

NHDES Beach Program Generic Quality Assurance Project Plan



**Prepared by:
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April 2012

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Watershed Management Bureau Administrator:

Signature / Date
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Program Coordinator:

Signature / Date
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Limnology Center QA Officer:

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Scott Ashley, NHDES

NHDES Quality Assurance Manager:

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QA/QC Officer, Division of Public Health Services
Public Health Laboratories - Water Analysis Lab

Signature / Date
Rachel Rainey, NHDHHS

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US EPA QA Officer:

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Nora Conlon, US EPA Region I

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A 2.0 Distribution List and Project Personnel Sign-off Sheet

A 2.1 Distribution List

The approved QAPP, Sampling and Analysis Plans (Appendix D), and any amendments are distributed to people who implement, oversee, and review the progress of the NHDES Beach Program (Table 1).

Table 1. QAPP Distribution List for the NHDES Beach Program

Recipient	Title	Organization	Telephone	Email
Sonya Carlson	Beach Program Coordinator	NHDES	603-271-0698	sonya.carlson@des.nh.gov
Ted Diers	Watershed Mgmt. Bureau Administrator	NHDES	603-271-7940	Ted.diers@des.nh.gov
Beach Inspector	Seasonal Beach Inspector	NHDES	Varies	Varies per season
Teresa Ptak	Beach Program Assistant	NHDES	603-271-8803	teresa.ptak@des.nh.gov
Barbara Davis	Youth Recreation Camp Licensing Program	NHDES	603-271-2542	barbara.davis@des.nh.gov
Deb Soule	Program Data Manager	NHDES	603-271-8863	deb.soule@des.nh.gov
Scott Ashley	Limnology Center QA/QC Officer	NHDES	603-271-2968	scott.ashley@des.nh.gov
Rachel Rainey	NHDHHS Laboratory QA/QC Officer	NHDHHS	603-271-8501	rachel.rainey@des.nh.gov
Mona Freese	NHDHHS Laboratory Microbiology Section	NHDHHS	603-271-2992	mona.freese@des.nh.gov
Vincent Perelli	NHDES QA Manager	NHDES	603-271-8989	vincent.perelli@des.nh.gov
Nora Conlon	US EPA QA Officer	US EPA	617-918-8335	conlon.nora@epamail.epa.gov
Beth Edwards	US EPA Project Officer	US EPA	617-918-1840	edwards.beth@epamail.epa.gov

A 2.2 Project Personnel

Contact information and title of all Beach Program personnel is maintained in the QAPP (Table 2).

Table 2. Project Personnel for the NHDES Beach Program

Personnel	Title	Telephone #	Email address
Sonya Carlson	Beach Program Coordinator	603-271-0698	sonya.carlson@des.nh.gov
Ted Diers	Watershed Mgmt. Bureau Administrator	603-271-7940	Ted.diers@des.nh.gov
Teresa Ptak	Beach Program Assistant	603-271-8803	teresa.ptak@des.nh.gov
Recreation Camp Inspectors	Drinking Water and Groundwater Bureau - Seasonal Camp Inspector	603-271-2542	barbara.davis@des.nh.gov
Beach Inspector	Seasonal Beach Inspector	Varies yearly	Varies yearly
Deb Soule	Program Data Manager	603-271-8863	deb.soule@des.nh.gov
Scott Ashley	Limnology Center QA/QC Officer	603-271-2968	scott.ashley@des.nh.gov
Rachel Rainey	NHDHHS Laboratory QA/QC Officer	603-271-8501	rachel.rainey@des.nh.gov
Mona Freese	NHDHHS Laboratory Microbiology Section	603-271-2992	mona.freese@des.nh.gov
Vincent Perelli	NHDES QA Manager	603-271-8989	vincent.perelli@des.nh.gov
Nora Conlon	US EPA Region 1 Quality Assurance	617-918-8335	conlon.nora@epamail.epa.gov
Beth Edwards	US EPA Region 1 Project Officer	617-918-1840	edwards.beth@epamail.epa.gov

A 3.0 Project Organization

A 3.1 Project Organization Description

The New Hampshire Department of Environmental Services (NHDES) Public Beach Inspection Program, or Beach Program, involves a number of key partners. The Beach Program Coordinator is responsible for program oversight. The Beach Program Coordinator is responsible for QAPP development, program coordination, inspection and sampling of coastal waters, issuing beach advisories, and supervision and training of a program assistant and interns. The Drinking Water and Groundwater Bureau's Camp Inspectors are responsible for inspecting and sampling juvenile camps and their associated beaches. Other responsibilities of the NHDES Beach Program include website maintenance, investigation of non-point and point sources of pollution on the coast, conducting a tiered approach to monitoring, cataloging all public beaches in the state, conducting public education and outreach, maintaining a public notification process and investigating new and improved methods for public notification, managing and analyzing water quality data for beach advisories, and investigating water quality complaints at public beaches.

The Seasonal Public Beach Inspector is responsible for the inspection and sampling of freshwater beaches. The Seasonal Coastal Beach Inspector works with the Coordinator to inspect and sample coastal beaches. The Program Assistant supports the Coordinator with the inspections and other projects such as wet-weather monitoring, microbial source tracking, education and outreach, and website maintenance. The Program Data Manager is responsible for data management and database organization and maintenance. The detailed responsibilities of each position are on file at NHDES. Any changes in project organization will be revised in the QAPP and submitted to EPA for approval by the Bureau Administrator or Program Coordinator.

The Beach Program personnel are responsible for the identification of cyanobacteria blooms and microcystin analyses. Upon identification, the Program Coordinator or Program Assistant is responsible for issuing beach advisories. New Hampshire Health Officers and Beach Managers work with the NHDES Beach Program to post advisories at town beaches and convey public health concerns. The New Hampshire Department of Health and Human Services' (NHDHHS) Division of Public Health Services, Public Health Laboratories - Water Analysis Lab (or PHL-WAL) (603-271-2997) is responsible for bacterial sample analysis. The Program Data Manager (603-271-8863), is responsible for development and management of the beach database. The Bureau Administrator is responsible for oversight and management of the Beach Program, Program Coordinator, Program Assistant, Beach Inspector, interns, beach data, grants, US EPA communications and QAPP development.

A 3.2 Communication Pathways

The Coordinator is the primary contact for all aspects of inspecting, sampling, and posting advisories at public beaches. The Coastal Inspector and the Coastal Intern communicate all problems from sampling to their supervisor, the Coordinator. The Assistant, under the supervision of the Bureau Administrator, assists the Coordinator in monitoring and sampling coastal beaches and various program-related duties. The Assistant, Coastal Inspector, and Program Intern report to the Coordinator if problems should arise in the field or laboratory. The Coordinator reviews beach results, resolves issues with beach owners, and coordinates with the Assistant to issue advisories to NH Health Officers and Beach Managers. If a problem arises and neither the Coordinator nor the Assistant is available, the Bureau Administrator carries out required duties for the program.

A 3.3 Personnel Responsibilities

Within the NHDES Beach Program, personnel from a variety of sections and agencies have various responsibilities and qualifications (Table 3).

Table 3. Personnel Responsibilities.

Name and Position	Responsibilities
Ted Diers, NHDES Watershed Management Bureau Administrator	Program Oversight
Sonya Carlson, NHDES Biology Section	Program Coordination
Teresa Ptak, NHDES Biology Section	Program Assistance
Freshwater Beach Inspector	Public Beach Inspector for all freshwater beaches
Drinking Water and Groundwater Bureau Camp Inspectors	Inspectors for youth recreation camp beaches
Scott Ashley, Limnology Center QA/QC Officer	Oversees QA/QC of the Limnology Center
Mona Freese, Microbiologist, NHDHHS Laboratory	Oversees Microbiology section of PHL-WAL
Rachel Rainey, NHDHHS Laboratory QA/QC Officer	Oversees PHL-WAL QA/QC activities
Deb Soule, NHDES Watershed Management	Develops and manages the Beach database.
Nora Conlon US EPA Region 1 Quality Assurance Officer	Oversees QA/QC of the US EPA Region 1
Beth Edwards, US EPA Region 1 Project Officer	Assists NH Beach Personnel as needed

A 4.0 Project (Program) Planning/Project Definition

A 4.1 Problem Definition/Background

Protecting and maintaining public health at freshwater and coastal beaches continues to be a goal of the NHDES Beach Program, which has been monitoring and sampling beaches throughout the State since the early 1970's. The purpose of a monitoring and sampling program is to protect the public from contracting waterborne diseases. Waterborne diseases, such as cholera, can pose serious threats to public health. The greatest threat is through the contamination of water from animal and human waste. Fecal material can host a variety of coliform bacteria, the most common being *Escherichia coli* (*E. coli*) and Enterococci. These bacteria are found in the intestines of warm-blooded animals, including humans. Since *E. coli* and Enterococci are present in fecal material, and are easily cultured within 24 hours, they are the two best indicators of fecal contamination in surface waters. Their presence in significant numbers statistically increases the potential for the presence of pathogenic organisms.

In order to protect the public from contracting diseases through recreational activities at public bathing areas, the NHDES inspects, samples, and issues advisories to public bathing beaches. In accordance with U.S. EPA requirements, the state has set strict standards for acceptable bacteria levels at public beaches. In accordance with RSA 485-A:8 (Appendix B), the state standard at freshwater beaches for *E. coli* in one sample is 88 counts per 100 mL of water, or no more than a geometric mean of 47 counts per 100 mL of water in 3 samples during a sixty day period. The state monitors coastal beaches for Enterococci, the preferred biological indicator for saltwater. The state standard for Enterococci in one sample is 104 counts per 100 mL of water, or no more than a geometric mean of 35 counts per 100 mL of water in 3 samples over a sixty day period. Beach advisories are posted when state standards are exceeded and remain posted until retesting of the beach yields acceptable bacteria levels (Appendix A-7).

NHDES also recognizes the threat of toxic cyanobacteria (blue-green algae) to public health. Cyanobacteria are capable of producing toxins known to target the liver and central nervous system. They can also cause irritation to the skin and mucous membranes. High concentrations of cyanobacteria have caused fish-kills and the death of small animals, including domestic animals. The ingestion of cyanobacteria over a period of time can cause toxins to accumulate in the body with potential chronic effects to humans. Loss of liver function and subsequent organ failure are serious health threats. The NHDES Beach Program recognizes these threats, and has adopted an advisory for beaches where cyanobacteria scums are identified. Advisories

are posted at public beaches when a visible cyanobacteria scum is present and cyanobacteria cell dominance is >50% of the sample cell count. An advisory will remain in effect until further testing by NHDES reflects that cyanobacteria cell dominance is <50% of the sample cell count and the beach area is safe for recreational activity. By posting advisories for cyanobacteria, NHDES is taking a proactive step in protecting and maintaining public health at its beaches.

