STANDARD OPERATING PROCEDURE FOR STORMWATER MONITORING USING PORTABLE SAMPLERS

WATER QUALITY

State of Utah
Department of Environmental Quality
Division of Water Quality

Revision 1.1
Effective July 2021

Foreword

Utah Division of Water Quality (DWQ) Standard Operating Procedures (SOPs) are adapted from published methods, or developed by in-house technical experts. This document is intended primarily for internal DWQ use. This SOP should not replace any official published methods.

Any reference within this document to specific equipment, manufacturers, or supplies is only for descriptive purposes and does not constitute an endorsement of a particular product or service by DWQ. Additionally, any distribution of this SOP does not constitute an endorsement of a particular procedure or method.

Although DWQ will follow this SOP in most instances, there may be instances in which DWQ will use an alternative methodology, procedure, or process.

The methodology detailed below is the protocol followed by DWQ's monitoring staff and verified by DWQ's Quality Assurance officer.

Signature: Benjamin R. Brown
Benjamin R. Brown (Jul 6, 2021 10:25 MDT)
Email: brbrown@utah.gov

Benjamin R. Brown **Date**

Monitoring Section Manager

Signature: Toby Hooker
Toby Hooker (Jul 6, 2021 10:25 MDT)
Email: tobyhooker@utah.gov

Toby Hooker **Date**

Quality Assurance Officer

Revision Page

Date	Revision #	Summary of Changes	Sections	Other Comments
4/7/20	0	Not applicable	Not applicable	New SOP
12/4/20	1.0	Changed name to SOP_Portable Sampler_2021_v0	All	Previous name: Portable Sampler SOP 4-20
4/29/21	1.1	Removed “clean hands, dirty hands” processes	9.0	
4/29/21	1.1	Updated language, grammar and structure	All	
4/29/21	1.1	Added Figures section	13.0	

Table of Contents

1.0 SCOPE AND APPLICABILITY

This document presents Utah Division of Water Quality's (DWQ) Standard Operating Procedures (SOP) for the installation, operation, and maintenance of portable samplers in Utah's natural (rivers, streams, lakes) or engineered (stormwater outfalls, ditches, canals, reservoirs) surface water bodies. It is anticipated that the primary use of portable samplers will be to obtain water quality data from stormwater outfalls during and following precipitation events. This SOP applies to DWQ staff or cooperators installing or maintaining portable samplers for stormwater monitoring. This SOP also outlines the responsibilities of DWQ staff to perform inspections of portable samplers and associated equipment while collecting water samples.

Portable samplers are an effective and efficient means to collect water quality samples for laboratory analysis of chemical parameters such as nutrients, metals, and total dissolved solids. When combined with an area velocity flow meter or other flow measurement device, portable samplers can be used to quantify pollutant loads at remote locations that flow intermittently from precipitation driven events.

Portable samplers consist of a peristaltic pump connected to a tube and strainer that is placed in the flow path of the water body to be sampled and transfers water samples to one or more bottles housed within the portable sampler's body. The pump is powered by a control unit that when combined with a flow meter can be programmed to initiate sampling based on flow as well as control the timing and duration of sampling to obtain a flow-weighted composite sample. Composite sample data is used by DWQ scientists and engineers for a variety of purposes including but not limited to:

- determining pollutant loading and inputs into receiving waterbodies
- setting permit requirements for discharge of stormwater
- characterizing current water quality conditions and detecting long-term changes

Portable sampler controllers can also log flow rate, rainfall, and parameter data when combined with a flow meter, rain gauge, and multiparameter sonde. When connected to a wireless modem the controller can provide system status updates and alert the user when samples have been collected through email or text messages. Power to operate the pump and controller is provided by a standard 12-volt DC lead acid or equivalent battery.

The information discussed in this SOP is not a substitute for equipment user manuals or other technical documentation. Consult the appropriate manual for a complete guide to the proper use, calibration, maintenance, deployment, and troubleshooting of portable sampler equipment and software. This SOP is to be used as a reference but the complete user manual should always accompany field personnel.

