



Buzzards Bay Stormwater Collaborative



Stormwater Monitoring Guidelines



Rev 7
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Acknowledgements

The Buzzards Bay Stormwater Collaborative Stormwater Monitoring Guidelines were prepared and updated by the Buzzards Bay National Estuary Program. The current Collaborative consists of the towns of Acushnet, Bourne, Dartmouth, Fairhaven, Marion, Mattapoisett, Wareham, and Westport. The Collaborative is jointly managed by Massachusetts Maritime Academy and the Buzzards Bay National Estuary Program

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GENERAL CONTAC/EMERGENCY INFORMATION

NAME	CONTACT NAME	PHONE	ADDRESS
Stormwater Collaborative Manager	Kristin Osborne, PhD, Assistant. Professor MMA	Office:508-451-1059	MMA 101 Academy Dr. Buzzards Bay
Stormwater Collaborative Manager	Joseph Costa, PhD BBNEP Director	Office: 774-377-6000	81-B County Road, Suite E Mattapoisett
Stormwater Coordinator	Maura Flaherty	Cell: 774-283-3918	MMA 101 Academy Dr. Buzzards Bay
BBNEP Technical Project Advisor BBNEP Stormwater Specialist	Bernadette Taber Kevin Bartsch	Office: 774-377-6004 Cell: 508-789-6206 Office 774-377-6003 Cell: 774-313-6775	81-B County Road, Suite E Mattapoisett
Emergency Fire and/or Police (all towns)		911	
Poison Control Center		1-800-222-1222	

ACUSHNET

NAME	CONTACT NAME	PHONE	ADDRESS
Acushnet Coordinator	Pat Hannon	Office:508-998-0200 X 4203	Parting Ways Building 130 Main Street
Acushnet DPW	Dan Menard	Office: 508 998-0230	Parting Ways Building 130 Main Street
Fire Department		508-998-0250	24 Russell Street
Police Department		508-998-0240	64 Middle Road
Nearest Hospital	St. Lukes (New Bedf)	508-997-1515	101 Page St, New Bedford

BOURNE

NAME	CONTACT NAME	PHONE	ADDRESS
Bourne Coordinator	Tim Lydon	Office:508-7590600 x1345	Bourne Town Hall 24 Perry Ave. Buzzards Bay
Bourne DPW	Shawn Patterson	Office: 508-759-0600	35 Ernest Valeri Road Buzzards Bay
Fire Department		508 759-0600 Dial 2	St1. 130 Main St
Police Department		508 759-4453	175 Main St, Buzzards Bay
Nearest Hospital	Tobey (Wareham) Falmouth Hosp	508-295-0880 508-548-5300	43 High Street, Wareham 100 Ter Huen Dr. Falmouth

DARTMOUTH

NAME	CONTACT NAME	PHONE	ADDRESS
Dartmouth Coordinator/DPW	Timothy Barbar	Office: 508-999-0740	759 Russells Mills Road
Fire Department		508-996-3313	Fire District, 10 Bridge Street
Police Department		508-910-1700	1390 Tucker Road, Dartmouth
Nearest Hospital	St. Lukes (New Bedf)	508-997-1515	101 Page St, New Bedford

FAIRHAVEN

NAME	CONTACT NAME	PHONE	ADDRESS
Fairhaven Coordinator/DPW	Vinnie Furtado	508 979-4030	5 Arsene Street
Fire Department		508 994-1428	146 Washington Street Fairhaven
Police Department		508 997-7421 508 997-1344	1 Bryant Lane Fairhaven, MA 02719
Nearest Hospital	St. Lukes (New Bedf)	508-997-1515	101 Page St, New Bedford

MARION			
Marion Coordinator	Meghan Davis	Office: 508-748-3540	50 Benson Brook Road MA
Fire Department		Office: (508) 748-3596 Chief 508-748-3596	50 Spring Street
Police Department		508-748-1212	550 Mill Street (Rt6)
Nearest Hospital	Tobey (Wareham)	508-295-0880	43 High Street, Wareham
MATTAPOISETT			
Mattapoisett Coordinator	Nick Nelson	508-758-4100 Ext. 231	16 Main Street Mattapoisett
Mattapoisett DPW	Garrett Baur	(508) 758-4181	5 Mendell Rd. Mattapoisett
Fire Department			
Police Department			
Nearest Hospital	St. Lukes (New Bedf) Tobey (Wareham)	508-997-1515 508-295-0880	101 Page St, New Bedford 43 High Street, Wareham
WAREHAM			
Wareham Coordinator and Municipal Maintenance	David Menard	508 295-5300	95 Charge Pond Rd, Wareham
Fire Department		508-295-2973	273 Main St.
Police Department		508-295-1212	2515 Cranberry Hwy.
Nearest Hospital	Tobey Hospital	508-295-0880	43 High Street, Wareham
WESTPORT			
NAME	CONTACT NAME	PHONE	ADDRESS
Westport Coordinator	Jim Hartnett	Office:508-636-1037 Cell:	856 Main Road Westport
Westport DPW	Chris Gonsalves	Office: 508-636-1020 Cell:	820 Main Road Westport
Fire Department		508-636-1110	54 Hixbridge Rd Westport
Police Department		508-636-1120	56 Hixbridge Rd Westport
Nearest Hospital	St. Lukes (New Bedf) St Annes (Fall River) Charlton (Fall River)	508-997-1515 508-674-5600 (508) 679-3131	101 Page St, New Bedford 795 Middle St, Fall River 363 Highland Ave, Fall River