A 5.0 Project (Program)/Task Description and Schedule

A 5.1 Project (Program) Overview

The purpose of the NHDES Beach Program is to protect and maintain public health at New Hampshire's public beaches. NHDES works cooperatively with town health officials, beach managers, lifeguards and private entities to ensure safe swim areas. The Program is administratively divided into the Coastal Beach Program and Freshwater Beach Program. Participation is voluntary, at the option of the beach owner, for the Freshwater Beach Program. Participation is mandatory for the Coastal Beach Program due to federal funding and associated grant requirements. The Drinking Water and Groundwater Bureau manages the Youth Recreation Camp Licensing Program. Camp beaches are private, and therefore not under the direction of the Beach Program. Recreation camps must pass annual inspections and obtain an operational license.

The beach season in New Hampshire begins on Memorial Day and lasts until Labor Day. As of 2011, 16 coastal beaches are sampled during the swim season. A coastal beach with high use or multiple bacteria violations is classified as Tier I and sampled twice a week. A coastal beach with medium use or seldom bacteria violations is classified as Tier II and sampled once per week. A coastal beach with low use or no bacteria violations is classified as Tier III and sampled every other week. All coastal beaches are evaluated yearly according to the risk-based beach evaluations, and tiers are adjusted as needed according to the Tiered Monitoring Plan (Appendix F). Changes in tier status are implemented at the beginning of each swim season. Each coastal beach requires 2 to 5 samples per beach averaging 65 to 85 samples per week. During the swim season, approximately 168 freshwater beaches are sampled on a monthly basis. Each beach is sampled once per month with 2 to 3 samples per beach averaging 336 to 504 samples per month. Approximately 100 recreation camp beaches are inspected once per season with one to two samples collected per beach averaging 150 samples per season. Beach Inspectors will complete a Field Data Sheet (Appendix C) for each beach inspected. Monitoring/sampling techniques are based on the Beach Program Standard Operating Procedures (SOPs, Appendix A). Freshwater public beaches are considered Tier IV and are sampled once per month. Juvenile camp beaches are considered Tier V and are sampled once per season. Freshwater beaches are not subject to risk-based beach evaluations.

Bather loads are recorded at beaches during visits. DES will compile data from any illnesses reported during the beach season. An illness report form (Appendix C) was developed and can be accessed on the DES Beach Program's website or by contacting the Beach Program. Illness reports will be completed by DES staff or the public. Depending on the outbreak extent and potential classification as a reportable disease, the DES Beach Program will consult the NHDHHS public health nurses in certain instances. DES hopes to raise awareness of waterborne illnesses, and data collected will be used to assess the outbreak of waterborne illnesses at New Hampshire's public beaches.

Advisories are posted at beaches if two of the three samples collected have bacteria levels above the state standard or if one of the samples collected exceeds the state standard by more than 70 counts. Beach advisories are posted during the swim season according to the NHDES Beach Program's Standard Operating Procedure for Beach Advisories (Appendix A-7). If samples collected during the non-swimming season exceed the state bacteria standards, a beach advisory will only be posted if conditions at the beach are conducive to primary contact recreational activities. NHDES also analyzes algal scums at public beaches for potential toxic cyanobacteria (blue-green algae). If a cyanobacteria scum proves to be a dominant toxin-producing cyanobacteria species, an advisory will be posted at the beach area. Cyanobacteria sample collection and identification follows the NHDES Beach Program's SOP for Algal Collection/Identification (Appendix A-2). Algal scum samples positively identified as dominated by toxin producing species will be

analyzed for Microcystin. Microcystin is a toxin produced by certain species of cyanobacteria common to New Hampshire waters. The analyses follow the SOP for Microcystin Sample Analysis (Appendix A-4).

The Beach Program will also work to promote public education and awareness by increasing its outreach through surveys, pamphlets, and fact sheets. These educational materials are dispersed to all town health officials, beach managers, lifeguards, and state parks.

A 5.2 Project (Program) Schedule/Sampling and Analysis Tasks

Project Schedule: Annual sampling of public beaches is performed on a seasonal basis due to the temperate climate in New Hampshire. The sampling season begins on June 15th and ends on Labor Day for all freshwater beaches. Sampling will begin the day after Memorial Day and end on Labor Day for all coastal beaches (Appendix F).

Sampling tasks: Bacteria sampling will be performed at coastal beaches on a twice a week, weekly, or on a bi-weekly basis during the swim season. Monthly sampling will be scheduled for public freshwater beaches, and a single season sample will be scheduled at juvenile camp beaches. Additional sampling is performed if sample results yield bacteria counts exceeding the state standards. Freshwater samples are analyzed for *E. coli* and coastal samples are analyzed for Enterococci. For beaches with a shoreline greater than 100 feet in length, three samples are collected at each beach at left, center, and right swim area locations. The swim area is defined by a roped off area of the beach or entire shoreline at the beach. If the beach is less than 100 feet in length only two samples are collected one third of the distance from either end of the beach. If the beach area is located at a recreation camp, one to two samples may be necessary to assess beach water quality. These samples are collected at the center of the beach area or at left and right stations. Beach areas located on a river, or flowing water, require sample collection upstream of the beach area, in the beach area center, and downstream of the beach area. The purpose of collecting two or three samples per beach is to collectively represent the whole beach area instead of a single point on the beach. Water temperature is also measured at each site. Sampling methods are included in Appendix A in the Beach Program Standard Operating Procedures (SOPs). If visible cyanobacteria scums are present, a sample is collected according to the Beach Program SOPs for Algal Sample Collection/Identification (Appendix A-2).

All coastal and freshwater beaches have GIS coverage and maps are available on the EPA Beach Monitoring and Notification website (http://water.epa.gov/type/oceb/beaches/beaches_index.cfm).

Analysis tasks: Samples are analyzed for *E. coli* (freshwater) and Enterococci (saltwater). All analyses are conducted by the NHDHHS PHL-WAL. The SOPs for bacteria sample analysis are on file at EPA. Identification of cyanobacteria is performed in the NHDES Limnology Center Laboratory (Appendix A-2). All cyanobacteria samples calculated at elevated concentrations and positively identified as a toxin-producing species will be analyzed for the presence of the toxin Microcystin (Appendix A-4). Temperature is collected at freshwater and coastal public beaches (Appendix A-5). Temperature is not typically collected at recreation camp beaches. Various staff members are responsible for analysis of the various tasks (Table 4).

Table 4. Surface Water Analytical Services Table for NHDES Beach Program

Analyte	Responsible Position Contact Information
LAB ANALYSIS	
<i>E. coli</i> & Enterococci	NHDHHS Public Health Laboratories - Water Analysis Lab, Mona Freese, 603-271-2992
Cyanobacteria & Microcystin	Limnology Center, Beach Program Coordinator, 603-271-0698
FIELD ANALYSIS	
Temperature	Coastal and Freshwater Beach Inspectors

A 5.3 Project (Program) Schedule

Table 5 represents the recurring schedule of deliverables required of the NHDES Beach Program.
 NHDES Beach Program: Generic Quality Assurance Project Plan

Table 5. Project (Program) Schedule Timeline for the NHDES Beach Program

Activity	Time Frames		Deliverable	Deliverable Due Date
	Anticipated Date(s) of Initiation	Anticipated Date(s) of Completion		
QAPP resubmitted to DES QA Manager & EPA every 5 years	June 2006	June 2011	QAPP Document	June 2011
QAPP review	January	May	Program Audit	Every February
Laboratory Analyses	Seasonally	Seasonally	Analysis Results	Daily
Monitoring/Sampling	June	September	Quantity of Beaches Monitored	Reviewed annually
Annual Summary	End of sampling	April 1	Annual Program Report	Annually

A 6.0 Project Quality Objectives and Measurement Performance Criteria

A 6.1 Quality Objectives and Measurement Performance Criteria

Table 6 summarizes the performance criteria for samples collected for this project.

Precision: No laboratory duplicates are analyzed. Lab quality control includes the positive and negative controls as well as a blank as the standard operating procedure requires.

Precision in the field will be assessed using duplicate samples every tenth sample and the absolute difference between log-transformed values for validation, according to the following equation:

$$\text{Field Precision} = | \text{Log}(\text{result}) - \text{Log}(\text{duplicate}) |$$

Field Precision \leq 0.8 (log values) will be deemed acceptable.

Field duplicate precision at coastal beaches is performed on each day of inspections for 10% of samples. Field duplicate precision at freshwater beaches is performed on two inspection days per week for 10% of samples due to limited funds available for extra samples. Field precision is not assessed at recreation camp beaches due to the additional costs involved.

Accuracy/Bias: Accuracy/Bias is measured in the laboratory by conducting 0 of colonies. Verification of Enterococci is performed on a monthly basis when using mEI media. The verification process can be found in the SOP for Enterococci analyses. Verification of Enterococci is not necessary when using the Enterolert method. Accuracy/Bias in the field is measured by collecting trip blanks. Trip blanks for coastal beaches are performed for each inspection day. Trip blanks for freshwater beaches are performed for two inspection days per week. Trip blanks are not presently collected during recreation camp beach inspections due to the additional costs involved.

Representativeness: Samples must be representative of the conditions present at the time of collection in order for beach advisories to be issued. Left, right, and center locations at beaches greater than 100 ft. in length are sampled in order to collectively represent the swim area as a whole and not just a single point on the beach. Left and right locations are sampled at beaches less than 100 ft. in length. Recreation camp beaches may require only one sample at the center station to be representative of the areas; otherwise two samples are collected at left and right stations. Conditions that may be pertinent to sample representativeness are recorded on the Beach Program Field Data Sheet (Appendix C). Algal samples are collected when surface scums are present to identify possible toxic conditions to the public.

