
Aqua-GAPs Freshwater Passive Sampling Protocol:



Research centre
for toxic compounds
in the environment

Application to Tube Shrouds



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!! IMPORTANT – PLEASE READ !!

Before travelling to the field site:

- **Read all sections of this Guide**
- **Ensure that you have all necessary materials (listed in the guide)**

1 Package contents – Tube shroud and sample holder.

- 1 One sample holder with cable (Figure 1)
- 2 One protective shroud and nuts/bolts (Figure 2)
- 3 Pins, washers and cotter pins to keep the sheets on place (mounted in the holder) (Figure 3)
- 4 Plastic tubes containing jars/vials with samplers (Figure 4), each jar/vial labelled with “aqua-gaps FW” (FW – freshwater), type, and a sequence number:
 - Silicone Rubber (SSP) Samplers (2 amber 100 mL jars each containing 5 SSP)
 - Polyethylene (LDPE) Samplers (2 amber 40 mL vials each containing 5 LDPE)
 - Scourer (soxhletted with methanol) wrapped in foil for cleaning the sheets after removal
- 5 **Until exposure the jars with samplers are best stored in a freezer.**

2 Items needed for sampler deployment

- 1 Sample holder and protective shroud assembly and hardware
- 2 Tools for attaching hardware (e.g. wrenches (adjustable or 7/16 inch), pliers)
- 3 Clean disposable laboratory gloves
- 4 Non-sharp tweezers
- 5 a clean stainless steel tray or aluminium tray or aluminium foil (solvent cleaned) and optionally a steel mesh that can be used to sort the samplers on
- 6 Clean lab tissues
- 7 Thermometer, conductivity or salinity meter

See also Figure 5

3 Items needed for sampler retrieval

- 1 The sampler jars and field controls
- 2 Tools to remove nuts / bolts (wrenches, pliers, bolt cutters)
- 3 Clean disposable laboratory gloves
- 4 Non-sharp tweezers
- 5 The methanol washed scourer for cleaning of sampler sheets after exposure.
- 6 Beaker, or anything else not obviously polluting to sample some local water
- 7 Clean stainless steel tray, metal pot, or metal bowl (NO plastic) to clean the samplers in.
- 8 Clean lab tissues to dry the sheets

See also Figure 5

4 Choosing Deployment Locations

Ideally sampler housings will be deployed in open lake waters accessing the location by boat. This reduces potential interference by curious people, and ensures the sampling location is set away from direct sources.

If deploying along the shoreline, attempt to find a pier, jetty, dock or quay that ensures the sampler is out into the water as much as possible. The risk of vandalism or theft should be considered, and appropriate measures should be taken to minimize this risk (e.g. by hiding, camouflaging, using secure areas, or using locks).

Please find a location that is not directly impacted by a local source (avoid river mouths, sewer discharges and other outfalls).

5 Sample Housing Configuration

The sample holder frame (Figure 1) is made of stainless steel and has strong stainless steel cable with eye loops supporting the frame and housing. This allows the housing to turn in the water conditions and prevent twisting and tangling of deployment lines. The eye loops allow flexibility to hang the housing between anchor and float, from a buoy, pier, or quay. Ensure secure fastening to the loops. For example, **knots in ropes need to be secured with cable ties.**

6 Deployment

1 Deployment Configuration: The samplers in housings should be deployed with a combination of anchor and float/buoy, but could also hang from a navigation buoy, or from a pier/dock/quay (examples in Figure 6). The stainless steel cable loops should allow flexibility to accommodate whatever local arrangements you have for deploying the samplers. If using navigation buoys, make sure that the deployments do not interfere with the buoy maintenance schedule. Long ropes will wind up around nearby objects.

2 Sampler Depth: Typically, a sampling depth of 1 - 4 m below the surface is appropriate for lake waters, as this is typically within the mixed layer if the lake stratifies. If the local water depth is less than 4 m, then the half depth can be chosen, but should be at least 1 m in depth.

