September 7, 2017

Binyoti Amungwafor, Project Manager
Wisconsin Department of Natural Resources
2300 Martin Luther King Drive, Milwaukee, WI 53212

Re: WDNR BRRTS #02-41-552537
Westwood Dry Cleaners
8731 W. North Ave
Wauwatosa, WI 53226

Dear Ms. Amungwafor:

Hydrodynamics Consultants, Inc. (HDC) is pleased to submit this Site Investigation Workplan for your review and approval. The purpose of the additional site investigation is to:

- Gather information to define the nature, degree and extent of chlorinated volatile organic compounds contamination from the drycleaning operation at site;
- Define the source or sources of the contamination; and
- Perform risk-based assessments to determine whether any interim action, remedial action option to be selected to comply with applicable laws.

If you need any further information, please contact me at 630-724-0098, or email to Mike_Wan@HydrodynamicsConsultants.com

Best Regards,

Mike (Minghua) Wan, PE
Maple Testing Services, Inc.
D/B/A Hydrodynamics Consultants, Inc.

CC: Dong Sin, Owner

SITE INVESTIGATION WORKPLAN

Prepared For
Westwood Cleaners
(WDNR BRRTS#02-41-552537)

Attn. Mr. Dong Sin
8731 West North Avenue
Wauwatosa, Wisconsin 53226

September 7, 2017

Certifications

I, Wenbin Yuan, hereby certify that I am a hydrogeologist as the term is defined in NR 712.03 (1), Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wic. Adm. Code.

Signature ___________________________________

Title Hydrogeologist

Date ___________________________________

5403 Patton Dr., Suite 215, Lisle, Illinois 60532

Tel. 630-724-0098 Web Site: http://www.HydrodynamicsConsultants.com

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1.0 INTRODUCTION AND SITE BACKGROUND

1.1 Objectives

On August 19, 2008, Hydrodynamics Consultants, Inc. (HDC) was hired to perform limited soil boring and testing at the subject property. Four (4) soil borings were advanced to a depth of 16' deep each, and two soil samples were collected from each boring for laboratory analysis of volatile organic compounds (VOCs). Drycleaning solvent, tetrachloroethene (PCE or perc) and its degraded products were discovered at this site. The soil boring location and distribution of contaminants of concern in the borings is illustrated in Figure 1.

Based on the laboratory analysis, up to 320 mg/kg of PCE was found in the borings. HDC, therefore submits this Site Investigation Workplan to conduct additional site investigation to:

- Gather information to define the nature, degree and extent of chlorinated volatile organic compounds contamination from the drycleaning operation at site;
- Define the source or sources of the contamination; and
- Perform risk-based assessments to determine whether any interim action, remedial action option to be selected to comply with applicable laws.

1.2 Location and Project Information

1. Site Owner:
   Dong Sin
   8371 West North Avenue
   Wauwatosa, WI 53226

2. Site Address:
   8371 West North Avenue
   Wauwatosa, WI 53226

3. Site Location (Figure 1):
   NE ¼ of the NW ¼ of Section 21, T07N, R21E, Milwaukee County, Wisconsin.

4. Environmental Consultant:
   Mike Wan, PE, Project Manager
   Hydrodynamics Consultants, Inc.
   5403 Patton Drive, Suite 215

Lisle, IL 60532
Tel. 630-724-0098
Email Mike_Wan@HydrodynamicsConsultants.com

5. WDNR BRRS#:
   02-41-552537

6. WDNR Project Manager:
   Binyoti Amungwafor
   Wisconsin Department of Natural Resources
   2300 Martin Luther King Drive, Milwaukee, WI 53212
   Tel. 414-263-8607
   Email: Binyoti.Amingwafor@Wisconsin.gov

2.0 SITE BACKGROUND

According to our inquiry, the subject dry-cleaning plant has been in operation since about 1985. It appears that this dry-cleaner is in compliance with regulatory requirements.

