Corrective Action Plan 35133

Gasamat #563

1752 Montana Avenue

Helena, MT 59620

Facility ID# 25-04619, Release# 3330,

Work Plan# 35177

Prepared for:

Hi Noon Petroleum

1101 S. 6th W.

Missoula, MT 59801

Prepared by:

West Central Environmental Consultants, Inc.

1030 South Ave. W.

Missoula, MT 59801

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WCEC Project No. 12-9413-70

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1.0 Introduction

West Central Environmental Consultants (WCEC) has prepared this Corrective Action Plan for the Gasamat #563 facility (Facility ID# 25-04619, Release# 3330, Work Plan ID# 35133) as requested by the Montana Department of Environmental Quality (MTDEQ) on January 12, 2026.

1.1 Site Location

The Gasamat #563 facility is located at 1752 Montana Avenue in Helena, Montana. A site location map is included as Figure 1 and a current site details map is included as Figure 2. The Public Land Survey System (PLSS) description for the site is the SE/4, SE/4, SE/4 of Section 19, T10N, R3W. The approximate geographic coordinates are Latitude 46.6034°, Longitude -112.0211°. Township, range, and section information was obtained using the United States Geological Survey (USGS) Helena, Montana 1:24,000 Quadrangle. The site is located within the Upper Missouri River Hydrologic Unit.

1.2 Geologic/ Hydrogeologic Setting

The surficial geology of the Helena Valley is dominated by Quaternary glacial and alluvial deposits. The upper few hundred feet of Quaternary deposits consist of complex stratified lenses of cobble, gravel, and sand with abundant intercalated silts and clay (Briar and Madison, 1992). The layers of silt and clay are not laterally continuous across the valley, which allows for hydraulic interconnection of water bearing zones (Moreland and Leonard, 1980). Monitoring well installation and soil boring logs completed at the facility show a subsurface lithology of sandy/ silt with interbedded rounded and sub-rounded gravel of less than 1 inch diameter. A layer of sand and sub-rounded gravel exists near the groundwater interface. A hard silty clay was logged in some wells near the bottom of the borings. This layer of silt/ clay at approximately 10 to 15 feet below ground surface (bgs) prevented further vertical transport of hydrocarbon at the facility, and that the overlying layer of rounded sand and gravel allows for the transport of water and hydrocarbon impacts to downgradient locations at the site. The rapid drop in groundwater elevation between MW 14 and MW 16 may be indicative of a break in the lateral continuity in the silt and clay layer as noted by Moreland.

2.0 Site History

2.1 Former UST and Pump Island History

The installation of three underground storage tanks (USTs) at the facility was conducted in 1964 according to the tank records. The UST system consisted of a 4,000 gallon tank, a 12,000 gallon tank, and a 20,000 gallon tank. Records at the time of closure show the 4,000 gallon tank as containing super unleaded, the 12,000 gallon tank containing unleaded plus, and the 20,000 gallon tank containing regular unleaded gas. All three tanks are recorded to have been constructed of bare steel. All three tanks passed tightness test during 1997.

2.2 Remedial Investigation

Atlatl Inc. of Butte, Montana conducted a soil boring investigation during May and June 1998. This investigation identified petroleum impacts in the vicinity of the pump islands and UST basin, and identified the pump islands as the most likely source of the release [Atlatl, 1998]. Atlatl completed all eleven borings as monitoring wells. To address the soil impacts identified in the soil boring investigation, Atlatl conducted a remedial excavation of petroleum impacted soil in July and August 1999.

2.3 Remedial Excavation

The remedial excavation removed approximately 3,200 cubic yards of petroleum impacted soil from the site. The USTs and pump islands were removed from the facility at the same time as the excavation. The excavation also removed monitoring wells MW5, MW7, and MW8. Confirmation samples on the north/northeast sidewall contained petroleum impacts at the groundwater interface.

Monitoring well MW12 was installed north of the subject property on November 14, 2000.

2.4 Installation of Additional Groundwater Monitoring Wells

In May 2001, Water and Environmental Technologies (WET) of Butte, Montana installed two additional monitoring wells (MW13 and MW14). Further sampling of available site wells was conducted by WET in 2003 and 2006.

No further remedial actions occurred between 2006 and 2013.

2.5 2013 Well Redevelopment, Surveying, and Utility Corridor investigation

In June 2013, WCEC located all monitoring wells that had not been destroyed since 2006. All of the wells that still existed were repaired and redeveloped. Wells that had heaved or were in need of additional clearance between the well casing and the monument were cut to appropriate elevations. All site monitoring wells were surveyed for NAD 83 state plane location and mean sea level elevation. A utility corridor investigation was conducted in conjunction with additional groundwater monitoring events during 2013. All surrounding utilities were located and surveyed. Their locations are depicted in Figure 2.