3 Field Controls: A **field control** is a sampler that goes through the same procedure as deployed sheets but without contact with the water to be sampled:

- Two of the 10 polyethylene (LDPE) sheets and two of the 10 silicone rubber (SSP) sheets will be kept as field controls. These will be removed from the glass jars / vials at the same time as the sample sheets and exposed on the stainless steel tray or aluminium foil for the time required to assemble and deploy the unit. Then put the sheets back in one of the jars/vials they came in and store in a freezer between deployment and retrieval.
- Use the first / lower numbered jar/vial for to store the field controls. [For example, if the amber jars and vials are have Sample Nr 21 and 22, then place the SSP field controls (2 sheets) in jar number 21, and place the LDPE field controls (2 sheets) in vial number 21.]
- Keep the second / higher numbered jar/vial capped and sealed for recovery of samplers.

4 Before Deployment: Make sure all materials (tray, foil, tweezers, etc.) are clean, solvent rinsed if possible before going to the field site. Use clean floats and lines (cable or ropes).

- **Before exposing the sheets**, set up the mounting gear (weights, float/buoy, cable/rope, with whatever attaching hardware you need. If possible test the deployment set up with the housing without the sheets to ensure you have the set up together as required. This will minimize the time sheets are exposed out of water prior to deployment and once mounting of the sheets begins.
- Prepare a clean working surface (for example on aluminium foil) and a stainless steel or aluminium tray for setting the samplers out for mounting. If you don't have a steel or aluminium tray, then a large diameter steel / aluminium cooking pot can be used.
- Using clean gloved hands and tweezers, remove the samplers from the jars and place in the tray/pot. **Set aside 2 SSP and 2 LDPE sheets** from each set of 10 to use as **field controls** (as described above). Discard the paper clip holding the LDPE sheets.
- If sampler sheets stick together is recommended to add some lake water to the tray (**NOT** for field control) to reduce sticking together. Be careful of winds blowing samplers away. Adding lake water to the pan will help keep them out of the wind. Use the tweezers to weigh down the LDPE which floats in water. Alternatively for sorting the sheets during deployment a metal wire netting is convenient. (**Note**: If for some reason mounting of the sheets is delayed after removing samplers from the jars, they can be kept under local lake water to minimize air exposure).

5 Mounting the Sheets: Best to have two people helping with mounting, one to hold the bracket, and one person with clean gloves handling and mounting the sheets. Hold the bracket upright for easier mounting.

- Sheets will be placed on each pair of bolts, starting at the top and going to the bottom, in the order of 1 LDPE sheet, 1 SSP sheet, a second SSP sheet, and the second LDPE sheet. 16 sheets total will be deployed, 8 LDPE and 8 SSP. Four sheets (2 LDPE and 2 SSP) are to be exposed for the same time as **field controls**.
- Note the time that jars are opened and sheets exposed. When opening the jar make sure not to lose the stainless steel inlay.
- Using clean lab gloves, remove the cotter pin from the top two pins in the bracket, and pull out the pins. Pick up the first LDPE sheet and put pins through the sheet to up to the heads with washer (Figure 7a).
- Slide the pins mostly through one side of the bracket (Figure 7b). Pick up the first SSP sheet and slide it onto one pin through both holes. Repeat for the second pin (Figure 7c).
- Slide the pins the rest of the way through the bracket. Pick up the second LDPE sheet and gently stretch the sheet over the ends of the pins (Figure 7d). Slide the cotter pins through each hole on the pins.
- When finished, there will be 4 sets of sheets on each pair of bolts (16 total), with LDPE sheets on the ends of the bolts, and SSP sheets threaded on the bolts between the bracket plates (Figure 7e). ~~There is also a video available to demonstrate the mounting.~~

6 Secure the housing: After mounting the sheets, slide the bracket with the sheets into the protective tube housing and affix with the 4 long nuts and bolts supplied (Figure 8). Gently snug the nuts. The housing tends to reduce the amount of algae / plants caught on the samplers.

7 Deployment: Deploy the sampler unit into the water at the chosen site immediately after mounting the samplers and securing the housing.

