

Southeast Coast Network

National Park Service
Inventory and Monitoring Division



Standard Operating Procedure 1.1.06

Estuarine Water and Sediment Shipping and Tracking of Laboratory Samples—Version 2.0

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Summary

The following standard operating procedure (SOP) outlines the procedure for shipping and tracking of laboratory samples collected during fixed-station and park-wide assessment sampling. The purpose of this SOP is to ensure that samples are correctly packed and shipped to the contracted analytical laboratory. Some of these procedures comply with methods suggested by EPA (2014); others have been modified to meet the requirements of the courier and the contracted analytical laboratory. Mention of couriers or labs by trade name does not constitute an endorsement by the NPS.

Revision Log

Revision Date	Author	Changes Made	Reason for Change	New Version #
2013		Citation updated	Protocol publication	1.1
1/2021	E. N. Starkey	Updated based on the most recent EPA field manual and SECN procedures. SOP now reflects distinct processes for fixed station and park-wide assessment. Removed the benthic macro-invertebrate section. Updated equipment/materials list. Added hold times. Updated title to match standardized SOP naming convention.	Outdated shipping procedures. The SECN does not sample benthic macroinvertebrates. Hold times not included in v1.1.	2.0

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Fixed Station and Park-wide Assessment Activities and Workflow Summary

An overview of fixed-station and park-wide assessment activities are presented in Figures 1 and 2. SOPs are presented left to right in the general order of operations for each activity. This SOP (1.1.06) pertains to the Data Collection (Figure 1) and Post-Sampling (Figure 2) activities.