Hydrodynamics Consultants, Inc. had completed an initial site investigation on August 19, 2008 with analytical results indicating up to 320 mg/kg of tetrachloroethene being discovered at the site (see attached Figure 1). A Potential Claim Notification was completed and sent to the Department of Nature Resources (DNR) on August 28, 2008. Jennifer Feyerherm, Grant Manager of the WDNR sent the owner, Mr. Song Sin a letter on July 20, 2016, stating the site is qualified for reimbursement from the Wisconsin Drycleaners Environmental Response Fund (DERF).

In order to complete the site investigation to pursue official closure letter from DNR, HDC submits this Site Investigation Workplan to conduct additional site investigation to delineate the soil, groundwater, and soil gas contamination at this site.

3.0 FIELD INVESTIGATION

3.1 Proposed Scope of Work

To satisfy the requirements of WDNR, HDC proposes to conduct the following.

- Complete **12** soil borings to a depth of 16 - 20 feet (each) below the ground surface. Each boring will be logged in accordance with the Unified Soil Classification System

("USCS") to document the subsurface strata, variation of soil color, compositions and visual evidence of drycleaning solvent contamination.

- Continuously sample each soil boring and screen each soil sample with a photo-ionization detector (PID) for VOC contamination.

- Select **36** representative soil samples, three from each soil boring, for laboratory analysis. Each soil sample will be collected in accordance with SW-846 Method 5035 using a purge-and-trap soil sampler. A bulk soil sampling will also be packed into a 4-ounce glass jar for the determination of sample's dry weight. All soil samples submitted will be analyzed for volatile organic compounds (VOCs) utilizing SW-846 Method 8260B.

- Additionally, 2 soil samples will be collected from outside the potential contamination plume at depths below the water table. These soil samples will be analyzed for fractional organic carbon contents (foc) in accordance with ASTM D 2974-87, entitled "Standard Test Methods for Moisture, Ash and Organic Matter of Peat and Other Organic Soils". The foc content will help to determine the attenuation capacity of local soil to the VOCs at this site.

- Install **6** groundwater monitoring wells to a depth of 15 to 20 feet or to a depth of at least five feet below the water table. The monitoring wells will be flush mounted, well annular space be sealed with bentonite, and screened to a depth about two feet above the water table. Upon completion, all wells will be developed. One of the monitoring well will be used for slug tests which must be at minimum of 2”-diameter well installed with augers.

- Collect and submit **6** representative groundwater samples for laboratory analysis (one from each well). The groundwater samples will be collected using a PVC bailer and immediately preserved in 4-ml glass vials containing HCl. The groundwater samples submitted will be analyzed for VOCs utilizing SW-846 Method 8260B. Proper well purging will be completed before the sampling.

- Develop/purge the monitoring wells after they are installed.

- Complete water table depth measurements from the monitoring wells and survey the ground surface to determine the groundwater flow directions.

- Perform Slug tests in one 2”-diameter monitoring well to determine the hydraulic conductivity for water-saturated subsurface soil formation.

- Conduct a water-supply well survey by contacting the local municipalities and related parties to determine if there is any private or community well in the vicinity of the subject drycleaner facility and to determine if the subject facility is located within any minimum setback zone for any water supply well.

- Collect 3 representative soil vapor samples inside the drycleaning facility to determine if soil vapor intrusion is a risk concern at this site. Summa canisters will be used for the soil vapor collection. RR-986, Sub-Slab Vapor Sampling Procedures will be followed.

- Prepare Site Investigation Report and a Risk-based Remediation Objectives Report. The potential impact to human health and the environment will be evaluated pursuant to the ASTM E2081-2015, Standard Guide for risk-based corrective action (RBCA). Options for risk-based site closure will be evaluated.

3.2 Methods of Investigation

Please see Appendix II for Methodologies

4.0 DATA ANALYSIS AND REPORT PREPARATION

Please see Appendix II for Methodologies

5.0 COST ESTIMATE

Cost estimate as shown on bid sheets:

Drilling Costs Total =	**$7,210.00**
Analytical Costs Total =	**$6,750.00**
Consulting Costs Total =	**$14,130.00**
Misc Costs Total =	**$3,600.00**
Grand Total =	**$31,690.00**

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6.0 PROPOSED SCHEDULE

HDC anticipate the fieldwork may take one to two weeks. The tentative schedule is as follows.