STANDARD OPERATING SAFETY PROCEDURES

Hazard	Standard Operating Procedure
Heat Stress	Wear breathable protective clothing. Take frequent breaks in hot weather and ensure that you have adequate amount of drinking water on hand.
Slips/trips/falls	Personnel will wear boots or waders that provide suitable mobility and traction.
Drowning	Personnel will not enter fast-flowing water that is greater than knee deep.
Caught-in Mud	Personnel will not enter into areas of thick or deep mud along shorelines where it is possible to be stuck. Test all areas with pole/stick prior to entering.
Confined Space Entry	Permitted for <i>Trained Municipal Maintenance staff</i> only. Under no circumstances will untrained municipal staff or any MMA/BBNEP staff, intern or volunteer will enter a confined space. Confined space is a term from labor safety regulations that refers to an area which is enclosed with limited access which make it dangerous. An example is the interior of a storage tank, manhole, culvert, which workers may enter for maintenance but which is not ordinarily a habitable space.
Insects General Hazards	Personnel will wear long-sleeved shirts and pants during fieldwork. Insect repellent will be applied prior to field work and reapplied as needed throughout duration of work. Mosquitos DEET – recommended mosquito repellent. 50% concentration recommended reapplication as needed.
Wasps & Bees	Remain calm; try not to disturb nest areas. If stung, remove stinger with tweezers or other blunt object (such as credit card) against sting site.
Ticks	Wear light-colored protective clothing such as long sleeve pants, shirts & head coverings. Tuck pants into socks and tape at seam to keep ticks away from skin. Use permethrin-based spray onto clothes and shoes to repel ticks (do not apply directly to skin). Do a thorough tick-check following field-based work.
Noxious Plants (poison ivy, poison oak, poison sumac)	Personnel will wear long-sleeved shirts and pants during fieldwork. Use commercially available pre-contact skin protectant towelettes or barrier cream. Exposed skin will be washed as soon as possible with dish soap & water or commercially available post exposure scrub wash products to remove the oil. Use gloves to remove exposed clothes & shoes. Seek medical attention if conditions worsen.

GENERAL SAFETY PRECAUTIONS

Working On, Over, or Near Water

Note: Normal monitoring events may require the use of (knee-high) waders. Any sampling that requires "above the knees" waders or utilization of a boat, is considered hazardous and should not be attempted without the direct supervision and/or approval of the MMA Stormwater Specialist. If municipal/MMA staff, interns or volunteers will be working over or near water where a risk of drowning could occur (per OSHA > 2 feet deep), then monitors must be provided with and use United States Coast Guard (USCG) approved personal flotation devices (PFDs, i.e., life jackets).

Noise Exposure / Hearing Conservation

Note: Normal monitoring events will not require the collection of samples at or near construction sites. If samples are needed on or through a construction site, the MMA Stormwater Specialist will obtain permission from the property owner and/or construction supervisor. Monitoring at or near a construction site, Field Teams must wear appropriate safety gear/ equipment including but not limited to hard hat, safety vest and hearing protection devices (ear plugs and/or muffs).

Weather-Related Hazards

In addition to heat and cold temperatures, weather-related hazards should be anticipated and appropriate protective measures must be taken. Given the multi-season work schedule and unpredictable New England weather, adverse weather should be anticipated. Field teams should always re-check the weather forecast prior to each sampling event. The following are some possible weather-related hazards and protective measures:

- *Lightning* - Do not work during electrical storms. Stay off high areas (e.g., top of the landfill) and hazardous areas (e.g., on water) that attract lightning.
- *Hurricane/Tornado/Flash Flooding/Hail/Hazardous Weather*-Do not schedule monitoring when weather reports indicate potential high winds, excessive rains, flash flooding, hail, hurricane or tornado warnings or watches. If weather becomes hazardous during monitoring, the Field Team Leader should stop all monitoring activities and send Field Teams to an appropriate safety location.

Reagents for Field Test Kits

The handling of certain reagents may be required for field test kits, such as test kits for Surfactants and test kits using Chlorine colorimeter. When handling and use is required, ensure that the user has reviewed the Safety Data Sheet, is aware of the associated hazards and first aid measures, and that the appropriate personal protective equipment is selected and used.

Roadway Infrastructure Safety Awareness

Field Teams may work in areas that are in close proximity to roadways, parking lots, or associated with the highway infrastructure (e.g., bridges, tunnels). ***Under no circumstances will Field Teams acquire samples within MA Highway road infrastructure without the direct supervision and/or approval of the MMA Stormwater Specialist.***

Monitoring within municipal infrastructure, Field Teams may be exposed to hazards both inside and outside the work zone. Depending on the specific project and work task, this may include the risk of injury from passing motor vehicle traffic as well as the potential risk from the movement of construction vehicles and equipment near the work zones (very rare).

When working alongside of roadways:

1. Locate a safe place to park vehicles for each sampling site.
2. If practical, park appropriate municipal maintenance vehicles between on-coming traffic and work area to serve as a warning barricade.
3. Use temporary traffic control devices, such as cones, signage, warning devices, barricades, and similar whenever necessary based on the type and location of work to be performed, the duration of operations, time of day, the characteristics of the roadway, and/or the volume and speed of traffic.
4. Wear **high visibility safety apparel at all times during sampling**. This safety apparel must be inspected regularly to ensure that color has not faded and that reflective properties have not been lost.
5. Always use extreme care when sampling at the edge of a roadway or bridge with guard rails, stonewalls, etc. Test railing firmly before leaning out over them.

When working within the road infrastructure (manholes and catchbasins):

1. Removal and placement of manhole and catchbasin covers is to be considered hazardous and is the responsibility of **Trained Municipal Maintenance staff** only. Under no circumstance will untrained municipal staff or any MMA/BBNEP staff, intern or volunteer engage in the removal of such covers.
2. Use extreme caution when removing manhole and catch basin covers as they are very heavy and require a pick or lifting device. Wear heavy-duty gloves and hard-toed boots to protect fingers and toes. Make sure on-coming traffic has plenty of visual warnings and traffic cones/signs to alert drivers of crew members on and along the roadway.
3. When lifting a manhole or catchbasin covers always use proper lifting techniques when in the field. Never lift more than you are capable of lifting. Follow the lifting techniques below:
 - a. First, test the weight of the load by tipping it. If in doubt, ask for help. Do not attempt to lift a heavy load alone.
 - b. Take a good stance. Plant your feet firmly with legs apart, one foot farther back than the other. Make sure you stand on a level area with no slippery spots or loose gravel, etc.
 - c. Get a firm grip. Use as much of your hands as possible, not just your fingers.
 - d. Keep your back straight, almost vertical. Bend at the hips if you bend.
 - e. Hold load close to your body. Keep the weight of your body over your feet for good balance.
 - f. Use large leg muscles to lift. Push up with the foot positioned in the rear as you start to lift.
 - g. Lift steadily and smoothly. Avoid quick, jerky movements.
 - h. Avoid twisting motions. Turn the forward foot and point it in the direction of the eventual movement.
 - i. Never try to lift more than you are accustomed to.
 - j. Always get help when you must lift bulky loads.

