

Sample Submittal Guidelines – DWR Water Sciences Section Chemistry Laboratories

NC Division of Water Resources – Water Sciences Section
4405 Reedy Creek Road
1623 Mail Service Center
Raleigh, NC 27699-1623
Telephone: (919) 733-3908
Fax: (919) 733-6241

This document is specific to the DWR Chemistry Laboratories to maintain conformance to technical and quality system requirements. While this document may be informative for other organizations, it is not intended for and may not be directly applicable to operations in other laboratories. Mention of brand names or vendors does not constitute an endorsement of products or services by DWR Chemistry Laboratories.

	Roy Byrd	5/20/2016
Inorganic Chemistry Manager Approval		Date
	Chris Johnson	5/20/2016
Organic Chemistry Manager Approval		Date
	Cyndi Karoly	5/20/2016
Section Chief Approval		Date
	Norma Good	5/20/2016
QA/QC Officer Approval		Date

Table of Contents:

Section	Title	Page
	Table of Contents	2
1.0	Introduction	3
2.0	Sample Containers, Preservation and Holding Times	4
3.0	Sample Containers	5
4.0	Sample Preservation	6
5.0	Holding Times	9
6.0	Time-Sensitive Samples	10
7.0	Trip Blanks for Volatile Organic Analysis	11
8.0	Field Reagent Handling	11
9.0	Sample Identification Requirements	12
10.0	Sample Custody and Documentation	12
11.0	Sample Submission Documentation	13
12.0	Legal or Evidentiary Custody Procedures	15
13.0	Sample Packing and Transport	18
14.0	Sample Receipt Procedures	20
15.0	Login Documentation	21
16.0	Verification of Sample Preservation	21
17.0	Rejection of Submitted Samples	22
18.0	Qualification of Analytical Results	24
19.0	Electronic Documents and Reports	24
20.0	References	25
21.0	Attachments	26
	Attachment A – WSS Chemistry Laboratory Information	26
	Attachment B – Guidance to Data Fields of a Sample Submission Form	27
	Attachment C – Trip Blanks for Volatile Organics Analysis	28
	Attachment D – Analytical Codes for Labworks	29
	Attachment E – Guidelines for Assigning Location Codes	30

1.0 Introduction

This guidance document is intended for personnel involved in collection of environmental samples, and is to be used by staff of the North Carolina Department of Environmental Quality. The document provides guidelines and protocols to follow prior to, during, and after collection of environmental samples that will be submitted to the Water Sciences Section's Chemistry Laboratories (North Carolina Division of Water Resources) in Raleigh and Asheville, NC. Adherence to these guidelines will help to ensure that analytical data reported by the laboratories is accurate and able to withstand legal and technical challenges.

The WSS Chemistry Laboratories do not provide field sampling services, and guidance and protocols for field collection of environmental samples is the responsibility of field staff. However, guidance and protocols in this document are intended to assist field staff in preparing for and conducting sample collection events and studies. This includes providing field staff with the appropriate sample containers and preservative chemicals, forms for documenting sample collection and submittal (field sheets), log-in of submitted samples into the Laboratory Information Management System (LIMS), and analysis and reporting of requested analytical parameters.

The Water Sciences Section has two chemistry laboratories: The Central Laboratory is located in Raleigh, NC; and the Asheville Regional Laboratory is located in Swannanoa, NC (see Attachment A for location and contact information for the two laboratories).

The WSS Central Laboratory consists of two analytical branches: The Organic Chemistry Branch and the Inorganic Chemistry & Microbiology Branch, which includes the Support Unit. The two chemistry branches provide analytical services for environmental samples that include microbiology, metals, nutrients, wet chemistry, herbicides and pesticides, and semi-volatile organic and volatile organic compounds.

The Support Unit of the Central Laboratory plays an essential role in providing sample collection supplies to field staff and receiving samples submitted to the lab. Support Unit personnel oversee ordering of sample bottles and containers, chemical preservatives, and assorted supplies; these supplies are stored at the Central Laboratory and disbursed to field staff by request. Personnel in the receiving room are responsible for receipt of samples submitted to the Central Laboratory, both by state courier and hand-delivery. This includes log-in of samples into the LIMS, completion of field sheets and chain-of-custody forms, and completion of sample bottle identification based on the assigned laboratory sample number.

The WSS Asheville Regional Laboratory is responsible for receipt and LIMS log-in of samples submitted for analysis at the regional lab (mostly time-sensitive parameters) as well as analysis of samples for the requested parameters. The regional laboratory is part of the Inorganic Chemistry & Microbiology Branch and provides analytical services for water samples that include microbiology and wet chemistry parameters.

During planning for a sample collection event or study, field staff must consider the following items:

Items to Consider during Planning of a Sample Collection Event or Study:
Analytical parameters of interest – types/quantities of sample bottles needed
Chemical preservatives needed for proper preservation of collected samples
Temperature preservation of collected samples
Hold times for the requested analytical parameters, especially time-sensitive parameters with a hold time of 48 hours or less, and prior notification of the laboratory
Preventing contamination of the samples
Documentation of sample collection and transmittal to lab (field sheets and COC forms)
Delivery of samples to the laboratory

Collection of environmental samples for laboratory analysis is challenging, and both the collection and the analysis of the samples requires the skills and effort of the involved field and lab personnel. But when done carefully and correctly, the collected samples and subsequent analytical results can provide representative, defensible, and high quality information to state and federal personnel involved in the assessment and protection of the waters of North Carolina.

2.0 **Sample Containers, Preservation and Holding Times**

Field staff must first determine which analytical parameters are needed for the sampling event or project. Then the following can be determined: (1) the types and quantities of sample containers needed; (2) which chemical preservatives are needed for correct preservation of collected samples; and (3) the holding times for each of the requested parameters.

Information regarding sample containers, temperature and chemical preservation requirements, and holding times for the analytical parameters offered by the chemistry laboratories is available at the following web-page:

<http://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/microbiology-inorganics-branch/sample-submission>

Guidance tables on this web page are provided for **surface water samples, ground water / UST samples, and soil/sediment samples**. Each of these guidance tables includes the following:

- 1) Analytical parameter
- 2) The minimum volume or weight of sample to complete the analysis
- 3) The routine container type used for sample collection by DWR Water Sciences Section Laboratories
- 4) Preservation requirements (chemical and temperature) required to maintain integrity of the sample
- 5) Maximum Holding Time (from sample collection to preparation/analysis in lab)

- Footnotes in the tables include additional information and must also be followed.

Note that the container types listed in the tables are those commonly used throughout the Division of Water Resources; other container types may be acceptable but must be pre-approved by the laboratory.

For surface and ground water samples, the WSS Chemistry Laboratories follow USEPA requirements for sample containers, preservation techniques, and hold times, which are outlined in the Code of Federal Regulations (CFR), 40CFR Part 136, Table II (May 18, 2012 update). Anytime that there is an update of the federal regulations, lab procedures will follow the updated protocol. For any parameters not in Table II, the referenced test method is used to determine requirements.

For soil/sediment samples, guidelines are adapted from *Test Methods for Evaluating Solid Waste, Third Edition SW-846, Update V*. Fish tissue samples are collected, filleted and frozen in metal tins prior to submission to the Central Laboratory.

Sample Collection Supplies:

The WSS Central Laboratory in Raleigh provides all sample containers and chemical preservatives upon request. Also available upon request are supplies such as security seals, pH test strips, chlorine test strips, and analyte-free deionized water for Dissolved Organic Carbon field blanks.

The **Supplies Order Form** can be found on the following web-page:

<http://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/microbiology-inorganics-branch/supplies-technical-assistance>

Guidance for Submitting Samples to the WSS Chemistry Laboratories

Note: Sample kits for EPA Method 1631 Low-Level Mercury samples are provided by request. Sample kits for collecting 1 sample or 2 samples can be requested on the Supplies Order Form.

Completed order forms for containers, preservatives, and supplies shall be submitted to the Central Laboratory by:

- Email to chemlaborders@lists.ncmail.net
- Hand deliver to Receiving Room staff at Central Laboratory

Completed order forms for EPA Method 1631 Low-Level Mercury sample kits should be submitted to the Central Laboratory by:

- Email to denr.dwg.mercurykit@lists.ncmail.net

3.0 Sample Containers

The Water Sciences Section Central Laboratory offers pre-cleaned, ready-to-use sample containers for all of the analytical parameters tested at the Central and Asheville laboratories. The containers used for sample collection are normally borosilicate glass (G) or plastic (P); however, high-density polyethylene (HDPE) bottles are used for select parameters.

Most sample containers are intended for one-time use only, which includes 500-ml disposable plastic bottles, 4-liter amber glass bottles, and 40-ml glass VOA vials. Certificates are kept on file at the Central Lab for glass containers, which are pre-cleaned and certified to be “analyte-free” by the manufacturer.

For certain analytical parameters, sample bottles are re-used and in these cases the laboratories clean the containers after each use (and prior to shipment to field staff). Parameters for which sample containers are cleaned and re-used include coliforms (fecal and total), BOD and cBOD, Chlorophyll a, cyanide, and phenols.

For a few analytical parameters, the sample containers provided by the laboratory are pre-filled with chemical preservative(s). In these cases, the sample container must not be rinsed prior to addition of the sample.

Parameters for which pre-filled sample containers are supplied:
Coliforms (fecal and total): 250-ml plastic, sterilized bottles are pre-filled with 0.2 ml of 10% sodium thiosulfate and 15% EDTA.
Sulfide: 40-ml glass vials pre-filled with zinc acetate preservative.
Volatile Organics: 40-ml glass vials pre-filled with HCl (for surface water samples) or NaHSO ₄ (ground water samples only).

- **EPA1631 low-level mercury** sample containers are only available as part of sample kits prepared by the Central Laboratory.