Activities	Estimated Completion Date
Workplan Completion and Submittal to WDNR	September 2017
WDNR Review and Approval, Bids	September-October 2017
Field Work	November 2017
Evaluate Data and Prepare Reports	December 2017

7.0 TERMS & CONDITIONS

The terms and conditions between the Client and Hydrodynamics Consultant, Inc. are agreed upon as follows:

- Client will provide HDC and/or its subcontractors with adequate physical access to the subject property;
- The Client will pay $15,000 down payment when the contract is signed, and then will make monthly payments of $2,000/month until balance is paid off.
- HDC will provide equipment and labor to complete the scope of work proposed herein in a manner consistent with all regulatory requirements (especially NR 716) and/or industry standards.
- The field work may take about one week to complete. HDC will try to complete the report within one month after the fieldwork is completed.
- HDC will assist Client reimburse the costs from the Wisconsin Drycleaners Environmental Response Fund. But HDC will not guarantee the full reimbursement, nor will Client's payment to HDC's work be conditioned with any third party payment to the Client.

8.0 WORKPLAN PREPARER'S SIGNATURE

The above Site Investigation Workplan is prepared and submitted by

Mike (Minghua) Wan, PE
Vice President
Consultant: Hydrodynamics Consultants, Inc

9.0 OWNER'S APPROVAL AND ACCEPTANCE OF THE ABOVE WORKPLAN

The above Site Investigation Workplan is approved and accepted by

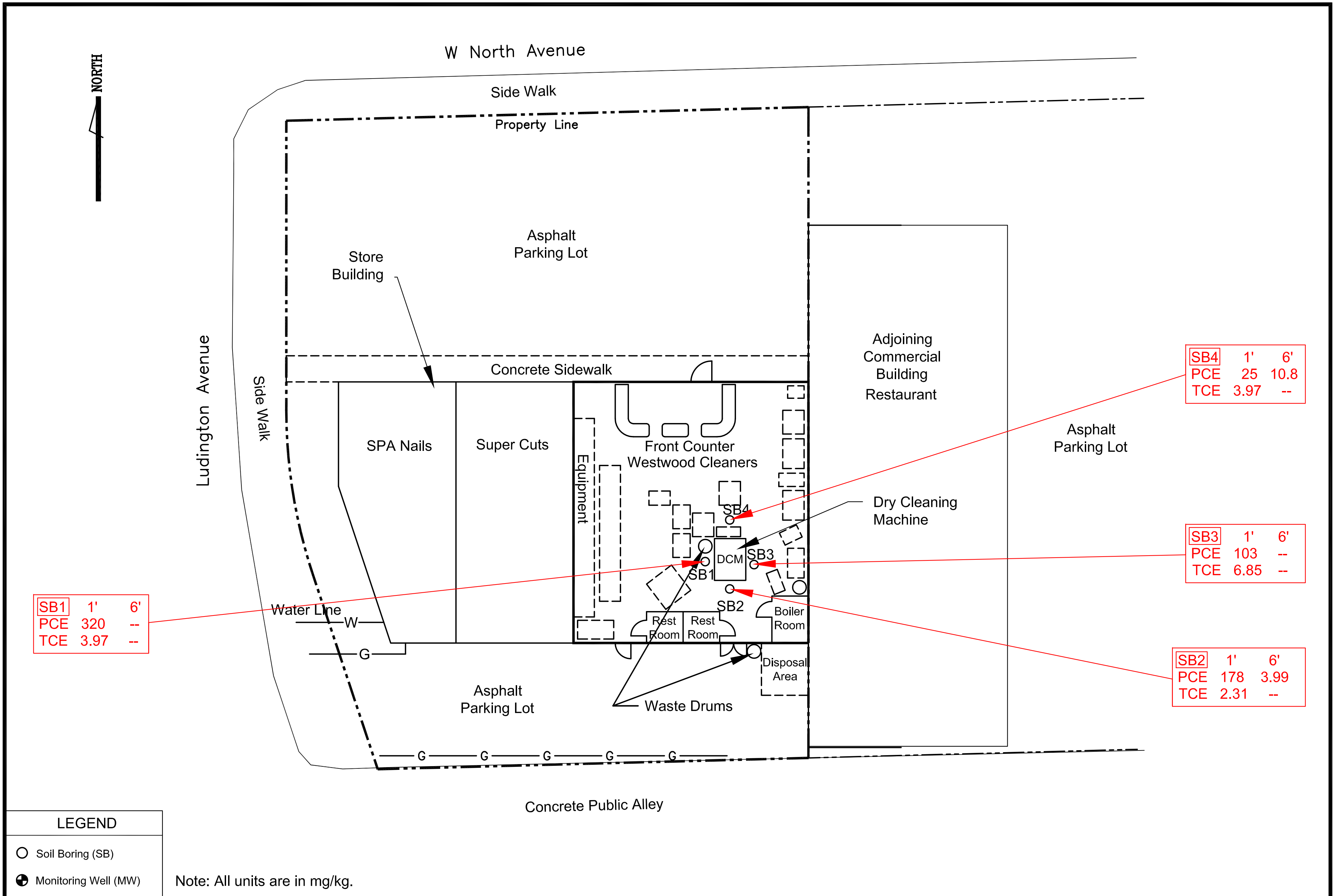
Dong Sin ______________________________ (Signature), Date __________________