- Place the field controls in the first (lower) numbered jar (for the two SSP controls) and the first (lower) number vial (for the two LDPE controls) and seal with their caps.

If for any reason mounting or deploying is interrupted, place the bracket with already mounted samplers in the local lake water during this interruption. Note any interruptions on the sample log sheet, and record the timing so the duration of the deployment process is approximately known.

8 Recording Sampling Information: A Sample Log Sheet is provided on the last page of this guide. Make copies if additional sheets are required). Record the requested sampling data on the Sample Log Sheet. List the time field controls were exposed, the time deployed into the water, and all relevant observations and document with some photographs. Note GPS coordinates of the deployment location, site depth (if possible), and depth the samplers are deployed at. If possible, measure and record air and water temperature, pH, and salinity/conductivity. Although not essential please try to provide those that you can measure.

9 Sample Jar and Field Control Storage: Store the field controls in the freezer and keep the jars of the deployed samplers at a known place for retrieval. Keeping the empty jars together with the field control samplers in the freezer is the best way to ensure they are available for retrieval.

7 Retrieval

1 Prepare a clean working surface for field controls and empty jars/vials, and set out a tray/pan/pot with 1 L or more of local lake water.

2 Remove the sampler from the water, open and expose the **field controls**, and record the time.

3 Clean the 4 bolt threads holding the bracket in the tube housing prior to removing the nuts and bolts and sliding the bracket out of the protective tube housing. Not cleaning may result in threads of the nuts and bolts binding. (Note: Having a bolt cutter available in case of the nuts binding is a good idea).

4 Using clean lab gloves, remove the sheets in reverse order from set up. Remove the cotter pins, slide the LDPE sheet off the ends of the pins, then slide the SSP sheets off the bolts, and lastly slide the bolts out of the last LDPE sheet. Place each in the tray/pan/pot of local lake water.

5 Careful not to mix the LDPE and SSP sheets together in jars/vials...you should be able to feel the difference through the gloves. The LDPE sheets should float.

- Using the supplied Scourer (wrapped in foil and came with the sampler jars), scrub fouling off the sheets as well as possible but in a short time in the local water.
- Dry each sheet with clean lab tissue, and roll together (8 LDPE sheets) into the 40 mL amber vial with the second (higher) sample number.
- Wipe each **LDPE field control** (2 sheets) with clean lab tissue and place the two together back into the 40 mL vial they were stored in (first (lower) numbered vial).

- 6 The SSP (silicone rubber) sheets should be under water.
 - Clean each with the Scourer under water as clean as possible in a short time, dry with clean lab tissue, and roll and place together (8 SSP sheets) into the 100 mL amber jar with the second (higher) sample number.
 - Wipe each **SSP field control** (2 sheets) with clean lab tissue and place the two together back into the 100 mL jar they were stored in (first (lower) numbered jar).
- 7 Record the time that samplers and **field controls** are firmly capped and sealed in their jars/vials (Note instructions for firm closing in Figure 9).
- 8 As was the case for the deployment, record the requested sampling data on the same Sample Log Sheet. List the time field controls were exposed, the time the samplers were retrieved from the water, and all relevant observations and document with some photographs, especially to indicate the level of fouling (of the housing on retrieval and the samplers before scrubbing). If possible, measure and record air and water temperature, pH, and salinity/conductivity.
- 9 Store sampler and field control jars in the freezer until shipment to the laboratory for analysis.

8 Shipping Instructions

- 1 Details for returning the samplers and field controls to the analytical laboratory will be forwarded separately. Keep the protective plastic tubes that the jars/vials were received in for return shipping.
- 2 Details for return of the sampler hardware (brackets and housing) will be forwarded separately at a later date. Keep the shipping tubes that everything came in for possible return shipping.

Questions/remarks:

Email to smedes@recetox.muni.cz or if urgent Phone +420 604 801 114 (take local time in CZ into account!)

Or

Email to paul.helm@ontario.ca or if urgent Phone +1 647 938 0791 (take local Ontario time into account!)

