TETRA TECH

February 24, 2025

Indian Brothers, LLC
Attn: Mr. Harinder Singh
3913 19th Avenue South
Great Falls, Montana 59405-5596

Subject: Remedial Investigation Work Plan- Revised
Former Flying J Truck Stop/Subway Sandwich Shop
Cut Bank, Glacier County, Montana
MDEQ Facility No. 18-08666; Release No. 3836; Work Plan No. 34758

Dear Mr. Singh:

Tetra Tech is pleased to submit this **revised** Remedial Investigation Work Plan for an additional subsurface investigation at the Former Flying J Truck Stop/Subway Sandwich Shop (Site), located in Cut Bank, Glacier County, Montana, MDEQ Facility No. 18-08666, Release No. 3836, Work Plan No. 34758. Site location is provided on **Figure 1** (**Attachment A**). Additional subsurface investigation is required to determine the downgradient extent and magnitude of contamination to the west and northwest of the Site. Investigation work in the former UST and product pump areas was added to the original scope of work at the request of the DEQ to identify the potential sources of petroleum impacts to the Site.

This Work Plan is intended to fulfill the requirements of the MDEQ Petroleum Tank Cleanup Section (PTCS) *Remedial Investigation Work Plan Required* letter dated March 28, 2024. The following section presents our proposed scope of work. Referenced figures are included in **Attachment A**. An outline of anticipated costs and a Unit Cost worksheet for groundwater monitoring are included as **Attachment B**.

FACILITY BACKGROUND

A petroleum release was reported to the Montana DEQ at the facility on November 12, 1999. The release was identified during a tank removal on November 11, 1999. A Montana DEQ 30-day Release Report dated June 5, 2000 identified gasoline and diesel impacted soil encountered during a tank and piping system removal on November 12, 1999. Approximately 1,500 cubic yards of impacted soil was removed and stockpiled onsite and covered with plastic. The 30-day report noted five, 27-year-old coated steel tanks at the site that were without cathodic protection. Uncoated, unprotected galvanized steel pipes were also removed at that time. The contractor did not encounter groundwater in the excavation that extended to a depth of 14 feet below grade.

A forensic chemical analysis of product samples letter report from wells CBFJ-7, CBFJ-4, CBFJ-2, CBFJ-9, and CBFJ-3, dated October 27, 2010 was provided by the DEQ for this work plan preparation. The analysis was performed by Friedman and Bruya of Seattle, Washington and identified the product as weathered gasoline. Organic lead detected in the gasoline product was reported as consistent with gasoline manufactured between 1960 and 1983 but was most consistent with gasoline manufactured in the 1970s.

Since 2012, seven groundwater monitoring events were completed on Site monitoring wells. Wells CBMJ-2, CBFJ-7, and CBFJ-11 contained free product when last measured in December 2021. These three wells, in addition to wells CBFJ-6, CBFJ-9, CBFJ-10, and CBFJ-13 contained VPH constituents that exceeded Montana DEQ RBCA guidelines. Lead and lead scavenger DCA were detected in wells CBFJ-6 and CBFJ-10 in February 2021 samples. DCA concentrations exceeded RBCA levels. Lead scavenger EDB is not present in reportable quantities at the Site.

Soil gas monitoring was performed in January and February 2019. In addition, indoor and ambient air samples were collected at the Subway structure and adjacent Glacier Cinema structure at the time of soil gas monitoring. Petroleum vapors appear to be accumulating beneath the slab at the Glacier Cinema and Subway restaurant structures. Contaminant concentrations in the sub-slab were below residential and industrial screening levels requiring action. Petroleum hydrocarbon vapors were detected in the indoor air at the Glacier Cinema and Subway restaurant. Several constituents were detected above the residential screening levels for two aliphatic hydrocarbons but were less than the industrial screening level. Ambient air samples collected outside these structures contained BTEX concentrations consistent with what may be expected adjacent to a busy roadway used as a truck bypass through Cut Bank, Montana. Ambient air concentrations were similar to the indoor air samples collected in these two structures.

The downgradient extent of gasoline impacts to the west and northwest of the Site remains unknown. The source area of petroleum releases from the former Flying J fueling equipment has not been identified and data from monitoring wells CBFJ-1, CBJF-3 and CBFJ-4 was not found. The forensic analysis of the petroleum from 2010 suggests that water from CBFJ-3 and CBFJ-4 are impacted with gasoline range hydrocarbons.

Mr. Eric Smart of Tetra Tech visited the site in August 2024 to observe the existing well heads present at the ground surface. No evidence of the well heads CBFJ-1, CBFJ-3 and CB FJ-4 was identified during the site walkover. A steel plate was present in the area of CBFJ-4, but the plate could not be moved to observe the area below.

SCOPE OF WORK

To meet the requirements of the MDEQ-PTS for this release, Tetra Tech proposes the following twelve tasks:

Task 1 – Report and Background Information Research

Tetra Tech will review the 24-hr Release Notification, 30-day Release Report provided by the DEQ. Tetra Tech will also review reports from adjacent releases at the Bell Motors (Rel#4725) and Bell Motors Quicklube facilities.

