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March 3, 2020

Mr. Mike Warfel, L.G., L.H.G., R. G.
Voluntary Cleanup Program Site Manager
State of Washington, Department of Ecology
NW Regional Office/Toxics Cleanup Program
3190 160th Avenue SE
Bellevue, Washington 98008

Subject: Work Plan to Address Existing Data Gaps
U-Haul Facility No. 801053
6720 Bothell Way NE, Kenmore, Washington 98028
Ecology Facility/Site ID No. 15418523
Voluntary Cleanup Program Project No. NW2800
ATC Project No. 1052 1053 07

Dear Mr. Warfel:

ATC Group Services LLC (ATC) has prepared this work plan on behalf of AMERCO Real Estate Company (the property owner of the subject site). The proposed scope of work is intended to address data gaps identified in the *Remedial Investigation Report* (prepared by ATC and dated May 20, 2019) as evaluated by the Washington Department of Ecology (Ecology) in correspondence dated August 19, 2019. The objective of the work plan is to fully characterize the soil and groundwater and includes an indoor air quality (IAQ) survey to allow ATC to update the conceptual site model (CSM) and prepare a Feasibility Study (FS)/Disproportionate Cost Analyses (DCA) for the subject site.

SCOPE OF WORK

The objective of the work proposed in this work plan is to obtain additional soil and groundwater data and IAQ data to evaluate the human health risk potential associated with residual petroleum hydrocarbon impacts. This work plan includes:

- Soil sampling and analyses at the approximate location of the former fuel (gasoline and diesel) underground storage tanks (UST);
- Soil sampling and groundwater monitor well installation south and east of the former fuel UST area;
- Soil sampling and groundwater monitor well installation down-gradient of (and adjacent to) the former used oil UST;
- Gauge all wells, conduct low-flow purge followed by sampling and analyses of groundwater at existing wells MW-1, MW-2, MW-3 (and all new wells); and,
- Conduct an IAQ survey and compare the results to Ecology's Model Toxics Control Act (MTCA) Method B indoor air cleanup levels

The proposed investigative activities are described in detail below.

1. HEALTH AND SAFETY PLAN (HASP)

ATC's primary mechanism to ensure employee, environmental and public safety at the project site is the HASP. Prior to conducting field activities ATC will prepare for implementation a site-and task-specific HASP for this project. All individuals working under the purview of ATC will be required to read and sign the HASP to acknowledge their understanding of the information contained therein.

2. UNDERGROUND UTILITY SURVEY

Prior to initiating subsurface activities, ATC will delineate the former fuel and used oil UST areas to identify the locations of all underground utilities in the focus area. This will start with a call to the Washington Utility Notification Center to identify public utilities. A private utility locator will also be contracted to trace out subsurface utility lines in these areas.

3. INVESTIGATION AT FORMER FUEL UST AREA

Background

All soil excavated during the May 1996 fuel UST removal activities was reportedly used as backfill. Evidence of varying degrees of petroleum hydrocarbon impact were noted throughout the excavation (to a maximum depth of 12 feet below ground surface [bgs]). The impacted spoils (generated during UST removal activities) were reportedly emplaced on top of imported fill to bring the excavation to within four to six inches of surface grade prior to asphalt resurfacing[1].

Characterization activities in June 2015 included drilling and sampling at MW-2 at approximate depths of five, 10, 15 and 20 feet bgs[2]. The location of MW-2 was selected based on the UST removal confirmation sample that exhibited the greatest degree of impact.

Characterization of Infill and Vertical Definition of Soil

Four soil borings (B4 through B7) are proposed within the approximate excavation limits associated with the four former fuel USTs (attached Figure 1, Proposed Boring Locations). Data collected from these borings is intended to satisfy two objectives:

> Objective #1: Characterize the infill material.
>
> Borings will be drilled and sampled at varying intervals starting at two feet bgs through approximately 15 feet bgs. At least two samples at each boring will be selected for laboratory analyses, to characterize the infill material and the native soil immediately beneath the former fuel UST basin.
>
> Objective #2: Vertically define the petroleum hydrocarbon impacted soil.
>
> At 20 feet bgs, soil at MW-2 exhibited low levels of ethylbenzene (0.0985 milligrams per kilogram [mg/kg]) and total xylenes (0.594 mg/kg)[2]. Two of the four proposed borings in the former fuel UST area will be sampled at five foot vertical intervals from 15 feet bgs to a proposed maximum depth of 40 feet bgs to vertically define the petroleum hydrocarbon impacted soil. Field screening of soil samples (utilizing a photoionization detector [PID]) will be evaluated to select which borings to utilize for vertical definition.