The quantity of sample containers required for a sample collection event or project will primarily depend on the number of sample sites/locations. However, the following must also be considered when determining the number of sample containers needed:

Guidance for Submitting Samples to the WSS Chemistry Laboratories

- Separate sample containers for total and dissolved analyses (*see note below*)
- Field blanks or duplicates
- Filter blanks for Dissolved Organic Carbon (DOC), Dissolved Metals, and Dissolved Nutrients
- Trip Blanks for Volatile Organics
- Parameters requiring multiple sample containers per sample location: oil & grease, sulfide, and volatile organics (refer to the sample guidance tables in section 2.0).

Note: Organic Carbon, Metals, and Nutrients are typically analyzed as “total”. If the “dissolved” form of any of these parameters is needed, then a portion of the collected sample must be field-filtered. In this case, the filtered sample aliquot must be submitted in a separate sample bottle (labeled as dissolved) from the sample bottle for total analysis. This bottle must be accompanied by a separate field sheet for dissolved parameters.

Finally, also take into account when a single sample container can be submitted for multiple analytical parameters. Each group of parameters listed below can be collected and submitted together in a single bottle:

- Inorganic anions: Bromide, Chloride, Fluoride, and/or Sulfate
- Residues: Total Suspended Residue, plus Volatile and Fixed Suspended residues (if requested)
- Residues: Total Residue, plus Volatile and Fixed Suspended residues (if requested)
- Nutrients: Ammonia, Nitrate+Nitrite, Total Kjeldahl Nitrogen (TKN), and/or Total Phosphorus (TP)
- Metals: all except for boron and EPA 1631 low-level mercury
- Pesticides: Organochlorine, Organonitrogen, and/or Organophosphorus

For sediment and soil samples, glass jars with Teflon-lined caps are provided in the following sizes: 125-mL, 250-mL, and 1000-mL.

4.0 Sample Preservation

Preservation of collected samples is critical to assuring that the sample remains representative of the sample location throughout storage and transport to the laboratory, and then until preparation and analysis at the chemistry laboratory. Without proper preservation, the target analyte(s) can degrade, bind with other chemical constituents, or be biologically transformed during the time between sample collection and sample analysis.

Each analytical parameter has specific requirements regarding sample preservation, which can be found in the sample guidance tables mentioned in section 2.0. Correct preservation of samples submitted to the laboratories is the responsibility of field staff (not the laboratory).

Preservation of a Collected Sample may include:
Thermal preservation
Chemical preservation
Situation-based chemical preservation (<i>e.g., additional chemical additive when chlorine is detected in sample</i>)
Light-protection (<i>amber glass bottles or brown plastic bottles to protect sample from light exposure</i>)

Guidance for Submitting Samples to the WSS Chemistry Laboratories

- Field blanks, filter blanks, and trip blanks must follow the same preservation procedures as environmental samples.

4.1 **Thermal preservation**

Thermal preservation of a collected sample is required for many analytical parameters and involves maintaining the sample below a specified temperature. The most common requirement is that the sample container be chilled and maintained at a temperature between 0.1 (with no signs of freezing) to ≤ 6 degrees Celsius. The sample container(s) must be chilled **immediately after collection** (following any filtration or chemical preservation) and maintained within the specified temperature range until delivered to the laboratory.

Thermal preservation is best achieved by placing a sample bottle in crushed ice within an insulated cooler. The sample bottle(s) must be completely covered by ice. This can be used for field preservation and for shipment/hand-delivery of samples to the chemistry laboratory. **NOTE:** Wet ice (NOT dry ice or “blue ice” packs) must be used for this purpose, in order to ensure that samples maintain appropriate temperature.

Temperature Blanks: If a sample transport container (shipping cooler) contains sample bottles for analytical parameters requiring thermal preservation, then a temperature blank must be included in the container/cooler. Generally, a 500-ml plastic bottle filled with water is used for the temperature blank (label the bottle with “T” or “Temp Blank”). A temperature blank bottle must be packed in a transport container in the same manner as the associated water sample bottles, and added to the container at the same time that the sample bottles are placed on ice.

Temperature Blanks are not recorded on the field sheets or COC forms for sample bottles. A temperature blank bottle is only intended for use by laboratory personnel as a method to measure and document the temperature for each sample shipment cooler. At the time of receipt by the laboratory, the measured temperature for a temp blank is recorded on the field sheet(s) of all sample bottles within a cooler. Temperature blanks shall be handled exactly as the environmental samples are handled. Fill a Temp Blank bottle with water at the sampling site and add to the sample transport container when the sample bottles are placed on ice.

Occasionally, samples that are collected and delivered to the lab within a short period of time may not have time to cool to $\leq 6^{\circ}\text{C}$ (or $<10^{\circ}\text{C}$ for bacterial tests) before they arrive at the laboratory. If these samples are placed in ice immediately after collection and are shipped on ice, then the sample collector has complied with the thermal preservation requirements to the best of their ability and the samples will be accepted. ***Documentation of the actual sample temperature at the time of collection and upon receipt at the laboratory must exhibit a downward trend and will complete the preservation documentation requirements. The field temperature must always be documented if there is any question as to whether samples will have time to cool to less than or equal to 6°C (or $<10^{\circ}\text{C}$ for bacterial tests) during shipment.***

4.2 **Chemical Preservation**

Chemical preservation of a collected sample is required for many analytical parameters and is the responsibility of field staff. The Central Laboratory supplies all chemical preservatives by request (see section 2.0). Most chemical preservatives are solutions (e.g., acid and base preservatives) and are provided either in glass or plastic ampoules (vendor-prepared) or in glass dropper bottles (lab-prepared). Sample preservatives and other reagent preparations shall be traceable to preparation dates, vendor sources and lot numbers. Original documents and records from manufacturers or generated in the laboratories for reagent preparation must be kept on file at the Central Laboratory.

Guidance for Submitting Samples to the WSS Chemistry Laboratories

Documentation shipped with chemical preservatives to field staff must be kept on file in the field offices.

Chemical preservation of a sample most often involves addition of a specified acid or base solution to the sample after collection. The volume of preservation solution to add may be specified; however, the requirement is often-times for the pH of the sample to be adjusted to a specified pH (e.g., sample pH adjusted to <2). In this case, the pH of the sample must be checked with a pH test strip to verify that the specified pH has been attained. This may be accomplished by pouring a small portion into a disposable container.

Due to the risk of compromising sample integrity, the pH of sulfide and volatile organics analysis (VOA) samples cannot be checked in the field.

After addition of the preservative, the sample bottle must be capped and inverted several times to insure that the chemical preservative and water sample mix well. Sample pH shall be checked after mixing. If the measured pH is within the appropriate range, then the sample may be submitted to the laboratory as is; if not, additional chemical preservative must be added drop-wise until the proper pH is achieved. If an excessive amount of chemical preservative must be added to achieve the specified pH range, then contact the laboratory for additional guidance (care must be taken to not over-dilute the sample or alter sample matrix with preservative).

Important: Complete the following before preservation of a sample:

- Filtration of a sample (either analyte-required or for dissolved parameters)
- Checking a sample for chlorine (if parameter requires de-chlorination if chlorine is present)

For specific parameters, one or more chemical preservatives are pre-added to each sample container prior to shipment to field staff. In these cases, field staff must add sample directly to the sample container without pre-rinsing the containers. The parameters are:

- **Coliforms (fecal and total):** plastic bottles are pre-filled with sodium thiosulfate and EDTA.
- **Sulfide:** glass vial containers contain 1 ml of 2N zinc acetate. Sample is added to a vial, followed by addition of 6N NaOH to specified pH. Vials must be filled to top leaving no head space.
- **Volatile Organics:** glass vial containers are available that are pre-filled with NaHSO₄ (ground water samples only) or HCl (surface water samples only). Consult the sample guidance tables or laboratory staff for more information. In either case, vials must be filled to top leaving no head space.

Field staff are requested to verify correct sample preservation by including the preservative(s) used on the sample bottle labels. For pre-printed labels, sample collectors are also requested to either initial the label or attach the chemical preservative label on the sample bottle. Sample preservatives and other reagent preparations shall be traceable to vendor and lot number (or preparation date for lab-prepared preservatives). This is the responsibility of the sample collector, and shall be documented on the sample submission form(s) and/or field notes and records.

For the vendor-prepared vials of acid and base preservatives, field staff are requested to record the lot number from the vial(s) on the sample submission form. This is especially important for metals (nitric acid), Nutrients (sulfuric acid), and Total Organic Carbon (phosphoric acid).

4.3 **Situation-Based Preservation:**

Chemical preservation can also be required if chlorine is detected in a sample. For these analytical parameters, chlorine interferes by binding with the target analyte and generally causing negative interference during analysis. When there is the possibility of chlorine being present in a collected sample (e.g., WWTP effluents) or if there is any doubt, the collected water sample must be checked in the field with a chlorine test strip. If chlorine is detected, then a specified chemical preservative is added to the sample bottle in sufficient amount to effectively de-chlorinate the sample (de-chlorination procedures are included in the guidance tables).

4.4 **Light protection**

When required, light protection of a collected sample serves to prevent either photo-degradation of target analytes or biological change. Chlorophyll *a* is a parameter that is particularly susceptible to change if the collected sample is exposed to light; therefore, samples must only be collected in plastic, brown bottles. If a sample is field-filtered for Chlorophyll *a*, then the filter must be placed in a plastic container and immediately covered with tin foil to protect the filter from light during transport to the Central Laboratory (see guidance table for surface water samples for additional information and requirements).

Important: The *Preservation* column of the sample guidance tables includes requirements for field filtration of a sample, which is required for a few parameters. The information may include required pore size of the filters used for filtration and a time-limit for filtration to be completed (e.g., a sample for orthophosphate analysis must be filtered within 15 minutes of collection).

