

Maryland Department of Natural Resources

Non-tidal Network Program Standard Operating Procedures

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MD-DNR Non-tidal Network Program Protocols

Maryland's Non-tidal Water Quality Monitoring Network currently includes 13 load sites where nutrient and sediment concentrations are sampled monthly during base flows, as well as 8 times throughout the year during high flow events.

Load Sites: GEO0009, ANT0047, MON0546, BEL0053, TUK0181, WIL0013, NPA0165, GWN0115, DER0015, TF1.2, CAC0148, PXT0972 and GUN0258

Procedure: We will use a modified version of the USGS equal width interval assignment for our load sites. The PA USGS modified protocol reduces the number of verticals collected from 10 to a lower number based on the width of the stream being sampled.

<u>Width of Waterway (ft.)</u>	<u>Minimum # of Verticals</u>
0-25	1
25-100	3
100-250	5
250-500	7
>500	9

The number of verticals that will be used for MD-DNR sampling is dependant on the width of the stream at the time of sampling. The PA USGS modification assumes that the number of verticals required can be reduced because the stream is well mixed across the horizontal direction. To check this assumption each time a station is sampled four in-situ parameters (oxygen, pH, specific conductance and temperature) will be determined at each selected vertical sampling point. If the stream appears well mixed, the composite sample will be collected from vertical samples drawn at these selected sampling points. In addition, the variability across the stream will be checked every one to three years. This will be done by running the full nutrient suite on a sample generated at each vertical sampling point and on the normally generated vertical/horizontal composite. If variability is excessive, additional vertical sampling points (max 10) will be required for that station.

Once stream variability has been assessed, collection of a water sample that is both horizontally and vertically integrated will begin. If the maximum stream velocity observed is greater than or equal to 1.5 ft/sec and under 7.0 ft/sec an isokinetic equal width increment (EWI) composite sample will be generated using an approved USGS sampler (DH95 or DH81). If maximum stream velocity is under 1.5 ft/sec a non-isokinetic equal width increment composite sample will be generated using an approved USGS sampler (WBH-96 or modified DH81). At this time, no sampling method for velocities over 7 ft/sec has been developed.

The EWI composite sample will be generated by collecting individual depth integrated samples at each specified vertical sampling point. These samples will be composited in either a 4L or 8L churn splitter. Two to three sample bottles will then be drawn from the churn splitter for field processing and /or delivery to the appropriate laboratory. One sample bottle will be processed in the field to generate both filter pads for the particulate nutrient parameters and a bottle of filtered sample water for the dissolved nutrient parameters. A second bottle will be filled for TSS analysis. All of the water in the TSS bottle will be used for the analysis. The TSS samples will be analyzed by the Maryland Department of Health and Mental Hygiene (DHMH). During storm events a third sample will be drawn and sent to the USGS Sediment Lab in Kentucky for suspended sediment analysis.

Please see the [Hydrolab Sampling Procedures](#) for a detailed explanation of how the in-situ parameters are sampled.

Please see [Non-tidal Network Program Sampling Procedures](#) for details on the collection of the EWI composite sample.

Please see the [Non-tidal Network Program Sample Processing](#) for a detailed explanation of how the field samples are processed.

Samples collected: Depth integrated samples collected at the vertical sampling points will be composited in the churn splitter. Sub-samples will then be dispensed from the churn splitter and used to generate:

One 500 ml HDPE bottle of whole water for Suspended Sediment analysis at the USGS Sediment Lab in Kentucky (only during storm events).

One TSS whole water bottle 30ml to 500 ml (volume dependent on turbidity)

One HDPE 2 quart nutrient sample bottle that will be field processed into:
Two 25mm GF/F 0.7 micron Particulate Carbon/Particulate Nitrogen filters
Two 47mm GF/F 0.7 micron Particulate Phosphorus filters
One 8 or 16 ounce HDPE bottle of filtrate for dissolved nutrient analysis

SAMPLE QA/QC

One Source Solution Blank must be submitted for each sampling day.
One Duplicate Stream Sample is processed every 10 to 20 samples.
One Deionized (DI) Water Equipment Blank is processed once a month.