Title ________________________

Westwood Cleaners
8371 West North Avenue
Wauwatosa, WI 53226

Attachments:
Appendix I - Figure 1 Site Map with Initial Site Investigation Results
Appendix II - Methodologies

APPENDIX I
FIGURE 1
SITE MAP WITH INITIAL SITE INVESTIGATION RESULTS



SITE NAME	Westwood Dry Cleaners (#02-41-552537)	FIGURE NO.	1
FIGURE NAME	Site Map with Initial Site Investigation Results		
ADDRESS	8751 West North Avenue, Wauwatosa, WI 53226		

HYDRODYNAMICS CONSULTANTS, INC.
5403 Patton Dr. Unit 215, Lisle, IL 60532
Tel: (630) 724-0098, HydrodynamicsConsultants.com

APPENDIX II
METHODOLOGIES

Methodologies (Drycleaning Facilities)

Maple Testing Services, Inc.

D/B/A/ Hydrodynamics Consultants, Inc. (HDC)

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1.0 SOIL SAMPLING

1.1 Selecting of Soil Boring Locations

Prior to the emplacement of soil borings and monitoring wells, HDC visually and physically inspects the subject facility to identify the areas of concern that are present. This site inspection is also aided with the review of public records and as interview with the current storeowner or occupant.

Based on the above studies, the following areas of concern are usually identified at a subject drycleaner facility and warrant further investigation:

- The drycleaning machines are presumed to be the main potential source for PCE release at the subject facility. Previous perc-based drycleaning machine was also major potential contamination sources;
- Locations near floor drains, sumps, or pipelines, if any;
- The back door area where drycleaning solvent is/was delivered and waste solvent/filter are/were removed from; and
- Previous site investigation results.

Soil boring locations are designed to provide adequate coverage for the potentially contaminated areas to ensure that the hot spots of said VOC contamination are properly investigated, and the contamination plume is reasonably defined, and the natural and/or potential man-made pathways, which mainly consist of the current and/or former underground utilities conduits and sanitary/storm sewer pipes, are adequately investigated in the study.

Soil sample collection locations are reviewed with the property owner or representative prior to subsurface activities to determine the location of private utilities and other obstructions. A one call service for utilities location is also contacted in order to mark all the utility lines at and around the site. Soil sample locations may need to be moved during the soil boring due to various conditions, including but not limited to utility lines and subsurface refusal encountered while drilling.

Procedures used to collect the samples are provided in the subsections below.