2.6 LIF Investigation

In September 2015, the adsorbed light non-aqueous phase liquid (LNAPL) plume underlying and downgradient of the site was delineated. The total area of the 2D horizontal LNAPL impacted area is approximately 92,680 square feet (2.2 acres). The vertical extent of the LNAPL plume body ranged in depth between 8 and 18 feet below ground surface (bgs). The majority of the petroleum impacts at the facility are present between 10 and 15 feet bgs. The total volume of the three dimensional LNAPL plume body is approximately 7,000 cubic yards. This delineated plume body extends from the area of the former USTs to slightly north of Popular Street. The length of the LNAPL plume at the current time is approximately 590 feet in length and maximum width of approximately 130 feet [WCEC, 2015].

2.7 Site Conceptual Model (SCM)

The site geologic setting described in Section 1.2 in conjunction with historical sampling data and the results of the LIF investigation allow for interpretation of the site conceptual model (SCM) which includes the following assertions:

1. The subsurface lithology consists of two distinct layers. A layer of sand intermixed with gravel overlays a layer of silt/clay. This layer of clay impedes the vertical migration of water and hydrocarbons [WCEC, 2013].

2. LNAPL impacts exist in the area of the UST basin at the approximate elevation of the groundwater interface and downgradient of this known source area to the northern side of Poplar Street. The highest concentration of LNAPL from this release existed in the immediate vicinity of the retail store of Barreta Audio. Elevated %RE responses were also noted near the northwest corner of Clear Choice Auto Glass. LNAPL impacts are typically present at a depth of approximately 10 to15 feet below grade, 0.5 feet in thickness, and underlie an area of approximately 92,500 square feet (2.2 acres). The total volume of LNAPL impacted soil is estimated to be 7,000 cubic yards.

3. The primary factors affecting the horizontal transport of LNAPL are groundwater flow direction (north/northeast) and subsurface lithology of the underling silt/clay layer. It does not appear the preferential pathways along utility corridors have played a role in the migration path of NAPL at the facility, and that the major majority of the utilities are buried at a depth that would not coincide with the NAPL plume.

4. The primary factors limiting vertical migration of LNAPL are groundwater and the silt/clay layer that underlay the site. The underlying silt/clay layer exists at a depth of approximately 15 feet below ground surface. Groundwater historically has been recorded in site monitoring wells at a depth of 9 to 12 feet below ground surface.

5. The LNAPL plume appears to be stable in its current location based on its area of spread and time since the known release occurred. Since LIF does not detect dissolved phase constituents, it is unknown at the current time the fate and transport of dissolved phase petroleum constituents, but it is likely that they extend onto the private property parcel north of Poplar Street.

2.8 MPE Pilot Study

In 2018 WCEC completed a Multi-phase extraction (MPE) pilot study. Multi-Phase Extraction (MPE) is the combination of two commonly used technologies, pump and treat and soil vapor extraction. The removal of water and free product via high volume pumping depresses the water table to below levels that would occur naturally, while recovering and treating water and collecting free LNAPL if present. The depression of the water table also exposes soils with adsorbed LNAPL to be addressed via soil vapor extraction. MPE is accomplished at a given well location by installation of a smaller diameter suction tube within a larger diameter extraction well using a dual completion wellhead manifold. Fluids are recovered from the suction tube (high volume pumping) with simultaneous application of pneumatic vacuum to the extraction well (soil vapor extraction).

This test demonstrated that the use of MPE as a remediation technology is limited in effectiveness at the site likely due to the relative thickness of the aquifer, which limited the size of the cone of depression and the volume of hydrocarbon impacted soils within the MPE system area of influence. The maximum extraction rate was 0.2 gallons of gasoline equivalent as TPH over the initial 12-hour period. This extraction rate declined notably over the 12-hour period indicating that longer operation periods would result in minimal removal rates. Groundwater analytical samples collected before and after the event also indicated that this technology was not effective in remediation of groundwater impacts. The results of this test also indicates that soil vapor extraction, air sparge, and pump and treat technologies if used individually at the site would also be of limited values in achieving remediation goals at the facility.

2.9 Remedial Alternatives

As discussed in the previous section, soil vapor extraction, air sparge, pump and treat, and MPE technologies show minimal effectiveness at the facility due to subsurface soil lithology. Remedial excavation was conducted to the maximum extent practicable at the time of the underground storage tank pull. The remaining LNAPL impacts are present in a smear zone approximately 10 to 15 feet below grade that is 0.5 feet thick and underlie an area of approximately 92,500 square feet (2.2 acres). The total volume of LNAPL impacted soil is estimated to be 7,000 cubic yards. Additional excavation at this time would be very costly relative to the rate of removal and limited in scope due to surface impediments.

These factors leave the injection of in-situ remediation products as the most viable option to address the impacts delineated during the LIF investigation.

PetroBac™ & CBN™, Petrofix™, ORC®, PermeOx®, and hydrogen peroxide were considered in the assessment of injectable remediation products.

