name of sampler.

All samples sent to a laboratory will have a chain-of-custody document completed. This document (DNR Form 4400-151 or equal) will:

- Be completed in duplicate;
- Include that information required on sample labels;
- Provide enough space for signature, time and date of those persons relinquishing and receiving the samples;
- Be signed by those persons relinquishing and receiving the samples;
- Be always kept with the sample until the sample is analyzed and be returned to the sampler with sample analyses when complete.

## **H. INVESTIGATIVE WASTES**

The investigation process may generate an unknown quantity of contaminated soils. Disposal of wastes will be completed in a manner appropriate as determined by the nature of the waste and the hazardous material(s) contaminating the waste. All waste disposal will be documented and completed by approved DNR methods.

## **I. SCHEDULE**

Cedar Corporation, on behalf of the City, will begin the investigation at this site in Oct. 2019. The tentative schedule is as follows:

- \* Complete indoor air sampling – (completed Oct. 10, 2019. See Appendix B)
- \* Drill, construct, and develop monitoring wells – Spring 2020
- \* Complete Investigation Report – Summer 2020

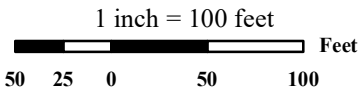


## FIGURES



Utilities	
<b>Stormwater</b>	<b>Water</b>
● Structures	● Hydrant
— Mains	— Main
<b>Sanitary</b>	<b>Electric</b>
● Manhole	● Pole
— Main	● Structure
	— Overhead
	- - - Underground

N  
 W — 0 — E  
 S



**CITY OF NEW RICHMOND UTILITIES**  
**NEW RICHMOND, WISCONSIN**

Proposed Monitoring Well Location

ALL LOCATIONS APPROXIMATE  
 MAP DOES NOT INCLUDE PRIVATE UTILITIES

Image: Spring 2017  
 Date: 03 December 2019



## **APPENDIX A**

### Standard Operating Procedures

## Standard Operating Procedure

### Collection of Quality Control Samples

#### Purpose

To describe the procedures used in the collection of quality control samples (masked duplicate samples, trip blanks, field blanks, and equipment blanks).

#### Applicability

This procedure applies to sample handling techniques used by both the technician(s) and the laboratory in regards to quality control.

#### Definitions

**Masked Split Sample.** This is the collection of a sample at the same time the original sample is being collected. Both samples are collected, preserved, and analyzed exactly the same. This is done to check laboratory and sampling precision.

**Trip Blank.** Is a water blank free of any contaminants, prepared prior to sampling events by the laboratory providing the sampling containers. The purpose of the trip blank is to determine if contamination has occurred from:

1. Improper sampling container cleaning.
2. Contaminated blank source water.
3. Sample contamination during storage and transportation due to exposure to contaminants.
4. Other environmental conditions during sampling.

**Field Blank.** A sample container prepared onsite by filling it with (analyte-free) water. These blanks are used to evaluate:

1. The effects of onsite environmental contaminants.
2. The purity of reagents used as preservative or additives.
3. General sample container filling/collecting techniques.

**Equipment Blank.** A sample collected from the final (analyte-free) rinse water. The water is rinsed on or through sampling equipment. The rinse water is collected for analysis. These blanks are used to determine:

1. The effectiveness of field cleaning procedures.
2. Any sources of contamination in a trip blank.

#### References

Wisconsin Department of Natural Resources Groundwater Sampling Procedures Field Manual ((PUBL- DG-038 96)

#### Procedure

##### *Quality Control Samples*

- C. Split duplicate sample:
1. Collect samples by rotating sampling containers from original sample to the split (using the same exact methods for both).
  2. Preserve, store, and transport the split duplicate sample in the same manner as the original sample.
  3. Submit the masked duplicate sample to the laboratory for the same analysis as the original sample.

**Note:** Ten percent of all samples are collected in duplicate (split).

D. Trip blank:

1. Trip blanks are sealed prior to sampling (prepared by the laboratory doing the analysis).
2. Transport trip blanks to the site in the sample storage cooler.
3. Trip blanks are not to be opened in the field.
4. Transport trip blanks back to the laboratory in the sample storage cooler.
5. The trip blanks should be listed on the chain-of-custody along with the other samples and the analysis required. (Generally, VOCs are the only requirement for trip blanks).

**Note:** Labeling of all sample blank containers follow the SOP for the collection of groundwater samples.

E. Field blank:

1. Get the appropriate sampling containers. (Generally, field blanks are taken for each parameter.)
2. Prepare field blanks onsite by filling sample containers with the (analyte-free) water.
3. Seal the field blank sample containers and store with other samples collected (should be handled exactly the same).