Characterize petroleum hydrocarbon impacted soil and groundwater to property extent.

Three soil borings (B8 through B10) are proposed to the south and east of the former fuel UST basin (Figure 1). Based on the existing groundwater elevation contour maps, the limiting flow lines across the former fuel UST area extend outward in a south-southwesterly to a southeasterly heading. The existing well MW-3 serves as the point-of-compliance for

[1] Blaes Environmental Management, Inc., 1996. Underground Storage Tank Removal Report. August 5.
[2] ATC, 2019. Remedial Investigation Report. May 20.

groundwater data south-southwest relative to the former fuel UST area. At least one, but potentially all three of the proposed borings will be completed as groundwater monitor wells with a screen interval extending across the static water level. ATC will evaluate PID screening results to determine which of these borings will be completed as groundwater monitor wells. Borings not completed as wells will be backfilled with bentonite chips.

Field work will be conducted in general accordance with ATC's Standard Operating Procedures (SOP) including:

- Hollow-Stem Auger Drilling and Soil Sampling,
- Field Soil Vapor and Metals Monitoring, and
- Groundwater Monitor Well Installation and Development

The referenced SOP are included as Attachment A.

4. Investigation at Former Used Oil UST Area

ATC will attempt to advance a boring (B11) southeast (hydraulically down-gradient) relative to the former used oil UST (Figure 1). This boring is intended to intercept groundwater, and will be completed as a monitor well with a screen interval extending across the static water level. Access is limited in this area; the east end of the U-Haul building is utilized for custom hitch installations (single bay) with roll-up garage doors on both the south and north sides. The proposed location accurately depicts the proximity relative to the former used oil UST. In the event that underground utilities or other field conditions render the proposed boring B11 unfeasible, ATC proposes to core through the building foundation and attempt to hand auger to five feet. This location (B12, Figure 1) is intended to obtain soil samples at five feet bgs to evaluate current soil condition with those collected on the south wall of the excavation at the time of removal (May 1996). Boring B12 is not intended to be advanced to groundwater, but if field conditions indicate petroleum hydrocarbon impacts exist at five feet bgs, ATC will attempt to sample soil at deeper intervals. Additionally, ATC will attempt to advance a hand auger boring (B13, Figure 1) adjacent to existing well MW-1, angled toward the south; this boring and its associated soil samples/analyses are intended to characterize the backfill materials within the former used oil UST area. The target total depth at B13 is eight feet bgs.

Field work will be conducted in general accordance with ATC's SOP - Hand Auger Drilling and Soil Sampling (included in Attachment A) in addition to the SOP cited in Section 3. For field quality control, one equipment blank will be collected each day (pouring distilled water over decontaminated sampling equipment and capturing it in 40-milliliter hydrochloric acid preserved vials, to be submitted for volatile organic compounds [VOC] analyses by Environmental Protection Agency [EPA] Method 8260B).

5. Groundwater Sampling Event

ATC will conduct a groundwater sampling event, including gauging depth to water at all wells and low-flow purge/sampling at wells MW-1, MW-2, MW-3 and the proposed new wells installed as part of the investigations described in this work plan. The newly installed wells will require the services of a professional surveyor (latitude, longitude and casing elevation) if data suggests that there are risks associated with the residual petroleum hydrocarbon impacts (i.e., cleanup actions beyond natural attenuation are necessary).

Field work will be conducted in general accordance with ATC's SOP - Low-Flow Purging and Groundwater Sampling (included in Attachment A). The groundwater sampling field activities will including collection and VOC analyses (EPA Method 8260B) of a field duplicate and a sampling equipment rinseate blank in addition to VOC analyses (EPA Method 8260B) of a laboratory-supplied trip blank.

6. Indoor Air Quality Survey

ATC will perform an IAQ survey at the facility. The IAQ will include the collection of three air samples (in laboratory supplied 6-liter Summa canisters equipped with an 8-hour time integrated sampler). Two canisters will be utilized to collect representative breathing space samples within the 1,380 square foot building. One canister will be setup in the hitch installation bay; a second indoor sample will be collected inside the store. The third canister will be secured in an outdoor location on the subject site to collect a representative sample of ambient air. The canisters will be deployed in the morning and retrieved in the afternoon to best represent a standard 8-hour working day. The results of the IAQ survey will be compared to Ecology's MTCA Method B indoor air cleanup levels.