For **Chlorophyll *a***, a time period of 24 hours is allowed from the time of sample collection to the time of filtration of the water sample (normally conducted at the Central Laboratory in Raleigh). If a sample is filtered in the field, then the temperature preservation requirement of the filter is that it be frozen until delivery to the lab. In addition, the holding time extends to 21 days until analysis of the filter.

5.0 **Holding Times**

The holding time for an analytical parameter is the maximum time allowed between the time of sample collection in the field and the time that sample preparation/analysis begins in the laboratory. The date and time documented on the field sheet establishes zero-hour; for composite samples, the date and time for the end of the sampling cycle is zero-hour.

Published holding times must be considered by field staff when scheduling a sampling event. Samples shall be delivered to the lab as soon as possible after collection. When immediate delivery is not possible, the sample collector must be aware of the maximum holding times for all requested parameters and take into account the time required for delivery of samples to the chemistry laboratories. This is especially critical for parameters with holding times of ≤ 48 hours (e.g., BOD₅, coliforms, color, hexavalent chromium, nitrite, MBAS) in order to allow sufficient time for sample preparation and analysis.

Note: The only permissible exception to the holding times listed in the sample guidance tables (and published in 40 CFR Part 136 Table II) is the extended holding time allowed by DWR for non-compliance coliform samples. Since it is not possible to transport some samples to the WSS chemistry laboratories in less than the 6-hour requirement, non-compliance samples delivered within 24 hours of collection will be accepted and analyzed (but reported with qualification). Compliance and enforcement samples **must** meet the 6-hour holding time.

Guidance for Submitting Samples to the WSS Chemistry Laboratories

For some parameters, there is more than one holding time in the sample guidance tables. In these cases, different holding times are specified for the time allowed between sample collection and sample preparation (such as extraction), and then between sample preparation and sample analysis. Additional holding times may also be specified based on whether or not an optional chemical preservative is added to the sample, or for when a sample contains an interfering compound.

Note: Field parameters typically have a published holding time of “within 15 minutes of collection.” For example, pH is required to be measured in the field, even though the laboratory can analyze water samples for pH. In specific cases (by request only), the chemistry laboratories will measure and report pH for water samples. The associated report will be qualified with a qualifier denoting that the sample exceeded hold time. It is important that such results be used only for information and not for compliance or enforcement situations as the results are not legally defensible.

6.0 Time-Sensitive Samples

A time-sensitive sample is a water sample collected and submitted for an analytical parameter with a maximum holding time of 48 hours or less. The time required in the laboratory for sample preparation and/or analysis makes it especially crucial that collection of samples and subsequent sample delivery be scheduled by field staff in a manner that provides laboratory staff with sufficient time to complete the analysis within the required holding time. Therefore, advanced notification is recommended prior to collection and submittal for the parameters listed below.

Analytical Parameters with a Holding Time of \leq 48 hours:
Coliforms (fecal and total)
BOD and cBOD
Color (ADMI and Platinum Cobalt)
Hexavalent Chromium
MBAS
Nitrite
Orthophosphate
Turbidity

Important: Time-sensitive samples for the analytical parameters listed above are subject to the following restrictions (unless pre-arranged with laboratory staff):

- (1) Not accepted after 3:00 P.M., Monday through Thursday
- (2) Not accepted after 1:00 P.M, Friday
- (3) Not accepted on a week day that is a state holiday or that precedes a state holiday weekend
- (4) BOD and cBOD may include additional restrictions for state holidays

Information for sample submittal restrictions and laboratory contacts can be found on the following web-page:
<http://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/microbiology-inorganics-branch/sample-submission>.

Information available on the web page includes a guidance document, *Submission of Samples for Time-Sensitive Parameters*, as well as tables and calendars that specify sample submission restrictions for each State Holiday.

7.0 **Trip Blanks for Volatile Organic Analysis**

A trip blank must accompany any samples (aqueous or solid) for volatile organic analysis submitted to the Central Laboratory. **Attachment C** includes additional guidance on trip blanks. A trip blank is defined as a sample of analyte-free media (e.g., well water with charcoal filtration, non-chlorinated bottled water, and deionized water) taken from the laboratory or other point of origin to the sampling site and returned to the laboratory unopened. The purpose of a trip blank is to document contamination attributable to shipping and field handling procedures (i.e., diffusion of volatile organics through the septum during shipment and storage).

The source of the trip blank water must be identified on the field sheet (e.g., X Brand Bottled Water, regional office tap water with charcoal filtration, etc.). The trip blank is then submitted for analysis as any other sample.

Three 40-ml vials are required for a trip blank (whereas four 40-ml vials are required for each environmental sample). A trip blank is treated just as any other sample and, consequently, a separate field sheet must be completed and submitted with a trip blank (and it must also be recorded separately on a COC form, when used).

Important:

- Each transport container with samples for volatile organic analysis (VOA) must include a trip blank; the trip blank covers all VOA samples in the container. If there is more than 1 transport container with VOA samples, then each transport container must include a trip blank.

Note: The tracking of Trip Blanks and associated samples is the responsibility of the collector.

8.0 **Field Reagent Handling**

All reagents, cleaning materials and preservatives that are maintained by field staff shall be stored, transported and handled in such a way as to prevent and/or minimize contamination. All chemicals that are maintained in-house and transported to the field shall be segregated according to reactivity (i.e., acids, bases, etc.). Acids shall be stored in an acid storage cabinet and solvents shall be stored in a vented solvent storage cabinet.

Note: Safety Data Sheets (SDS) for chemical preservatives are available as pdf files on the following web page; it is the responsibility of field staff to read the SDS for each chemical and follow proper precautions:
<http://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/microbiology-inorganics-branch/supplies-technical-assistance#Safety>

All chemicals transported to the field shall be stored to avoid exposure to extreme temperatures and sunlight, and to avoid breakage of preservative containers. Chemicals shall be segregated from sample containers so as to avoid reaction and accidental contamination.

Expiration dates for chemical preservatives must be noted and adhered to; expired vials of chemical preservatives may be returned to the Central Laboratory for disposal.

Analyte-free deionized water shall be segregated from solvents and chemicals to prevent contamination. The submittal of field blanks for analysis by the laboratories is recommended to verify that sample collection apparatus and containers are free of contamination, but is left to the discretion of the sample collector. An exception to this is Hg 1631, which requires a field blank for every sampling site.

9.0 **Sample Identification Requirements**

All sample containers must be labeled or tagged to provide identification of the sample. Information on the label or tag must be sufficient to allow the sample container to be matched with certainty to the corresponding sample submission form (field sheet) and Chain of Custody form (if included).

Information to Include on Sample Container Label:
Location Description
Location Code (or other identification number)
Date of Collection
Sample Collector's Name or Initials
Analytical parameter(s)
Chemical preservative(s) added to sample container

Important: The time of collection must also be documented on the label or tag for the following time-sensitive parameters: coliforms (fecal and total) and Chlorophyll a. This allows holding time deadlines to be readily calculated by the lab staff).

For pre-printed tags and labels, EPA Region IV has suggested that the sample collector initial the preservative on the tag to verify that the sample was preserved with the appropriate chemical preservative.

Field staff are required to check or indicate "water supply well" on sample bottle tags or labels, and to list "water supply well" on the associated sample submission form (when appropriate).

Hand-written information must be legible and written in indelible ink. The label or tag shall be attached so that it does not contact any portion of the sample removed or poured from the container.

Important: For parameters requiring multiple sample containers per sample location, each of the individual vials submitted for a sampling site must be labeled to prevent misidentification of any single bottle or vial in the field or in the laboratory. This includes oil & grease, sulfide, and volatile organics.

Containers for field blanks, filter blanks, and trip blanks must also follow these guidelines.

As a safety precaution, any sample suspected to be extremely hazardous or heavily contaminated must be identified as such on sample labels as well accompanying field sheets and COC documentation.

10.0 Sample Custody and Documentation

A sample transmittal form (field sheet) must accompany all samples that are submitted to the WSS chemistry laboratories. In addition, a Chain-of-Custody (COC) form must be included to document sample custody, when needed.

These forms serve as primary documentation for a set of samples collected at a specific location which are subsequently submitted to the WSS chemistry laboratories for specified analytical parameters. These forms also serve as documentation of sample collection and are the primary link between sample collection by field staff, sample analysis by laboratory staff, and reported results for the requested analytical parameters.

The original copies of submitted field sheets and COC forms are maintained at the WSS Central Laboratory in Raleigh and the WSS Regional Laboratory in Swannanoa. Electronic copies of the forms are also maintained by the laboratories.

The history of a sample must be clearly evident from retained records and documentation. Originals of all documentation that are associated with the collection of samples during a sample event must be retained. Any additional documentation that is generated by field staff is their responsibility. Note that records of a sample event can also include additional documentation or communications sent to or received from all field and laboratory personnel involved with the collection, receipt, and analysis of a set of samples. The records as a whole must contain enough information so that excessive clarifications, interpretations or explanations of laboratory data are not required from the originator

There are two levels of documentation regarding environmental samples:

- 1) **Sample Submission documentation** is required by DWR for all sample collection events. It includes all records and documentation necessary to trace a sample from its point of origin through analysis and to the final report. Sample custody requires that each event or procedure to which the sample is subjected be documented. These include, but are not limited to: sample collection, field preservation, sample receipt and log in, sample preparation, and sample analysis. In addition, those tasks or activities that relate to each of the above-mentioned events (e.g., reagent preparation, calibration, preventative maintenance, quality control measures, etc.) must be documented. The history of the sample must be readily understood through the documentation. The required documentation associated with sample transmittal is outlined in Section 10.
- 2) **Legal or Evidentiary Chain of Custody (COC)** is a special type of sample custody that requires that physical possession, transport and storage of a sample be documented in writing (or established procedures). The recorded documentation must at a minimum account for all periods of time from sample collection, storage, transport to the laboratory, and receipt by the laboratory. If COC is needed for a sample collection event, then the minimum documentation requirements outlined in Section 11 must be followed.

