SOP

HORSESHOE LAKE

Photo by Noel Johnson

BY HILARIE LARSON, REHS/RS

COWLITZ COUNTY ENVIRONMENTAL HEALTH UNIT

Contents

1. General Information

This Standard Operating Procedure (SOP) is applicable to the collection of representative liquid samples from Horseshoe Lake for grant work completed December 2015 – January 2018. The intent of SOPs is to ensure safety of personnel and improve validity of results. Please consider this a "working document" and note any changes to procedures as deemed appropriate and/or necessary. Significant changes will be noted in the project's final report.

Activities for each sample event are divided into four segments: land preparation, water preparation, sampling and measuring, and shipping.

In general, sampling should occur either between 9 and 12, or between 1 and 4pm. It is ideal to sample consistently during one of the two windows of time. However, there is flexibility in both the time and the day of the sampling event, especially in consideration of weather conditions. Common sense and good judgment dictate timing. Under no circumstances should volunteers be on the water during rain or electrical storms, high winds, or other unsafe conditions.

To assist in obtaining the highest quality of data possible, please keep in mind that there are two common sources of interference; cross contamination of samples and improper sample collection. Following proper decontamination procedures and minimizing disturbance of the sample site will help to eliminate these problems.

The charts below will assist in sample event preparation:

Horseshoe Lake Sample Plan Overview					
Location	**#**	Latitude	Longitude	**In-Situ and Secchi Depth**	Total Phosphorus, Total nitrite-nitrate, Chlorophyll *a*
Inlet	1	45° 54' 2.265" N	122° 44'27.509" W	Yes	Yes
Swim Beach	2	45° 54' 1.379" N	122°44'42.077"W	Yes	Yes
Midpoint	3	45° 53' 43.419" N	122° 44' 57.656"W	Yes	Yes
South	4	45° 53' 33.831" N	122° 44' 40.109"W	Yes	Yes

Horseshoe Lake # of Test Bottles / Event Feb 2016 – Jan 2017					
Sampling Event Target Date	Month / Week	Total Phosphorus	Chlorophyll a	Total Nitrate-Nitrite	Turbidity
Feb 1, 2016	Feb wk 1	4	4	4	4
Mar 7, 2016	Mar wk 1	4 + Q = 5	4 + Q = 5	4 + Q = 5	
Apr 4, 2016	Apr wk 1	4	4	4	
May 2, 2016	May wk 1	4	4	4	
Jun 6, 2016	Jun wk 1	4 + Q = 5	4 + Q = 5	4 + Q = 5	
Jun 20, 2016	Jun wk 3	4 + B = 5	4 + B = 5	4 + B = 5	4
*Jul 5, 2016	Jul wk 1	4	4	4	
Jul 18, 2016	Jul wk 3	4	4		
Aug 1, 2016	Aug wk 1	4	4	4	
Aug 15, 2016	Aug wk 3	4	4	4	
*Sep 6, 2016	Sep wk 1	4 + Q = 5	4 + Q = 5	4 + Q = 5	
Sep 19, 2016	Sep wk 3	4	4		
Oct 3, 2016	Oct wk 1	4	4	4	
Nov 6, 2016	Nov wk 1	4	4	4	4
Dec 5, 2016	Dec wk 1	4 + Q = 5	4 = Q = 5	4 = Q = 5	
Jan 9, 2017	Jan wk 1 / 2	4	4	4	
Totals/year		69	69	53	12

2. Land Preparation

Land Preparation includes four distinct tasks:

TASK 1 - Confirm sample schedule and plan, and weather conditions.

- Check the above Sample and Test Schedule table to determine what tests to perform and what samples to take.
- Check the current and forecasted weather and decide if the conditions allow for safe sampling. Confirm this decision after personally inspecting lake conditions prior to launching the boat and beginning the sampling trip.
- Ideal sampling days are Mondays, Tuesdays, or Wednesdays. If sampling is to occur on any other weekday, check with the receiving lab.

TASK 2 – Ensure that Probe is calibrated and recording.

Use the YSI ProDSS User Manual, with Quick Start Guide and Probe Tutorial Notes from 8/27/15 to calibrate probes. Instead of one rinse as described, use three rinses. Ensure calibration by checking "last calibrated date" for each analyte on the sonde after each calibration procedure. Ensure that the sonde is properly storing information by taking an "in office" sample and entering the File menu, view data.

TASK 3 – Prep labels and reports.

See "Bottle Prep Directions for Sampling" attached.