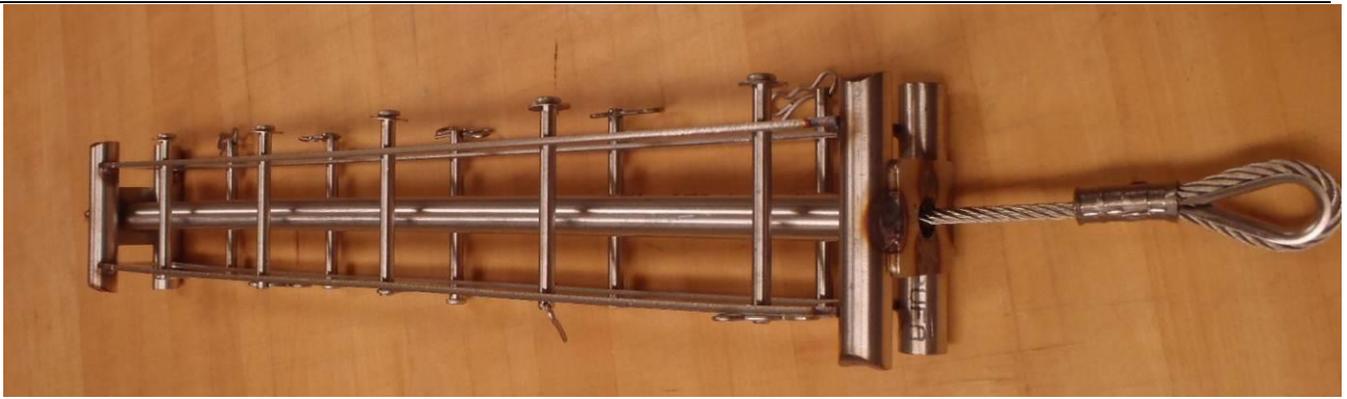


Figure 1: One sample holder with cable



Figure 2: One protective shroud and nuts/bolts



Figure 3: Pins, washers and cotter pins to keep the sheets in place (mounted in the holder)



Figure 4: Plastic tubes containing scourer, jars/vials with samplers, each jar/vial labelled with “aqua-gaps FW” (FW – freshwater), type, and a sequence number



Figure 5: Materials especially required for retrieval of samplers. Please also bring along gloves, tools for removing nuts/bolts, thermometer/conductivity or salinity meter, the original jars from deployment for sampler storage, and clean lab tissues.