Task 2 - Work Plan and Health & Safety Plan Preparation

Activities associated with the preparation of this work plan are included in Task 1 and Task 2. Such activities include correspondence with you, the MDEQ-PTS and the Petroleum Tank Release Compensation Board (PTRCB). Preparation of the work plan also includes solicitation and review of subcontractor bid from the drilling contractors and laboratory analytical services. Completion of the project cost estimate is also performed under this task.

In order to comply with Occupation Safety and Health Administration Code of Federal Regulations (CFR) 29 1910.120, Tetra Tech routinely prepares a health and safety plan (HASP) for projects that involve field investigation activities, especially for those projects where environmental contaminants may be encountered. The aim of each HASP is to disclose potential chemical and physical hazards that may be encountered at a site, identify job hazards associated with field activities, describe safe work practices, identify personal protective equipment and decontamination procedures, and identify project contacts, emergency medical procedures, and the location of medical facilities. A HASP will be prepared for this project using Tetra Tech's standard format, which readily fulfills applicable regulatory requirements.

Task 3 – Mobilization

Tetra Tech will mobilize a project geologist out its Missoula, Montana office. The project will be completed in one mobilization event including drilling, soil sampling, monitoring well installation and groundwater monitoring and sampling.

Task 4 – Boring, Soil Sampling and Monitoring Well Installation

Prior to any subsurface work, a public utility locate service will be used. Boland Drilling, Services, Inc. (Boland) will use a hollow stem auger drill rig to advance each borehole, extract soil samples, and install the six to eight groundwater monitoring wells. It is proposed to advance soil borings in potential petroleum source areas shown on **Figure 2, Attachment A.** One boring each at the former pump island locations, and one to two borings in the vicinity of former well CBFJ-1 at the former tank farm. An additional boring will be advanced in the area CBFJ-4 (an additional potential UST location), if the well can't be located beneath the steel plate in the area. If petroleum impacts are identified in soil vapor screening samples, the borings will be completed as groundwater monitoring wells.

Four downgradient wells monitoring wells will be installed to identify the downgradient extent of the dissolve petroleum plume (**Figure 2, Attachment A**).

Drilling contractor bids are attached in **Attachment B**. Each borehole will be advanced to an approximate depth of 30 feet below grade. The ultimate depth may vary depending on where the groundwater interface is encountered. The location of proposed boring and wells are shown on **Figure 2**, **Attachment A**. The soil samples will be obtained from the subsurface during the drilling process using a stainless-steel split spoon sampler that will be decontaminated between samples (SOP-11). The driller or Tetra Tech field staff will open the split-spoon sampler to allow access to the soil cores (SOP-29B). Tetra Tech personnel will quickly scan along the exposed soil core with a PID and examine the soil for indications of VOCs (e.g., staining, odors). Samples will then be obtained from the split spoon samplers in resealable plastic bags, such as quart-sized food storage bags (SOP-32). The interval with the highest PID reading from each boring and the interval at the groundwater interface will be submitted for laboratory analysis. If field screening results do not show VOC impacts, then only the sample obtained from the groundwater interface will be submitted for laboratory analysis. Field personnel will collect soil samples for laboratory analysis using laboratory-supplied 4- or 8- ounce glass containers. These will be filled by hand; clean gloves will be donned prior to handling the soil.

Field personnel will record the lithology encountered in each borehole on a log sheet (SOP-10). Information such as grain sizes, moisture, staining, odor, PID readings, and sample intervals collected for analysis will be documented on the boring logs. The six to eight borings advanced during this investigation will be designated as **MW-14 through MW-18.** Soil sample names will be unique identifiers that tie them to the Site, boring number, and depth. For example, a sample collected from the 18- to 19-foot depth interval in the boring for monitoring well MW-15 will be labeled **MW-15 (18-19').** Field personnel will collect a rinsate blank sample following sampling from one of the boreholes after decontamination. The rinsate blank sample will be collected by pouring deionized water supplied by the laboratory over the surface of a decontaminated sampling equipment and directing the water into a laboratory supplied container. The sample will be labeled **FJCB-RB1** and analyzed for the same constituents as the soil samples. Soil samples will not be collected from below the water table.

Soil samples will be placed immediately into a cooler containing sealed bags of ice (SOP-9 and SOP-12). Ice will be replenished as needed during temporary transport and storage, and again prior to shipment to the laboratory. The soil samples will be returned to the lab in one cooler, along with one aqueous trip blank that will have been supplied by Pace to Tetra Tech. The trip blank will be analyzed for VOCs. It will be designated on the Chain of Custody form as **Trip Blank**. Field personnel will wear powder-free nitrile gloves during sampling handling.

After the auger reaches the maximum depth of exploration (approximately 30 feet below grade), Boland will complete the boring with a two-inch PVC monitoring well (SOP-21). The wellheads of all the monitoring well for the Site will be surveyed by a licensed land surveyor to a precision of 0.01 foot. Because of the fracture flow potential for groundwater at the site, it is important to have precise wellhead elevations and locations.