SAMPLING EQUIPMENT (in the field equipment) SAFETY (*pH, Ammonia, Conductivity, Temperature, Salinity, Chlorine*)

Note: Water samples will be collected for other field parameters (*surfactants and nitrates*) and will be tested offsite by MMA staff or interns.

Keep test kits, meters and test strips in a cool dry place (storage bin). Carefully read and abide by all instructions and safety warnings regarding in the field-testing equipment. All test strips must be kept dry until the individual strip is used for sampling.

Keep the sampling pole minimum of 10 ft. away from power lines at all times. Prior to deploying the sampling pole, visually scan your surroundings to identify the location of all power lines. If the sampling pole cannot be safely deployed, do not collect a sample. The sampling pole should always be transported in the non-extended position. Even in the non-extended position care must be taken not to bump people or property with the sampling pole. Carry the pole in the horizontal position (parallel to the ground) by gripping the pole in the middle.

EQUIPMENT AND MATERIALS CHECKLIST

Testing Equipment:

- ammonia test strips
- chlorine test strips
- conductivity, salinity, pH and temperature meter

Sampling Equipment:

- map with sampling location and Facility ID's
- clipboard
- 100 ml pre-labeled laboratory bacteria sample bottles (bacteria)
- 100 ml pre-labeled sample bottles (for conductivity, salinity, pH, temperature, ammonia and MMA off-site testing)
- 100 ml laboratory sample bottles (for chlorine)
- Assorted bottles necessary for other parameters
- data sheet/chain of custody forms
- de-ionized water or laboratory purified water
- pens
- permanent markers
- sampling pole
- squeeze bottle (filled with de-ionized water)
- disinfecting wipes
- carpenters ruler

Sample Transport:

- coolers
- frozen blue ice

Tools:

- flashlight
- manhole hook (from local DPW)
- measuring tape and/or carpenters ruler
- safety glasses
- shovel
- safety vests
- knee boots

Other:

- bug spray (the CDC recommends products with: DEET (exposed skin and clothing) or Permethrin (on clothing))
- digital camera (smartphone)
- field log books
- nitrile gloves
- paper towels
- sealable bags
- wet wipes

If you are allergic to poison ivy we recommend you bring your own poison ivy wash (example: Tecnu, Zanfel)

IN THE FIELD SAMPLING PROCEDURES

General Sampling Procedures

All data and field observations are recorded on MMA's Water Quality Sampling Sheet using a G-2 roller pen (or equivalent). Once monitoring is completed, all sampling sheets will be signed by the Field Team Leader (Chain of Custody) and given to the Stormwater Coordinator (or designee). The Stormwater Coordinator (or designee) will also sign the when samples are taken from the Field Team Leaders. If feasible, copies will be made of the sampling sheets before the samples are transported to the laboratory. Once the samples are delivered to the lab, the sampling sheet or a Chain of Custody Form supplied by the laboratory will be signed by lab personnel. The lab will keep the original and supply a copy to the Stormwater Specialist. The offsite testing conducted by the MMA will be recorded on the sampling sheet, which will then be filed at the BBNEP office as part of the permanent record for the individual monitored site.

Set-Up Procedures

1. **Coordination:** All monitoring events must be coordinated with the Stormwater Coordinator. The Stormwater Coordinator will need to schedule the delivery of materials to individual Field Teams along with making arrangements for sample deliveries to the labs. The Stormwater Coordinator will obtain a supply of bottles from the lab to ensure sufficient monitoring of flows discharging into impaired waters as indicated in MA DEP's Massachusetts Integrated List of Waters, Category 4 and 5 (<https://www.mass.gov/lists/integrated-lists-of-waters-related-reports>). In most circumstances, the Stormwater Coordinator will determine the appropriate monitoring events, especially with regards to wet weather and tides. The Stormwater Coordinator will keep track of weather and tidal conditions and record rainfall events on a daily basis. *All samples should be taken as close to low tide as possible to minimize mingling of tidal water with stormwater flows.*

Wet weather defined

- During a rain event with a minimum rainfall of 0.25-inches and a minimum duration of 1 hour before the sample is collected.

Dry weather defined

- Previous conditions where no more than 0.1 inches of rainfall have occurred at least 24 hours prior to the sampling event,
- No significant rainfall or snowmelt is currently occurring.

Note: Because rainfall events can be localized, Field Team Leaders (FTL) can also determine a monitoring event provided there is adequate notification to the Stormwater Coordinator and the parameters regarding weather and tides are met.

2. **Bottles and Laboratory Containers:** Organize sample bottles and laboratory containers. For each sampling site, there should be a minimum of three 100 ml containers:
 - 100 ml pre-labeled sterile (BBNEP Water Quality Sample) container for bacteria,
 - 100 ml pre-labeled (labeling tape with sample ID) container for *Pocket Pro*TM+ *Multi 2* meter testing plus onsite ammonia and chlorine testing and
 - 100 ml container for MMA offsite testing for nitrates and surfactants.

BBNEP Water Quality Sample	
Sample Date/Time:	_____
SampleID:	_____
SampleType:	<u>IDDE\Stormwater</u> _____
Laboratory Analysis:	_____
Preservative	_____
Collected By:	_____

Additional samples may also be collected at the discretion of the Stormwater Coordinator (discharges flowing into impaired waters). Attach a BBNEP sampling label to all bottles and containers requiring laboratory analysis. Use a sharpie permanent marker to label all appropriate information. Identify the correct laboratory analysis for the individual containers/bottles. Be sure that the location from which the sample is being collected matches the identification on the bottle (i.e. don't grab the wrong bottle when you are out sampling).

3. Ice: Prepare a freezer “ice pack” and store it in your freezer.
4. Paperwork: Fill out as much data sheet as possible prior to leaving vehicle at each station, including date and location.
5. Equipment Check: Check through your storage bin/equipment to be sure that you have everything and that it is all in good working order (e.g. test your flashlight). See checklist on pg. 8
6. Equipment Calibration: Calibrate Conductivity/Salinity/Temperature/ pH meter (s) every three weeks (see below). If meters have not been used in awhile, fill meter cup with de-ionized water, put meter electrodes in cup, allow to soak for 2 minutes.

