Resource Technologies, Inc.

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October 3, 2025

Rachel Mindt
Environmental Project Officer
Montana Department of Environmental Quality
Petroleum Tank Cleanup Section
1520 E 6th Avenue
Helena, Montana 59601

Subject: Revised Excavation Work Plan; Former Saco Conoco; 303 Taylor Street, Saco, Phillips County, Montana; Facility ID 36-00573 (TID 26203), Release 2763, Workplan 35054

Responsible Party: Ms. Deborah Taylor
3730 South 76th Drive
Phoenix, AZ 85042
Contact: (406) 690-6681
dbtaylormt@gmail.com

Dear Ms. Mindt,

Pursuant to the DEQ Corrective Action Plan request letter to Deborah Taylor dated September 10, 2024; our phone conversation of April 7, 2025; and your e-mail of April 8, 2025; Resource Technologies, Inc. (RTI), is submitting the following workplan for excavation and landfarming of gasoline-impacted soil at the former Saco Conoco located at 303 Taylor Street in Saco, Montana (Figure 1). The extent of soil impacts to be excavated is discussed in *Phase III Remedial Investigation Report, Former Saco Conoco* dated July 18, 2022.

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FIGURES

ATTACHMENTS

1.0 BACKGROUND

The former Saco Conoco is located at 303 Taylor Street in Saco, Montana (Figures 1 and 2). Release 2763 was discovered in October 1995 during the removal of nine underground storage tanks and product piping. Approximately 80 cubic yards of impacted soil were excavated and land farmed at that time.

The site is currently owned by Ms. Deborah Taylor. The on-site building is currently used as a fabrication shop. The Taylor's closed the Saco Conoco in 1995; however, four double-wall concrete aboveground storage tanks (ASTs) with cardtrol dispensers were operated at the site by Ezzie's Wholesale until the mid-2000s. The ASTs have been removed.

RTI conducted a remedial investigation (RI) at the site in 2016. The initial investigation included installation of three groundwater monitoring wells and collection of groundwater samples. The investigation identified soil and groundwater impacts on the south side and to the west of the facility building. RI results are documented in *Final Abbreviated Site Investigation Report, Saco Conoco* dated September 14, 2016.

CTA Environmental conducted additional remedial investigation in 2020 that included installation of seven soil boreholes with five of the boreholes completed as groundwater monitoring wells. Soil impacts exceeding applicable Montana Tier 1 Risk Based Screening Levels (RBSLs) were identified in six of the sampled monitoring wells (Figure 2). RI results are documented in *Report of Remedial Investigation, Former Saco Conoco Station* dated October 27, 2020.

In 2022, RTI conducted additional RI activities that included installation of seven additional monitoring wells (MW-6 through MW-12) and collection of soil and groundwater samples. The data collected from these samples demonstrated substantial impacts to soil and groundwater remained at the site. RI results are documented in *Phase III Remedial Investigation Report, Former Saco Conoco* dated July 18, 2022.

The three phases of RI successfully delineated the extent of soil and groundwater impacts. Soil impacts reside in the former UST area south of the site building and extend into Taylor Street. Soil impacts also reside on the southwestern portion of the property. Soil impacts are generally encountered at depths of six to 12 feet. Due to site soils being composed primarily of tight clay, in-situ remediation of soil impacts is not a practical option. Consequently, excavation of impacted soils has been chosen as the preferred remedial option. A site map with the anticipated extent of excavation is included as Figure 3.

2.0 PRE-EXCAVATION ACTIVITY CONCLUSIONS

Since landfill disposal of excavated soil would require a 100 mile round trip, RTI determined that landfarming soil locally is the most cost-effective disposal option for

excavated soil. As part of the Pre-Excavation Work Plan (Work Plan 35032), RTI met with a representative of the site owner to determine a potential landfarm site. Conditions of the landfarm were documented and background samples were collected for volatile petroleum hydrocarbons (VPH), extractable petroleum hydrocarbons (EPH), and total metals analysis.

Additional activities included:

- Meeting with Town of Saco personnel;
- Locating utilities that may be impacted by excavation;
- Confirming excavation limits relative to the US Highway 2 right-of-way;
- Identifying paved surface areas to be removed;
- Determining monitoring wells to be abandoned;
- Confirming Town and Montana Department of Transportation (MDT) requirements for encroachment, backfilling, and repaving.

3.0 PURPOSE AND OBJECTIVES

The primary objective of this workplan is to excavate hydrocarbon-impacted soils and dispose of them at the selected one-time landfarm.

Additional objectives include: Sample and analyze groundwater conditions before and after excavation, evaluate site conditions during and following excavation based on field observations and soil sampling; replace select wells for groundwater monitoring; and treat impacted soil at a One-Time Landfarm.

Specific tasks include:

- Obtain an encroachment permit to excavate in MDT right-of-way.
- Obtain a permit for a One-Time Landfarm.
- Develop traffic control plan for closure of Taylor Street.
- Prior to excavation, abandon monitoring wells DEQ-1, DEQ-2, MW-2, MW-3, and MW-4 that lie within the limit of excavation.
- Prior to well abandonment, complete a groundwater sampling event from all site monitoring wells.
- Remove approximately 1,200 square feet of asphalt, transport, and dispose at an appropriate location.
- Remove and replace water and sewer service lines to 303 Taylor Street.
- Oversee excavation of an estimated 1,000 bank cubic yards of impacted soil.
- Field screen excavated soil with a photoionization detector to determine limits of excavation.
- Collect confirmation soil samples from floor and sidewalls of excavation.