Table 6. Measurement Performance Criteria for Surface Water Samples

Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	Corrective Action
Precision-Field	Precision value ≤ 0.8	Duplicate Samples	If both numbers are over the closure criteria, resample. If the numbers span the closure criteria (one lower and one higher), resample. If both numbers are under the closure criteria, no action.
Accuracy-Field	0 counts	Trip Blanks	Discard batch results outside control limits
Accuracy-Lab	100% positive identification of Enterococci	Colony Verification	None since verification occurs long after sample collection
Representativeness	3 Samples/Beach >100 ft. long 2 Samples/Beach <100 ft. long	Beach Program Field Data Sheet Completeness Check	Complete more samples
Comparability	Deviation from SOPs Should Not Influence More Than 5% of the Data	Data Comparability Check	Continue to not deviate from SOP in future events.
Sensitivity	Not Expected to be an Issue for This Project	N/A	N/A
Data Completeness	100% Samples Collected 90% Beaches Sampled	Data Completeness Check	Check for completeness and continue completeness in the future
Quantitation Limits	The detection and quantitation limits for this program are met.	Limits in table 7 met	N/A

Comparability: Comparability between samples is achieved through maintaining consistency with SOPs, sampling locations, sample holding times, and sampling methods. This allows current data to be compared with past data. Comparability is for the swim area as a whole by incorporating multiple samples and completing the Field Data Sheet. Comparability in the laboratory is maintained by analyses of samples using the same method of detection and maintaining consistency with SOPs.

Sensitivity: The historical data show that the methods used to detect the analyte(s) of concern are able to do so at the levels of interest for this program. Detectable ranges of the methods (as shown in the methods and SOPs) are adequate for the purpose of this program.

Completeness: Completeness for this program is at least 90% for sample collection at public beaches. 90% of freshwater beaches are sampled once a month per summer and 90% of coastal beaches are sampled once a week during the summer. On a per beach basis, completeness is 100%. Completeness per beach must be 100% in order for data to be considered usable and advisories posted by the NHDES Beach Program.

Quantitation Limits: The analytical method, analytical/achievable method detection limit, and the analytical/achievable laboratory quantitation limits for this program are shown in Table 7.

Table 7. Surface Water Target Analytes and Reference Limits

Analyte	Analytical Method (See Appendix [A] for SOP Reference)	Project Action Level	Analytical/Achievable Method Detection Limit	Analytical/Achievable Laboratory Quantitation Limit
E. coli	<i>E. coli</i> Standard Method 9213D	88 cts/100 mL or Geometric Mean of 47 cts/100 mL per 3 Samples in 60 Days	0+ cts/100 mL	0+ cts/100 mL

Enterococci	Enterococci Standard Method 9230C (same as EPA Method 1600, includes Enterolert method)	104 cts/100 mL or Geometric Mean of 35 cts/100 mL per 3 Samples in 60 Days	Method 1600: 0 cts/100 mL , Enterolert: < 1 mpn/100 mL	Method 1600: 0cts/100 mL Enterolert: < 1 mpn/100 mL
Potential Toxic Cyanobacteria	Microscopic Analysis	Observed Cyanobacterial Scums	N/A	Presence/Absence of Potential Toxic Cyanobacteria
Microcystin	Microcystin Analysis	N/A	≤ 0.5 – ≥ 3.0 ppb	≤ 0.4 – ≥ 2.5 ppb
Temperature	Water Temperature	N/A	-5°C - 50°C	-5°C - 50°C

A 7.0 Special Training/Certification

The Beach Program Coordinator trains the Program Assistant, Beach Inspector, and intern(s) in the sampling procedure (Table 8). Recreation camp inspectors are trained by the Drinking Water and Groundwater Bureau. All training follows the Beach Program SOPs for Bacteria Sampling (Appendix A-1) and Algae and Cyanobacteria Collection and Identification (Appendix A-2). Training provided by the Beach Program is documented on a training form (Appendix C), and kept in the Beach Program’s Personnel Training files at NHDES.

Table 8. Special Personnel Training Requirements for the NHDES Beach Program

Project Function	Description of Training	Trainer	Trainee	Location of Records
Bacteria Sample Collection for Laboratory Analysis	Proper Techniques for Sample Collection and Preservation in the Field.	Beach Program Coordinator, Assistant and/or Beach Inspector	All Personnel Involved in Bacteria Sample Collection from Public Beaches.	Documentation will be kept in the Beach Program files.

A 8.0 Documents and Records

The most current approved version of the Generic Quality Assurance Project Plan (QAPP) for the NHDES Beach Program is stored electronically in the NHDES Beach Program’s database. A hard copy is retained in the Beach Program’s files for the length of the approval period. Any changes to the QAPP are submitted to the NHDES QA Manager and EPA by the Beach Program Coordinator for approval. Special projects, other than routine monitoring/sampling of beaches stated in the Generic QAPP, such as storm sampling, may require a project specific QAPP to be developed, in which case the approval and process design for site specific plans, referred to as Sampling and Analysis Plans (SAPs) hereafter, is contained in Appendix D. All current and revised versions of the QAPP will be distributed to appropriate parties by the Beach Program Coordinator.

Hard copies of the SOPs and illness reports are stored indefinitely in the appropriate folder in the Beach Program’s files. Hard copies of the Beach Program field data sheets, advisory chain of communication forms, training documentation and sample results are stored for a minimum of three years in the appropriate folder in the Beach Program’s files. Results of sample analysis by the PHL-WAL are stored as hard copies for three years in the Beach Program files and electronic data are entered into the Oracle database. A database built in Oracle stores all beach data indefinitely. The database is exportable to STORET where all beach data resides before export to the EPA STORET Database (<http://www.epa.gov/storet/index.html>). The database is part of the Watershed Management Bureau’s Environmental Monitoring Database. Cyanobacteria cell count data are stored as hard copies in the Beach Program files and the Limnology Center Laboratory’s Bench Book for Microscopic Analysis and Taxonomic I.D. Electronically, data is stored in the Beach database. Microcystin data are stored as hard copies in the Beach Program’s files and electronically in a spreadsheet format. Hard copies of posted beach advisories are kept in the Beach Program’s files. Electronic versions of the data are maintained in the Beach Program database and posted on the advisory page of the Beach Program’s website (<http://des.nh.gov/organization/divisions/water/wmb/beaches/index.htm>) and twitter feed

([www.twitter.com/NHDES Beaches](http://www.twitter.com/NHDES_Beaches)). Electronic notification is sent to subscribers via Enews (<http://des.nh.gov/media/enews/index.htm>)

Special projects, postings, educational materials, reports, and other pertinent documents are stored as a hard copy in the Beach Program's files and electronically in the NHDES database. Appropriate references, citations, and acknowledgements are included and distributed to those parties involved.

B 1.0 Sampling Process Design

The monitoring/sampling of freshwater and coastal beaches incorporates biological and physical information. All freshwater beaches are analyzed for *E. coli* in aqueous media. Coastal beaches are analyzed for Enterococci in aqueous media. Samples are collected at knee depth where children are more likely to consume water since bacteria tend to dissipate as distance from the shore increases. The collection of three samples at knee depth better represents bacteria concentrations at the designated beach area. Beach areas less than 100 feet in length require two samples, one at a third and one at two thirds the beach length. Recreation camp beaches may require one sample collected at the center station or two samples collected at left and right stations to represent the swim area. Each sample bottle is labeled appropriately with beach name, date, time, and sample site. The beach inspector records pertinent information on the Beach Program Field Data Sheet (Appendix C) while inspecting and sampling each beach. The beach manager, lifeguards, and the public are encouraged to voice their concerns while the beach inspector is present.

Additional sampling is performed when a cyanobacteria scum is observed in the beach area (Appendix A). One scum sample is collected and brought to the Limnology Center for microscopic identification. Samples are transported on ice and returned to the Limnology Center for analysis within 24 hours. The identification of dominant toxin producing cyanobacteria populations requires the posting of a beach advisory and further analysis to confirm the presence of Microcystin. Dominance is considered 50% or more of the cell count. Cell count is equivalent to a colony of cyanobacteria (many species can be colonial). An advisory will remain in effect until further testing by NHDES reflects that the beach area is safe for recreational activity.

E. coli and Enterococci samples are returned to the NHDHHS PHL-WAL within 8 hours for analysis. *E. coli* and Enterococci results are both reported within 24 hours and advisories are posted if bacteria concentrations exceed the state standards. Refer to the SOP for Beach Advisories (Appendix A-7). Advisories are issued if one sample exceeds the state standard by more than 70 counts, if two of three samples exceed the standard, or if all samples exceed the standard. If one sample exceeds the standard by less than 70 counts, the beach is re-sampled and the situation is considered a safety response. The state standard for freshwater beaches is 88 counts per 100 mL, and 104 counts per 100 mL for coastal beaches, or no more than a geometric mean of 47 counts per 100 mL of water in 3 samples during a sixty day period for freshwater beaches, and no more than a geometric mean of 35 counts per 100 mL of water in 3 samples over a sixty day period for coastal beaches. If bacteria counts exceed these criteria, and an advisory is required, the Program Coordinator or the Assistant issue the advisory by contacting the town health officer or beach manager. If clarification is needed, Beach Program personnel will consult with the Watershed Management Bureau Administrator. Beach advisories are posted during the swim season only. Pre-season and post-season bacteria sampling may occur at select beaches. If bacteria levels exceed state standards, a beach advisory is posted at the discretion of the Program Coordinator and Program Assistant, in consultation with the Watershed Management Bureau Administrator if necessary. Notification of an advisory requires the posting of a state-approved sign and an immediate re-sample. The re-sample collection schedule is determined by the Beach Program Coordinator who may discuss the process with the Watershed Management Bureau Administrator, Beach Program Assistant, Beach Inspector, Program Intern, Recreation Camp Inspector, town administration, health officer, or beach manager. Advisories remain posted until re-sample results are below the state standards. All advisory postings and public notification procedures are detailed in SOP for Beach Advisories (Appendix A-7) and in Public Notification and Risk Communication Plan (Appendix F).

B 2.0 Sampling Methods

B 2.1 Bacteria Sample Collection

To maintain uniform sample collection at all beaches, the SOP for Bacteria Sampling (Appendix A-1) are followed by all parties involved in beach monitoring and sampling. Three samples per beach are collected, two if the beach area is less than 100 feet in length, one or two at juvenile camp beaches; additional samples are collected using the same protocol if conditions require so. Sterile 8 oz. screw cap containers are used for sample collection; sterilization protocol is included in NHDHHS Laboratory Services SOP for Bottle Washing in the Quality Systems Manual (QSM), revision 2.2, March 4, 2011, or more current version (on file at EPA). Sample volumes must be equal to or exceed 100 mL in order for sample analyses to be performed. Samples are transported to NHDHHS PHL-WAL within proper holding times and proper preservation techniques will be initiated (Table 9).

