# Standard Operating Procedure (SOP) #7

## *Collecting Freshwater Samples: General Procedures*

Version 2.03 (July 2, 2021)

### Change History

| New Version # | Revision Date | Author | Changes Made | Reasons for Change | Previous Version # |
|---|---|---|---|---|---|
| 2.0 | 5/27/2016 | David Raikow | The former SOP #7 has been split into multiple SOPs; new procedures and details added | Too much in one SOP; changes made reflect current practices | 1.0 |
| 2.01 | 7/17/2019 | Kim Weisenborn | Minor updates to content | To update outdated SOP references and external links | 2.0 |
| 2.02 | 5/11/2020 | David Raikow | Appendices incorporated into text. Field binder elements moved to SOP #2. | General reorganization. | 2.01 |
| 2.03 | 7/2/2021 | Kim Weisenborn, Amanda McCutcheon | Updated to NRR formatting, minor text updates | Formatting needed to be applied, text updates for clarification | 2.02 |

Only changes in this specific SOP will be logged here. Version numbers increase incrementally by hundredths (e.g., version 1.01, version 1.02) for minor changes. Major revisions should be designated with the next whole number (e.g., version 2.0, 3.0, 4.0). Record the previous version number, date of revision, author of the revision, changes made, and reason for the change along with the new version number.

### Purpose

This SOP outlines general considerations and procedures common to water quality sampling in freshwater ecosystems in all parks. For groundwater well water collection procedures refer to SOP #8 Collecting Groundwater Samples at Kaloko-Honokōhau National Historical Park (KAHO). For marine ecosystem water collection procedures, refer to SOP #9 Collecting Marine Water Samples.

### All Ecosystems

- Collect water from just below the water surface to avoid disturbance of sediment on the bottom or collection of floating material.
- Take care that the sonde does not disturb sediment at the site of water collection.
- Replicate sub-samples should be taken from the same place.

- Use forceps to place a GF/F filter on a filter tower, ensuring proper final placement of the filter. Extra filters and filter forceps should be packed in a Ziploc bag in order to change the filter in the field.
- Syringes and loaded filter caps can be used as a backup in the event the filter tower malfunctions.

### All Streams

- Collect water at the 30 m transect when concurrent with the Stream Monitoring Protocol.
- Do not walk through the area from which water samples will be taken.

### Kauhako Lake, Kalaupapa National Historical Park (KALA)

- Although it is preferable that samples be taken from the center of the lake, samples must be taken at the edge as mandated by the KALA Chief of Cultural Resources.

### High-altitude lakes, Haleakalā National Park (HALE)

- Collect samples from the center of lakes when possible.

### Wetlands, American Memorial Park (AMME)

- Extra personal protective precautions must be taken when sampling from the sewer outflow to protect from bacteria. Consult the AMME Job Hazard Analysis for specific safety actions.

### Filtered and Unfiltered Sampling

Standard sampling is three replicate independent-grab field-filtered samples per site. Additional unfiltered samples are taken at selected sites, currently:

- Puʻukoholā Heiau National Historic Site (PUHE): Unnamed gulch (FPUHE01, 02, and 03)
- Puʻuhonua O Hōnaunau National Historical Park (PUHO): All three royal compound anchialine pools (FPUHO03, 04, and 05).
- American Memorial Park (AMME): Wetlands (FAMME01, 02, 03, 09).

<u>To pair filtered and unfiltered samples at a site</u>:

1. Use a 1L bottle, or Niskin in the case of marine sampling, to make a grab.
2. For the unfiltered samples, rinse each sample bottle 3 times with about 20 mL of unfiltered water poured directly from the 1L bottle or Niskin.

3. Filter the remainder of the water (or grab a new sample if not enough water remains) through a clean filter tower loaded with a GF/F filter.
4. Use this filtered water to rinse all 3 sample bottles that will house filtered samples. Discard unused filtered water from the bottom chamber.
5. Grab a new sample using the 1L bottle or the Niskin.
6. Pour unfiltered water into a sample bottle for an unfiltered replicate.
7. Filter a portion of the remaining water from the 1L bottle for a filtered replicate.
8. Repeat to produce three replicate pairs of samples. Samples A, B, and C should be filtered samples and D, E, and F should be unfiltered. A is paired with D, B with E, and C with F.