- Backfill excavation within MDT right-of-way with flowable fill and disrupted area of Taylor Street.
- Backfill portion of excavation outside MDT right-of-way with pit-run fill in approximate two-foot lifts and compact.
- Cap excavated area outside MDT right-of-way with crushed gravel.
- Prepare and berm the land farm, spread contaminated soil, and till as required.
- Coordinate with landfarm owner for tilling the landfarm.
- Install five replacement groundwater monitoring wells and survey all wells.
- Complete groundwater sampling six months and one year following excavation.
- Sample the landfarmed soil after one year.
- Prepare a Clean Up Report summarizing all excavation and confirmation sampling activities.
- Prepare an Interim Data Report summarizing groundwater conditions following the six month post-excavation groundwater sampling event.
- Prepare a Groundwater Monitoring Report following the one-year post-excavation sampling event.
- Validate all sample analytical data.
- Update Release Closure Plan.

If contaminated soil intersects the water main line in Taylor Street, excavation will also entail the following:

- Removal and replacement of approximately 90 feet of water main in Taylor Street.
- Provide temporary water service to 309 Taylor Street during water main removal and replacement.

4.0 SCOPE OF WORK

4.1 Project Management

RTI has consulted with the Client and MDEQ to define the scope of this investigation. This CAP was developed based on these consultations. As the project progresses, RTI will communicate with MDEQ and the Client regarding field work schedule, field findings, and initial evaluation of laboratory results.

Prior to commencing field work, RTI will submit a One-Time Landfarm permit application to MDEQ Solid Waste Division. RTI will update the Site-specific Health and Safety Plan for the excavation activities. Standard practices for construction safety will be implemented. RTI will obtain an encroachment permit from MDT and implement traffic control to route traffic around the site during excavation activities. The one-call underground utility locate service will be contacted at least two working days prior to excavation activities.

If impacted soil intersects the water main line in Taylor Street, the water line in the impacted area will be removed to access impacted soil. RTI will contact the owners of 309 Taylor Street and provide them with an alternative water source while the line is disconnected. The line will be replaced as soon as possible following soil removal in the area. An excavation map showing known utility lines is shown in Figure 4.

4.2 Monitoring Well Abandonment

Monitoring wells DEQ-1, DEQ-2, MW-2, MW-3, and MW-4 are within the proposed excavation boundary and will be abandoned prior to the excavation. Monitoring wells will be abandoned by a licensed monitoring-well driller and abandonment logs will be provided to the Montana Bureau of Mines and Geology Groundwater Information Center.

4.3 Groundwater Sampling

Three groundwater monitoring events will be conducted: prior to well abandonment, six-month post-excavation, and one-year post-excavation. Groundwater samples will be collected from monitoring wells DEQ-1, DEQ-2, DEQ-3, MW-1, MW-2, MW-3, MW-4, MW-5, MW-9, MW-10, MW-11, and MW-12 during the first sampling event. Wells MW-6, MW-7, and MW-8 (located on the south side of US Highway 2) will not be sampled since wells MW-11 and MW-12 lie between wells MW-6, MW-7, and MW-8 and the contaminant source and wells MW-11 and MW-12 have not exhibited detectable contaminant concentrations.. Abandoned monitoring wells will be replaced prior to the 6-month post-excavation sampling event. Monitoring-well replacement is discussed in Section 4.6.

If monitoring wells located well beyond the excavation area (MW-1, MW-9, and MW-10) show non-detectable contaminant concentrations during the first groundwater sampling event, RTI will discuss with DEQ whether to discontinue sampling of those wells.

Groundwater levels will be measured in all site wells with an electronic water-level indicator. Samples will be collected using a stainless-steel submersible pump or peristaltic pump, clean PTFE lined tubing, and low-flow sampling methods. During purging, groundwater stabilization parameters including pH, temperature, specific conductance, dissolved oxygen, oxidation/reduction potential, and turbidity will be measured and recorded on a groundwater sampling log. Also during purging, water levels will be recorded to monitor drawdown. When groundwater parameters have stabilized in accordance with DEQ groundwater sampling guidance, groundwater samples will be collected in laboratory provided containers, placed on ice, and submitted under chain-of-custody procedures to Energy Laboratories in Billings for volatile petroleum hydrocarbons (VPH) analysis. Additionally, select samples will be submitted for 1,2 DCA analysis, including monitoring wells DEQ-1, DEQ-2, MW-3, MW-4, and

MW-5, and their replacement wells following the excavation. A low flow groundwater sampling SOP is included as an attachment.

A work zone will be established around the well and support vehicle during sampling to reroute traffic and provide pedestrian control.

Following sample collection at each location, equipment will be decontaminated using detergent wash, tap water rinse and distilled water final rinse. Purge water will be managed per the MDEQ Disposal of Untreated Purge Water from Monitoring Wells flowchart.

4.4 Landfarm Permit

Prior to mobilization for soil excavation, RTI will obtain a one-time landfarm permit from DEQ Solid Waste Division. The proposed landfarm location is shown in Figure 5.

The landfarm will be tilled several times during the warm months (May to October). The landfarm will be sampled in accordance with MDEQ permit requirements approximately one year after landfarm operations are initiated and at least yearly thereafter until contaminant concentrations in landfarmed soil reach closure levels.

4.5 Soil Excavation

Prior to excavation, the excavation subcontractor will remove approximately 1,200 square feet of asphalt from Taylor Street. The asphalt will be disposed of in an appropriate manner. The subcontractor will excavate up to 1,000 cubic yards of contaminated soil. The excavation is expected to extend to a depth of 12 feet below ground surface (bgs) beneath Taylor Street and to depths of six to 8 feet in areas north of Taylor Street (Figure 3).

Excavated soil will be transported to the proposed One-Time landfarm located 3 miles east of Saco. A location map of the landfarm is included in Figure 5. The excavation contractor will prepare the landfarm by creating a berm around the landfarm perimeter. Excavated soil will be spread in a thin layer (less than 6 inches) over the landfarm site.