Source Solution Blank

Each day a 16 ounce filtrate HDPE bottle must be filled from one of your vehicle Deionized Water bottles. This will be sent to DHMH with your sample filtrate bottles for dissolved parameter analysis. Label the 16 ounce bottle with "DI Filtrate Blank", the date and your initials. Rinse this three times with DI water and then fill $\frac{3}{4}$ full with DI. Add date, time filled and your initials to DI Blank Lab sheet in the field pack. Send Results To: should list "Sally Bowen" and be highlighted. The sample should be iced and shipped with regular filtrate samples. Results will be reviewed by the Field Office Chief. Repeat problem parameters will be discussed with Principal Investigator and corrective solutions will be explored.

Duplicate Sample

A replicate sample will be processed from the churn splitter every 10 to 20 samples. It will be drawn from the same churn splitter as the original sample and processed identically. See Churn Splitter Sub-Sampling Procedure and Non-tidal Network Program Sample Processing for a detailed explanation of these processes. Results will be reviewed as part of MD DNR duplicate data set.

DI Blanks: Processed and Unprocessed

One sampling team per month must process and submit an equipment blank. The churn splitter will be thoroughly rinsed with DI water. Then it will be filled with DI water. One DI Nutrient Only 2 quart sample bottle will then be drawn from the churn splitter and processed for particulate and dissolved nutrients. Process this bottle in the same way that stream samples are processed. Generate filtrate, PC/PN filters and PP filters. No DI Blank is submitted for either Suspended Sediment or TSS. Label the Processed Blank as Pxxx Filtrate (with xxx = filter unit) and add the date. Also submit an Unprocessed Blank as UPxxx Filtrate by labeling, rinsing 3 times, and then filling a filtrate bottle with DI water. Fill from the same DI bottle you used for the Processed Blank. Place 2 blank filters each for PC/PN and PP in the Unprocessed Blank foil squares. See Churn Splitter Sub-Sampling Procedure and Non-tidal Network Program Sample Processing for a detailed explanation of these processes. Add date, time processed, your initials and either Pxxx or UPxxx in the sample bottle line on the DHMH lab sheets in the field pack. A separate sheet must be submitted for processed and unprocessed samples. Send Results To: should list "Sally Bowen" and be highlighted. Ice samples and ship with regular stream samples. Results will be reviewed by the Field Office Chief. Problems will be discussed with the Project Officer and potential solutions explored.

Non-tidal Network Program Sampling Procedure

1. You will need to record the time and gage height at the beginning and end of the sample collection period on the field sheet. If you are sampling at the exact location of the gage, open the gage house and record the gage height and time before sampling and after you finish collecting samples. If you will not be sampling at the exact gage location stop at the gage and record a beginning gage height and time. If the gage is on-line you can get the end reading from the USGS web page. Check the recorded gage height against the cross reference list in the field pack to determine if maximum velocity expected is greater than or equal to 1.5 ft/sec. **If YES**, an isokinetic composite sample **MUST** be collected. If the maximum velocity is under 1.5 ft/sec or over 7.0 ft/sec a non-isokinetic composite sample is collected.
2. Set up cones on the road to block off enough room so that you feel safe on the downstream side of the bridge. Wear your orange safety vest.
3. Measure stream width by placing the measuring tape along the bridge from stream bank to stream bank. Measure from left to right looking downstream. Establish the number of increments (transects) you will sampling by using the table on page 3. After you determine the number of increments (transects) that will be sampled, use the formula below to determine the location of each vertical sample. A more detailed explanation of the new isokinetic sampling protocols can be found in the Non-tidal Field Pack. Check "Sampling Procedures and Protocols for the Chesapeake Bay Non-tidal Water Quality Network" report, page 6 or the USGS procedures.

Here is a formula to determine the number of transects and the location of verticals:

- Stream Width / number of transects = transect length
- 1st vertical = Transect length / 2
- 2nd vertical = Transect length + 1st vertical
- 3rd vertical = Transect length + 2nd vertical
- 4th vertical = Transect length + 3rd vertical
- 5th vertical = Transect length + 4th vertical

For example, if the stream is 60 feet wide and it is divided into 3 transects, the 1st sample should be taken at 10 feet from the left bank (while facing downstream), the 2nd at 30 feet, the 3rd at 50 feet. Record vertical locations in the comment section of the field sheet.

4. Once you have established a location for each vertical, record Hydrolab readings for each vertical by immersing the Hydrolab in the stream directly (if equipment and stream velocity are suitable) or by collecting a

rinsed bucket at each vertical. Refer to Hydrolab Sampling Procedures for a detailed explanation of this process. Review these readings. The stream is well mixed if no set of readings for any one parameter differs by 20 %. If the stream is well mixed, record the median value for each parameter on the field sheet and begin collecting samples.