Table 9. Collection methods and holding time for samples

Analytical parameter	Collection Method	Sampling SOP	Sample Volume	Container Size and Type	Preservation Requirements	Max. Holding Time (Preparation and Analysis)
<i>E. coli</i>	Grab	Appendix A-1	100 mL	8 oz. sterile plastic bottle	Chilled to $\leq 10^{\circ}\text{C}$	8 hours
Enterococci	Grab	Appendix A-1	100 mL	8 oz. sterile plastic bottle	Chilled to $\leq 10^{\circ}\text{C}$	8 hours
Cyanobacteria	Grab	Appendix A-2	$\leq 100\text{mL}$	8 oz. sterile plastic bottle or other clean container	Refrigeration	24 hours
Microcystin	Grab	Appendix A-4	$\geq 5\text{ mL}$	clean container	Freeze	6 months
Temperature	In-situ	Appendix A-5	N/A	N/A	N/A	N/A

B 2.2 Bacteria Analyses

E. coli and Enterococci analyses are performed by the NHDHHS PHL-WAL. Sample analysis follows *E. coli* Standard Method 9213D/Method 1603 and Enterococci Standard Method 9230 (On file with NHDHHS PHL-WAL). Two analytical methods are available to the Laboratory Services Unit to enumerate Enterococci. The method selected will be based upon media availability, time constraints, and colony size constraints.

B 2.3 Algal and Cyanobacteria Collection and Identification

Samples are collected at beaches where potential cyanobacteria scums are observed on the water surface or on the beach shoreline. Sample collection is a surface grab using an 8 oz. sterile screw cap container or another clean container. Samples are transported to the Limnology Center where they are preserved and refrigerated. The SOP for Algal Collection/Identification (Appendix A-2) is followed.

B 2.4 Water Temperature

Water temperature is measured in the field according to the SOP for the Collection of Water Temperature (Appendix A-5). Water temperature is not recorded at camp beaches.

B 2.5 Microcystin Analysis

Microcystin analyses are performed on all algal scum positively identified as a toxin producing cyanobacteria species at elevated cell concentrations. Sample analysis follows the SOP for Microcystin Sample Analysis (Appendix A-4).

B 3.0 Sample Handling and Custody

Bacteria sample collection is performed by the appropriate trained parties. Samples are transferred to a cooler with ice to initiate the preservation process immediately after sample collection. Samples are transported to the NHDHHS PHL-WAL within 8 hours after collection (Appendix A-1, Table 9). Algal and cyanobacteria samples are transported to NHDES Limnology Center Laboratory on ice for analysis within 24 hours (Appendix A-2).

Custody of samples is relinquished to the NHDHHS PHL-WAL or the Limnology Center Laboratory. Protocol for custody requirements can be obtained from the NHDHHS's PHL-WAL QSM, revision 2.2, March 4, 2011, or more current version (on file at EPA), the NHDES Beach Program SOPs for Bacteria Sampling (Appendix A-1), and the NHDES Beach Program SOPs for Algal Collection/Identification (Appendix A-2). The sample custody and login sheet is included in Appendix C.

B 4.0 Analytical Methods

Analyses for *E. coli* and Enterococci are performed by trained NHDES employees following the appropriate protocols (on file at EPA). Algal identification follows the SOP for Algal Collection/Identification (Appendix A-2) and is performed by trained DES employees in the Limnology Center. Microcystin analyses are performed by trained DES employees in the Limnology Center and follow the SOP for Microcystin Analysis (Appendix A-4).

B 5.0 Quality Control

Table 10. Field QC Samples and Frequency Table

Matrix	Analytical Parameter	Field QC	Data Quality Indicators	Acceptable Limits	Corrective Action	Person Responsible	Frequency
Surface Water	<i>E. coli</i>	Field Duplicates	Precision	absolute difference between log-transformed values ≤ 0.8	Address Field Operations and Precision	Beach Program Coordinator	10% of Samples two days a week
Surface Water	Enterococci	Field Duplicates	Precision	absolute difference between log-transformed values ≤ 0.8	Address Field Operations and Precision	Beach Program Coordinator	10% of Samples daily
Surface Water	<i>E. coli</i>	Trip Blanks	Accuracy/Bias	0 counts	Retest and Address Lab D.I. Water and Bottle Sterilization	Beach Program Coordinator	Twice per week
Surface Water	Enterococci	Trip Blanks	Accuracy/Bias	0 counts	Retest and Address Lab D.I. Water and Bottle Sterilization	Beach Program Coordinator	Once per sampling day

Biological monitoring/sampling and analyses performed by the NHDHHS PHL-WAL or the NHDES Limnology Center adhere to the QC guidelines listed in the NHDHHS PHL-WAL's QSM, revision 2.2, March 4, 2011, or more current version (on file at EPA), the Watershed Management Bureau's Limnology Center Procedures and Protocols, the Beach Program SOPs for Bacteria Sampling (Appendix A-1), and the Beach Program SOPs for Algal Collection/Identification (Appendix A-2). Recreation camp beach data are exempt from the field quality control measures for field duplicates and trip blanks (Table 10).

B 6.0 Instrument/Equipment Testing, Inspection, Maintenance

All equipment used in the analyses of bacteria samples are tested, inspected, or maintained according to the NHDHHS PHL-WAL's QSM, revision 2.2, March 4, 2011, or more current version (on file at EPA). Inspection and maintenance of the thermometers is performed on a daily basis prior to sampling. Inspection

and maintenance of the NHDES Limnology Center microscope is performed prior to sample identification. An annual maintenance and inspection program is completed for microscopes.

B 7.0 Instrument/Equipment Calibration and Frequency

All instrument/equipment calibration in the NHDHHS PHL-WAL is performed according to their QSM, revision 2.2, March 4, 2011, or more current version (on file at EPA). Thermometer calibration is performed by the program personnel according to NHDHHS PHL-WAL's SOP for Thermometer Calibration (Appendix A-5-1). Thermometer recalibration is done on an annual basis or more frequently as needed. Microscope calibration is performed on an annual basis according to the NHDES Limnology Center's Microscope Analysis Standard Procedures (on file with NHDES).

B 8.0 Inspection/Acceptance Requirements for Supplies and Consumables

All supplies and consumables used to perform laboratory analyses of bacteria samples are QC checked according to the NHDES NHDHHS PHL-WAL's QSM, revision 2.2, March 4, 2011, or more current version (on file at EPA). All sample bottles are QC checked by NHDHHS PHL-WAL, and the protocol is included in the QSM. Trip blanks require the use of D.I. water obtained from the Limnology Center. Trip blanks are analyzed for the presence of bacteria according to the NHDHHS PHL-WAL's QSM. All supplies and consumables used to perform laboratory analyses of algal samples for microcystin are QC checked according to package instructions.

B 9.0 Non-direct Measurements

Data obtained from other NHDES Programs may be used in the cataloging of all freshwater and coastal beaches. This could include site and tax maps, and lot-by-lot surveys conducted on the coast. Literature on cyanobacteria may be used to further develop beach posting advisories in the presence of cyanobacteria scums. Data obtained from other NHDES Programs may also be used for specific projects at the coast (not including regular monitoring/sampling of beaches stated in the Generic QAPP), which prior to implementation, a Sampling and Analysis Plan will be developed (Appendix D). Data obtained from other NHDES programs may also be used for evaluations of coastal beaches according to the Risk-Based Beach Evaluation and Classification Form (Appendix F).

B 10.0 Data Management

Field data sheets (Appendix C) are completed for each public and recreation camp beach sampled in the Beach or Recreation Camp Inspection Program. They are secured in clipboards in the field and maintained in year-specific files at NHDES. Hard copies of field data sheets are stored for a minimum of three years. Inspection data recorded on the field data sheets is entered into the electronic Beach Program database on a weekly basis by the Beach Inspectors or Program Intern. Advisory chain of communication forms (Appendix A-7: SOP for Beach Advisories) are completed for each advisory issued. Advisory data is stored electronically in the Beach Program's database and hard copies are stored in the appropriate folder. Data are stored electronically in the laboratory database. Laboratory QA/QC data is recorded in the bench book and is entered into the database.

Analytical data generated by NHDHHS PHL-WAL is exported nightly to the Beach Program module located in the Watershed Management Bureau's Environmental Monitoring Database. An error report is generated for data that fails to be exported. The Beach Program Coordinator consults with the Data Manager, corrects errors, and the data is re-exported or hand entered into the database. All analytical data is marked as final upon import into the database. Required beach data is exportable to EPA via XML and STORET and historical beach data are made accessible through the database. All data are made accessible on the NHDES OneStop web page. Algal samples are logged into the Limnology Center Login Database (SOP on file with NHDES

Limnology Center). Results of algal analyses are entered into the Limnology Center Login Database (SOP on file with NHDES Limnology Center). Hardcopies of the results are filed in the appropriate beach folder.

C 1.0 Assessment and Response Actions

A Field Sampling Technical Systems Audit (TSA) is performed by the program coordinator at the beginning of the sampling season (Table 11). Corrective measures are taken immediately to address deviations or project deficiencies from the QAPP, SAPs, or SOPs when necessary by verbal communication. Revisions to the SAPs or SOPs are made if deemed necessary by the program coordinator. Sampling techniques are reevaluated using the training document for the Beach Program (Appendix C), and future sampling is monitored to ensure compliance is reached.

Field Analytical Assessment is performed by the program coordinator at the beginning of the sampling season (Table 11). Corrective measures are taken immediately to address deviations or project deficiencies from the QAPP, SAPs, or SOPs when necessary by verbal communication. Revisions to the SAPs or SOPs are made if deemed necessary by the program coordinator. Future sampling is monitored to ensure compliance is reached.

The NHDHHS PHL-WAL's Fixed Laboratory TSA is performed by the Laboratory Services QA/QC Officer. Corrective measures are taken immediately to address deviations or project deficiencies from the QAPP, SAPs, or SOPs. Replicates and critical range tables are checked with data to determine if sources of error exist. Data is entered into the computer weekly and cross-referenced with bench books for accuracy. Any deviations in results are addressed in both written and verbal formats, and future sampling is monitored to verify that compliance is reached.