1.2 Soil Sampling Point Determination from Soil Cores

During soil sampling activities in the field, each soil boring is continuously sampled, logged and described, with representative soil samples being collected at a depth interval of every two feet in any given soil boring. All of the soil samples are screened and measured with a photo-ionization detector (PID) (MiniRAE2000 equipped with a 9.8ev lamp and calibrated with 100 ppm benzene equivalent of isobutylene) in the field for the presence of volatile organic compounds (VOCs).

However, due to the cost concern, not every soil sample as collected is submitted for laboratory analysis. Rather, the soil sampling points, from which the representative soil samples are selected for laboratory analysis, are determined using the following criteria:

- The first soil sample is selected for analysis within the upper 3 feet to evaluate the soil ingestion pathway and the surface soil conditions.

- The second soil sample is selected for analysis at the most contaminated segment based on PID readings, odor, visual observation, etc. in order to define the highest level of contamination in the soil boring.

- The third soil sample is collected at the depth representing the lower boundary of the contamination plume in a vertical plane. This lower boundary of the contamination plume is identified in the field at the depth where no PID reading higher than zero ppm is recorded and no visual evidence of contamination, such as odor and/or discoloration, is observed. This soil sample is collected to help delineate the vertical soil contamination.

For the soil borings placed in the source area, additional soil samples are also collected to delineate the vertical distribution of the contaminants of concern (COCs).

1.3 Soil Sample Collection

During the soil sampling process, each soil boring is advanced with a GeoProbe system and is continuously sampled with a 4-foot stainless-steel sampling tube lined with a four-foot long plastic liner.

Upon retrieval, the plastic liner along with the soil core is immediately taken out of the sampling tube and is cut open for soil sampling. To minimize the loss of the contaminants through volatilization, the following procedure is followed in soil sampling activities in chronological order:

After the plastic liner is cut open, the entire soil core is screened with the PID to determine the highest VOC concentration segment of the soil core where it is then immediately sampled using purge-and-trap samplers (plastic syringes) for a total of four discrete soil samples on the same segment. Each discrete soil sample is collected into two 40-ml glass vials; one containing sodium bisulfate preservative, and one 40-ml glass vial containing a methanol preservative. Said glass vials are provided by the laboratory and are deemed clean. Upon collection, soil samples are immediately preserved in an ice chilled cooler. One 4-ounce glass jar is also packed with the same sample for testing of the moisture content and other parameters.

One soil sample is also taken every 2-feet interval of the entire length of the four-foot soil core for head-space screening with PID. These PID screening samples are placed in air-tight plastic bags.

METHODOLOGIES

Prior to taking the PID readings, we allowed enough time for each soil sample to stabilize. PID measurements are performed using the standard headspace method in which the soil organic vapors that built up in the top 3/4 empty headspace are directly measured with a MiniRAE2000 PID meter. The PID meter is calibrated daily to read in 100 ppm benzene equivalent of Isobutylene in a detection range from 0.1 ppm to 9,999 ppm.

The entire four-foot long soil core is then carefully inspected for visual signs of contamination, and a description of the subsurface strata, variation of soil color, compositions, etc. is noted.

Based on the combined results of the field PID measurements and visual inspection/observation of the soil core brought up by the GeoProbe, HDC selects representative soil samples for laboratory analyses from each soil boring.

All VOC samples are collected, stored, and handled in accordance with the EPA's SW-846 Method 5035. Each set of soil samples is contained in four containers, with three 40-ml glass vials respectively containing sodium bisulfate & methanol, and one 4-oz glass jar. The soil sample packed in the 4-ounce jar is used to measure the moisture content of the soil sample among other purposes.

Proper decontamination procedures are followed during the soil sampling activities. The sampling tubes are washed and rinsed prior to and between each sampling activity. A new plastic liner is used for each soil boring advancement. A new pair of gloves is used for the collection of each soil sample.

The Chain of Custody documentation is strictly adhered to during the field sampling activities and during the holding and delivery of the soil samples from the field to a NELAP NIHA-LAP accredited laboratory (Stat Analytical Corporation in Chicago, Illinois) for analysis.