If stream is not well mixed, increase the numbers of verticals by at least two and repeat steps 3 & 4.

5. Based on the stream velocity and sampler choices available, choose a sampler to use. Rinse the sampler collection bottle and all whole water sample bottles three times with stream water (directly in stream or from a freshly collected bucket of stream water). Rinse the churn splitter with 2 to 4 L of stream water. Run a liter of water through the spigot.

1) DH-59 (Brass, hand-held isokinetic sampler with a fixed nozzle.)

As of December 2005, the DH-59 has not been used.

- A. Follow instructions 1 – 5 under Non-tidal Network Program Sampling Procedure.
- B. Put glass collection bottle into sampler by pulling on the hook at the bottom, place the mouth of the bottle in first and then slide the bottom in. Make sure there is a good seal around the mouth of the bottle.
- C. Decide who will be the clean hands person (who handles the sample) and who will be the dirty hands person (who handles the equipment). The clean hands person must wear rubber gloves during the sampling. They will only touch the sample bottle and churn splitter.
- D. If the stream looks deeper and faster in one area, establish your transit rate at that spot before starting to sample. Remember, if the sampler collection bottle is over-filled (more than $\frac{3}{4}$ full) at any of the verticals using the transit rate you establish initially, you must discard all sample water in the churn splitter and begin sampling over again. The sampler collection bottle must still be bubbling when it reaches the surface. The DH-59 fills very slowly. Try to go at the slowest, steady rate you can while filling the bottle. It most likely will take more than one dip to fill the collection bottle. If the collection bottle is less than 40% filled after the first up/down pass, you can lower and raise it again before you empty it into the churn splitter. Remember total amount collected must be $\frac{3}{4}$ or less. **If you decide to do multiple dips, you must do the same number of dips at each vertical sampled.**
- E. Once you establish your transit rate and number of dips, you are ready to collect the first vertical. Lower the sampler until the back fin is touching water surface. Wait until it orients towards the flow and lower the sampler

- at the established transit rate. When you feel it touch the bottom, automatically begin to raise the sampler to the surface at the same transit rate it was lowered. Repeat, if doing multiple dips.
- F. Raise the collected sample. The dirty hands person should set the sampler on the ground in a steady position and the clean hands person should then retrieve the bottle from the sampler and empty it into the churn splitter.
 - G. Move the sampler to the next vertical location. Repeat steps E & F for each vertical.
 - H. Continue this process until the verticals for all transects have been completed. The churn splitter must contain enough water to process all the samples. If necessary you can return to each vertical location and collect an additional sample if more water is needed. Remember, the churn splitter cannot be overfilled!!! If it does overflow, you must empty the churn splitter and begin the sampling over again.
 - I. Follow the instructions under Churn Splitter Sub-Sampling Procedure at the end of this section.
- 2) DH-95 (bronze, plastic coated isokinetic sampler)
- A. Follow instructions 1 – 5 under Non-tidal Network Program Sampling Procedure.
 - B. Connect the sampler to a hanger bar and the hanger bar to the suspension cable on the crane or the bridge board.
 - C. Decide who will be the clean hands person (who handles the sample) and who will be the dirty hands person (who handles the equipment). The clean hands person must wear rubber gloves during the sampling. They will only touch the sample bottle and churn splitter.
 - D. Select the largest diameter nozzle size that the transit rate and depth will allow. The largest size (5/16" diameter) nozzle is the most commonly used, and seems to be appropriate for most situations. Screw the selected nozzle into a clean cap and bottle configuration.
 - E. Lift the o-ring and place the bottle configuration into the sampler cavity. The o-ring should fit over the neck of the bottle and hold it in place. Rotate the bottle until the air vent hole is vertical. Visually check the nozzle and air vent hole for obstructions.
 - F. If the stream looks deeper and faster in one area, establish your transit rate at that spot before starting to sample. Remember, if the sampler

collection bottle is over-filled (more than $\frac{3}{4}$ full) at any of the verticals using the transit rate you establish initially, you must discard all sample water in the churn splitter and begin sampling over again. The sampler collection bottle must still be bubbling when it reaches the surface. If the collection bottle is less than 40% filled after the first up/down pass, you can lower and raise it again before you empty it into the churn splitter. Remember total amount collected must be $\frac{3}{4}$ or less of the liter bottle. **If you decide to do multiple dips, you must do the same number of dips at each vertical sampled.**