RTI will oversee all excavation activities. The excavation will be guided by field screening of excavated soil using a Photo Ionization Detector (PID) and historical soil boring data. The PID will be calibrated with 100 part per million (ppm) isobutylene span gas at the start of each work day. Excavation will be discontinued when PID readings reach less than 100 ppm. Confirmation samples will be collected at the following frequency:

- One discrete base sample will be collected for every 625 square feet of excavation floor (estimate four total).
- One discrete sample for every 25 linear feet of excavation sidewall from depths 0-

2 feet, 2.1-10 feet, and greater than 10 feet (estimate 33 total).

- Up to six additional worst case samples from inaccessible soil exhibiting elevated PID readings may also be collected.
- One composite sample of excavated soil for every 200 yards transported to the landfarm (five total).

Samples will be submitted to Energy Laboratories to be analyzed for volatile petroleum hydrocarbons (VPH). Up to eight samples exhibiting elevated PID readings will also be submitted for 1,2 DCA analysis. A soil sampling SOP is included as an attachment.

4.5.1 Excavation Backfill

Since the excavation extends into the MDT right of way, RTI contacted MDT to notify them of the work and to get the required backfilling specifications. MDT required that the excavation be backfilled with excavatable flowable fill. The flowable fill does not require compaction testing. The portion of the excavation within the MDT right-of-way will be repaved with the same thickness of asphalt as was removed (anticipate 4-inch thickness).

The excavation beyond the MDT right-of-way will be backfilled with pit-run fill in approximate two-foot lifts and compacted. The excavation in this area will be capped with crushed gravel.

4.6 Groundwater Monitoring Well Installation

Abandoned monitoring wells DEQ-1, DEQ-2, MW-2, MW-3, and MW-4 will be replaced following completion of excavation activities. Monitoring wells will be installed using hollow-stem auger drilling methods. Soil samples will be collected from monitoring-well boreholes beginning at the bottom of excavation backfill and at 5-foot intervals thereafter including from the bottom of the borehole. Soil samples will be field screened with a PID. The soil sample from each borehole exhibiting the highest PID reading and sample from the bottom of the borehole will be submitted to Energy Laboratories for VPH analysis. A soil sampling SOP is included as attachment.

Monitoring wells will be constructed using two-inch schedule 40 PVC casing and a 0.010 slot screen. Well depths are anticipated to be 20 feet. Screen length will be 15-feet and will be positioned to intercept the water table allowing for seasonal fluctuations. The remainder of the borehole will be completed with schedule 40 PVC solid riser pipe to grade. A filter pack composed of 8/12 silica sand will be placed in the borehole annulus to a depth no less than two feet above the screen. A bentonite seal will be placed above the sand filter pack. The well will be fitted with a locking expandable well cap, and the wellhead will be completed in a traffic-rated flush-mount manhole set in concrete.

The location and top-of-casing elevations of newly installed and existing monitoring wells will be surveyed by a Montana Licensed Surveyor.

4.7 Evaluation and Reporting

Upon completion of the excavation and receipt of soil analytical data, RTI will prepare and submit a Cleanup Report that satisifies requirements specified in the *Montana Cleanup Guide for Petroleum Releases* (DEQ, November 2020). This report will include:

- Facility map(s) showing site layout, monitoring wells locations, excavation boundary and sample locations, and soil sample concentrations;
- Tabulated summaries of soil analytical data, including soil data from the three phases of site investigation(laboratory analytical results and data validation checklists will be appended to the report);
- Summary of all corrective action activities including well abandonment, removal and replacement of utilities, field observations, and sampling methods.

RTI will prepare a Groundwater Monitoring Interim Data Submittal (IDS) following both the initial and second (six-month post excavation) groundwater sampling events. Each IDS will include:

- Summary of field activities and data from the pre-excavation sampling event and six-month post excavation sampling events:
- Facility map(s) showing site layout, locations of monitoring wells, potentiometric surface, dissolved contaminant distribution, and contaminant plume dimensions;
- Tabulated groundwater analytical and elevation data (laboratory analytical results and data validation checklists will be appended to the reports);

Following the one-year post excavation groundwater sampling event, RTI will prepare a Groundwater Monitoring Report (GWM) that satisifies requirements specified in the *Montana Groundwater Monitoring Work Plan and Report Guidance for Petroleum Releases* (DEQ, March 2021). This report will include:

. This report will include all components of the IDS plus:

- Summary of all three groundwater sampling events;
- Tabulated summaries of new and cumulative groundwater elevation and analytical data (laboratory analytical results and data validation checklist will be appended to the report);
- Recommendation for release closure or additional work required to resolve the release.
- Summary of the Release Closure Plan (RCP), with a copy of the RCP appended to the report.