All records shall be maintained in a manner that facilitates document tracking and allows historical reconstruction of an analytical event and ancillary procedures that produced the resultant sample analytical data. The filing and storage systems shall be straightforward and shall facilitate the retrieval of all working files and archived records for inspection and verification purposes. Final reports, data summaries, or other condensed versions of data that have been prepared by external parties shall be linked to internal records by an unequivocal cross-referencing mechanisms (usually field and/or laboratory ID numbers).

11.0 Sample Submission Documentation

All samples submitted to the WSS chemistry laboratories must include a sample submission form (field sheet). These forms are for documentation of sample collection, request of analytical parameters, and laboratory sample information.

The field sheets that are used by DWR and the Department of Environment Quality are:

- Water Sample Field Sheet – Central Lab
- Water Sample Field Sheet – Asheville Lab
- Underground Storage Tank Field Sheet
- Water Quality Sediment, Soil and Tissue Field Sheet.

The current, approved versions of these forms can be found (and downloaded) from the WSS Website at: <http://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/microbiology-inorganics-branch/sample-submission>.

Attachment B is a guide to the data entry fields of a sample submission form - to use as an additional resource with the information below. Field staff are responsible for completing all sections of a field sheet except for the *Lab Use Only* box and the *Lab Comments* field.

A sample submission form must be submitted for each sample location at which environmental samples are collected; in addition, a sample submission form is required for all field blanks and duplicates, filter blanks, and trip blanks.

For each sample location/event, the following information must be recorded on the appropriate field sheet:

- **Visit ID:** Required for AMS and RAMS sample sites. Optional for other sites.
- **Tag ID (optional):** number written on sample container labels/tags and field sheet to assist in matching.
- **Location Description:** Descriptive text of sample site or location; may include street address, owner's name, river/stream/lake name, etc.
- **Location Code:** A unique identifier used for only a single, distinct sample location. A location code allows for all of the data for that particular location to be retrieved over time and establishing a historical record. A location code **must** be recorded on each field sheet. See **Attachment E** for guidelines.
- **County:** The name of the county in which the sample site is located.
- **DWR Region (based on county):** The Division of Water Resources region in which the sample site is located, based on county (not sample collector's regional office).
- **River Basin:** The major river basin that the sample site lies within; intended primarily for surface water sites.
- **Presence and Removal of Chlorine:** check boxes when applicable
- **Filtered in Field:** check box if samples documented by the field sheet were field-filtered
- **Name of sample collector** – Collector's first initial and last name. If more than one collector involved, leader of the field team or person primarily responsible for associated sample containers. To provide consistency, each sampler must use the following format for recording his/her name: the initial of the first name followed by the last name. (For example, Betty Smith would record her name as "BSmith".) **NOTE:** If more than one collector is listed on a field sheet, the first (legible) name written will be entered into Labworks™ and that collector will be able to access the final report electronically.

Guidance for Submitting Samples to the WSS Chemistry Laboratories

- **DWR Office (or agency name):** The acronym for the DWR office or other agency where the collector is located.
- **Date and time of sample collection** – The date and time of sample collection must be documented on each sample submission form. The standard format for date is year/month/day (YY/MM/DD). It is recommended that collection time be recorded using 24-hour notation (e.g., 1:00 PM is 1300 hours). For composite samples, enter one date/time for initiation of sample collection and a second date/time for conclusion of sample collection.
- **Sample Priority, Water Matrix, Location Type:** For each field, check the appropriate boxes to indicate sample priority status (e.g., routine or emergency), water matrix (e.g., surface or ground), and location type (e.g., river/stream, monitoring well, effluent).
- **Analytical parameters requested:** Check the boxes corresponding to request analytical parameters. There must be a properly-preserved sample bottle for each parameter requested on the sample submission form (field sheet). If a field sheet is pre-printed and a sample bottle is not submitted for a selected parameter, then the collector shall write “NS” beside the checked box to indicate “No Sample” submitted for that parameter. See **Attachment D** for a list of Analytical Parameters (and corresponding Labworks Analytical Codes).
- **Filtered samples submitted for dissolved analyses:** Must be on separate sample submission form than unfiltered (total) samples. Check the box “*filtered in field*” and enter “**DIS**” in the boxes corresponding to the requested analytical parameters.
- **Preservative name or abbreviation and preservative strength.** The following abbreviations (these shall be written in the space to the right of the analysis requested, written on the sample tag, or the label from the preservative may be placed on the field sheet; however, a permanent record is preferred) may be used:
 - HCl - hydrochloric acid
 - 1+1 HCl – hydrochloric acid, 1+1
 - 1:1 H₂SO₄ - sulfuric acid, 1:1
 - 1+1 HNO₃ - nitric acid, 1+1
 - 6N NaOH - sodium hydroxide, 6N
 - 0.008% Na₂S₂O₃ - sodium thiosulfate, 0.008%
 - 2N Zn Acetate - zinc acetate, 2N
 - NaHSO₄ - sodium bisulfate
 - H₃PO₄, conc. – phosphoric acid, concentrated
 - ICE - for samples that are thermally preserved only
- **Quality Control (QC) samples** – Field Blanks, Filter Blanks and Trip Blanks must be documented on separate sample submission forms than the associated environmental samples. Priority is “QA”; Water Matrix is “Blank”; and Location Type is either “Field Blank”, “Filter Blank”, or “Trip Blank.” QC samples must be documented in the same manner as all other samples and must meet all container, preservation, sample volume and hold-time requirements specified for the parameter of interest.
- **Collector’s Comments** – space for collector to record additional sample conditions, location information, etc.

Additional documentation may include:

- **Temperature of samples** (i.e., water temperature) at the time of collection - This is important for short transport times to document a downward trend during the cooling process.
- **Field Parameters data** – Entry fields for field measurements of water temperature, pH, dissolved oxygen, conductivity, and salinity.

Hand-written entries on sample submission forms must be written legibly and must be made with indelible ink. Entries of records shall not be obliterated by erasures or markings. All corrections to entry errors shall be

made by one line marked through the error (**do not use Wite-out®**). The individual making the correction shall initial and date the correction.

12.0 Legal or Evidentiary Custody Procedures

Legal Chain of Custody (COC) protocols are procedures designed to document and track the physical possession and/or storage of sample containers for a sampling event from point of origin in the field through to the laboratory analytical group(s) receiving the sample containers for analysis. The primary objective of chain of custody is to ensure the integrity of a sample or samples from collection to data reporting by creating an accurate, written, verified record that can be used to trace the possession and handling of the sample(s) from the moment of collection through sample analysis and data reporting. It can be used to demonstrate that sample containers were handled and transferred in such a manner to eliminate possible tampering. Documented chain of custody of a sample container is achieved through a combination of field and laboratory procedures and documentation, document control and review.

Chain of custody is necessary if there is any possibility that resulting analytical data, or decisions based upon that data, will be used for compliance or enforcement actions, or potentially be the subject of litigation. Discretion shall be used when requesting COC. It must be noted that COC samples are not necessarily given higher priority over routine samples. The only difference between routine samples and COC samples is the custody documentation trail and associated procedures.

Note: Samples that require priority handling must be designated as "Emergency" on the sample submission form. This designation must only be used when necessitated by the situation (e.g., human health threat, spill response and control) and/or with concurrence with the collector's immediate supervisor since emergency samples are given priority over all other samples and may lead to other samples exceeding holding times. Notify the laboratory regarding delivery of emergency samples whenever possible.

The WSS Chemistry Laboratory's COC form is intended to establish an intact, contiguous record of the physical possession of a set of collected samples. The COC form is designed to account for sample containers during two major time periods:

- (1) Sample collection to hand delivery to lab by field personnel (or sealing of the sample transport container if shipped to lab by courier);
- (2) Receipt by laboratory personnel (and breaking of security seal on the transport container) at laboratory and then transfer of sample containers from receiving room personnel to personnel from the appropriate analytical groups.

Note that the time during delivery of a transport container to the laboratory by courier is considered to be accounted for **if** the security seal on the transport container remains intact and there are no visible signs of tampering.

The resulting COC record must include the signatures of all individuals in possession of the sample(s); required signatures include:

Personnel who must sign a Chain of Custody form:
Field - Sample collector
Field - Staff member responsible for storage of samples (<i>if not collector</i>)
Field - Staff member responsible for packing and delivery of samples to lab (<i>if not collector</i>)

Guidance for Submitting Samples to the WSS Chemistry Laboratories

Laboratory – Staff member receiving the transport container; breaks the security seal
Laboratory – Staff member(s) receiving sample container(s) for an analytical group or unit

In order to simplify record-keeping, the number of people who physically handle the sample shall be minimized.

Important: A COC form must be initiated by the sample collector; laboratory COC procedures are valid only when the field COC is properly performed and documented.

Field staff collecting the sample(s) and/or packing the transport container must complete the items listed in the table below:

COC Record (form) – Field Staff responsibilities:
Indicate the Water Sciences Section laboratory to which the samples are being submitted
Brief description of the purpose of the sample collection or investigation
Sample Collector’s full name – printed and signature <ul style="list-style-type: none"> • Must be staff member listed as sample collector on sample submission form (field sheet)
Field storage conditions and location (if applicable)
List each sample location: <ul style="list-style-type: none"> • Location code or tag number • Location description • Date Collected • Time Collected (24-hour notation, e.g. 2:00PM is 1400 hours) • Total number of sample containers for the sample location • Required analyses
<ul style="list-style-type: none"> • Staff member that packs sample transport container and signs/dates the security seal (Calendar date and time of day of each transfer or handling procedure) • Sign Relinquished by column • Enter Date and Time Relinquished
Method of Shipment – circle one selection to indicate how transport container is delivered to the laboratory
Shipment Container Sealed by: <ul style="list-style-type: none"> • must be signed by person who signs/dates the security seal on the sample transport container

- A COC form must include sufficiently detailed information to allow the form to be unquestionably linked to the associated sample submission forms.