- G. Once you establish your transit rate and number of dips, you are ready to collect the first vertical. Lower the DH-95 sampler until the tail makes contact with the water surface. Record the number from the reel in the "Cable reading - start" line on the field sheet.
- H. Wait until the sampler orients towards the flow before lowering the sampler into the water column. Once it has aligned, begin to lower the sampler at a fixed rate, when you feel it touch the bottom, quickly note the number on the reel and reverse directions to raise the sampler to the surface. Record the number from the reel in the "Cable reading - end" line on the field sheet. Repeat, if doing multiple dips.
- I. Raise the collected sample. The clean hands person should then retrieve the bottle from the sampler and empty it into the churn splitter. Gently swirl the bottle to ensure that all sediment has been transferred to the churn splitter.
- J. Move the sampler to the next vertical location. Repeat steps G through I for each vertical.
- K. Continue this process until the verticals for all transects have been completed. The churn splitter must contain enough water to process all the samples. If necessary you can return to each vertical location and collect an additional sample if more water is needed. Remember, the churn splitter cannot be overfilled!!! If it does overflow, you must empty the churn splitter and begin the sampling over again.
- L. Follow the instructions under Churn Splitter Sub-Sampling Procedure at the end of this section.

2) WBH-96 (Weighted bottle, hand held, non-isokinetic sampler)

- A. Follow instructions 1 – 5 under Non-tidal Network Program Sampling Procedure.

- B. Put the plastic liter size collection bottle in the sampler and place the elastic around the neck of the bottle making sure it is secure.
- C. Decide who will be the clean hands person (who handles the sample) and who is the dirty hands person (who handles the equipment). The clean hands person must wear rubber gloves during the sampling. They will only touch the sample bottle and churn splitter.
- D. If the stream looks deeper and faster in one area, begin there. Remember, if the sampler collection bottle is over-filled (past the neck of the bottle) you must discard the sample water and begin again. The sampler collection bottle must still be bubbling when it reaches the surface.
- E. Lower the sampler until the bottom of the sampler is touching the water surface. Begin lowering the sampler and when you feel it touch the bottom, automatically begin to raise the sampler to the surface.
- F. Raise the collected sample. The dirty hands person should set the sampler on the ground and the clean hands person should then retrieve the bottle from the sampler and empty it into the churn splitter.
- M. Continue this process until the verticals for all transects have been completed. The churn splitter must contain enough water to process all the samples. If necessary you can return to each vertical location and collect an additional sample if more water is needed. Remember, the churn splitter cannot be overfilled!!! If it does overflow, you must empty the churn splitter and begin the sampling over again.
- G. Follow the instructions under Churn Splitter Sub-Sampling Procedure at the end of this section.

3) DH-81 (Hand held wading sampler, optional isokinetic/ non-isokinetic)

If stream velocity is ≥ 1.5 ft/s and considered safely wadable, you may use the DH-81 as an isokinetic sampler by using the appropriate nozzle (usually 5/16"). If flows are less than 1.5 ft/s the DH-81 may be used without the nozzle to obtain a grab sample.

- A. Select the area of stream that you will be sampling and secure the tape measure across the stream. Measure from left to right looking downstream. Establish the number of increments (transects) you will be sampling and location across the transect where you will be collecting your vertical sample based on the width of the stream.

- B. Once you have established a location for each vertical, record Hydrolab readings for each vertical. Have one person on the stream bank recording the numbers while the other person handles the Hydrolab. See Hydrolab Sampling Procedures for a detailed explanation of the process.
- C. Rinse the DH-81, including bottle, nozzle (if needed), cap and the churn splitter in the stream. Make sure you are downstream of the sample area to ensure that you do not stir up the streambed prior to sampling.
- D. Assemble the DH-81 by screwing the cap onto the liter sample bottle and attach the nozzle to the cap (if the stream velocity is under 1.5 ft/sec you can sample without the nozzle). Secure the DH-81 to the wading rod by snapping it into place over the cap.
- E. Decide who will be the clean hands person (who handles the sample) and who is the dirty hands person (who handles the equipment). The clean hands person must wear rubber gloves during the sampling. They will only touch the sample bottle and churn splitter.
- F. Enter the stream down river of the sampling location and walk up to the sampling location in the centroid (maximum) of the stream flow. Raise and lower the sampler at a constant rate such that the sample bottle is $\frac{1}{2}$ - $\frac{3}{4}$ full when breaking the surface.
- G. **If the sample bottle is too full pour out sample and speed up your transit rate or use a smaller nozzle or a combination of both until the sample bottle fills $\frac{1}{2}$ - $\frac{3}{4}$ when the sampler is raised out of the water column. Likewise, if the sample is not full enough, pour out the sample and use a larger nozzle or slow your transit rate to increase sample volume.**
- H. Empty the collected sample into the churn splitter. Move to the next vertical and repeat the collection process.
- I. Repeat the sample collection process until there is sufficient volume to fill the 4 or 8 Liter churn splitter.
- J. Follow the instructions under Churn Splitter Sub-Sampling Procedure at the end of this section.