**Note:** One field blank should be prepared per day or at a frequency of 10 percent of the samples per sampling event, whichever is greater.

4. Transport all of the samples to the laboratory for analysis. The analysis on both field blanks and samples should be exactly the same.

F. Equipment Blank:

Bailer blank:

1. Pour (analyte-free) water into a clean bailer.
2. Pour this water into the appropriate sampling containers.
3. Store and transport the equipment blank with the appropriate samples for laboratory analysis.

Filtered equipment blank:

1. Pour (analyte-free) water into the groundwater sampling filter.
2. Begin filtering.
3. After filtering is completed, pour water into the appropriate sampling container.
4. Store and transport the equipment blank with the appropriate samples for laboratory analysis.

**Note:** The filtered equipment blank is usually conducted for filtered metals samples.

## Documentation

The quality control samples are documented on the chain-of-custody record and the field log data sheet. The technician(s) are required to document any such quality control samples.

## **Standard Operating Procedure**

### **Preparation of Soil and Groundwater Samples to be Laboratory Analyzed**

#### **Purpose**

To describe the procedures necessary for preparing and shipping soil and groundwater samples to be laboratory analyzed.

#### **Soils**

When a soil sample is to be laboratory analyzed, a sample is taken and sealed in a laboratory provided glass jar having a Teflon lined septum. Sampling analytical guidance is provided from "Modified GRO Method for Determining Gasoline Range Organics", Wis. DNR publication, PUBL-SW-140, September 1995. For modified GRO, VOC, and PVOC analyses, a minimum of 25 grams and up to a maximum of 70 grams of samples are preserved in methanol in a 120 ml capacity sample containers. Alternatively, a laboratory provided soil syringe is used to collect a standard volume of soil for placement into a 40 ml vial pre-filled at the laboratory with 10 ml of methanol. For DRO analysis, a minimum of 25 grams and up to a maximum of 70 grams of sample are collected in 120 ml capacity sample containers. Additional soil samples are collected in four ounce sample jars to determine dry weights for GRO, DRO, and VOC analyses. All cyanide, metals, and PAH samples are collected in four ounce jars with Teflon lined septums. The pertinent sample data is recorded on the label and on the chain-of-custody document and is then transported to an analytical laboratory with the completed chain-of-custody document. The sample is transported in a cooler at a maintained temperature of 4°C.

#### **Groundwater**

Monitoring wells being sampled after development must be purged. According to the Wisconsin Department of Natural Resources Groundwater Sampling Field Manual (PUBL-DG-038-96), the monitoring well to be sampled must have four well volumes purged by use of a pump or bailer and transferred to a laboratory acquired bottle by a bottom emptying device. Nitrile disposable gloves are worn throughout the purging and collection procession. Sampling analytical guidance is provided from Table C-3, Appendix C, Interim Guidance on Natural Attenuation for Petroleum Releases, Wis. DNR publication, Pub-RR-614, January 2014. GRO samples are collected in 40 ml glass vials, DRO and PAH samples in one liter amber glass containers, and VOC and PVOC samples in three 40 ml glass vials. All vials and containers have Teflon lined septums. All DRO, GRO, VOC, and PVOC samples are preserved with HCl as the method requires. Samples collected for metals are field filtered per EP A requirements and collected in HNO<sub>3</sub>, preserved containers. Samples collected for cyanide are filtered and preserved with NaOH. All other parameters are collected in containers provided by the analytical laboratory appropriate for the parameter being analyzed. The samples are preserved on ice at or below a temperature of 4°C throughout handling and shipment to the laboratory.

#### **Sample Preservation during Shipping**

Samples to be laboratory analyzed are placed in a cooler with ice to preserve the sample temperature at or just below 4°C. Samples are shipped in an insulated sealed cooler with ice and vermiculite to maintain the 4°C temperature. When opened in the laboratory, the sample custodian notes sample conditions and temperature or notes "on ice" on the chain-of-custody record to verify sample preservation. In the laboratory, samples are stored in a refrigerated location.

#### **Laboratory Procedures**

For this project, the samples were sent to a Wisconsin Department of Natural Resources certified laboratory, Test America, Inc., University Park, IL (Certification Number 999580010). Analytical procedures follow the guidelines and methods identified in Wis. Adm. Code NR149 and/or the EPA Methods Manual (EPA SW-846), which fully describes the procedures for each method. These procedures include specific quality control criteria as associated with the particular method. The requirements include instrument calibration and quality control samples and require daily laboratory performance tests as well as demonstrations of instrument precision and accuracy.