5.0 SCHEDULE AND BUDGET

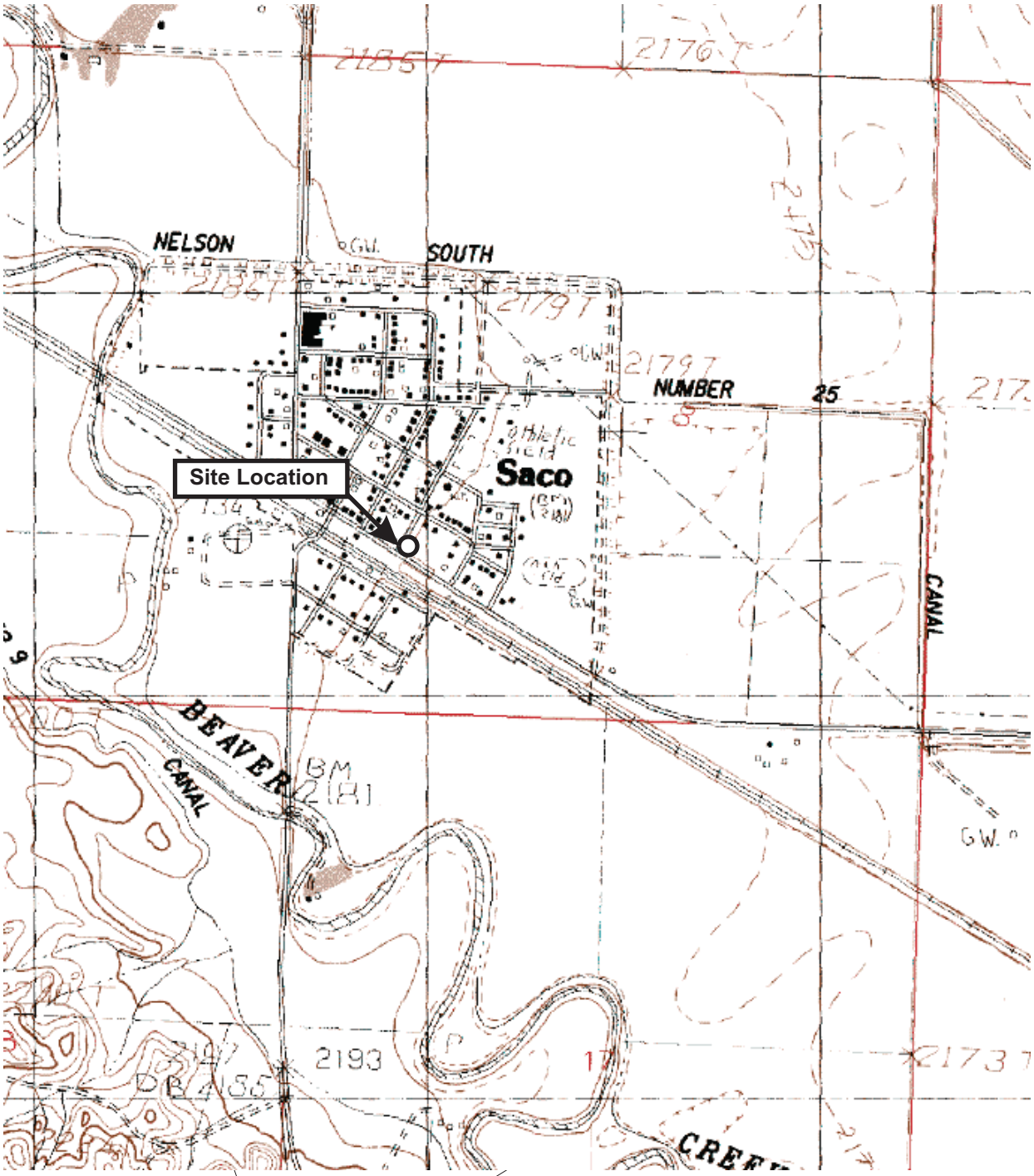
Following approval of this work plan by MDEQ, and obligation by the PTRCB, RTI will schedule the first groundwater sampling event, well abandonment, and excavation work for fall 2025 (low groundwater). The well abandonment and groundwater sampling will be completed on the same trip. Well installation will be scheduled for fall 2025 or spring 2026, depending on driller availability. The first groundwater sampling will be scheduled for spring 2026, and the second groundwater sampling will be fall 2026. The landfarm will be sampled during the fall 2026 groundwater sampling event.

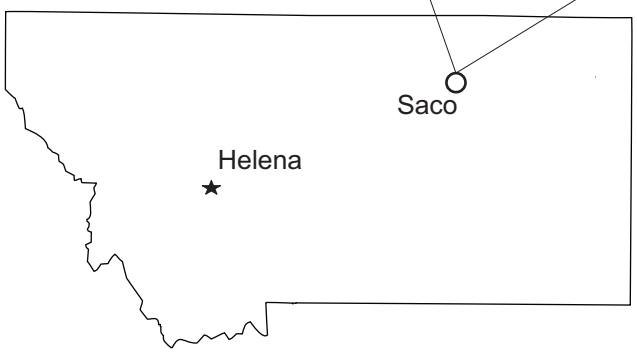
A breakdown of costs associated with the CAP activities is attached. Bids for well drilling services were obtained from four drilling contractors. Hansen Drilling of Glasgow provided the low bid. Bids for excavation activities and soil disposal at the landfarm were solicited from three excavation contractors. Bishop Inc. of Malta provided the low bid. LSE, Inc. of Fort Peck provided a bid and Fossum/Century Materials of Glasgow declined to provide a bid. Subcontractor bids are attached. Costs associated with groundwater sampling are provided on a unit cost basis and are included in the attached Groundwater Monitoring Tool worksheet. The total cost for excavation and groundwater sampling activities is $389,148.47. If you have any questions or comments r egarding this workplan, please do not hesitate to call.

Respectfully Submitted,

Cole Histon
Environmental Geologist
Resource Technologies, Inc.

Figures





Base Map: U.S.G.S Saco Quadrangle, 7.5 minute Series, 1984 - Scale 1:24,000 (1" = 2000')

Figure 1

Site Location Map
Former Saco Conoco
303 Taylor Street
Saco, Montana

Resource Technologies Inc.