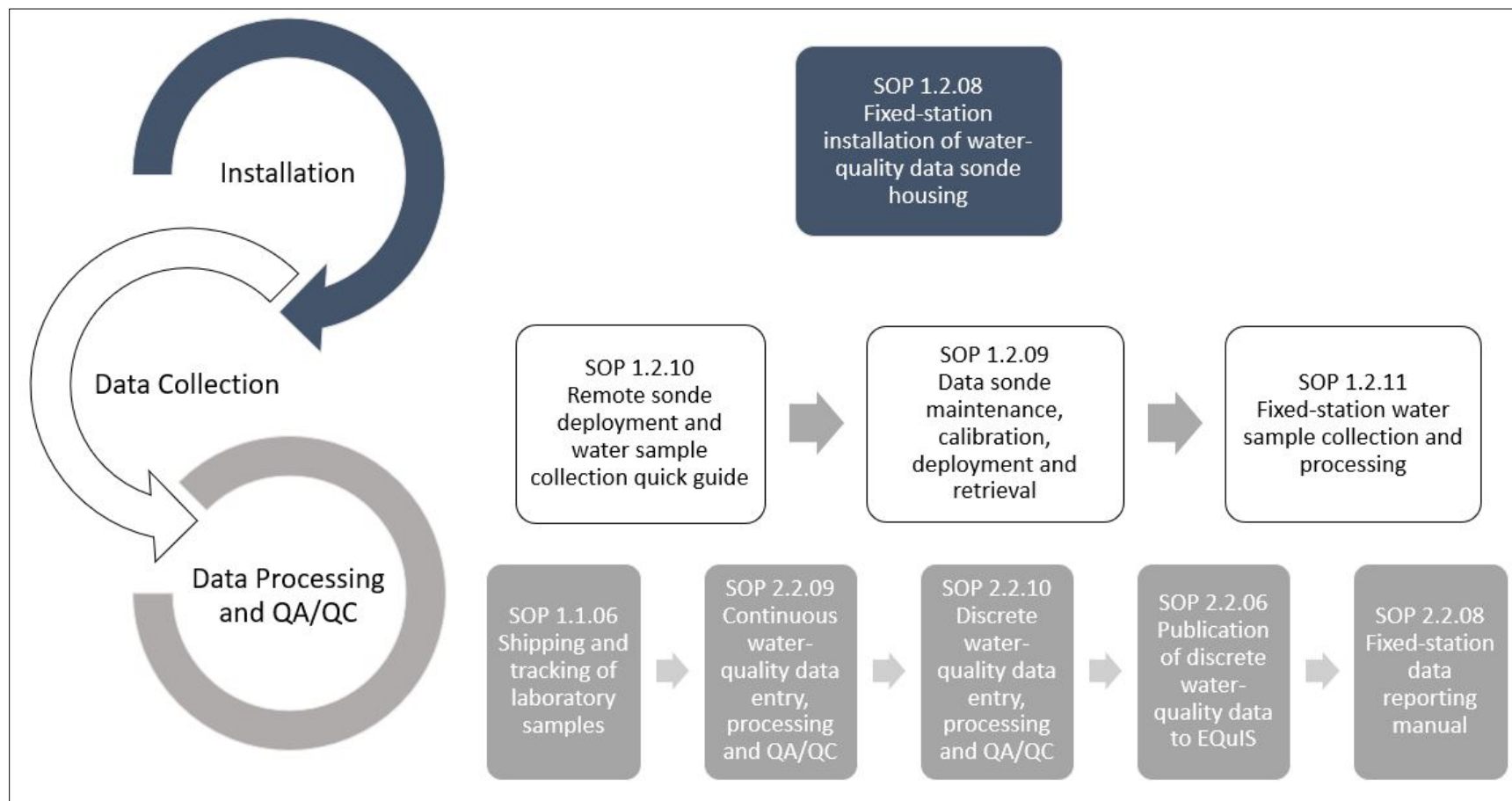


Figure 1. Fixed-station activities and workflow. SOPs are presented left to right in the general order of operations for each activity.