Table 11. Project Assessment Table

Assessment Type	Frequency	Staff Responsible
Field Sampling Technical Systems Audit	Yearly	Beach Program Coordinator, NHDES
Field Analytical Assessment	Yearly	Beach Program Coordinator, NHDES
NHDHHS Public Health Laboratories - Water Analysis Lab Fixed Lab Audit	Yearly	PHL-WAL QA/QC Officer, NHDHHS

C 2.0 Reports To Management

The NHDES Beach Program produces an annual report on the quality of New Hampshire's public beaches. The report is provided to the EPA on the progress of the program in meeting the goals outlined in the Beaches Environmental Assessment and Coastal Health Act (BEACH) grant application. The Beach Program Manager also completes an NHDES QA System Self-Audit, which is submitted to the NHDES QA Manager by January 31st of each year, or by an alternate date as directed the NHDES QA Manager. An annual review of this Beach Program QAPP is accomplished via the Annual Self-Audit process. The NHDES also has developed a Measures Tracking and Reporting System (MTRS) database that allows management to track the progress of certain projects. Beach Program personnel update the progress of projects as tasks are completed at a minimum of once per quarter.

D 1.0 Data Review, Verification, and Validation

The NHDES Beach Program Coordinator reviews all data generated. All quality control data generated is reviewed against Table 10, as referenced in Section B 5.0. All data are accepted due to the impact, and potential health risk to the public. However, if the data do not meet the stated RPDs or precision values, immediate re-sampling is performed. All data review, verification and validations results are stored in a spreadsheet format electronically and as a hardcopy in the subject specific folder in the Beach Program's files. Data is reviewed for:

1. Completeness: Omissions from logs, notebooks, field forms, and the database will not represent the true volume of samples collected and analyzed. If the data generated does not meet the 90% or 100% completeness requirement, a meeting will be held with all staff responsible for sample collection, analyses, and the representative QA/QC officers. Incomplete field data may require re-sampling at the site(s). Incomplete laboratory data may call for re-introduction or re-analysis of the questionable sample, if feasible. Completeness is measured on a daily basis.

2. Consistency: The consistency of the program is reviewed on a weekly basis, and upon identification of any discrepancies, the program coordinator meets with all responsible staff and QA/QC officers to remediate the problems immediately. Consistency is measured at the end of the sampling season.

D 2.0 Verification and Validation Procedures

The Coordinator reviews all data generated and evaluates QC requirements for usability in obtaining the stated objectives of the project by following the steps listed in Section D 1.0. Verification and validation of data generated from the NHDHHS PHL-WAL is compliant with their QSM, revision 2.2, March 4, 2011, or more current version (on file at EPA). Verification and validation of data generated from the NHDES Limnology Center is compliant with the Limnology Center Procedures and Protocols (on file with NHDES Limnology Center). All data review and verification and validations results are stored in a spreadsheet format electronically and as a hardcopy in the subject-specific folder in the Beach Program's files.

D 3.0 Reconciliation with User Requirements

Data are generated based on the quality objectives defined in Section A 7.0 and verified according to Sections D 1.0 and D 2.0. Data usability should be 100% due to the public health risk of the analytes in question. If data usability is not 100% for a sample location, immediate re-sampling is conducted. Any limitations of the data are clearly defined for all users of the reports produced.

Appendix A Beach Program Standard Operating Procedures

**A-1 Standard Operating
Procedure for Bacteria
Sampling**

Prepared by: _____ **Date:** _____
Beach Program Coordinator

Reviewed by: _____ **Date:** _____
Watershed Management Bureau Administrator

Approved by: _____ **Date:** _____
Quality Assurance Officer

**N.H. DEPARTMENT OF ENVIRONMENTAL SERVICES
BEACH PROGRAM**

PROCEDURES

1.0 Scope and Application

- 1.1 This Standard Operating Procedure encompasses all aqueous sample collection for bacteria at freshwater and coastal beaches by the NHDES Beach Program. It includes all samples collected at knee and surface depth.

2.0 Health and Safety Warnings

- 2.1 When sampling waters with known fecal contamination always wear disposable plastic gloves and utilize a sampling pole. Do not ingest or allow the water to come into contact with the skin. Always wash hands after sampling and do not touch hands to mouth or other exposed areas of the body before washing.
- 2.2 Ingestion of waters containing fecal contamination can cause health problems such as gastroenteritis, fever, vomiting, and diarrhea. Caution should be taken when recreating in areas where there may be a potential for fecal contamination.

3.0 Interferences

- 3.1 Interferences from bacteria sampling can include cross contamination and improper sample collection.
 - 3.1.1 Cross Contamination

Avoid cross contamination by sampling with sterile bacteria bottles. Never touch the inside of the sample bottle cap or neck of the sample bottle, and always sample water that is flowing towards the body. Any bacteria that may be present on the body could contaminate the sample.
 - 3.1.2 Improper Sample Collection

Improper sample collection can include rinsing of the sample bottle, disturbance of the substrate, sampling in a disturbed area, improper sample depth, and improper sample technique.
 - 3.1.3 Always follow standard operating procedures for sample collection to avoid these errors.

4.0 Equipment and Supplies

- 4.1 The following supplies are needed for collection of bacteria samples:
 - 8 oz. sterile plastic screw cap containers
 - Sampling pole
 - Cooler(s)
 - Ice
 - Clipboard, three ring binder, waterproof pen(s)
 - Beach station list
 - Station identification form
 - Field data sheets, sample login and custody sheets
 - Shoulder length polyethylene gloves
 - Waterproof tape
 - Thermometer
 - Beach advisory signs

Maps, directions, NH Atlas

- 4.2 Cyanobacteria collection supply list can be found in the NHDES Beach Program Standard Operating Procedures for Algal Collection and Identification.

5.0 Sample Collection – Preparation

- 5.1 Determine how many beaches will be sampled that day. Based on the number of beaches to be sampled, obtain sterile bacteria bottles from the NHDHHS Public Health Lab - Water Analysis Lab (PHL-WAL). Each beach will require at least three sample bottles per beach.
- 5.2 Procure a large cooler from the Limnology Center and fill cooler to about 1/2 full with ice.
- 5.3 Obtain a sterile bacteria sample bottle from the laboratory. Label the bottle with date, time and Trip Blank. In the Limnology Center, fill the bottle at least 2/3 of the way full with D.I. water being careful not to touch the inside of the bottle cap or neck of the bottle. Place the bottle in the ice filled cooler.
- 5.4 Review the equipment and supplies checklist to ensure all materials are present.
- 5.5 Once you have arrived at the sample location:
 Introduce yourself to the beach management.
 Observe beach and facility operations.
 Provide necessary educational material.
- 5.6 If the beach area is less than 100 feet in length, only two samples are collected one third the distance from either end of the beach.
- 5.7 If sampling waters with known fecal contamination, always have disposable shoulder length gloves and a sampling pole available.
- 5.8 Presence of a surface scum may require additional samples. Refer to the NHDES Beach Program's Standard Operating Procedures for Algal Collection/Identification.
- 5.9 Print out the pre-populated station identification forms from Cognos. Complete a station identification form for the beach and sampling points (if applicable). Fill out all shaded areas of the form.
- 5.10 Print out beach specific pre-populated inspection data sheets and sample log-in and custody sheets from the WQD.

6.0 Sample Collection - Method

- 6.1 Wade into the water to knee depth. Wait for the water to be clear of debris that may have been disturbed when walking into the water. Or sample away from the disturbed area.
- 6.2 Unscrew the bottle cap making sure not to touch the inside of the cap or neck with fingers or any other object.
- 6.3 Hold the cap in one hand, and with the other hand turn the bottle upside down so the opening is facing the water surface. Make sure you never touch the opening of the bottle neck.
- 6.4 With a downward thrust moving away from your body, dip the bottle at least a foot below the surface. Fill the bottle with one sweeping motion, and discard a few milliliters to allow some head (air) space.

- 6.5 Replace the cap carefully over the bottle and tighten.
- 6.6 Mark the site location, the name of the public beach, and the date and time the sample was collected. Make sure to always use a waterproof pen or Sharpie®.
- 6.7 Measure the water temperature according to the Beach Program's SOPs for Temperature Collection.
- 6.8 If the swim area is located on a naturally flowing watercourse, such as a brook or river, samples should be collected upstream, at the public beach area, and downstream. In streams or rivers in which it is difficult to collect a sample at the desired depth, locate the deepest area with a moving current. Always collect sample moving against the current to reduce the chance of contamination.
- 6.9 If there is known fecal contamination or if the area is difficult to access, use a sampling pole. Attach the sample bottle to the clamp, remove the bottle cap, and repeat step 6.4. Make sure to adjust the length of the pole to collect the sample as close to knee depth as possible.

7.0 Sample Handling and Preservation

- 7.1 After sample collection the process is as follows:
 - 7.1.1 Place all samples in a cooler(s) with ice for preservation. Acceptable preservation temperature for *E. coli* and *Enterococci* is less than 10°C.
 - 7.1.2 Return samples to the NHDHHS PHL-WAL within 8 hours after sampling.
 - 7.1.3 Place samples in order according to the procedures outlined by the lab personnel on the bench in the log-in room of Laboratory Services. Complete the pre-populated login and custody sheet. If you have any questions ask the lab personnel to assist you.
 - 7.1.4 Write the beach specific EPA number on the bottle label. The EPA numbers can be found on the Beach Station List.
 - 7.1.5 Place the appropriate labels on the bottle caps. These labels inform lab personnel of analyses to be run.
 - 7.1.6 Sample dilution is required for suspected sewage samples. Dilutions are X1, X10, or X100. Indicate the dilution factor by listing it on the label. Login sheets must also be labeled with the dilution factor(s) in the other/notes section.
 - 7.1.7 Sign the custody sheet to relinquish the samples to the laboratory. The lab personnel must review and sign the custody sheet. **Notify lab personnel when samples have been properly processed.**

8.0 Data and Records Management

- 8.1 Observations must be recorded on the Beach Program Field Data Sheet. This sheet must be filled out completely. The required observations are:

Beach name, town, station ID
Advisory, complaint, initial, subsequent, or safety inspection
Beach inspector name, number of collected samples
Date, time, weather conditions, recent storm events
Presence or absence of toilet facilities
Type of toilet facility: bathhouse/bathroom, outhouse, portable
Presence or absence of enclosed trash receptacles

Presence or absence of lifeguards, swim ropes, rafts
Presence or absence of appropriate signage
Number of bathers (exact number if possible, otherwise estimate)
Water conditions (e.g. clarity, water level, water temperature, surface scums)
Presence or absence of emergency safety equipment and signage
Waterfowl, wildlife, domestic animals
Culverts, storm drains, pipes
Complaints from lifeguards or bathers

8.2 All inspection data must be entered into the WQD Beach Module Inspections. Data is entered on a weekly basis by the Beach Program intern. Data entry follows the WQD Beach Module Training document.

