



Environmental Analysis Program

Pomona College
Biogeochemistry Laboratory

SOP-F300

Surface Water Sampling

Standard Operating Procedure

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1. Purpose

This SOP describes procedures for the manual collection, preservation, and handling of surface water samples. Representative samples are required for defensible water quality data (APHA et al., 2012; US Environmental Protection Agency, Region 4, 2014).

2. Scope

- **Applies to:** Manual collection of surface water samples from streams, rivers, lakes, ponds, lagoons, surface impoundments, wastewater access points, and outfalls
- **Does not apply to:** Automated sampling devices, pelagic marine sampling, or groundwater sampling
- **Location:** All EA Program surface water field sites

3. Responsibilities

Role	Responsibility
Lab PI	Approve sampling plan, ensure training compliance
Field Lead	Coordinate logistics, verify equipment and supplies
Trained Personnel	Collect and handle samples per this SOP
New Students	Complete training before independent sampling

3.1. Required Training

- [SOP-F001 Field Safety](#)
- [SOP-L003 Hazardous Materials Handling](#) (for sample preservation chemicals)

4. Definitions

- **Bailer:** A cylindrical sampling device lowered on a line to collect water at a specific depth; commonly used in wells and deep water; can be disposable (polyethylene) or reusable (stainless steel).
- **Bottle blank:** A sample container filled with laboratory-pure water, preserved identically to field samples, and submitted to the laboratory as a QC sample to detect contamination from the container or washing process (APHA et al., 2012).

- **Chain of custody (COC):** A legal record of sample possession at every transfer point from collection to analysis; must accompany all samples; see [SOP-F008](#) for the full procedure (US Environmental Protection Agency, Region 4, 2014).
- **Discrete-depth sampler:** A device (Van Dorn, Kemmerer bottle) that collects a water sample from a specific depth without mixing with overlying or underlying water; tripped by a messenger weight.
- **Equipment blank:** Laboratory-pure water poured through or into sampling equipment in the field, collected and analyzed as a QC sample to verify equipment cleanliness.
- **Field duplicate:** A second sample collected at the same time and location as a primary sample and submitted blind to the laboratory; used to assess field and laboratory precision.
- **Grab sample:** A single-point, instantaneous water sample collected at one time and place; represents conditions at that moment only; the simplest and most common field collection method (APHA et al., 2012).
- **Holding time:** The maximum elapsed time between sample collection and analysis within which the sample remains analytically valid; analyte- and preservative-specific (e.g., 6 h for *E. coli*, 28 d for nitrate preserved with H_2SO_4) (APHA et al., 2012).
- **Peristaltic pump:** A battery-operated field sampling pump that moves sample water through disposable tubing by compressing the tube with rollers; used to collect samples from depths or locations inaccessible by hand.
- **Preservative:** A chemical added to a sample container to retard biological or chemical degradation of target analytes during transport and storage (e.g., H_2SO_4 for nutrients, HNO_3 for metals, $\text{Na}_2\text{S}_2\text{O}_3$ for chlorine) (APHA et al., 2012).
- **Sampler blank:** Laboratory-pure water passed through or into a sampling device (bailer, peristaltic pump) and submitted as a QC sample to verify the device is clean.
- **Zero headspace:** A sample container filled completely with no air gap; required for volatile organic compound (VOC) samples to prevent analyte loss to the headspace.

5. Safety and Hazards

Hazards

- **Biological/Chemical:** Water bodies may be contaminated; avoid ingestion and direct skin contact.
- **Physical:** Drowning risk, slippery surfaces, swift currents, unstable banks, and bridge traffic.
- **Chemical:** Sample preservatives (H_2SO_4 , HNO_3 , NaOH) in pre-preserved bottles are corrosive.

5.1. Required PPE

- ☐ Latex or nitrile gloves
- ☐ Leather gloves (for handling ropes and cables)
- ☐ Antibacterial hand sanitizer or soap
- ☐ Personal flotation device (PFD) when sampling from boats or in deep/swift water
- ☐ Safety vest and lines (as appropriate for the site)
- ☐ Traffic control signs and cones (for bridge sampling)

5.2. Emergency Procedures

Refer to [SOP-F001 Field Safety](#) for emergency response procedures, including medical emergencies near water.

6. Summary of Collection Methods

Sampling situations vary widely and no universal procedure applies. Representative samples from most surface waters can be collected by one or more of the following:

- Bailers
- Dip samplers
- Direct method (hand collection)
- Discrete depth samplers (Kemmerer or Van Dorn bottles)
- Peristaltic pumps
- Stormwater collection devices

(APHA et al., 2012; US Environmental Protection Agency, Region 4, 2014)

7. Required Materials

7.1. Field Documentation

- Field notebook and pens (per [SOP-F003](#))
- Chain of custody forms (per [SOP-F008](#))
- Sample tags with assigned sample numbers
- Field data sheets

7.2. Sampling Equipment

Item	Notes
500 or 1000 mL sampling bottles	Polypropylene or glass, as required by the analyte
Syringe filters (0.45 µm)	For dissolved analyte samples
Stainless steel or Teflon dipper	For surface grab samples
Depth-integrated sampler	For vertically integrated samples
Van Dorn or Kemmerer sampler	For discrete depth samples
Extension pole with container holder	For sampling from piers, docks, or banks
Deionized / ultrapure distilled water	For blanks and equipment rinsing
Decontamination supplies	To prevent invasive species transfer

7.3. Transport and Storage

Item	Notes
Coolers with ice	Pre-chilled to 4 °C
Pre-labeled sample containers	From the analytical lab, with preservatives
Custody seals	For sealing coolers before shipment

8. Interferences and Contamination Prevention

! Critical

The inner surfaces of sample bottles and caps must not be touched with bare hands, gloves, or any other material. Keep sample bottles in a clean environment away from dust, dirt, fumes, and vehicle exhaust (APHA et al., 2012).