2.0 SUMMARY OF METHOD

The portable samplers will be programmed to collect samples from precipitation events based upon parameters outlined in individual Sample Analysis Plans. Flow-weighted, whole water (unfiltered) sample aliquots will be collected over the course of the storm event with portable samplers. These whole water samples will be retrieved from the field by the sampling team and transported to the DEQ Tech Support Center. Portable sampler performance will be evaluated and water from the individual sampler bottles will be composited into a single container. Following sample compositing, sample bottles for specific parameters of interest will be filled. Once filtered and preserved, as needed, the analytical sample bottles will be capped, labeled, and placed on wet ice or refrigerated at the TSC until transported to the laboratory.

The installation site of the portable sampler will be assessed for feasible placement of the sampling tube inside of a stormwater outfall or structure, with the bottom of the tube as close as possible to the low water level of the stormwater discharge. See the manufacturer's documentation on the technical limits for the portable sampler pump, including vertical pump height and the recommended maximum length of tubing, (these are limited by how much head pressure the pump can generate to transfer water to the sampler bottle). The flow meter will be installed on the top of a stormwater pipe or structure facing downwards onto the flow path and tubing and cabling secured to prevent debris from snagging on it. The portable sampler and battery will be housed in a secured enclosure at the site to safeguard against theft and vandalism.

3.0 DEFINITIONS

Area Velocity Flow Meter: A device that measures water flow.

Portable Sampler: A unit that can be programmed to collect discrete sequential samples, time-composite samples or flow-composite samples.

Base flow: Flows occurring in the drainage after 48 hours with no measurable rainfall are defined as base flows. This flow may be consistent or intermittent within a stormwater conveyance system.

Best Management Practice (BMP): Physical, structural, and/or managerial practices that, when used singly or in combination, reduce the downstream quality and quantity impacts of stormwater.

Composite Sample: Used to determine average loadings or concentrations of pollutants, such samples are collected at specified intervals based on time, flow volume or flow rate, and are pooled into one large sample.

Conveyance System:	A single pipe or series of pipes that convey stormwater as part of a municipal separate storm sewer drainage system.
Drainage area:	The area contributing runoff to a single point measured in a horizontal plane, which is enclosed by a ridge line.
EMC:	Event Mean Concentration. The average pollutant concentration for a given stormwater event, expressed in units of mass per volume (e.g., mg/L). The EMC is calculated to obtain an accurate and representative mean pollutant concentration from a site during a runoff event.
Equipment blank:	Equipment blanks are used to determine if any contaminants or interferences are introduced as part of the sampling equipment or the processes of cleaning that equipment prior to sampling. Deionized water is passed through the sampling equipment and collected in sampling bottles. These samples are sent to the laboratory for analyses. Corrective action is taken if any contamination is found in these blank samples.
Field duplicate:	A field duplicate sample consists of aliquots of the field composite split sample that are equally distributed in two sets of analytical sample bottles. These samples will be analyzed identically to evaluate the repeatability of sample handling, analytical procedures, and sample heterogeneity.
Hydrograph:	A graph of runoff rate, inflow rate or discharge rate past a specific point as a function of time.
Outfall:	Location where an effluent or municipal separate storm sewer system discharges into receiving waters.
Pollutant Load:	A mass concentration multiplied by the total volume of water passing by a certain point in time, expressed in units of pollutant-weight per time (i.e. kg PO4-P per day).
Stormwater:	That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, channels, or pipes into a defined surface water channel or a constructed infiltration facility. According to 40 CFR, part 122.26(b)(13), this includes stormwater runoff, snow melt runoff and surface runoff and drainage.

Time of Concentration: The time of travel for rain runoff from the farthest point in the tributary area to the sampling location.

4.0 HEALTH AND SAFETY WARNINGS

In most cases, installation of portable samplers will take place at or near stormwater outfalls and near stream or lake shorelines that may be stabilized with rip-rap, which can be unstable, slippery, and sharp. Power tools, including hammer drills and reciprocating saws, can be hazardous if used improperly. Working near water in waders poses a drowning hazard, and working near water in the winter poses a hypothermia hazard.

