SAMPLING PLAN
HOXSEY PROPERTY
WEDRON, LASALLE COUNTY, ILLINOIS

CONTRACT No. HWA-8317
WORK ORDER No. 009

Prepared for

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
1021 N. Grand Avenue East
Springfield, IL 62794-9276

Prepared by

WESTON SOLUTIONS, INC.
750 East Bunker Ct., Suite 500
Vernon Hills, Illinois 60061

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SECTION 1
INTRODUCTION

Weston Solutions, Inc. (WESTON®) has prepared this sampling plan at the request of the Illinois Environmental Protection Agency (IEPA), to investigate soil and groundwater contamination in Wedron, Illinois. The subject property is a triangular-shaped parcel, shown on Figure 1 and is referred to as the Hoxsey property (Hoxsey).

1.1 BACKGROUND INFORMATION

In 2009, benzene was detected in two private wells in Wedron at concentrations above the Maximum Contaminant Level (MCL) of 5 ppb. Following a second round of water samples collected by the IEPA, the groundwater contamination issue was referred to the U.S. EPAs Removal Program in 2011. Since that time, U.S. EPA has collected groundwater samples from approximately 40 additional homes in Wedron. Currently eight homes are being supplied drinking water by U.S. EPA. In house treatment units have recently been installed in the eight homes. U.S. EPA is in the process of trying to identify an alternate water supply for impacted homes in Wedron. U.S. EPA and IEPA continue efforts to identify the source of the Volatile Organic Compound (VOC) groundwater contamination.

The subject property is located in the rural community of Wedron, Illinois in LaSalle County. The Hoxsey property is a triangular shaped parcel formed by N 3462nd Road (County Highway 21, Wedron Road), E 2153rd Road (County Highway 11/County Highway 21), and Jackson St., as shown on Figure 1. The subject property is legally known as:

> Lots 1 and 2 in Block 9 in Belrose's Addition to Wedron; also a certain piece of land 20' wide and 215' long lying East of the and adjoining lots No.1 and 2 in Block 9 in Belrose's Addition to Wedron, all situated in LaSalle County, Illinois, with PIN 14-09-216-001.

The coordinates for a central location within the property are 41.43579° N (latitude), -88.77203° W (longitude), and the elevation is approximately 530 feet above mean sea level (AMSL). Property use to the north and west of the subject property is primarily residential. E 2153rd Road and north/south trending railroad tracks separate the Hoxsey

property from Fairmont Mineral/Wedron Silica property. The Fox River is located adjacent to the Fairmont Mineral property approximately 550 feet east of the Hoxsey property.

The Hoxsey property operated as a general store from the late 1920s to 1977 when a fire destroyed all of the buildings located on the property. The foundation outline of the general store building can be observed in historical aerial photos. The subject property is reported to have been vacant since the 1977 fire; however, several structures remain on the property, including two sheds and a mobile home.

Two private water supply wells have been located on the property. The first well is believed to have been approximately 80 feet deep and was contaminated with petroleum related compounds in the mid-1980s. A deeper, uncontaminated well has been installed on the property since that time. It is unclear if the original water supply well has been properly abandoned.

Prior to 1977, retail operations included the sale of gasoline. Three underground storage tanks (USTs) are reported to have been present on the Hoxsey property. The tanks consisted of one 500-gallon and one 1,000-gallon gasoline tank, and a third kerosene tank of undisclosed volume. Information regarding the installation and removal dates of the three USTs is unclear; however, the USTs are reported to have been removed prior to 1986. The USTs are believed to have been located in the northern third of the eastern side of the property adjacent to E 2153rd Road.

Investigative activities performed by the IEPA and the U.S. EPA in July 2012 revealed petroleum contamination in subsurface soils in a boring located adjacent to the Hoxsey property. A subsequent geophysical investigation performed by the U.S. EPA on the Hoxsey property identified at least two anomalies suspected to be USTs. Based on this information, a release incident was reported to the Illinois Emergency Management Agency (lEMA) and Incident No. H2012-0831 was issued for the Hoxsey property.

At the request of the U.S. EPA, Civil and Environmental Consultants, Inc. performed an investigation in November 2012 to determine if USTs were still present on the Hoxsey property. No USTs were unearthed; however, metal fill consisting of ventilation piping

was discovered during the investigation in the vicinity of the contaminated boring location.

Subsequent sampling by IEPA on and adjacent to the Hoxsey property in May 2013 indicated petroleum contamination in soil and shallow groundwater. Contamination was concentrated on the east side of the property.