7. Laboratory Analyses

ATC proposes to utilize Pace Analytical Services LLC located in Mt. Juliet, Tennessee (License No. C847) for all analytical services (soil, water and air).

To evaluate potential soil and groundwater impacts, sample analyses will include the chemical constituents identified in Table 830-1 of Washington Administrative Code 173-340, including:

- Total petroleum hydrocarbons (TPH) gasoline and diesel range utilizing Northwest Method NWTPH-Gx and NWTPH-Dx (respectively),
- VOC utilizing EPA Method 8260B. This includes benzene, toluene, ethylbenzene and total xylenes, hexane, 1,2-dichloroethane, methyl tert butyl ether and fuel additives,
- Polynuclear aromatic hydrocarbons utilizing EPA Method 8270C-SIM, limited to naphthalene, 1-methylnaphthalene and 2-methylnaphthalene,
- Total lead utilizing EPA Method 6010C, and
- 1,2-dibromoethane by EPA Method 8011.

Additional analyses for soil and groundwater in proximity to the former used oil UST will include:

- TPH (heavy oil range) utilizing NWTPH-Dx, volatile petroleum hydrocarbons and extractable petroleum hydrocarbons utilizing VPH and EPH, respectively,
- Halogenated VOC (EPA Method 8260B full suite),
- Carcinogenic PAH (EPA Method 82070C-SIM) including benzo[a]pyrene, benzo[a]anthracene, benzo[b]fluoranthene, dibenz[a,h]anthracene benzo[k]fluoranthene, chrysene and indeno[1,2,3-cd]pyrene,
- Total metals (cadmium, chromium, nickel and zinc) utilizing EPA Method 6010C, and
- Polychlorinated biphenyls utilizing EPA Method 8082.

The air samples will be analyzed for VOC utilizing EPA Method TO-15.

8. Investigation Derived Waste Disposal

Investigation derived waste including soil cuttings and purge water are anticipated during field activities. These materials will be contained in labeled Department of Transportation approved, steel drums and stored temporarily at the site. After acceptance of waste profiles, the drums will be removed and transported to an appropriate disposal facility.

9. Data Evaluation and Report Preparation

At the conclusion of field investigations and the receipt of all associated lab data, ATC will present the findings in a summary report that will include an updated CSM, and a FS/DCA. All field activities related to the proposed investigation will be conducted under the supervision of a Washington Licensed Geologist (L.G.). Technical documents submitted to Ecology will be reviewed, signed and stamped by a Washington L.G.

Please contact Edwin Vandegrift at 480-355-4672 with any questions or comments.