Task 5 – Soil Sample Analysis

Soil samples will be analyzed for volatile petroleum hydrocarbons (VPH) and extractable petroleum hydrocarbons (EPH) screen analyses by the Massachusetts Method as well as 1,2-dichloroethane (DCA) using EPA Method 8260B. Previous samples have not contained detectable levels of 1,2-Dibromoethane (EDB) so that analysis will be omitted. Following RBCA screening criteria, soil samples exhibiting TEH concentrations greater than 200 milligrams per kilogram (mg/kg, ppm) will be further analyzed for EPH fractions.

Task 6 – Groundwater Monitoring

New wells will be allowed to stabilize for at least 24-hours before monitoring. Groundwater monitoring activities will occur at the site during one groundwater sampling event. The six to eight new monitoring wells and 10 of the existing site monitoring wells (CBFJ-1 through CBFJ-13; Figure 2) associated with Release 3836 will be sampled during the monitoring event. Groundwater monitoring will consist of measuring depth to water (DTW) and depth to free phase hydrocarbon product (if present), measuring select groundwater parameters during well purging (temperature, pH, dissolved oxygen, oxidation-reduction potential and conductivity), and collecting groundwater samples for laboratory analyses. Any free product present will be removed using a bailer and placed in a drum as investigation derived waste.

DTW will be measured in all monitoring wells using a properly decontaminated water level meter. DTW data will be used to calculate casing volumes for each of the monitoring wells. Well purging and sample collection will be accomplished using a submersible low-flow bladder pump with a new disposable polyethylene bladder. Groundwater parameters will be measured using an AquaTroll 500 Multi-parameter Sonde, and evacuation will continue until IBI parameters for the parameters stabilize (SOP-8A). Evacuated water will be dispersed on paved surfaces proximate to each well. A groundwater sample will be collected from wells that exhibit free phase hydrocarbons (free product), because of the age of the product to determine the concentration of contaminants relative to the solubility of gasoline in water. Free product will be removed and placed in a 55-gallon drum if encountered.

Following well evacuation, laboratory analytical samples will be collected from the discharge hose, placed in laboratory provided containers and preserved in accordance with the requirements of the analytical laboratory. The water samples will be labeled, placed in coolers with ice, and shipped to Pace National Laboratory in Mt. Joliet, Tennessee using chain-of-custody protocols. A duplicate water sample will be collected from a well that historically has elevated levels of volatile +petroleum hydrocarbons for data evaluation purposes.

All reusable, down-hole equipment will be decontaminated before monitoring each well. Decontamination will consist of a Liquinox® detergent solution scrub, a 10-percent methanol solution rinse, and a deionized (DI) water rinse (SOP-11). Groundwater monitoring observations and field data will be recorded on field forms.

Task 7 – Groundwater Sample Analysis

Samples will be analyzed for VPH and EPH screen analyses by the Massachusetts Method as well as 1,2-dichloroethane (DCA) using EPA Method 8260B. Previous samples have not contained detectable levels of 1,2-Dibromoethane (EDB) so that analysis will be omitted. In accordance with RBCA screening criteria, groundwater samples exhibiting TEH concentrations greater than 1,000 micrograms per liter (μg/l – i.e. “parts per billion,” or “ppb”) will be analyzed for EPH fractions. Samples will be analyzed for IBI parameters total iron and manganese, dissolved iron and manganese, sulfate, and nitrate plus nitrite.

Task 8 – Lodging and Per Diem

Per diem will be charged at the state rate of $33.50 per day. Lodging will be charged at the hotel rate for Cut Bank per the hotel invoice.

Task 9 – Data Validation

All soil sample and water sample laboratory data will be validated using the DEQ’s Data Validation Summary Form. Up to two soil and two water sample data delivery groups will be verified.

Task 10 – Report Preparation

Following our receipt of final groundwater and soil vapor laboratory analytical data, Tetra Tech will prepare a Remedial Investigation Report which will include groundwater monitoring data, free product thicknesses and site remediation recommendations. The report will include all of the information outlined in the DEQ RI Guidance document.

Task 11 – Update Release Closure Plan

Tetra Tech will update the DEQ Release Closure Plan (RCP) which will include an evaluation of cleanup alternatives. Tetra Tech will contact the DEQ to discuss cleanup methods that were presented in the RCP dated February 18, 2022 to determine any additional technology should be evaluated. Results of the RCP will be discussed with the DEQ project manager, and the updated form will be appended to the project report discussed below.

Task 12 – Project Management

Project management will include working with the DEQ project manager to discuss any required modifications to this work plan. Project management will also include working with the utility locating company and the Glacier County Public Works department to identify utilities present in the area for drilling and for potential contaminant migration corridors. Lastly, project management will include supervising the licensed land surveyor.

SCHEDULE

Tetra Tech will coordinate the project schedule with you and the MDEQ-PTS following our receipt of your authorization to proceed and our receipt of MDEQ-PTS and PTRCB approval of this work plan and associated cost estimate. For the purposes of the Work Plan, we assume the proposed field work can be completed over three to four consecutive field days. Laboratory analysis of groundwater samples typically takes three to four weeks. The Remedial Investigation Report will be prepared and submitted following our receipt of final laboratory data.

FEE

Attachment B contains a detailed project cost estimate for the scope of work described above. Attachment B will also include a Unit Cost worksheet for groundwater monitoring.