8.3 Station identification forms must be filled out completely for each sampling station per beach. Required fields are as follows:

Project (program or project associated with the station a.k.a Beach)
Station ID
Station Type
Latitude, longitude
Correction of latitude or longitude if possible
GPS unit manufacturer, model
Method of location other than GPS
Datum

9.0 Quality Control and Quality Assurance

9.1 Duplicate samples are collected in the field at a frequency of 10%. The absolute difference between log-transformed values of the sample and duplicate is calculated and should be ≤ 0.8 . If the absolute difference is greater than 0.8, re-sampling will be performed if both numbers are over the closure criteria or if the numbers span the closure criteria (one lower and one higher). If both numbers are under the closure criteria, no action. All data generated will be accepted due to the impact, and potential health risk to the public.

9.2 Trip blanks are collected prior to each sampling trip using D.I. water. Trip blanks are performed twice per week for freshwater beaches and every trip for coastal beaches. Accuracy/bias of trip blanks is zero bacteria counts. If the trip blank displays bacteria colonies, immediate action is taken to identify and correct the problem.

9.3 Inspection data entered into the WQD are QA/QC checked by Beach Program staff. Inspection data QA/QC cannot be performed by the person responsible for entering the data.

10.0 References

Water Sampling Protocol for *E. coli* Testing, Environmental Fact Sheet WD-BB-13, New Hampshire Department of Environmental Services, 1998.

**A-2 Standard Operating
Procedure for Algae
Collection & Identification**

Prepared by: _____ **Date:** _____
Program Coordinator

Reviewed by: _____ **Date:** _____
Watershed Management Bureau Administrator

Approved by: _____ **Date:** _____
Quality Assurance Officer

**N.H. DEPARTMENT OF ENVIRONMENTAL SERVICES
BEACH PROGRAM**

PROCEDURES

1.0 Scope and Application

- 1.1 The Standard Operating Procedure for Algal Collection/Identification incorporates aqueous sample collection for surface scums at freshwater, inter-tidal, and coastal beaches. It includes all samples collected at surface depth, and incorporates microscopic identification in the Limnology Center.

2.0 Health and Safety Warnings

- 2.1 Cyanobacteria (blue-green algae) are capable of producing neurotoxins and hepatotoxins which could be harmful to humans through water contact or ingestion. These toxins can damage the liver, kidneys, and central nervous system. Scientists have shown the toxins to cause fish kills and the death of fish, livestock, and domestic animals when ingested in large amounts.
- 2.2 Exposure to cyanobacteria through recreational contact at public bathing areas can cause acute and chronic health effects. Acute health effects occur through dermal exposure to cyanobacteria which can cause irritations to the skin and mucous membranes leading to rashes and inflammation upon contact. Chronic health effects such as liver and kidney failure may occur through the ingestion of cyanobacteria. The toxins can bio-accumulate over time resulting in chronic illnesses.
- 2.3 When sampling water with known cyanobacteria scums, do not aspirate or ingest the water.

3.0 Equipment and Supplies

- 3.1 The following supplies are necessary for the collection of surface scum samples:
 - 8 oz. sterile plastic bottle or other clean container
 - Waterproof tape, pens
 - Field data sheet or complaint form, clipboard
 - Station identification form
 - Toxic cyanobacteria advisory posters
 - Cooler with ice
 - Lugols solution for preservation
- 3.2 The following equipment and supplies are necessary for identification of surface scum samples:
 - Phase contrast, binocular compound microscope or equivalent compound microscope
 - Microscope slide, cover slip
 - Pen, algal identification sheet
 - Pipette
 - D.I. water
 - Cyanobacteria keys/references/pictorials

4.0 Sample Collection – Preparation

- 4.1 Determine the number of potential beach inspections for the day. Obtain a clean 250 mL sample bottle (sterile bacteria bottles may be used) from the NHDES Limnology Center or the NHDHHS PHL-WAL.

- 4.2 Obtain a cooler and fill $\frac{1}{4}$ of the depth with ice.
- 4.3 Review the equipment and supplies checklist to ensure all materials are present.
- 4.4 Once you have arrived at the sample location:
 - 4.4.1 Introduce yourself to the beach management.
 - 4.4.2 Make observations on the Beach Program field data sheet or complaint form.
 - 4.4.3 Provide relevant educational material.
- 4.5 Complete a station identification form for the site where the sample was collected.

5.0 Sample Collection – Method

- 5.1 Inspect the beach area, shoreline, and swim area for the presence of surface scums. Note on field sheets the presence or absence of scums or other observations that may be relevant to the complaint.
- 5.2 Obtain one sample bottle and label with:
 - Beach name
 - Date and time
 - Sample location
 - Name of individual collecting sample
- 5.3 Open the bottle cap and dip into the water where the scum is present. Fill the bottle at least $\frac{1}{4}$ full with the sample. **Do not dip container into the sediment!**

6.0 Sample Handling and Preservation

- 6.1 After sample collection the process is as follows:
- 6.2 Place samples into the cooler.
- 6.3 Transport samples to NHDES Limnology Center immediately.
- 6.4 Process all samples as follows:
- 6.5 Uniformly mix sample and split contents into two separate containers. One sample is preserved by the addition of 2-3 drops of Lugols solution while the other sample is retained as a live sample.
- 6.6 Login samples into the Limnology Center Login System. Refer to the Limnology Center Sample Login SOP.
- 6.7 Log samples in under Beaches or Complaint and microscopic ID as the parameter.
- 6.8 Affix the login label to the sample container and refrigerate all samples.
- 6.9 Immediately notify the Limnology Center Director and Beach Program Coordinator that a surface scum sample requires microscopic identification.

7.0 Sample Identification and Notification

- 7.1 Preparation for microscopic analyses is as follows:
- 7.2 Remove preserved and unpreserved sample from the Limnology Center refrigerator.
- 7.3 Obtain an algal identification sheet, slide and coverslip.
- 7.4 Invert the samples to assure sample homogeneity.

- 7.5 Take a small pipette and rinse with D.I. water a few times, discard waste into plankton waste bottle. Pipette a small amount of homogenous sample onto a specially designed Hausser Scientific microscope slide and carefully place coverslip over the sample.
- 7.6 Once the slide is placed on the microscope stage, scan the slide and check off identified algae on the algal identification sheet. If necessary, perform cell counts.

8.0 Data and Records Management

- 8.1 All field data sheets are filed in the beach specific folder and all completed complaint forms are filed with the Limnology Center in the appropriate complaint folder. Required observations for the sheets include:

- Beach name, town, station ID
- Beach Inspector name
- Date, time, weather conditions
- Presence of algal scum
- Proximity of surface scum and dimensions of scum
- Presence or absence of lifeguards
- Estimate bather population
- Water conditions (e.g. clarity, water level, water temperature)
- Complaints from lifeguards or bathers
- Station identification forms must be completed for samples not collected at an established beach station, and must include the following:
 - Project (program or project associated with station a.k.a. Beach)
 - Station ID
 - Station Type
 - Latitude, Longitude
 - Correction of latitude and longitude if possible
 - GPS unit manufacturer, model
 - Method of location if other than GPS Datum

- 8.2 Plankton identification data sheets are filed in the beach specific folder. Results of plankton identification are entered into the Limnology Center Login Database. Refer to the Limnology Center Login Data Entry SOPs.
- 8.3 The presence of cyanobacteria will be reported to the Limnology Center Director who will, in cooperation with the appropriate beach program personnel, make a determination if a beach advisory is appropriate.

9.0 Calibration

- 9.1 The compound microscopes are calibrated using a Whipple grid and stage micrometer, as outlined in Standard Methods (20th Edition, p 10-11 to 10-13).

10.0 Quality Control and Quality Assurance

- 10.1 Sample collection and identification are consistent with the standard operating procedures outlined above and the Limnology Center Standard Operating Procedures and Protocols.

11.0 References

Standard Operating Procedure for Microscopic ID, Complaints Program, Limnology Center Laboratory Standard Operating Procedures and Protocols, New Hampshire Department of Environmental Services, 2005.

Data Entry Q.C., Section VII, Rev. 1.2, Limnology Center Laboratory Manual, NHDES, January 2005.

Data Entry for Analysis and Q.C. Data, Section VII, Rev. 1.2, Limnology Center Laboratory Manual, NHDES, January 2005.

Sample Login: Standard Operating Procedures, Section V, Rev. 1.2, Limnology Center Laboratory Manual, NHDES, January 2005.

A-3 Standard Operating Procedure for Designated Beach Identification

Prepared by: _____ **Date:** _____
Program Coordinator

Reviewed by: _____ **Date:** _____
Watershed Management Bureau Administrator

Approved by: _____ **Date:** _____
Quality Assurance Officer

**N.H. DEPARTMENT OF ENVIRONMENTAL SERVICES
BEACH PROGRAM**

Procedures

1.0 Scope and Application

- 1.1 The NHDES Beach Program has drafted a new definition for a designated or public beach area: 'A designated beach means a public bathing place that comprises an area on a water body and associated buildings and equipment, intended or used for bathing, swimming, or other primary contact purposes. The term includes, but is not limited to, beaches or other swimming areas at hotels, motels, health facilities, water parks, condominium complexes, apartment complexes, youth recreation camps, public parks, and recreational campgrounds or camping parks as defined in RSA 216I:1, VII. The term does not include any area on a water body which serves 3 or fewer living units and which is used only by the residents of the living units and their guests.'
- 1.2 The definition is to be applied statewide to develop catalogues of all coastal and inland beaches. In order to develop these catalogues a procedure for determining areas which comply with the above definition will be utilized.

2.0 Interferences

- 2.1 GPS interferences include cloud coverage, satellite availability, and object cover such as trees, buildings, or other large features.

3.0 Equipment and Supplies

- 3.1 The following equipment and supplies are needed in assessing designated beach areas:

- GPS Unit
- Pen/pencil
- Station ID Form
- Atlas
- Tax Maps
- Assessor's Records
- Beach Station List
- Clipboard

4.0 Assessment Method – Office

- 4.1 Compile a list of all public beaches previously identified in the state.
- 4.2 Using the list of public waterbodies, determine designated beach areas for each public waterbody, on or adjacent to that waterbody. The process is as follows:
 - 4.2.1 Select a watershed, town(s), and/or waterbody(s) to assess.
 - 4.2.2 Contact the town health official, select person, or agencies/programs to determine sites within the town used for swimming and other water contact purposes.
 - 4.2.3 Obtain tax maps from the town and review lot information, ownership, land use etc. on or near the water body(s).
 - 4.2.4 Send a letter to the owner and ask if their water frontage meets the definition of public beach. If the owner responds yes, enter the information in the database. Pertinent information may include beach name, owner, address, operator (if different from owner), and contact information.