4) Bucket Sampling Note: If D.O. and Temp are read from a bucket sample YOU MUST Enter a B in the G/L box associated with D.O. so that these values are deleted from data sent to CBP.

Bucket samples are taken from bridges. A sample may be collected to provide stream rinse water for sampling equipment and whole water bottles. If in-situ readings cannot be made by immersing Hydrolab directly in the stream you can collect a bucket from each vertical point for readings. See note above.

- A. Select the appropriate length of rope for the bridge from which you will be sampling and secure tightly to bucket.
- B. Chose a vertical sampling location to sample.
- C. Lower the bucket to the water.
- E. Tip the bucket and fill with enough water to rinse the bucket (at least a few inches).
- F. Depending if it is a high or low bridge, you may want to shake the rope to expel the rinse water from the bucket, or pull the bucket back up to dump the rinse water out of the bucket. Rinse three times.
- G. Fill the bucket.
- H. Pull the bucket back up, making sure the rope does not rub against the side of the bridge. This can sometimes cause dirt, rust, paint, etc to fall into the sample.
- I. Immediately carry the bucket back to the van. Rinse equipment or go to J.
- J. If using for in-situ readings immerse the Hydrolab sonde in the bucket, swirl at 1 ft/sec. Record readings. Repeat for all verticals. Remember to record a "B" in G/L box for D.O.

Churn Splitter Sub-Sampling Procedure

The following steps are to be completed for filling of all sample bottles from the churn splitter:

- A. Set the churn splitter in an area where the spigot is easily accessed to dispense water.
- B. One person should churn the sample, while the other person fills the sample bottles from the churn splitter.
- C. Churn the sample at 9 inches per second.
- D. Do not break the water surface with the wand while churning.
- E. Churn the sample a minimum of 10 times before dispensing water.
- F. Continue to churn the sample until all the sample bottles are filled.
Samples cannot be dispensed if the water level is at or below the spigot.
- G. Dispense whole water sediment related samples first. Dispense:
 - a. SSC (storms only)
 - b. TSS
 - c. Nutrient Filtration BottleNote: After filtering for PC/PN if the sample volume originally chosen for the TSS sample is too small or too large, discard and dispense a TSS bottle with a better volume.
- G. Process sample bottles filled as per the instructions under Non-tidal Network Program Sample Processing.

CHURN SPLITTER CLEANING PROCEDURE

After all samples are collected and processed empty churn splitter and rinse well with DI water. Rinse sampler collection bottle with DI. If any of the sample collection equipment needs to be reused before it can be cleaned at the office, follow procedure below.

- A. Soak equipment in 10% Liquinox Solution for 20 – 30 mins. If churn splitter is being cleaned fill it with Liquinox and add collector bottle and nozzles. Let sit while completing station or while driving to next station. There is a small cup for soaking just nozzles in the field tub.
- B. After soaking, scrub with brush provide and rinse completely with tap water. Rinse three times with DI. Air dry and store in clean baggies or use again.

Non-tidal Network Program Sample Processing

A. Laboratory Supplies

Pads

- a) PC/PN
The pads used for PC/PN samples come directly from DHMH. The PC/PN pads are pre-combusted (490 °C), 25mm Whatman GF/F glass fiber filters – pore size 0.7 µm. Two PC/PN pads are used per sample.
- b) PP
The pads used for PP samples are 47mm Whatman GF/F glass fiber filters - pore size 0.7 µm. Two PP pads are used per sample.