PermeOx® and hydrogen peroxide were eliminated early in the process because they have the capability to impact underground utilities negatively by destroying electrical coatings and seals on sewer and storm drain piping.

ORC® is safe to use around underground utilities but tends to be less soluble in water and has a higher probability surfacing during injection based on historical soil borings completed at the facility.

Petrofix™ is a viable option for injection at the facility but is typically more effective when used for blocking further migration of a plume or in treating areas of dissolved phase impacts. This product effectively spreads through more permeable layers during the injection process and then stabilizes in place, which in many cases is beneficial, but presents a potential deficiency at the Gasamat #563 facility.

PetroBac™ & CBN™ are recommended for use at this site because it is compatible with utilities, inoculates the subsurface with bacteria capable of petroleum breakdown, and supplies the electron acceptors for these bacteria to breakdown source area LNAPL. This product is also completely water soluble and has the potential for down gradient migration with groundwater flow, which would be beneficial in areas with overlying structural impediments of roads and buildings. It is anticipated that the recommended injection will serve as a large scale pilot study for the remainder of known impacts at the facility.

2.10 In-situ Injection PetroBac™/ CBN™

A remedial injection of PetroBac™ and CBN™ nutrients was conducted between July 8 and July 17, 2024. The injection was conducted in the area of defined hydrocarbon impacts on the property parcel located at 1915 N Montana Ave, in Helena, MT. PetroBac™ is a bioremediation product that includes TPH Bacterial Consortium (EZT-A2TM) and Enzyme Accelerator (EZT-EATM). This was mixed with CBN™ nutrients, which include macro- and micro-nutrients specially blended for in-situ bioremediation. These products work together to efficiently degrade hydrocarbons through three critical in-situ functions. It supplies a large population of pre-acclimated bacteria to optimize initial growth of a healthy, in-situ, hydrocarbon-degrading microbial population. It maximizes contact between the contaminants and the bacteria allowing the petroleum food source and the electron acceptors (oxygen, nitrate, and sulfate) to biochemically oxidize the petroleum to CO_2 and water. This remediation blend achieves this by supplying critical nutrients (nitrogen, phosphorus, and potassium) to support ongoing biological growth.

A total of 8,000 lbs of CBN™ and 240 gallons of PetroBac™ was mixed with 8,250 gallons of water and injected across this area in a grid pattern during the July 2024 event. Additional groundwater monitoring occurred on a semiannual basis for 1 year following this injection event.

3.0 Groundwater Monitoring

3.1 Groundwater Monitoring & Sampling

WCEC will complete one year of semiannual sampling to assess treatment effectiveness in the injection area. It is expected that all of the nutrients in the injection area will be depleted by the occurrence of the final sampling even in this work plan. This will allow for assessment of the effectiveness of this remedial technology and extrapolation of potential benefits in additional injection in untreated areas of the facility.

Semiannual groundwater monitoring will be conducted during high and low groundwater periods for one year. Groundwater samples will be collected from monitoring wells MW3, MW4, MW14R, MW17, MW22, MW23, MW24, and MW25 to assess current impacts and the effectiveness of the remedial injection event and depletion of nutrients across the facility. Well sampling will be completed during each groundwater monitoring event using low flow sampling methodologies in accordance with MTDEQ requirements and WCEC SOPs. WCEC will use a peristaltic pump to purge and sample each monitoring well. Purge rates will be adjusted to minimize draw down and limit stress on hydrologic system (<0.3 ft). Groundwater quality parameter data (conductivity, pH, salinity, dissolved oxygen, temperature, ORP, and turbidity) will be acquired from all site wells sampled using a flow through cell. Groundwater sample collection from each well will be completed following stabilization of groundwater quality parameters. Groundwater parameters will be considered stable when the following groundwater parameters exhibit a change less than the acceptable range for each parameter (DO: 10%; temperature: 3%; pH: +/- 0.1 unit; Specific Conductance: +/- 3%; turbidity: +/- 10%; ORP:+/- 10 millivolts). Static water levels, groundwater quality parameters, and purge rate for each well will be recorded in the field using WCEC's Well Sampling Form. Depth to water measurements will be used to calculate the potentiometric groundwater surface, flow direction, and gradient for each event.

Analytical Analysis Chart					
Sample Location	VPH	EPH	Lead Scavengers	IBI - Injection parameters	Depth to Water only
MW1	-	-	-	-	x
MW2	-	-	-	-	x
MW3	x	-	-	x	-
MW4	x	x	-	x	-
MW6	-	-	-	-	x
MW12	-	-	-	-	x
MW13	-	-	-	-	x
MW14R	x	x	-	x	-
MW16	-	-	-	-	x
MW17	x	x	-	x	-
MW22	x	x	-	x	-
MW23	x	x	-	x	-
MW24	x	x	-	x	-
MW25	x	-	-	x	-
Analysis per event	8	6	0	8	6
Total all events	16	12	0	16	12

Samples and field measurements from all site wells will be collected during each event as shown on the table above. Samples will be submitted for analysis of VPH and EPH screen. If the EPH Screen exceeds 1,000 µg/L, TEH analysis will be requested. Additionally, MW3, MW4, MW14R, MW17, MW22, MW23, MW24, and MW25 will be analyzed for soluble iron, soluble manganese, sulfate, nitrate (Nitrogen as N NO3-, Nitrite as N N02-, Nitrate + Nitrite). All groundwater samples will be preserved in compliance with the requested analytical method, packed on ice, and delivered to Energy Laboratories (Energy), in Helena, Montana under chain of custody. WCEC will perform data validation of each analytical report using the Montana DEQ – Waste Management and Remediation Division Data Validation Summary Form (DVSF).