### Field Filtering

- Filtering will occur in the field at the time of sampling.
- Filter towers are the first choice of filtering method in the field. Currently used filter towers are "Thermo Scientific Nalgene Reusable Filter Holders with Receiver."
- Syringes and in-line filters are only to be used as a back-up.
- 0.7 µm GF/F filters are to be used at all times.

### General Procedures for All Samples

- 1L Nalgene HDPE sample collection bottles or similar may be used to grab samples. Each bottle should be cleaned with a brush but not with cleaner, and dedicated to a specific park and specific resource type (i.e., HALE streams or PUHE brackish)
- Each replicate will be a separate grab but see pairing of filtered and unfiltered sampling.
- Three replicate samples are to be collected at each site.
- Collect samples in 125 mL Nalgene square PETG media bottles with closure.
- Sample bottles in the field are to be placed on ice in the dark, e.g., inside a cooler or insulated backpack.
- Samples are to be transferred to a freezer on the day of collection, if possible, with rare exceptions such as Hawai‘i Volcanoes National Park (HAVO) pools at Halapē or KALA upper portions. If it is not possible to use a freezer, a cooler of ice can also be used.
- Samples are to be transported to HAVO while frozen as quickly as reasonably possible.

- Samples are to be delivered to the sample processing lab as quickly as possible.

### Filter Tower Use

1. Use filter forceps to load a 47mm GF/F glass microfiber filter into the tower.
2. Secure the top portion using the tightening-ring taking care not to rip the filter. If filter rips or is damaged in any way replace the filter immediately.
3. Add water to the top chamber.
4. Attach a tube to the bottom chamber and plug the outlet.
5. Using a hand-pump attached to the bottom chamber, apply a vacuum no stronger than 15 mmHg. Generally, you should be able to pull water through the filter using a pressure of no greater that 5-10 mmHg. If the pressure lingers around 10 mmHg or if water is taking a long time to move through the filter, change the filter.
6. Filter enough water to rinse each sample bottle three times.
7. Rinse the sample bottle three times with ~20 mL of water dumping water from the sample bottle between each rinse.
8. After the sample bottles have been rinsed dump the remaining water in the lower chamber. This acts as a rinse of the lower chamber.
9. Place water from a new grab in the filter for the first replicate. Filter as above.
10. Fill the sample bottle only up to the shoulder with filtered water. It is very important not to over-fill the bottle because the sample will expand when frozen. Cap the bottle.
11. Discard remaining water before filtering water for the next replicate. Collect, filter and dispense water for replicates B and C.
12. Filters should be changed at every site when possible. Additionally, the level of clogging indicates when filters should be changed. If in doubt, change the filter. The filters should be changed at least daily as well as if multiple park units will be visited within the same day.
13. Pour out all remaining water from the bottom chamber between sites.

***Post-trip:***

1. Send filter towers to the HAVO technician after each field trip.
2. The HAVO technician will deliver used towers to the sample processing lab for acid washing.
3. Notify the HAVO technician if filter towers are needed for the next sampling trip.

4. It is the responsibility of the remotely-based technician to request cleaned towers and other supplies including bottles and calibration solution well in advance.

### Syringe Use

Syringes may be used as a backup if a functional filter tower and hand pump are not available, but filter towers are the preferred method.

1. Filter holders should be pre-loaded with new GF/F filters before entering the field.
2. Rinse the sterile (or acid washed) 140cc syringe 3 times at the selected site, each time disposing of the 'rinse water' away from the site.
3. After drawing the water sample, place a filter holder with a GF/F filter over the syringe.
4. Rinse the sample bottle 3 times with filtered sample water.
5. Dump rinse water away from the sampling site.
6. Slowly and carefully plunge the site water through the syringe and filter into the rinsed 125 mL bottle.
7. If the filter becomes clogged (passing sample water through the cap is difficult or impossible), replace the filter holder.
8. Water should never be forced through a clogged filter.

### Datasheet

- Date: Fill out field using the format mm/dd/yyyy.
- Park: Enter the four letter designation for the park in which you are working.
- Station number: Enter the station number.
- Station type: Circle Fixed site if this is a fixed monitoring station or Temporary site if it is not.
- Time: Enter the starting time next to s: and the ending time next to e:
- Resource type: Circle the resource type being monitored. Anchialine pools are brackish.
- Names: Enter the names of the field personnel present at the sampling site.
- Site location: Enter the Latitude and Longitude (in decimal degrees) and error (in meters) as displayed by the GPS (Global Positioning System).

