

Washington State Department of Ecology

Environmental Assessment Program

Standard Operating Procedures for the Collection of Fecal Coliform Bacteria Samples

Version 1.3

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EAP030

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Please note that the Washington State Department of Ecology's Standard Operating Procedures (SOPs) are adapted from published methods, or developed by in-house technical and administrative experts. Their primary purpose is for internal Ecology use, although sampling and administrative SOPs may have a wider utility. Our SOPs do not supplant official published methods. Distribution of these SOPs does not constitute an endorsement of a particular procedure or method.

Any reference to specific equipment, manufacturer, or supplies is for descriptive purposes only and does not constitute an endorsement of a particular product or service by the author or by the Department of Ecology.

Although Ecology follows the SOP in most instances, there may be instances in which Ecology uses an alternative methodology, procedure, or process.

SOP Revision History

Revision Date	Rev	Summary of changes	Sections	Reviser(s)
2/2/2007	1.0	Editorial; formatting	all	Bill Ward
2/9/2007		Internal Review	all	Dave Hallock
3/21/2007	1.1	Incorporate Comments, More Edits	all	Bill Ward
4/2/2007		QAO Review	all	Bill Kammin
4/5/2007	1.2	Incorporate Comments, More Edits	all	Bill Ward
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4/22/2007	1.3	Minor Edits	all	Bill Ward

Environmental Assessment Program

Standard Operating Procedure for the Collection of Fecal Coliform Bacteria Samples

1.0 Purpose and Scope

- 1.1 This document is the Environmental Assessment Program (EAP), Environmental Monitoring and Trends Section, Freshwater Monitoring Unit, Standard Operating Procedure (SOP) for the collection of freshwater samples for laboratory analysis of fecal coliform bacteria. The procedures in this SOP may also be used to collect other bacteria samples such as E. coli and Enterococci.
- 1.2 Freshwater can contain many potentially viable disease-causing microorganisms. Testing water samples for the presence of all disease-causing microorganisms is expensive. Due to the high cost, Ecology tests water samples for fecal coliform bacteria (an organism used as an indicator of the presence and level of potentially viable disease-causing microorganisms).

2.0 Applicability

- 2.1 This SOP is intended for freshwater monitoring.

3.0 Definitions

- 3.1 Ecology – Washington State Department of Ecology.
- 3.2 EAP – Environmental Assessment Program.
- 3.3 EIM – Environmental Information Management System. A searchable database developed and maintained by the Washington State Department of Ecology
- 3.4 Fecal coliform – A group of bacteria that inhabit the intestinal tract of warm-blooded animals and remain viable in freshwater for a variable period of time. The presence of fecal coliform bacteria in water indicates fecal contamination of the water by a warm-blooded animal; harmful bacteria and viruses associated with fecal contamination may also be present.
- 3.5 Field Logbook – A weather resistant logbook containing “Rite in the Rain” ® writing paper used to document any and all field activities, sample data, methods and observations for each and all collection sites.
- 3.6 MQO’s – Measurement Quality Objectives

3.7 MSDS – Material Safety Data Sheets provides both workers and emergency personnel with the proper procedures for handling or working with a particular substance. MSDS’s include information such as physical data (melting point, boiling point, flash point, etc.), toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment and spill/leak procedures.

3.8 QA – Quality Assurance

4.0 Personnel Qualifications/Responsibilities

4.1 Field operations require training specified in EAP’s Field Safety Manual (Ecology, 2006) such as First Aid, CPR, and Defensive Driving.

4.2 Boat operations require that staff meet specific training requirements as described in EAP’s Field Safety Manual, such as an EAP Boating Course and an approved Boating Safety Course.