Equipment Calibration

- **Pocket Pro™+ Multi 2, Conductivity, Salinity, pH, and Temperature**

Calibrate every three weeks for Conductivity *and* pH.

Safety precautions: The calibration solution can cause skin and eye irritation and should be well flushed if exposed. Wear gloves and eye protection.

Disposal: Calibration solution can be disposed into a sink with running water to a sewer system.

Calibration: Conductivity mode using potassium chloride (KCl) solution 1,413 uS/cm; pH using a pH 4.01 buffer solution.

Steps for Conductivity:

1. Set the power to on.
2. Remove the cap from the sensor.
3. Push and hold → until Conductivity shows.
4. Push ↵ to go to calibration mode, the auto-recognition standard (KCL-1413) to measure shows on the bottom line. *Note: If "Cl" shows on the bottom line, do not continue. Set the meter to auto calibration mode. Refer to Users Guide*
5. Rinse the sensor and cap with de-ionized water and blot dry.
6. Pour potassium chloride (KCl solution 1,413 uS/cm) into the cap to the fill line.
7. Put the sensor fully into the cap.
8. When the measurement is stable, push ↵ to save the calibration and go to continuous measurement mode. The measured value will flash 3 times and then stop.
9. Push and hold ↵ to go to continuous measurement mode. "END" shows on the display.
10. Once calibrated, rinse the electrode area of the meter and the sample cup three times with de-ionized water, blot dry, Leave meter on.

Steps for pH

11. Push and hold → until pH shows.
12. Push ↵ to go to calibration mode, the auto-recognition standard (pH buffer solution - 7.0) to measure shows on the bottom line. *Note: If "Cl" shows on the bottom line, do not continue. Set the meter to auto calibration mode. Refer to Users Guide*
13. Follow steps 5-10 above but substituting the pH buffer solution 7.0 for the KCl
14. Once all calibrations are completed, replace cap and return to monitoring storage bin.

- **Exstick II, Conductivity, Salinity, and Temperature, for pH use Hach Pocket Pro pH Tester**

Calibrate every three weeks for Conductivity using potassium chloride (KCl) solution 1,413 uS/cm)

Safety precautions: The KCl calibration solution is not considered hazardous with normal laboratory use. If splashed in eyes, it may cause eye irritation. Flush eye and skin after contact. Wear gloves and eye protection.

Disposal: The calibration solution (KCl) can be disposed into a sink with running water to a sewer system

Calibration: Done in conductivity mode only. Salinity is calculated from conductivity values, this procedure also calibrates the salinity ranges

Steps:

1. Rinse electrodes and meter cup with de-ionized water, blot dry.
2. Fill a sample cup with the KCl solution 1,413 uS/cm .
3. Turn the meter ON and insert the electrode into the solution. Tap or move the electrode in the sample to dislodge any air bubbles.
4. Press and hold the **CAL/RECALL** button (approximately 2 seconds) until “CAL” appears in the lower (temp) display. The main display will start flashing.

5. The meter will automatically recognize and calibrate to the standardizing solution. The display will briefly indicate "SA", END and then return to the measurement mode after a calibration.
Note: The "SA" will not appear if the calibration fails.
6. The "range calibrated" symbol will appear in the display for each range that is calibrated during that power on cycle.
Note: Each time the calibration mode is entered all calibration symbols on the display are cleared, but only the calibration data for the currently calibrated range is replaced. The other two ranges keep the existing calibration data, just the symbols are removed.
7. Once calibrated, rinse the electrode area of the meter and the sample cup three times with de-ionized water, blot dry, replace cap and return to monitoring storage bin.

- **Hach Pocket Pro pH Tester**



Calibrate every three weeks using pH 4.01 buffer solution

Safety precautions: The calibration solution can cause skin and eye irritation and should be well flushed if exposed.

Wear gloves and eye protection

Disposal: calibration solution can be disposed into a sink with running water to a sewer system

Steps:

1. Set the power to on.
2. Remove the cap from the sensor.
3. Push  to go to calibration mode. The auto-recognition standard(s) to measure shows on the bottom line.
Note: If "CI" shows on the bottom line, do not continue. Set the meter to auto calibration mode. Refer to "Configure the settings" in Users Guide.
4. Rinse the sensor and cap with de-ionized water and blot dry.
5. Pour the Hach pH 4.01 Buffer solution into the cap to the fill line.
6. Put the meter electrode into the cap.
7. When the measurement is stable, push to save the measurement. The measured value flashes three times.
8. Push and hold  to go to continuous measurement mode. "END" shows on the display.
Note: "ECAL" shows on the display if the calibration was not successful. Refer to Troubleshooting In Users Guide.
9. Once calibrated, rinse the electrode area of the meter and the sample cup three times with de-ionized water, blot dry, replace cap and return to monitoring storage bin.

DRY AND WET WEATHER MANUAL GRAB SAMPLE GENERAL PROCEDURES

Notes:

- In dry weather circumstances, the expected outcome is the stormdrain systems will be dry (no flow). All No Flow observations must be documented on the BBNEP's No-Flow Data Log Sheet (see page 20). ***If water is flowing within a stormdrain system during dry weather, the site must be monitored*** as indicated in the instructions below
- If a monitoring site is inaccessible, the Field Team should make a note as to the reason. Examples: embankment too steep, fenced private property, excessive brush, unable to remove cover or grate, sediment in sump. Obstructions that can be removed (brush, covers, grates, sediment) should be removed by the DPW before the next monitoring event.
- Each sampled discharge pipe, inlet pipe or sump sample will involve at least 3 containers, one **sterile** 100 ml container for bacteria (lab analysis) and 2 (nonsterile) 100 ml containers (for on-site and off-site MMA testing). At the discretion of the Stormwater Coordinator additional samples for laboratory analysis may also be collected.
- All samplers must wear clean nitrile gloves prior to collecting samples. The gloves must be changed for each new sample taken. Place used gloves in trash bag.
- For Wet Weather or Dry Weather without flow, fill out BBNEP No Sample Data Log Sheet (pg. 21)
- For Wet Weather or Dry Weather that have flow, fill out BBNEP Water Quality Sampling Sheet (pg. 18).
- If discharge pipe is partially blocked with sediment or land, remove blockage and let stormwater flow out for a few minutes before taking samples.
- All meters (Conductivity, pH) must be rinsed three times with de-ionized water, wiped dry and capped between uses.