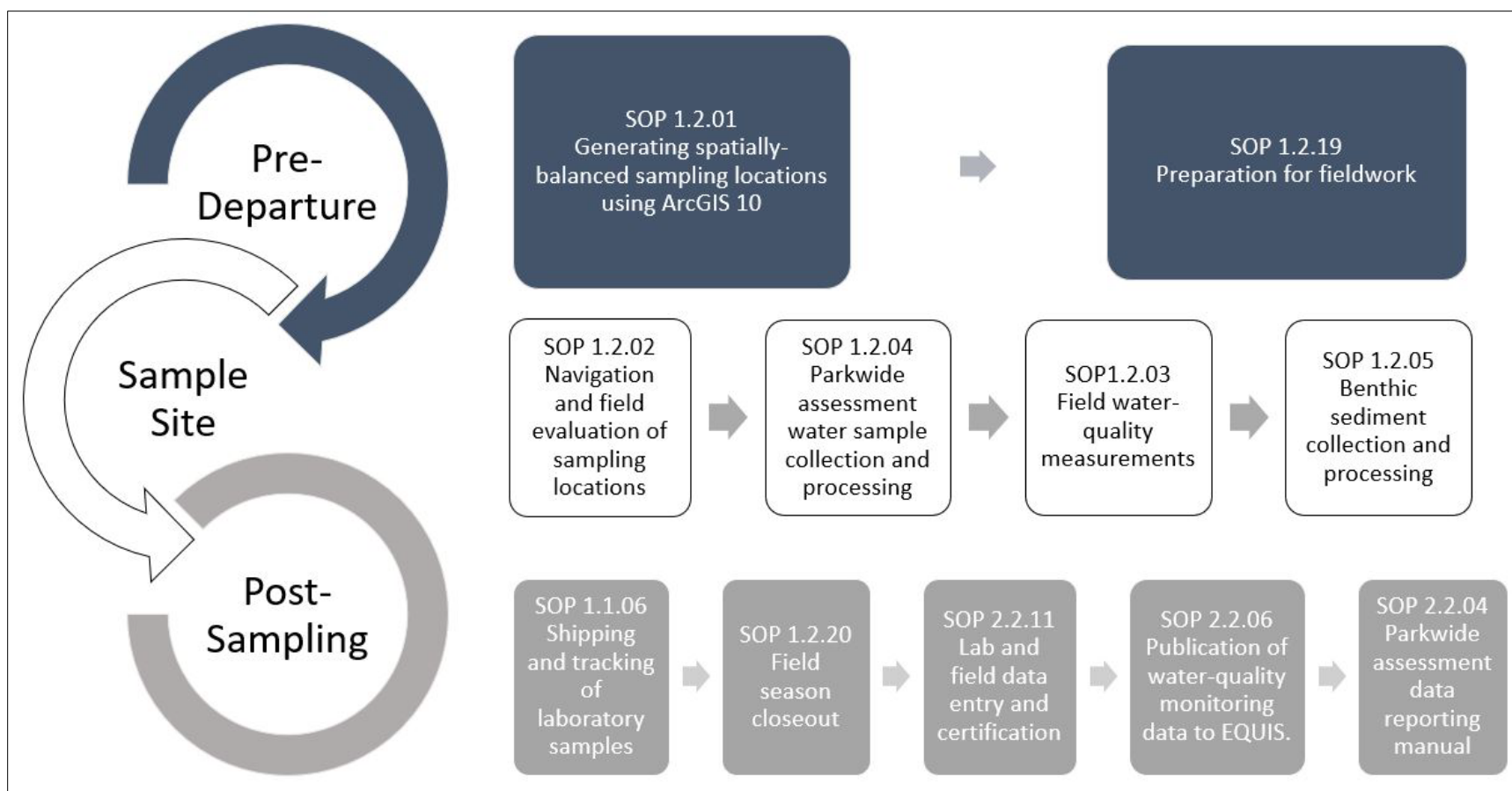


Figure 2. Park-wide assessment activities and workflow. SOPs are presented left to right in the general order of operations for each activity.

Overview

Implementation of the Southeast Coast Network's (SECN) Estuarine Water and Sediment Quality Monitoring Protocol requires frequent transport of samples from the field or office to an analytical laboratory. Samples typically need to be maintained at specific temperatures and have limited hold times; as a result, it is crucial that samples be shipped according to the procedures outlined in this SOP. Courier and shipment companies such as FedEx typically provide overnight and next-day services required for timely transport of these samples. All shipping related to this monitoring effort uses the SECN aquatic program shipping account. Please contact the SECN aquatic ecologist for more information.

Sample shipping and tracking for fixed-station and park-wide monitoring are covered separately due to differences in frequency, sample types, media, and volume.

Fixed-Station: Water Samples

Water samples from fixed station monitoring consist of one (monthly) or two (quarterly [February, May, August, November]) 125 milliliter (mL; 4.3 ounce [oz]) sample bottles for nutrients, and a single foil pouch for chlorophyll *a* per site. Additional QA/QC samples (blanks and duplicates) occur on a random schedule throughout the year. Cooler and box sizes are adjusted according to the number of samples being shipped.

Equipment/Materials List

- Labeled sample bottles with nutrient samples (frozen)
- Labeled foil pouches with chlorophyll *a* samples (frozen)
- Styrofoam cooler (typically provided by the lab)
- Cardboard box
- Packing tape
- Shipping label(s)
- Reusable ice pack or dry ice (wet ice cannot be used to ship chlorophyll samples)
- Copies of corresponding fixed station water sample forms

Procedures for Nutrients and Chlorophyll *a*

- Do not hold frozen samples for more than 28 days.
- Nutrient samples are stored (frozen) in 125 mL acid washed bottles. Chlorophyll *a* samples are stored (frozen) in labeled aluminum foil pouches, inside sealed plastic bags.

- Confirm that the labels on the sample bottles and foil pouches have the correct site name and collection date.
- Confirm that all information on the fixed station water sampling sheet matches the label on the sample bottles and foil pouches. Also confirm that salinity has been recorded on the sampling sheets. While not required, salinity readings help the lab select the appropriate analytical method.
- Make copies of the water sampling sheets and seal them in a plastic bag.
- A sample tracking form is not required for fixed-station samples because they are shipped in small batches (less than three sites/shipment) and are accompanied by the water sample forms.
- Place the frozen sample bottles, foil pouches and sampling sheets in the cooler with the reusable ice pack(s). If ice packs are not available, the sample is packed with dry ice rather than wet ice to prevent contamination of the chlorophyll samples. If using dry ice, see the Packing and Ice Use section below.
- Surround the samples with absorbent material in case sample bottles or ice packs leak.
- Use packing material (e.g., bubble wrap, foam peanuts) to fill the excess space at the top of the cooler to prevent damage during shipping.
- Place the Styrofoam cooler inside of the cardboard box and secure it with packing tape.
- Affix shipping labels. Ship samples priority overnight to the contracted laboratory. Unless special arrangements are made with the lab, samples are only shipped Monday through Wednesday to allow for delivery on Thursday and Friday during normal business hours.

