

January 31, 2025

Mr. Reed Miner
Environmental Science Specialist
Montana Department of Environmental Quality
Petroleum Tank Cleanup Section
655 Timberwolf Pkwy, Suite 3
Kalispell, MT 59901

Subject: Groundwater Monitoring Work Plan for Petroleum Release at the former National Guard Armory, 1840 US Highway 93, Kalispell, Flathead County, Montana; DEQ Facility ID #15-13373 (TID 21051); Release #4494; Work Plan #34948

Dear Mr. Miner,

This work plan has been prepared at the request of the Montana Department of Environmental Quality (DEQ) October 7, 2024 correspondence. The purpose of this scope of work is to evaluate current groundwater conditions related to a gasoline release at the site.

Site Description

The former National Guard Armory site is located at 1840 U.S. Highway 93 in Kalispell, Montana. The legal description of the site is the Northwest $\frac{1}{4}$ of the Northwest $\frac{1}{4}$ of Section 20, Township 28 North and Range 21 West. The site is currently owned by Kalispell Hotel LLC and includes the Hilton Garden Inn. The remainder of the site is landscaped or asphalted parking lot.

Buried utilities in the area of the petroleum release range in depth from 4 to 6 feet below ground surface (bgs). An 8-inch diameter water main is buried approximately 6 feet deep and is located near the center of the drive lane south of monitoring well MW-4. The water main provides water for fire suppression through a hydrant system that surrounds the building. A storm drain is located approximately 10 feet west of monitoring well MW-2. The storm drain is connected to a 15-inch diameter main that is buried to a depth of approximately 4 feet. The storm main is connected to a second drain located approximately 50 feet east-northeast of MW-2 and continues from there in a northerly direction towards the western edge of Highway 93.

There are six monitoring wells associated with the site that are all completed flush mount. The wells range in depth from 13 to 15 feet below ground surface (bgs). The locations of the monitoring wells are displayed on Figure 1. Groundwater has fluctuated at the site

between approximately 4 to 8 feet below the tops of the PVC casings (btoc). The average depth to groundwater across the well network since monitoring began is 4.82 feet btoc. These wells were re-surveyed by a professional land surveyor on March 18, 2022.

Background

The property was previously the home of the Kalispell Armory and one 1,000-gallon underground storage tank (UST) was located on-site and used to store gasoline. The UST was removed in November 1991.

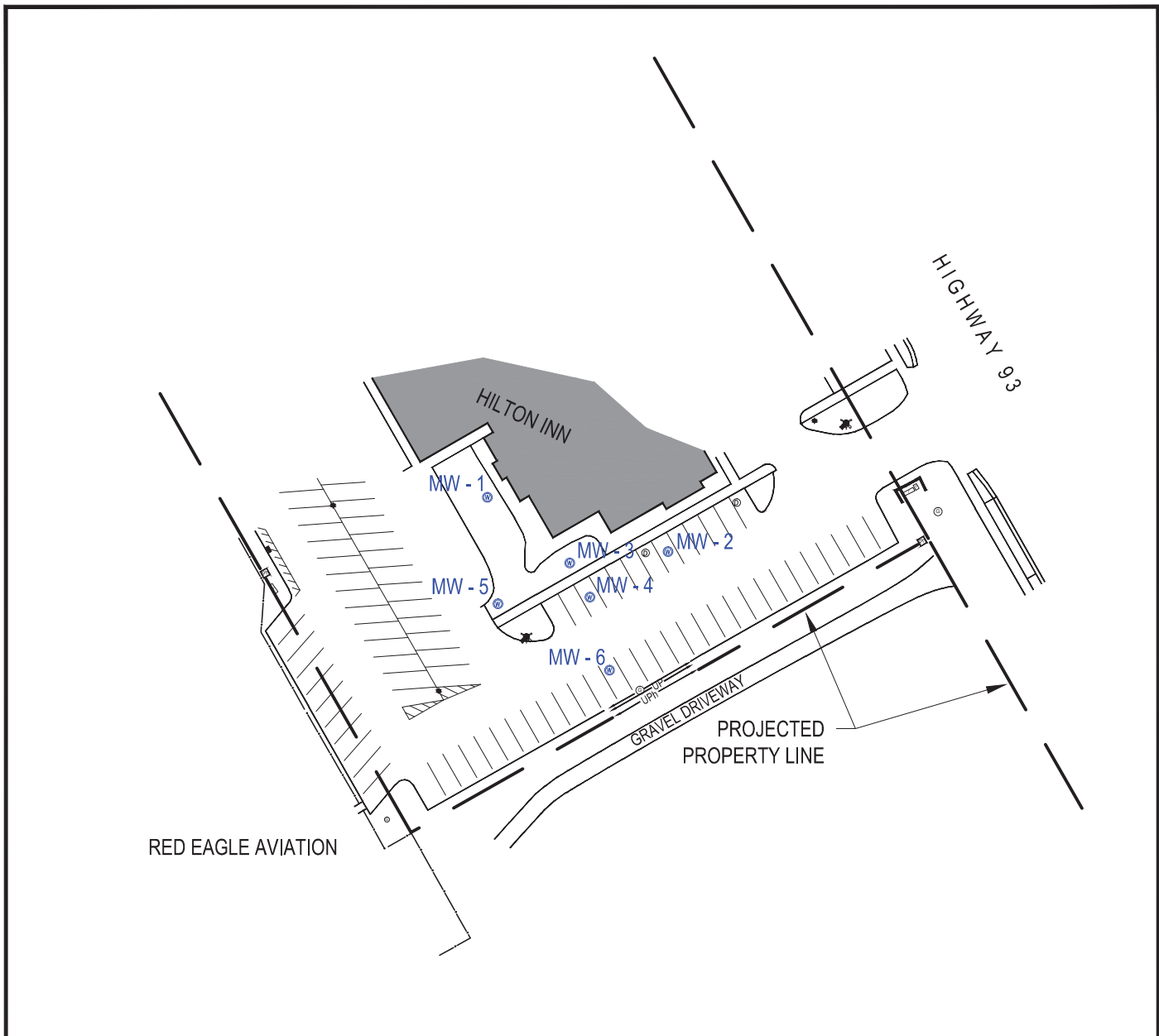
Morrison Maierle, Inc. completed a Phase II Environmental Site Assessment (Phase II) at the property in May 2006 that included the installation of six groundwater monitoring wells. The results of the Phase II indicated that monitoring well MW-6 displayed impacts associated with gasoline. A petroleum release was confirmed on May 30, 2006.

Morrison Maierle, Inc. completed further assessment work in June 2006 that included the installation of 12 hollow stem auger soil borings. The 12 soil borings were installed in all directions of MW-6 and ranged in distance from 12 to approximately 30 feet away from MW-6. The results of the investigation indicated that concentrations of volatile petroleum hydrocarbons (VPH) were quantified above risk-based screening levels in groundwater samples collected at locations SB-2, SB-10, SB-12 and monitoring well MW-6. The remaining soil boring locations exhibited concentrations of VPH below RBSLs or below the reporting limits of the laboratory. The results of the soil boring investigation were presented by Morrison Maierle, Inc. in a July 3, 2006 correspondence and was included with the 30-day release report for the site.