4.0 Report Preparation

A comprehensive report will be prepared following the completion of both semiannual sampling events. The report will include a detailed site history and analysis of the results of the groundwater monitoring events. Maps detailing groundwater flow direction and gradient will be generated for each sampling event. DVSF, groundwater field data sheets, cumulative field and analytical data tables, and laboratory analytical reports will be appended to the report. A site details map will include all current and historic monitoring wells and utilities overlayed on an orthophoto of the facility. Cumulative analytical tables will be included for all soil and groundwater analytical data. Analytical results for soil and groundwater will be compared to the Montana Numeric Water Quality Circular 7 (DEQ-7 standards). Hydrocarbon constituents that do not have associated DEQ-7 standards will be compared to Montana DEQ Tier 1 Risk-Based Screening Levels (RBSLs).

WCEC will include discussion and recommendations for additional remedial actions based on evaluation of all site data collected throughout the implementation of this corrective action plan and analysis completed during the creation of the RCP.

5.0 Timeline and Cost

The attached PTRCB Groundwater Monitoring and Sampling Unit Cost Worksheet [Appendix A] details the anticipated cost to complete groundwater monitoring included in this work plan. The initial groundwater monitoring event is anticipated to occur in May 2026 with the second semiannual sampling event occurring in October or November 2026. A work plan completion date of January 31st, 2027 is requested for this CAP.

This work will be conducted following applicable comment periods and approval of the final corrective action plan by the Montana DEQ.

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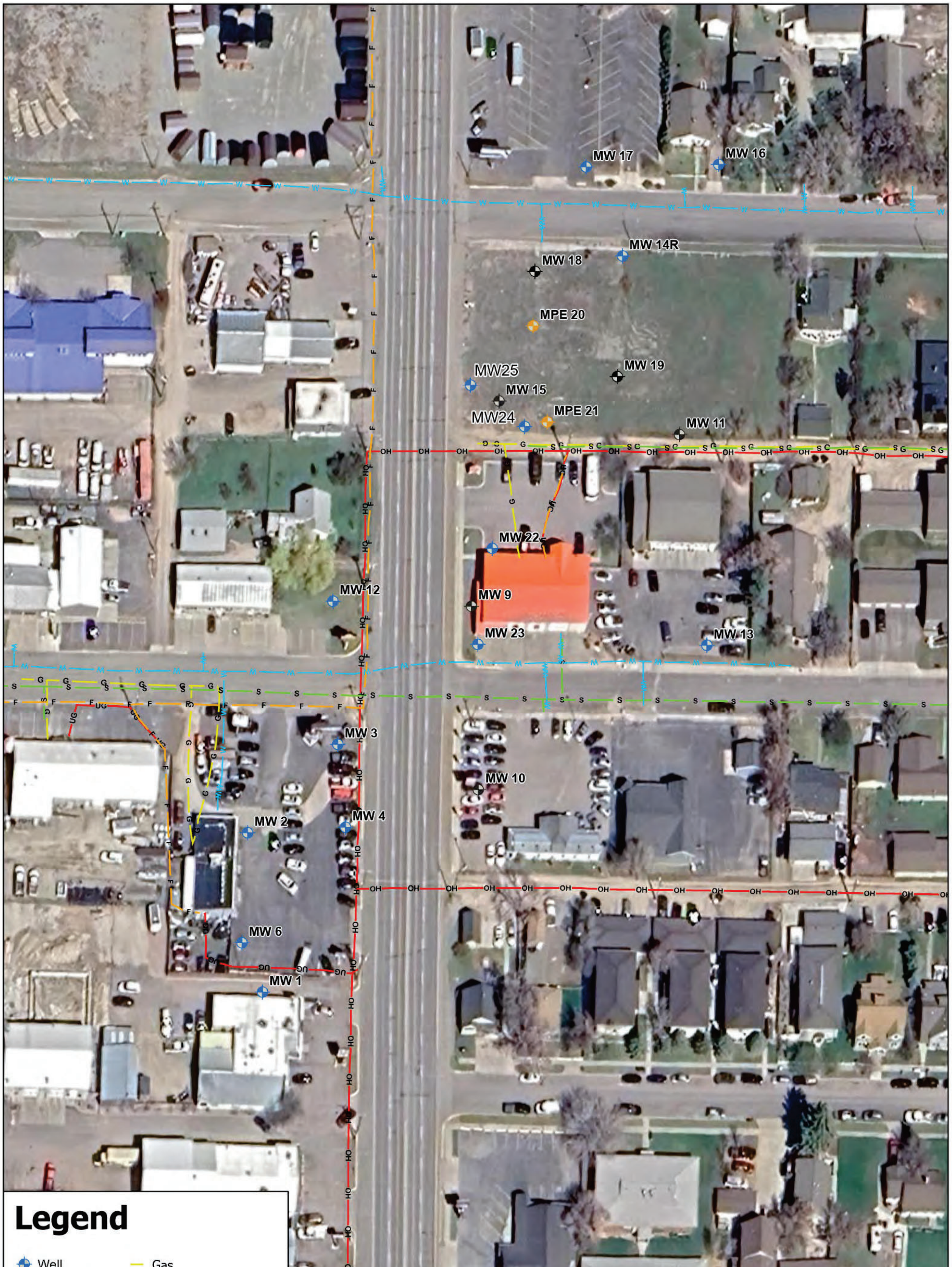
PROJECT #: 12-9413-70	**Site Location Maps**
DATE: 12/31/15	Gasamat #563
DRAWN BY: NGO	1752 Montana Avenue
ORTHOPHOTO DATE: 05/07/12	Helena, MT