Field personnel should be aware that hazardous conditions potentially exist at every site. If unfavorable conditions are present at the time of sampling, the sample visit is recommended to be rescheduled. If hazardous weather conditions arise during sampling, such as lightning or high winds, personnel should cease sampling and move to a safe location.

5.0 CAUTIONS

The placement of portable samplers in the field should be considered carefully due to the potential for vandalism and theft of sampling equipment. A nondescript enclosure secured to a heavy base and locked access door is recommended to discourage tampering and prevent theft.

Sample cross-contamination can occur if sampling devices are not properly cleaned. Equipment blanks will be performed to demonstrate that all sample collection and processing activities requiring reusable equipment are contaminant-free.

6.0 INTERFERENCES

A strainer must always be attached to the intake end of the sample tube installed within the water source being sampled to prevent clogging. The sample tube and area velocity flow meter must be anchored firmly to prevent movement and snagging on debris.

7.0 PERSONNEL QUALIFICATIONS/RESPONSIBILITIES

DWQ personnel performing water sampling must be familiar with sampling techniques, safety procedures, proper handling, and record keeping. Samplers are responsible for attending refresher meetings held each spring/summer to review procedures and techniques. New staff will be trained in the field by DWQ trained personnel.

Cooperators are required to read this SOP annually and acknowledge they have done so via a signature page that will be kept on-file at DWQ along with the official hard copy of this SOP (see **Appendix 1**).

8.0 EQUIPMENT AND SUPPLIES

- ❑ Copy of this SOP
- ❑ Installation, Inspection and Maintenance form (Appendix 2)

8.1 Installation

- ❑ ISCO Model 3700 portable sampler or equivalent. Includes controller, top cover, center section, base, and distributor arm.
- ❑ Signature® Flowmeter system or equivalent area velocity flow meter.
- ❑ Flowlink® Pro software
- ❑ AVFM Sensor carrier and mounting plate.
- ❑ 306 sampler interface assembly with 10 m long cable
- ❑ CDMA LTE cellular modem with magnetic mount antenna.
- ❑ Connect cable for external 12 VDC source, typically a deep cycle marine battery.
- ❑ Deep cycle 12V DC marine battery, 50-amp hour minimum
- ❑ 3/8-inch vinyl suction line – 100 feet
- ❑ 3/8-inch stainless steel tubing coupler
- ❑ 3/8-inch stainless steel strainer
- ❑ 24 polypropylene 1-liter bottles with caps, bottle retaining ring, and two pump tubes, or single compositing bottle of appropriate volume.
- ❑ Laptop or desktop computer to communicate with the ISCO Model 3700 controller.
- ❑ Attachment materials and tools
- ❑ ¾-inch SS strapping, seals, and tensioner
- ❑ Hammer drill, 3/32-inch masonry bits, ¼-inch X 2-inch masonry screws
- ❑ Powder-actuated nailer, powder charges, and concrete pins
- ❑ 1.5-inch two-hole metal conduit straps
- ❑ Tin snips
- ❑ Keyed or combination long-shackle padlock to secure the enclosure containing the portable sampler

8.2 Sample Collection and Processing

- ❑ Box of powderless nitrile gloves
- ❑ Cooler and ice
- ❑ Waterproof marker/pen/pencil
- ❑ Lab Sheets
- ❑ DI water

- ❑ Analytical sample bottles
- ❑ Geopump® with quick-release pump head, with approximately 3 feet of tubing
- ❑ Filter (0.45 µm)
- ❑ Laptop to connect to the flow meter and download data.
- ❑ Paper or electronic Field Form

9.0 PROCEDURE

9.1 Installation

See **Section 13.0** for pictures of some typical installations.

9.1.1 Monitoring Site Selection

Select a representative site to ensure samples are collected that best represent the storm runoff condition through the stormwater conveyance. The following consideration must be included in selecting a representative site:

- A stormwater outfall located where stormwater is relatively well mixed and relatively "stable" or "uniform".
- Select sites with uniform flows, and avoid steep slopes, junctions, confluences, grade changes, and areas of irregular channel shape due to breaks, repairs, roots, debris, etc. Sites with pipe slopes less than 2% typically have uniform flows.
- Select sites where the channel and storm drains are soundly constructed and have free-flowing (gravity flow) conditions. Avoid selecting sites affected by backwater conditions since these areas can complicate measurement of flow and the interpretation of data.
- Ensure the influent sampling station will not include any prior treatment of stormwater up gradient from the station.
- Obtain permission for site access and conduct a follow-up site inspection during dry and wet weather.
- The ISCO brand autosampler can pump to a maximum height of 26 feet and a maximum tube length of 99 feet, but the tubing should be kept as short as possible to preserve battery life and ensure proper back flushing. If using other brand equipment, see the manufacturer documentation for maximum height.