Legend

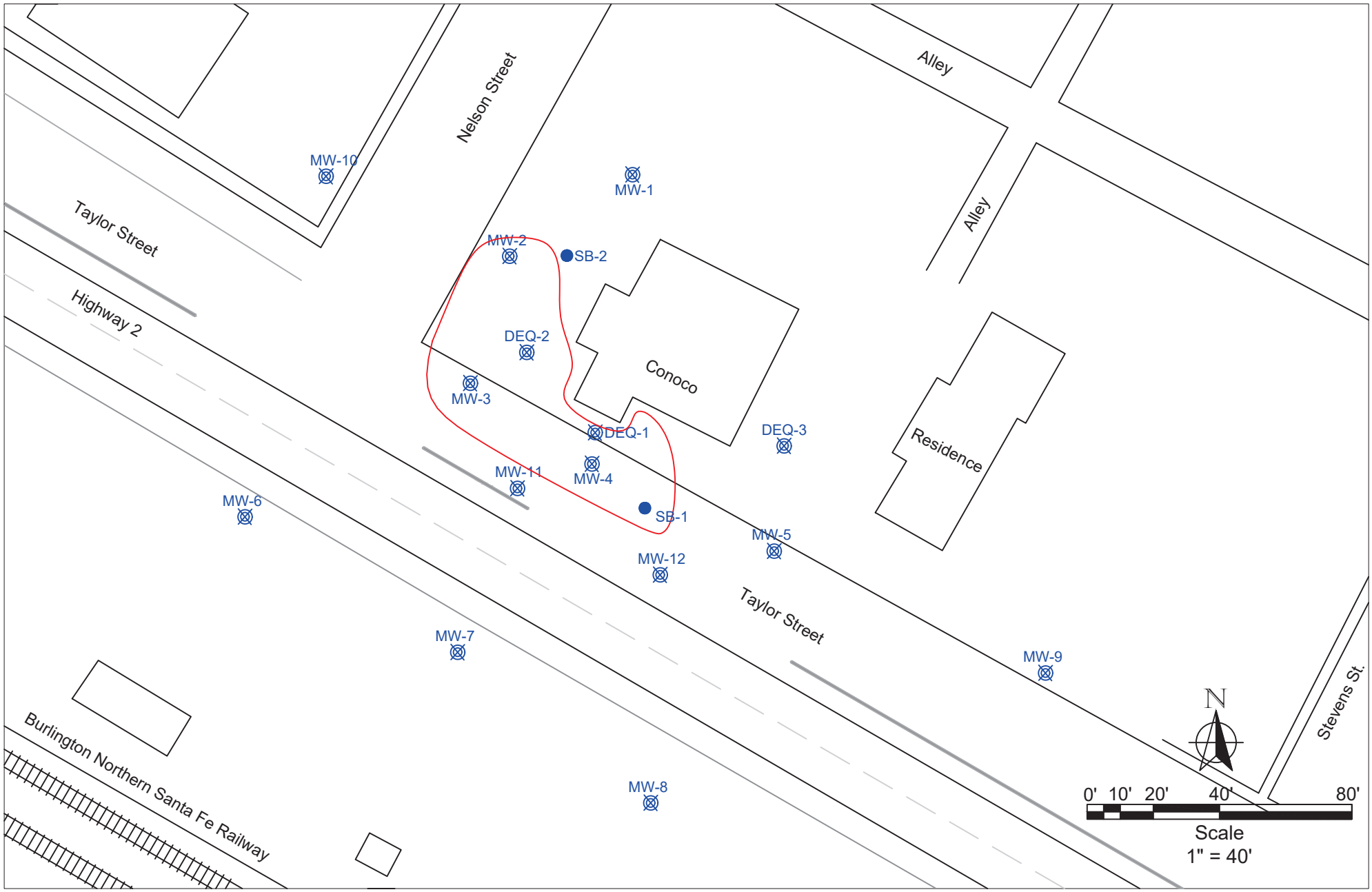
MW-5 — Groundwater Monitoring Wells

SB-1 — Soil Boring

Figure 2

Site Map
Saco Conoco Site
303 Taylor St,
Saco Montana

RESOURCE TECHNOLOGIES, INC.
1050 EAST MAIN STREET, SUITE 4
BOZEMAN, MT 59715
(406) 585-8005 FAX: (406) 585-0069



Legend

MW-5 Groundwater Monitoring Wells

SB-2 Soil Boring

Proposed Excavation Area

Figure 3

Proposed Excavation
Saco Conoco Site
303 Taylor St,
Saco Montana

RESOURCE TECHNOLOGIES, INC.
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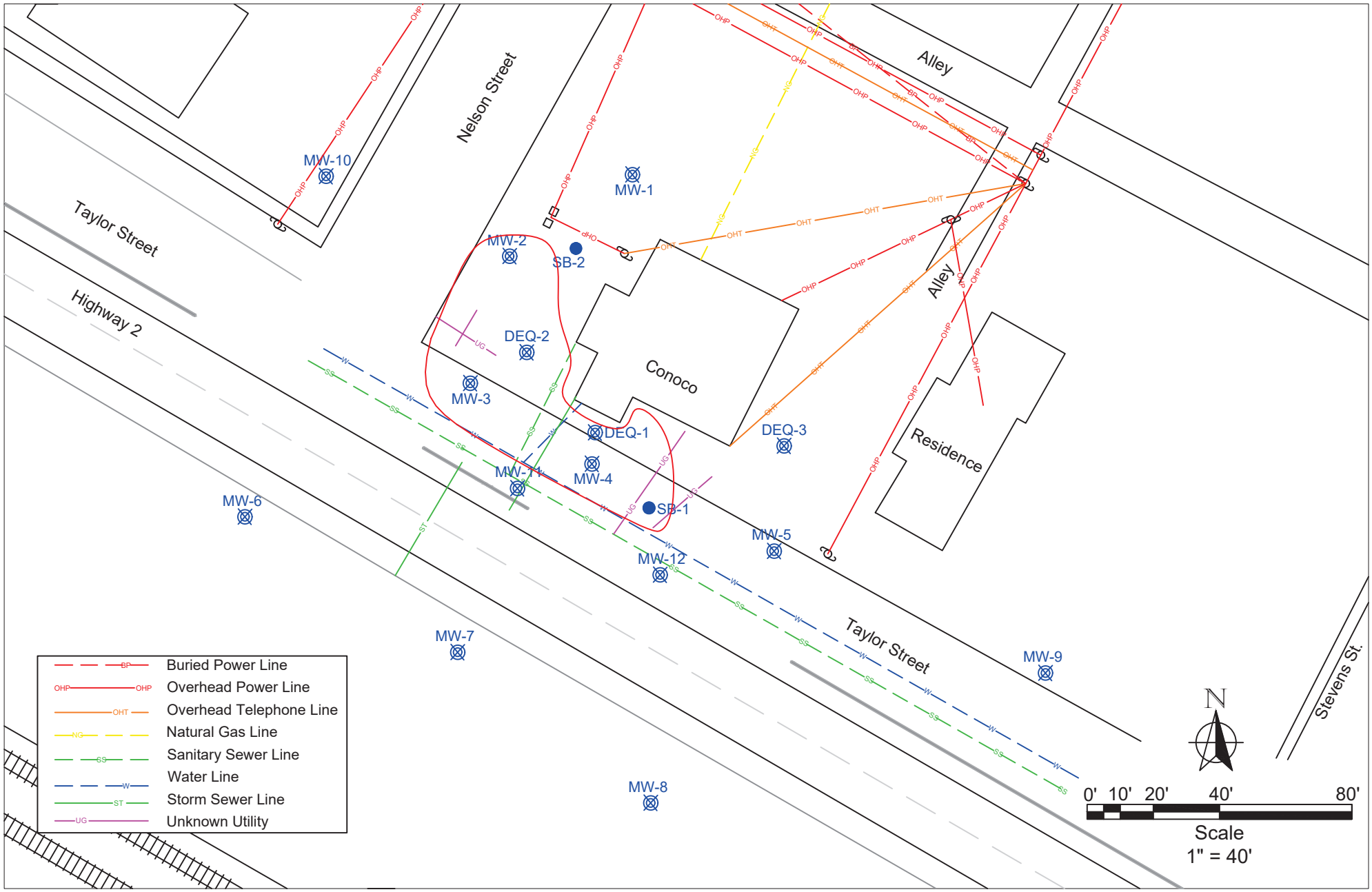

Legend

MW-5 — Groundwater Monitoring Wells

SB-1 — Soil Boring

Proposed Excavation Area

Figure 4

Proposed Excavation and Utility Map
Saco Conoco Site
303 Taylor St,
Saco Montana

RESOURCE TECHNOLOGIES, INC.
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Basemap: Google Earth 2016

Figure 5

Landfarm Location
Former Saco Conoco
Saco, Montana

Resource Technologies Inc.

Approximate Scale: 1 inch = 1,700 feet

SOP: Low Flow Groundwater Sampling

SOP W.4
Low Flow Groundwater Sampling

Monitoring well sampling will be conducted using low-flow (minimal drawdown) purging. This sampling method induces laminar (non-turbulent) flow in the immediate vicinity of the sampling pump intake, thus drawing groundwater directly from the sampled aquifer horizontally through the well screen and into the sampling device. This results in collecting groundwater from a discrete portion of the well screen at a rate that closely replicates the natural recharge of groundwater from the formation into the well screen. Pumping at flow rates in the approximate range of 100 to 500 milliliters per minute (ml/min) or 0.026 to 0.132 gal/min while monitoring the water level within the well ensures minimal drawdown. Low flow rates minimize disturbance in the screened aquifer, resulting in (1) minimal production of artificial turbidity and oxidation, (2) minimal mixing of chemically distinct zones, (3) minimal loss of volatile organic compounds, and (4) collection of representative samples while minimizing purge volume.

Equipment and Supplies

Plastic Sheeting	Wrench with appropriate sockets to remove well cover
Water level indicator and/or oil/water interface probe	Personal protective clothing and equipment
Variable speed, stainless steel submersible pump	Nitrile, vinyl or latex gloves