WCEC ENVIRONMENTAL CONSULTANTS

FIGURE 1



Legend

- Well
- Abandoned Well
- MPE Well
- Electric
- Gas
- Sewer
- Telephone
- Water

Feet
80 40 0 80
1 in = 70 ft
N

Gasamat #563
1752 Montana Ave
Helena, MT

Site Details Map

WCEC
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Figure 2

JOB NO: 2403-0996	DATE: 06/11/25	DRAWN BY: TCP	IMAGE SOURCE: Google

Appendix B

Field Investigation Standard Operating Procedures

Field Investigation Standard Operating Procedures

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1.0 Field Notes

Field books are bound and all information recorded in these books are written in indelible ink. All deletions are a single line cross out. The field books contain:

- Time and date fieldwork started.
- A purpose and description of the proposed field task.
- Location and description of the work area.
- Names of field personnel.
- Name, address, and phone number of any field contacts.
- Weather conditions.
- Details of the fieldwork performed, including sketches of locations, construction details, and field analytical results.
- All field measurements gathered.
- Record of any on-site communication with clients.

2.0 Boring Logs/ Well Logs

A boring log is constructed for each boring done at a specific location. Boring logs include the following:

- Project name, project number, Facility ID number, and boring identification number.
- Driller.
- Date and time that drilling begins and ends.
- ASTM symbol and depth for each lithologic unit.
- Material description and geologic origin for each lithologic unit.
- Photoionization detection readings of samples from a particular horizon.
- Depth that groundwater is encountered.
- Type, depth, and type of analysis of samples collected.
- Comments made during the drilling.

3.0 Photographs

Photographs of field activities are taken with a perspective similar to the naked eye. Photographs include a scale in the picture when practical. The following information is recorded in the field notebook:

- Photographer's name, date and time photo was taken, general direction of photo.
- Description of the subject and fieldwork portrayed in the picture.
- Sequential number of the photograph and the associated roll number.

4.0 Sample Identification and Sample Labels

A sample numbering system will be developed on a site specific basis to identify each soil or ground water sample obtained during a field investigation. This numbering system provides a tracking procedure to allow retrieval of information about a particular sample and assure that each sample is uniquely numbered.

Each unique sample number is entered onto the sample label using indelible ink. Additional information included on to the label includes the analytical parameter(s), preservative(s), sampling personnel, date of sample collection, time of sample collection, sample type (grab or composite) and the project number. The sample label is then directly affixed to the appropriate sample container and may be covered using clear tape.

5.0 Sample Custody

Samples are logged onto a chain-of-custody (COC) form while on-site. This record contains the following information: Project number, sample description, matrix, number of containers, type of preservative, analyses requested, sampling date, sampler(s), sampler(s') signature(s), West Central Environmental Consultants (WCEC) relinquishing signature(s), date, and time.

The last page of the COC form is retained by WCEC; the remainder of the form is shipped with the samples to the laboratory. At the laboratory, the COC form is signed by the appropriate laboratory personnel at the time the samples are received. A copy of this COC form is included in each laboratory report sent to WCEC. As few people as possible handle the samples and COC.

Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in each sample cooler. All shipments will be accompanied by the COC form identifying the contents. The original copy and one copy will accompany the shipment, and one copy will be retained by the sampler.

If samples are sent by common carrier, a bill of lading should be used. If sent by mail, the package will be registered with the return receipt requested. Commercial carriers are not required to sign off on the custody forms as long as the custody forms are sealed inside the sample cooler and the custody seals remain intact.