TASK 4 – Check for boating safety equipment.

- Ensure that a personal flotation device is available for each person. Devices must be Coast Guard-approved, readily available, and properly sized.
- Ensure that a first aid kit is onboard.
- Check for other equipment that may be required by State and local boating laws. For example, boats may be required to carry fire extinguishers and sound-producing devices. Also, the boat must be registered according to State and local laws.

TASK 5 – Confirm sampling equipment and supplies

Before leaving shore, ensure that all sampling equipment and supplies are on board the boat:

- Anchor. Two anchors are helpful on windy days, one off the bow and the other off the stern.
- Secchi disk with a measured line to ¼ feet increments
- Water sampler instrument
- Water sample collection container
- Clipboard and water proof pen
- Field manual including map of lake with sampling sites and landmarks marked
- Sampling forms including Log Sheet for Horseshoe Lake Field Testing and Check Off Sheet for Horseshoe Lake Lab Samples
- Laboratory issued shipping coolers with frozen ice packs and Chain of Custody Reports
- Phosphorus and nitrate-nitrite sample shipping bottles (with a small amount of acid to preserve the sample), and chlorophyll *a* sample shipping bottles in ALS laboratory cooler
- Box of vinyl gloves
- One pair of safety goggles for phosphorus and nitrogen pour
- Fresh bottle of distilled water (crucial if submitting a blank field sample!)

3. Water Preparation

TASK 1 - Position boat at the designated sample site.

Locate the sample site on the water. The position should be verified using the shoreline landmark method, and indicator buoys if present. Use the GPS function of the sonde (see below GPS coordinates) to confirm site. If the South arm, site 4, is not accessible, then collect a sample as close to it as possible. If you are able to collect within approximately 4 boat lengths, then continue to record this as site 4. If a sample is collected from an area greater than 5 boat lengths, then record this as Alternate Site 5.

Once the site is located, anchor the boat if necessary. Repositioning the anchor once it is dropped should be discouraged, especially in shallow lakes, because it can stir up sediments from the lake bottom. Increasing sediment turbidity may alter data results. After anchoring, volunteers should allow the boat to stabilize.

Site Number:	Site Name:	Site GPS Coordinate (degrees, minutes, seconds)	
Sample Site 1:	Lake Inlet	45° 54’ 2.265” N	122° 44’27.509” W
Sample Site 2:	Swim Beach	45° 54’ 1.379” N	122°44’42.077”W
Sample Site 3:	Midpoint (bend)	45° 53’ 43.419” N	122° 44’ 57.656”W
Sample Site 4:	South (garbage dump)	45° 53’ 33.831”N	122° 44’ 40.109”W
Alternative Site 5:	W of South site	record GPS coordinates and reasons for alternate site	

TASK 2 - Complete the observations portion of the sampling form.

Record your observations about the lake and weather conditions on the field log. In addition, write down any unusual conditions that may affect the sampling results. Reporting visual conditions such as water color and appearance will aid in interpreting data results. For example, if the sampling trip was conducted after a storm, the water may temporarily be more be more brownish and turbid than usual. This turbidity probably will lower the Secchi disk reading and elevate the total phosphorus concentration. Without the information concerning the rainstorm, an analyst might conclude that other factors could have caused a decrease in water quality.

- If not done previously, record the name of the lake and site, the date, the time of sampling, and the names of volunteers and staff doing the sampling.
- Record water condition observations at the site including water color, suspended sediment and algae, aquatic plants, waterfowl activity, and odor.
- Record weather conditions on the form including the amount of cloud cover (when taking the Secchi disk reading), and water surface conditions. Indicate any unusual weather conditions that may have occurred in the past week including storms, high winds, and temperature extremes.
- Record any other factors or conditions that make the sampling trip unusual or that may potentially influence sample results. For example, report any chemical, mechanical, or biological control of algae or aquatic weeds that may have been done recently on the lake.

4. Take Samples and Measurements

TASK 1 Water Probe Measurements.

The CCHD staff will follow all manufacturer's instructions to obtain measurements of ambient air temperature, surface water temperature at 1', and at 3' the following: water temperature, pH, conductivity, dissolved oxygen, and turbidity. Measurements at 3' will be taken twice and averaged in results during data compilation in the office. *Be attentive to the fact that pH readings need a few minutes to equilibrate at each depth. These measurements will be recorded on the Log Sheet for Horseshoe Lake Field Testing and retained for study records.