During dry weather, inspect the site for base flows (dry weather flows, presence of debris, signs of staining, odors, discoloration in water, unusual flows and/or excessive sediment/solids deposits. Note observations in the Installation, Inspection and Maintenance form (**Appendix 2**). During wet weather, inspect the discharge flow condition to get a sense of sampling conditions during storm runoff events. Note observations in the Installation, Inspection and Maintenance form (**Appendix 2**).

9.1.2 Equipment Installation

For installation of the sample tube, meter probes and triggering equipment, locate the appropriate place at the monitoring station for representative placement. The selected area should be an area where the runoff stream is adequately well mixed to ensure representative sampling from the entire cross-section of the conveyance system (typically mid-stream in the pipe/channel). The sample tube, other parameter probes and sampler triggering devices must be placed downstream of flow monitoring devices in such a manner as to not create turbulence which can influence flow measurements.

1. If Confined Space Entry is required to install the sample tube, ensure field staff is properly trained and certified. If staff are not trained to enter confined spaces they are not to continue with installing equipment or collecting samples.
2. Place the sample tubing in the stormwater conveyance system where it will best represent runoff through the system providing at least 2 inches of depth or greater for the tube. The sample tube must be covered during sampling to avoid improper aliquot collection.
3. For placement of the sample tube in less than 2 inches of water, a depth can be created by constructing a deeper pool, for example with weirs or flumes.
4. Take caution when placing any constriction in the pipe since it can also cause sedimentation which can cover the tube's intake end and affect the aliquot volume collected.
5. If constricting items are used, provide regular maintenance and checks to keep the sampler intake free of debris and sedimentation.
6. If necessary, mount the sample tube slightly above mid-stream on one side of the pipe/channel if high solids loadings (bed load, trash, debris) are present. However, with the sample tube offset of the mid-channel, low flows may not completely submerge the strainer.
7. Place the sample tubing mid-stream, facing upstream, parallel to the water flow and downstream of the flow measuring device. The line should not be placed in an eddy or area of flow disturbance.
8. Place the line to avoid disturbance or turbulence in the flow pattern (this could interfere with flow measurements).
9. Prevent clogging by adjusting the tubing at an angle.
10. Use an anchor system or anchors to secure the tubing. Some manufacturers have a mounting plate available to mount the tubing and other probes in the channel or pipe.
11. Anchor the line to prevent bending/crimping during high velocity storm flows within the pipe/channel. Place an anchor every 20 inches for higher-velocity flows.
12. Ensure there are not kinks or dips in the tubing which can hold residual amounts of liquid or deposited stormwater solids/sediments that could cross-contaminate sample volumes.