The current owners of the property began site work that included the raising of buildings and general site preparation for new construction in June 2006. At that time, the six monitoring wells on the property were abandoned and approximately 600 cubic yards of petroleum-impacted soil was excavated in the area that was delineated during the soil boring investigation. In October 2007, upon completion of the site construction activities, current monitoring wells MW-1 through MW-5 were installed at the site. Monitoring well MW-3 was installed in the vicinity of the former monitoring well MW-6 that was abandoned for site development.

Groundwater monitoring activities began in October 2007. Based on the historical groundwater monitoring data, monitoring wells MW-1, MW-2 and MW-5 have displayed consistent VPH concentrations below the RBSLs. Groundwater samples collected at monitoring well locations MW-3 and MW-4 displayed concentrations of benzene and C₅ to C₈ aliphatics above the RBSLs.

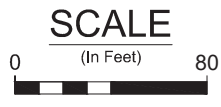
Monitoring well MW-6 was installed in May 2013 to evaluate the extent of petroleum impacts observed at well locations MW-3 and MW-4 in a southerly direction.



LEGEND

MW - 6 MONITORING WELL

- | | |
|-------------------|------------------------|
| PHONE PEDESTAL | CHAIN LINK FENCE |
| BURIED PHONE LINE | STORM MANHOLE (GRATED) |
| BURIED GAS LINE | CATCH BASIN |
| BURIED POWER LINE | FIRE HYDRANT |
| ILLUMINATOR POLE | |



GROUNDWATER MONITORING WORK PLAN
CITY OF KALISPELL
FORMER NATIONAL GUARD ARMORY SITE
FACILITY ID 15-13373 RELEASE ID #4494

SITE MAP
FORMER NATIONAL GUARD ARMORY
1480 US HWY 93
KALISPELL, MT

FIGURE
1

Groundwater monitoring conducted since 2013 displayed continued natural attenuation of the petroleum hydrocarbon plume in the vicinity of MW-3 and MW-4. Samples collected from MW-6 have displayed concentrations of VPH below the laboratory reporting limits suggesting that the current network of wells has defined the petroleum hydrocarbon plume.

Samples collected at MW-3 since May 2019 have displayed concentrations of VPH below the RBSLs; therefore, MW-3 will no longer need to be sampled. Benzene in MW-4 is the only parameter that remained above the RBSL at the time of the last sampling (February 2022). There was a downward trend to benzene concentrations in MW-4 prior to the February 2022 sampling event (11 µg/L in 5/2020 and 14 µg/L in 2/2022). Lead scavengers have been collected in 2019 and 2020 from historically petroleum impacted monitoring wells MW-3 and MW-4. Lead scavengers have not been detected above laboratory reporting limits in the samples collected.

Project Management

Project management will include obtaining an access agreement, discussions and meeting with responsible party and DEQ case manager, compiling health and safety documents, correspondence and report review. Project management will also include submittal of interim data reports to DEQ.

Groundwater Monitoring

Groundwater monitoring will consist of collecting groundwater elevation data from each of the six site monitoring wells using an oil-water interface probe. The oil-water interface probe will be decontaminated and dried between each well.

Groundwater samples will be collected from monitoring well MW-4 using a peristaltic pump and disposable polyethylene tubing. The samples will be collected using low-flow sampling techniques. Water collected during monitoring activities will be discharged to grassy areas adjacent to the wells and allowed to infiltrate into the perched aquifer beneath the site based on DEQ's Disposal of Untreated Purge Water from Monitoring Wells guidance document.

Field parameters such as pH, temperature, specific conductivity, dissolved oxygen, oxidation-reduction potential (ORP) and turbidity will be collected during the low-flow purging activities. After well stabilization parameters have been met, a groundwater sample will be collected and poured directly into laboratory prepared bottles. Groundwater samples will be submitted for laboratory analysis of VPH. The samples will be properly preserved in the field and shipped on ice overnight to a DEQ-approved

Mr. Reed Miner
January 31, 2025
Page 5

analytical laboratory. Standard operating procedures (SOPs) are presented in Attachment A.

Laboratory analytical data will be validated using the DEQ's Data Validation Summary Form upon receipt.

Interim Data Submittal

Groundwater monitoring data and laboratory results will be summarized, added to historical data and discussed in a technical memorandum to DEQ case manager. Interim data submittal will occur upon receipt of analytical results for each groundwater monitoring event.

Summary Report

A Groundwater Monitoring Report will be prepared following discussions of interim data submittals with DEQ case manager. The report will include all required sections of a Groundwater Monitoring Report.

Cost Estimate

The total estimated cost to complete the work described in this corrective action plan is presented as Attachment B. The cost presented is for four groundwater monitoring events, interim data submittals for three events, and one final groundwater monitoring report, along with the associated project management and laboratory fees.

If you have any questions regarding this work plan, please contact me at (406) 696-8154.

Sincerely,

Hydrometrics, Inc.



Brody Bissonette
Engineer 1

Attachments (2)

C: Joe Schrader, Water Resources Manager, City of Kalispell

Attachment A
SOPs

**STANDARD OPERATING PROCEDURE
INSTRUMENT CALIBRATION FORM
HF-000**

Project Name: _____

Project Number: _____

Date: _____

Personnel: _____

Weather Conditions: _____

Air Temperature: _____ °F or °C

Meter Type: _____

Serial Number: _____

pH

Time	Buffer	Temperature °C	pH value before cal.	pH value after cal.	pH millivolts (mV)*	* Acceptable pH mV in buffer: 7 (-50 to +50 mV) 4 (+165 to +180 mV from pH 7 mV buffer value) 10 (-165 to -180 from pH 7 buffer value)
	4					
	7					
	10					

pH slope in GLP record after calibration: **

** Acceptable range for pH mV is 55 to 60 ph mV

Specific Conductance

Time: _____ Conductivity Solution: _____ $\mu\text{s/cm}$
 Reading when sensor is dry: _____ $\mu\text{s/cm}$ (must be < 1 $\mu\text{s/cm}$)
 Actual Reading before calibration is accepted: _____ $\mu\text{s/cm}$ Reading after calibration is accepted: _____ $\mu\text{s/cm}$
 Temperature: _____ °C Conductivity cell constant in GLP record after calibration: _____ $\mu\text{s/cm}^*$
 * Acceptable cell constant range is 4.5 to 6.5

Redox Potential

Time: _____ ORP Reference Solution at Observed Temp: _____ mV
 Reading in solution before calibration accepted: _____ mV Reading in solution after calibration accepted: _____ mV
 Temperature: _____ ORP calibration offset in GLP record after calibration: *
 *Acceptable ORP calibration offset is from -100 to 50

Dissolved Oxygen

Time: _____ Barometric Pressure: _____ mmHg Elevation: _____ ft
 Reading before DO% calibration accepted: _____ % Reading after DO% calibration accepted: _____ %
 Actual DO value after calibration accepted: _____ mg/L

Turbidity

Meter type: _____ Serial Number: _____

Time	Standard	Reading

Notes/Additional Information:

Project Name: Former National Guard Armory **Site Designation:** MW-4
Project Code: 25002 **Sample Code Number:** _____
Sample Team Member(s): _____ **Sample Date:** _____
Laboratory Used: Energy Labs **Sample Time:** _____ (military)