B. Particulate sample filtration, processing and storage

1. **Particulate Carbon/ Particulate Nitrogen (PC/PN)**

- a) To generate PC/PN filters first clean two 25mm bells with deionized (DI) water. Set up unit for filtering. Be sure that there is a trap in line between the manifold and the vacuum source.
- b) Place a pre-combusted 25 mm GF/F filter (pore size = 0.7 µm) on each filter frit. Always use clean forceps when handling the filter pads.
- c) Using the two quart whole water sample drawn from the churn splitter **(please see Section D- Churn Splitter Sub-Sampling Procedure)** mix sample thoroughly by agitating and shaking the sample bottle vigorously, then rinse graduated cylinder three times with sample.
- d) Agitate the sample again before measuring in the graduated cylinder. Fill graduated cylinder with sample and filter desired volume through filtration unit. Be sure to use a graduate that is close to the volume being filtered (ex: if you are only filtering 80 ml of sample use a 100 ml graduate). Keep the vacuum pressure below 10 inches of Hg (around 8" Hg is good).
- e) Filter 10-200 ml through each filter. Filter enough sample to leave noticeable color on the filter pad.
- f) Make sure filter is sucked dry and the **same volume is filtered for both pads.**
- g) Record the volume filtered (total volume through one pad - do not add the volumes for the 2 pads together) on the foil square.

NOTE: Samples for dissolved parameters are not to be collected from this filtrate.

- h) Using forceps, fold each filter in half.
- i) Place both filters in a foil square labeled with date, station, sample layer, PC/PN, and volume filtered. Be sure that the pads are not overlapping in the foil square to keep them from freezing together.
- j) Place pad in pre-marked foil square, and carefully fold foil square in thirds, horizontally. Then fold the ends in to seal the filter inside. Be

sure forceps do not touch sample residue on the filter pads, because the sample will adhere to the forceps. Place the folded foil in a zip-lock bag or pad container, and put it in a cooler on ice.

- k) Upon return to the Field Office, place the foils in their appropriate zip-lock bag in the sample freezer and place the bag in the DHMH bin. Put the completed volume sheet in the bag with the foils.

2. Particulate Phosphorus/ Particulate Inorganic Phosphorus (PP/PIP)

- a) To generate PP filters, clean two 47mm bells with deionized (DI) water. Set up unit for filtering. Be sure that there is a trap in line between the manifold and the vacuum source. The filters used are two Whatman 47 mm GF/F filters.
- b) Using the two quart whole water drawn from the churn splitter filter 50 ml of sample through each filter pad.
- c) Use the filtrate as an equipment rinse and discard.
- d) Then filter enough additional (another 50 - 750 ml) to leave a noticeable color on the filter pad.
- e) Record the **total** volume filtered through each pad being sure to add the 50 ml rinse water (total volume through one pad – do not add the volumes for the 2 pads together) on the foil square.
- f) **Use this filtrate to fill up the container for the dissolved parameter analysis. See section C (Filtered dissolved nutrient sample collection) below.**
- g) After collecting filtrate, make sure filter is sucked dry.
- h) Rinse the filter pad using at least three - 10 ml rinses of DI water sucking the pad dry after each rinse.
- i) Using forceps, fold each filter in half.
- j) Place both filters in a foil square labeled with date, PP, station, sample layer, and volume filtered (this is the total volume of sample through each pad, including the initial 50 ml rinse). Be sure that the pads are not overlapping in the foil square to keep them from freezing together.
- k) Fold the foil square as described in step B.1.i. above. Place foil square in zip-lock bag or pad container, and put in the cooler on ice until you return to the field office.
- l) Upon return to the Field Office, place the foils in their appropriate zip-lock bag in the sample freezer and place bag in the DHMH bin. Put the completed DHMH volume sheet in bag along with the foil squares. Frozen samples are delivered Friday of sampling week so Lab can analyze within 28 days of collection.

C. Dissolved nutrient sample filtration, collection & storage

NOTE: The filtrate collected for this sample must come from the PP filtration set-up. If you cannot get enough water through these pads to fill the filtrate sample bottle, then use more GF/F filters to get enough filtrate. The filtrate may not come from pads that are pre-combusted (PC/PN).

The following steps are to be completed for collection of all filtrate:

- a) Run 50 ml of sample water through the filter.
- b) Use this 50 ml of filtrate to rinse the flask and then discard.
- c) Run more sample water through the filter and collect in the flask.
- d) Rinse 8 oz or 16 oz HDPE bottle and cap three times with filtrate.
- e) Fill the bottle with filtrate and replace cap. If sample will be frozen before delivery to the lab do not fill more than $\frac{3}{4}$ full.
- f) Store the bottle on ice in a cooler. Deliver to the courier or directly to DHMH at the end of the field day. If you miss the courier filtrate sample bottles may be frozen and delivered on Friday directly to DHMH. If freezing the filtrate sample, copy the regular DHMH Lab Sheet and place the copy in a zip-lock bag with the filtrate bottle. Lab must analyze unfrozen sample within 24 hrs of collection; frozen sample within 28 days.