The PTRCB has determined that this site is eligible for reimbursement and the release has met its deductible. As a result, additional eligible costs will be 100 percent reimbursable by the PTRCB, up to a total of $1 million for the release.

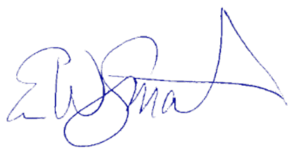
ACCEPTANCE

If you agree with the terms and conditions of this work plan, as described above, please review, sign, and return a copy of the attached *Work Order No. 4*. Our receipt of a signed copy of

Work Order No. 4 will serve as our authorization from you to proceed with this scope of work. A fully executed copy of the work order will be returned to you for your file.

A copy of this work plan has been submitted to the MDEQ-PTS and the PTRCB on your behalf. If you have any questions regarding this project, please contact me in our Missoula office at your earliest convenience (406-543-3045). I appreciate the opportunity to prepare this scope of work for you, and I look forward to helping you meet the requirements of the MDEQ-PTS for this release.

Respectfully Submitted:



Eric W. Smart, P.G.
Project Manager

Attachments: A – Figures
B – Project Cost Estimate
C – SOPs
D - Work Order No. 4

cc w/ Attachments: Mr. Donnie McCurry, MDEQ-PTS, P.O. Box 200901, Helena, Montana 59620-0901

Ms. AJ Pate, Montana PTRCB, P.O. Box 200902, Helena, Montana 59620-0902

ATTACHMENT A

Figures

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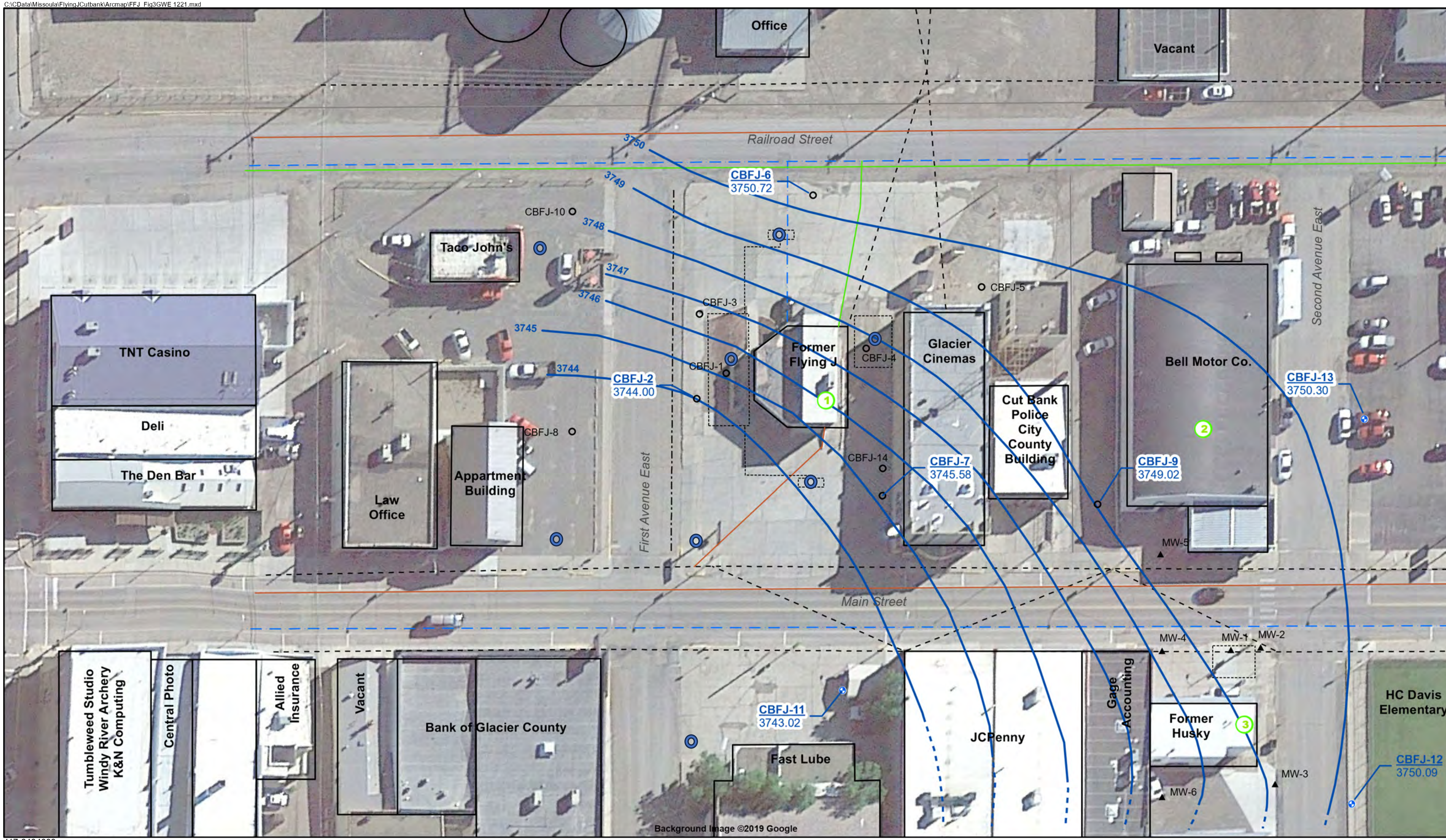