**If Duplicate Sample Collected,
Please Record Below**

Duplicate Sample Code #: _____
 Duplicate Sample Time: _____

Site Conditions

New Site: Yes No Photo taken: Yes No
 Site Type: DRY surface water process water
 monitoring well domestic well adit seep
 spring other: _____
 Weather Conditions: calm breeze windy
 no precip. rain snow
 clear p. cloudy overcast
 Air Temperature: _____ °C _____ °F

For Groundwater Samples

well volume
 formula: $V = (TD-SWL) \times (Dia.^2) \times 2.5$ 25 Comments
 TD (ft): _____
 SWL (ft): _____
 Casing Diameter (I.D.): _____
 Water Volume (V) (gal): _____
 x 3=(gal.) _____
 Actual Vol. Removed (gal.) _____
 Water Level Recovery: slow moderate rapid

For Low Flow

Pumping Rate (Ml/Min): _____ Cycles per min: _____
 Fill (seconds): _____ Discharge (seconds): _____
 QED Depth (gauge): _____ QED PSI (gauge): _____
 purge pump and tubing prior to parameters and sample

Field Parameter Stabilization

Time (military)	ORP (mV)	DO (mg/l)	pH	S.C. (µmhos/cm)	Turbidity (n.t.u.)	Temp (°C)	OTHER	
							SWL	ML

Turbidity: clear moderate **Sample Method:** grab composite pump bailer other
 (circle) slight very (describe) Peristaltic Pump

Field Parameters

Bottles Collected

	Sample	Stabilization	Quantity	Size	Filter or Unfilt.	Preservative	Parameter	Other
ORP (mV)		± 10 mV	3	40 mL	UF	HCL	VPH	
DO (mg/l)		± 0.3 mg/L						
pH		± 0.1 pH unit						
SC (µmhos/cm)		± 3% (SC>100)						
Turbidity (ntu)		F > 10 NTU						
H ₂ O Tmp. (°C)		± 0.2°C						
Color								
Other:	Turbidity measure at sample							

Comments: _____

Field Parameter Stabilization

Time (military)	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/l)	pH	S.C. (μ mhos/cm)	Turbidity (n.t.u.)	Temperature ($^{\circ}$ C)	Additional Parameters or Notes	
							SWL	ML

STANDARD OPERATING PROCEDURE

HSOP-002

DETERMINATION, IDENTIFICATION, AND DESCRIPTION OF FIELD SAMPLING SITES

1.0 SCOPE AND APPLICATION

HSOP-002 presents general procedures to be followed by field personnel to locate and describe positions where samples of environmental media (e.g., air, water, soil, waste material) are collected, or where field observations and/or measurements are recorded. The purpose of this procedure is to ensure that field locations are described and recorded with the degree of accuracy necessary to allow personnel to revisit the site during future monitoring events, and to facilitate preparation of site maps and interpretation of data in project reports. In most cases, the project work plan or sampling plan will describe proposed sampling locations in general terms, relative to known site features; the precise locations are determined, described, and recorded during the field event.

TABLE OF CONTENTS

1.0 SCOPE AND APPLICATION	1
2.0 SUMMARY OF METHOD	1
3.0 HEALTH AND SAFETY WARNINGS	1
4.0 INTERFERENCES	1
5.0 PERSONNEL QUALIFICATIONS	2
6.0 EQUIPMENT AND SUPPLIES	2
7.0 PROCEDURE	2
8.0 DATA AND RECORDS MANAGEMENT	3
9.0 QUALITY CONTROL/QUALITY ASSURANCE	3
10.0 REFERENCES	3
11.0 APPROVED	3

2.0 SUMMARY OF METHOD

Sampling sites will be described through a combination of recorded descriptions in field notebooks and on maps, photographs, and mapping or survey techniques (global positioning system (GPS) or total station) as stipulated by the project work plan. For sites that will be sampled more than once, the majority of site description and mapping work will be done during the first site visit. Each location will be assigned a unique code for identification purposes.

3.0 HEALTH AND SAFETY WARNINGS

Field personnel should be aware of the health and safety precautions to be followed during any field event, and should be familiar with any project-specific hazards. This may include review of task-specific Hazard Assessments (HAs), Job Safety Analysis (JSAs), project-specific health and safety plans (HASPs), site-specific and/or organization-specific safety requirements and training.

4.0 INTERFERENCES

Some common problems with identifying and describing sampling sites might include the following:

- Incorrect locations shown on or interpreted from work plan site maps; or
- Inoperative GPS instrument or weak satellite signal.



To avoid difficulties locating sites in the field, it is imperative that field personnel verify proposed sampling locations and obtain current area maps, site photographs, and narrative descriptions prior to field work. If GPS instruments are inoperative due to weak signals or other problems, narrative descriptions and/or alternative geographic descriptions (see Section 7.0) may have to suffice. In such cases, maps of sampling locations should state that locations are approximate.

5.0 PERSONNEL QUALIFICATIONS

Personnel should be familiar with the project work plan and objectives, and with the operation of equipment listed in Section 6.0 below. Site safety and training requirements (including HAZWOPER training) must also be met as necessary.

6.0 EQUIPMENT AND SUPPLIES

- Site map (may be surveyed map, area topographic map, aerial photo, or other general location map) with sampling locations;
- Project work plan, sampling plan, or other planning documents;
- Global Positioning System (GPS) instrument;
- Field notebook;
- Site marker (e.g., stake, flagging, rebar, spray paint); and
- Camera.

7.0 PROCEDURE

1. Determine location at which samples will be collected, using project work plan or sampling plan and accompanying maps as guidance. If locations are at known latitude/longitude, locations should be entered as waypoints in GPS instrument prior to field work, and GPS can be used to navigate to specific location.
2. Photograph site, provide a full narrative description of the view, and record geographic location using GPS instrument (**HSOP-005**). If GPS is unavailable or receiving a weak signal, alternative methods of specifying location may be used, such as the U.S. Bureau of Land Management quarter-section method outlined in Attachment 1. If possible, measurement to two nearby known permanent object points should be performed.
3. Assign a unique site code to the location as indicated in the project work plan. In many cases, the site code reflects the type of sampling location (i.e., MW- prefix for monitoring wells, SW- prefix for surface water). Site codes are often stipulated by the work plan, but may also be generated during field activities if necessary.
4. Record narrative description of site in field notebook. Include the unique site code, the direction of the site photograph (NE, SW, etc.), distances and directions to nearby landmarks, and any other pertinent information that may aid in finding the site during future monitoring events. Sketch maps of the site and the immediate vicinity are often invaluable during future site visits.
5. If practical, place a labeled site marker (stake, flagging, etc.) at or near the sampling location.



8.0 DATA AND RECORDS MANAGEMENT

Copies of all field notes, photographs, sketch maps, and sample site coordinates obtained through surveying will be maintained in the project file (hard copies) and/or on the network directory dedicated to the project (electronic files).

9.0 QUALITY CONTROL/QUALITY ASSURANCE

- Accuracy of GPS equipment should be periodically checked using survey control points, by comparing coordinates obtained with the GPS with the established coordinates of the control point (**HSOP-005**).
- Verification of field identification information will be conducted on subsequent visits by independent field personnel.