Tubing – PVC, HDPE, or PTFE	Appropriate sample containers
Flow-through cell	Paper towels
Meters for temperature, pH, conductivity, dissolved oxygen (DO), redox potential (ORP), turbidity	Decontamination supplies

Equipment Maintenance and Calibration

All field measurement equipment shall be decontaminated prior to any measurement activities and shall be protected from any potential contamination until ready for use.

Water quality indicator parameters are temperature, pH, conductivity, DO, ORP, and turbidity. Water quality instruments (meters) shall be calibrated at the beginning of each day according to manufacturer's procedure. A calibration check should be performed at the end of the day to ensure the instruments remained in calibration. Calibration results shall be documented in either the field notebook or calibration log for each individual instrument.

For pH, at least two buffer solutions that bracket the probable sample pH (e.g., 7.0 and 10.0) shall be used. Specific conductivity meters shall be calibrated with either a 1413µs/cm or 12.9 ms/cm calibration standard. The solution that is nearer the expected sample electrical conductivity shall be used. DO meters shall be calibrated according to the manufacturer's instructions using zero oxygen solution and water saturated air.

If equipment problems are encountered, the problems will be resolved by reviewing the owner's manual, recalibrating the equipment, contacting the equipment vendor, and/or replacing the equipment.

Field Procedure

1. Well Inspection and Sampling Preparation

Wells shall be inspected for signs of tampering or other damage. If tampering is suspected, (i.e., casing is damaged, lock or cap is missing) this shall be recorded in the field logbook and on the groundwater sampling log (attached), and reported to the field team leader. Wells that are suspected to have been tampered with shall not be sampled until the field operations leader has discussed the matter with the Client project manager.

Plastic sheeting may be placed on the ground surrounding the well to provide a clean working area around the wellhead and to prevent any soil contaminants from contacting sampling equipment, as warranted at the discretion of the field team leader. Water in the protective manhole or in the vaults around the well casing will be removed prior to opening the well casing.

