Water Monitoring Program

WASHINGTON CONSERVATION DISTRICT
STANDARD OPERATING PROCEDURE (S.O.P.) No. 1

AUTOMATED WATER SAMPLING

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1.0 SCOPE AND APPLICABILITY

This S.O.P. describes the procedure to be followed in installing automated sampling equipment, and operating and maintaining the equipment. This S.O.P. also addresses handling of samples collected by the automated samplers, sample transportation and chain-of-custody tracking, and submission to the laboratory for analysis. QA/QC requirements are also described.

This S.O.P. does NOT provide detailed instructions on how to program, trigger and troubleshoot automated sampling equipment, since these aspects are unique to the specific make and model of automated sampler in use. Field personnel responsible for installing, operating and maintaining automated samplers must therefore make reference to the relevant equipment user manuals.

For Twin Cities watersheds automated sampling is typically used to gather wet weather water samples from streams and storm water collection systems.

2.0 DEFINITIONS

.1 Stream Site

A stream site is a location along an open watercourse at which automated sampling is required.

.2 Stormwater Site

A stormwater site is a location along a closed watercourse (pipe outfall) at which automated sampling is required

.3 Confined Space Entry Site

A confined space entry site is a location along a closed watercourse at which automated sampling is required that has a limited means of egress, which is subject to the accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere

.4 Composite Sample

A composite sample is a single mixed sample that is collected over time by an automated sampler. It may be time-composite (where a specific volume of water is added to the composite sample at regular time intervals) or flow-composite (where the rate of sampling is proportional to the measured rate of flow at the sampling location).

.5 Automated Sampler (or Auto-Sampler)

A portable sampler unit that can be programmed to collect discrete sequential samples, time-composite samples or flow-composite samples. (See EQUIPMENT section below for further details).

3.0 EQUIPMENT AND MATERIALS

.1 Automated Sampler Sites

The following equipment and materials will be required.

- Field log book or electronic field note recorder
- First-aid kit
- Automated samplers and associated materials such as batteries and sampling tubing. Samplers should include the following features:
  - Initiation (triggering) of sampling may be accomplished manually or via a control signal generated by an external device such as a flow meter or timer.
  - Samples are drawn into the sampler by peristaltic pump.
  - Sample delivery is through a suction line of vinyl tubing.
  - The suction line should be equipped with a stainless steel or polypropylene intake strainer.
- Sample bottles
- Sample bottle labels
- Chain-of-custody forms and laboratory submission forms
- Flashlights
- Tools, hardware, and other materials needed for securing sampling equipment at the installation site

.2 Special Equipment and Materials Required for Confined Space Entry

- Portable multi-gas monitor
- Full body harness
- Traffic safety cones
- High-visibility safety clothing
- Self-contained breathing apparatus (if necessary)
- Ventilating Blower (if necessary)
- Hardhat
- 3-way rescue and recovery tripod and winch system
- Tools, hardware, and other materials needed for confined space entry as stated is OSHA Occupational Safety and Health Standards 1910.146

4.0 PROCEDURES

.1 Sampler Installation

.1.1 General

The manufacturer's instructions and recommendations should be followed. Refer to equipment manuals provided with the automated samplers.

.1.2 Installing Suction Intake Tubing and Intake Strainer

At the designated sampling location, the intake strainer should be placed parallel to the flow, facing upstream. The strainer is to be secured to a length of PVC pipe or other material of suitable diameter. The PVC pipe is mounted to the bottom or walls of the conduit using steel strapping or some other method that will secure the assembly in place. Alternatively, it may be necessary to secure the PVC pipe/strainer assembly to a heavy object (e.g., piece of steel plate) and place the entire assembly within the flow.

The minimum amount of tubing to reach the sampler should be used. Make sure to measure the entire length of the tubing since this information is needed when programming the automated sampler. Strapping or clips should be used to secure the tubing in place. There must be no kinks or dips in the tubing.

.1.3 Securing the Automated Sampler

Outfall Site Installations

Outfall site installations will typically be within open effluent or stormwater channels.

In these situations, the automated sampler can be secured to the wall of the channel at locations above the expected high water level.

Suitable strapping, chains, ropes or other methods may be used to secure the auto-sampler in place. The sampler should be situated to facilitate routine access to the operational switches and programming keypad. The sampler should also be situated and secured in a manner that does not impede the ability to access, remove, and replace sample bottles.

Stream Site Installations

At stream site installations, the same procedures and requirements apply. However, it will likely be necessary to provide secure housing for the sampler. This can be accomplished in a number of ways, depending on site conditions and site location.