10.0 REFERENCES

Hydrometrics' HSOP-005: Global Positioning System (GPS) Equipment Operation

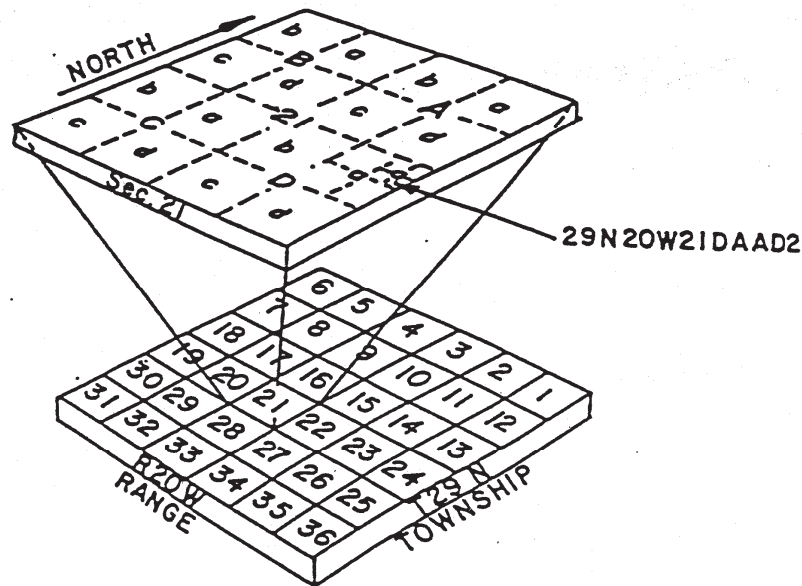
11.0 APPROVED

Approved By	Title	Signature	Date
Mark Walker	Senior Scientist		3/20/2023



SYSTEM FOR GEOGRAPHICAL LOCATION OF FEATURES

Geographic features such as sampling sites, wells and springs are assigned a location number based on the system of land subdivision used by the U.S. Bureau of Land Management. The number consists of 10 to 16 characters and describes the location by township, range, section and position within the section. The figure below illustrates this numbering method. The first three or four characters of the number give the township, the next three or four the range. The next two numbers give the section number within the township and the next letters describe the location within the quarter section (160-acre tract) and quarter-quarter section (40-acre tract). If the location is known to sufficient accuracy then one or two additional letters can be used to describe the quarter-quarter-quarter-quarter section (2 1/2-acre tract). These subdivisions of the 640-acre section are designated as A, B, C and D in a counterclockwise direction beginning in the northeast quadrant. If there is more than one feature in a tract, consecutive digits beginning with the number 1 are added to the number. For example, if a sampling site was in Section 21, Township 29 North, Range 20 West, it would be numbered 29N20W21DAAD2. The letters DAAD indicate the well is in the southeast 1/4 of the northeast 1/4 of the northeast 1/4 of the southeast 1/4 and the number 2 following the letters DAAD indicates there is more than one site location in this 2 1/2-acre tract. If geographic features are located to the nearest 40 acre or 10 acre tract, the numbering methodology is the same except the last one or two letters are absent.



Attachment 1. U.S. Bureau of Land Management Quarter Section Method



STANDARD OPERATING PROCEDURE

HSOP-004

CHAIN-OF-CUSTODY PROCEDURES, PACKING, AND SHIPPING SAMPLES

1.0 SCOPE AND APPLICATION

HSOP-004 presents procedures to be followed when shipping samples of environmental media (e.g., air, water, soil, waste material) to a laboratory for analysis. All samples submitted should be accompanied by chain-of-custody documentation.

2.0 SUMMARY OF METHOD

Samples of environmental media submitted to laboratories for analysis are often shipped via commercial carrier. Samples are packed in shipping containers to minimize the potential for container breakage or leaking. Each shipment will be accompanied by sample documentation, including chain-of-custody forms and a list of required analytical parameters, methods, and detection limits. Samples are cooled with ice during transport, to maintain temperature at approximately 4°C ($\pm 2^\circ\text{C}$). Shipments of hazardous materials must conform to International Air Transport Association (IATA) Dangerous Goods regulations and/or Department of Transportation (DOT) regulations, as well as any carrier-specific requirements.

3.0 HEALTH AND SAFETY WARNINGS

Field personnel should be aware of the health and safety precautions to be followed during any field event, and should be familiar with any project-specific hazards. This may include review of task-specific Hazard Assessments (HAs), Job Safety Analysis (JSAs), project-specific health and safety plans (HASPs), site-specific and/or organization-specific safety requirements and training.

- Care should be exercised when handling samples of hazardous or potentially hazardous waste. Personal protective equipment (PPE) should be utilized (gloves, safety glasses, coveralls) as appropriate.
- Glass sample containers should be handled with extreme care to avoid breakage, loss of sample, and possible injury.

4.0 INTERFERENCES

Not Applicable

TABLE OF CONTENTS

1.0 Scope and Application	1
2.0 Summary of Method	1
3.0 Health and Safety Warnings	1
4.0 Interferences	1
5.0 Personnel Qualifications	2
6.0 Equipment and Supplies	2
7.0 Chain-of-Custody Procedure	2
8.0 Packing and Shipping Procedure	4
9.0 Data and Records Management	5
10.0 Quality Control/Quality Assurance	5
11.0 References	5
12.0 Approved	5



5.0 PERSONNEL QUALIFICATIONS

Personnel should be familiar with the project work plan and objectives, and with the operation of equipment listed in Section 6.0 below. Personnel should also familiarize themselves with the schedule of the shipping location to be used for shipping samples. For projects involving hazardous materials, consult the project work plan, courier regulations, and any state and federal air or ground shipping regulations for details on shipping hazardous material.

6.0 EQUIPMENT AND SUPPLIES

- Shipping container (metal or plastic cooler);
- Packing material (bubble wrap, Styrofoam peanuts);
- Absorbent material (clay absorbents, rock wool);
- Shipping tape;
- Shipping strap;
- Custody seals;
- Chain-of-custody (COC) forms;
- Heavy-duty or contractor grade garbage bags or similar plastic bags;
- Ziploc bags; and
- Ice.