117-8404003
3/21/2022

SCALE IN FEET
0 50

- Monitoring Well
- Monitoring Well (October 2006)
- Approximate Location of NCI Monitoring Well
- AST
- Natural Gas
- Storm Sewer
- Telephone
- Water Line
- Sanitary Sewer
- Overhead Electric
- Property with Registered Historic Underground Storage Tanks
- 3744.49 Groundwater Elevation (feet amsl) (* - indicates measureable free product)
- Groundwater Elevation Contours (dashed where inferred)
- Proposed Well

Groundwater Elevations
December 2021
Former Flying J
Cut Bank, Montana

Figure 2

ATTACHMENT B

Project Cost Estimate

ATTACHMENT C

SOPs

STANDARD OPERATING PROCEDURE
FIELD MEASUREMENT OF GEOCHEMICAL PARAMETERS
USING A MULTI METER AND FLOW-THROUGH CELL

1. Remove the protective cover from the multi-meter head. Remove the rubber cover from the dissolved oxygen (DO) sensor. Inspect the probes and sensors for damage, including cracks in the pH electrode or bubbles in the DO membrane. Repair as necessary according to manufacturer's instructions.

2. Rinse the probe with distilled water.

3. Connect the electronic unit to the probe and turn it on. Calibrate the device according to manufacturer’s instructions.

4. Rinse the probe with distilled water to remove calibration solution.

5. Install the probe into the flow-through cell. Connect the hose from the outlet of the pump to the inlet barb on the flow-through cell. Install a hose on the outlet barb of the flow-through cell and place the other end of the hose into a bucket to capture the purge water.

6. Begin purging. After approximately five minutes, begin taking readings from the multi-meter. Record the various parameters into appropriate cells on the field form.

7. Refer to the project QAPP or SAP for stabilization criteria. The sample can be collected when the criteria have been met.

8. Disconnect the pump outlet hose from the flow through cell and collect the samples out of this hose. Do not collect samples from the discharge hose of the flow through cell.

STANDARD OPERATING PROCEDURE

SAMPLE PACKAGING AND SHIPPING

All environmental samples collected should be packaged and shipped using the following procedures:

PACKAGING

1. Label all sample containers with indelible ink (on the side, not on the cap or lid). Place labeled sample bottles in a high quality cooler containing an adequate amount of ice and/or frozen blue ice (appropriate for the season), making sure the cooler drain plug is taped shut.

2. Place the samples in an upright position and wrap the samples with absorbent, cushioning material for stability during transport. Samples should not be loose; the cooler should be able to withstand rough handling during shipment without sample breakage.

3. Fill out the appropriate shipping forms, and place the paperwork in a ziploc bag and tape it to the inside lid of the shipping container. Shipping forms usually include: 1) a chain-of-custody form, documenting the samples included in the shipment; 2) an analysis request form, specifying the laboratory analyses for each sample. If more than one cooler is used per chain of custody, put a photocopy in the other coolers and mark them as a copy.

4. Close and seal the cooler using fiberglass strapping tape.

5. Secure the shipping label with address, phone number, and return address clearly visible.

SHIPPING HAZARDOUS MATERIALS/WASTE

Hazardous materials need to be shipped using procedures specified under Federal Law. Samples need to be shipped in ziploc bags or paint cans filled with vermiculite, depending on the level of hazard. Special package labeling may be needed. Consult the project manager for specific shipping procedures.

STANDARD OPERATING PROCEDURE

FIELD FORMS

All pertinent field investigations and sampling information shall be recorded on a field form or in a field notebook during each day of the field effort and at each sample site. The field crew leader shall be responsible for ensuring that sufficient detail is recorded on the field forms/field notebook. No general rules can specify the extent of information that must be entered on the field form or in the field book. However, field forms/field notebook shall contain sufficient information so that someone can reconstruct all field activity without relying on the memory of the field crew. All entries shall be made in indelible ink weather conditions permitting. Each day's or site's entries will be initialed and dated at the end by the author.

At a minimum, entries on the field form or in field notebook shall include:

- Date and time of starting work and weather conditions.
- Names of field crew leader and team members
- Project name and type
- Description of site conditions and any unusual circumstances.
- Location of sample site, including map reference, if relevant
- Equipment ID numbers
- Details of actual work effort, particularly any deviations from the field work plan or standard operating procedures
- Field observations
- Any field measurements made (e.g., pH)
- Names and times of samples collected
- Preservative(s) used

For surface water and groundwater sampling efforts, specific details for each sample should be recorded using Tetra Tech standardized field forms. Surface water and groundwater field forms contain fill-in-the-blank type information so that all pertinent information will be recorded. In addition to the items listed above, the following information is recorded on surface water and groundwater field forms during sampling efforts:

- Time and date samples were collected
- Number and type (natural, duplicate, QA/QC) of samples collected
- Preservative(s) used
- Analysis requested

- Sampling method, particularly deviations from standard operating procedures

Strict custody procedures shall be maintained with the field forms and field notebooks. Field forms/notebooks shall remain with the field team at all times, while being used in the field. Upon completion of the field effort, photocopies of the original field forms and notebooks will be made and used as working documents; original field forms/notebooks shall be filed in an appropriately secure manner.