## Standard Operating Procedure

### Mini RAE 2000 Photoionization Detector

#### Purpose

The MiniRAE 2000 will be used to measure total organics. The following describes the start-up, calibration, shutdown and recharge procedures for the Mini RAE 2000.

#### Policy

Calibration documentation will include instrument identification, initial and final settings, date, time, concentration and type of calibration gas, and name of person who calibrated the instrument.

#### Safety

Safety considerations are described in detail in the manual. the operator should not look at the ultraviolet light source from closer than 6 inches with unprotected eyes and should observe only briefly. The operator should also use caution to prevent electrical shock when handling the analyzer outside its case.

#### Procedure

The photoionization detector (PID) is used to measure concentrations of volatile compounds in the air space being evaluated. The PID measures the total concentrations of all volatile compounds present and determines the concentration as equivalent to isobutylene. The PID is more sensitive than a FID, but less accurate. PIDs are best suited for measuring concentrations of "light" hydrocarbons spills such as gasoline. The higher the millivolt lamp intensity; the more sensitive the instrument.

#### A. GENERAL CARE AND MAINTENANCE

1. PID should be stored in protective case.
2. Keep instrument in temperature above freezing if possible. Exposure to excessive heat may result in erroneous readings.
3. Keep battery charged. Check battery status with Batt Key. Low Batt will be displayed when battery is low. Norm is 13 volts.
4. Dust/water filter should be replaced if necessary. Filters ordered from miniRAE.
5. Do not immerse probe tip in liquid.
6. Instrument is sent to factory each year for routine O&M and calibration. Instrument sent to:

MiniRAE 2000

#### B. CALIBRATION

1. Calibrate as shown in users manual (located in lab ).
2. Calibrate at the beginning of each field day use, or as required.
3. Calibration is to 100 ppm isobutylene.
4. Use gas sample bag for calibration.
5. Zero gas is ambient air -DO NOT USE THE ISOBUTYLENE FOR ZERO GAS.
6. Follow the prompts on display of PID.

Calibration gases may be purchased from:  
Field Environmental Instruments, Inc. (FEI)  
Joe Kearney  
6410 Oxford Street  
St Louis Park, MN 55426  
952-922-0023  
866-580-5512  
FAX: 952-922-9092

C. FIELD USE

1. Accuracy when calibrated to isobutylene:

- " 10% for 0 to 100 ppm
- " 15% for 100 to 1,000 ppm
- " 20% for 1,000 to 2,000 ppm

Readings over 2000 ppm are questionable.

2. PID instruments are affected by CO<sub>2</sub> and humidity and tend to have a non-linear response above 200 to 300 pm. (PIDs read moisture. Wet samples are not always dirty.)
3. High humidity may require you to recalibrate more than once during a job. If instrument does not zero - recalibrate.
4. Use a FID if samples are wet, methane is present, or at petroleum spills of "heavy" hydrocarbons (fuel oil, etc.).
5. PIDs do not measure methane accurately.

D. RECORD KEEPING

1. Record calibration, operator, date, time, site, and instrument status in record book and site field book for each day of use.
2. Check known gas once during first half of day and at end of day. Record readings in site field book.



## **Standard Operating Procedure**

### **Field Screening Soils for Volatile Organic Compounds**

#### **Purpose**

To describe the field screening methods used for soils.

#### **Applicability**

This procedure applies to soils suspected of containing volatile organic compounds (VOCs).

#### **Discussion**

The field screening techniques for soils containing VOCs are as follows: (1) visual examination; (2) oil sheen; (3) odor; and (4) headspace organic vapor screening. The results of these four screening procedures will be used to determine the gross level of contamination of the soil sample.

#### **Field Screening**

Soil samples recovered at various depths and locations during the environmental investigation are logged and field screened using a photo-ionization detector with a 10.6 eV lamp or a Flame Ionization Detector (FID). Field screening is completed using the "Headspace Method" wherein sufficient sample is placed in a clean, one quart Ziploc bag. The bag is tightly sealed, agitated to break up the soil, and slightly warmed to encourage the release of any volatile organic compounds in the sample. After waiting 5 to 15 minutes (dependent on original soil temperature), the bag is partially opened and the sampling probe of the instrument is introduced into the "headspace" and an analysis of the vapor in the jar is completed. Samples collected in cold temperatures or when soils are cold should be warmed for 15 minutes using a vehicle heater.