7.0 CHAIN-OF-CUSTODY PROCEDURE

1. Chain-of-custody involves ensuring that samples are traceable from the time of collection until received by the analytical laboratory. The laboratory is responsible for custody during processing and analysis. A sample is under custody if:
 - It is in your possession;
 - It is in your view, after being in your possession; or
 - It was in your possession and you then placed it in a designated secure or locked area to prevent tampering.
2. When ready to ship samples, set out samples in a clean, secure area to complete chain-of-custody forms. Chain-of-custody forms may be obtained from the project laboratory, or from Hydrometrics' Data Quality Department. An example COC form is shown in **Attachment 1**. Each sample should be identified on the form by its sample number, date and time of collection, and analysis requested. Check sample labels against information recorded in field notebook and on chain-of-custody to ensure consistency and guard against transcription errors (**HSOP-029**). It is usually best to use one chain-of-custody form per shipping container, covering the samples included in the container. When shipping multiple coolers to the laboratory, label chain-of-custody forms as "Cooler 1 of 3," "Cooler 2 of 3," etc. While chain-of-custody forms obtained from various sources may differ, certain information regarding sampling dates and times, sample identification, contact information, and requested parameters for analysis should be included on all acceptable forms. Complete all fields on the chain-of-custody form, as applicable



to the particular sampling event. Examples of typical COC information to be completed are as follows:

- a) **Company Name:** Enter "Hydrometrics, Inc."
 - b) **Project Name:** Enter the project name and Hydrometrics' project number.
 - c) **Report Mail Address:** Enter the name, address, and e-mail address of the person who should receive the laboratory report.
 - d) **Contact Name:** Enter the name of the project manager, sampling personnel, or other responsible contact.
 - e) **Phone/Fax:** Enter the phone and fax number of the contact person for the project.
 - f) **E-mail:** Enter the e-mail address for the contact person.
 - g) **Sampler:** Print the name of the person who collected the samples.
 - h) **Invoice Address:** Enter the address where the invoice should be sent.
 - i) **Invoice Contact and Phone:** Enter the name and phone number of the person responsible for approving the invoice.
 - j) **Purchase Order:** Enter the Hydrometrics' Purchase Order number for the sample order.
 - k) **Quote/Bottle Order:** Enter the laboratory quote number for the project or bottle order number provided with the sample bottle order.
 - l) Note any special reporting requirements or formats.
 - m) **Sample Identification:** Enter the unique sample number assigned to the sample.
 - n) **Collection Date:** Enter the date each sample was collected. Do not use ditto ("") marks, arrows or lines to represent the same date.
 - o) **Collection Time:** Enter the time each sample was collected. Do not use ditto ("") marks, arrows or lines to represent the same time.
 - p) **Number of Containers and Matrix:** Enter the number of bottles the sample is contained in followed by a dash and then a letter representing the type of sample matrix (i.e., A=Air, W=Water, S=Soil/Solid, V=Vegetation, B=Bioassay, O=Other).
 - q) **Analysis Requested:** Write the analysis to be performed on each sample and check the box for each sample you want to receive this analysis. Also include an analytical parameter list.
 - r) **Remarks:** Use this field to make notes or comments to the laboratory.

(Note: If a laboratory-provided COC form is used, be sure to follow any additional instructions included from the laboratory.)
3. Record shipping information (tracking numbers, name of courier, other pertinent information) on chain-of-custody form. Sign and date chain-of-custody form, and retain one copy of form for project file.



8.0 PACKING AND SHIPPING PROCEDURE

1. Seal drain holes in bottom of shipping cooler (inside and out) to prevent leakage. Check sample container lids to ensure they are tightly sealed.
2. Line bottom of cooler with packing material (bubble wrap). Open and place two heavy-duty plastic bags in cooler (one inside the other).
3. Seal samples within individual plastic or bubble wrap bags, as necessary. All glass containers (VOAs, amber glass bottles, glass soil jars) should be placed in individual bubble wrap bags. Place sealed sample containers in shipping cooler, inside double plastic bags. In most instances, a labeled temperature blank should be included with the samples to allow the laboratory to check the sample temperature upon arrival. The temperature blank is generally a small vial or bottle filled with tap water and labeled "Temperature Blank." Ensure that temperature blank meets temperature requirements upon receipt by laboratory.
4. Cover samples with ice, inside double plastic bags.
5. Close and seal double plastic bags, by knotting or with shipping tape. Fill any empty space in cooler with additional packing material or absorbent material.
6. Record shipping information (tracking numbers, name of courier, other pertinent information) on chain-of-custody form. Sign and date chain-of-custody form, and retain one copy of form for project file.
7. Place original chain-of-custody, sample parameter list, cover letter, and any other documentation needed by the laboratory into a plastic Ziploc bag. Seal Ziploc bag and tape to the inside of the shipping container lid.
8. Label outside of shipping container with sampling organization name, address, and phone number, laboratory destination name, address, and phone number, and any required DOT shipping labels.
9. Place custody seals on front and back of cooler (see **Attachment 2**) and tape in place with shipping tape to avoid accidental breakage. Wrap cooler securely in at least two places with a minimum of three wraps of shipping tape. Shipping strap may also be used to provide additional insurance against the cooler opening during shipment.
10. Deliver sample containers to the shipping location. Since samples should reach the laboratory as soon as possible to protect sample integrity, **overnight shipping is required**, unless unavailable at the shipping location. Retain copies of shipping receipts for the project file. Shipping receipts and tracking numbers serve as chain-of-custody documentation during sample transport from the sampler to the laboratory.
11. Additional guidance may be found in the EPA's *Contract Laboratory Program Guidance for Field Samplers* (EPA, 2004). More stringent shipping requirements may apply to samples collected under CLP protocols. The project work plan should be consulted to determine any special requirements.



9.0 DATA AND RECORDS MANAGEMENT

The following documents generated during sample packing and shipping will be retained in the project file:

- Chain-of-custody form;
- Analytical parameter list;
- Cover letter; and
- Shipping receipts.

10.0 QUALITY CONTROL/QUALITY ASSURANCE


- Field personnel should cross-reference information on sample labels, in the field notebook, and on sample chain-of custody forms during the sample packing and shipping process.
- Data quality review will include checking of sample documentation to ensure consistency.
- Temperature blank measurements by the laboratory upon arrival of samples will document that samples were maintained at the appropriate temperature during shipping.

11.0 REFERENCES

Hydrometrics' HSOP-029: Labeling and Documentation of Samples

EPA, 2004. Contract Laboratory Program Guidance for Field Samplers (Draft Final). EPA 540-R-00-003. January 2004.

12.0 APPROVED

Approved By	Title	Signature	Date
Michael Wignot	Principal/Senior Engineer		06/2004



Attachment 1. Example Chain-of-Custody Form



Hydrometrics, Inc.
3020 Bozeman Ave. • Helena, MT 59601 • (406) 443-4150

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME	NO. OF CON-TAINERS			REMARKS	
		DATE	TIME	SAMPLE NUMBER		
SAMPLERS: (Signature)						
DATE	TIME	GRAB	COMP	NO. OF CON-TAINERS	REMARKS <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Attachment 1 Example Chain-of-Custody Form</div>	

Commons UF / RAW	Nutrients UF / H ₂ SO ₄	Diss. Metal F / HNO ₃	CN UF / NaOH	Total Metals UF / HNO ₃	Total Recoverable Metals UF / HNO ₃	BTEX	TPH	P.O. #	Shipped via: Bus <input type="checkbox"/> FedEx <input type="checkbox"/> UPS <input type="checkbox"/>
									Other
									Air Bill #

Relinquished (Signature)	Date / Time	Received by (Signature)	Lab	Remarks

Relinquished (Signature)	Date / Time	Received for Laboratory by (Signature)	Date / Time	Enclosed:
				<input type="checkbox"/> Parameter sheet w/detection limits
				<input type="checkbox"/> QA / AC standard mixing instructions
				<input type="checkbox"/> Cover letter
				<input type="checkbox"/> Other