Guidance for Submitting Samples to the WSS Chemistry Laboratories

- A COC form may include multiple sample locations (if packaged in one transport container), and therefore must be able to be linked to each sample submission form for each of the locations.

Entries into all COC records must be written legibly and must be made with indelible ink. All documentation entries shall be signed or initialed by responsible staff. Entries in records shall not be obliterated by erasures or markings. All corrections to record-keeping errors shall be made by one line marked through the error. The individual making the correction shall initial and date the correction.

Access to all legal and evidentiary samples shall be controlled and documented. The number of individuals who physically handle the samples shall be limited to those responsible for sample collection, initial laboratory receipt, sample preparation, sample analysis and sample disposal. A sample is considered under custody if it is in your possession, in your view after being in your possession, or placed in a secure area (e.g., sealed container for shipping or an area accessible by authorized personnel only) after being in your possession.

If samples are stored in the field prior to delivery to the laboratory, the location and security condition of those samples must be documented on the COC form. Chain of Custody seals may be placed on the outside of sample storage refrigerators or over the caps of individual sample bottles for added precaution.

All persons visiting a building where samples are stored must sign a log upon entrance and exit. Only authorized personnel are to be permitted within chemistry laboratory areas where samples are stored. All external doors are either visually monitored by DEQ staff or kept locked. Visitors are required to sign in and out at the front entrance.

When the above information has been completed on the COC, and the sample transport container is ready for delivery to the laboratory, the COC form can be attached to the sample transport/shipment container along with the associated sample submission forms (field sheets). If collected samples will be packaged in more than one transport container, then each container must include a COC form for the enclosed sample bottles, and must include a signed/dated security seal.

Sample transport containers must be secured with packing tape to prevent opening of the container during shipment. A tamper-proof custody seal must be affixed directly to the junction of the transport container's lid and body. The custody seal must have space for the signature of the person who affixed the seal, as well as the date and time that the seal was affixed (must match entries on COC form). The seal must be placed so that the transport container cannot be opened without breaking the seal.

Field staff must also keep in mind the following that can pertain to chain of custody and litigation:

- Records for chemical preservatives
- Location and security conditions of samples (if stored in field); e.g., locked refrigerator or room
- Storage conditions for the samples, including chemical and thermal preservation
- Private carrier documents (if applicable) (Shipping bills (i.e., Federal Express, UPS, etc.) will be retained with the COC and/or field sheet if a sample is delivered by means other than state courier or hand-delivery).
- Unique field identification code (or location code) for each sample location
- Record of all field personnel involved in collecting samples

13.0 Sample Packing and Transport

Sample containers must be protected during storage and transport to the WSS chemistry laboratories. Since most analytical parameters require thermal preservation, the standard sample transport/shipping container is an insulated cooler with secure lid.

For thermal preservation of sample containers during transport, only use crushed, wet ice (do not use dry ice or freezer packs). All sample containers and the temperature blank bottle must be completely covered with ice, especially during summer months.

Glass sample containers shall be wrapped in protective material such as bubble-wrap to prevent breakage. Glass vials for sulfide or volatile organics for a sample location must be secured together in a manner that keeps the 4-vial set together and protected.

Each sample transport container must contain the following:

A sample transport/shipment container must contain:
Sample submission form(s)
COC form (if applicable)
Sample containers for all analytical parameters requested on the attached sample submission form(s) <ul style="list-style-type: none">• Exception: Due to their size, 4-liter glass amber bottles for semi-volatiles, herbicides, and pesticides may be transported in a separate shipment container (if submission form is in accompanying container).• This exception does <u>not</u> apply if COC is in use.
Wet ice for thermal preservation
A temperature blank bottle filled with water
A trip blank (if transport container includes samples for volatile organics analysis)

Note: samples for EPA1631 Low-Level Mercury analysis must be packaged and transported to the Central Laboratory using the sample kits provided by the laboratory. No exceptions are allowed.

- For safety and billing reasons, transport/shipping containers must not exceed a maximum weight of 50 pounds. Use additional containers as necessary.

Completed sample submission forms (field sheets) and COC forms shall be placed in a waterproof bag, sealed, and attached to the transport container. Transport containers must be secured with packing tape or duct tape to insure that the container does not open accidentally during transport.

If applicable, COC seals must be attached to front of a transport container, and stretch from the cover to the container such that the container cannot be opened without breaking the seal. "COC" or "EMERG" shall be written in indelible ink on the cooler wrapping tape to alert laboratory staff to priority or special-handling samples. The date and sample handler's signature must also be written on the COC seal.

When a transport container contains short holding time samples (e.g., coliform and hexavalent chromium) that will not arrive at the laboratory until the following day, the samples often risk exceeding holding times before

Guidance for Submitting Samples to the WSS Chemistry Laboratories

they can be identified, checked in, and expedited to the appropriate analytical unit(s) for analysis. Collectors can greatly increase the possibility of having these samples recognized and checked in first by identifying these priority contents on the outside of coolers using tape or labels.

Packed sample transport containers can be hand-delivered to the laboratory by field staff, or may be shipped by State courier or common carrier. If sent by common carrier, all documentation shall be sealed and placed inside the shipping container prior to sealing it closed.

Samples transported to the Central Laboratory in Raleigh must be submitted at the Receiving Room (loading dock on west end of building). Samples transported to the Asheville Regional Laboratory in Swannanoa must be delivered to the chemist at the lab.

14.0 Sample Receipt Procedures

Upon receipt of samples at the chemistry laboratories, laboratory personnel (support unit staff or chemists) are responsible for logging all samples and sample containers, and verifying that all records are complete, correct and are entered into the sample custody records.

Upon receipt, each sample transport container is immediately opened by the custody technician in the receiving area, and the sample submission form(s), COC form (if present), and temperature blank bottle are removed for inspection. Sample bottles are matched to the corresponding submission forms based on identifying information entered on the forms and sample bottle tags/labels.

The following checks are also performed upon receipt of samples:

- Verification of the integrity and condition of all sample transport containers.
- Verification of the integrity and condition of all sample bottles and containers.
- Checks for leakage, cracks or broken closures for sample containers; evidence of grossly contaminated container exteriors or shipping cooler interiors, and obvious odors, etc.
- Checks for air headspace in VOA and sulfide samples
- Verification of receipt of complete documentation for each container - the minimum information for each sample container must include the items listed previously.
- Verification that sample identification information on sample transmittal forms corresponds to sample identification information on the individual sample containers.
- Verification that COC procedures, when applied, have been properly carried out and documented. This includes verifying that the COC security seal on a transport container was secure and unbroken at the time of receipt.
- For samples that require thermal preservation (i.e., wet ice), sample receipt technicians will verify proper storage temperature by determining that sample containers are in adequate contact with wet ice in the shipping chest and by documenting sample temperatures to be less than or equal to 6°C (or less than 10°C for bacterial tests).

Temperature must be measured using an NIST-traceable, calibrated thermometer or digital measuring device. The following techniques may be used to verify the actual sample temperature (listed in procedural order):

1. The temperature is generally determined by measuring the temperature of the temperature blank shipped with samples in a transport container.

Guidance for Submitting Samples to the WSS Chemistry Laboratories

2. The temperature of submitted samples may be measured by pouring an aliquot of a sample into another container. Failure to include a temperature blank, requiring this procedure, creates the risk that a sample may then have too little volume for successful analysis or be contaminated prior to analysis.

Under no condition shall a thermometer or other temperature-measuring device be placed into a sample container.

The measured temperature for a temperature blank is then recorded in the *Temperature on Arrival* field of all sample submission forms associated with the transport container. This field is located in the *Lab Use Only* portion of the sample submission forms, which is completed by laboratory staff during sample check-in.

Note: Sample kits for EPA1631 low-level mercury are delivered by laboratory personnel to the metals analytical group, and the coolers are unpacked in the mercury clean room. Sample containers are verified against the sample submission forms, then the sample submission forms are then returned to the receiving room for log-in of the samples into Labworks™.

Each sample submission form (field sheet) is then assigned a PO number, which is hand-written at the top of the form. The PO number is a unique identifier based on the last two digits of the year; a letter denoting the sample type (W-surface water; G-groundwater; U-UST); and a sequential number (for example, 16W0001). *Note: The PO number system will no longer be used as of May 23, 2016.*

Information from each sample submission form is then entered into Labworks™ – the primary Laboratory Information Management System used by the NC Division of Water Resources Water Sciences Section. This includes sample collection information recorded by field staff, the requested analytical parameters, and the sample receipt information recorded by laboratory staff. **Attachment D** lists Labworks analytical codes.

Once information has been entered for a sample submission form, Labworks™ generates a unique identifier (Laboratory Sample Number). A sample number consists of two letters followed by a sequential number (for example, AB02001). The assigned sample number is then entered on the sample submission form (*Laboratory Sample Number* field), the COC form (if included), and all sample containers associated with the sample submission form. Sample numbers entered on sample containers are either hand-written with indelible ink or attached using waterproof labels.

Laboratory personnel also complete any COC forms included with the samples received, including the following: (1) Lab Sample Number(s); (2) signature of the staff member who broke the security seal on the transport container; and (3) the Intra-Laboratory Chain of Custody section (for transfer of sample containers to analytical unit staff).

15.0 Login Documentation

Documentation for sample submission and log-in at the WSS Central Laboratory and the WSS Regional Laboratory is maintained by the laboratories. Original copies of completed sample submission forms and COC forms are kept on file, as are any other records pertaining to sample log-in at the laboratories.