6.0 Health & Safety Plan

A site specific Health and Safety Plan indicates the necessary site information (address, phone numbers, contact, etc.) and all pertinent data regarding potential health risks. A map indicating the site address and the closest hospital with an emergency route are included as a part of this Plan. General information and procedures pertaining to company wide health and safety are part of the WCEC Health and Safety Plan.

7.0 Sampling/Handling Procedures

Disposable latex gloves are used by field technicians at all times during sampling. Gloves are replaced when soiled and between each sampling point to minimize cross or background contamination. Sampling equipment and sampling jars are kept segregated from potential sources of cross or background contamination and are replaced if deemed necessary.

8.0 Equipment Decontamination

All non-disposable sampling equipment used is scrubbed in a solution of biodegradable Alconox detergent and warm de-ionized water, then rinsed with de-ionized water, followed by a methyl alcohol rinse (when applicable), and finally triple-rinsed with warm de-ionized water. Water disposal is in accordance with state guidelines.

9.0 Quality Assurance / Quality Control

In order to detect background contamination (for VOCs, BTEX, MTBE, and/or GRO), laboratory supplied trip blanks are kept with the sample jars and exposed to the same conditions as the actual samples. Trip blanks are not opened until analyzed by the laboratory.

Duplicate water samples are collected to evaluate the variability in laboratory analytical methods. When possible, an additional set of samples is collected from a well with petroleum contamination. This duplicate is labeled as an additional monitoring well and is kept with the other samples to be analyzed for all project parameters.

When re-usable sampling equipment is used for water sampling, field blanks may be collected to detect possible cross-contamination. The field blank samples are collected by running distilled water through the same equipment used to collect the actual samples; the field blank samples are then analyzed by the laboratory for the same project parameters.

10.0 Investigation Procedures

10.1 Surface Soil Sampling

The following procedure is used to collect surface soil samples:

- Carefully remove the top layer of soil or debris to the desired sample depth with a pre-cleaned spade.

- If volatile organic analysis is to be performed, transfer the sample directly into an appropriate, labeled sample container with a stainless steel lab spoon or equivalent, and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval.

- Place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

10.2 Solid Investigation Derived Waste (IDW)

General trash and personal protective equipment will be cleansed of any gross soil accumulation and placed in plastic garbage bags, double bagged, and transferred or transported to a licensed solid waste disposal facility as municipal waste.

Soil cuttings which exhibit obvious signs of contamination will be segregated and stockpiled on plastic or containerized pending profiling for disposal. Methods for soil cutting profiling and disposal will be determined on a case-by-case basis by the WCEC project manager in conjunction with the appropriate regulatory agency.

11.0 Headspace Analysis

Soil samples for on-site screening are placed in plastic zip lock baggies or glass “Mason” style jars. Each baggie is one third filled with soil and sealed trapping headspace air. Each jar is half-filled with soil and covered with aluminum foil. To seal the sample, a ring lid is carefully screwed onto the jar.

Headspace development proceeds for a minimum of 5 minutes; each baggie or jar is shaken for 15 seconds before and after this period. Analysis is completed with a MiniRAE 3000 photoionization detector (PID) with 10.2 eV lamp. The PID is calibrated on-site prior to commencement of field activities, and as necessary with compressed isobutylene gas to read parts-per-million volume/volume of volatile organic compound vapors. Additionally, the PID is recalibrated in the factory every year. To perform the analysis, the PID probe is inserted into the container or baggie to a depth of approximately one half of the total headspace, and maximum meter response over a period of 5 seconds is recorded.

12.0 Receptor Survey

A county water well receptor search is conducted using the Ground Water Information Center (GWIC) developed by the Montana Department of Natural Resources (DNRC). The GWIC is searched for wells within ½ mile of the release site. If greater than 25 wells exist within ½ mile, information is included for the nearest 25 wells. If no wells exist within ½ mile of the release site, the search is extended to 1 mile. The County sanitarian is also contacted; information is requested on wells within either ½ mile or 1 mile of the release, depending on the range of the GWIC search. If additional information is still required, the DNRC will be contacted directly.

13.0 Well Monitoring Procedures

13.1 Monitoring Well Water Level Measurement

The static water level in each well is measured to the nearest 0.01 foot from a referenced point on the well casing using a factory-calibrated electric water level probe. Water level measurements are collected from all monitoring wells on site within the shortest time interval achievable and recorded in the Monitoring Well Sampling Field Sheet. Water levels are measured from the least contaminated wells (known or suspected) first followed by increasingly contaminated wells. Water level measurements are converted to water level elevations using surveyed elevations of the reference points on the innermost well casings. Water level probes are decontaminated after each use according to WCEC’s Decontamination procedures.

13.2 Monitoring Well Free Product Measurement

If free product is present in a monitoring well, the thickness in feet or inches is measured and recorded in the Monitoring Well Sampling Field Sheet. Free product measurements are obtained using an oil/water interface probe.