In some situations, it may be possible to secure the sampler at or within a bridge or culvert crossing of the watercourse. In such cases, it may be necessary to construct a platform on which the sampler is mounted. In other cases, it may be necessary to construct a platform and housing for the sampler on the banks or shore of the watercourse.

In these cases, efforts must be made to minimize risk of equipment vandalism and theft by suitably locating and securing the equipment.

Confined Space Entry Installations

Confined space entry site installations will typically be within closed channel systems such as storm sewers or sanitary sewers. In these situations, automated sampler manufacturers should be consulted because they may have specific requirements in order to conduct sampling within these locations.

.2 Initiating Sampling

Following instructions provided in the equipment manuals, the sampler must be programmed to sample at regular time intervals, or according to a flow-proportional signal generated by a nearby flow meter. For the Twin Cities watersheds the first sample taken at a site is typically time composited. Once a good stage discharge curve is established subsequent samples should be collected by flow proportion.

Sampling can be initiated either by manually triggering the sampler, or by programming the sampler to respond to changes in flow or water level that are indicated by changes in control signal generated by a nearby flow meter or water-level sensor. Again, the equipment manuals must be referred to for instructions on how these various types of operation are accomplished.

Automated samplers must be provided with fully charged batteries or an outside auxiliary power souce (i.e. 120V AC source, solar panel) immediately prior to initiating sampling.

If samples are to be refrigerated between the time of sample collection and submission to the laboratory, then immediately prior to initiation of sampling, the sampler's bottle carousel should be iced.

.3 Sample Handling, Transportation and Chain of Custody

.3.1 Sample Removal from the Automated Sampler

At the end of the sampling period, the sample distributed to appropriate bottles for the required analyses, preserved, and delivered to the laboratory where they will be analyzed for the required parameters. If any of the bottles were not filled or if spillage occurred during sampling or during sample bottle removal, make appropriate notes in the field logbook.

When samples are removed from the sampler, careful handling is required to minimize risk of contamination. Samples should be handled as little as possible and by as few people as possible.

- The inner portion of sample bottles and caps should not be touched with bare or gloved hands
- Sample bottles must be kept in a clean environment away from dust, dirt, fumes and grime. Vehicle cleanliness is important to eliminating contamination problems.
- Samples must never be allowed to stand in the sun. They should be stored in a cool place. Ice chests are recommended

.4 Sample Labeling and Identification

The labels must be legibly and completely filled out and placed firmly on the bottle when samples are collected.

All samples will be assigned an 8-character project sample number, as shown below. The sample number will be clearly written on the sample label. Information on river mile, type of sample (grab or composite), start time and date of sampling period, and end time and date will also be clearly indicated on the sample label in order to match information on lab submission sheet.

Sample Labeling:

Site Name
Mile--XX **Project #: Enter unique 8 character # here**
Composite/Grab
Start date: MM/DD/YYYY End date: MM/DD/YYYY

Start time: HH:MM End time: HH:MM

.5 Sample Chain of Custody

The field sampling crew will initiate a chain-of-custody form for all samples.

Chain-of-custody forms will include information on project name, date and time of sample collection, sample description, sample ID number, date and time of sample custody transfer, and the names of persons from and to whom custody was transferred.

The chain-of-custody form will be signed and dated each time custody is changed.

If commercial couriers are used to transport samples to the laboratory, copies of the custody form will be made by field sampling personnel before samples are shipped to the laboratory. (The commercial courier does not sign the custody form.) The original custody form will be sealed in a plastic bag and sealed in the shipping container. Once received by the laboratory, the sample custodian at the lab will inspect the samples for damage, sign the custody form, make a copy for the laboratory file, and then forward the original form to the project's field program manager for filing in the project files.

.6 Submission to the Laboratory

Blank copies of laboratory submission forms are to provided by the laboratory to which samples will be submitted for analysis.

The laboratory submission forms will be completed by the field sampling crew and will accompany the chain-of-custody forms when the samples are delivered to the laboratory.

The laboratory sample submission forms must include information on the identification numbers for all samples submitted, which parameter analysis is required on each sample, and the method of sample preservation used at the time of sample collection.

.7 Maintenance of Automated Samplers

In general, manufacturer's instructions and recommendations regarding routine maintenance are to be followed.

Sampler pump head and intake tubing will be inspected after each sampling period. Intake strainer will be cleaned or replaced as necessary. Tubing will be replaced if necessary. Cleaning and replacements must be noted in the field logbook.