16.0 Verification of Sample Preservation

Verification of thermal preservation and light protection of samples is conducted by laboratory staff at the time of sample receipt. Any discrepancies observed during sample log-in are documented by laboratory staff receiving the sample, and communicated to the field staff member listed on the sample submission form and to the appropriate laboratory staff.

Guidance for Submitting Samples to the WSS Chemistry Laboratories

Verification of chemical preservation is conducted in the laboratory units after receipt of samples. Verification of chemical preservation of samples is based on the specific requirements for the analytical parameter.

Laboratory personnel verify the pH of samples for all analytical parameters that require acid-preservation or base-preservation. This includes checking the sample bottle tags or labels to verify that the collector has entered the correct preservatives. Sample pH is checked as soon as possible, and before any sample preparation or sample analysis procedures are initiated (excluding VOAs and coliforms, which are checked following extraction or sub-sampling of aliquots for analysis). Additional pH checks and adjustments, where required by the approved method, shall be documented. The proper pH adjustment, as stipulated by approved preservation protocols or approved sample preparation methods, shall follow the method-prescribed procedures. If none are specified, the pH is determined as follows:

- An aliquot of the sample is poured over a pH test strip. The reaction zones are observed to determine pH. The test strips are never inserted into the sample bottle.
- Disposable, non-contaminating transfer implements are used, if necessary, to obtain a sample portion for use in the pH check procedure. This is to prevent contamination of the sample and cross-contamination to other sample bottles.
- pH of VOA and coliform samples is checked after taking a sample aliquot for analysis.

Verification of sample pH is documented in sample receipt forms or in laboratory analysis notes.

Samples for analytical parameters subject to chlorine interference are checked for residual chlorine with chlorine test strips, when possible. However, samples for parameters that require acid preservation (e.g., NH₃) cannot be accurately checked in the laboratory. In these cases, laboratory staff check the sample bottle label and sample submission form to determine if field staff followed proper procedures for checking for chlorine and de-chlorinating a sample. If there is uncertainty, the sample collector is contacted for additional information. Laboratory personnel check the appropriate samples for residual chlorine before any sample preparation or sample analysis procedure is initiated (excluding VOA, sulfide, and coliform samples). If chlorine is detected and de-chlorination of a sample is conducted in the laboratory, the process is documented in either sample receipt forms or laboratory analysis notes.

Note: Failure to de-chlorinate a sample in the field may result in the submitted sample being rejected for analysis.

Additional checks of samples may be conducted in the laboratory as needed. This includes verification of the type of acid added to a sample bottle for pH adjustment to insure that the acid specified by the approved analytical method was used in the field.

Although laboratory staff conduct the above procedures for verification of sample preservation, it is still the responsibility of field staff to insure that samples are correctly preserved following collection. Any discrepancies observed by laboratory staff, as well as corrections made prior to sample analysis, are included in the final report and may also be communicated to the appropriate field staff by email or telephone.

17.0 Rejection of Submitted Samples

Laboratory staff involved in receipt of samples use electronic "Sample Condition Upon Receipt" (e-SCUR) form to document any anomalies observed in sample integrity, sample identification or proper preservation. Documentation of incomplete information is also recorded for each transport container or sample submission form.

Guidance for Submitting Samples to the WSS Chemistry Laboratories

SCUR forms may be used to document an observed error, such as omission of important data on a sample submission form (e.g., no collection time recorded). In other cases, a SCUR may be used to document the reason(s) for a sample container or set of sample containers in a transport container being rejected for analysis. Discrepancies observed during sample receipt/log-in, and documented using a SCUR form, include the following:

Transport Container Condition:	Sample Container Tag/Label Condition:
Samples were not transported on wet ice.	ID/Info does not match sample submission form
No temperature blank bottle in container.	ID/Info does not match COC form (if applicable)
Temperature >6° C (or ≥10°C for bacterial tests).	<u>Incomplete – missing the following:</u> <ul style="list-style-type: none"> • Location code or Field ID • Collection date • Collector’s name • Analytical parameter • Chemical Preservative(s)
Samples frozen.	
Sample Container Condition:	
Container leaking or broken	
Container not labeled or tagged	Entries illegible or label/tag torn
Container cap loose; possible contamination	
VOA or sulfide vials with headspace	
Sample Documentation Discrepancies:	Chain of Custody Discrepancies:
Parameter requested on submission form but no sample bottle included	No security seal on transport container
Sample bottle received, but parameter not requested on sample submission form (or form missing).	Security seal not intact
Samples not received, but listed on COC.	COC form – no signature for <i>Relinquished By</i> .
Samples received, but not listed on COC.	COC form – No date/time relinquished
Mislabeled as to tests, preservatives, etc.	COC form – No signature for collector
Holding time expired prior to receipt of sample(s).	COC form – no signature for <i>Shipment Container Sealed By</i> .
Improper sample container used for parameter.	Incomplete sample location information
Insufficient quantity of sample for analysis.	General Documentation Discrepancies:
Entries on forms not written in indelible ink.	Sample Submission form wet or illegible
Wite-Out® used to correct entry error	Submission form incomplete

When any of the issues outlined above are observed, the sample collector or other contact person will be notified as soon as possible. Laboratory staff responsible for sample receipt will document the problem on an electronic SCUR form, which is then sent to the appropriate field and laboratory staff.

Guidance for Submitting Samples to the WSS Chemistry Laboratories

If possible and within normal business hours, laboratory staff will obtain concurrence or further instruction from the sample collector or other contact person regarding any proposed rejection of submitted samples. All correspondence and/or conversations concerning the final disposition of the samples shall be documented on the SCUR form and/or sample submission form. The laboratory Quality Assurance Coordinator and/or receipt staff will attempt to resolve custody discrepancies expeditiously to avoid compromising holding-time for the sample bottle(s). After a decision concerning a sample has been made, sample receipt staff shall add the decision to the SCUR form. Copies of this documentation are to be maintained in the electronic and hard-copy sample files.

In the case when the sample collector insists on analysis of a compromised sample, the out-of-control event(s) will be fully documented and kept with the analytical file. Analytical result(s) for the affected parameter(s) will be reported with the appropriate qualifier codes(s) on all internal documentation and the final report.

The WSS Chemistry Laboratories may reject submitted samples if they are deficient in any of the requirements that are listed in the sample preservation guidance tables. In these cases, analysis will only be considered if the samples are designated "Emergency" and there is no possibility of re-sampling the sample location.

If an anomaly is documented with regards to COC procedures or documentation, then the associated samples usually analyzed as requested on the sample submission form(s); however, the samples will be re-designated as routine samples. The custody chain will be considered null and void and an e-SCUR submitted to the sample collector.

18.0 Qualification of Analytical Results

Thermal preservation discrepancies observed during sample log-in, chemical preservation discrepancies observed in the laboratory analytical units, and analytical anomalies observed during preparation and/or analysis of an environmental sample are documented in the *Sample Comments* field for the laboratory sample number in Labworks™. All sample comment entries for a sample appear in the final report and shall be reviewed by the sample collector. The standard format for entries in Sample Comments is as follows: acronym of the laboratory unit; analytical parameter; qualifier code; and a brief description of the anomaly.

In addition, the affected analytical parameter is reported with the appropriate qualifier code that pertains to the observed anomaly. The qualifier code is entered in Labworks™ with the reported analytical result. The qualifier code then appears with the reported result in the final report for the sample.

Note: A qualifier code may or may not indicate a level of uncertainty associated with the analytical result. If there is any question or concern regarding a qualified result, please contact a laboratory supervisor or manager.

Sample comment entries can pertain to sample containers for the specified analytical parameter being rejected for analysis. This can occur if it is determined in the laboratory that an unacceptable chemical preservative has been added to a sample container (e.g., nitric acid added to a sample container for Nutrients analyses). In these cases, the sample collector will be contacted to make them aware of the rejected samples in case re-sampling is a possibility. In these cases, a qualifier code will be entered in Labworks™ as the analytical result(s) for the affected parameter(s).

A list of the qualifier codes used by the WSS Chemistry Laboratories can be found at the following web page: <https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/microbiology-inorganics-branch/methods-pqls-qa>

19.0 **Electronic Documents and Reports**

For all submitted samples, the WSS Chemistry Laboratory scans the sample submission form, COC form and any other documentation (if applicable), to create electronic copies of the documents. These electronic documents are stored in Laserfiche® (*Water Resources* repository; *DWR – Chemistry Lab* directory; *Field Sheets* folder). A file is created for each laboratory sample number, as well as for each COC form. These files are titled and organized by laboratory sample number. In Laserfiche®, primary folders in the *Field Sheets* folder are titled based on calendar year; these folders contain sub-folders that are titled based on calendar month. The sub-folder for a specific sample submission form (i.e., lab sample number) is located based on the month and year of sample collection.

An electronic final report is generated for each sample submission form (i.e. laboratory sample number) in Labworks™. A final report cannot be generated until all of the requested analytical results have been entered, peer-reviewed, and validated (as part of final review). A generated final report is saved as an electronic document (pdf format) that is then imported to the appropriate sample file in Laserfiche®. In this way, sample submission documentation and final reports of analytical data are located in the same sub-folder.

Hard-copies of final reports can also be generated from Labworks™; however, the WSS Chemistry Laboratories only provides hard-copies of final reports to clients upon request from the sample collector or other project member.

With Labworks™ client installed on their computer and/or using the web-based Laserfiche® client (<https://edocs.deq.nc.gov/Weblink/Welcome.aspx?cr=1>), field staff and other data users can access analytical data for a sample, or for multiple samples for a sample event and study. Labworks™ can be used to run queries for data pertaining to a particular sample location (location codes greatly aid in this endeavor).