## **Standard Operating Procedures Collection of Air Samples**

### **Purpose**

To describe the procedures necessary to collect air samples for laboratory testing.

### **Ambient Air Sample Collection**

Ambient air samples are collected by drawing two liters per minute through the appropriate media required for the analyses being performed. This produces a sample volume in liters as required by the analytical method. In general, ambient air samples are collected over a period of at least six hours to emulate human exposure during working activities. After collection, the samples are preserved as required by the analytical method and shipped on ice to the laboratory.

### **Air Sample Collection**

#### **\* Charcoal Tubes**

Air samples are generally collected by drawing samples at 200 cc/min. through carbon adsorption tubes. The length of time depends on the analytical method being used and the desired sample volume. Sampling pumps calibrated to the approximate volume are used to collect the samples. After collection, the samples are labeled, preserved on ice, and shipped to a laboratory.

#### **\* Suma Canisters**

Suma Canisters are steel canisters prepared by the analytical laboratory for sampling VOCs by EPA Method TO-14 or TO-15. The canisters are received, cleaned and purged in a manner that a vacuum is present in the canister. Samples are collected by opening the canister inlet valve and drawing the sample into the canister. If a sample is to be collected from a remote location or source, a sampling line is attached to the canister.

#### **\* Tedlar Bags**

Tedlar bags are generally collected by drawing samples into laboratory provided bags. The rate of sample collection depends on the analytical method and the desired sample volume. Generally, Tedlar Bags are two liters in volume and are filled with a sampling pump at a desired flow rate.

## Standard Operating Procedure

### Sub-Slab Vapor Port Installation and Sampling

#### Purpose

This section describes procedures used to install sub-slab vapor ports and collect sub-slab vapor samples for laboratory testing. Vapor port installation and sample collection procedures were developed in accordance with the WDNR RR-986 guidance “Sub-Slab Vapor Sampling Procedures”.

#### Sub-Slab Vapor Port Installation

Installing sub-slab vapor ports involves using a hammer drill to drill a 5/8” hole through a concrete building foundation to reach the underlying soil. Care should be taken while drilling to periodically wet the drill bit with deionized water in order to keep it cool. Once drilled through the concrete and into the underlying soil, the hole is cleared out to prepare for the vapor pin installation. A small silicone sleeve slides over the bottom end of the Mini Vapor Pin® which is then hammered lightly into the hole until just the silver tip remains above grade, with the silicone sleeve acting as a seal.

#### Sample Train Set-Up

Once the vapor pin is installed in the port, a sample train is set up to convey sub-slab vapors from the port to the 6L SUMMA® Canister with a 200 mL/min regulator. First, the port seal is tested by piecing non-VOC molders clay in a ring around one edge of a small section of PVC and placing it on the foundation around the port to create a water dam. A small amount of deionized water is then poured into the PVC ring and observed for any leaks or bubbles. If any leaks are noted, the port may not be utilized and another must be drilled and re-installed. If no leaks are observed the PVC is removed and the water is mopped up around the port.

Once the water dam is deconstructed, the sample train is constructed. A small (1-2”) piece of 1-4”x3/8” Teflon®-lined tubing is used to connect the sub-slab port to a small brass valve, which may be closed at the time of set-up. Another longer (6”) piece of tubing is used to connect this valve to a larger 2-way valve with a pressure gauge, which may also be closed at the time of set-up. Before connecting the 2-way valve, the initial VOC reading is taken from the tubing using a Photoionization Detector (PID) and opening the valve near the port opening. From the 2-way valve, another (6”) piece of tubing is used to connect the sample train to the sampling end of the SUMMA® Canister regulator. Teflon tape may be used on any connections throughout the sample train which may not have a sufficient seal.

After the sample train is set-up it must be tested for leaks. A hand pump is connected via tubing to the bottom end of the 2-way valve. The valve near the port opening is closed while the 2-way valve is opened. The pump is then used to create a -5 inHg vacuum. If the vacuum is not held at -5 inHg, more Teflon tape may be used to seal any connections suspected to be leaking. Once the sample train is tested for leaks, holds -5 inHg for at least 1 minute, and 3 volumes of air are purged from the sample train, the pump is removed, and the bottom valve of the pressure gauge is closed so that air may only flow horizontally through it.