I. Data Collection

1. Using paper maps and/or tablet, carefully determine the location of the FacilityID for the discharge pipe to be sampled. Take notes regarding observations (trash, waste products, unusual color or sheen) or smells. Observe discharge and tide, make estimate of tidal condition (high, mid, low).
2. Sample Collection:
 - a. Container 1 (does not have to be sterile and can be re-used): field testing for salinity/pH/conductivity/temperature (meter) and chlorine and ammonia (test strips). Labeling tape applied to container body.
 - b. Container 2 ***Must be sterile***: for bacteria, will be encased in plastic and have a cap seal. Fill out a BBNEP Water Quality Sample label and apply it to the body of the container.
 - c. Container 3 (does not have to be sterile): offsite testing of nitrates and surfactants
3. Start each sample collection at discharge pipe or roadcut. If unable to locate or access discharge, go to Step 4, otherwise proceed to Step 5.
4. If unable to locate discharge or discharge is inaccessible, go to first Manhole (MH) ***If the stormdrain system does not have MHs, go to the first CB.*** Use Outfall Notes as a guide for deciding the correct MH or CB.
5. Begin filling out Water Quality Sampling Sheet (See Instructions for Sampling Form page 17-19), Confirm Facility ID on Sampling Sheet with Location Map. Fill out Section I (except departure time) and all of Section III. Draw a Sketch Location on Sampling Sheet (as needed See Instructions for Sampling Form page 19). Each Sampling Sheet must have a Station Sketch to determine the location of the actual monitoring site (Catch Basins and Manholes can have more than one pipe associated with it).
6. If sampling at a MH or CB:
 - a. Public Works staff should remove cover or grate and place off to the side (see Safety Procedures Page 6). Using flashlight, look inside MH (but do not place head inside MH), make notes regarding condition of MH (presence of sump, presence of sediment, functioning, cracks, etc.) in comment section. If available use carpenters ruler or measuring device to approximate the amount of sediment in sump, make notation in comment section and then rinse ruler off.
 - b. Draw sketch of inlet pipes entering MH or CB both from other MHs or CBs and location of discharge pipe. Label pipes on sketch in accordance with Instructions for Sampling Form page 19). Collect samples from all free-flowing inlet pipes (stations on Sampling Sheet) found in MHs or CBs. If submerged or partially submerged pipes appear to be flowing, take a sample as close to the pipe as possible and make a note that pipe was submerged or partially submerged. Fill all the bottles and containers and complete all the field testing (conductivity/temperature/salinity, pH, chlorine and ammonia) for each station within the MH or CB before starting the next station in the same MH or CB.

Sample Collection

1. Put on clean pair of nitrile gloves.
2. Start collection sample with Container 1 (label tape with Sample ID and date)
 - a. If pipe is easily accessible, collect sample from the discharge pipe (or roadcut or flowing inlet pipes in CB or MH) directly into Container 1.
 - b. If pipes are not easily accessible, use sample pole. Place Container 1 into holder attached to bottom of pole and uncap. Lower pole into pipe flow to collect sample. If at a MH or CB, trying not to touch sides of MH or CB. If contact with MH or CB wall cannot be avoided, make a note in the comment section. To collect from a free-flowing pipe, tilt the bottle towards the water while avoiding collecting any "sump water" (NOTE: if sump water cannot be avoided, make a note in the comment section). If at a MH or CB and the pipe(s) are not free flowing (submerged or partially submerged) but appears to be flowing (the sump water is moving and does not appear to be stagnant), take the sample in the sump as close to the pipe as possible. Make a note on the data sheet that the sample is in the sump, but water is not stagnant.

3. Using meter, check salinity of the sample (See Section II),
 - a. if > 6.0 ppt, record the salinity on data sheet and discontinue monitoring at this station and move to the next monitoring station.
NOTE: If monitoring at discharge pipe, the next station is generally (although not always) at the next upstream structure (MH or CB), consult the outfall notes as to which structure to select. If monitoring at a CB or MH with more than one free-flowing pipe, check salinity at each pipe, if a pipe is $=$ or < 6.0 ppt proceed with step 4.
 - b. if $<$ or $= 6.0$ ppt, continue with Step 4.
4. If salinity is $<$ or $= 6.0$ ppt, record salinity on data sheet and use water in container 1 to record pH, conductivity (**Note: specify correct unit, see Units on data sheet**) and temperature. Make sure to rinse meter probe 3 times with deionized water and blot dry. Cap the sample and place in cooler. This will be used for offsite testing.
5. Collect Bacteria sample in Container 2 (100 ml sterile). This container **must be sterile**. Make sure not to touch bottle opening or inside cap lid during sample collection. If cap needs to be on the ground during sample, make sure it is placed cap up and preferably on a solid surface (rock, sand, road surface, etc.) and out of rain. Fill in blanks on BBNEP Water Quality labels and attach to container. Follow Step 2 for sample collection. Place sample immediately into cooler after collecting.
6. Collect sample (following sample collection in Step 2) in Container 3 to conduct Chlorine (meter) and Ammonia (test strips) tests. **NOTE: Chlorine is highly reactive and must be done first (before ammonia)**. Follow instructions in Section II below or manufacturer's instructions for testing of Chlorine (**Note: specify correct unit, see Units on data sheet**) and then Ammonia. This 100 ml container can be re-used for ongoing Ammonia and Chlorine testing. Rinse this container plus all other ammonia and chlorine sampling tubes 3 times with deionized water.
7. Collect any other laboratory analysis samples in a clean, labeled (BBNEP Water Quality Sample label) bottle, cap and place in cooler. Bottle size:

Total Nitrogen (TN) – 500 ml plastic

Total Suspended Solids (TSS) - 1 liter plastic

Total Phosphorus (TP) - 125 ml plastic or larger

Turbidity – 125 ml plastic or larger

Oil and Grease (OG) - 500 ml or 1 liter amber glass with reagent

Dissolved Oxygen (DO) - 300 ml glass

Biological Oxygen Demand (BOD) – 500 ml plastic




Metals – 500 ml plastic

8. If more than 1 free-flowing inlet pipe in CB or MH, repeat steps 1-7 and Section III for each flowing inlet pipe. Use a new sterile container for bacteria and clean (nonsterile) containers for the remaining samples for each pipe being sampled.
9. Obtain a sequential sample if required (see III below).
10. Once all samples at the site are collected, record Time Depart on Sampling Sheet.