Sincerely,

ATC Group Services LLC

State of Washington
2806
Licensed Geologist
Edwin T. Vandegrift

State of Washington
2790
Licensed Geologist
Girard E. Morgan

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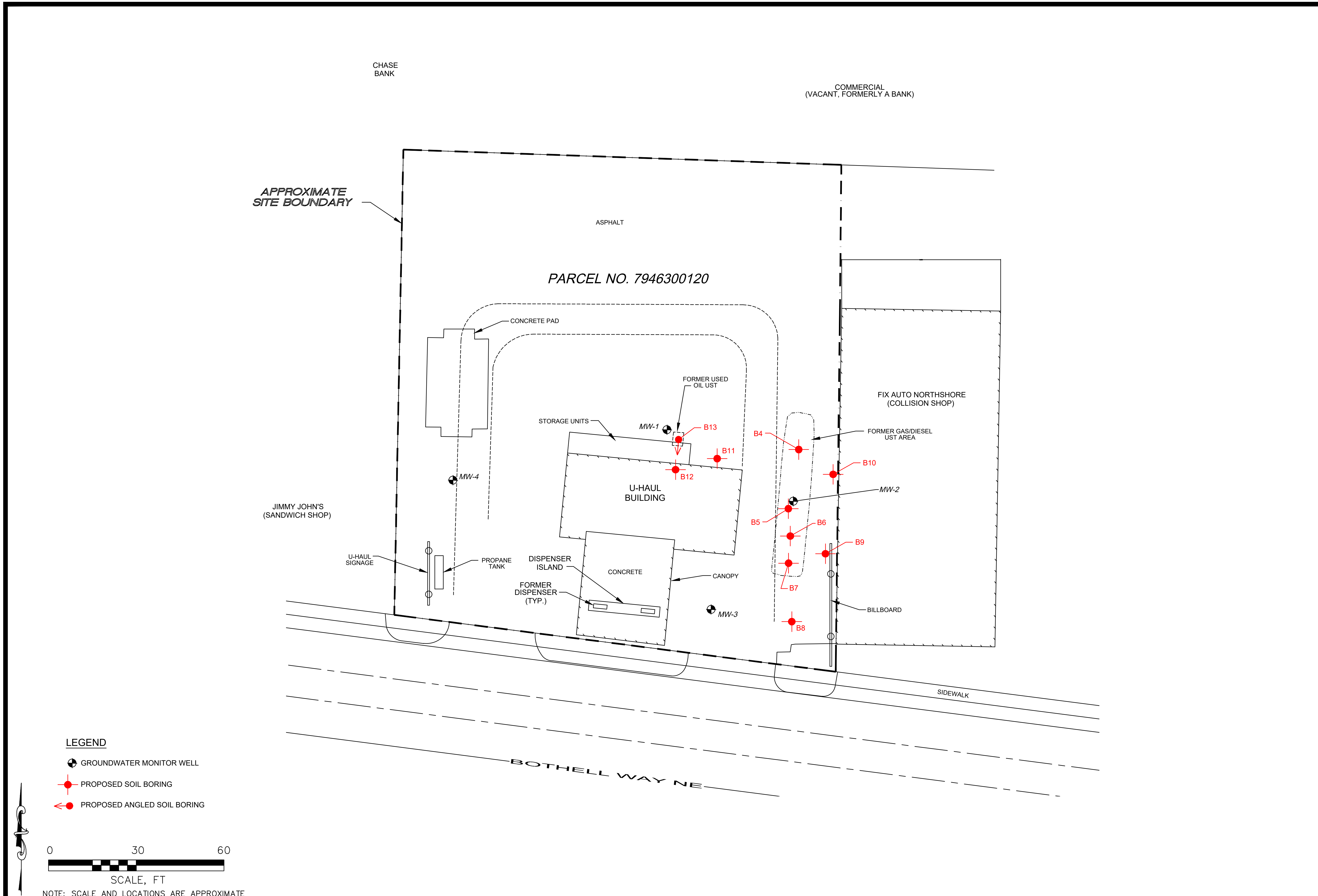
Attachments: As stated.

cc: Larry Hine, AMERCO Real Estate Company



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ROPOSED BORING LOCATIONS

U-HAUL FACILITY NO. 801053
6720 BOTHELL WAY NORTHEAST
KENMORE, WA 98028

PROJECT NUMBER: 1052105307
DATE: 2/28/20
APPROVED BY: EV
DRAWN BY: BK
FIGURE 1

ATC
9185 S. Farmer Ave., Ste. #111
Tempe, Arizona 85284-2912
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Attachment A

ATC Standard Operating Procedures

ATC STANDARD OPERATING PROCEDURE
HOLLOW-STEM AUGER DRILLING AND SOIL SAMPLING

Soil borings are drilled using a truck-mounted hollow-stem auger drilling rig equipped with seven to 10-inch nominal outside diameter casing. ATC attempts to obtain representative soil samples at approximate five- to 10-foot intervals in each boring using a using a standard 2.5-inch outside diameter split-barrel sampler in accordance with American Society of Testing and Materials (ASTM) Method D 1586-84. The sampler is loaded with clean three- and/or six-inch long by two-inch diameter brass sample tubes. Samples are collected in the three- or six-inch brass sample tubes contained within the sampler. Soil samples are collected by inserting the sampler through the open end of the drill pipe and driving the sampler with a 140-pound drop hammer on the drill rig free-falling 30 inches. The sampler is driven a maximum of 18 inches into undisturbed soil below the bottom of the auger, or to sampler refusal (greater than 50 blows per six-inch interval). The number of blows required to drive the sampler each six-inch interval is recorded on the boring logs to provide data to evaluate the relative consistency or density of the soil. If an insufficient sample volume is recovered during the initial sampling event, a maximum of two additional attempts are made to obtain an adequate sample volume. In coarse-grained lithologies (i.e., sand and gravel), a sand catcher may be placed inside the sampler to improve sample recovery.