#### Sub-Slab Vapor Sample Collection

After the sample train is determined to be leak free and the sample train is purged, sub-slab vapor sampling may begin. The valve near the port opening is opened, and the bottom valve on the pressure gauge is closed. The SUMMA® Canister is then deployed for about 50 min – 1 hour, or until the regulator on the SUMMA® Canister reads 0 inHg. To end the sampling period, the SUMMA® Canister is closed and packaged with the regulator for transport to the laboratory. Regulator vacuum measurements should be recorded before and after sampling is completed. The rest of the sampling train is deconstructed. All tubing is disposed of and the small, round metal covered is screwed onto the port. The Mini Vapor Pin® will remain in place for future sampling until abandonment.

Mini Vapor Pins® may be purchased from:  
VaporPin  
7750 Corporate Blvd.  
Plain City, Ohio 43064  
Phone #: 614-504-6915

[www.vaporpin.com/product/mini-vapor-pin/](http://www.vaporpin.com/product/mini-vapor-pin/)

**Standard Operating Procedure**

## **Laboratory Analytical Sample Documentation on a Chain-of-Custody**

### **Purpose**

This section describes procedures to identify samples and document handling of the sample by chain-of-custody. The purpose of these procedures is to ensure that the integrity of the samples is maintained during collection, transportation, storage and analysis.

### **Sample Identification**

Sample identification documents are carefully prepared so that sample identification and chain-of-custody is maintained and sample disposition controlled.

Sample identification documents include:

- field notebooks
- sample labels
- chain-of-custody (DNR Form 4400-151) or equivalent

Each sample is labeled, physically preserved, and sealed immediately after collection. To minimize handling of sample containers, labels are completed immediately prior to sample collection. The sample label is completed using waterproof ink and is firmly affixed to the sample containers. The sample label provides the following information:

- location
- sample number
- date and time of collection
- analysis required
- name of sampler

A chain-of-custody record is fully completed in duplicate by the sampler immediately following sample collection.

### **Shipping Transfer of Custody**

The coolers in which the samples are packed are accompanied by the chain-of-custody record. When transferring samples, the individuals relinquishing and receiving them sign, date, and note the time of transfer on the chain-of-custody record.

### **Laboratory Custody Procedures**

A designated sample custodian accepts custody of the shipped samples and verifies that the sample identification number matches that on the chain-of-custody record. This individual also records the temperature of the received samples on the chain-of-custody records. Any discrepancies are immediately noted to the sampler. A copy of the completed chain-of-custody record is retained by the laboratory until analyses are completed. The record is returned to the project file with the analytical results.

## **Standard Operating Procedure**

### **Soil Sample Collection**

A variety of samplers (split-barrel, split barrel with liners, backhoe, hand auger or shovel) may be used to retrieve soil from sampling locations. Depending on the analysis to be conducted on the soil sample, the soil sample will either be sealed within the sampler (e.g., collecting volatile samples) or the soil sample will be transferred to laboratory-supplied containers. The equipment required to transfer the soil from the sampler to the laboratory-supplied sample containers includes: stainless steel spoons or scoops and the appropriate personal protective equipment necessary for collection and handling of soil samples as described in the Project Health and Safety Plan.

All soil sampling equipment will be carefully cleaned before and during soil sampling. All sampling tools including split-barrels, stainless steel spoons and scoops will be cleaned before use and between samples in the following manner:

1. Clean with tap water and TSP, using a brush if necessary to remove particulate matter and films;
2. rinse three times with tap water; and
3. rinse three times with deionized water.

To prevent sample cross-contamination, the sampler will discard the outer pair of sample gloves and put on a new pair between each sample event. At the desired sample location, a soil sample is immediately collected from the sampling unit with clean equipment and placed in a one quarter glass jar for field screening. If desired, a split sample is collected and placed in a laboratory specimen jar with a Teflon lined septum for laboratory analysis. Personal protective equipment including latex disposable gloves, safety glasses, boots, hard hats, and organic vapor masks are used as necessary as protection from potential contaminants.

#### **Hand Auger Soil Borings**

Soil samples were recovered from soil borings completed with a stainless steel auger. The auger consists of a 12 inch long, 3-1/2 inch diameter enclosed sampling device. It is connected to 4-1/2 foot long rods equipped with screw threads such that additional sections can be added to increase the depth of sampling. The auger sections are marked to identify the depth of the sample. The auger is decontaminated prior to each sampling event.

#### **Hollow Stem Auger Soil Borings**

Hollow stem auger sampling techniques were completed using 4-1/4 inch HSA (hollow stem augers) at locations as determined by the existing conditions and at the direction of the field supervisor. Soil samples were recovered using standard split spoon sampling methods. In this method, a 2 inch diameter, 24 inch sample spoon is attached to an AW rod. When the auger has reached the desired depth, the spoon is lowered into the auger until it reaches the top of the sampling interval. Using a 140 pound hammer dropped 30 inches, the spoon is driven into the formation. A sample catcher in the tip holds the sample in the spoon. During the driving of the spoon, the number of hammer blows is noted for each six inches of advancement. These values are recorded on the driller's logs.