13.3 Monitoring Well Purging and Sample Collection

In order to ensure that representative groundwater samples are collected WCEC will purge each monitoring well until all groundwater quality parameters stabilize. Groundwater parameters of temperature, dissolved oxygen, temperature, conductivity, salinity, pH and ORP are recorded after stabilization in a site specific field log. Monitoring wells will be purged using a peristaltic pump which discharges into a YSI-556 multi-parameter meter flow through cell. All purge water will be collected in a volumetrically scaled container for accurate measurement of total volume of purged water. New tubing is used for each well to ensure that cross contamination between wells is impossible. Prior to sample collection personnel raise the sample tubing to an elevation immediately

below the water interface, and then cut the tubing between the YSI flow through cell and the peristaltic pump to allow for sample collection.

In the event that the depth to water is greater than the capabilities of the peristaltic pump, a bladder pump or disposable bailers will be used for well purging and sample collection. Three well volumes will be purged from each well prior to sample collection. All purge water will be collected in a volumetrically scaled container for accurate measurement of total volume of purged water. Samples will be collected from the uppermost groundwater interface with the bailer after the well has been purged. Water quality parameters will be recorded after laboratory sample collection is completed with a sensor probe lowered down the well to a depth slightly below the water interface attached to a YSI-556 multi-parameter meter. The YSI sensor probe is decontaminated after each use according to WCEC's Decontamination procedures.

Samples are transferred to the appropriate laboratory-supplied sample jars with as little disturbance as possible and with minimal exposure to the atmosphere. Homogenous water samples are collected by grouping sample vials and adding water to each vial in a cyclical order attempting to reach the required sample volume in each vial at approximately the same time. All water samples are labeled with the date, time, facility, well designation, and name of sample collector. Sample times, dates, and samplers are recorded in the site specific log book and recorded onto a chain-of-custody following sample collection. Samples are preserved as necessary for analytical method, placed in a cooler on ice to decrease the sample temperature to below 4 degrees Celsius, and shipped/delivered for analysis at an analytical laboratory on the MT DEQ Approval list.

All water sample collection, handling, and storage procedures are conducted to minimize the potential for contamination of the water sample. Monitoring well sampling details are recorded in the *Site Specific Field Log Book* or *Groundwater Sampling Field Data Sheet*, and included the date the site was sampled on, facility name, location, facility ID and release number, description of weather conditions, current barometric pressure, samplers names, laboratory analysis samples will be analyzed for, number and volume of sampling containers, methods of sample preservation, time of sample collection, depth to static water level in wells, field chemistry parameters of salinity, pH, conductivity, dissolved oxygen in mg/L and percent, temperature, and oxygen-reduction potential (ORP). Turbidity will also be recorded if requested on a site specific basis. Field personnel will record visual and olfactory properties of the purge water from each well.

13.4 Disposal of Contaminated Groundwater Monitoring Purge Water

Purge water removed from monitoring well for the purpose of collecting representative groundwater samples will be discharged in accordance with the Montana Water Quality Act (75-5-101) as defined in the MT DEQ Technical Guidance Document #10 and according to the MT DEQ Disposal of Untreated Purge Water From Monitoring Wells Flow Chart. In the circumstance that the purge water contains a listed or characteristics waste covered by the Resource Conservation and Recovery Act (RCRA), free product or visible pollutants, could enter a shallower aquifer that is less contaminated, or if discharge could enter surface water or storm drains, purge water will be containerized and stored at the site. An assessment of the most economical disposal options that comply with federal, state, and local regulations will be conducted by WCEC's project manager for the facility in conjunction with the MT DEQ project manager. In the event that purge water meets the criteria established in the MT DEQ Flow Chart, purge water will be discharged onto the ground next to the well, allowing the purge water to return to the same groundwater where it originated.

13.5 Sample Handling

Disposable nitrile gloves are used by field technicians at all times during sampling. Gloves are replaced when soiled and between each sampling point to minimize cross and/or background contamination. All sampling equipment and sampling jars are kept away from potential sources of cross and/or background contamination and are replaced if deemed necessary.

13.6 Equipment and Work Area Decontamination

All non-disposable or non-dedicated equipment introduced to the well is scrubbed in a solution of biodegradable Alconox detergent and warm distilled water, and then rinsed with distilled water. All sampling work and equipment storage space is maintained free of possible sources of cross contamination. Work space is cleaned using Alconox and/or distilled water.

13.7 Chain-of-Custody

Samples are logged onto a lab-specific chain-of-custody form. This record contains the following information: project number, sample description, environmental matrix, number and type of containers, type of preservative, analytical method to be conducted, date and time of sample collection, sampler(s), sampler's signature(s), WCEC relinquishing signature(s), date, and time. Samples that are shipped to the laboratory will be custody sealed prior to shipment by relinquishing signatory.