Following sampler retrieval, the sampler is opened and the bottom three- or six-inch brass tube is collected. The bottom sample tube is visually inspected to insure that the tube is completely filled with soil, and no headspace exists in samples submitted for laboratory analysis. The collected brass sample tube is sealed at each end with Teflon® liner squares followed by aluminum foil liners, capped with plastic end-caps, sealed with Teflon® tape, marked for identification and stored in an ice chest cooled to approximately four degrees Celsius with wet ice for delivery to a State-certified laboratory. Alternatively, soil samples for volatile organic compound analysis are extracted in the field using laboratory-provided extraction kits. Chain of custody records are maintained as samples are collected and accompany the samples to the laboratory.

The contents of the second brass sample tube is emptied into a sealable plastic bag and used for field soil vapor monitoring and soil classification purposes. Soil samples are logged by a ATC Field Scientist in general accordance with ASTM Method D 2488 and field boring logs maintained.

To minimize the potential for cross-contamination, a new pair of disposable gloves are worn when preparing a sample for laboratory analysis. Additionally, all downhole sampling equipment is washed in an Alconox® or Liquinox® and tap water solution, rinsed with tap water and rinsed again with distilled water prior to each sampling event. If necessary, the drill pipe and auger bit is high pressure washed between bore holes. Decontamination water is stored in labeled 55-gallon drums and remains on-site pending disposal. Excess drill cuttings are placed in 55-gallon drums or a rolloff-type container and remain on-site pending disposal. Borings are typically backfilled with grout (or other materials deemed acceptable by the permitting agency).

STANDARD OPERATING PROCEDURE
FIELD SOIL VAPOR AND METALS MONITORING

Soil Vapor

The MiniRAE 2000 (or equivalent) photoionization detector (PID) is calibrated on-site at the commencement of each work day to zero and to 100-parts per million by volume (ppmV) using isobutylene-in-air span gas (equivalent to benzene). An appropriate PID lamp is selected based on the ionization potential of the primary chemical(s) of concern relevant to the investigation.

A representative soil sample is collected from each sample location and placed in a sealable plastic bag. The soil sample identifier is marked on the bag above the top of the bag seal. The bag is sealed and the soil disaggregated. At least ten minutes is allowed for the soil to be heated by direct sunlight and for any volatile organic compounds in the soil to accumulate in the headspace of the bag. In cool weather (e.g. below 60 degrees Fahrenheit) or darkness, the soil sample bag is warmed for at least ten minutes inside a heated vehicle.

Volatile gases are then monitored by inserting the probe of the PID into the bag. The PID is equipped with a lamp which is capable of detecting volatile organic compounds at concentrations of 0.1 to 9,999 ppmV. The PID probe remains inside the bag for a period of time sufficient to allow the reading to peak and stabilize. The peak reading is recorded on the soil boring log.

Metals

Soil samples subject to x-ray fluorescence (XRF) analyzer screening are retained in the sealable plastic bag which is wiped clean of debris. The contents of the bag are packed so that the soil in the bag is a minimum of one inch thick below the XRF analyzer window. The XRF analyzer is calibrated to known standards and programmed to measure target metals concentrations in soil. The XRF analyzer window is placed over the packed soil sample and the x-ray trigger engaged for 60 seconds. After 60 seconds, the analysis is terminated and the metals constituent concentrations of interest are recorded along with the unique sample identifier in the field notes (all data are also recorded in the XRF's data logger and are available for later download).

ATC STANDARD OPERATING PROCEDURE
GROUNDWATER MONITOR WELL INSTALLATION AND DEVELOPMENT

Prior to drilling, ATC completes an applicable permit from the regulating agency (varies by state and locality). Copies of the original permits are on-site during drilling operations.

Following completion of each well boring, wells are constructed using two- or four-inch nominal diameter, Schedule 40, 0.020-inch machine slotted, polyvinylchloride (PVC) well screen from the bottom of the borehole to 10 feet above the static depth to groundwater to account for seasonal water level fluctuations. The remaining well string is constructed of Schedule 40 blank PVC casing. Actual well construction specifications are determined on a site-specific basis.

The bottom of the perforated interval is capped with a flush-threaded PVC cap or riveted cap and the monitor well casing is assembled and lowered into the open end of the drill pipe. No PVC cement of other solvents or glues are used in construction of the monitor well. All well casing and screen material is delivered to the site in factory-sealed containers.