The sample spoon is retrieved from the boring and opened. A field geological log is completed and the soils are sampled for field screening, laboratory analysis, and/or sieve analysis. Prior to reuse, the sampling equipment is decontaminated.

#### **Sonic Sampling Techniques**

Sonic Sampling techniques are completed with tooling designed to recover 10 feet or greater core samples from the subsurface. The tooling can vary in diameter, but is typically 4 inches in diameter for most sampling events. Core samples are recovered from the subsurface by vibrating and rotating the core sampler into the subsurface to the desired depth. The core is then retrieved and placed in 10 foot long plastic bags for logging and sampling. At depth below 20 feet, an outer casing is used to advance the boring to the desired depth. This technique allows core samples to be collected in bedrock as well as unconsolidated materials.

## **Hydraulically Advanced Sampling Techniques**

Hydraulically advanced sampling techniques, such as Geoprobe®, typically use a one inch outer diameter steel probe with a large bore soil core sampler. The probe rods and the sampling unit are driven to the desired sampling depth by a carrier vehicle mounted sampling unit. The probe rods and sampler are hydraulically advanced using the static weight of the carrier vehicle to assist in penetrating the formation or a combination of vehicle weight and hydraulic hammer percussion. Typical sample lengths are 24 inches.

While driving the soil core sampler to the desired depth, a pin stops the end point and piston from sliding into the collection tube. At the desired sampling depth, the pin is removed and the probe rods advanced some 24 inches. The piston and end point are forced into the collection chamber by the sample being collected. Sample collection chambers are typically lined with removable acetate sleeves. The sampling device is brought to the surface and the sample, contained in the acetate sleeve, retrieved from the carrier assembly.

Upon retrieval, the sample is immediately opened, logged, sampled for laboratory analysis (if required) and placed in a clean jar for Headspace Analysis. After each sampling event, the probe rods and soil core sampling equipment are decontaminated. A new acetate liner is placed in the sampling chamber for the next sampling event.

## **Standard Operating Procedures**

### **Decontamination of Monitoring Well Sampling Equipment**

#### **Purpose**

All sampling-related equipment including pumps, meters, and materials coming into contact with actual sampling equipment or with sampling personnel will be decontaminated as described below. Disposable bailers, protective gear, and filtration devices will be discarded after one use. Non-disposable bailers are used once and are then decontaminated as described below.

#### **Responsibilities**

The field technicians are responsible for decontamination in the field at each individual sampling point. Decontamination will be performed before sampling and after working at each sampling point. All equipment will be handled in a manner that minimizes cross-contamination between points. After cleaning, the equipment will be visibly inspected to detect any residues or other substances that may exist after normal cleaning. If inspection reveals that decontamination was insufficient, the decontamination procedures will be repeated.

#### **Procedures for Monitoring Well Equipment**

Equipment will be decontaminated in the following manner:

1. Equipment that does not contact sample water or the inside of the well:
  - a. Rinse with clean control water.
  - b. Inspect for remaining particles or surface film and repeat cleaning and rinse procedures if necessary.
2. Equipment that contacts sample water or the inside of the well:
  - a. Clean (inside and outside where possible) with an Alconox/clean water solution applied with a scrub brush made of inert materials.
  - b. Rinse with clean water.
  - c. Inspect for remaining particles or surface film and repeat cleaning and rinse procedures if necessary.
  - d. Shake off remaining water and allow to air dry.

The internal surfaces of pumps and tubing that cannot be adequately cleaned by the above methods alone will be cleaned by circulating decontamination fluids through them. The fluids will be circulated through this equipment in the order shown above. Special care will be exercised to ensure that the "rinse" fluids will be circulated in sufficient quantities to completely flush out contaminants and detergents.

When transporting or storing equipment after cleaning, the equipment will be protected in a manner that minimizes the potential for contamination.

## **Standard Operating Procedure**

### **Measuring Static Water Level and Total Well Depth**

#### **Purpose**

Describe the instruments and techniques for measuring static water level and total well depth.

#### **References**

Wisconsin Department of Natural Resources Groundwater Sampling Procedures Field Manual (PUBL-DG-038 96)

#### **Discussion**

Types of water level measurement devices:

Electric Water Level Indicator. This instrument consists of a spool of wire or steel tape graduated in hundredths with a probe attached to the end. When the probe comes in contact with the water, the circuit is complete and the light and/or buzzer on the instrument signals the contact. The instrument's power source is AA or 9-volt batteries.