TETRA TECH

GROUNDWATER SAMPLING LOG

Project:________________________________ **Sample Date**___________________________ **Time**: ______________ **Well ID:** ______________________

Personnel: ____ Weather: ____

Casing Diameter/Type: ______________________________ Measuring Point Description: TOC North Side ________________________

Well Depth (feet below measuring point): __________________________ Depth to Water____________________________________ ft water

Screen: _______________________________ Depth to Product_______________

WELL EVACUATION

Method: [ ] Mechanical Bailer, [ ] Galvanized Bailer, [ ] PVC Bailer, [ ] Disp. Polyethylene Bailer, [ ] SST Bailer, [ ] Submersible Pump, **[ ] Low Flow,** [ ] Other:

__________________ ft. water x ____________________ gal./ft * = one casing volume _________ gals. x 3 = purge volume ________________ gals.

SCH 40 Pipe * 2" well = 0.163 gal./ft. 4" well = 0.653 gal./ft. 6" well = 1.469 gal./ft. 8" well = 2.611 gal./ft. Any Well C feet in diameter = 5.875 x C^2

START TIME:_________ PURGE RATE:________ SET PUMP:__________

EVACUATION DATA

	Time	pH	DO	Temp	ORP	SC	TURBIDITY	DTW
Units								

TOTAL GALLONS:______________

WELL SAMPLING

Sampling Method: [ ] Disposable Poly Bailer, [ ] Submersible Pump, [ ] Low Flow, [ ] Other:

Sample Type: [ ] Natural [ ] Duplicate [ ] MS/MSD

[ ] Field Blank [ ] Equipment Rinsate Blank

Natural Sample Name: _______________________

QC Sample Name: ___________________________

Filtered: [ ] Yes, [ ] No

	Parameter	Sample Container	Preservative
[ ]	MBTEXN & EDC	2 x 40 mL amber glass	Hydrochloric acid, </= 6 deg. C
[ ]	VOCs - EDB	2 x 40 mL amber glass	Hydrochloric acid, </= 6 deg. C
[ ]	PAHs	2 x 40 mL amber glass	</= 6 deg. C
[ ]	__________________	__________________	__________________
[ ]	__________________	__________________	__________________

Laboratory: _ESC lab Sciences, Juliet, TN____________________________

Chain-of-Custody: [ ] Yes [ ] No

Meter	Serial No.	Calibration Date
pH	______________	___________________
SC	______________	___________________
ORP	______________	___________________
DO	______________	___________________

Decontamination

Potable Water:	Yes [ ] No [ ]	Nitric Acid:	Yes [ ] No [ ]
Liquinox:	Yes [ ] No [ ]	DI Water:	Yes [ ] No [ ]
Methanol:	Yes [ ] No [ ]	Steam:	Yes [ ] No [ ]

Comments: ____

STANDARD OPERATING PROCEDURE

EQUIPMENT DECONTAMINATION

The purpose of this section is to describe general decontamination procedures for field equipment in contact with mine/mill tailings, soil, or water. During field sampling activities, sampling equipment will become contaminated after it is used. Sampling equipment must be decontaminated between sample collection points if it is not disposable. Field personnel must wear disposable latex or vinyl gloves while decontaminating equipment at the project site. Change gloves between every sample. Every precaution must be taken by personnel to prevent contaminating themselves with the wash water and rinse water used in the decontamination process.

Table A-1 lists equipment and liquids necessary to decontaminate field equipment.

The following should be done in order to complete thorough decontamination:

1. Set up the decontamination zone upwind from the sampling area to reduce the chances of windborne contamination.

2. Visually inspect sampling equipment for contamination; use stiff brush to remove visible material.

3. The general decontamination sequence for field equipment includes: wash with Liquinox or an equivalent degreasing detergent; deionized water rinse; 10% dilute nitric acid rinse; deionized water rinse; rinse with sample water three times.

4. Rinse equipment with methanol in place of the nitric rinse if sampling for organic contamination. Follow with a deionized water rinse.

5. Decontaminated equipment that is to be used for sampling organics should be wrapped in aluminum foil if not used immediately.

6. Clean the outside of sample container after filling sample container.

Alternatively, field equipment can be decontaminated by steam cleaning, rinsing with 10% dilute nitric acid, and rinsing with deionized water.

All disposable items (e.g., paper towels, latex gloves) should be deposited into a garbage bag and disposed of in a proper manner. Contaminated wash water does not have to be collected, under most circumstances.

If vehicles used during sampling become contaminated, wash both inside and outside as necessary. Heavy equipment will be decontaminated by brushing loose soil from the equipment then steam cleaned.