Park-wide Assessment—Water Samples

Water samples resulting from a single park-wide assessment consist of sixty-six 125 mL sample bottles for nutrients (33 for analysis of total nitrogen and total phosphorus [TN/TP] and 33 for analysis of total dissolved nitrogen, total dissolved phosphorus, dissolved inorganic nitrogen, and dissolved inorganic phosphorus [TDN, TDP, DIN and DIP]) and 33 foil pouches for chlorophyll *a*. Three of the nutrient samples and three of the chlorophyll *a* samples correspond to QA/QC samples (blanks and duplicates) taken at three random sites.

Equipment/Materials List

- Labeled sample bottles with nutrient samples (frozen)
- Labeled foil pouches with chlorophyll *a* samples (frozen)
- Hard sided cooler (48 quart [45.5 liter])
- Dry ice
- Packing or strapping tape
- Shipping label(s)
- Park-wide assessment water sample tracking form (Figures 3 and 4)
- Copies of corresponding park-wide assessment water sample forms

Procedures for Nutrients and Chlorophyll *a*

- Nutrient samples are stored (frozen) in 125 mL acid washed bottles. Chlorophyll *a* samples are stored (frozen) in labeled aluminum foil pouches, inside sealed plastic bags.
- Confirm that the labels on the sample bottles and foil pouches have the correct site name and collection date.
- Confirm that all information on the park-wide assessment water sampling sheet matches the label on the sample bottles and foil pouches. Also confirm that salinity has been recorded on the sampling sheets. Salinity readings help the lab select the appropriate analytical method.
- Make copies of the water sampling sheets.
- Fill out the water sample tracking form (Figure 3 and 4).
- Seal sampling sheets and tracking form in a plastic bag.
- Place the frozen sample bottles, foil pouches and sampling sheets in the cooler

V1.0 (01/2021)

[illegible]

Received by: _____ Received date: _____ Condition: _____

Figure 3. Park-wide assessment water sample tracking form page 1 of 2.

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Figure 4. Park-wide assessment water sample tracking form page 2 of 2.

- The samples are packed with dry ice rather than wet ice to prevent contamination of the chlorophyll samples. See the Packing and Ice Use section below for special dry ice considerations.
- Surround the samples with absorbent material in case sample bottles leak.
- Use packing material (bubble wrap, foam peanuts, etc.) to fill the excess space at the top of the cooler to prevent damage during shipping.
- Tape the cooler shut. See the Packing and Ice Use section below for special dry ice considerations.
- Affix Class 9 Dangerous goods label for dry ice (Figure 5). See the Packing and Ice Use section below for special dry ice considerations.

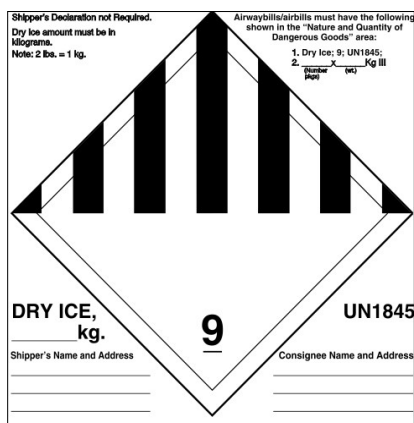


Figure 5. Class 9 Dangerous goods label for dry ice.

- Affix shipping labels.
- Ship samples priority overnight to the contracted laboratory. Unless special arrangements are made with the lab, samples are only shipped Monday through Wednesday to allow for delivery on Thursday and Friday during normal business hours. See the Packing and Ice Use section below for special dry ice considerations.