Further information regarding Labworks™ and Laserfiche® are available at the following web-page: <http://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/microbiology-inorganics-branch/Labworks™-Laserfiche®>

20.0 **References**

United States Code of Federal Regulations. Title 40 Chapter I. Subchapter D. Part 136 *et. seq. Guidelines Establishing Test Procedures for the Analysis of Pollutants*. Method Update Rule May 18, 2012. U.S. Government Printing Office. Washington, DC.

U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory. December 1996. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846*, 3rd edition. Cincinnati, OH.

North Carolina Administrative Code Title 15, Department of Environment, Health and Natural Resources Chapter 2, Environmental Management Division, Subchapter 2H, Procedures for Permits, Approvals, Section .0800: Laboratory Certification.

North Carolina Division of Resources. *Quality Assurance Manual for the North Carolina Division of Water Resources Water Sciences Section Chemistry Laboratories*, Revision 1, June 30, 2015. NCDWR. Raleigh, NC.

APHA, AWWA, WEF. 1998. *Standard Methods for the Examination of Water and Wastewater*, 20th Edition, Section 1020 Quality Control, Published by American Public Health Association, American Water Works Association, and Water Environment Federation, Washington, DC (and later additions).

21.0 Attachments

Attachment A – WSS Chemistry Laboratory Information

<p style="text-align: center;">North Carolina Division of Water Resources</p> <p style="text-align: center;">Water Sciences Section – Chemistry Laboratory Information</p> <p>Central Laboratory:</p> <p><u>Address:</u> 4405 Reedy Creek Road Raleigh, NC 27607</p> <p><u>Mail Service Center number:</u> 1623</p> <p><u>Telephone Number:</u> 919-733-3908</p> <p><u>Email:</u> SampleNotification@ncdenr.gov</p> <p><u>Contacts:</u> Roy Byrd – Inorganic Chemistry – extension 222 Chris Johnson – Organic Chemistry – extension 224 Cindy Green – Nutrients & Wet Chemistry – ext. 243 Ellen Stafford – Metals & Microbiology – extension 213 Norma Good – Quality Assurance Officer – extension 257</p> <p>Asheville Regional Laboratory:</p> <p><u>Address:</u> 2090 US Hwy 70 Swannanoa, NC 28778</p> <p><u>Telephone Number:</u> 828-296-4678</p> <p><u>Contact:</u> Kathy Jimison</p>
--

Guidance for Submitting Samples to the WSS Chemistry Laboratories

Attachment B: Guidance to Data Fields of a Sample Submission Form

Guidance for Data Fields in the Water Sample Field Sheet:				Visit ID: (optional)	19	Tag ID	20	Lab Use Only:	
North Carolina Division of Water Resources Central Laboratory (Water Sciences Section)				Water Sample Collection & Submittal Form					
Location Description: 1				Location Code: 2					
County: 3	Collector: 7	16 Priority:		Water Matrix: 17	Location Type: 18				
DWR Region: (based on county) 4	DWR Office: (or agency name) 8	<input type="checkbox"/> Ambient	<input type="checkbox"/> Surface	<input type="checkbox"/> River/Stream	<input type="checkbox"/> Lake				
River Basin: 5	Date: 9	<input type="checkbox"/> Routine	<input type="checkbox"/> Ground	<input type="checkbox"/> Estuary	<input type="checkbox"/> Canal				
Notes: 6	Time: 10	<input type="checkbox"/> Compliance	<input type="checkbox"/> Waste	<input type="checkbox"/> Stormwater	<input type="checkbox"/> Monitoring Well	<input type="checkbox"/> Water Supply			
<input type="checkbox"/> Chlorinated 13 <input type="checkbox"/> De-chlorinated in Field	Sampling Method: <input type="checkbox"/> Grab 11 <input type="checkbox"/> Composite	<input type="checkbox"/> COC	<input type="checkbox"/> Blank	<input type="checkbox"/> Effluent	<input type="checkbox"/> Influent	Delivery Method: <input type="checkbox"/> State Courier			
<input type="checkbox"/> Filtered in 14 Dissolved analysis: Enter "DIS" in check-boxes for parameters	Sample Depth: 12	<input type="checkbox"/> Emergency	<input type="checkbox"/> Solution	<input type="checkbox"/> Field Blank	<input type="checkbox"/> Trip Blank	<input type="checkbox"/> Hand Delivery			
<input type="checkbox"/> Other: 13		<input type="checkbox"/> QA		<input type="checkbox"/> Filter Blank		<input type="checkbox"/> Other:			
Collector's Comments: 15				<input type="checkbox"/> Other:		Temperature (°C) on Arrival: 22			

Revision: 2/06/2015

- Description of sample collection location; may include site or owner name, geographical location, and/or descriptive text.
- Unique FIELD location identification number or code which may be established for a sample location/site. A location code should be associated with only one sample location/site. Can be used for variable depths, multiple sampling events.
- County of North Carolina in which the sample site is located; if outside NC, please include state.
- DWR Office acronym in which the sample site is located; based on sample site, not collector's office; outside NC, use closest office. Acronyms: ARO, FRO, MRO, RRO, WARO, WIRO, WSRO.
- River basin in which sample site is located; optional and generally for surface water sites like rivers, streams, lakes.
- Space for additional sample location information or other field notes.
- Name of person that collected samples; first initial and last name is acceptable.
- DWR Regional Office for sample collector; may also include section or unit name. If outside of DWR, enter agency name.
- Date of sample collection. If composite sample, enter start and end dates.
- Time of sample collection; use military time or include AM/PM. If composite, enter start and end times.
- Check box to indicate sampling method; check "other" and enter method, if needed.
- Sample depth (if applicable). Generally measured in meters (or indicate unit of measurement).
- Check if sample contains chlorine; if measured, enter value in comments; indicate if sample de-chlorinated in field.
- Check if sample was filtered in field at time of collection and is for dissolved analysis - applies to all selected parameters. Enter DIS in check boxes for parameters. Doesn't apply for parameters that include filtration in collection guidance (PC).
- Line for collector to include additional sample site info, site observations, notes, and/or requests.
- Ambient:** Select if for Ambient Monitoring (AMS, RAMS, Lakes), including associated blanks.
Routine: Select if for routine investigation or monitoring, including associated blanks.
Compliance: Select if for compliance situation such as NPDES, permit, and enforcement actions.
COC: Select if including Chain-of-Custody form with samples.
Emergency: Select if sample results are needed ASAP. Primarily intended for spills, public health, enforcement action
QA: Select if for Quality Assurance; prepared solution with known concentration(s); PT samples, round-robin, test solution.
- Surface:** Select for any surface water, e.g. rivers, streams, lakes, estuaries, canals/ditches, stormwater.
Ground: Select for ground water, e.g. monitoring wells and water supply wells.
Waste: Select for waste water sites and discharges, e.g. treated effluent, influent, animal waste.
Blank: Select for blank water samples, e.g. field blank, filter blank, or trip blank.
Solution: Select for prepared solutions, e.g. PT samples, QA standards, experimental solutions.
- Location type - select applicable type; if sample site does not fit any options, select "Other" and enter a type.
River/Stream includes creeks and un-named tributaries.
Canal includes man-made canals and ditches.
Water Supply can be a private well or other water supply well.
Effluent includes discharge from outfalls, discharge/spill from pond (e.g. animal waste).
Influent includes waste water entering a WWTP or settling/treatment pond.
- Field Blanks:** preserved in field the same as associated water samples; includes equipment and rinse blanks.
Filter Blank: filtered and preserved same as associated water samples; usually associated with dissolved analysis.
Trip Blanks: use for trip blanks, which must be submitted with water samples for Volatile Organics.
Other: Select if needed and enter a location type/description.
- Visit ID: Optional; can be used as field ID; primarily used for ambient monitoring stations.
- Tag ID: Number or letter entered on field sheet and the tags for associated sample bottles. Simple method for matching sample bottles to a field sheet (especially when several sites are sampled as a group).
- This column of data fields are for use by chemistry laboratory personnel. The Laboratory Sample Number is generated by the Labworks LIMS and entered on a field sheet following sample log-in.
- Temperature on Arrival: Measured upon receipt of samples at chemistry laboratory using temperature blank bottle from shipment container in which samples were received. Only 1 temp blank bottle required per shipment container.

Attachment C: Trip Blanks for Volatile Organics Analysis

Trip Blanks

Trip blanks are a required quality control element for volatile organics testing. Trip blanks should be regarded as one of the most critical aspects of the sampling regime. Processed accurately, a trip blank ensures that your primary samples were not contaminated during sampling and transport.

A trip blank is a sample of analyte-free media (aqueous or soil) collected in the same type of container used for the analytical test. It is meant to remain unopened and to accompany the sample containers throughout the sampling and shipping process. A trip blank is used to document contamination attributable to shipping and field handling procedures (i.e., diffusion of volatile organics through the septum during shipment and storage). A trip blank may also serve to detect contamination from containers (i.e., bottle blank). This is especially important when non-certified sample containers are used. The Central Laboratory supplies only certified containers for VOA collection.

VOA samples from different locations may be placed in the same cooler to reduce the number of required trip blanks provided that the samples are clearly marked and segregated. NOTE: Even when VOA samples are containerized separately, each of the sample containers submitted for a site must be labeled appropriately (location ID or sorting number) to prevent misidentification. The trip blank is then submitted for analysis as a distinct sample. A separate field sheet must be completed for the trip blank, and it must be recorded on the Chain of Custody (COC) form as any other sample.