1.2 PROJECT OBJECTIVES

This soil and groundwater investigation will be conducted in order to determine if the Hoxsey property has contributed, or is still contributing to the groundwater contamination in the area. Specific objective of the investigation include the following:

- Determine if a source of contamination remains at the Hoxsey property.
- Determine if an off-site source of contamination is contributing to groundwater contamination beneath the Hoxsey property.
- Generate the data necessary to evaluate the groundwater to indoor air exposure pathway.
- Based on the data obtained from this investigation, identify current or future potential risks to private residences or commercial buildings on the Hoxsey property.

1.3 SAMPLING PLAN ORGANIZATION

This sampling plan details the approach for soil and groundwater sampling to occur at and adjacent to the Hoxsey property. Section 1 presents the background information and the project objectives. Section 2 presents the investigative scope of work to achieve the project objectives. The project schedule is provided in Section 3. Table 1 is a summary of the anticipated analyses to be conducted as part of this investigation. Figures 1 and 2 show the general site location and the proposed sampling locations, respectively.

Appendix A contains field investigation Standard Operating Procedures (SOPs), which describe standardized methods, procedures, and protocol for soil and groundwater sampling.

SECTION 2
SCOPE OF WORK

This section details the scope of work to be performed during sampling activities at the Hoxsey property. The field investigation for the Hoxsey property will include the installation of four monitoring wells, soil sampling, and groundwater sampling. Three of the monitoring wells to be installed are to be located on the Hoxsey property, and one is to be installed east of E 2153rd Street. The approximate monitoring well locations are shown on Figure 2.

2.1 UTILITY CLEARANCE

A utility clearance will be conducted prior to the beginning of field activities on the first day of fieldwork. The appropriate utility companies will be contacted through the Illinois One-Call system (JULIE). As locations are intended to be located on private property, which is typically not covered through the JULIE, a private locator will be used to clear and verify utilities marked in the vicinity of these boring locations.

The soil boring locations shown on Figure 2 are approximate. Actual soil boring locations may be modified, based on the location of buried utilities, overhead utilities, or other site-specific reason identified during the field investigation.

2.2 SOIL SAMPLING

The four soil borings will be advanced using a hollow-stem auger (HSA) drill rig capable of collecting continuous soil samples. Each 2-foot soil interval will be screened using a photo-ionization detected (PID), and a sample will be collected into a disposable, sealable plastic bag for headspace screening. Each soil boring will be advanced to approximately 25 feet below ground surface (bgs), where bedrock is anticipated to be encountered.

Soil samples will be collected for laboratory analyses from each soil boring. Up to two samples will be collected from each soil boring. One sample will be collected from within the top 3 feet of soil and one sample will be collected from within the vadose zone

below 3 feet bgs. The deeper sample is to be collected from the soil horizon which appears to be most contaminated. This will be determined through PID headspace screening and visual, and olfactory observations. If obvious contamination is not observed in a given soil boring, the deeper sample will be collected near the bottom of the vadose zone, at least 2 feet above the water table, if encountered.

The soil samples will be analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total lead, and pH. Enough volume from each sample will be collected in order to also analyze for toxicity characteristic leaching procedure (TCLP) lead; however, this analysis will only be performed if the total lead concentration exceeds screening criteria (i.e., the TCLP lead samples will be held at the laboratory). The soil samples to be analyzed for VOCs will be preserved in the field using a sampling kit, such as a Terra Core soil sampling kit, in accordance with USEPA SW-846 Method 5035.

Four samples will be collected for fraction organic carbon (foc) analysis. Two of the samples will be collected from within the top 3 feet of soil, and two will be collected from within the vadose zone and below 3 ft bgs. These samples will be collected from the same depth intervals to be sampled for the chemical analytes discussed above. Upon collecting each sample, the sample jar will be appropriately labeled and placed into an iced cooler.

2.3 MONITORING WELL INSTALLATION AND DEVELOPMENT

The four soil boring locations will be converted to permanent monitoring wells. The drill rig will be re-tooled with a tri-cone drilling bit to be advanced through the middle of the augers. Each borehole will be advanced an additional 20 feet into bedrock. The boreholes will be a minimum 4-inch diameter, a size sufficient to construct a 2-inch monitoring well. Water will be used as a drilling fluid, and efforts will be made to avoid the use of additives to the drilling fluid. A solid casing will be temporarily installed in the borehole if a large loss of drilling fluid is observed.

Each of the four monitoring wells will be constructed of 2-inch diameter polyvinyl chloride (PVC) materials and will be installed to the bottom of the borehole. The

monitoring well will consist of one 15-foot long, slotted screen with 0.010-inch slots, and enough riser pipe to reach the surface. The monitoring well installation will be in accordance with industry standards to include: a sand pack to at least 2-feet above the top of the screen; a minimum of 2-feet of a bentonite seal on top of the sand pack; and a bentonite grout (or equivalent) on top of the seal to within 2-feet of the ground surface. Each monitoring well will be completed at the surface with a locking, flush-mounted, protective casing set in concrete.