During the field sampling activities, a waterproof pen is used to mark each soil sample container. The information marked on the sample containers includes, but is not limited to, the sample date & time, the sample identification & depth, the sample location, and any other applicable data.

All samples are generally picked up by an analytical laboratory the same day of sampling or the next working day. Before they are picked up, they are stored in a cooler with ice packs. The cooler is stored in our refrigerator, which is set up to 4ºC.

Upon completion of the soil boring activities, each soil boring is filled with bentonite, and then patched with concrete or asphalt to match the original surface finish.

2.0 SOIL GAS/VAPOR SAMPLING

2.1 Soil Gas Sampling

The US Environmental Protection Agency (EPA) has approved the use of GeoProbe's Post Run Tubing System for soil vapor sampling. Hydrodynamics Consultants has employed the following sampling procedures with GeoProbe's Post Run Tubing (PRT) System and Summa canisters:

- A soil gas sample is taken from subsurface soil at approximately 2.5' to 3.5' below the ground surface in areas where soil vapor intrusion is a concern.
- No rainfall over ½" occurred within the past 48 hours, the sample is taken above the water table, and the sampling surface area is dry.
- A clean GeoProbe's direct-push steel rod (4'-long, 1.25" OD with 0.65" hollow ID) with Dispensable Tip mounted on a 1.25"-diameter PRT Expendable Point Holder, is driven to 3.0' to 4.0' below the ground surface.
- The sampling rod is pulled up 6" to create a cavity to collect the soil gas sample.
- A 4'-long, stainless steel rod with 0.25" OD tip is inserted inside the probe rod to push down the expendable probe tip to the bottom of the probed hole.
- 0.25"-OD and 0.125"-ID Teflon tubing is connected to a 0.125"-ID Post-run Tubing Adaptor, and then inserted into the probe rod to thread (counter-clock wise) to the Expendable Point Holder and tightened with an o-ring seal in the bottom of the adaptor.
- Concrete/bentonite slurry is applied around the surface of the rod to prevent any surface air entering the hole along the side of the rod.
- Sampling Device (Summa canister and flow control regulator provided by a certified lab) Preparation: (a) check to make sure the canister valve is tightly closed, (b) remove cap from the canister air inlet using a 9/16 wrench and use the cap to seal the inlet of the flow control regulator, (c) attach the flow control regulator and tighten it, (d) quickly open the canister valve ½ turn and close it, while observing that the pressure gauge stays at 30" Hg without dropping. If a pressure drop is observed, either tighten the connections or use a new canister.
- A 3-way shutoff valve is connected to the surface end of the Teflon tubing to function as a sampling port inlet. The valve is tightly connected to the 0.25" OD and 0.125" ID Teflon tubing with a perfect seal. The inlet port for the Summa canister is connected to one outlet of the 3-way valve while the purging pump is connected onto the other outlet. The 3-way valve can turn on one outlet while turning off the other outlet simultaneously.
- The 3-way valve is first turned on to the purging pump outlet to purge 3 times of its volume of tubing and the probed cavity (about 0.5 liter) prior to the sampling.
- Turn off the 3-way valve after purging and turn on the inlet for the Summa Canister.
- Isopropyl alcohol tracer is sprayed over the sampling train during the sampling to ensure that there is no leakage to the sample train.
- Turn on the Summa Canister valve and observe the vacuum pressure drop in the regulator gauge.
- A sample of soil gas is drawn through a sampling train, with regulated rate, into the pre-evacuated Summa canister provide by the laboratory.

- Turn off the canister valve when the pressure gauge drops to about 5" Hg (8" Hg for this site due to the slow flow rate toward the end); then replace and tighten the canister cap. It may normally take about 8 minutes for each sample to fill a one liter Summa canister, but it took more than 20 minutes for each sample at this site.
- Record the final canister pressure and flow controller number on the canister sample tag, including sample ID and other information.
- The sample is then sent to the laboratory for analysis of VOCs using Method TO-15, including isopropyl alcohol content as its QA/QC parameter.
- To prevent any cross contamination, all the sampling probe rods are washed and the tubes are purged with helium gas before next use.
- The borehole is later sealed to match the existing conditions.