5.0 Equipment, Reagents, and Supplies

Bacteria Sampler
with sample bottle



5.1 Bacteria Sampler

5.2 Sampling ropes 1 @ 10 ft., 1 @ 35 ft. and 2 @ 55 ft.

5.3 Extension pole with three prong clamp

5.4 Cooler containing ice

5.5 250 or 500 mL autoclaved bacteria sample bottles 1

5.6 Field Logbook or Field Data Report Form (see Attachment A for form)

6.0 Summary of Procedure

6.1 Field Preparation

6.1.1 Care should be used at all times to avoid contamination of the inside of the sample bottle, or the foil-covered silicon stopper or bottle cap. Also, the sample needs to be placed in ice in a cooler as soon as possible after collection. *Note: non-drinking water bacteria samples have a maximum holding time of 24 hours (APHA, 2000).*

6.2 Sample Collection

6.2.1 Bacteria Sampler Method. This method is typically used to collect samples when standing on a bridge, boat, or from the stream bank.

6.2.1.1 Secure the bacteria sample bottle into the bacteria sampler and attach the sampling rope.

6.2.1.2 Move to a well mixed location such as the deepest part of the active channel or where a representative sample may be collected.

¹ 500 ml sample bottles may be necessary if both fecal coliform and other bacteria tests are conducted.

- 6.2.1.3 Remove the aluminum foil covered stopper or cap and set it where contamination can be avoided.
- 6.2.1.4 Carefully lower the sampler to the water surface, taking care to not dislodge bridge debris onto it. Allow the bottom of the sampler to touch the water surface, and then raise the sampler off the water for a few moments to allow any debris from the bottom of the sampler to drop off and float away. *Note: This minimizes the sampling of any debris from the bottom of the sampler.*
- 6.2.1.5 Lower the sampler about 15 cm (6 inches) into the water. Allow the current to re-orient the sampler so the sample bottle is on the upstream side of the sampler. Then rapidly lower the sampler about 0.5 meters to completely submerge it. *Note: This minimizes the sampling of surface film.*
- 6.2.1.6 Retrieve the filled bottle taking care to not dislodge bridge debris onto it or the sampler.
- 6.2.1.7 Carefully replace the aluminum foil covered stopper or cap in a way that avoids contamination to the inside of the bottle. Also, do not touch the lower part of the stopper or inside of the cap with your hand.
- 6.2.2 Hand Dip Method. This method is typically used to collect samples within reach of the water surface (when standing in or near the stream or from small boat).
- 6.2.2.1 Move to a well mixed location such as the deepest part of the active channel or another location where a representative sample may be collected. Do not contaminate the sample location by wading upstream of it or collect a sample from an eddy that had been waded. *Note: Use the Extension Pole Method (see 6.2.2 below) if sampling from a lake.*
- 6.2.2.2 Grab the base of the sample bottle with one hand and remove the bottle cap. Then invert the bottle, reach upstream, and plunge the bottle into the water about 15 cm (6 inches), and then tip the bottle mouth up toward the water surface. Allow the bottle to fill and then take it out of the water. *Note: If sampling from a boat or in still water, plunge the bottle into the water, and move it away from the boat while tipping it to avoid contamination.*
- 6.2.2.3 Replace the aluminum foil covered stopper or cap in a way that avoids contamination to the inside of the bottle.
- 6.2.3 Extension Pole Method. This method is typically used to reach a more representative or undisturbed sample location from the stream bank, or when sampling a lake or slow moving stream.
- 6.2.3.1 Secure the bacteria sample bottle in the extension pole clamp.
- 6.2.3.2 Move to a location where a representative sample may be reached with the pole.

- 6.2.3.3 Remove the aluminum foil covered stopper or cap from the bottle and put it where contamination can be avoided.
- 6.2.3.4 Position the bottle over the desired sample location.
- 6.2.3.5 Invert the bottle and in one quick motion plunge the mouth of the bottle into the water about 15 cm (6 inches). Then slowly move the bottle upstream with the bottle mouth tipped toward the water surface until the bottle fills. If sampling a lake, then slowly move the tipped bottle away from the bottle entry point until it completely fills.
- 6.2.3.6 Take the filled bottle out of the water and then replace the aluminum foil covered stopper or cap in a way that avoids contamination to the inside of the cap and bottle

6.3 Field Processing

- 6.3.1 Label the collected sample bottle with the appropriate tag and place it in ice in a cooler to preserve the sample during shipment to the laboratory.
- 6.3.2 Record the date, time, and sampling location on a Field Logbook or Field Data Report Form.