The drilling subcontractor will develop each monitoring well by alternately surging and pumping the wells. Development will be monitored by a WESTON field geologist and the groundwater quality parameters (pH, temperature, turbidity, and specific conductance) will be documented at regular intervals. The goal of development will be to remove a minimum of three well volumes, plus the amount of water lost during drilling, and to attain a turbidity of less than 25 nephelometric turbidity units (NTU). No more than approximately 10 well volumes plus the volume of water lost during drilling will be purged during development. All groundwater produced during well development will be containerized in 55-gallon drums.

2.4 GROUNDWATER SAMPLING

Each of the four new monitoring wells will be sampled, no sooner than 1 week after the completion of development. Groundwater sampling will be completed using low-flow sampling methods utilizing a bladder pump. Pumping will occur at a rate of approximately 100 milliliters (ml) per minute. Water quality parameters will be measured through a flow-through cell and a stand-alone turbidity meter until stability is achieved. Stabilization criteria for pH, temperature and specific conductance will be 5%. Stabilization criteria for turbidity will be 10%, or a reading of less than 5 NTU. Field parameters will be read at regular intervals of approximately 5 minutes.

Groundwater samples will be collected once the well has stabilized. The samples will be collected directly from the pump discharge tubing into the laboratory-supplied bottles. Sample bottles will be filled at an angle to minimize agitation and aeration of the sample and samples for VOC analysis will be capped without headspace. Samples requiring preservation (e.g., with an acid) will be preserved in the field. Samples will be collected

for VOCs, SVOCs, and lead. Sample bottles will be appropriately labeled and placed into an iced cooler.

2.5 QUALITY CONTROL – QUALITY ASSURANCE SAMPLES

The sampling effort will include the following types of field quality control (QC) samples - field duplicates, trip blanks, and equipment blanks. Field duplicate samples will be collected during soil and groundwater sampling at a minimum, one-per-ten sample frequency, using procedures identical to those used for the investigative samples. The field team leader will determine which samples are to be sampled in duplicate. Trip blanks are laboratory-prepared samples of high-purity water that travel with sample bottles to and from the site. One trip blank of pre-filled volatile organic analysis (VOA) vials will accompany each shipment of aqueous samples to be analyzed for VOCs. One soil sampling kit will be used as a trip blank and will accompany each shipment of solid samples to be analyzed for VOCs.

Equipment blanks will be collected for the soil and groundwater media. The soil sampling equipment blank will be collected by passing high-purity water across the soil sampling equipment (e.g., a split spoon), and collecting the water directly into the appropriate sampling vials or bottles. The groundwater equipment blank will be collected by pumping high-purity water through the sampling pump and a short length of tubing, which was used during sampling, and directly into the appropriate sampling vials and bottles. Equipment blank samples will be analyzed for VOC, SVOCs, and lead.

2.6 INVESTIGATION-DERIVED WASTE

All investigation-derived waste (IDW) will be containerized in steel, 55-gallon drums. IDW will include soil cuttings, personal protective equipment, drilling fluids, monitoring well development water, and purge water from groundwater sampling. Solids and liquids will be containerized in separate drums. The drilling subcontractor will be tasked to move the 55-gallon drums to a pre-determined location.

One soil and one liquid sample will be collected for analysis of disposal parameters. With the exception of the sample to be collected for the volatile fraction analysis, the soil

and groundwater samples will be collected as composite samples. The soil and liquid samples to be analyzed for the volatile fraction will be collected from the drums expected to contain the worst-case (most impacted) soil and groundwater.

The final list of analytes required for disposal will be determined by the receiving facility.

2.7 LABORATORY

The laboratory that will perform all of the chemical analyses will be approved through the Illinois Environmental Laboratory Accreditation Program (IL ELAP). The list of approved laboratories is found on the IEPA web site.

2.8 DECONTAMINATION

To prevent cross-contamination between sampling locations non-disposable equipment, tools, and the drill rig will be decontaminated in accordance with the procedures outline in the attached standard operating procedure (SOP).

2.9 SURVEYING

The northing and easting of the four monitoring wells will be determined by an Illinois licensed land surveyor in the UTM 16 N NAD 83 Coordinate System. The elevation of the top of the inner casing and the top of the flush-mount protective casing will be surveyed and reported in feet AMSL and referenced to the NAVD88 datum.

SECTION 3
PROJECT SCHEDULE

3.1 PROJECT SCHEDULE

Based on the scope of work presented in this sampling plan, WESTON developed a proposed project schedule, presented in Table 2, which will allow for timely project completion. If significant schedule revisions are necessitated by scope, changes, or other unanticipated delays, WESTON will provide updated schedules as appropriate to IEPA.