13. Attach a strainer to the end of the pre-cleaned sample tubing. Slide the end of the strainer into the tubing and secure it with a stainless-steel hose clamp.
14. Cut the tubing to the desired length in 1-foot increments and cap the end with new aluminum foil, tape or laboratory-grade cellophane to prevent contamination.
15. The minimum length of the pump tubing must be used to minimize the contact of the sample water and tubing as the sample water is carried from the intake tubing into the sampler bottle(s). See the manufacturer documentation on the technical limits for the portable sampler pump and the recommended maximum length of tubing, and for limitations in elevation difference between pickup point and sampler.
16. If the sampling program is long-term, the sample tubing can remain in-place for extended periods, however, provisions must be made for flushing the tubing thoroughly with DI water before each sampling event and with site water (DI or ambient water) before each aliquot is drawn. If sample tubing needs to be replaced, frequency of replacement should be included in the project-specific SAP.
17. Measure the entire length of tubing since this information is needed when programming the portable sampler. Record measurements in the Installation, Inspection and Maintenance form (**Appendix 2**).
18. Install all other appropriate probes and sampler triggering devices such as the velocity flow meter near the sample tube.
19. All equipment installed within stormwater conveyance systems should be secured in a way to not create turbulence and not dislodge from the sampling location. Turbulence can create cavitation (air pockets) around the sample tube which varies the volume of water sampled for each aliquot.
20. For the installation of the portable sampler, place the sampler on a level surface as close to the sample intake as possible. See the manufacturer documentation on the technical limits for the portable sampler pump including vertical pump height and the recommended maximum length of tubing. The sampler should never be placed at a height below the sampler intake. This situation would create a siphon.
21. When sampling for metals, only stainless-steel fittings or clamps should be used in all areas of sample contact. Other metallic hardware (plates, fittings, conduit, and clamps) should not be used in areas of sample contact. Take care to ensure that the ends of all tubing do not touch any object that is not known to be clean during installation. Metallic hardware can be used only in areas where contact with the sample doesn't occur e.g., anchors used on the outside of the tubing.
22. For above ground enclosures, install housing/enclosure for the equipment well above the highest water level expected.
23. Secure enclosure in such a manner to prevent tipping, vandalism, or theft.
24. Use an electrical (metal) conduit, plastic conduit or a water pipe to protect the length of sample intake tubing from the sampling point into the enclosure. Make sure the conduit is large enough to accommodate all connection cables (flow meter, parameter

probes, and rain gauge), and that any rough or sharp edges resulting from cutting the conduit are removed by reaming or scraping.

25. For placement within a manhole or junction box, place the portable sampler either on a shelf in the manhole/catch basin junction box or hang sampler inside the manhole/catch basin. Some manufactures have suspension harnesses and other anchors commercially available.
26. Make sure that the sampler is above any high water level within the pipe. High water, such as surging or tidal water, can float the sampler damaging the sampler unit and/or its electronics, and can contaminate the enclosed sampler bottle(s) once the sampler is submerged.
27. Secure the sampler in place.
28. Install a secondary "safety line" for all equipment to prevent equipment from being lost if the platform or hanger fails.

9.1.3 Preparing the Sampler

1. Remove the cover or top of the sampler and carefully place it to the side making sure not to kink the sample intake line.
2. Prepare the base section for the desired configuration (composite bottle or sequential multi-bottle setup).
3. Place the cover back on and feed the pre-cleaned flexible pump tubing through the peristaltic pump and into the area of the sampler where the sample bottle(s) are housed.
4. Take care to ensure that the ends of the tubing do not touch any object that is not known to be clean during installation.
5. Slide the end of the sample intake tubing (at least ½ inch) into the pump tubing and secure it with a hose clamp, if necessary.
6. Connect other equipment to samplers such as flow meters, rain gauges, level actuator, and/or parameter probes.
7. Attach the power source to the sampler (solar, AC, battery).
8. Turn on the sampler and any other equipment.
9. To check the sampler function, purge the sample tubing with site water or DI water to make sure the sampler is operating properly. See manufacturer's manual.

9.1.4 Sampler Programming

Portable samplers alone or with flow measurement devices can be programmed to collect various types of samples including time composite, flow composite, and sequential (multi-bottle) sampling schemes. Each type of equipment system has unique programming elements; however, three elements are common to all systems: flow quantity interval, the total number of aliquot samples and the volume of each aliquot sample.

In general, the portable sampler is programmed to collect a sample aliquot each time it receives a pulse. The pulse can be either time-based or flow-based.

For specific, step-by-step procedures for programming the portable sampler, refer to the manufacturer's user manual.

Programs can vary between portable equipment but some elements are similar and include: start sampling (enable) and end sampling (disable) options. These options are dependent upon flow depth, flow velocity, precipitation amount, or time.

To ensure the collection of representative samples, portable samplers should be programmed to perform a back-flow purge cycle in between each aliquot collected. Purging the sample intake tube prior to collection of each aliquot also helps keep the line clear.

Auto samplers can be programmed to collect samples in a number of ways. See project-specific SAP for additional programming requirements.