- CCDH staff shall calibrate for depth upon every event.

TASK 2 - Measure the Secchi disk depth – No sunglasses:

It is preferable to have the same individual take the reading at a site throughout the entire sampling season. Sunglasses should not be worn at the time of this measurement. The line attached to the Secchi disk must be marked according to feet and designated to the nearest ¼ foot.

- Check to make sure that the Secchi disk is securely attached to the measured line.
- Lean over the side of the boat and lower the Secchi disk into the water, keeping your back toward the sun to block glare.
- Continue to lower the disk until it just disappears from view. Lower the disk another one foot, and then slowly raise the disc until it just reappears. Continue to move the disk up and down until the exact vanishing/reappearing point is found.
- Call out the reading if one is possible with certainty, or attach a clothespin to the line at the point where the line enters the water and slowly pull the disk out of the water and record the measurement based on the location of the clothespin on the line (applies to deeper water readings).

This procedure will be repeated as a quality control check; an average of the two readings should be recorded on the sampling form. See below:

Log Sheet for Horseshoe Lake Field Testing

Names:

Date:

	Time	Secchi Depth	Air Temp	Surface Probe √	3' Probe √	3' Probe √	Notes
(1) Inlet							
(2) Swim Beach							
(3) Midpoint							
(4) South Arm							
(5) Alternative to (4) if necessary							Give GPS Coordinates if (5) Alternative sampling location is used due to inaccessibility of site (4). Also approximate boat lengths away. Latitude: Longitude:
Comments (weather, QA samples, QAPP deviations, etc):							

TASK 4 – Collect a point sample for appropriate lab tests.

- When you arrive at each sampling location, rinse sample collection jar with surface water and shake dry.
- Attach sample collection jar to the Telescopic Jar Sampler.
- Lower the sampler gently into the water to the desired depth as marked on the pole.
- Pull the pull-ring extending from the handle to open the plunger on the telescoping pole. When bubbles stop rising from the sampler, release the pull ring to close the plunger and gently bring the sampler to the surface.
- Mark sampling time on lab containers with waterproof pen.
- Remove the sampling collection bottle from the pole and fill the pre-labeled lab containers.
- Shake collection jar to remove water drops.
- Place lab containers in cooler with ice.

5. Shipping

TASK 1 - Transfer sample water into lab bottles, but use caution!

Both the phosphorus an nitrate-nitrite bottles have acid present in powder form.

Lids are susceptible to contamination – do not remove until ready to pour.

Prepare to transfer sample water into laboratory bottles. If weather conditions could interfere with a safe transfer of sample water into lab bottles, then bring the boat back to shore and unload the sampling equipment and supplies, and move indoors or find an outdoor location that is dry and shielded from the wind.

Both the phosphorus lab bottle and the nitrate-nitrite bottle contains an acid that preserves the sample water during transport, which can burn skin or stain clothing and even the boat surfaces if spilled or mishandled. The bottle vapors should also be avoided. Please be familiar with the Acid Warning Info Sheet kept in the Field Manual.

Use the Check Off Sheet for Horseshoe Lake Lab Samples, shown below, to help avoid missed QC samples, etc. Perform the applicable test, as described in the sampling plan, in the order listed below and on Check Off Sheet.

A. For *phosphorus* sample bottle – Glasses/Goggles needed!

Warning: cap is extremely susceptible to contamination. Remove cap only when ready to pour sample.

- Make sure the phosphorus sample bottle is (yellow) labeled with:
  - the parameter to be analyzed (total phosphorus).
  - the date and the sample lake, location, and depth.
  - any additional information such as an accession number for laboratory identification and the acid content.
- Confirm that there is **acid present** in the bottom of the bottle by visual inspection.
- Move the total phosphorus sample bottle into position and remove the cap, being careful not to spill the acid contents or breathe in the vapors.

- Gently shake the collection container with the sample water to re-suspend any settled material.
- Gently pour the sample water into the phosphorus bottle until the liquid reaches the fill line.
- Carefully cap the sample bottle and place it into the shipment container with the frozen ice packs and close the lid so sunlight cannot reach it.

B. For Nitrate-Nitrite sample bottle – Glasses/Goggles Needed!

- Make sure the sample bottle is labeled with:
    - the parameter to be analyzed (nitrate-nitrite).
    - the date and the sample lake, location, and depth.
    - any additional information such as an accession number for laboratory identification and the acid content.
- Confirm that there is **acid present** in the bottom of the bottle by visual inspection.
- Move the nitrate-nitrite sample bottle into position and remove the cap.
- Gently shake the container with the sample water to re-suspend any settled material.
- Gently pour the sample water into the nitrogen bottle until the liquid reaches the fill line.
- Carefully cap the sample bottle and place it into the shipment container with the frozen ice packs and close the lid so sunlight cannot reach it.