The annulus of the well is backfilled with clean #3 Monterey or 8/12 sand (or equivalent) filter pack to approximately three feet above the top of the well screen. In general, the sand filter pack extends to a height above the top of the well screen equivalent to approximately 10% of the well screen length. The top of the filter pack is direct measured with a weighted tape. A minimum 1.5-foot thick layer of bentonite pellets or chips is placed on top of the filter pack and hydrated to form an annular seal. The bentonite pellets are hydrated by adding approximately one gallon of water for each linear foot of bentonite. The remaining annular space to the surface is filled with cement grout. Well construction details are recorded in the boring logs. The well is completed at the ground surface with a watertight, flush-mounted, traffic rated vault.

The well vault lid or surface completion is typically marked with the permit registration number and unique well identifier. The geographic position and elevation of the well is recorded using a handheld global positioning system unit. A permanent mark is made on the north side of the well casing, and this point surveyed for location and elevation. All subsequent groundwater level measurements are recorded from this surveyed point.

A minimum of 24 hours after well completion, the groundwater monitor well is developed to remove sediment and to stabilize the filter pack by a combination of surging, bailing and/or pumping groundwater from the well. Bailing or purging continues until movement of the fine sediment stabilizes or ceases and turbidity stabilizes. Groundwater purged from the well is contained in 55-gallon drums and remains on-site pending the waste profile sample analytical results and subsequent disposal.

ATC
—AN ATLAS COMPANY—

ATC STANDARD OPERATING PROCEDURE
HAND AUGER DRILLING AND SOIL SAMPLING

Soil borings are advanced utilizing a stainless steel hand-operated auger tool. The subsurface lithology will determine the type of auger bucket head used: a regular solid-body bucket is best for dry to slightly damp, light to medium density soils; a sand auger bucket is designed to retain soils comprised primarily of sand; and a mud auger bucket (windowed bucket) is best suited for wet silt and clays with high plasticity. Auger buckets are 3.25-inches in diameter, although 2.25-inch diameter and smaller, custom designs can be utilized depending on the lithology. ATC attempts to advance the hand auger by gently rotating the hand auger into the soil, allowing it to pull itself into the ground. Once the bucket is 3/4 full of cuttings, it is lifted out of the hole and emptied by shaking the bucket vertically. Using this technique, the boring is advanced to the desired sample depth. Extensions can be added to increase the length of the tool.

Sample collection is achieved by one of two methods. The soil extracted from the desired sample depth can be removed from the auger bucket head and placed directly in a laboratory supplied container appropriate for the proposed analysis. The collected sample container is appropriately sealed, marked for identification and stored in an ice chest cooled to approximately four degrees Celsius with wet ice for delivery to a State certified laboratory. Chain of custody records are maintained as samples are collected and accompany the samples to the laboratory.

The second method utilized for sample collection with hand-operated tools involves the use of a slide hammer and a two-inch diameter split core sampler (six-inches in length). The split core sampler is generally loaded with a decontaminated metal sleeve (brass or stainless steel), which is fitted with extensions to reach the bottom of the auger-advanced boring. At the surface, a hand-operated slide hammer is utilized to drive the split core sampler into the subsurface soils. After the sampler is driven, the tools are extracted from the boring and the split core sampler is disassembled to obtain the representative soil sample. The sample tube will be visually inspected to insure that the tube is completely filled with soil, and no headspace exists in samples submitted for laboratory analysis. The collected brass sample tube will be sealed at each end with Teflon® liner squares followed by aluminum foil liners, capped with plastic end-caps, sealed with Teflon® tape, marked for identification, and stored in an ice chest cooled to approximately four degrees Celsius with wet ice for delivery to a State certified laboratory. Alternatively, soil samples for volatile organic compound analysis are extracted in the field using laboratory-provided extraction kits. This sampling technique minimizes the sample exposure to the atmosphere (a potential for loss of volatile organic compounds). Chain of custody records are maintained as samples are collected and accompany the samples to the laboratory.

When utilizing hand auger for soil borings, selected cuttings are emptied into a sealable plastic bag for field soil vapor monitoring and soil classification purposes. Soil samples are logged by an ATC Field Scientist in general accordance with American Society of Testing and Materials (ASTM) Method D 2488 and boring logs maintained.

To minimize the potential for cross-contamination, a new pair of disposable gloves are worn when preparing a sample for laboratory analysis. Additionally, all downhole sampling equipment is washed in an Alconox® or Liquinox® and tap water solution, rinsed with tap water and rinsed again with distilled water prior to each sampling event. Decontamination water and soil boring cuttings are stored in separate, labeled 55-gallon drums which remain on-site pending disposal.