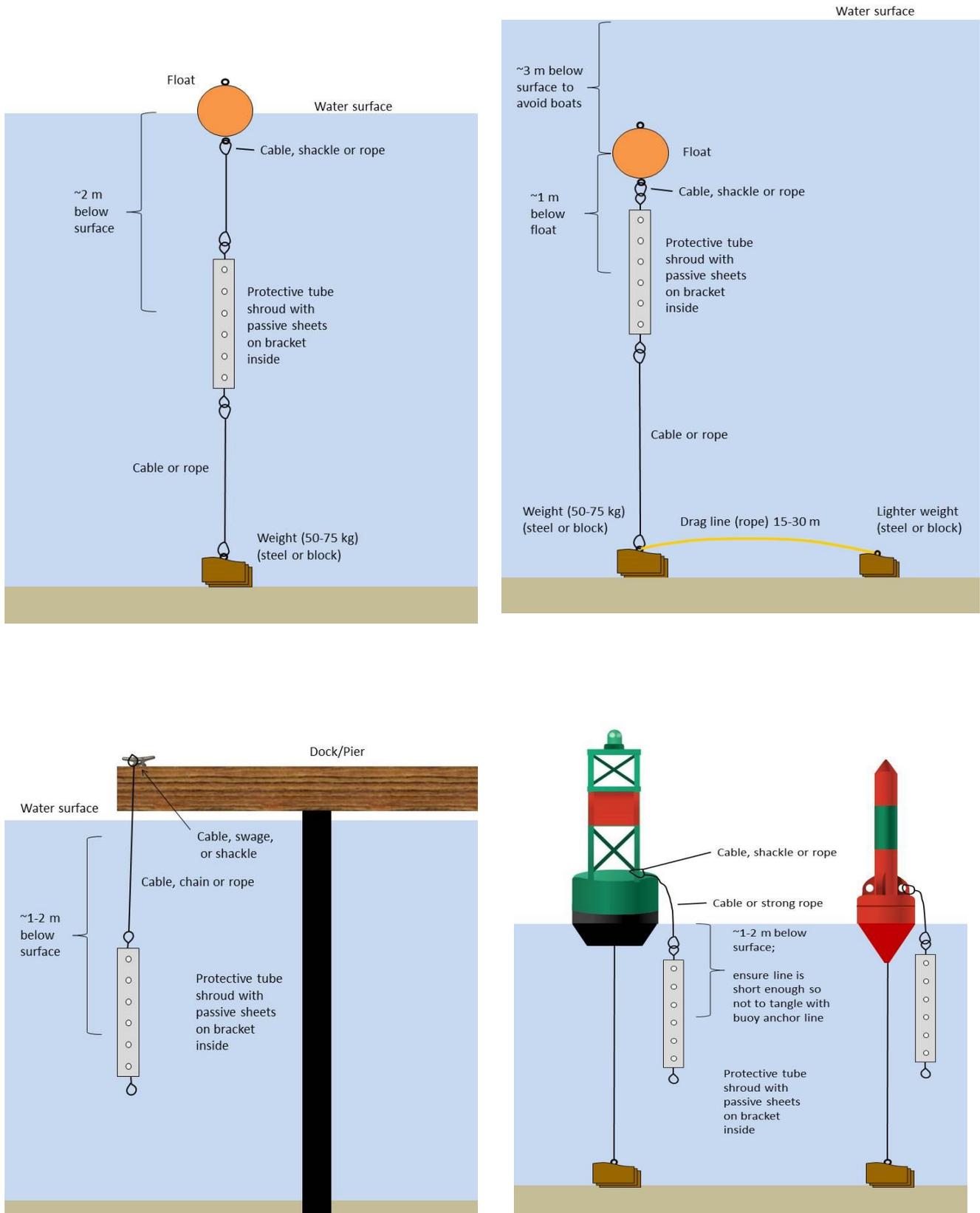


Figure 6: Possible deployment configuration options. Ensure no deployment lines are not too long that they tangle with other anchor lines or dock/pier components.



a. Slide a LDPE sheet onto the pins up to washer



b. Slide the pins mostly through one side of the bracket.



c. Slide the first SSP sheet onto one pin through both holes. Repeat on other pin. Spread the sheet out on the pin.



d. Slide the bolts through the bracket. Gently stretch the second LDPE sheet over the ends of the pins.



e. Replace cotter pins, repeat for all other sheets and slide into shroud.

Figure 57: Fixing the sheets on the sampler holder.



Figure 8: Bolts through shroud and holder – ready for deployment.



Note stainless steel lining easily falls out



This grip does not allow firm closing



Put pressure in full circle to open and close firmly

Figure 9: Sampler jar with SS lined lid, tightening procedure

SAMPLE LOG SHEET

SAMPLER code and sequence number(s) on the label:

SSP Sample Jar Numbers:

LDPE Sample Jar Numbers:

Sampling site		
GPS coordinates	Latitude	Longitude
	DEPLOYMENT	RECOVERY
Names of staff deploying / retrieving		
Dates (Deployment / Retrieval)		
Start Exposure times	(time removed from jars)	(time samplers out of water / controls out of jars)
End Exposure times	(time samplers in water / controls away)	(time samplers and controls sealed in jars/vials)
Site Details / Notes		
Site Water depth (m)		
Sampler Depth from Surface (m)		
Conductivity/salinity (note units)		
pH		
Water (and air) temperature		
Flow / Turbulence indications (e.g. wave height)		
Photos at deployment (#), Retrieval & before cleaning (#)		
Remarks		