.8 Field Documentation

During automated sampler installations, field notes will made in the field log book including

- Time, date and specific location of installation
- Flow conditions during installation
- Weather conditions
- Any problems encountered
- Results of checks on sampler operation and battery condition.

On each occasion that sampling is initiated, field notes will be made regarding the following:

- Date and time of sampling start-up
- Flow conditions at start-up
- Type and details of auto-sampler programming set-up, indicating if sampling is intended as discrete sequential, time-composite or flow-composite.
- Details on programmed sampling interval.
- If sampler operation is being controlled by signals from nearby flow meters of water-level sensors, include notes on how the sampler has been programmed to react to changing level or flow.
- Any problems encountered

When sampling is completed and samples are being removed from the samplers, make field log notes regarding:

- Condition of sampler including information on whether all bottles were filled or if any spillage appeared to have occurred.
- Condition of intake strainer and intake tubing, noting any cleaning or replacements undertaken.
- Weather conditions
- Date and time of sample removal from the sampler
- General observations regarding flow, water clarity, odors at sampling sites
- Description of any apparent problems with the sampler

Complete and accurate field logbook or electronic field notes are an essential part of the QA/QC process (see below). Proper attention must therefore be given to completing the field notes during the course of fieldwork.

5.0 HEALTH AND SAFETY

.1 Health of Personnel

Gathering of water samples may result in exposure to sewage and bacteriologically contaminated water. All field-sampling personnel must therefore be adequately protected against risk of exposure to such contaminants.

- Field personnel shall wear rubber gloves or suitable hand protection during the collection and handling of samples.
- Before embarking on any sample collection activities, field personnel shall acquire adequate medical protection against risk of infectious disease, including (as a minimum) protection against tetanus, polio, pertusis, diphtheria and hepatitis A. Hepatitis B protection is also recommended.
- While working in the field, the field crew shall carry a complete first-aid kit that provides materials for disinfection and protection of any skin cuts or abrasions. Personnel will promptly attend to any such cuts or abrasions, and seek medical attention if appropriate. Any need for first aid or medical attention shall be recorded in the field logbook, including information on time and location of any injury to personnel and description of first-aid treatment applied.

.2 Confined Space Operations

- No confined space installations are to be attempted without proper on-site permits, safety equipment and applicable training. Refer to OSHA Occupational Safety and Health Standards 1910.146 for operations in confined spaces

6.0 PERSONNEL

.1 Field Sampling Personnel

The field personnel responsible for installing and operating automatic samplers should be technical personnel with experience in installing, operating and maintaining the specific equipment to be used.

All field personnel must have acquired recommended medical protections to guard against risks associated with sampling of contaminated waters. The specific requirements are set out above, under "Health and Safety:"

.2 Quality Assurance Personnel

Quality assurance reviews and auditing requirements (described below) will be the responsibility of the sampling team leader. This person must have experience in water sampling and environmental monitoring programs, and be familiar with sample collection, handling, preservation, chain of custody, and laboratory submission requirements.

7.0 QUALITY ASSURANCE AND CONTROL (QA/QC)

.1 Data Management and Records Management

Field sampling personnel will be responsible for maintain copies of all chain-of-custody forms and laboratory sample submission forms.

Field sampling personnel will be responsible for maintaining the field logbook. Field sampling personnel will be responsible for providing the quality assurance personnel with the above materials after each sampling period, to allow the QA personnel to carry out QA review and audit.

The QA personnel will also keep copies of all chain-of-custody and laboratory submission forms, and will be responsible for maintaining a record of the results of reviews and audits of the individual sampling periods (see below).

.2 Quality Control

.2.1 Submission of Duplicate Samples

Duplicate samples are obtained by dividing one sample into two or more identical sub-samples. This should be done on 5% of samples and each sampling run. The purpose is to obtain information on the magnitude of errors owing to contamination, random and systematic errors, and any other variabilities which are introduced from the time of sampling until samples arrive at the lab.

.2.2 Quality Assurance Audits

Immediately after completion of a sampling run, the designated quality-assurance personnel will carry out a review and audit of the sampling run. This will include

- Review of the field log book
- Review of copies of chain-of-custody forms and lab submission forms
- Interview with field sampling personnel

The purpose will be to determine whether or not automated sampling operations, sample handling, transportation, and chain of custody and laboratory submission procedures were properly executed.

If this review determines that there were errors or deficiencies in the procedures used, then the quality-assurance personnel will review the matter in detail with the field sampling crew to ensure that any necessary corrective action is taken to ensure that the problems do not recur. The QA personnel will make records of the errors or deficiencies and take any other corrective action that may be appropriate or necessary to avoid errors in data that results from the sampling run.