TABLES

Table 1
Summary of Sampling and Analysis Program
Illinois Environmental Protection Agency
Hoxsey Property
Wedron, LaSalle County, Illinois

Boring/Well ID	General Location	VOCs		SVOCs		Total Lead		TCLP Lead *	pH	Fraction Organic Carbon **
		Soil	GW	Soil	GW	Soil	GW	Soil	Soil	Soil
IMW-101	East side of N. 2153rd Street	2	1	2	1	2	1	2	2	4
IMW-102	Hoxsey Property - E. Side	2	1	2	1	2	1	2	2	
IMW-103	Hoxsey Property - N. Side	2	1	2	1	2	1	2	2	
IMW-104	Hoxsey Property - W. Side	2	1	2	1	2	1	2	2	
Sample Duplicates		1	1	1	1	1	1	1	1	--
Equipment Blanks		1	1	1	1	1	1	--	--	--
Trip Blanks		1	1	--	--	--	--	--	--	--
Total Number of Samples		11	7	10	6	10	6	9	9	4

Notes and Abbreviations

GW - Groundwater

VOC and SVOC compounds to be reported include those listed in 35 IAC 740 - Site Remediation Program, Appendix A.

* - TCLP lead samples will be collected and held at the laboratory pending evaluation of the total lead results.

** - Two fraction organic carbon samples will be collected from surface soil (from top 3 ft bgs), and two fraction organic carbon samples will be collected from suburface soil (from vadose zone below 3 ft bgs). The locations are to be selected in the field and will attempt to be collected from un-impacted areas.

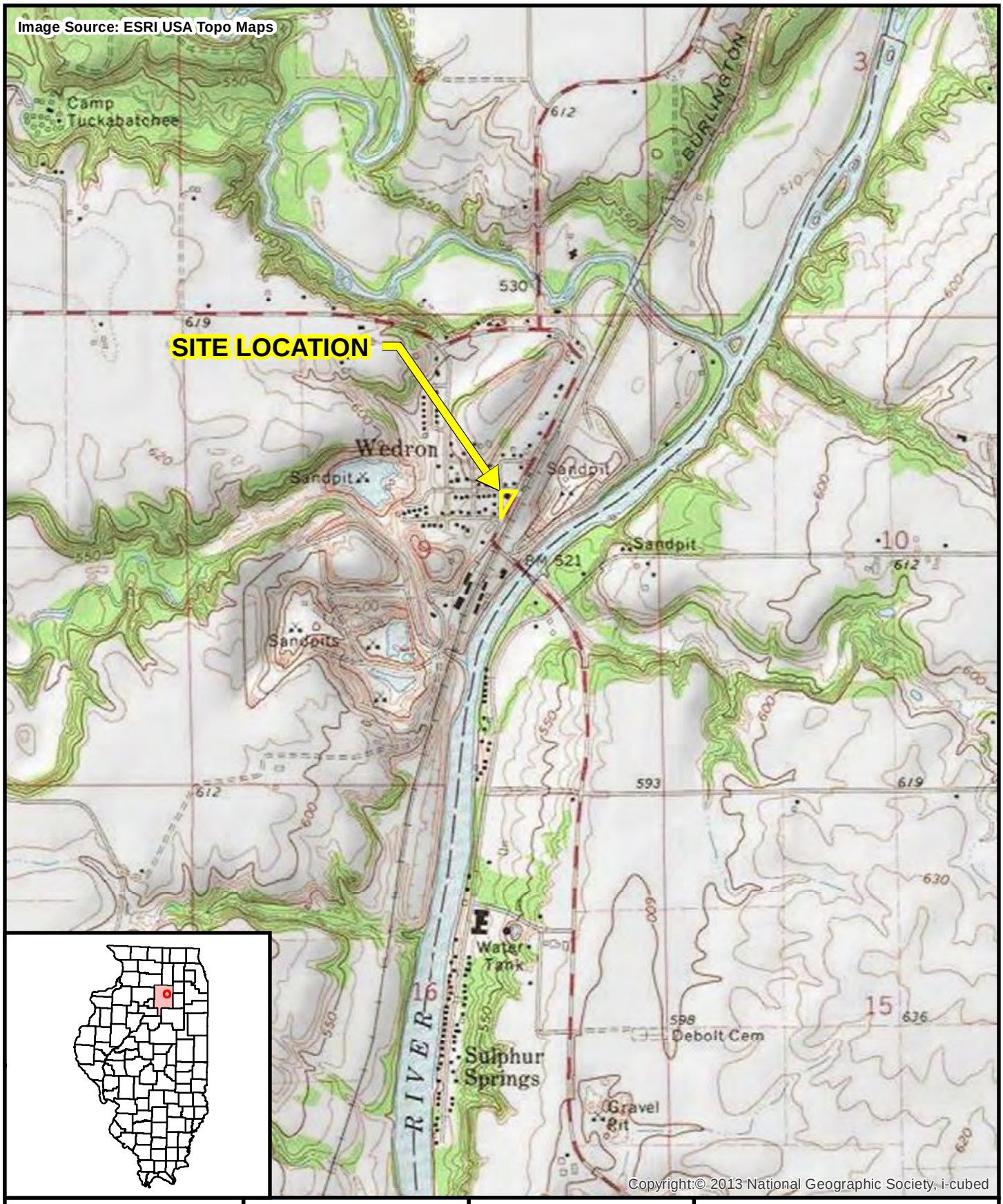
One Matrix Spike/Matrix Spike Duplicate (MS/MSD) sample will be collected for each media, for VOCs, SVOCs, total lead, and TCLP lead.