The last page of the chain-of-custody form is retained by WCEC; the remainder of the form is shipped with the samples to the appropriate laboratory. At the laboratory, the chain-of-custody form is signed by the appropriate laboratory personnel at the time the samples are received. A copy of this chain-of-custody form is included in each laboratory report sent to WCEC. As few people as possible handle the samples and chain-of-custody forms.

13.8 Quality Assurance / Quality Control

In order to detect background petroleum hydrocarbon contamination, laboratory supplied trip blanks are kept with the sample jars and exposed to the same conditions as the actual samples. Trip blanks are not opened until analyzed by the laboratory. Temperature blanks accompany samples in each cooler to ensure that samples are kept at or below 4 degrees Celsius.

Field blanks may be collected to detect contamination from ambient sources. A field blank is collected by pouring distilled water directly into the sample jars in the same location that samples are collected. Equipment sample blank collection may be conducted to detect contamination from sampling equipment and/or sampling method. An Equipment sample blank is collected by running distilled water through the same equipment used to collect the actual sample. Field and equipment blanks are kept with the other samples and analyzed by the laboratory for the same project parameters.

Duplicate water samples are collected to evaluate the variability in laboratory analytical methods. The duplicate consists of an additional set of homogenous samples collected by grouping sample vials and adding water to each vial in a cyclical order attempting to reach the required laboratory sample volume in each vial at approximately the same time. Duplicate samples are collected from wells with known petroleum contamination and are assigned a mock sample ID's to maintain the principals of a scientific single blind to prevent laboratory personnel from consciously or unconsciously biasing the analytical results. The duplicate samples are kept with the other samples and analyzed by the laboratory for the same project parameters.

When applicable, WCEC will complete the MT DEQ Data Validation process.

13.9 Survey of Monitoring Wells

Survey elevation measurements are collected from the northern rim at the top of the PVC monitoring well casing. The survey location is marked for use when collecting depth to water measurements from the monitoring well. The location of this measuring point is accurately located in both the latitude and longitude plan as well as the vertical dimension. Vertical survey measurements are accurate to the Fourth Order (0.10 feet x square root of total distance of level loop in miles) with a measurement precision of 0.01 feet (US Army Corps of Engineers Manual “Geodetic and Control Surveying). Latitude and longitude measurements are typically accurate to a precision of 1.0 feet, but may deviate on a case-by-case basis if necessary. GPS devices may be used to collect latitude and longitude coordinates.

The vertical control datum used to determine the elevation of the well is the North American Vertical Datum of 1988 (NAVD 88), which is referenced to a nearby United States Geological Survey (USGS), or equivalent, benchmark. Deviations from this technical standard may be made on a case -by-case basis where another datum can be justified. The North American Datum of 1983 (NAD 83) is used for determining latitude and longitude coordinates and are also referenced to a nearby USGS, or equivalent, benchmark. Deviations from this technical standard may be made on a case-by-case basis where another datum can be justified. GPS devices may be used to collect latitude and longitude coordinates.

14.0 Procedures For Low-Flow Sampling With Pumps

The general steps are outlined below. Begin with least contaminated well and progress to the most contaminated well. Where applicable, WCEC will conduct low-flow groundwater sampling in accordance with MT DEQ Groundwater Sampling Guidance (March 2018).

- To avoid disturbing particulates, complete a round of water levels before sampling; record water levels and measuring point in logbook.
- Calibrate field water quality instruments at the beginning of each sampling day.
- Wearing gloves, install tubing and/or pump equipment and slowly lower until intake is positioned at selected depth.
- Purge well; if using an adjustable rate pump, adjust pump rate to achieve minimal drawdown.
- Every 5 minutes measure water levels (using an electric water level probe) and pumping rate (using a bucket graduated for volume measurement).

- Monitor indicator parameters every three to five minutes by placing probes in a clean container of the purge water. Stabilization is considered complete when three consecutive readings are within the following limits:
  DO: 10%; temperature: 3%; pH: +/- 0.1 unit; Specific Conductance: +/- 3%; turbidity: +/- 10%; ORP: +/- 10 millivolts.

15.0 Water Supply Well Sampling Procedures

When water samples are required to be drawn from wells used as drinking or industrial water supplies, the following procedures are followed:

- Samples are collected from the point in the waterline closest to the well; that is before water is softened, filtered, or heated.

- All aerators, filters, or other devices are removed from the tap before sampling. If possible, samples are taken before the water enters the pressure tank. If that is not possible, the water is run to waste long enough to empty the tank and the water in storage in the pipes. One well volume (and the pressure tank) is evacuated to obtain a sample of fresh aquifer water.

- The water being collected should be withdrawn from the source at a slow rate.

- Water samples are collected according to protocol for laboratory analysis in laboratory-supplied, test-specific sample containers.

- Samples are labeled and logged onto a chain-of-custody form in the field, then stored and shipped at 4° C in an ice-filled cooler along with the completed chain-of-custody. Any pertinent details regarding the samples or sampling procedure are noted in the Site Specific project notebook.