C. For chlorophyll *a* sample bottle:

- Make sure the chlorophyll a sample bottle is labeled with:
    - the parameter to be analyzed (chlorophyll *a*).
    - the date and the sample lake, location, and depth.
    - any additional information such as an accession number for laboratory identification
- Move the chlorophyll *a* sample bottle into position and remove cap.
- Gently shake the container with the sample water to re-suspend any settled material.
- Gently pour the sample water into the chlorophyll *a* bottle until the liquid reaches the fill line. ***Filling to neck is best.*** A fill that is less than shoulder height will be inadequate. Some air space is also necessary.
- Cap the chlorophyll *a* sample bottle and place it into the shipment container with the frozen ice packs and close the lid so sunlight cannot reach it.

Check Off Sheet for Horseshoe Lake Lab Samples

Date:

Start Time:

Staff:

#	Location	Time	Turbidity?	Total Phos √	Nitrate-Nitrite √	Chlor a (fill to neck) √	Field Duplicate / Blanks: (highlight box if needed)		
1	Inlet								
2	Swim Beach								
3	Midpoint								
4	South Arm								

Describe Field Duplicates or Field Blanks that are to be collected today, if any:

Comments (weather, QA samples, QAPP deviations, etc)

TASK 2 – Clean Equipment and Transport Samples with Forms

Clean the sampling and laboratory equipment for the next sampling trip. The Secchi disk and water sampler should be rinsed off with fresh tap water, and the sampling containers rinsed with distilled water.

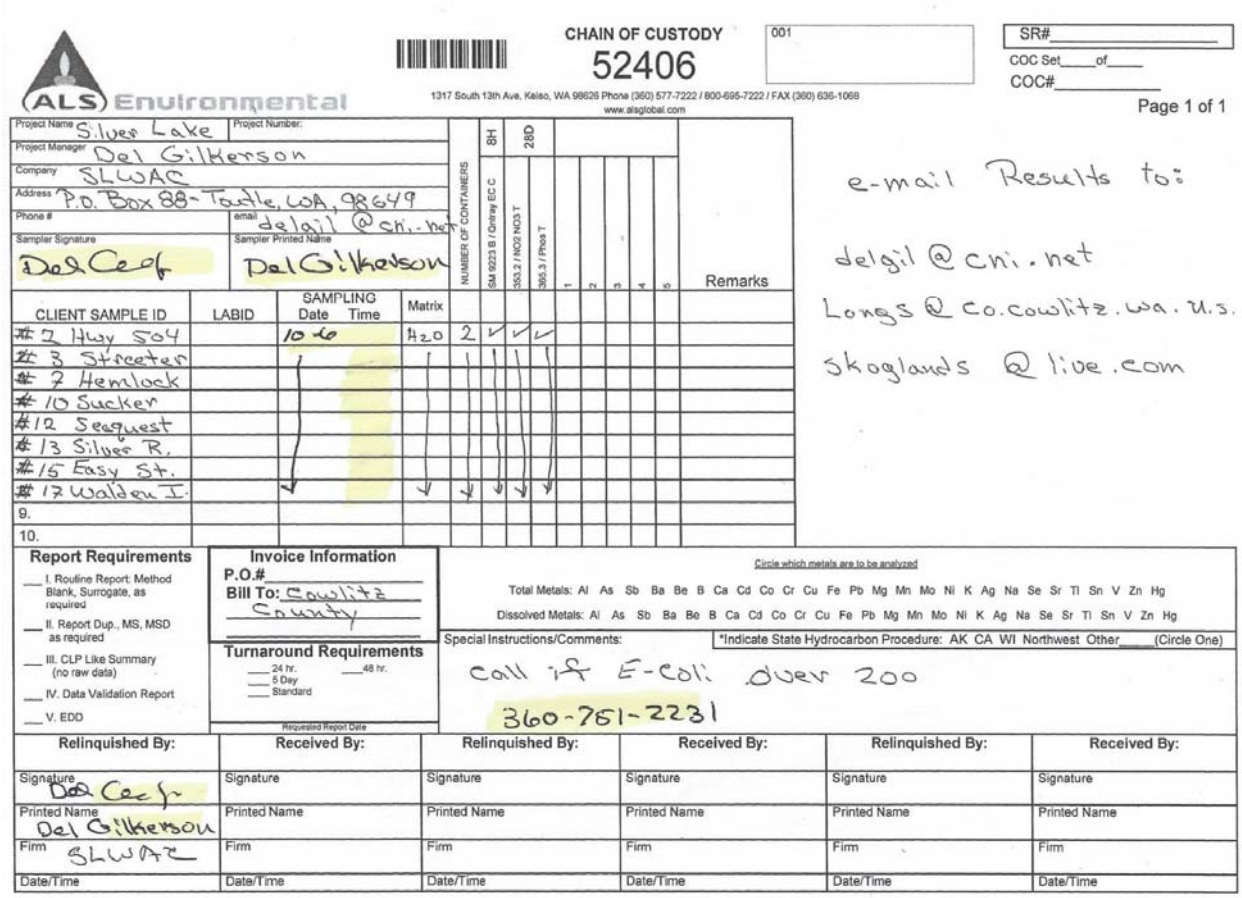
Pack and forward the shipping containers with the samples to the laboratories as soon as possible.