2. Water Level Measurement

Using an electronic water level indicator, measure and record the depth to water (to 0.01 ft) in the well to be sampled before inserting tubing or preparing to purge the well. Care should be taken to minimize suspension of any particulates attached to the sides or at the bottom of the well. Water levels shall be measured from the mark on the top of the well casing and recorded on the groundwater sampling log (attached). If well casings are not marked, measurements shall be taken from the north side of the well casing. If the water level is not static due to release of pressure or vacuum in the well casing when the well is opened, water level will be monitored until the level stabilizes. *If LNAPL is suspected in the well, an oil/water interface probe shall be used to determine the presence and thickness of floating product. Wells containing LNAPL shall not be sampled.*

3. Equipment Set-up

Monitoring wells will be purged and sampled with a variable-speed, stainless steel submersible pump fitted with clean PTFE-lined tubing. The pump and tubing will be lowered slowly into the well. The pump will be situated with the intake at a depth approximately three feet below the measured water level and within the screened interval of the well. Care should be taken to avoid disturbing sediments in the bottom of the well.

The water level indicator will be inserted in the well and suspended just above the static water level to facilitate water level monitoring during purging.

The discharge end of the hose will be connected to the inflow port of a flow cell that houses probes for measuring water quality parameters including temperature, pH, conductivity, dissolved oxygen (DO), redox potential. Samples for turbidity measurement will be collected from the flow-cell discharge line. The flow cell will discharge to a graduated container for measuring purge volume.

4. Well Purging. When set up is complete, the pump will be activated and start time will be recorded on the groundwater sampling log (attached). The pump will be set to discharge at a low flow rate of approximately 100 mL/min (0.026 gal/min) to a maximum of 500 mL/min (0.132 gal/min). Discharge rate will be adjusted maintain a steady flow rate while maintaining a constant minimal drawdown in the well (not to exceed 0.33 ft).

During purging, water quality-indicator parameters will be monitored continuously and will be recorded every two to four minutes on the groundwater sampling log (attached). Water level in the well will be measured and recorded every two to four minutes.

Stabilization criteria must be met for successive readings of the water quality field parameters. When water quality indicator parameters have stabilized, sample collection can take place. Stabilization criteria are presented in the following table.

Low-Flow Sampling Stabilization Criteria

Parameter	Stabilization Criteria
pH	+/- 0.1 pH units
Specific Conductance	+/- 3% S/cm
oxidation-reduction potential (ORP)	+/- 10 millivolts
Dissolved Oxygen (DO)	+/- 0.3 milligrams per liter
Turbidity	+/- 10% NTUs (when turbidity is greater than 10 NTUs)
Temperature	+/1 °C

If stabilization is not occurring and the sampling procedure has been strictly followed, then sample collection will take place once three (minimum) to six (maximum) casing volumes have been removed. In the event that water quality indicator parameters do not stabilize, specific information on what took place during purging must be recorded on the groundwater sampling log.

Purge water will be handled in accordance with the DEQ *Disposal of Untreated Purge Water From Monitoring Wells* flowchart (07/25/2015).

5. Sample Collection. Groundwater samples will be collected immediately after purging. Before collecting groundwater samples, the sampler shall don clean gloves. Samples for laboratory analyses must be collected before the flow cell. The pump discharge line will be severed with a decontaminated blade immediately upstream of the flow cell and samples will be collected from the discharge hose at the same pumping rate used during purging.

Collect samples in appropriate containers as indicated by laboratory conducting the analysis. Hold the discharge tube as close as possible to the sample container without allowing the sample tubing to contact the container. When more than one sample contaminant type is to be collected from the well, samples should be collected in order from most volatile to least volatile analytes. Immediately after a sample bottle has been filled it should be preserved according to the specific analytical method, unless the sample container is pre-preserved by the laboratory.

For volatile organic compounds (VOCs) and volatile petroleum hydrocarbons (VPH), fill 40-mL vials in a manner that minimizes turbulence, air entrapment, and overfilling. Fill the bottle completely leaving a positive meniscus at the top of the vial. After capping, invert the vial and tap with a finger to check for air bubbles. For other analytical parameters, fill the appropriate container to the level of the bottle neck and cap.

Samples will be labelled according to procedures specified in the project planning documents. If required (per project plans), collect duplicate sample from well with known or suspected contamination.

Place samples in an insulated cooler containing ice. Transport the sample cooler under chain-of-custody procedures to the laboratory.

6. Post-Sampling Activities

Following sample collection, the total depth of the well from the top of the casing shall be determined using a weighted tape or electric indicator and recorded on the groundwater sampling log.

Secure the monitoring well.

Decontamination

Pumps, water level indicator, and flow cell shall be cleaned prior to field work, after each sampling location, and upon return to the office from the field. Flush with laboratory grade detergent solution for at least one minute. Flush with deionized water to remove all the detergent solution. Flush one final time with distilled/deionized water.

If required (per project plans), collect equipment blank after final flushing. The equipment blank will consist of purging de-ionized water through submersible pump, and/or rinsing equipment with de-ionized water, and collection for appropriate sample analysis.

Refer to RTI SOP G.5 – Equipment Decontamination.

Management of Investigation-Derived Waste

RTI will follow the process outlined in DEQ's *Disposal of Untreated Purge Water From Monitoring Wells* flow chart (07/25/2015). Purge water will be pumped from the well into a 2.5 gallon container adjacent to the well location. If containment of purge water is required, water will then be transferred to either 55-gallon drums or a 275-gallon plastic tote that will be in a secured area at the site. If containment of purge water is not required, purge water will be discharged to the ground surface adjacent to the sampled well.

Disposable equipment (gloves, tubing, paper towels) will be placed in plastic garbage bags and will be disposed of in an approved solid waste receptacle.

Refer to RTI SOP G.6 – Investigation-Derived Waste Management.

Special Notes

Prior to conducting a groundwater monitoring event, information regarding well construction, development, and water level records for each well to be sampled should be obtained and reviewed to determine the appropriate pump to be used, the depth of intake, and the potential groundwater recharge rate of the well.