Popper. A popper consists of a hollow weight, usually a deep socket with an eye bolt attached. This is secured to the end of a measuring tape. When the socket strikes the water surface, a "popping" sound is made. The accurate reading can be made by lifting and lowering the socket in short strokes, reading the tape at contact. Poppers have a correction factor because of the way they are made. Always check the unit's correction factor and record the corrected water level. Poppers are ineffective in wells where the water level is within the well screen.

Note: The "popping" sound cannot be heard if made in the well screen.

Tape and Chalk. This consists of a steel measuring tape and chalk or water indicating paste. To determine the water level, the first two to three feet of the metal tape are coated with chalk or paste. Lower the tape into the well to the approximate groundwater depth and retrieved. Subtract the water contact area from the total length for the depth to groundwater .



## **Standard Operating Procedure**

### **Measuring LNAPL/DNAPL Levels in Wells**

LNAPL/DNAPL (free product) level measurements are made in reference to an established point on the well casing. Measurements are made from the high side of the riser pipe or well casing unless otherwise specified. All level measurements are made and recorded to the nearest 0.01 foot.

Measuring LNAPL/DNAPL elevations can be accomplished using an interface probe or the rope method. Measuring devices will be cleaned between wells with tap water and tri-sodium phosphate (TSP) and rinsed with tap water.

#### **Interface probe**

An interface probe consists of a flat measuring tape cable, a probe attached to the end, and an indicator. After grounding the instrument, the probe is slowly lowered into the well casing. The indicator signals when the probe contacts LNAPL. The probe depth is recorded. The probe is then lowered further into the well until the water / LNAPL interface is encountered. This interface is also recorded. If DNAPL is present, the probe is lowered further into the well until the probe contacts the water / DNAPL interface. The depth of DNAPL is recorded and the total depth of the well is also recorded.

#### **Rope Method**

The rope method will be used if an interface probe is not compatible with the LNAPL/DNAPL. A rope with a weight attached is lowered into the LNAPL/DNAPL. The LNAPL/DNAPL will stain the rope and the DNAPL elevation can be measured. The procedures are as follows:

- a. Attach a weight to the end of a nylon rope.
- b. Lower the rope to the expected depth of the LNAPL/DNAPL and mark the rope against the high side of the well casing.
- c. Remove the rope from the well and measure the length of rope from the mark to the highest point of the LNAPL/DNAPL.
- d. Remove the weight and discard the stained section of rope.

## Standard Operating Procedure

### Calculation of Purge Volumes for Groundwater Sampling Wells

#### Purpose

The purpose of this procedure is to describe the methods used in calculating and measuring purge volumes.

#### Applicability

The procedure applies to the amount of water that is purged out of a well before sampling can occur.

#### Definition

Purge volume is a specific amount of water taken out of a well before sampling.

#### Reference

Wisconsin Department of Natural Resources Groundwater Sampling Procedures Field Manual (PUBL-DG-038-96)

#### Procedure

##### *Calculating and Measuring Purge Volumes*

1. Calculate the volume of standing water in the well (using the following equation):

**Note:** Please see Table 1 for volume calculations for standard well casing and borehole diameters.

- a.  $V = (\pi)(r^2)(h)$   
V = Volume in cubic feet of standing water  
= 3.14  
r = Radius of the well casing or hole (in feet)  
h = Height of the column of water in the well (in feet)  
(h = water level - total well depth)

2. Convert the volume of standing water in the well from cubic feet to gallons using the following equation:

- a.  $WV = (V)(7.48 \text{ gallons per cubic foot})$   
WV = Well volume in gallons

3. Determine the amount of water to be purged (using this equation):

- a.  $VP = (WV)(NWV)$   
VP = Volume of water pumped  
WV = Well volume in gallons  
NWV = Number of well volumes that monitoring plan requires to be purged

#### Documentation

The technicians will document flow rate, well volume, time pumped/bailed, volume removed, water level, and total well depth on the field log data sheet.

