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SAN FRANCISCO BAYKEEPER

STANDARD OPERATING PROCEDURE

Volunteer Monitoring of Marine Waters for Bacteria and Standard Water Quality Parameters

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1. BACKGROUND & APPLICABILITY

This Standard Operating Procedure (SOP) defines the procedures that all staff and volunteers must follow when taking samples to be analyzed for fecal indicator bacteria and when measuring water quality parameters.

One of the indicators of poor water quality is the presence of pathogens, disease causing viruses, bacteria and protozoans. Often, the presence of pathogens is the result of fecal contamination which, in marine waters, can be the result of inadequately treated sewage, urban runoff, boat and marina waste, combined sewer overflows, and animal waste. Testing for directly pathogens is difficult and expensive. As a result, this monitoring program is designed to test for “indicator” species instead. Indicator species are bacteria that appear in feces. Therefore, the presence of indicator bacteria, such as *E. coli*, total coliforms and enterococcus, also indicates that a water body is contaminated with fecal matter.

2. METHODS SUMMARY

2.1 Sample collection. Water samples will be collected using sterile Whirl-pak grab bags.

2.2 Temperature. Temperature will be measured using a YSI multimeter. The multimeter measures temperature using a thermistor, which measures temperature based on changes in electrical resistance.

2.3 pH. pH will be measured using a YSI multimeter. The pH probe measures the pH of a liquid using two electrodes that measure voltage. One electrode is contained in a liquid that has a fixed pH. The other electrode responds to the pH of the water sample. A voltmeter in the probe measures the difference between the voltages of the two electrodes. The meter then translates the voltage difference into pH.

2.4 Conductivity. Conductivity, a measure of the ability of water to pass an electrical current, will be measured using a YSI multimeter probe.

2.5 Dissolved Oxygen. Dissolved oxygen (DO) will be measured using a steady state polarographic probe on a YSI multimeter. The probe measures dissolved oxygen based on the rate of molecular oxygen diffusion across a membrane.

2.6 Clarity. Clarity will be measured using a Secchi disk.

3. HEALTH AND SAFETY

3.1 Always be aware of your surroundings; do not take a sample if doing so could put you in a precarious situation.

- 3.2** Wash your hands before and after a sampling trip. Sterile latex gloves should be worn when collecting samples to prevent contamination of the samples and to protect you if pollution is suspected.
- 3.3** Report all accidents immediately to Baykeeper staff.

4. APPARATUS AND MATERIALS

- 4.1** Monitoring Binder with: maps to sample stations, sampling schedule, and Field Data Sheet.
- 4.2** 500 mL sterile Whirl-Pak bags labeled with the sample ID.
- 4.3** Disposable latex gloves.
- 4.4** YSI 556 Multiprobe System.
- 4.5** Secchi disk.
- 4.6** Sterile water for field blanks and to rinse probes.
- 4.7** Garmin GPS.
- 4.8** Cooler with ice.
- 4.9** Disposable plastic bags for garbage.

5. PROCEDURES

5.1 Observations of Environmental Conditions

- 5.1.1** Enter the appropriate information at the top of the Field Data Sheet to identify the Station ID, Station Name, Trip ID, Visit ID, names of observers, and other relevant information required.
- 5.1.2** Observations of environmental conditions are made at each site where a sample is collected. On the Field Data Sheet, circle the underlined option that best describes the current conditions for each available field.
- 5.1.3** Describe any unusual conditions that might affect the sample on the back of the Field Data Sheet.

5.2 Water Quality Parameter Measurements

5.2.1 Remove the clear plastic transport cup from the multimeter and replace it with the black sensor guard.

5.2.2 Immerse the multimeter at the depth at which you will be collecting the water sample (approximately 1 foot for surface sample). Gently rock the probe back and forth to induce mixing of the water around the probe.

5.2.3 Wait for the probe displays to stabilize (60-90 s).

5.2.4 Record the results in the appropriate area of the Field Data Sheet.

5.3 Sample Collection

5.4.1 Label the whirl-pak bag with the sample ID number using waterproof ink.

5.4.2 Put on a set of new sterile gloves.

5.4.3 With gloved hands, open the whirlpak and attach it to the sampling line.

5.4.4 Collect a 300 mL sample from surface water at the immediate point of discharge where stormwater reaches the Oakland Inner Harbor..

5.4.5 Close the bag by “whirling” it or folding the top edge over itself 3-4 times and twisting the ties together. Gently squeeze the bag to ensure an airtight seal has been formed.

5.4.6 Place immediately in the cooler and cover with ice.

5.4.7 Record the time at which the sample was collected.

5.4.8 For each sampling day, prepare one field blank (to identify cross contamination). Prepare the blank by pouring distilled or deionized water into a whirl-pak, sealing and placing on ice.

5.4.9 When directed, prepare a duplicate sample by collecting a sample and then, using identical technique, immediately collecting a second sample.

5.4.10 When directed, prepare a split sample (to be analyzed by another laboratory for quality control purposes). Prepare a split sample by collecting a sample and then pouring half of the contents of the whirl-pak into a second whirl-pak. Close and place on ice.

5.5 Sample Transport

5.5.1 Make sure that ice covers the samples, the cooler lid is closed and that samples remain cool.

5.5.2 Deliver to the Barkeeper Lab for processing within 6 hours. Samples must be discarded if holding time exceeds 6 hours.

5.5.3 Complete a Chain of Custody Form if the person collecting the samples is different from the person analyzing the samples.

6 DOCUMENTATION

6.1 On the top of the Field Data Sheet, record the time the samples were delivered to the lab.

6.2 Complete a Chain of Custody Form if you are not personally processing the samples.

7. QUALITY ASSURANCE AND QUALITY CONTROL

7.1 Equipment Calibration

The YSI 556 Multi-Probe System must be calibrated before each monitoring trip. The directions for calibrating the YSI meter are contained in the Lab Equipment and Maintenance Notebook in the laboratory. All calibration results must be recorded in the Calibration Log for each meter. See page 10 of the Quality Assurance Project Plan.

7.2 Field Duplicates

Collect field duplicates once per sampling day or once per ten samples collected, whichever is greater. See page 10 of the Quality Assurance Project Plan. At least twice a year, a field duplicate should be sent to the EPA's Richmond laboratory for independent analysis.

7.3 Field Blanks

To ensure sterile technique, field blanks should be collected once per sampling event.

REFERENCES

USEPA, *Standard Operating Procedures for Volunteer Monitoring of Surface Waters for Bacteria*, EPA SOP # 1106, Rev #3, December 2001.

USEPA, *Volunteer Stream Monitoring: A Methods Manual*, EPA 841-B-97-003, November, 1997.

USEPA *Volunteer Estuary Monitoring: A Methods Manual*, EPA 842-B-93-004, December, 1993.