EQUIPMENT LIST FOR DECONTAMINATION

5-gallon plastic tubs
5-gallon plastic water-container
5-gallon carboy DI water
1-gallon cube of 10% HNO_3 (metals sampling)
1-gallon container or spray bottle of
  10% Methanol or pesticide grade
  acetone (for organics sampling)

Liquinox (soap)
Hard bristle brushes
Garbage bags
Latex gloves
Squeeze bottles
Paper Towels

STANDARD OPERATING PROCEDURE

SAMPLE DOCUMENTATION

Sample documentation is an important step to ensure the laboratory, project manager, and field personnel are informed on the status of field samples. Depending on the specifics required for each project, a number of forms will need to be filled out. Most sample documentation forms are preprinted carbonless triplicates, enabling copies to be filed or mailed from labs or offices. The forms will be completed by field personnel, who have custody of the samples. The office copy will be kept in the project file and subsequent copies sent to the laboratory, or other designated parties. The responsibility for the completion of these forms will be with each field crew leader. It is important the field crew leader is certain field personnel are familiar with the completion process for filling out forms, and the expected information is included.

Potential documents to be completed clearly in ink for each sample generated include:

- Field Form
- Chain-of-Custody
- Custody Seal

If working on Superfund activities, the following additional forms will also be prepared:

- EPA Sample Tags
- SAS Packing Lists
- Sample Identification Matrix Forms
- Organic Traffic Report (if applicable)
- Inorganic Traffic Report (if applicable)

STANDARD OPERATING PROCEDURE

MONITORING WELL CONSTRUCTION

Many states require certification and licensing for monitoring well drillers. Be sure you know the State's regulations before arriving on-site, especially if drilling outside your own State.

1. Safety equipment required on-site of the drill rig is mandatory. Personal protective equipment includes (at a minimum): hard hat, ear plugs, safety glasses, steel toed boots, gloves, first aid kit, and site safety plan - with routes to hospitals known by all personnel on-site.

2. Arrive on-site with properly sized drilling equipment and materials for site conditions. All drilling equipment and materials should be properly decontaminated prior to its arrival on-site. Decontamination usually includes steam - or hot water-cleaning methods.

3. Drilling muds or drilling solutions of any kind <u>are not to be used</u> during drilling activities in conjunction with monitoring well construction. Acceptable drilling techniques include air-rotary, cable tool, hollow-stem auger or sonic. If unconsolidated material is encountered, it may be necessary to drive steel casing during drilling to maintain borehole integrity. It is suggested threaded steel casing be used in lieu of welding joints together to minimize this source of potential well contamination. Hydraulic jacks or the drill rig can be used to pull back the steel casing following emplacement of plastic casing.

4. A detailed lithologic log shall be completed during drilling activities. Water bearing characteristics of the formations should also be noted on the log. In addition, details of monitoring well construction should also be described on the well log including total depth, perforated interval, sizes and types of construction materials, etc.

5. Seven (7) - to 10-inch outside diameter hollow-stem augers can used in drilling shallow exploration drill holes in many situations. Care is taken to avoid contamination due to oil and grease from the drill rig and split-spoon sampler. Appropriate decontamination is performed of the drill rig between drill holes. Soil and sediment samples are collected using a standard 1.4-inch inside diameter split-spoon sampler and a 140 pound drive hammer. The number of blows necessary to obtain an 18-inch length of sample is recorded on the exploration log. Appropriate decontamination of the split-spoon sampler is performed between sample depth intervals.
6. Install factory-slotted well screen and blank section of well casing into the borehole, with the well screen set at the desired depth interval, based on site conditions. The well screen and casing will be selected based on the type of contamination present; typically polyvinyl chloride (PVC), stainless steel or polytetrafluoroethylene (PTFE; for organics).
   Either a single- or multi-completion monitoring well can be constructed in a single borehole where hollow-stem auger drilling is not used.

7. Backfill the annular space below and above the perforated well screen and to at least 2-feet above the well screen with chemically-inert silica sand. Place a bentonite plug above the sand to ground surface. Where appropriate, begin pulling temporary steel casing out of borehole as the sand and bentonite are placed. For some sites, states may require bentonite (granular or chips) be placed to 3 feet above the level of silica sand followed by placement of a tremied bentonite slurry or grout to the surface. Monitoring well development is presented in SOP-22.

8. Place a locking well protector over well casing(s) after the outer steel drill casing has been removed from the borehole, if necessary. The locking well protector will either be a flush-mount well cover or steel riser with locking well cap. If a flush-mount well cover is used, an inner locking well cap will be installed. Place bentonite a plug below the bottom of well protector with a 1- to 2-inch layer of sand at the base and within

the flush-mount protector to allow drainage. This will allow water to drain from the flush-mount well to limit the surface casing from accumulating atmospheric water. Grout well protector in place.

9. Lock the well with high quality lock.

STANDARD OPERATING PROCEDURE

SUBSURFACE SOIL SAMPLE COLLECTION VIA HOLLOW-STEM AUGER

This Standard Operating Procedure (SOP) describes the field equipment and sampling methods for subsurface sampling of soil material using a hollow-stem auger drill rig. Methods explained in this SOP may be different from those identified in a project-specific Sampling and Analysis Plan (SAP), Quality Assurance Project Plan (QAPP), or work plan. The project-specific SAP, QAPP, or work plan should be referenced for additions or deletions to the methods noted below. All sampling equipment should be decontaminated using the procedures in SOP-20 before arriving on site.