Table 2
Investigation Schedule
Illinois Environmental Protection Agency
Hoxsey Property
Wedron, LaSalle County, Illinois

Activity	Anticipated Duration	Start	End
Mobilization for Field Investigation	1 week	08/19/13	08/23/13
Field Investigation - Soil Borings/Well Install	4 days	08/26/13	08/30/13
Field Investigation - Groundwater Sampling	2 days	09/03/13	09/06/13
Laboratory Analysis	3 weeks (from final sampling date)	08/28/13	09/27/13

Notes:
All dates are approximate.

FIGURES



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Legend

0 2,000 Feet

N

Prepared For:
ILLINOIS EPA

Contract No.: HWA-8317
Work Order No.: 09

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Figure 1
Site Location Map
Hoxsey Property
Wedron, LaSalle County, Illinois

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Legend

Proposed Monitoring Well

0 100 Feet

N

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ILLINOIS EPA

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Figure 2
Proposed Monitoring Well Location Map
Hoxsey Property
Wedron, LaSalle County, Illinois

APPENDIX A

STANDARD OPERATING PROCEDURES (SOPs)

SOP
DRILLING, SOIL SAMPLING, AND FIELD SCREENING PROCEDURES

1.0 INTRODUCTION

The purpose of this Standard Operating Procedure (SOP) is to provide Weston Solutions, Inc. (WESTON®), personnel with guidance for conducting and overseeing soil boring drilling and rock coring activities conducted by a drilling subcontractor.

2.0 DRILLING ACTIVITIES

Field personnel should review and become familiar with the specifications of the drilling subcontract prior to the beginning of field work. This is to ensure that the drilling subcontractor conducts the operations as required by WESTON. In addition, an appropriate Health and Safety Plan (HASP) must be prepared for all site activities.

2.1 Hollow Stem Auger Rig

A drill rig is utilized for soil boring and rock coring. During drilling oversight, field personnel should observe all specific tasks of the overall drilling operation at each drilling location. Field personnel will identify drilling locations and verify borehole depth for the subcontractor. Under *no* circumstances shall WESTON personnel tell the drilling subcontractor *how* to operate the drill rig. Soil borings will be advanced with a truck-mounted drill rig, using the following procedures:

- The working end of the drill rig and all drilling equipment, tools, and materials will be decontaminated with a pressurized steam cleaner prior to drilling at each location. Provisions will be made to keep equipment, tools, and materials from coming into contact with surface soil during drilling and well installation.

- The soil borings will be advanced to the established sampling depths utilizing 83 or 108 mm (3.25 or 4.25-inch) inner-diameter hollow-stem augers. Sampling will be conducted at each boring location using standard split-spoon sampling techniques. Split-spoon samplers will be advanced ahead of the lead auger to ensure collection of an undisturbed soil sample. A standard 63.6-kilogram (140-pound) rig hammer will advance the split spoon.

- Each split-spoon sampler will be decontaminated in accordance with the standard decontamination protocol for sampling equipment.

- Samples will be collected and placed into appropriate laboratory-supplied sampling containers.

- Upon completion of sample collection, drill cuttings will be returned to the borehole, drummed, or managed in accordance with the site-specific work plan.

- Rock cores will be obtained with a 10-foot long core-barrel (e.g., NX core-barrel). Coring will be conducted with water as a drilling fluid.

- Boreholes to be drilled into bedrock will require the use of a drilling fluid to maintain an open borehole and to remove the rock cuttings. For environmental drilling, care should be taken to ensure the drilling fluid is not excessively spilled to the ground.