Split Samples: Accepted Declined


Signature _____

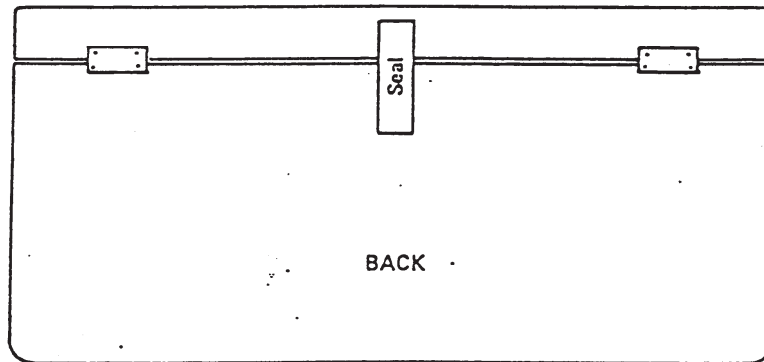
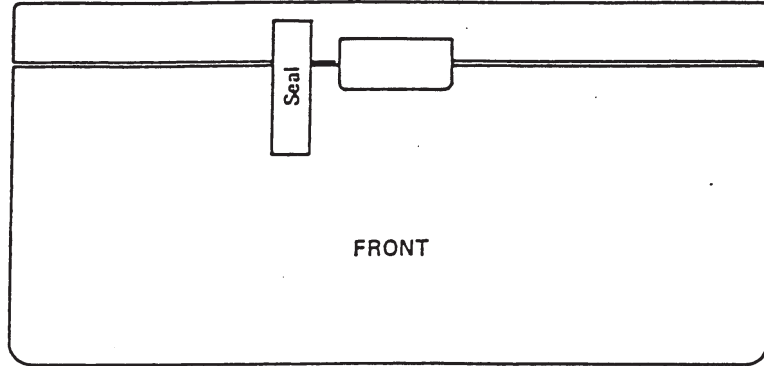
Return results & electronic copy to:
QA / QC Dept. at address at top of page

HFORM-1 07/11
TNC 406-443-8550



Attachment 2. Example of Custody Seals and Placement

 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY OFFICIAL SAMPLE SEAL	SAMPLE NO.	DATE	SEAL BROKEN BY DATE EPA FORM 7500-2 (R7-75)
	SIGNATURE		
	PRINT NAME AND TITLE (<i>Inspector, Analyst or Technician</i>)		



STANDARD OPERATING PROCEDURE

HSOP-006

FIELD MEASUREMENT OF pH, DISSOLVED OXYGEN, CONDUCTIVITY, ORP, AND TEMPERATURE USING A MULTI-METER

1.0 SCOPE AND APPLICATION

This procedure will allow field personnel to collect pH, conductivity, dissolved oxygen (DO), temperature, and oxidation reduction potential (ORP) parameters of groundwater/surface water with a single meter.

2.0 SUMMARY OF METHOD

A multiple parameter meter (multi-meter) is calibrated and subsequently used to gather field water quality parameters for groundwater and surface water samples.

3.0 HEALTH AND SAFETY WARNINGS

Standards used for calibration of the multiple parameters of the meter may present a hazard to personnel performing calibration or handling solutions. Care should be taken to minimize the risks of spills. Minimum personal protective equipment (PPE) to be worn during calibration procedures should consist of latex or nitrile gloves. For calibration in the field at the project site rather than the lab, additional PPE may be required by the work plan or project specific Health and Safety plan. Material safety data sheets (MSDS) for all substances used for calibration should be available during calibration.

Field personnel should be aware of the health and safety precautions to be followed during any field event, and should be familiar with any project-specific hazards. This may include review of task-specific Hazard Assessments (HAs), Job Safety Analysis (JSAs), project-specific health and safety plans (HASPs), site-specific and/or organization-specific safety requirements and training.

4.0 INTERFERENCES

The primary potential interference during use of the multi-meter comes from damage to the meter or its various probes. The meter should be handled with care to limit potential damage to the probes. Damaged probes should be repaired or replaced according to the manufacturer's instructions.

TABLE OF CONTENTS

1.0 Scope and Application	1
2.0 Summary of Method	1
3.0 Health and Safety Warnings	1
4.0 Interferences	1
5.0 Personnel Qualifications	2
6.0 Equipment and Supplies	2
7.0 Procedure	2
8.0 Data and Records Management	3
9.0 Quality Control/Quality Assurance	4
10.0 References	4
11.0 Approved	4



5.0 PERSONNEL QUALIFICATIONS

Personnel should be familiar with the usage and operation of the multi-meter being used. It is recommended that manufacturer's documentation on use and storage be reviewed prior to operation.

6.0 EQUIPMENT AND SUPPLIES

- YSI Model 556 Multi-meter (or similar);
- Standard/buffer solutions (Conductivity, pH, ORP); and
- Latex or nitrile gloves.

7.0 PROCEDURE

7.1 CALIBRATION

7.1.1 Conductivity and pH

1. From the main menu, select **Calibrate**.
2. Place the correct amount of calibration standard into a clean, dry or pre-rinsed calibration cup.
3. Immerse the probe into the solution, making sure the sensor to be calibrated and the temperature probe are adequately covered.
4. Allow at least one minute for temperature to stabilize.
5. Select the sensor to be calibrated. For conductivity, a second menu will offer the option of calibrating in **specific conductance, conductivity, or salinity**. Calibration of any one option automatically calibrates the other two. For pH, a second menu will appear offering the choice of a 1-, 2-, or 3-point calibration. Always perform a 3-point calibration.
6. Enter the value of the standard being used. (For pH, always calibrate in the 7 buffer first.) Be certain that the units are correct and press **Enter**. The current values of all enabled sensors will appear.
7. Observe readings and when they show no significant change for approximately 30 seconds, press **Enter**. The screen will indicate if the calibration has been accepted.
8. Press **Enter** again to return to the Calibrate screen, or, for pH, to continue with the second point of the calibration.

7.1.2 Oxidation – Reduction Potential (ORP)

1. Place the correct amount of a solution with known ORP value into a clean, dry, or pre-rinsed calibration cup.
2. Immerse the probe into the solution, making sure the sensor to be calibrated and the temperature probe are adequately covered.
3. Allow at least one minute for temperature to stabilize.
4. Read the ORP value and compare to the known value. Note that ORP values vary with temperature.



5. If ORP value is within ± 20 mV of known value, record ORP value and temperature on calibration form.
6. If ORP value exceeds ± 20 mV of known value, selected Calibrate from main menu, select ORP sensor, and enter known ORP value.
7. Observe readings and when they show no significant change for approximately 30 seconds, press **Enter**. The screen will indicate if the calibration has been accepted.
8. Corrections of ORP to E_H are typically calculated for individual samples based on temperature, due to the variability of reference electrode potentials with changing temperature.

7.1.3 Dissolved Oxygen

1. Place approximately 3 mm (1/8 inch) of water in the bottom of the transport/calibration cup. Screw the transport/calibration cup onto the probe, engaging only 1 or 2 threads to ensure venting to the atmosphere. **Make sure the DO and temperature sensors are NOT immersed in water.**
2. Turn the instrument on to the Run mode and wait 10 minutes for the DO sensor to stabilize.
3. From the main menu, select **Calibrate**, then **Dissolved Oxygen**, then **DO%**.
4. Observe the readings and when they show no significant change for approximately 30 seconds, press **Enter**. The screen will indicate if the calibration has been accepted.
5. Press **Enter** again to return to the DO Calibration screen.