D. Total Suspended Solids (TSS) collection and storage

- a) Chose the appropriate size sample bottle.** Label with Station Id, date and TSS ONLY. Rinse cap and bottle three times with sample water. Bottle may be rinsed from a Rinse Only bucket of water.
- b) Fill bottle with sample from the churn splitter. Theoretically the TSS bottle should be filled before the nutrient bottle. Follow the Churn Splitter Sub-Sample Procedures. Because DHMH will be sampling the entire amount we send them, you cannot dump any water out once you fill the container.
- c) Ice sample. Deliver directly or send by courier to the DHMH within 48 hrs. An original completed DHMH Lab Sheet must accompany the sample. Note: If you are sampling on a weekend or miss the courier since the holding time for TSS samples is 48 hours the sample can be sent by courier the day after you collected it OR delivered directly to the Lab within 48 hours of collection.

** Note: DHMH will be using all the water in the TSS sample bottle to generate the TSS filter. DO NOT SEND THEM TOO MUCH WATER. The DHMH uses 25 mm filters for TSS. Fill the TSS Sample Bottle with the same amount of water that you expect to use for the PC/PN filters. REMEMBER the Lab will need to rinse their TSS filters THREE TIMES. There are 60ml, 225ml and 500ml bottles in the field tub to use for the TSS sample. The 60 bottles are graduated. The 225ml and 500ml bottles can be filled to any estimated volume.

E. Suspended Sediment Concentration (SSC) collection and storage

- a) Label 500ml plastic Nalgene bottle with Station ID, date and time.
- b) Fill bottle to shoulder from churn splitter. Follow the Churn Splitter Sub-Sample Procedure instructions. No water can be dumped from the filled Nalgene bottle. **This sample must be the first sample taken from the churn splitter.**

- c) Mark water level line on the Nalgene bottle with a Sharpie.
- d) Sample does not need to be iced but should be kept in dark. Place in the box labeled "Sediment Samples" when you return to the office. Samples will be shipped quarterly to the USGS Sediment Lab in Kentucky. Note: Each year (Oct-Sept.) all samples must be shipped by September 30th.

Hydrolab Sampling Procedures

Make sure the Hydrolab has been turned on for at least 15 minutes prior to sampling. Submerge the Hydrolab sonde directly in the stream to obtain the required readings. If flow is too swift or your meter is not practical for in-situ readings obtain readings from a bucket grab. Add B in G/L box for DO and note "Bucket Readings" in "Comments" on Field Sheet.

1. Remove plastic storage cup from the Hydrolab, check DO membrane to make sure it is clear and there are no bubbles.
2. Protect probes by installing probe guard or stirrer if flow will be under 1 fps for any in stream measurement point .

A. Sampling in the bucket: (Remember "B" in DO G/L box)

- a) Follow steps 1 and 2 above.
- b) Swirl the Hydrolab in the bucket at 1 fps until the readings stabilize.
- c) Record readings on the field sheet.
- d) Remove the Hydrolab from the bucket, and rinse probes with deionized water before replacing plastic storage cup.

B. Sampling from the bridge:

- a) Follow steps 1 and 2 above.
- b) Turn on the circulator from the Hydrolab display menu.
- c) Lower the Hydrolab over the bridge at the first vertical. Position the probes at mid-depth for the vertical.
- d) Wait for the readings to stabilize and record them on the field sheet.
- e) Carefully raise the Hydrolab back up and move to the next vertical.
- f) Repeat steps c through e until all the verticals have been sampled.
- g) Remove guard. Rinse probes with DI. Replace storage cup.

C. Sampling while wading:

- a) Follow steps 1 and 2 above.
- b) Turn on the circulator from the Hydrolab display menu.
- c) Place the Hydrolab directly in the water at the first vertical. Position the probes at mid-depth for the vertical.
- d) Wait for the readings to stabilize and record them on the field sheet.
- e) Repeat steps c and d until all the verticals have been sampled.
- f) Remove guard. Rinse probes with DI. Replace storage cup.