- Collect samples upstream of your position and upstream of any sampling-related disturbance.
- Sample away from areas influenced by tributaries, outfalls, or other point sources unless those features are the target.
- Change gloves between sample sites to prevent cross-contamination.

9. Procedure

9.1. Field Collection – Direct Method (Grab Sample)

1. Remove the stopper or lid from the container just before sampling.
2. Do not contaminate the cap, neck, or inside of the bottle.
3. **If no preservative is present:** Face upstream in flowing water (or upwind in still water). Hold the container near its base, reach out in front of your body, and plunge it mouth-down below the surface to approximately mid-water column.
4. If the water is too shallow for this technique (risk of disturbing sediment), collect a surface water sample and note the change of method in the field notebook.
5. Fill the bottle to the appropriate level for the target analyte.
6. Leave a small headspace for mixing, **except** for volatile organics and alkalinity samples (no headspace).

9.2. Field Collection – Extension Pole

1. Securely attach the sample container (lid in place) to the pole holder using clamps.
2. Remove the lid carefully to avoid contamination.
3. Follow the direct method procedure above.
4. Do not use this method for pre-preserved containers; use intermediate devices instead.

9.3. Field Collection – Pre-Preserved Containers

1. Hold the container upright.
2. Place the lid over the mouth to create a small opening.
3. Submerge and fill carefully to avoid spilling or diluting the preservative.

9.4. Field Collection – Intermediate Devices

For samples collected via Van Dorn, Kemmerer, bailer, or peristaltic pump, follow the device operating instructions (see [SOP-F202](#) for pump procedures). Transfer collected water to appropriate labeled sample containers promptly (US Environmental Protection Agency, Region 4, 2014).

Sampler Blanks

Prepare periodic sampler blanks by pouring ultrapure distilled water through or into the sampler and submitting for laboratory analysis to verify cleanliness (APHA et al., 2012).

10. Sample Preservation, Handling, and Storage

Once samples are collected:

1. Transfer samples to correctly labeled containers.
2. Preserve immediately, or verify that pre-preserved bottles were used (see holding-time requirements, Table 9.1 in APHA et al. (2012)).
3. Record all pertinent data in the field notebook and on the COC form.
4. Attach custody seals to the cooler before transport.
5. Decontaminate all sampling equipment before collecting additional samples (see [SOP-F007](#)).

Important

Samples must never stand in the sun. Store on ice in coolers immediately after collection and ship to the laboratory without delay (US Environmental Protection Agency, Region 4, 2014).

11. Quality Control

11.1. Bottle Blanks

Before each field trip, select one sample bottle per ten of each container type, fill with ultrapure distilled water, preserve identically to field samples, and submit for analysis as a “bottle blank” (APHA et al., 2012).

11.2. Field Duplicates

Collect one field duplicate per 10 samples (minimum one per event). Duplicates are collected from the same location at the same time and submitted blind to the laboratory.

11.3. Equipment Blanks

When non-dedicated sampling equipment is used, collect an equipment blank (ultrapure distilled water through the equipment) and submit for analysis.

11.4. Documentation

- Complete the COC form before samples leave the field.
- Record all deviations from this SOP in the field notebook.
- Photograph site conditions at each sampling location.

12. References

- APHA et al. (2012)
- US Environmental Protection Agency, Region 4 (2014)

APHA, AWWA, & WEF. (2012). *Standard methods for the examination of water and wastewater* (22nd ed., p. 1360). American Public Health Association.

US Environmental Protection Agency, Region 4. (2014). *Operating procedure for sediment sampling* (SESDPROC-200-R4). Science; Ecosystem Support Division, US EPA. <https://www.epa.gov/quality/sediment-sampling>

13. Related SOPs

SOP	Title	Relationship
F001	Field Safety	Required prerequisite
F007	Field Decontamination	Equipment cleaning between sites
F008	Sample Labeling and COC	Chain of custody
F205	Handheld Turbidity Meter	Field turbidity
F208	Portable Colorimeter	Field nutrients/metals
F209	Dissolved Oxygen Meter	Field DO measurement

14. Training Record

Before collecting surface water samples independently, personnel must:

1. Read this SOP, [SOP-F001](#), and [SOP-L003](#) in full
2. Demonstrate correct grab sampling technique (contamination prevention, bottle handling)
3. Demonstrate proper use of pre-preserved containers and at least one intermediate device (bailer, Van Dorn, or pump)
4. Complete at least one supervised sampling event including COC completion and sample cooler packaging
5. Be signed off by the PI or field lead