Order of monitoring well sampling will be from least impacted to most impacted based on information available at the time of sampling. This practice will help reduce the potential for cross contamination between wells. When contaminant distribution is unknown, begin with wells upgradient of likely contaminant source(s), continue with downgradient wells, and finish with wells in or closest to suspected contaminant source(s).

SOP: Soil Sampling

SOP S.2
Soil Sampling

Soil sample locations shall be based on criteria specified in project planning documents.

Equipment and Supplies

Hand trowels, spatulas, scoops, shovels	Bucket augers, corers	Heat source (e.g., sunlight or vehicle heater)
Sampling gloves	Zipper lock plastic bags	Photoionization detector
Terra Core™ sampling devices (optional)	Weigh scale (optional)	Magnifying lens for observing soil

Surficial and Shallow Soil Sampling

Surficial and shallow soil sampling is generally conducted using common hand tools, such as shovels, trowels, etc. An appropriately gloved hand can also be used. Additionally, bucket augers and borers may also be useful for sampling below a depth of one foot.

The goal of the sample collection is to collect the soil with minimal disturbance and limit the amount of handling and tooling contact. Remove debris, twigs, rocks, vegetation, and organisms (such as bugs and worms) from the sample point to gain a representative sample material.

If using a bucket auger, advance the auger to the desired sample depth. Upon reaching an inch or two above the desired depth, removed the bucket auger and empty out soil. Remove any soil that might have collapsed into the hole with bucket auger after removing the first time. Reinsert auger, and advance to desired depth. Remove bucket auger and containerize soil samples from soil at end of bucket auger, trying to minimize handling as much as possible.

Excavation Soil Sampling

During excavation (removal) of contaminated soil, soil samples are obtained for field screening and confirmation analysis. As directed by field sampling personnel, the equipment (backhoe/trackhoe) operator shall lower the bucket to the desired depth and collect a sample of the soil from the sidewall or bottom of the excavation and bring the bucket to a stable position at the ground surface. Care should be taken to make sure that the soil sample containerized is from the specific depth to be sampled, not from soil smeared by the equipment, or soil having fallen into the excavated hole from the surface.

Borehole Sampling

Direct Push Techniques. Direct push sampling will be accomplished by advancing a steel sampling tube fitted with an internal acetate sleeve into undisturbed soil by direct hydraulic pressure. After withdrawing the sampler from the borehole and removing the sleeve from the sampler tube, the sleeve shall be cut with a specialized tool to expose the sample.

Hollow-Stem Auger Drilling. Soil samples collected during HSA drilling will be collected using stainless-steel split-spoon samplers. Split-spoon samplers are 24 inches in length and samples are obtained by driving the sampler a distance of 24 inches into undisturbed soil with an automatic hammer simulating a blow from a 140-pound hammer free falling a distance of 30 inches.

Field Screening and Logging

Preliminary Field Screening. Upon opening the acetate sleeve or split-spoon sampler, a preliminary field-screening of the sample will be conducted with a previously calibrated photoionization detector (PID). If volatile organic compounds (VOCs) are detected, a section of core taken from the interval exhibiting the highest PID reading will be retained for laboratory analysis.

Sample Logging. Lithologic descriptions of unconsolidated materials encountered during soil sampling shall be described in accordance with the Unified Soils Classification System (USCS) and the USCS group symbol shall be used. Descriptive information to be recorded shall include color; an estimated percentage of gravel, sand, fines, or all three; description of shape, size, grading, and sorting of coarse particles; plasticity and moisture content of fines; hardness (fine grained) or density (coarse grained); and moisture content (dry, wet, or moist).

Additional information to be recorded shall include staining and odors, field screening readings, blow counts, soil structures (root holes, laminations, prismatic structures, etc.), water table depth, caving or sloughing of the borehole, changes in drilling pressure, intervals of laboratory samples, presence of organic materials, and any other noteworthy observations.

Soil description and observations will be recorded in the field notebook and/or appropriate field sampling form.

Headspace Test. Upon completion of preliminary field screening (see above), approximately two ounces (by volume) of soil will be placed in a clean zipper lock plastic bag for headspace test (RTI SOP S.1 – Soil Headspace Test). If no soil has been retained for analysis prior to headspace screening, a sufficient volume of soil will be left undisturbed to facilitate sample retention. Place the closed bag in the sun or under a vehicle heater vent for several minutes. Following heating, the tip of the PID will be inserted through the side of the bag and the reading will be recorded on the field notebook or appropriate field sampling form.

Sample Collection for Laboratory Analysis

Typically, the portion of sample from each borehole corresponding to the highest PID reading will be retained for laboratory analysis. If no VOCs are detected during field screening of soils from a borehole, then the portion of sample obtained from immediately above the soil/groundwater interface will be retained for analysis. Project specific planning documents may specify other samples for laboratory analysis.

RTI personnel will don clean sampling gloves prior to handling soils to be retained for laboratory analysis. Soils will be placed in clean, sample jars (or other laboratory provided container) using clean, decontaminated stainless steel scoops and/or spatulas. Soil will be packed in the jar in a manner that minimizes headspace. The filled sample containers will be sealed, placed in a protective bubble sample bag, and placed in a cooler held at a temperature as close to 4° Celsius as feasible until delivered to the analytical laboratory.

As an option for VOCs analysis, samples may be collected with disposable sampling devices. An approximate 5 gram mass of sample will be collected with the Terra Core™ device and will be immediately extruded into a tared 40 ml volatile organics sample vial with magnetic stir bar and the vial will be sealed. Sample vials will be placed in a zipper lock sample bag and will be laid on their sides in an iced cooler at a temperature as close to 4° Celsius as feasible until delivered to the analytical laboratory.