II. Data Collection using Equipment - Conductivity, Salinity, pH, Temperature and Ammonia

- a. **Pocket Pro™+ Multi 2, Conductivity, Salinity, pH, and Temperature** multi-range sensor for measuring Conductivity, Salinity, Total Dissolved Solids (not monitoring) and Temperature. Do not touch the inner surfaces of the conductivity electrodes. Touching the surface of the electrodes may damage and reduce the life of the probe. Store the electrode dry in the storage cap. **Note: this meter always measures total dissolved solids, which is not currently being monitored.**



- 1) Shake the tester from side to side to remove air bubbles as bubbles under the probe tip when submerged can cause slow stabilization or cause an error in measurement.
 - 2) Set the power to on.
 - 3) Remove the cap from the sensor.
 - 4) If the lock icon  shows on the display, push to go to continuous measurement mode.
 - 5) Push and hold  to select the parameter to measure (i.e., Conductivity).
 - 6) Rinse the sensor and cap with deionized water and blot dry.
 - 7) Submerge the sensor/probe (lower section of meter) into the 125ml bottle.
 - 8) To keep the measured value on the display when the sensor is removed from the sample, push .
- Note:** The lock icon shows on the display when the measurement is stable.
- 9) To measure another parameter, do steps 4–9.

10) When completed, rinse the electrode area of the meter three times with de-ionized water and blot dry before next use, put the cap on the meter and turn off.

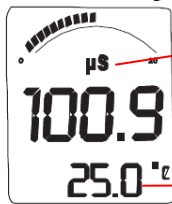
b. Exstick II, Conductivity, Salinity, and Temperature 4-in-1 multi-range sensor for measuring Conductivity, Salinity, Total Dissolved Solids (not monitoring) and Temperature. Do not touch the inner surfaces of the conductivity electrodes. Touching the surface of the electrodes may damage and reduce the life of the probe. Store the electrode dry in the storage cap. **Note: this meter always measures total dissolved solids, which is not currently being monitored.**



- 1) Fill sampling cup to 20ml line
- 2) Remove bottom cap on meter (electrodes)
- 3) Press the **ON** button. (“SELF CAL” will appear in the display during the turn-on diagnostics)
- 4) Depress and hold the MODE/Hold key to scroll to the desired measurement mode.
- 5) Insert the electrode into the sample making sure that the electrodes are completely submersed.
- 6) Slowly stir the solution with the electrode to remove air bubbles.
- 7) The meter will auto-range to the proper range and then display the reading.
- 8) Record Conductivity, Temperature (°C), and Salinity on sampling sheets, including a reading for LOL (Below Recordable Limits).
- 9) Put the cap water from this meter into the cap of the pH meter (see Section II b1-7)
- 10) Rinse the electrode area of the meter and the sample cup three times with de-ionized water and blot dry before next use.

Note care should be given when recording units for conductivity and salinity (see Schematic below)

Conductivity



Under salt water (brackish, tidal) conditions, this unit will automatically change units to **ms**, make note of **ms** on data sheet

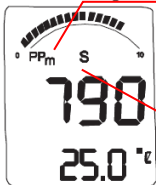
Temperature

TDS(mg/L)



Not monitoring TDS
(Total Dissolved Solids)

Salinity



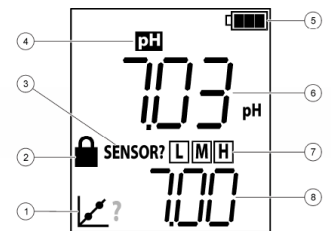
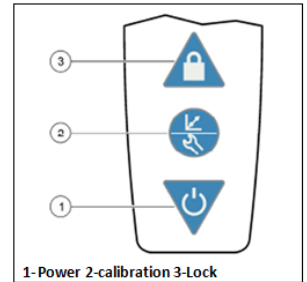
Under salt water (brackish, tidal) conditions, this unit will automatically change units to **PPT**, make note of **PPT** on data sheet

If this **S** is not displayed, then the meter is in TDS mode, use the MODE/Hold key to scroll to **S**

c. Hach Pocket Pro pH Tester *Sensor for measuring pH. Do not touch the inner surfaces of the conductivity electrodes. Touching the surface of the platinized electrodes may damage and reduce the life of the probe. Store the electrode dry in the storage cap.*

After a dry storage, with the unit off, soak the sensor for several minutes in tap water or a sample.

- 1) Shake the tester from side to side to remove air bubbles. Air bubbles under the probe tip when submerged can cause slow stabilization or error in measurement.
- 2) Set the power to on.
- 3) Remove the cap from the sensor.
- 4) If the lock icon shows on the display, push the lock button to go to continuous measurement mode.
- 5) Rinse the sensor and cap with de-ionized water and blot dry.
- 6) Pour the water sample from the Conductivity cap into the cap to the fill line.
- 7) Put the sensor fully into the cap. Wait for the value to stop drifting and read the stable value
- 8) To keep the measured value on the display when the sensor is removed from the sample, push the lock button.
- 9) Note: The lock icon shows on the display when the measurement is stable.
- 10) Record pH on Water Sampling Sheet.
- 11) Use water in cap to test for ammonia (see II.c1-7 pg14) then complete steps II b 12-14 to clean pH meter
- 12) Rinse the sensor and cap three times with de-ionized water and blot dry.
- 13) Put the cap on the tester.



- 14) Set the power to off.