7.2 TAKING READINGS

1. Power the instrument on, or select **Run** from the Main Menu.
2. Insert probe into the sample to be measured. Continuously move the probe through the sample until the readings on the screen stabilize. If using a flow through cell, insert and connect the probe to the flow through cell and wait until readings stabilize, according to **HSOP-049**.
3. Record the sample readings in the sample field book and on sample specific sample forms (if used).
4. If recording readings in the meter's electronic memory, use the arrow keys to highlight **Log one sample**, or select **Start logging** to record a series of data. Press **Enter**.
5. The Enter Information screen should appear. Use the keypad to enter a file name and description. Press Enter.
6. Highlight **OK** and press **Enter** to confirm the data was successfully logged.

8.0 DATA AND RECORDS MANAGEMENT

Field readings will be documented in the field notebook which is maintained in accordance with **HSOP-031**, and on sample specific sample forms (if used). Sample forms will be maintained in the project file as noted in **HSOP-029**.



9.0 QUALITY CONTROL/QUALITY ASSURANCE

Field personnel should cross reference recorded readings with the display on the meter. If at any time during the use of the meter erroneous readings are suspected, buffer solutions should be used to check calibration and recalibrate if necessary. Notes of the calibration check or calibration should be made in the field book. The project work plan and QAPP should be reviewed for project-specific directions regarding use of a multi-meter to gather and record water quality parameters.

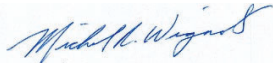
10.0 REFERENCES

Hydrometrics' HSOP-029: Labeling and Documentation of Samples

Hydrometrics' HSOP-031: Field Notebooks

Hydrometrics' HSOP-049: Use of a Flow Cell for Collecting Field Parameters

11.0 APPROVED

Approved By	Title	Signature	Date
Michael Wignot	Principal/Senior Engineer		4/2012



STANDARD OPERATING PROCEDURE

HSOP-031

FIELD NOTEBOOKS

1.0 SCOPE AND APPLICATION

HSOP-031 presents general guidance on recording field activities in a dedicated project notebook. Field books are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during the implementation of the project. In legal proceedings, field notes are typically admissible as evidence and subject to cross-examination.

2.0 SUMMARY OF METHOD

Bound notebooks with sequentially numbered pages are used to record observations, sampling information, weather conditions, and other pertinent information during field activities. Entries are made in permanent ink, and signed and dated at the bottom of each page. Both original notebooks and copies of field notes are retained as part of the project file.

3.0 HEALTH AND SAFETY WARNINGS

Field personnel should be aware of the health and safety precautions to be followed during any field event, and should be familiar with any project-specific hazards. This may include review of task-specific Hazard Assessments (HAs), Job Safety Analysis (JSAs), project-specific health and safety plans (HASPs), site-specific and/or organization-specific safety requirements and training.

4.0 INTERFERENCES

The primary potential problem with recording information in field notebooks is dealing with incorrect entries. In no case should erasures be made or information be obliterated or made illegible. Errors should simply be crossed out with a single line, dated, and initialed by the person making the original entry.

5.0 PERSONNEL QUALIFICATIONS

No specific qualifications are necessary for recording information in field notebooks. Personnel should be familiar with the scope and objectives of the project in order to record more meaningful field observations.

TABLE OF CONTENTS

1.0 Scope and Application	1
2.0 Summary of Method	1
3.0 Health and Safety Warnings	1
4.0 Interferences	1
5.0 Personnel Qualifications	1
6.0 Equipment and Supplies	2
7.0 Procedure	2
8.0 Data and Records Management	3
9.0 Quality Control/Quality Assurance	3
10.0 References	3
11.0 Approved	3

6.0 EQUIPMENT AND SUPPLIES

- Bound notebook with water resistant, sequentially numbered pages; and
- Pen (indelible ink).

7.0 PROCEDURE

1. New field notebooks should be labeled with the project title and number on the cover. Inside the front cover, write Hydrometrics' address and phone number as contact information, in case the notebook is lost. Multiple field notebooks may be required for large or ongoing projects; these should be assigned sequential numbers or labeled on the cover with the inclusive dates of observations recorded in the notebook (e.g., Project X, May 2002 through May 2004).
2. Notebook entries should begin on a fresh page for each day during a field event. While specific entry formats may vary with personal preference, the intent of the field notebook is to provide a daily record of significant events, observations, and measurements, as well as sampling information. All entries should be accompanied by date and time. Examples of information to be recorded in the field notebook includes:
 - Weather conditions;
 - Personnel on-site, including arrival and departure times and identities of visitors and observers;
 - Purpose of daily activities;
 - Site sketch maps;
 - Health and safety briefing information;
 - Field meter calibration information;
 - Identification and description of sampling sites (see **HSOP-002**);
 - Descriptions of photos taken;
 - Communication logs;
 - Documentation of deviation from methods; and
 - Sampling instrument decontamination records.

Sampling-specific information should include (see also **HSOP-029**):

- Sample number, date, and time;
- Site identifier;
- Description of sample containers, preservation, and sample collection method;
- Sample tag number (if applicable);
- Field parameter measurements and water calibration (static water level, total well depth, pH, specific conductance, water temperature, turbidity, color, odor, etc.); and
- Soil depth intervals and descriptions.

This list is not meant to be exhaustive, and other pertinent information should also be recorded in the field notebook as determined by field personnel.



3. The field notebook will be used to record communication with individuals on-site and on the phone that could result in a deviation from the SAP or that could impact the quality of the data being collected as part of the investigations.
4. Observations and measurements should be recorded in indelible ink, at the time they are made.
5. If erroneous entries are recorded, corrections should be made by deleting incorrect information with a single line, and dating and initialing the deletion in the notebook. Do not erase or obliterate incorrect entries, or remove pages from the notebook.
6. Blank and unused portions of notebook pages should be crossed out with a single line.
7. At the conclusion of the field event, review notebook entries, sign and date each page (if not already done), and photocopy notebook pages for inclusion in the project file. Original notebooks may be maintained in the project file, or in the files of individual field personnel at the discretion of the project manager.

8.0 DATA AND RECORDS MANAGEMENT

Copies of field notes are retained in the project file. Original field notebooks are maintained in the project file, or in the files of individual field personnel at the discretion of the project manager. Completed (filled) notebooks should be placed in the project files or the Data Quality Department notebook library, at the discretion of the project manager. Copies of field notebooks should be updated in project files at the end of each field event.

9.0 QUALITY CONTROL/QUALITY ASSURANCE

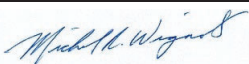
Standard procedure requires review of field notes by a person other than the person who recorded the field notes, prior to entering the information into the project files, to check for inaccurate, incomplete, or unclear entries, blank pages, or other problems with documentation. Peer review of notebook entries should also be conducted at least once per day during field activities.