- 4.2.5 For large lakes bordering multiple towns (Lake Winnepesaukee) contact the DES Wetlands Bureau for a list of permits issued in the towns. Permits issued for beach construction, sandy fill or replenishment require field investigation to verify beach presence.

5.0 Assessment Method – Field

- 5.1 This method requires a GPS unit. Follow the field method below.
- 5.1.1 Survey areas suspected of or meeting the definition of public beach.
- 5.1.2 Use the GPS unit to obtain the latitudes and longitudes at each end of the beach area. Calculate the beach length from GPS points.
- 5.1.3 If you are unable to obtain GPS points from either end of the beach, determine beach length by following the Beach Length as a Function of Pace document found in the Beach Program files.
- 5.1.4 Complete a Station Identification Form.

6.0 Data and Records Management

- 6.1 All stations must have a detailed description recorded in the EMD. Required observations for the form include:
- Beach name, town, EPA ID
 - Station ID
 - Station Type
 - Latitude, Longitude
 - GPS unit manufacturer, model (if other than Beach Program GPS units)
 - Method of location if other than GPS
 - Direction to beach station
 - Description of beach station
- 6.2 All data obtained from GPS will be downloaded and stored electronically. Hardcopies of the information will be stored in subject specific folder in the Beach Program Files.
- 6.3 All beach specific data gathered in the field will be stored electronically and as hard copies in the subject specific folder in the Beach Program Files.

7.0 Quality Control and Quality Assurance

- 7.1 Dependent upon make and model of GPS unit used, post-processing could be done on-site or in the office. Refer to NHDES' Field Locating Handbook.
- 7.2 All positions are QA/QC checked against known sites. In the case of a suspected error in data, an error report is generated. Data is reviewed, checked against the error report and errors are corrected.

**A-4 Standard Operating Procedure
for Microcystin Sample Analysis**

Prepared by: _____ **Date:** _____
Program Coordinator

Reviewed by: _____ **Date:** _____
Watershed Management Bureau Administrator

Approved by: _____ **Date:** _____
Quality Assurance Officer

**N.H. DEPARTMENT OF ENVIRONMENTAL SERVICES
BEACH PROGRAM**

Procedures

1.0 Scope and Application

- 1.1 This Standard Operating Procedure (SOP) incorporates all aqueous samples collected for surface scums at freshwater beaches by the NHDES Beach Program. It includes all samples positively identified as toxin producing cyanobacteria.

2.0 Health and Safety Warnings

- 2.1 Species of cyanobacteria produce toxins (cyanotoxins) that are known to cause both acute and chronic health effects in humans. The toxins can cause acute health effects such as skin and mucous membrane irritations upon water contact. Chronic health effects such as liver, kidney, and central nervous system damage can be caused by the ingestion of large amount of the toxins over an extended period of time.
- 2.2 The toxin of concern is Microcystin. Produced by more than one cyanobacteria species, Microcystin is a hepatotoxin that targets the liver, causing cirrhosis and tumor growth. The most common form is Microcystin-LR. The toxins are released into the water upon cell death or lysis. All contact and ingestion of waters containing Microcystin producing cyanobacteria should be avoided.
- 2.3 When performing analyses for Microcystin, do not ingest Microcystin standards or cyanobacteria samples; if skin contact occurs rinse with water.

3.0 Interferences

- 3.1 Interferences in these analyses can occur from cross contamination.
- 3.2 Avoid cross-contamination by using new syringes and associated filters for each sample. When dispensing samples into test tubes use clean pipettes. Rinse cuvette thoroughly with D.I. water between uses.

4.0 Equipment and Supplies

- 4.1 Store Microcystin test kit in refrigerator when not in use. Use all contents before the expiration date on the outside of the kit.
- 4.2 The following equipment and supplies are needed for Microcystin analyses:
 - 0.22 μ m pore size nitrocellulose filter membranes
 - Test tube rack
 - Permanent fine tip marker
 - Tape
 - Timer or stopwatch
 - Repeating pipetter with one 2.5 and three 12.5 ml syringe-style tips
 - Disposable tipped, adjustable air-displacement pipette to measure 75 μ L
 - D.I water
 - Wash bottles for D.I. water
 - Waste container
 - Safety goggles
 - Disposable gloves
 - Sample test tubes (provided in test kit)
 - Assay Diluent (provided in test kit)
 - Substrate (provided in test kit)

Enzyme Conjugate (provided in test kit)
0.4, 1.0, and 2.5 ppb standards (provided in test kit)
Negative control and Stop Solution (provided in test kit)
0.04 ppb Microcystin standard (optional; prepared using 0.4 ppb standard)
0.01 ppb Microcystin standard (optional; prepared using 1.0 ppb standard)
Cary 50 UV/Visible spectrophotometer
18 mm path length cuvette

5.0 Sample Storage and Log in

- 5.1 All samples must be logged in using the Limnology Center's Log-in database. Refer to the SOP for Sample Log-in (NHDES Limnology Center Laboratory Manual, Section V: Daily Procedures, page 26).
- 5.2 All cyanobacteria samples used in this analysis must have been positively identified as potential Microcystin producing cyanobacteria. These toxin producing cyanobacteria include *Anabaena*, *Microcystis*, *Aphanizomenon*, *Gloeotrichia* and *Oscillatoria*. Samples containing unknown cyanobacteria species may also be analyzed if concern exists that the unknown species could produce Microcystin.
- 5.3 Once a microscopic analysis determines that a scum contains greater than 50% dominance of potential Microcystin producing organisms, the following steps are performed:
 - 5.3.1 Transfer sample to plastic sample bottle (non-polypropylene).
 - 5.3.2 Place unpreserved samples in the Limnology Center freezer. Indicate on the sample log-in label that the sample is being prepared for a toxicity test.
 - 5.3.3 Indicate in the Microscopic Identification and Analysis bench book that the sample will be analyzed for toxins.
 - 5.3.4 All samples prepared for Microcystin analysis must undergo three freeze/thaw cycles. Indicate on the sample label the number of times the sample has been frozen/thawed. *The same individual should keep track of the freeze/thaw cycles of the samples to avoid any discrepancies.*
- 5.4 Microcystin samples should not be stored longer than six months.

6.0 Sample Preparation

- 6.1 Filter each of the samples as follows:
 - 6.1.1 Remove processed samples from the freezer. Allow samples to come to room temperature (at least 30 minutes). Place sample bottles on lab bench next to vacuum rack. Only remove as many samples as can be run through Test Kit Analysis steps 2 and 3 in 10 minutes.
 - 6.1.2 Remove the Microcystin test kit from the refrigerator. Allow all sample reagents and test tubes to come to room temperature.
 - 6.1.3 Label and prepare one 50 mL plastic sample vial per sample with Limnology Center ID.
 - 6.1.4 Record pertinent sample information on the Microcystin Analysis Data Sheet.

- 6.1.5 For each Microcystin sample, remove one filter funnel, filter collar and filtrate receiver. Connect filtrate receivers in series with a short piece of tubing. Attach plastic filter collar securely to filtrate receiver. Dampen collar with small volume of DI water.
 - 6.1.6 Using forceps, place a 0.22 μ m (47 mm) nitrocellulose membrane filter onto the filter collar. Avoid contact with filter. Use the forceps to center the filter on the filter collar (so the filter is not hanging off to one side).
 - 6.1.7 Thread plastic 250 mL Millipore cup onto filter collar. Avoid any tearing or wrinkling of filter paper. Check filter before pouring sample.
 - 6.1.8 Shake sample vigorously and pour up to 50 mL into cup.
 - 6.1.9 Ensure that large flask (1st in series) is not full before turning vacuum pump on or water will be drawn into pump and a short will occur. Turn on pump and run until most of the sample has filtered. If any of the samples are filtering slowly, turn off the pump, remove the finished containers, reconnect the remaining containers and continue pumping. When at least 1 mL of filtrate is in each receiver, turn off the pump. Remove and dispose of filter.
 - 6.1.10 Pour the filtrate from receiver into corresponding labeled plastic sample container. Filtered sample may be frozen until analyzed. Leave space to allow for expansion during freezing.
- 6.2 Preparation of the standards is as follows (*this step is optional and is the decision of the technician performing sample analysis. No filtration needed*):
- 6.2.1 Obtain a transfer pipette, pipette tip, and pipette stand.
 - 6.2.2 Obtain two plastic sample containers.
 - 6.2.3 Label the vials as 0.04 ppb and 0.1 ppb standards.
 - 6.2.4 Fill a clean beaker with D.I. water.
 - 6.2.5 Draw 100 μ L of D.I. water into the pipette. Transfer D.I. water to one of the marked plastic sample containers. Repeat eight more times for a total of 900 μ L of D.I. water in container.
 - 6.2.6 Remove all liquid from the pipette using the blow out button on the pipette aid.
 - 6.2.7 Draw 100 μ L of 0.4 ppb standard into the pipette (ensuring the bottom of the meniscus is in line with the pipette mark). Transfer the standard into the container labeled 0.04 ppb.
 - 6.2.8 Repeat steps 5-7 using the 1.0 ppb standard to prepare the 0.1 ppb standard.

7.0 Analysis: Envirologix Test Kit

- 7.1 All test kit components should be at room temperature. Organize all standards, samples (including the control sample) and reagents so that steps 2 and 3 can be performed within ten minutes. When adding reagents and samples to tubes, direct all the liquid to the bottom of the tube; avoid droplets sticking to the sides of the tube.