9.2 Stormwater Sample Collection

To prevent contamination of samples, new powderless nitrile gloves will be worn while handling the stormwater sampler bottle(s)(s), including sample storage and transport, and when replacing sample bottles in the portable sampler. Tubing will be replaced after each sampling event.

9.2.1 Sample Processing

Collected sampler bottles are labeled with site information directly on the bottle, stored in coolers with wet ice and transferred to the DEQ Tech Support Center at the conclusion of the sampling event. The field leader is responsible for maintaining sample integrity throughout the event. Once at the DEQ Tech Support Center, sample contamination is avoided by handling the sampler bottle with clean new powder-free nitrile gloves and transferring the samples from the sampler bottle into a mixing container, analytical sample bottles or refrigerators immediately after they are brought back from the field.

9.2.2 Sample Compositing

As part of the field sampling procedures, the sampling team will connect a laptop to the data logger using Flowlink® Pro software and download the sampling report and flow data. Review the data upon arrival at the DEQ Tech Support Center. If the sampling report and flow data indicate that there was no malfunction and all the sampler bottles are intact, the sample compositing and preparation will continue as follows.

If the sampler contains multiple sampler bottles, the contents of each will be emptied into a large clean mixing container (i.e. using a churn splitter or other suitable apparatus) and composited. Be sure equipment used for sample compositing and processing is clean to prevent cross contamination between samples; decontaminated in the same manner as the sampler bottles.

Alternatively, when the sampler contains a large volume composite sampler bottle, composited water will be transferred directly to analytical sample bottles.

See **Section 9.2.3** below for contingencies to sample collection when insufficient volume is available to fill all analytical sample bottles.

Analytical sample bottles for total chemistry, nutrients and metals will be filled directly from the composited sample. Filtered metals and nutrient samples will be prepared by pumping composite water by means of a peristaltic pump through a 0.45-micron filter, dispensing directly into analytical sample bottles dedicated for filtered metals and filtered nutrient analyses. The analytical sample bottles will be capped, labeled, and placed inside a cooler for transport to the analytical laboratory. See DWQ SOP for Collection of Water Chemistry Samples in Streams for detailed sample processing steps.

Rinse filter tubing with 500 mL sample water between sites.

Each sample will be analyzed for the chemicals defined in the project's project-specific SAP and may require varying volume to fill all bottles.

Note: Collect field duplicates and equipment blanks as needed (specified in the project-specific SAP) to ensure one duplicate per every 20 samples or one blank per every 10 samples.

9.2.3 Contingencies

Several problems could occur that may affect the viability of a sample collected. Common potential problems and contingencies are as follows:

1. Sample volume is not adequate for all analyses. This may occur when the actual precipitation is less than forecasted. Under these sampling conditions, the sample will be composited as normal and samples for analyses will be prepared in the following priority order based upon the SAP.
2. A portion of the sample is lost. This would occur when one or more of the sampler bottles are damaged or if the sampler malfunctions. In this situation, the sampling report and flow data will be reviewed to determine what representative portion of the storm volume is missing. In this situation it may be possible that a significant portion of the storm was not sampled, and/or there is not adequate volume to complete the desired analyses.

9.3 Equipment Decontamination

Equipment decontamination procedures are described below to be conducted between sampling events, at the end of the monitoring season when the units are retrieved from the field or as needed due to regular inspection.

9.3.1 Sample and Pump Tube Decontamination

If tubing is re-used between collection events, the following decontamination procedures apply:

1. Rinse thoroughly with hot tap water using a brush to remove particulate matter and surface film.
2. Rinse thoroughly three times with tap water.
3. Dry for at least 24 hours.
4. Cap ends with aluminum foil or store entire length of tubing in a clean zip-top bag.

9.3.2 Sampler Decontamination

The sampler top cover, center section, retaining ring, and tub of the portable sampler will be cleaned with warm soapy water and rinsed with tap water. The two pump drain holes will be checked to see that they are open and free of debris or buildup.