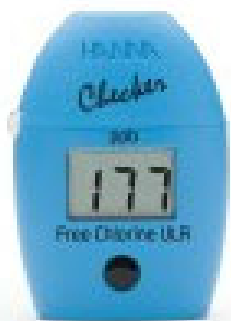
1 Calibration icon	5 Battery icon	9 Temperature
2 Lock icon	6 Parameter value	10 Custom standard (C1, C2) ⁴
3 Sensor? icon	7 Calibration standard(s) measured for last calibration (low, medium, high) ²	
4 Parameter	8 Calibration standard(s) expected ³	

d. Hach Ammonia Test Strips *Store container of testing strips in a cool dry place with no exposure to moisture as this will ruin the strips*

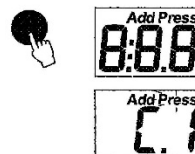
- 1) Using water in the Container 3 triple rinse the vial and cap. Fill sample vial to top line with water.
- 2) Remove an ammonia test strip out of the test strip container and replace the cap tightly.
- 3) Place test strip in vial and vigorously move up and down for 30 seconds. Make sure pads are always submerged.
- 4) Remove test strip, shake of excessive water.
- 5) Hold test strip level, with pad side up, for 30 seconds.
- 6) To read result, turn test strip over so both pads are facing away from you.
- 7) Compare the color of the small pad to the color chart on bottle. Read result through the clear plastic of the test strip and record.
- 8) Rinse vial and cap with de-ionized water.
- 9) Dispose of Hach strip in trash bag.



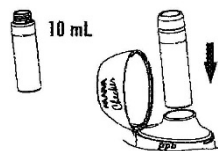
e. **Hanna Chlorine Meter** (Ultra Low Range HI762)



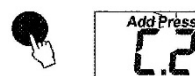
1. Turn the meter on by pressing the button. All segments will be displayed. When the display shows “Add”, “C.I” with “Press” blinking, the meter is ready.



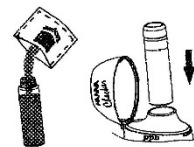
2. Fill the cuvette with 10 ml of unreacted sample and replace the cap. Place the cuvette into the meter and close the meter's cap.



3. Press the button. When the display shows “Add”, “C.2” with “press” blinking the meter is zeroed.



4. Remove the cuvette from the meter and unscrew the cap. Add the contents of one packet of HI 762-0 reagent. Replace the cap and shake gently for 20 seconds. Place the cuvette back into the meter.



5. Place and hold the button until the timer is displayed on the LCD (the display will show The countdown prior the measurement) or alternatively wait for 1 minute and press the button



6. The instrument directly displays the concentration of the free chlorine in ppb. The meter automatically turns off after 10 minutes.



III. Data Collection Sequential Samples

Sequential Samples are required for event 10th sample, if less than 10 samples are taken at least 1 sequential sample must be obtained for each monitoring event.

Example:

- 10 Samples or less, sequential sample at first site
- greater than 10 samples, take sequential sample at first site and at the last site.

Obtaining:

Follow same protocol as described in **I and II Data Collection** above except the Field Teams will be collecting samples in two 100ml sterile bacteria containers and two clean (non-sterile) 100ml bottles (off-site testing) and duplicates of additional parameters if needed.

- 1) Conduct salinity (Reminder salinity should be $<$ or $=$ to 6.0), pH, conductivity and temperature tests along with ammonia and chlorine.
- 2) Label the two sterile (bacteria) 100ml containers with the same SampleID except the 2nd container which will be labeled with a **-D** after the sample ID. Fill the first container, cap and place in cooler. As quickly as possible take another sample in the 2nd container (labeled with the -D), cap and place in cooler.
- 3) Then collect the two (clean, non-sterile) 100ml containers samples, one labeled with the Sample ID, the other labeled with the Sample ID plus the -D (for nitrates and surfactants)

Example: If SampleID WA19MAY01A was the 10th sample, take 1 regular sample and 1 sequential sample at monitoring station.

- a) Fill out Sampling Sheet, using two lines for Sample ID, first line SampleID **WA19MAY01A**, second line **WA19MAY01A-D**. Conduct salinity, pH, conductivity and temperature tests along with ammonia and chlorine *twice* each and record.
- b) Label two sterile 100ml bacteria containers: one with SampleID **WA19MAY01A**, the remaining container with the Sample ID **WA19MAY01A-D**.
- c) Label two non-sterile 100ml containers: one with SampleID **WA19MAY01A**, the remaining container with the Sample ID **WA19MAY01A-D**. Fill these containers using protocol in Sect. I Sample Collection (pg12), do the same for the 2nd 100ml. Utilize the containers to conduct MMA offsite testing *twice*.
- d) For additional laboratory parameters, label 2 bottles and fill as described above).

Instructions for Sampling Form

1. VisitID is a unique identifier for the year, town, date, and sequential number. The first two letters are an abbreviation for town as shown in the table below. An alternate abbreviation is given in the event that there are two teams sampling the same town at the same time.

Town	First Team	Second Team
Acushnet	AC	AT
Bourne	BO	BN
Dartmouth	DA	DM
Fairhaven	FA	FH
Marion	MR	MN
Mattapoisett	MT	MP
Wareham	WA	WM

The town abbreviation is followed by the date in the format of DDMMM followed by a sequential number is used starting with 01. An example for the first sample in Wareham on May 19th would be: WA19MAY01. Use all capital letters and no dashes.

Buzzards Bay Stormwater Collaborative - Water Quality Sampling Sheet

Check if back used for additional information: ()

Section I

VisitID:	1	FacilityID:	2	Location:	3	
4 Sample Type:	Wet () Dry ()	CatchmentID:	5			
Date:	8	Weather:	9	Town:	11	
Time Arrive:	10	Time Depart:		Collectors:	6	Facility Type: 7

Section II

Station	SampleID (Bottle Label)	Flow Type	Flow Area	Sensory	Turbidity (Y/N)	pH	Temp. (C)	Cond. (specify)	Sal. (ppt)	NH ₃ (ppm)	Cl (specify)	NO ₃ (ppm)	Surf. (ppm)
A	12	← 13 →										14	
B													
C													
D													
E													
SUMP													

Flow Type: P = Free Flowing Pipe
 F = Surface Flow or Weir
 W = Water Body / Wetland / Stream
 S = Sump or Submerged Pipe

Flow Area: From Pipe = diameter x depth in pipe (ie. 12"D x 2")
 Surface or Weir = width x depth (ie. 20" x 0.25")
 Measurements rounded to 1/4 in

Sensory: C=Color, O=Odor, W=Waste Products, T=Trash

Units: Conductivity: u for μS/cm or m for mS/cm
 Chlorine: b for ppb or m for ppm (mg/l)