ATC — AN ATLAS COMPANY

ATC STANDARD OPERATING PROCEDURE
LOW-FLOW PURGING AND GROUNDWATER SAMPLING

EQUIPMENT

Pumps: Adjustable rate, positive displacement pumps (e.g., low flow-rate submersible centrifugal or bladder pumps constructed of stainless steel or Teflon). The pump should be easily adjustable and capable of operating reliably at lower flow rates. Adjustable rate peristaltic pumps may be used with caution. Bailers are inappropriate for use in this procedure.

Tubing: Tubing used in purging and sampling each well must be dedicated to that individual well. Once properly located, moving the pump in the well should be avoided. Consequently, the same tubing should be used for purging and sampling. Teflon or Teflon-lined polyethylene tubing must be used to collect samples for organic analysis. For samples collected for inorganic analysis, Teflon or Teflon lined polyethylene, PVC, Tygon or polyethylene tubing may be used. The tubing wall thickness should be maximized (⅜ to ½ inch) and the tubing length should be minimized (i.e. do not have excess tubing outside of the well). Pharmaceutical grade (platinum-cured polyethylene, or equivalent) tubing should be used for the section around the rotor head of the peristaltic pump to minimize gaseous diffusion.

Water level measuring device, 0.01 foot accuracy, (electronic preferred for tracking water level drawdown during all pumping operations).

Flow measurement supplies (e.g., graduated cylinder and stop watch).

Power source (e.g., generator, located downwind; car battery; nitrogen tank; etc). The generator should not be oversized for the pump.

In-line flow-through cell containing purge criteria parameter monitoring instruments for pH, specific conductance, temperature, oxidation-reduction potential (ORP) and dissolved oxygen (DO). The in-line device should be bypassed or disconnected during sample collection.

Decontamination supplies: distilled water, scrub brushes, Liquinox® soap and three five-gallon buckets are required for three-stage decontamination (Liquinox®/water wash and two distilled water rinse cycles).

Sample Bottles: It is recommended that preservatives are added to sample bottles by the laboratory prior to field activities to reduce potential error or introduction of contaminants.

Sample tags or labels, chain of custody.

Well construction data, location map, field data from last sampling event.

PROCEDURE

1. Measure and record the depth to water (to 0.01 foot) in all wells to be sampled before installing the pump or tubing. Care should be taken to minimize disturbance to the water column and to any particulate matter attached to the sides or at the bottom of the well.
2. Attach and secure the tubing to the low-flow pump. Slowly lower the pump into the well and secure the safety drop cable, tubing, and electrical lines to each other using nylon stay-ties. For peristaltic pump operation, lower only the Teflon-lined tubing into the well and attach pharmaceutical-grade polyethylene tubing to the portion to be attached to the pump rotor.
3. Pump, safety cable, tubing and electrical lines should be lowered slowly into the well to a depth corresponding to the center of the saturated screen section of the well (by default), or at a location determined to either be a preferential flow path or zone where contaminants are present. The pump intake should be kept a minimum of two feet, if possible, above the bottom of the well to prevent mobilization of any sediment present in the bottom of the well. Secure the pump and tubing to the well casing to prevent slippage of the tubing into the well during purging and sampling.
4. Measure the water level again with the pump in the well before starting the pump. Start the pump at the lowest rate possible (100 milliliters per minute [mL/min]) while measuring drawdown continuously. Avoid

CONTINUED ON NEXT PAGE

surging water from the well. Observe air bubbles displaced from discharge tube to assess progress of steady pumping until water arrives at the surface. Adjust the pumping rate such that there is little or no water level drawdown in the well (less than 0.3 foot) and the water level should stabilize. If the minimum drawdown that can be achieved exceeds 0.3 foot, but remains stable, continue purging until indicator parameters stabilize without dewatering the well screen, if possible. Water level measurements should be made continuously. Pumping rate changes (both time and rate) should be recorded on the field logs. Precautions should be taken to avoid pump suction loss or air entrainment. Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to avoid pumping the well dry and ensure stabilization of indicator parameters. If the recharge rate of the well is very low, purging should be interrupted so as not to cause the drawdown within the well to advance below the pump intake but the operator should attempt to maintain a steady flow rate with the pump to the extent practicable. In these low-yielding wells, where 100 mL/min exceeds the entrance rate of groundwater into the well, it is important to avoid complete dewatering of the well screen interval. In these cases, the pump should remain in place and the water level should be allowed to recover repeatedly until three well volumes have been purged and there is sufficient volume in the well to permit collection of samples (up to four hours). Samples may then be collected even though the indicator field parameters have not stabilized.