During implementation of the field sampling protocol, it is not anticipated that screens and intake tubes will be removed for cleaning between sampling events. The sampler will be programmed to purge the intake tubes several times before and after each stormwater sample collected, which should ensure that any contamination from previous events is removed or sufficiently minimized. If upon routine inspection, it is observed that algae is growing in the intake tube, debris is blocking the tube, or any other contamination issues exist, contaminated screens and intake tubes will be replaced or decontaminated using the methods described above.

9.3.3 Sampler Mounts and Other Equipment

Mounting equipment such as slip rings, nuts, bolts, and brackets will be washed with warm soapy water using a brush to remove any oil, grease or other residue from the manufacturing process. Installation of the brackets at the sampling sites may create debris that could become a contaminant source (i.e. drilling holes, using powder-actuated tools to set studs and/or welds). After the brackets have been installed, the work site will be scrubbed with a brush to remove any debris and rinsed with DI water before the sampling hardware (intake screen) is mounted.

9.3.4 Sampler Bottle Decontamination

Sampler bottles will be HDPE plastic and cleaned for reuse with hot tap water and triple rinsed after sample collection.

9.4 Inspection and Maintenance

The success of any sampling program is dependent on the proper maintenance of the equipment. Maintenance of the portable sampler and other complementary equipment is required especially when the equipment is in place for extended periods of time or when sampling multiple events.

Because of the adverse operating conditions associated with storm event sampling (exposure to extreme conditions and events), the equipment should be maintained frequently and after each sampling event.

Perform regular maintenance every time the sampler is set to collect a storm event. Regular maintenance includes, but is not limited to:

1. Check to make sure all connections are tight.
2. Inspect the strainer and clear it of debris and sedimentation if necessary.
3. Make sure tubing is secure.
4. Inspect sample intake tubing for kinks, cracks, biological buildup, and unusual discoloration and replace if necessary.
5. If the site is to be monitored for an extended period, it is recommended to replace the tubing on an annual basis. Other replacement schedules may be required, depending on the specific installation and project requirements.
6. Note maintenance activities in the Installation, Inspection and Maintenance form (**Appendix 2**)
7. Calibrate the portable sampler every time the sampler is set to collect a storm event. Use procedures in accordance with manufacturer specifications.
8. Rinse tubing with DI water, or site water (i.e., stormwater or ambient water such as base flow).
9. Check the sampler by collecting a manual sample at the desired setting using the sampler and measure its volume.
10. Check the sampler bottle(s) to verify the desired sample volume was delivered to the sampler bottle(s). If not, recalibrate the desired sample volume.
11. Adjust the sample volume to the desired sample aliquot volume according to manufacturer specifications.

10.0 DATA AND RECORDS MANAGEMENT

Project-specific data and records management requirements can be found in the project-specific SAP. To maintain the integrity of sample site IDs, analytical sample bottles must be labeled properly and the information on the label must match the information on the Lab Sheet, or other sample tracking or Chain-of-Custody form. Information on sample labels must be written in permanent ink. For routine samples to be analyzed at the State Lab, sample labels must contain the following information: DWQ site ID, site description, date, time, and sampler(s).

Before leaving the field site, be sure that all required samples have been collected, labeled, and that all appropriate field sheets, field notes, and sample tracking forms have been filled out completely and accurately.

- The field form in **Appendix 2** should be included in the site portfolio of every site where a portable sampler has been installed. Use this form to record the installation of the portable sampler, inspections and maintenance performed and data retrievals performed.

- Upon returning to the office with downloaded sonde data, the file should be uploaded to the appropriate Monitors folder on the Utah DWQ server to safeguard against loss of data.

11.0 QUALITY ASSURANCE AND QUALITY CONTROL

Follow all site selection, cleaning, and inspection procedures described in this SOP to ensure valid, high-quality portable sampler collections. Follow all relevant procedures described in DWQ's SOP for Collection of Water Chemistry Samples in Streams to ensure valid, high-quality samples.

Keep up-to-date equipment maintenance records and calibration data (**Appendix 2**) with other site records to provide a defense of quality data from installed portable samplers.

11.1 Field Quality Control Procedures

Field duplicates are collected at a frequency of one per 20 samples. These are collected by splitting the composite into two identical sets of analytical bottles for analysis.