Because of a high moisture content in some soil probe locations at a depth of 3.5' below the ground, some soil gas sampling depths are raised to about 2.5'. Even at a 2.5' depth, high moisture content in some locations still makes it difficult to withdraw a sufficient air sample from the probe hole within 8 minutes (laboratory calibrated flow rate). Sampling time is sometimes extended from 8 minutes to about 20 minutes or more.

2.2 Sub-Slab Vapor Sampling

To assess the indoor sub-slab vapor quality, the following air sampling procedure is applied:

- Drilling concrete floor penetration sub-slab sampling holes inside the building.
- Properly inserted copper sampling probes with rubber sleeve into sub-slab sampling holes. The rubber sleeve tightly sealed the surrounding gaps between the copper probes and the wall of the concrete holes.
- Constructed a small water dam with VOC-free play mud around the sampling port and poured water inside the dam to ensure no leakage around the probes;
- Sampling Device (Summa canister and flow control regulator provided by a certified lab) Preparation: (a) check to make sure the canister valve is tightly closed, (b) remove cap from the canister air inlet using a 9/16 wrench and use the cap to seal the inlet of the flow control regulator, (c) attach the flow control regulator and tighten it, (d) quickly open the canister valve ½ turn and watch to observe that the pressure gauge stays at 30" Hg without dropping. If a pressure drop is observed, re-tighten the connections and cap.
- A 3-way shutoff valve is connected to one end of a Teflon tube and the other end of the tube is connected to the copper sampling probe inserted in the sampling port. The valve can be tightly connected to the 0.25" OD and 0.125" ID Teflon tubing with 100% seal.
- The inlet port for the Summa canister is tightly connected to one outlet of the 3-way valve while the purging pump (with PID reading) is tightly connected on the other outlet. The 3-way valve can turn on one outlet while turning off the other outlet simultaneously.
- The 3-way valve is first turned on to the purging pump outlet to purge 3 times its volume of tubing and the cavity (up to 5 liters or 5 minutes) prior to sampling.
- Turn the 3-way valve off the purging pump and turn to the inlet to the Summa canister to allow air to be sucked into the 1-liter vacuum Summar canister from the sub-slab.

- Isopropyl Alcohol tracer fluid is now spread over the sampling train during the sampling to ensure no leakage into the sample train.
- Turn on the Summa canister valve to observe the vacuum pressure drop on the regulator gauge.
- A sample of soil vapor is drawn through a sampling train comprised of components that regulate the rate and duration of sampling into the pre-evacuated Summa canister provide by the laboratory.
- Turn off the canister valve when the pressure gauge reaches about 5” Hg and replace and tighten the canister cap (it may take about 8 minutes for each sample withdrawing process to fill a one liter Summa canister).
- Record the final canister pressure and flow controller number on the canister sample tag, including sample ID and other information.
- The sample is then sent to the laboratory for analysis of VOCs using Method TO-15, including isopropyl alcohol content as its QA/QC parameter.

The borehole is later sealed with cement to match the existing conditions.

2.3 Indoor Air Sampling

HDC uses individually certified 6-liter stainless SUMMA canisters, equipped with a certified 24-hour critical orifice flow controller for indoor air sampling. The SUMMA canister(s) is/are placed in the breathing zone, approximately 3 feet from the floor. Once a SUMMA canister is in the appropriate sampling location, the canister valve is opened, and the initial vacuum pressure and start time is recorded on a air sampling data form.

After 24 hours, the canister valve will be closed, and the end time and ending vacuum pressure will be recorded on the air sampling data form. Following COC procedures, the canister and flow controller then will be shipped to the subcontracted laboratory for analysis and cleaning. Collected indoor air samples will be analyzed by TO-15 SIM.

2.4 Ambient Air Sampling

Ambient (outdoor downwind and upwind) air samples may be collected using individually certified 6-liter stainless SUMMA canisters, equipped with a certified 24-hour critical orifice flow controller. Ambient air locations will be free of obstructions such as large vegetation and building walls. The sample period will start prior to indoor air sampling and finish after the indoor air samples have been collected (if volume allows). Ambient air samples will be analyzed by TO-15 SIM by a subcontracted laboratory.