10.0 REFERENCES

Hydrometrics' HSOP-002: Determination, Identification, and Description of Field Sampling Sites

Hydrometrics' HSOP-029: Labeling and Documentation of Samples

11.0 APPROVED

Approved By	Title	Signature	Date
Michael Wignot	Principal/Senior Engineer		6/2004



STANDARD OPERATING PROCEDURE

HSOP-432

PRESERVATION AND STORAGE OF ORGANIC WATER SAMPLES

1.0 PURPOSE

An important factor in obtaining representative water quality data is the preservation and storage of samples. Preservation is designed to:

- Retard biological activity;
- Retard chemical reactions; and
- Reduce volatility of constituents.

Preservation generally includes chemical additives, pH control, refrigeration, proper container materials, and immediate field filtration for dissolved constituents.

2.0 EQUIPMENT

Table 1 (attached) lists recommended preservatives, containers and holding times for various parameters. Be sure to assemble all the required containers, preservatives, and filters, as required, before leaving for the field.

3.0 PROCEDURE

Samples will be preserved according to guidelines presented in **Table 1**, and will remain refrigerated or in coolers with ice until analysis. Samples for organics should not be filtered, unless otherwise indicated in the project plan. Samples of organics of a volatile nature are collected in bottles equipped with teflon-lined septum-top caps, and no air bubbles should be left in the bottles after capping.

4.0 HEALTH AND SAFETY WARNINGS

Field personnel should be aware of the health and safety precautions to be followed during any field event, and should be familiar with any project-specific hazards. This may include review of task-specific Hazard Assessments (HAs), Job Safety Analysis (JSAs), project-specific health and safety plans (HASPs), site-specific and/or organization-specific safety requirements and training.

TABLE OF CONTENTS

1.0 PURPOSE	1
2.0 EQUIPMENT	1
3.0 PROCEDURE	1
4.0 HEALTH AND SAFETY WARNINGS	1
5.0 REFERENCES	2
6.0 APPROVED	2



5.0 REFERENCES

Massachusetts Department of Environmental Protection, 1997. Characterizing Risks posed by Petroleum Contaminated Sites: Implementation of MADEP VPH/EPH Approach (Public Comment Draft). October 31, 1997.

U.S. EPA, 1983. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, 3rd Edition.

U.S. EPA, 1985. Test Methods for Evaluating Solid Waste SW-846.

U.S. EPA, 1985. 40 CFR 136.3 (7/1/85 Ed.).

6.0 APPROVED

Approved By	Title	Signature	Date
Mark Walker	Senior Scientist		05/11/2023



**TABLE 1. REQUIRED CONTAINERS, PRESERVATION
 AND HOLDING TIMES**

<u>Parameter</u>	<u>Volume Requirement</u>	<u>Container</u>	<u>Preservative</u>	<u>Holding Time</u>
BOD	1000 ml	Plastic or glass	Cool, 4°C	48 hours
COD	250 ml	Plastic or glass	Cool, 4°C H ₂ SO ₄ to pH <2	28 days
Oil & Grease	1000 ml	Glass	Cool, 4°C HCL or H ₂ SO ₄ to pH <2	28 days
Organic Carbon	250 ml	Plastic or glass	Cool, 4°C HCL or H ₂ SO ₄ to pH <2	28 days
Purgeable Halogenated Organics	2 - 40 ml vials no bubbles	Glass with Septum top	Cool, 4°C 3 drops HCL/vial Na ₂ S ₂ O ₃ *	14 days
Purgeable Nonhalo- genated Organics	2 - 40 ml vials no bubbles	Glass with Septum top	Cool, 4°C 3 drops HCL/vial Na ₂ S ₂ O ₃ *	14 days
Purgeable Volatile Organics and BTEX	2 - 40 ml vials no bubbles	Glass with Septum top	Cool, 4°C 3 drops HCL/vial Na ₂ S ₂ O ₃ *	14 days
Acrolein Acrylonitrile Acetonitrile	250 ml	Glass with teflon lid	Cool, 4°C HCL to pH <2 Na ₂ S ₂ O ₃ *	14 days
Phenols	1000 ml	Glass with teflon lid	Cool, 4°C HCL to pH <2 Na ₂ S ₂ O ₃ *	7 days until extraction; 40 days to analysis

* Used only in the presence of residual chlorine.



TABLE 1. REQUIRED CONTAINERS, PRESERVATION AND HOLDING TIMES (continued)

<u>Parameter</u>	<u>Volume Requirement</u>	<u>Container</u>	<u>Preservative</u>	<u>Holding Time</u>
Phthalate Esters	1000 ml	Glass with teflon lid	Cool, 4°C HCL to pH <2 Na ₂ S ₂ O ₃ *	7 days
Organo-chlorine Pesticides and PCBs	1000 ml	Glass with teflon lid	Cool, 4°C HCL to pH <2 Na ₂ S ₂ O ₃ *	7 days until extraction; 40 days to analysis
Nitro-aromatic and cyclic ketones	1000 ml	Glass with teflon lid	Cool, 4°C HCL to pH <2 Na ₂ S ₂ O ₃ *	7 days until extraction; 40 days to analysis
Poly-nuclear Aromatic Hydrocarbons	1000 ml	Glass with teflon lid	Cool, 4°C HCL to pH <2 Na ₂ S ₂ O ₃ *	7 days until extraction; 40 days to analysis
Chlorinated Hydrocarbons	1000 ml	Glass with teflon lid	Cool, 4°C HCL to pH <2 Na ₂ S ₂ O ₃ *	7 days until extraction; 40 days to analysis
Organo-phosphorus Pesticides	1000 ml	Glass with teflon lid	Cool, 4°C HCL to pH <2 Na ₂ S ₂ O ₃ *	7 days until extraction; 40 days to analysis
Chlorinated Herbicides	1000 ml	Glass with teflon lid	Cool, 4°C HCL to pH <2 Na ₂ S ₂ O ₃ *	7 days until extraction; 40 days to analysis

* Used only in the presence of residual chlorine.



**TABLE 1. REQUIRED CONTAINERS, PRESERVATION
 AND HOLDING TIMES (continued)**

<u>Parameter</u>	<u>Volume Requirement</u>	<u>Container</u>	<u>Preservative</u>	<u>Holding Time</u>
Semi-Volatile Organics	1000 ml	Glass with teflon lid	Cool, 4°C HCL to pH <2 Na ₂ S ₂ O ₃ *	14 days until extraction; 40 days to analysis
Total Organic Halogens	250 ml no bubbles	Glass with septum top	Cool, 4°C HCL to pH <2 Na ₂ S ₂ O ₃ *	14 days
Total Petroleum Hydrocarbons - gas	2 - 40 ml no bubbles	Glass with septum top	Cool, 4°C 3 drops HCL/vial Na ₂ S ₂ O ₃ *	14 days
Total Petroleum Hydrocarbons - diesel	1000 ml no bubbles	Glass with septum top	Cool, 4°C HCL to pH <2 Na ₂ S ₂ O ₃ *	7 days until extraction; 40 days to analysis
Volatile Petroleum Hydrocarbons (VPH)	40 ml no bubbles	Glass with teflon-lined septum cap	Cool, 4°C 3 drops HCL/vial (pH <2)	14 days
Extractable Petroleum Hydrocarbons (EPH)	1000 ml	Amber glass with teflon-lined cap	Cool, 4°C HCL to pH <2	14 days until extraction; 40 days to analysis

* Used only in the presence of residual chlorine.



Attachment B
Cost Estimate