2.2 Direct Push (Geoprobe®) Rig

A Geoprobe is utilized for soil boring in most geologic conditions, but is not effective to drill through bedrock, buried concrete, rubble, cobbles, and similar materials. During drilling oversight, field personnel should observe all specific tasks of the overall drilling operation at each drilling location. Field personnel will identify drilling locations and verify borehole depth for the subcontractor. Under *no* circumstances shall WESTON personnel tell the Geoprobe subcontractor *how* to operate the drill rig. Soil borings will be advanced with a truck-mounted or track-mounted Geoprobe rig, using the following procedures:

- The working end of the Geoprobe and all drilling equipment, tools, and materials will be decontaminated with a pressurized steam cleaner prior to drilling at each location. Provisions will be made to keep equipment, tools, and materials from coming into contact with surface soil during drilling and well installation.

- The soil borings will be advanced using the Geoprobe's motor-driven hydraulic hammer to the established sampling depths. Soil samples will be collected utilizing a 1.5 to 2-inch outer diameter sampler equipped with a disposable polyethylene sample liner.

- Each sample liner will be opened by the subcontractor on a clean surface (e.g., polyethylene sheeting).

- The non-disposable sampling equipment will be decontaminated in accordance with the standard decontamination protocol for sampling equipment.

- Samples will be collected and placed into appropriate laboratory-supplied sampling containers.

- Upon completion of sample collection, drill cuttings will be returned to the borehole.

2.3 Hand Auger Drilling

A hand auger is utilized for soil boring in locations where other drilling methods can not be utilized due to access limitations, where utilities are an issue, or for other applicable reason. Hand auger advancement may be conducted by WESTON or the subcontractor. During drilling oversight of the subcontractor, field personnel should observe all specific tasks of the overall drilling operation at each drilling location. Field personnel will identify drilling locations and verify borehole depth for the subcontractor. Soil borings will be advanced with a hand auger using the following procedures:

- The hand auger, rod extensions, and the handle will be decontaminated prior to augering at each location. Provisions will be made to keep equipment, tools, and materials from coming into contact with surface soil during augering.

- The soil borings will be advanced to the established sampling depths or to the maximum possible depth due to refusal or other limitation inherent to the manual augering approach. Soil samples will be collected utilizing a 2- to 4-inch outer diameter sampler.

- The hand auger will be advanced in approximately 6- to 8-inch increments. Soil within the auger will be pushed or knocked out onto a clean surface (e.g., polyethylene sheeting).

- The hand auger and associated equipment will be decontaminated following each soil boring in accordance with the standard decontamination protocol for sampling equipment.

- Samples will be collected and placed into appropriate laboratory-supplied sampling containers.

- Upon completion of sample collection, cuttings will be returned to the borehole.

3.0 SOIL SAMPLING PROCEDURES

Following removal from the boreholes, the split spoon or Geoprobe sampler will be opened onto a clean surface. The upper end (typically 51 to 76 mm [2 to 3 inches]) of the soil core will be discarded to reduce potential cross-contamination. A central portion of the soil core will be collected for VOC headspace screening purposes. Another portion of soil from the center of the soil core will be immediately collected for laboratory analysis for VOC (depending upon the results of field screening). Each VOC soil sample will be collected as a discrete "grab" sample from each 610 mm (2-foot) long soil core interval. The VOC sample will be immediately placed into an iced cooler.

The remainder of the core will be used to collect samples for the remaining parameters, as applicable. Soil will be placed into a decontaminated stainless steel or a dedicated plastic or aluminum bowl, and homogenized using a spoon or spatula. Homogenization will be

considered complete when the soil appears to have the same properties throughout (e.g., color and texture). When homogenization is complete, the sample material will be placed into the appropriate sampling containers.

All reusable sampling equipment, including the stainless steel spatulas, split spoons, spoons, mixing bowls, and trays, will be decontaminated between the collection of each sample.

4.0 FIELD SCREENING PROCEDURES

Each soil sample recovered will be screened using either a photo-ionization detector (PID) or an organic vapor analyzer (OVA) in accordance with the following protocols:

- Upon opening the split spoon or Geoprobe sample liner, a representative sample will be collected for laboratory VOC analysis, and a portion of the sample will be placed into an 8-ounce glass jar or plastic zip-lock-type bag.

- The 8-ounce glass jar to be used for screening will be covered with heavy-gauge aluminum foil and capped.

- The jar or bag will be allowed to equilibrate to room temperature (approximately 70°F).

- The sample will be shaken for a minimum of 30 seconds.

- The probe of the PID or OVA will be inserted into the jar through the aluminum foil, or into a small opening into the zip-lock-type bag, to a point halfway between the foil, or opening, and the sample. The peak instrument reading will be recorded.

To ensure proper operation, the field screening instrument will be calibrated each morning prior to use according to the manufacturer's specifications. Response of the unit will be routinely monitored for aberrant behavior that may suggest operational malfunction.