Park-wide Assessment—Sediment Samples

Sediment samples resulting from a single park-wide assessment consist of 99 glass sample jars (33 for total organic carbon, 33 for organics and metals, and 33 for grain size). In other words, there are three sample jars for each of the sampled sites (30) and three sample jars for each duplicate quality control (QC) sample (3). All samples from a site are individually labeled following their collection and maintained together in a 1-gallon sealable bag. These samples must be kept at 4°C (39.2°F) **and must not be frozen**. When possible, it is preferable to work with an analytical laboratory that is near the sampled park(s) to facilitate in-person drop off of these samples at the conclusion of fieldwork. Some labs offer sample pickup by a lab courier. When local drop off and courier services are unavailable, the samples are shipped priority overnight.

Equipment/Materials List

- Labeled sample jars with sediment samples kept at 4°C. Three per site and QC duplicate: Organics/Metals (PAH/Pesticides/PCB/Metals), Particle Size, Total Organic Carbon
- Four hard sided coolers (48 quart)
- Reusable ice packs or wet ice
- Packing or strapping tape
- Shipping label(s)
- Park-wide assessment sediment sample tracking form (Figure 6)
- Copies of corresponding park-wide assessment sediment sample collection forms

Client Name: National Parks Service			Project Name: Cape Hatteras National Seashore			BOTTLE SIZE & TYPE												LABORATORY I.D. NUMBER	
Address: 135 Phoenix Rd			P.O. Number/Project Number: P17PX01845																
Athens, GA 30605			Project Location:																
Phone: 706-286-0355			FDEP Facility No:				ANALYSIS REQUIRED	Al, Sb, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Zn by 6010	Se, Sn by 6020	Hg by 7471	8081/8082	PAHs	TOC	Particle Size by Sieve					
FAX:			Project Name and Address:																
Contact: Eric Starkey																			
Sampled By: Eric Starkey																			
Turn Around Time: ☐ STANDARD ☐ RUSH			Special Instructions: Jax Profile: 32685																
Page _____ of _____			☐ ADaPT ☐ EQuIS																
SAMPLE ID	SAMPLE DESCRIPTION	Grab Comp	SAMPLING		MATRIX	NO. COUNT	PRESERVATION												
			DATE	TIME				Ice	Ice	Ice	Ice	Ice	Ice	Ice	Ice	Ice	Ice		
CAHA-					SO	3		X	X	X	X	X	X	X					
CAHA-					SO	3		X	X	X	X	X	X	X					
CAHA-					SO	3		X	X	X	X	X	X	X					
CAHA-					SO	3		X	X	X	X	X	X	X					
CAHA-					SO	3		X	X	X	X	X	X	X					
CAHA-					SO	3		X	X	X	X	X	X	X					
CAHA-					SO	3		X	X	X	X	X	X	X					
CAHA-					SO	3		X	X	X	X	X	X	X					
CAHA-					SO	3		X	X	X	X	X	X	X					
CAHA-					SO	3		X	X	X	X	X	X	X					
Matrix Code: WW = wastewater SW = surface water GW = ground water DW = drinking water O = oil A = air SO = soil SL = sludge Preservation Code: I = ice H=(HCl) S = (H2SO4) N = (HNO3) T = (Sodium Thiosulfate)																			
Received on Ice ☐ Yes ☐ No ☐ Temp taken from sample ☐ Temp from blank Wh ☐ required, pH checked Temperature when received _____ (in degrees celcius)																			
DCN: AD-051 Form last revised 08/18/2014 Device used for measuring Temp by unique identifier (circle IR temp gun used) J: 9A G: LT-1 LT-2 T: 10A A: 3A M: 3A S: 1V																			
Relinquished by: _____ Date _____ Time _____						Received by: _____ Date _____ Time _____						FOR DRINKING WATER USE: (When PWS Information not otherwise supplied) PWS ID: _____ Contact Person: _____ Phone: _____ Supplier of Water: _____ Site-Address: _____							
1																			
2																			
3																			
4																			

Figure 6. Example park-wide assessment sediment sample tracking form supplied by the analytical laboratory.