- Environmental Conditions: Circle the appropriate cloud cover as described. Sunny weather is less than 25% cloud cover, Partly cloudy is between 25% and 75% cloud cover, mostly cloudy is greater than 75% cloud cover, overcast is complete overcast, and rain indicates that it is raining.

- Wind Direction: Enter the direction from which the wind is blowing using 8 point cardinal direction (N/NE/E etc.).

- Wind Speed: Use Kestrel to measure wind speed when available or estimate speed using the Beaufort scale (Table SOP 7.1). Enter speed in kilometers per hour (kph).

**Table SOP 7.1.** Beaufort force classifications. This table is an incomplete representation of the Beaufort scale. Force 7-12 also exist, but no field technician should ever be working in conditions above a strong breeze.

| Force | Wind (kph) | WMO Classification | Appearance of Wind Effects on the Water |
|---|---|---|---|
| 0 | 0-2 | Calm | Sea is like a mirror |
| 1 | 2-5 | Light air | Ripples with appearance of scales; no foam crests |
| 2 | 6-12 | Light breeze | Small wavelets: crests of glassy appearance, not breaking |
| 3 | 13-19 | Gentle breeze | Large wavelets: crests begin to break; scattered whitecaps |
| 4 | 20-29 | Moderate breeze | Small waves, becoming longer; numerous whitecaps |
| 5 | 30-39 | Fresh breeze | Moderate waves, taking longer form; many whitecaps; some spray |
| 6 | 40-50 | Strong breeze | Larger waves forming; whitecaps everywhere; more spray |

## Digital Photograph Information

- The number of the initial pictures of the sampling station should be entered in the outlined box. Indicate the direction you are facing when taking the picture. Direction can be eight-point cardinal, or upstream/downstream.

- For any other pictures taken, indicate the picture number, the direction you are facing, and any comments regarding the description of what the picture is of (i.e., oil cans near site, dead bloated cow in stream, etc.)

## Water Condition Assessment

- Tidal Stage: Circle the appropriate tidal stage at the time of sampling if applicable (this will primarily apply to brackish water and marine samples).

- Direction: Circle the direction of tidal flow at the time of sampling if applicable (this will primarily apply to brackish water and marine samples).

- Wave height: Estimate the wave height in meters and enter it in the space provided if applicable (this will primarily apply to marine samples).

- Flow Level: Circle the appropriate Flow Level (Table SOP 7.2).

- Sampling Depth: Enter the sampling depth in meters.
- Relative Depth: Circle the appropriate sampling depth.
- Water Depth: Enter the total water depth in meters.

**Table SOP 7.2.** STORET terminology for flow level.

| Choices | Description |
|---|---|
| Dry | No visible water in stream (typical of dry period for an ephemeral/intermittent stream). |
| No Flow | Discrete pools of water with no apparent connecting flow (at surface). |
| Low | Base flow for a stream or flow within roughly 10% to 20% of base flow condition. |
| Normal | When stream flow is considered normal (greatest time that stream is characterized by this in terms of flow quantity, level, or general range of flow during a falling or rising hydroperiod, but above base flow). |
| Above Normal | Bank full flow or approaching bank full (generally within upper 20% of bank full flow condition). |
| Flood | Flow extends outside normal bank full condition or spreads across floodplain. |

## Habitat Description and Site Comments

- Enter a general habitat description of the sampling site, including as much information as possible. If there are any general site issues or comments that may affect the sampling activities or results within this station, enter them here.
- Estimated canopy cover: Estimate the total canopy cover as a percent and enter it in the area provided.
- Elevation: Use estimates given on GPS unit to fill in the elevation of the site

## Water Quality Sampling

Record water temperature, pH, turbidity, dissolved oxygen (% an mg/L), conductivity, and salinity. Enter in any comments directly related to any sampling activity occurring at this site. For example, if the instrument battery dies or the sonde is collecting a clearly erroneous reading that would be entered here. Also enter any issues surrounding the sampling activity that deviate from the standard outlined procedures.

### Water Sample Container Label Number

Indicate the labeling on the water sample bottle collected at the site.

### Enter into Database

Check this box to indicate that this datasheet has been entered into the PACN Water Quality Monitoring Database.