Equipment blank samples are used to determine if contamination is present during the collection and processing of samples. Refer to the project-specific SAP for equipment blank requirements and corresponding blank IDs. Blanks are collected at a frequency of one per 10 samples.

Create the equipment blank in the field by filling and/or filtering all sample bottle types with DI water. Label the bottle with the "BLANK" site ID, time and process the equipment blank as a normal sample.

12.0 REFERENCES

EPA. 1996. Method 1669 – Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels. U.S. Environmental Protection Agency, Office of Water Engineering and Analysis Division (4303). Washington, DC.

USGS. 2000. Interagency Field Manual for the Collection of Water-Quality Data. Open-File Report 00-213. U.S. Geological Survey, in cooperation with the U.S. Environmental Protection Agency. Austin, TX.

Related DWQ SOPs:

- Standard Operating Procedure for Calibration, Maintenance and Use of Multiparameter Water Quality Sondes
- Standard Operating Procedure for Collection of Water Chemistry Samples in Streams

User Manuals:

The ISCO website (https://www.teledyneisco.com) has software updates and helpful Quick Guides, Instrument Manuals, Instruction Sheets and Technical Notes including:

- Signature® Flowmeter (https://www.teledyneisco.com/en-us/waterandwastewater/Flow%20Meter%20Documents/Manuals/Signature%20Flow%20Meter%20User%20Manual.pdf)
- ISCO Model 3700 Portable Sampler (https://www.teledyneisco.com/en-us/waterandwastewater/Sampler%20Documents/Manuals/3700%20Portable%20Sampler%20User%20Manual.pdf)
- Flowlink® Pro (https://www.teledyneisco.com/en-us/waterandwastewater/Flow%20Meter%20Documents/Manuals/Flowlink%205.1%20User%20Manual.pdf)

13.0 FIGURES

Typical Sampler builds and installation.

Figure 1. The flow meter is mounted to the left, above the battery power supply. The ISCO stormwater sampler is in the center, next to a separate battery power supply. The two small black boxes are the solar charge controllers connected to the solar panels. Used here is a jobsite lockbox that adequately holds and secures all autosampler parts from weather and vandalism.

Figure 2. Typical installation of an autosampler, here at a POTW in the influent sewage flow.

Figure 3. A typical mounting of the intake hose and flow meter sensor due to unconsolidated channel bottom. Both are attached to a T-post.

14.0 APPENDICES

APPENDIX 1 - SOP ACKNOWLEDGMENT AND TRAINING FORM

SOP Acknowledgement Form

This SOP must be read and acknowledged annually, and this form must be kept on file at DWQ.

Document Title:	
Document Revision Number:	
Document Revision Date:	

Please sign below in accordance with the following statement:

"I have read and understood the above referenced document. I agree to perform the procedures described in this SOP in accordance with the document until such time that it is superseded by a more recent approved revision."

Date	Printed Name	Signature

SOP Training Form

Training is required for all new samplers and Refreshers are required annually.

Trainee: Sign below to acknowledge that training on this SOP was received, understood, and all questions/concerns were addressed by the trainer.

Trainer: Sign below to acknowledge that training on this SOP was completed for the individual listed and that trainee is competent to perform the procedures described within.

Date	Trainee Printed Name	Trainee Signature	Trainer Printed Name	Trainer Signature

Management Approval
Printed Name:
Signature:
Date:

Appendix 2 – Installation, Inspection and Maintenance Form

Utah DWQ Portable Sampler
Installation, Inspection and Maintenance Form

Site Name:_____ STORET:_____
Latitude:_____ Longitude:_____
Site Description:_____
Portable Sampler Make/Model/Serial Number:_____
Portable Sampler Calibration Date:_____ Installation/Deployment Date:_____
Installation Personnel:_____
Notes from Installation:_____

Date	Monitor Initials	Visual Inspection Performed (Y or N)	Visual Inspection Okay (Y or N)	Data Retrieval Performed (Y or N)	Battery Life Remaining	Memory Remaining	Maintenance Performed (Y or N)	Flow Measurement Performed (Y or N)	Equipment Condition, Comments, Describe Maintenance