3.0 GROUNDWATER SAMPLING

3.1 Monitoring Well Preparation

Generally, monitoring wells are constructed with a 1”-diameter PVC screen and case; with a 10-foot to 15-foot PVC screen and 5-foot PVC riser. The annular space of the well is first filled with silica sand to a depth of about two feet above the well screen, then topped with two feet of bentonite, and then flush-mounted and grouted onto the surface. Upon completion, the groundwater monitoring well is developed by purging the standing water in the well until it is free or largely free of fines.

3.2 Groundwater Sampling

During groundwater sampling, the following procedures are adhered to:

- Prior to groundwater sampling, the wells are purged with a disposal bailer until they are free of visible fines.
- A groundwater sample is then retrieved with a disposable PVC bailer equipped with a Teflon ball check valve at the bottom.
- Each groundwater sample retrieved is divided and dispensed into two 40-ml glass vials containing HCL.
- The sample containers are closed with Teflon-lined lids.
- Upon completion, groundwater samples are immediately stored in an ice-chilled cooler.

After the vials are filled with water samples, we check to see if the vials are free of bubbles by holding the vials upside down. If bubbles are found, a new groundwater sample is collected from the well.

Proper decontamination procedures are followed during the groundwater sampling activities. A new PVC bailer is used in each groundwater sampling activity. A new pair of gloves is used for collecting each groundwater sample.

The Chain of Custody documentation is strictly adhered to during the groundwater sampling activities and during the delivery of the groundwater samples from the field to the laboratory.

During the field sampling activities, a waterproof pen is used to mark each groundwater sample container. The information marked on the sample containers includes, but is not limited to, the sample date and time, the sample identification, the sample locations, and any other applicable data.

All samples are generally picked up by an analytical laboratory the same day of sampling or the next working day. Before they are picked up, they are stored in a cooler with ice packs. The cooler is stored in our refrigerator, which is set to 4ºC.

4.0 SAMPLE HANDLING

The collected samples are labeled, packaged, and shipped in accordance with procedures outlined above.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

QC samples may be collected to evaluate the field sampling and decontamination methods, and the overall reproducibility of the laboratory analytical results. Specifically, QC samples may be collected at the following frequencies:

- Trip Blank
- 1 per shipment or cooler for water samples
- Field duplicate samples
- 1 per 10 investigative samples for groundwater samples
- Matrix spike/matrix spike duplicate samples
- 1 per 20 non-air investigative samples

Trip blanks are submitted for laboratory analysis to assess for potential contamination during handling, shipment, and storage of the investigative samples. Trip blanks are filled by the analytical laboratory with organic-free water and are kept with the investigative water samples throughout the field event. Field duplicate samples are collected for each investigative matrix (soil gas, sub-slab vapor, ambient air, indoor air, groundwater, and soil) as associated investigative samples. Field duplicate samples are processed, stored, packaged, and analyzed by the same methods as the investigative samples.

The HDC project manager, Mr. Mike Wan, PE, is responsible for ensuring that sample quality and integrity are maintained and that sample label and documentation procedures are correct and accurate.

6.0 DECONTAMINATION

Dedicated sampling equipment is primarily used during the collection of soil and groundwater samples. Used sampling equipment and personal protective equipment (PPE) is double-bagged and disposed of as dry, industrial waste.

Non-disposable equipment (such as the stainless steel dual tube coring device) is decontaminated between sampling locations. Decontamination water use will be kept to a minimum, and typically 5-10 gallons of rinsate water is generated. The decontamination water is disposed of on-site by evaporation over a hard surface.

7.0 REFERENCES

ASTM 2012. D7663-12, Standard Practice for Active Soil Gas Sampling in the Vadose Zone for Vapor Intrusion Evaluations, ASTM International, West Conshohocken, PA. www.astm.org

United States Environmental Protection Agency (EPA). 2010. Vapor Intrusion Guidebook.