5. While purging the well, monitoring of in-line water quality indicator parameters should include specific conductance, pH, DO, temperature and ORP, which must be collected every three to five minutes until all of the parameters have stabilized. Stabilization is achieved when three successive readings are within:
   - ±0.1 for pH;
   - ±3% for conductivity and temperature;
   - ±10 mV ORP; and,
   - ±10% for DO

   A minimum subset of these parameters that can be used to determine stabilization during purging in this procedure is pH, specific conductivity and DO. DO is typically the last parameter to stabilize. Stabilization of indicator parameters is used to indicate that conditions are suitable for sampling to begin. If, after one hour of purging, indicator field parameters have not stabilized, one of three optional courses of action may be taken:
   - Continue purging until stabilization is achieved;
   - Discontinue purging, do not collect any samples, and record in the logbook that stabilization could not be achieved (the documentation must describe attempts to achieve stabilization); or
   - If three well volumes have been evacuated from the well and parameter stabilization has not been achieved, discontinue purging, collect samples, and provide a full explanation of attempts to achieve stabilization in the logbook.
6. Once stabilization has been documented, volatile organic compounds (VOC) and gas sensitive (e.g., Fe^{+2}, CH_4) parameter samples should be immediately collected directly into pre-preserved sample containers. All sample containers should be filled by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence. Samples requiring pH adjustment should have their pH checked to assure that the proper pH has been obtained. For VOC samples, this will require that a test sample be collected to determine the amount of preservative required to be added to the sample containers prior to sampling.
7. Filtered metal samples are to be collected with an in-line filter. A high capacity, in-line 0.45-micron particulate filter must be pre-rinsed according to the manufacturer's recommendations, or with approximately one liter of groundwater following purging and prior to sampling. After the sample is filtered it must be preserved immediately.

As each sample is collected, the sample should be labeled and placed into a cooler with proper temperature control. After collection of the samples, the tubing from the pump should be properly discarded or dedicated to the well for re-sampling by hanging the tubing inside the well. When finished, secure the well (close and lock it up).

ATC STANDARD OPERATING PROCEDURE
INDOOR AIR QUALITY (IAQ) SAMPLE COLLECTION

Field personnel should refrain from wearing perfume, aftershave or any personal care products containing alcohol or other fragrances when using the SUMMA canister samplers as these products will impact the sample. Use only regular ink pens for note taking, not Sharpies or other markers.

The SUMMA canister is placed in the area of interest where there is moderate airflow around the canister and four to six feet above the floor surface. Do not place in a corner or against equipment. The regulator is then placed on the canister or opened if already placed. If the regulator must be screwed on and opened, ensure that the canister valve is closed and remains closed prior to attaching the regulator. The canister valve nut should be removed and the regulator should be delicately tightened into place using a wrench. Do not over-tighten. Once the regulator is securely attached, the canister valve may be opened. Some regulators attach using a quick-release. For these units, there is no valve on the canister. Once the regulator is attached using the quick release, sample collection has begun. For all samples, record the initial vacuum pressure displayed on the pressure gauge on the sampling form.

The regulator will be set by the analytical laboratory for the specified sample collection period. This period may range from eight to 24 hours on a normal basis and is dependent upon the sampling strategy. The container will be left in place throughout the sampling time period. Do not allow the canister to sit open for a prolonged period beyond the specified sampling time. Ideally, the canister is placed where it will not be impacted by human activity. Perfumes and other personal care products will bias the sample as will common office supplies such as dry-erase markers, Sharpie markers and cleaning fluids.

The sample is complete when the regulator reaches “0” or equilibrium with atmospheric pressure. At the conclusion of the sample period, the regulator is removed to stop sample collection if it is a quick release type. If it is a valve canister, the canister valve is closed BEFORE removing the regulator. The regulator is then removed and the canister valve nut is replaced. If the designated sample period has passed and the regulator does not read “0”, record the final vacuum pressure on the sampling form.

The canister should be uniquely labeled and information regarding sample number, vacuum pressure readings and time of sample collection is entered on the chain of custody form. If directed to do so, field personnel will collect information on the temperature and relative humidity of the sample area and enter that information on the chain of custody. The sealed canister and regulator is then returned to the analytical laboratory for analysis.