FIELD EQUIPMENT

- Shovel
- Stainless steel mixing bowl or re-sealable plastic bags
- Sampling trowel
- Hand lens (10) power
- Steel tape (10 foot minimum)
- Munsel color book (optional)
- USCS soil guide
- No. 10 sampling screen (project-specific)
- Field forms and field book
- XRF (project-specific)

SUBSURFACE SAMPLING VIA SPLIT-SPOON SAMPLER

Subsurface sampling will be completed using a split-spoon sampler. Sample collection, homogenation, and transfer to sampling containers should follow the same procedures as outlined for collection of surface samples.

1. Arrive on-site equipped with at least two standard 1.4-inch inside diameter split-spoon samplers (may be supplied by subcontracted driller). If geotechnical information is desired, a 140 pound drive hammer is also required.

2. Install sampler into borehole and advance to the desired depth with the 140 pound drop hammer or equivalent means. Record number of blow counts to complete sampling over each 18-inch interval, as necessary. Retrieve sampler and place on work table. Using the other sampler, repeat this sequence at the next sample interval.

3. Record lithology as outlined in the Unified Soil Classification System (USCS; method ASTM D2488) or the USDA - NRCS classification system and document percent recovery from cores retrieved from split spoon sampler.

4. Based upon the project SAP, QAPP, or work plan, composite desired sample interval by mixing in stainless steel bowl or new re-sealable polyethylene bag (e.g., Ziploc). When sampling for organics, the sample should not be mixed to avoid potential volatilization.

5. Transfer the sample into laboratory-supplied container (glass jars or resealable polyethylene bags (Ziploc or equivalent) eliminating void space as possible and seal the container. If using EPA method 5035, see SOP-29A.

6. Decontaminate sampling equipment between each interval sampled if required by the SAP, QAPP, or work plan. Decontaminate sampling equipment between sampling sites.

STANDARD OPERATING PROCEDURE

FIELD MEASUREMENT OF VOLATILE ORGANIC COMPOUNDS HEADSPACE

Equipment General

Ionization device (PID or FID)
Device accessories (regulator, tubing, filters, etc.)
Appropriate calibration gas
Sample containers (Ziplock re-sealable plastic bags or glass jars and aluminum foil)
Indelible pen or permanent marker.

INSTRUMENT OPERATION

1. Before taking the instrument to the field check the following:

   - Test the condition of the battery and recharge if necessary.
   - Make sure you have appropriate calibration gas in accordance with manufacturer recommendations and project work plan.
   - Check the integrity of the instrument and its accessories. Repair or replace broken parts and clean the sampling tip. On the PID clean the inlet filter.
   - Make sure you have all the accessories you will need for sampling.
   - If you are using the FID, check the hydrogen pressure and refill from the supply bottle if below 1000 psi.
   - If you are using the PID, check the expiration date on the span gas cylinder (normally 100 ppm isobutylene)

2. Arrive on-site with decontaminated equipment in working order. During transport, keep the instrument temperature stable and moderate.

3. Follow the manufacturer's instructions for starting up the instrument. Turn the instrument on and let it run for a few minutes, allowing the electronics to stabilize.

4. For the flame ionization detector (FID), let the electronics warm up for about 5 minutes and the pump to run for at least 3 minutes before attempting to light the flame. After lighting the flame, test the instrument with a known hydrocarbon (i.e., permanent marker etc.) to make sure the flame remains lit.

5. Calibrate meter before leaving for the field and each day in the field when headspace will be measured. Record results of calibration in the field book for the project in which the instrument is

being used. Calibrate the instrument by setting the zero and span against the calibration gases following manufacture instructions. To zero the instrument you may use clean air, if available, or a cylinder of compressed zero gas.

6. Complete your organic vapor readings and record the results according to the measurement method below.

7. Shut down the instrument according to the manufacturer's instructions. Decontaminate and carefully pack the instrument before leaving the site.

FIELD MEASUREMENT OF VOLITILE ORGANIC COMPOUND HEADSPACE

1. Place sample material in a Ziplock bag and seal. Mix contents in bag to break up soil clumps and homologize. Alternatively, place sample to be tested in clean canning type jar. Cover the sample tightly using aluminum foil and the outer ring of the jar lid. Be sure to mark container with sample location (boring/test pit # and depth).

2. Allow sample to come to room temperature (approximately 70 - 80° F) by placing in warm location not in direct sunlight. This can be accomplished by placing the container under the heater vent of the vehicle in winter or in a closed vehicle in summer.

3. Insert probe through foil or small opening in the Ziploc bag. Probe should be placed in container such that soil particles are not ingested into analyzer. Record maximum reading.

   NOTE: Consistency in results is enhanced by using approximately equal portions of material, similar jar or bag sizes and similar test temperatures. Moisture content may also affect readings using some instruments.

MAINTENANCE

1. Disassemble and store meters in their case.

2. Charge batteries after each use as described in user's manual.

3. Occasional routine maintenance may be necessary ie. cleaning or replacing filters following manufacturer recommendations. Any maintenance you feel unqualified to perform should be handled by an authorized service representative.

Attachment D
Work Order No. 4