Wrap the bottle containing the sample with bubble wrap.

- Place the bubble-wrapped bottle, along with a frozen ice package into a Styrofoam or well-padded shipping container. The sample must remain cool or the lab will have to discard it.

Deliver in person to: ALS Global Laboratory, 1317 S. 13th Ave, Kelso, WA 98626 between 8am and 5pm Monday-Friday and between 8am and 12pm on Saturday. They prefer to receive by 4pm on weekdays and by 11am on Saturdays.

6. Chain of Custody Sample



ALS Environmental

CHAIN OF CUSTODY
52406

001

SR#_____
COC Set____of____
COC#_____

1317 South 13th Ave, Kelso, WA 98626 Phone (360) 577-7222 / 800-695-7222 / FAX (360) 636-1068
www.alsglobal.com

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Project Name: Silver Lake
Project Number:
Project Manager: Del Gilkerson
Company: SLWAC
Address: P.O. Box 88 - Toutle, WA, 98649
Phone #
email: delgil@cni.net
Sampler Signature: Del Gilkerson
Sampler Printed Name: Del Gilkerson

NUMBER OF CONTAINERS | 8H | 28D | SM 9223 B / Colilert EC C | 353.2 / NO3 NO3 T | 365.3 / Phos T | 1 | 2 | 3 | 4 | 5 | Remarks

CLIENT SAMPLE ID	LABID	SAMPLING Date	Time	Matrix	NUMBER OF CONTAINERS	8H	28D	SM 9223 B / Colilert EC C	353.2 / NO3 NO3 T	365.3 / Phos T	1	2	3	4	5	Remarks
#1 Hwy 504		10-16		H2O	2			✓	✓	✓						
#3 Streeter																
#7 Hemlock																
#10 Sucker																
#12 Seaquest																
#13 Silver R.																
#15 Easy St.																
#17 Walden I.																
9.																
10.																

e-mail Results to:
delgil@cni.net
Longs@co.cowlitz.wa.u.s.
skoglands@live.com

Report Requirements
___ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
___ III. CLP Like Summary (no raw data)
___ IV. Data Validation Report
___ V. EDD

Invoice Information
P.O.#_____
Bill To: Cowlitz County

Turnaround Requirements
___ 24 hr. ___ 48 hr.
___ 5 Day
___ Standard
Requested Report Date

Circle which metals are to be analyzed
Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg
Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Special Instructions/Comments: Call if E-coli over 200
360-751-2231

*Indicate State Hydrocarbon Procedure: AK CA WI Northwest Other____(Circle One)

Relinquished By:	Received By:	Relinquished By:	Received By:	Relinquished By:	Received By:
Signature: Del Gilkerson	Signature	Signature	Signature	Signature	Signature
Printed Name: Del Gilkerson	Printed Name	Printed Name	Printed Name	Printed Name	Printed Name
Firm: SLWAC	Firm	Firm	Firm	Firm	Firm
Date/Time	Date/Time	Date/Time	Date/Time	Date/Time	Date/Time

7. Bibliography

Simpson JT. 1991. Volunteer lake monitoring: a methods manual. EPA 440491002

Joy J. 2006. Standard operating procedure for manually obtained surface water samples. Ecology. EAP015

Attachment: Bottle Prep Directions for Sampling