Procedures for Organics/Metals, Grain Size and Total Organic Carbon

- Do not hold sediment samples longer than two weeks.
- Ensure the following for each sampled site:
 - Organics/Metals (PAH/Pesticides/PCB/Metals) sample is stored in a 300 mL (10.1 oz) glass jar.
 - Grain size (Particle Size) sample is stored in a 300 mL glass jar.
 - Total Organic Carbon (TOC) sample is stored in a 125 mL glass jar.
 - The labels with sample ID are completed and covered with clear tape.
 - Each sample jar is logged on the sample tracking sheet (Figure 5).
 - All lids are sealed with electrical tape.
 - Each sample jar is individually wrapped in bubble wrap.
 - All sample jars for a site (3) are sealed in a 1-gallon resealable bag.
- Place several layers of bubble wrap in the bottom of each cooler.
- Line each cooler with a large plastic liner bag (30-gallon plastic bag).
- Place 7 to 8 sites worth of samples (each 1-gallon bag with 3 sample jars corresponds to a site) inside each cooler/liner. Ensure that all jars are sitting upright and that no jars or bags are stacked on top of each other.
- Place copies of the corresponding park-wide assessment sediment sample collection forms and the sample tracking form in a sealed bag. Place the sealed bag and sample forms inside of the liner.
- Seal the liner.
- Add reusable ice packs or wet ice to fill the cooler. See the Packing and Ice Use section below for special wet ice considerations. If airspace remains, use additional bubble wrap to fill the cooler.
- Affix shipping labels.
- Seal the cooler using packing or strapping tape.
- Ship samples priority overnight to the contracted laboratory. Unless special arrangements are made with the lab, samples are only shipped Monday through Thursday to allow for delivery on Friday during normal business hours. It is advisable to notify the lab of the anticipated ship and delivery dates.

Packing and Ice Use

It is recommended to use non-toxic reusable ice (i.e., freezer) packs to maintain temperature requirements of samples during shipment. However, some instances may require the use of dry ice (i.e., chl *a* samples) or wet ice. Both wet and dry ice have specific packing requirements and considerations.

Dry Ice

Modified from EPA 2014.

- Dry ice must be handled with insulated gloves or plyers. Improper handling of dry ice may freeze the skin and cause injury similar to a severe burn. See the [Safety Data Sheet](#) for more information.
- Samples in glass jars/bottles are not shipped on dry ice due to the potential for the freezing liquid to expand and break the container.
- Not all shipping companies or locations will accept dry ice. Call and check with the courier before packing and dropping off the samples. Dry ice shipments can generally be shipped from “FedEx staffed” locations. Dry ice shipments usually cannot be shipped from FedEx Kinko’s Office and Print Centers® or FedEx Authorized ShipCenter® locations. These types of locations are differentiated on FedEx.com in the “Find FedEx Locations” feature.
- All packages containing dry ice must indicate the amount of dry ice on the shipping label.
- All packages containing dry ice must be labeled with a Class 9 Dangerous Goods label (Figure 5).
 - Affix this label to the side of the package and not the top.
 - If it is not already completed, fill out the upper corners of the label with the same shipper and recipient information as on the shipping label.
 - Declare the weight (in kg) of the dry ice in the lower right-hand corner of the label, ensuring it is the same weight listed on the shipping label.
- Do not completely seal the entire edge of the cooler with packing tape such that pressure could build inside the cooler.

Wet Ice

Modified from EPA 2014.

- Ensure the ice is fresh immediately prior to shipment.
- Line the cooler with a large plastic liner bag (30-gallon plastic bag).

- Double bag the ice with enough white or clear 1-gallon zippered plastic bags to pack the entire cooler.
- To prevent misidentification of any water leakage as a possible hazardous material spill, use an indelible marker to label all bags of ice as “ICE.”
- Place bagged samples and bags of ice inside the cooler liner. Use as many ice packs as necessary so that the cooler is nearly full.
- Seal the liner.

Literature Cited

EPA. 2014. National Coastal Condition Assessment: Field Operations Manual. EPA-841-R-14-007. U.S. Environmental Protection Agency, Washington, D.C. 165 p.