**Table 1**  
**Water Volume in Well Casing or Borehole**

<b>Diameter of Casing or Hole (In)</b>	<b>Gallons per Foot of Depth</b>	<b>Cubic Feet per Foot Depth</b>	<b>Liters per Meter of Depth</b>	<b>Cubic Meters per Meter of Depth</b>
1	0.041	0.0055	0.507	0.507 x 10 <sup>-3</sup>
1 1/2	0.092	0.0123	1.140	1.140 x 10 <sup>-3</sup>
2	0.163	0.0218	2.027	2.027 x 10 <sup>-3</sup>
2 1/2	0.255	0.0341	3.167	3.167 x 10 <sup>-3</sup>
3	0.367	0.0491	4.560	4.560 x 10 <sup>-3</sup>
3 1/2	0.500	0.0668	6.206	6.206 x 10 <sup>-3</sup>
4	0.653	0.0873	8.106	8.106 x 10 <sup>-3</sup>
4 1/2	0.826	0.1104	10.26	10.26 x 10 <sup>-3</sup>
5	1.020	0.1364	12.67	12.67 x 10 <sup>-3</sup>
5 1/2	1.234	0.1650	15.33	15.33 x 10 <sup>-3</sup>
6	1.469	0.1963	18.24	18.24 x 10 <sup>-3</sup>
7	2.000	0.2673	24.83	24.83 x 10 <sup>-3</sup>
8	2.611	0.3491	32.43	32.43 x 10 <sup>-3</sup>
9	3.305	0.4418	41.04	41.04 x 10 <sup>-3</sup>
10	4.080	0.5454	50.66	50.66 x 10 <sup>-3</sup>
11	4.937	0.6600	61.30	61.30 x 10 <sup>-3</sup>
12	5.875	0.7854	72.96	72.96 x 10 <sup>-3</sup>
14	8.000	1.069	99.30	99.3 x 10 <sup>-3</sup>
16	10.44	1.396	129.70	129.7 x 10 <sup>-3</sup>
18	13.22	1.767	164.15	164.2 x 10 <sup>-3</sup>
20	16.32	2.182	202.66	202.7 x 10 <sup>-3</sup>
22	19.75	2.640	245.21	245.3 x 10 <sup>-3</sup>
24	23.50	3.142	291.83	291.9 x 10 <sup>-3</sup>
26	27.58	3.687	342.49	342.6 x 10 <sup>-3</sup>
28	32.00	4.276	397.21	397.3 x 10 <sup>-3</sup>
30	36.72	4.909	455.98	456.1 x 10 <sup>-3</sup>
32	41.78	5.585	518.80	519.0 x 10 <sup>-3</sup>
34	47.16	6.305	585.68	585.8 x 10 <sup>-3</sup>
36	52.88	6.069	656.61	656.8 x 10 <sup>-3</sup>

1 gallon = 3.785 liters

1 meter = 3.281 feet

1 gallon water weight 8.33 lbs. = 3.785 kilograms

1 liter water weight 1 kilogram = 2.205 lbs.

1 gallon per foot of depth = 12.419 liters per foot of depth

1 gallon per meter of depth = 12.419 x 10<sup>-3</sup> cubic meters per meter of depth

**APPENDIX B**

Indoor Air Sampling Results

Table 1: Indoor Air Sampling Results  
 Former Johnson Cleaners  
 New Richmond, WI

Contaminant	WI Residential Vapor Action Levels (ug/m3)		Sample ID	JOHNSON_SUBSLAB_20190624	104 S Knowles St_N_20191010	104 S Knowles St_S_20191010
	Indoor Air VAL	Sub-Slab Vapor VRSL	Date	6/24/2019	10/10/2019	10/10/2019
			Method	TO-15	TO-15	TO-15
			Location	Subslab (basement)	North	South
<b>Benzene</b>	<b>3.6</b>	<b>120</b>		<180	0.47 J	<1.2
<b>Chloromethane</b>	<b>94</b>	<b>3,100</b>		<1000	3.1 J	<6.9
<b>Dichlorodifluoromethane</b>	<b>100</b>	<b>3,300</b>		<520	20	3.9 J
<b>Hexane</b>	<b>730</b>	<b>24,300</b>		<350	1.2 J	<2.3
<b>Methylene Chloride</b>	<b>630</b>	<b>21,000</b>		<3800	14 JB	33 JB
<b>Tetrachloroethene</b>	<b>42</b>	<b>1,400</b>		<b>320000</b>	<b>990</b>	<b>2000</b>
<b>Trichlorofluoromethane</b>	-	-		320 J	1.4 J	<2.0

**Notes:**

Subslab sample collected during Phase II

- Only detected compounds were included in the table
- = Inhalation toxicity values are not available from USEPA

**Bold** values indicate VAL or VRSL Exceedance

B = Compound was found in the blank and the sample

J = Reported value was between the limit of detection and the limit of quantitation