7.0 **Records Management**

- 7.1 All hardcopy documentation of the data, such as completed Field Logbook and Field Data Report Forms are kept and maintained by the project lead. These documents are organized in binders or in expanding files. After about six years, hardcopies are boxed and moved to EAP archives.
- 7.2 Data collected for Ecology's Ambient River and Stream Monitoring Program will be entered into our Access-based database, reviewed and verified following the Quality Control and Quality Assurance procedures (see 8.1 below), uploaded into EIM, and posted on our web page http://www.ecy.wa.gov/programs/eap/fw_riv/rv_main.html.
- 7.3 Data collected for special project studies will be reviewed, verified, and stored based on the QAPP for the project.

8.0 **Quality Control and Quality Assurance**

- 8.1 The data QA program for field sampling consists of two parts: (1) adherence to the SOP procedures for sample/data collection and periodic evaluation of sampling personnel and (2) the collection of a field quality control (QC) sample during each sampling run. Our QA program is described in detail in Hallock and Ehinger (2003).

8.2 The field QC sample is collected as a duplicate sequential field sample. This consists of the collection of an additional sample approximately 15-20 minutes after the initial collection at a station. This sample represents the total variability due to short-term, in-stream dynamics, sample collection and processing, and laboratory analysis.

8.3 A two-tiered system will be used to evaluate data quality of individual results based on field QC. The first tier consists of an evaluation of the variability in field duplicates and the reasonableness of the result. Results exceeding pre-set limits were flagged. The second tier QC evaluation is a manual review of the data flagged in the first tier. Data are then coded from 1 through 9 (1 = data meets all QA requirements, 9 = data are unusable). Criteria for assigning codes are discussed in more detail in Hallock and Ehinger (2003). We do not routinely use or distribute data with quality codes greater than 4. *Note: results from highly turbid samples are estimated.*

9.0 Safety

9.1 Safety is the primary concern when collecting samples. Since most sample sites are located on highway bridges, road and pass conditions should always be checked before departure (especially in winter). If roadside hazards, weather, accidents, construction, etc. make sample collection dangerous, then skip that station. Note the reason on the Field Data Report Form and notify your supervisor of the hazard when you return to the office. If the hazard is a permanent condition, relocation of the station may be necessary. Review Ecology's Safety Program Manual periodically to assist with these safety determinations.

10.0 References

10.1 APHA (American Public Health Association), 2000. Standard Methods for the Examination of Water and Wastewater-Fecal Coliform Method No: 9222D 24 hour Membrane Filter (MF) method. 20th Edition.

10.2 Ecology, 2006. Environmental Assessment Program Safety Manual. Olympia, WA.

10.3 Ecology, 2006. Chemical hygiene plan and hazardous material handling plan. Olympia, WA.

10.4 Hallock, D. and W. Ehinger, 2003. Quality Assurance Monitoring Plan: Stream Ambient Water Quality Monitoring. Washington State Department of Ecology, Olympia, WA. 27pp. Publication No. 03-03-200.
www.ecy.wa.gov/biblio/0303200.html

ATTACHMENT A

FIELD DATA REPORT FORM



FIELD DATA REPORT FORM

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SURVEY SAMPLER PAGE OF

STATION NO.	STATION NAME	TIME	TEMP °C	DO mg/L	DO #	TEMP	TRUE pH	COND μMHOS/CM	BARO. PRESS. in. Hg	*	STAGE HEIGHT	CHK BAR/ WT LNGTH ADDTN	COMMENTS
						pH	METER						

WEATHER, etc.:

Relinquished By:	Received By:	Da	Hr	Mn	Comments