Section III

Location Sketch (plan view): <div style="text-align: center; border: 1px solid black; width: 100px; height: 40px; margin: 20px auto;">16</div>	Station Sketch: <div style="text-align: center; border: 1px solid black; width: 100px; height: 40px; margin: 20px auto;">15</div>
Comments:	

Lab: Use three dilutions for bacteria

Six metals: Al, As, Cd, Cr, Cu, Pb

17 Laboratory Work	Fecal	EColi	Enteroc	TN	TP	TSS	Turbidity	Oil & Grease	DO	BOD	Metals
Check all that Apply:											
Sampling Container:	100ml sterile	100ml sterile	100ml sterile	500ml plastic	125ml plastic	1000ml plastic	125ml plastic	500ml glass w/R	300ml glass	500ml plastic	500ml plastic
Custody 1:	18			Custody 2:			Custody 3:				

2. Location information: **FacilityID** is the unique identifier used in GIS for each feature in the database. All discharge points, manholes, and catch basins have a facility ID. This is very important for connecting the water quality data back to the collection area and stormwater infrastructure. If the facility ID is not clear or difficult to determine other blocks in the form are provided to add information about the street location, coordinates, and a sketch. A sketch is very useful when several manholes and catch basins are located close together even if the FacilityID is known. Accurate, detailed notes and sketches are critical to the sampling location.
3. Street Name and address when available.
4. Sample type for wet or dry weather is a function of recent rainfall and described in detail elsewhere in this manual. Note that it may be possible to collect a wet weather sample shortly after the rain stops.
5. Indicate the FacilityID of the outfall pipe. You may be sampling at this pipe and it would be the same as FacilityID on the form or it may be the outfall pipe of the catchbasin or manhole that you are sampling.
6. List all people present at sampling location.
7. Type of facility that the sample was collected: Pipe = Discharge Pipe; MH = Manhole; CB = Catch -basin. RC = Roadcut
8. Current date.
9. Weather: Indicate details about your specific location during sampling. An example observation might be “light rain”, “overcast”, “high wind”.
10. Indicate time of arrival and departure. Ten-minute increments are good.
11. Town location
12. SampleID: For up to six stations at a feature, a SamplingID is used for bottle labels and tracking water quality data. The SamplingID is simply the VisitID followed by the station letter. For example: WA19MAY01A. Other notation is required for sequential samples. *Note: if inlet pipes are partially or fully submerged and are flowing (as in the sump water is moving and not stagnant), indicate this on the Sample Sheet (fill in Sample ID, Flow Note as full, Submerge Note full or partial), then take Sump Sample and complete tests. If Sump is stagnant (no indication of water flowing into the MH or CB, no sample is needed)*
13. Field Observations/Tests: Water quality data for each sample is recorded in this section.

Flow Type: Free Flowing (Pipe), Surface or weir (Sample not from pipe), Waterbody/Wetland/Stream (Pipe submerged by Waterbody, etc), Sump or Submerged Pipe

Flow Area: Pipe: Diameter of pipe times the depth of flow or Surface/Weir: width x depth

Sensory: Indicate if there is color, odor, waste, or trash present. Can be all or any combination.

Turbidity: Indicate if the water is turbid

pH: Measure with Pocket Pro™+ Multi 2, Conductivity, Salinity, pH, and Temperature

Temp: Temperature in degrees Celsius. Pocket Pro™+ Multi 2, Conductivity, Salinity, pH, and Temperature.

Cond.: Conductivity in nano-Siemens per centimeter (µS/cm (Use U as unit)) or micro-Siemens per centimeter (mS/cm (Use M as unit)). Pocket Pro™+ Multi 2, Conductivity, Salinity, pH, and Temperature

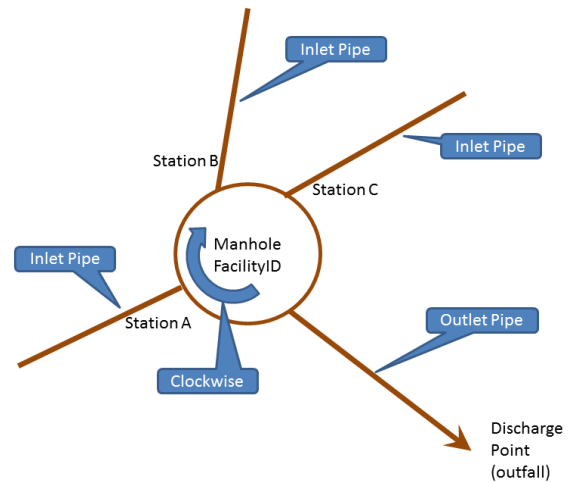
Sal.: Salinity in parts per thousand (ppt). Pocket Pro™+ Multi 2, Conductivity, Salinity, pH, and Temperature.

NH₃: Ammonia in parts per million (ppm). Measure with test strip.

Cl: Chlorine in milligrams per liter (mg/l)/or parts per million (ppm)-Use M for unit for either mg/l or ppm. Or parts per billion (use B as unit).
14. These blocks are for values determined in the office water analysis for Nitrates (NO₃) and Surfactants.

15. Enter any additional comments, notes, sketches or information. Use this area if one of the blocks is too small to complete an entry. The back of the form can be also used for additional notes or sketches. Indicate the methodology including test strip label information.

16. Location Sketch: Indicate the physical location of the Facility ID in relation to the street, landmark, house # etc. Especially important when monitoring a structure that does not have a current Facility ID. Station Sketch: This area will be used to indicate the physical layout of the pipes and other infrastructure where the sample was collected. Station designations are determined from the outlet pipe in a clockwise direction. For example, if a manhole has three pipes entering and one exit pipe (the outlet) the inlet pipes will be designated A, B, and C as shown below. Remember that all points may not be visible when submerged. The sketch will be invaluable when trying to determine which pipes were sampled.



17. Check appropriate box for samples collected for lab analysis. At least one bacteria (Enterococci, Ecoli, or Fecal coliform) sample will be collected for every pipe,. The remaining parameters will be monitored on a case by case basis and will be decided by the Stormwater Coordinator prior to the sampling event.

18. Chain of Custody: To be signed by individual releasing/accepting the samples for transport and by the laboratory staff upon arrival of the laboratory.