The following are acceptable sources of analyte-free aqueous media for trip blanks:

- well water with charcoal filtration,
- non-chlorinated bottled water which has been charcoal filtered
- laboratory-grade deionized water - ASTM Type II which has been charcoal filtered

The most reliable source of volatile organic free water is non-chlorinated well water or distilled water that has passed through an activated carbon filter. Activated carbon is used to remove free and combined chlorine and organic contaminants from water. The Central Laboratory simply passes well water through a wide bore burette packed with baked, activated charcoal (an approx. 1-ft. column of charcoal should provide sufficient contact area). An instruction sheet on the assembly and use of a carbon filtration system is available on our website:

In the past, Deerpark brand spring water in clear plastic bottles has proven to be an acceptable blank source. Other brands of spring water may be acceptable. Avoid water bottled in opaque "milk jug" containers since they may contain phthalates. Some locations have access to distilled or deionized water systems with carbon filtration cartridges. The carbon filtration cartridges must be serviced regularly to avoid contaminant build-up.

Tap water is NOT acceptable for VOA blanks. Chlorinated compounds, disinfection by-products and other interfering agents are present in tap water. Bottled waters may also contain these contaminants. Many of the contaminants are analytes of concern and will skew any results.

Guidance for Submitting Samples to the WSS Chemistry Laboratories

Attachment D: Analytical Codes for Labworks

Labworks Analytical Codes:		Central Laboratory (Water Sciences Section)		North Carolina Division of Water Resources	
Microbiology Parameters:		MBAS (surfactants) [MBAS_LIQ] mg/L		Metals Parameters:	
Acidity, as CaCO ₃ , to pH 4.5/8.3	mg/L	Oil and Grease, HEM, Total [G&O_LIQ]	mg/L	Aluminum (Al) [AL_LIQ]	µg/L
Alkalinity, as CaCO ₃ [SALK45_LIQ]	mg/L	Phenols, Total Recoverable [PHENOLD_LIQ]	µg/L	Antimony (Sb) [SB_LIQ]	µg/L
BOD: Biochemical Oxygen Demand, 5-day [BOD5_LIQ]	mg/L	Residue: Total (Total Solids) [RESTOT_WET]	mg/L	Arsenic (As) [AS_LIQ]	µg/L
cBOD: Carbonaceous BOD, 5-day [CBOD5_LIQ]	mg/L	Residue: Volatile, Total [RESTOTVOL_WET]	mg/L	Barium (Ba) [BA_LIQ]	µg/L
Coliform: Fecal MF [COLIFFECMF_LIQ]	/100ml	Residue: Fixed, Total [RESTOTFIX_WET]	mg/L	Beryllium (Be) [BE_LIQ]	µg/L
Coliform: Total MF [COLIFTOTMF_LIQ]	/100ml	Residue: Suspended (TSS) [RESSUS_WET]	mg/L	Cadmium (Cd) [CD_LIQ]	µg/L
Coliform: Tube Fecal	/100ml	Residue: Volatile, TSS [RESSUSVOL_WET]	mg/L	Calcium (Ca) [CA_LIQ]	mg/L
Coliform: Tube Total	/100ml	Residue: Fixed, TSS [RESSUSFIX_WET]	mg/L	Chromium (Cr), Total [CHROMIUM_LIQ]	µg/L
Specific Conductance [CONDSPEC_LIQ]	umhos/cm	TDS - Total Dissolved Solids [TDS_LIQ]	mg/L	Cobalt (Co) [CO_LIQ]	µg/L
TOC - Total Organic Carbon [TOC_LIQ]	mg/L	Silica [SILICA_LIQ]	mg/L	Copper (Cu) [CU_LIQ]	µg/L
Turbidity [TURBIDITY]	NTU	Sulfide [SULFIDE_LIQ]	mg/L	Iron (Fe) [FE_LIQ]	µg/L
		Tannin & Lignin [TANNIN&LIGNIN_LIQ]	mg/L	Lead (Pb) [PB_LIQ]	µg/L
				Lithium (Li) [LI_LIQ]	µg/L
Wet Chemistry Parameters:		Other Parameters:		Organics Parameters:	
Bromide [SWET_ICCHROM_LIQ]	mg/L	Ph [PH_LIQ]	s.u.	Magnesium (Mg) [MG_LIQ]	mg/L
Chloride [SWET_ICCHROM_LIQ]	mg/L	Hardness, Total as CaCO ₃ - by titration	mg/L	Manganese (Mn) [MN_ICP_LIQ]	µg/L
Fluoride [SWET_ICCHROM_LIQ]	mg/L	[HARDNESSBYTITRATION_LIQ]		Mercury (Hg) [HG_LIQ]	µg/L
Sulfate [SWET_ICCHROM_LIQ]	mg/L			Molybdenum (Mo) [MO_LIQ]	µg/L
Chlorophyll a [CHLOROPHYLLA_LIQ]	µg/L	Nutrients Parameters: [#NUTRIENTSONLY]		Nickel (Ni) [NI_LIQ]	µg/L
Color: ADMI [SADMI_LIQ]	c.u.	Ammonia as N (NH ₃ -N) [NH3N_LIQ]	mg/L	Potassium (K) [K_LIQ]	mg/L
Color: Platinum Cobalt [SPTCO_LIQ]	c.u.	Nitrate-Nitrite as N (NO ₃ +NO ₂ -N) [NO2&NO3_LIQ]	mg/L	Selenium (Se) [SE_LIQ]	µg/L
COD: Chemical Oxygen Demand [COD_LIQ]	mg/L	Total Kjeldahl Nitrogen as N (TKN) [TKNN_LIQ]	mg/L	Silver (Ag) [AG_LIQ]	µg/L
Cyanide, Total [CYANDIE_LIQ]	mg/L	Total Phosphorus as P (TP) [PHOSTOTP_LIQ]	mg/L	Sodium (Na) [NA_LIQ]	mg/L
Formaldehyde [FORMALDEHYDE_LIQ]	mg/L	Nitrite as N (NO ₂ -N) [NO2N_LIQ]	mg/L	Strontium (Sr) [SR_LIQ]	µg/L
Hexavalent Chromium (Cr ₆₊) [CHROMHEX_LIQ]	mg/L	Nitrate as N (NO ₃ -N calculated) [NO3N_LIQ]	mg/L	Thallium (Tl) [THALLIUM_LIQ]	µg/L
		Orthophosphate as P (PO ₄) [ORTHOPP_LIQ]	mg/L		

Study Groups in Labworks for logging in metals samples.
 Update: March 2, 2011. Study group #MET_AMB_LIQ, #MET_TIS, #MET_GW_COMPLETE_LIQ
 and #MET_ATU_LIQ were updated to reflect current parameters. #HARDNESSBYTITRATION_LIQ was added.

#MET_RAM_LIQ Elements in study group.		
Cd	As	Na
Cr	Se	
Cu	Fe	
Ni	Mn	
Pb	Ca	
Zn	K	
Be	Mg	

#MET_AMB_LIQ Elements in study group.		
Cd	Be	
Cr	Mn	
Cu		
Ni		
Pb		
Zn		
As		

#MET_ATU_LIQ Elements in study group.		
Cd	Ag	Mn
Cr	Al	Na
Cu	Ba	Ca
Ni	Be	Li
Pb	Co	K
Zn	Fe	
Se	Mg	

#MET_GWCOMPLETE_LIQ Elements in study group.		
Ag	Cr	Na
Al	Cu	Ni
As	Fe	Pb
Ba	K	Se
Ca	Mg	Zn
Cd	Mn	Hg

#HG_1631_LIQ Elements in study group. Hg-1631
<i>(This is the low level Hg that requires designated coolers, containers and must be open by chemists in Metals Unit.)</i>

MET_AMB_SOL Elements in study group.	
Cd	Hg*
Cr	Al
Cu	Fe
Ni	Mn
Pb	
Zn	
As	*Hg 245.1

#MET_GW_SOLIDS Elements in study group.		
Ag	Cu	Pb
Al	Fe	Se
As	K	Zn
Ba	Mg	
Ca	Mn	
Cd	Na	
Cr	Ni	

#MET_TIS Elements in study group.	
Hg	Zn
As	
Cd	
Cr	
Cu	
Ni	
Pb	

Guidance for Submitting Samples to the WSS Chemistry Laboratories

Attachment E: Guidelines for Assigning Location Codes

Guidelines for Assigning Location Codes:

Assigning a location code to a sample location, or one sample point at a particular site, enables the data user to compile historic, site-specific data to analyze either over the short or long-term.

1. **Code Consistency:** If you are at a “site” but have 5 separate sampling locations on the site, you may create a separate code for each sampling point. Keep in mind, if you return to the site at a later time to collect more samples, it would be beneficial (for the above-noted reasons) to use the same location code originally established for the site.
2. **No Variable Codes:** Do not use collector’s initials, dates, times, or any other information that may change to create a location code. A location code is a code that identifies a specific location, i.e., a specific place; not who, when, how, or why. Date, time, and collector names are already input into LabWorks™ and, therefore, makes it unnecessary to reflect this information in the location code. Frequently used examples of non-variable codes include: street address, GPS code, acronyms, and various other combinations.
3. **Special Characters:** LabWorks will not accept “special characters” or spaces included in the location code. Also, no mixed case letters. Everything in LabWorks is to be entered as **capital letters** only. Special Characters are defined as the following: ! @ # \$ % ^ & * () + = / \ | < >
4. **Code Length:** A location code must be between 5 and 24 characters in length. Location codes may not be duplicated for multiple sites. It is imperative that location codes be, at a minimum, 5 characters in length, otherwise the samples might have to be entered under the default regional NLC. For example, if RRO is using A1, A2, A3, A4 as their location codes, not only is that not very descriptive, it’s also possible that other collectors in other regions may inadvertently choose the same numbering convention for their sites as well, thus resulting in code duplication. There are currently almost 54,000 entries in LabWorks, and because of this, if location codes are not at minimum 5 characters in length they may have to be changed upon receipt by the laboratory. Location codes may not be more than 24 characters simply because LabWorks will not accept the code.

- *Contact the Central Laboratory if you have questions about Location Code assignment.*