5.0 DOCUMENTATION

Field personnel should note the following information in the site logbook when monitoring subcontractor drilling activities:

- Subcontractor site arrival/departure times and dates.
- Verification of equipment used.
- Drilling location(s) to include buildings, roads, utility lines (overhead and buried), and the north direction arrow.
- Weather conditions during monitoring activities (note significant weather changes, such as electrical storms, heavy rain, etc.).

- Permission for access.
- Specific changes in the scope of work, including personnel

A drill log should be completed by the field geologist and the drilling operator and should include the following:

- Client
- Site name
- Location to include city, county, and state
- Borehole identification
- Begin/completion date and time
- Blow counts for split spoon sampling
- Depth and description of each soil/rock horizon (including USCS classification)
- Depth of soil samples
- Depth to bedrock
- Depth of static water level (upon borehole completion)
- Depth of water bearing zones
- Depth of penetration in feet
- Amount of recovery in feet and percent
- Any problems/comments

The drill log should also include air-monitoring results and notes on any visual or olfactory indications of contamination. This detail will aid in the analysis of the site investigation.

SOP
Low Flow Groundwater Sampling

1.0 INTRODUCTION

The purpose of this Standard Operating Procedure (SOP) is to provide Weston Solutions, Inc. (WESTON), team members with a general step-by-step guide to collecting representative low flow groundwater samples using a bladder pump.

2.0 DISCUSSION

For this procedure, an all stainless steel and teflon bladder pump (e.g., IEA, TIMCO, Well Wizard, Geoguard and others) is used to provide the least amount of material interference to the sample (Barcelona, 1985). The water comes into contact only with the inside of the bladder (teflon) and the sample tubing (polyethylene or nylon), that may be dedicated to that well.

Barcelona (1984) and Nielson (1985) report that the non-gas contact positive displacement pumps cause the least amount of alteration in the sample as compared to other sample retrieval methods.

Low-flow purging rates (0.1 to 0.5 L/min) will be observed in conjunction with minimal drawdown of the water table. Adherence to these methods will insure nominal mixture of casing and formation water during the sample collection process. In addition, the above criteria along with placement of the pump intake near the center of the screened interval will allow for representative groundwater inflow from the formation, with negligible mixing of stagnant casing water.

Minimal drawdown of the water table is essential to collecting a representative sample of formation water. Drawdown should be limited to several inches when possible. Stabilization of drawdown is indicative of inflow of fresh formation water.

Water quality parameters will be obtained prior to sample collection at each well. Stabilization of pH, specific conductance, oxidation reduction potential, temperature, and turbidity is indicative of fresh formation water and is used to determine when sample collection will occur. Stabilization of pH, specific conductance, temperature, and turbidity will be considered constant when three readings within 5 percent (%) are achieved. Turbidity will be considered stabilized when either three readings are within 5 % or once readings are below 10 nephelometric turbidity units (NTU). Water quality meter, such as the YSI Model 600XL, and turbidity meter, such as the Hanna Turbidimeter Model HI98703 or equivalents, will be used to monitor field parameters. A flow-through cell will be used to pump groundwater past the meter probes. Water for turbidity measurements will be collected from the flow-through cell outflow.

Monitoring wells are sampled immediately after stabilization is achieved. Groundwater is pumped directly from the downhole tubing to the sample containers or by connecting the pump-outlet tubing directly to a filter unit for dissolved parameter samples. The

pump pressure shall be decreased so that the pressure build-up on the filter does not blow out the pump bladder or rupture the filter. Samples will not be collected after groundwater has passed through a flow-through cell.

2.1 Preparation

- Pump head should be taken apart, cleaned, reassembled and checked for operation.
- The number and type of sample bottles necessary for the sampling trip should be calculated and obtained, chain-of-custody forms, ice and coolers.
- Decontaminate all equipment prior to sampling.

3.0 OPERATIONS

Wells should be sampled from the least to the most contamined, whenever possible, to reduce the risk of cross-contamination between locations.

- Unlock the well, use a stiff brush to clean away any dirt or debris from around the well cap, and remove the cap.

- Lower the precleaned water level indicator down the well until the indicator sounds. Measure the depth to water from the mark on the well casing to the nearest 0.01 foot. Record this measurement in the logbook.

- Calculate and record the amount of water in the well (well volume).

- Gently lower the pump into the well until it is approximately at the midpoint of the screened interval. Purge and sample according to established protocol.

- The pump and pressure rate is adjusted with the cycle time so that the flow is not violent and the sample is representative of fresh formation water.

- Field parameter readings are measured and recorded on a regular basis, typically between 3 and 10 minutes. The depth to groundwater is measured concurrently with each field parameter reading to determine drawdown, and affirm the sample is representative of fresh formation water.

- Collect the samples into appropriate containers that have been cleaned to EPA standards.

- The type of analysis for which the sample is being obtained determines the type of bottle, preservative, holding time and filtering requirement. Just prior to collection of the sample, the container is pretreated, if required.

- If low-flow conditions cannot be achieved in a given monitoring well, as a result of excessive drawdown, the field team leader will determine the appropriate sampling approach, and will contact the Task Order Manager as appropriate.

4.0 POST OPERATION

After all samples are collected and preserved from a given monitoring well, the sampling equipment will be decontaminated and a new bladder installed prior to sampling another monitoring well to minimize the risk of cross- contamination.

5.0 REFERENCES

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SOP
DECONTAMINATION PROCEDURES

1.0 INTRODUCTION

To provide guidance for the decontamination of equipment used for sampling, installation of sample points (monitor wells, soil borings, etc.), and measurement of field parameters. This operating practice is not intended to be site specific or equipment specific, but to provide guidance in place of non-existent state or federal guidelines.

2.0 DISCUSSION

The objective of decontamination procedures is to provide clean equipment for the retrieval of representative environmental samples. Decontamination procedures differ depending on the nature of the equipment used. The three categories of decontamination procedures are discussed below:

- Intrusive equipment used to install sample points including drilling (tools, augers, rods, etc.) and excavation equipment (backhoes, excavators, etc.).

- Equipment used to measure the characteristics of the media to be sampled including water level, pH, specific conductivity, and temperature probes. This category also includes pumps to purge water.

- Equipment that has contact with the sample to be submitted for laboratory analysis including bailer, split-spoons, hand auger, and stainless steel bowls and scoops.

Because items from the first two categories do not contact the sample media that is sent to a laboratory for analysis, the decontamination procedures are less stringent. Dedicated and disposable equipment will be used whenever feasible to limit decontamination and the possibility of cross-contamination. This includes rope, tubing, filterware and, in some cases, soil scoops and bailers.

3.0 PROCEDURES

All equipment involved in field sampling activities will be decontaminated before and after sampling. Equipment leaving the site will be decontaminated as specified in the HASP. Extraneous contamination and cross-contamination will be controlled by using the proper decontamination procedure, by wrapping sampling equipment in aluminum foil when not in use, and by changing and disposing of the sample gloves frequently. Personnel directly involved in equipment decontamination will wear protective clothing, as specified in the HASP. The following decontamination procedures will be employed:

- Intrusive Equipment: Drilling tools, including augers, rods, drill bits, hand tools, etc. will be decontaminated prior to use and after each location. Backhoe buckets and arms will also be decontaminated prior to use and between each sample location. All

drilling equipment and tools will be decontaminated in accordance with the protocol provided in Table A.

- Sampling and Field Measurement Equipment: All sampling equipment, including trowels, split spoons, etc., will be decontaminated in accordance with the protocol outlined in Table B. Equipment used for sample collection include but are not limited to bailers, stainless steel scoops and bowls, hand augers, split spoons, water level probes, etc.

Sampling instruments should be wrapped in aluminum foil after decontamination to keep clean before sampling.

4.0 DOCUMENTATION

Decontamination efforts should be documented in the field logbook. Decontamination fluids should be disposed of properly. Depending on site conditions, it may be appropriate to contain spent decontamination fluids. In that case, the appropriate vessel (i.e., drum) should be used depending on the ultimate disposition of the material.

Table A

Standard Decontamination Protocol for Drilling Equipment

Step	Task
1	The drilling rig or other equipment/materials will be moved to the designated decontamination area. The decontamination area location will be selected to avoid the contamination of additional areas of the site.
2	All drilling casing and related drilling equipment will be supported aboveground and will be individually steam-cleaned using a pressurized steam/water spray.
3	The control panel and working area of the drill rig will be steam- cleaned, if it is deemed necessary.
4	If necessary, a nonsolvent type cleaning solution such as isopropanol or Alconox detergent will be used to spot clean any areas requiring further cleaning. Scrubbing of these areas will be followed by steam cleaning to remove the residual contamination.

Note: Steam cleaning will be performed using pressurized steam on all augers, tools, sampling devices, etc., before each use on a new borehole. Steam cleaning will continue until all visible contamination, oil, grease, etc., is removed.

Table B

Standard Decontamination Protocol for Sampling Equipment

Step	Task
1	Equipment will be scrubbed thoroughly with brushes in a low-sudsing (Alconox) detergent solution.
2	Equipment will be rinsed with distilled water by submerging and/or spraying.
3	Equipment will be allowed to drip dry before use. Equipment not used for an extended period of time will be covered in aluminum foil or plastic sheeting.