- 7.2 Label all test tubes with the appropriate standard or sample name and arrange in the test tube rack. Two test tubes should be prepared per standard and sample calling one A and one B.
- 7.3 *The following two steps should be performed in 10 minutes or less.* Attach a clean 2.5 ml syringe tip to the repeating pipetter and set the dispense dial to 3. Rapidly dispense 150 μ l of Microcystin Assay Diluent to each tube.
- 7.4 Using the standard pipette, immediately add 75 μ l of standards, negative control and lake water samples to the appropriate tube changing tips for each standard, control, and sample.
- 7.5 Mix the contents of the tubes by moving the test tube holder in a circular motion for 20-30 seconds.
- 7.6 Set timer for 15 minutes and incubate tubes at room temperature.
- 7.7 Attach a clean 12.5 ml syringe tip to the repeating pipetter and set the dispense dial to 1. Dispense 250 μ l of Microcystin Enzyme Conjugate to each tube. Mix the contents of the tubes for 20-30 seconds as in step 4 above.
- 7.8 Set timer for 15 minutes and incubate tubes at room temperature.
- 7.9 After incubation, vigorously shake the contents of the tubes into a sink or other suitable container. Flood tubes completely with cool tap water, then shake to empty. Repeat this wash step four times. Invert the tubes on a paper towel and tap to remove as much water as possible.
- 7.10 Attach a clean 12.5 ml syringe tip to the repeating pipetter and set the dispense dial to 2. Dispense 500 μ l of Substrate to each tube. Mix contents of the tubes for 20-30 seconds as in step 4 above.
- 7.11 Set timer for 15 minutes and incubate tubes at room temperature.
- 7.12 Visually interpret and record the results of the un-stopped tubes (blue solution). Score each sample tube as having less than, more than, or equal color to the two calibration tubes. If the color is darker than the 0.4 ppb standard, the sample contains less than 0.4 ppb of microcystin. If the color is between the 0.4 and 1.0 ppb standard, the sample contains between 0.4 and 1.0 ppb of microcystin. If the color is between the 1.0 and 2.5 ppb standard, the sample contains between 1.0 and 2.5 ppb of microcystin. If the color is lighter than the 2.5 ppb standard, the sample contains greater than 2.5 ppb of microcystin.

Note: If a color does not develop in the Negative calibration tube after incubation, the assay is invalid and should be repeated.

- 7.13 Don goggles and gloves for this step. Attach a clean 12.5 ml syringe tip to the repeating pipetter and set the dispense dial to 2. Dispense 500 μ l of Stop Solution to each tube. Mix contents of the tubes for 20-30 seconds as in step 4 above.

Note: Stop Solution is 1.0 N Hydrochloric acid. Handle with care!

8.0 Analysis: Spectrophotometer

- 8.1 Read samples on the Cary 50 spectrophotometer within 30 minutes of the addition of the stop solution. Refer to Appendix A for the parameter settings of the

spectrophotometer. The process is as follows. Steps 1-4 can be completed while the test tubes are incubating

- 8.2 Power on the computer connected to the Cary 50 spectrophotometer.
- 8.3 Select the "Run Microcystin" shortcut on the desktop to begin the Microcystin analysis program.
- 8.4 Select the "Setup" tab, select "Standards". Uncheck box saying "Calibrate during run". Also, be sure the frequency is set to 450nm, not 500.
- 8.5 Select "Sample" tab in the dialog box that opens. Enter the number of samples that you are going to use in the "Number of Samples" field. The table below this field will expand or contract to match your choice. In the samples table, enter the limnology lab id number/name for each sample.
- 8.6 Remove the v-shaped holder from the spectrophotometer and attach the square cuvette holder that is stored in the drawer below the fume hood.
- 8.7 Remove 10.0 mm cuvette box from drawer below fume hood. Rinse one cuvette with small volume of D.I. water.
- 8.8 Fill to volume with DI water to blank the machine. Place the cuvette in holder. ENSURE THAT CUVETTE SURFACES ARE FREE FROM MOISTURE AND FINGERPRINTS BEFORE PLACING IN SPECTROPHOTOMETER. USE KIMWIPES TO REMOVE MOISTURE AND FINGERPRINTS FROM CUVETTE. Close cover.
- 8.9 For the blank sample only, select "Connect" and the "Start" button to begin analysis. The program will ask for samples to be read. Select all samples for analysis. When asked where to save file, select "c:\Varian\Cary WinUV\MC". The file name should be YearMoDay. Example: 20080925. The file is saved as a BCN file. Select "Zero" to blank the machine.
- 8.10 Select the "Collect" button. Spectrophotometer will read absorbance of standard. Empty contents of cuvette into waste container. Rinse cuvette with DI water. Tap on Kimwipe to remove all liquid.
- 8.11 Fill cuvette with first sample requested by computer program. Wipe the cuvette as previously and place it in holder. Close cover. Select "Okay" button. The sample will be read by computer. Empty contents of cuvette into waste container. Rinse cuvette with DI water. Tap on Kimwipe to remove all liquid.
- 8.12 REPEAT PREVIOUS STEP FOR NEXT SAMPLE UNTIL ALL SAMPLES ARE READ.
- 8.13 If prompted to save the run, select "Yes".
- 8.14 All samples must be read within 30 minutes of adding the stop solution. No more than 40 samples, including duplicates and standards, should be run at any one time.
- 8.15 Save a copy of the CSV file to the folder:
H:\Biology\Beaches\Cyanobacteria\Microcystin Analyses\<(year).
- 8.16 Remove cuvette from spectrophotometer, empty and rinse with D.I. water.
- 8.17 Return clean cuvette to case and store in drawer below fume hood. Close Spectrophotometer cover.
- 8.18 Shut computer OFF.

9.0 Analysis: Concentration Calculation

- 9.1 Open the (year-mo-day)run1 CSV file (from [\(year\)_results](H:\BIOLOGY\Beaches\Cyanobacteria\Microcystin Analyses)) that contains the test results. Insert a column before the "sample number" column titled "Limno Log-in ID" and enter the id numbers from the Microcystin Analysis Data Sheet to identify standards and samples.
- 9.2 Open the file "MC Analysis Template" obtained from Envirologix (866-408-4597) and saved at: \\HAZDEFP3\WATERSHED\BIOLOGY\Beaches\Cyanobacteria\Analysis Microcystin\MC analysis template.xls (Appendix C) and save a copy in the current results folder titled "(year-mo-day)-MC". Copy the data from the csv file opened in step one to the "raw data" worksheet.
- 9.3 Copy the raw data onto the right side of the B-BO worksheet as well. This data will be used to fill in the "Data Reduction Worksheet."
- 9.4 Complete the operator, date, time, and kit lot # cells. Move on to Section I: Calibration Curve. Locate the "Calib. Conc." Column and the "rep 1" and "rep 2" columns. Use the "Abs" numbers from the raw data to fill these columns. "A" corresponds with "rep 1" and "B" corresponds with "rep 2". The "Abs value" column will be calculated automatically and points should appear on the calibration curve graph.
- 9.5 Continue to Section II: Sample Calculations. Now transfer the raw data into the table for calculation. Copy the first lake sample and right click in the first rep1 cell, select "paste special" and check the "transpose" box. Make sure to fill in the Lake column with the ID number. Repeat these steps for all of the samples.
- 9.6 Estimated PPB values should be calculated automatically. Check these values to make sure they are within range (0.1-2.5). If they fall outside of the range use the next column to indicate this. Record <0.1 or >2.5 when applicable.
- 9.7 Save the results and print a copy of the worksheet. Then exit Excel.

10.0 Data Entry

- 10.1 Results of each sample must be entered manually into the Limnology Laboratory Database in the following manner.
- 10.2 Enter the Limnology Center Login program
- 10.3 Select "Enter Results"
- 10.4 Select "Microcystin" as the Parameter.
- 10.5 Select "Jump" and enter the sample id number of the first sample to enter.
- 10.6 If the result is greater than 2.5, change the qualifier to "GT" for greater than and enter 2.5 in the result section.
- 10.7 For any result less than 2.5, enter the number in the result section. The program will automatically change a result to "LT 0.4" if needed. The program will record the actual value in the background.
- 10.8 Repeat steps 4-7 until all results are entered.
- 10.9 Click "Add QC" and enter sample number of the QC sample. Enter the numeric portion of the result for the QC sample.

10.10 Click "Stop" when done. Results will be reviewed by the QA/QC team and errors will be corrected by the microcystin analysis team.

11.0 Quality Control and Quality Assurance

11.1 Duplicate samples are run at a frequency of 10%. The relative percent difference (RPD) of the duplicate samples should be $\leq 25\%$ respectively. All data generated will be accepted due to the impact, and potential health risk to the public.

11.2 Standards are analyzed at the beginning of each run of samples.

12.0 References

QuantiTube™ Kit for Microcystin, Envirologix Inc., Catalog No. ET 039, Revision Date 08-29-05.

NHDES Limnology Center Laboratory Manual, Section V: Daily Procedures, page 33, Revision Date 1-12-05.

APPENDIX A-4-A

Spectrophotometer Parameters for Microcystin Analysis

These settings are programmed into the Perkin-Elmer Lambda 2, based on guidance from Enviro-Logix (manufacturer of Microcystin Tube Kit) and other methods run by the Limnology Center.

1. Mode: ABS
2. Wavelength: 450 nm
3. # of Standards: 0
4. Concentration Units: C (a general unit; our concentration of $\mu\text{g/L}$ was not available as a choice)
5. Standards: No (this indicates that the results are all in absolute values of reflectance)
6. Curve fit: None
7. Factor: 1
8. Divisor: 1
9. Response: 2 sec.
10. Lamp: VIS
11. Back correction: No
12. Samples/batch: 0
13. First sample #: 1
14. Cycles: 1
15. Cycle-Time: 0.01 min.
16. Print Data: Yes
17. Plot Standards: No
18. Print Standards: No
19. Auto Method: Yes
20. Operator ID: 0000
21. Sample ID: 0000

PLEASE NOTE: There is a parameter for VALUE of the standards. This value is replaced each time the standards are analyzed, so it is not necessary to change this value.

APPENDIX A-4-B: Microcystin Analyses Data Sheet

Analyst(s): _____ Date: _____ Start Time: _____

Limno Log-in ID	Sample Description (Lake/Town)	Sample Date	Color Description	Absorbance Value	Concentration (ng/mL)
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					

APPENDIX A-4-C: Microcystin Analysis Template

The calculations to determine the microcystin concentration of each sample is arrived at in the following manner.

1. The absolute value of the average of the negative control (B_0) and each calibrator's optical density (B) is calculated.
2. The average optical density of each calibrator (B) is divided by the average optical density of the negative control (B_0) to compare the relationship between the calibrators, obtaining the value of % B_0 for each control.
3. The value of each % B_0 for each control is graphed against its microcystin concentration on a semi-log scale.
4. Determine the microcystin concentration of each sample by finding its % B_0 value and the corresponding concentration level on the graph.
5. Interpolation of sample concentration is only possible if the % B_0 of the sample falls within the range of % B_0 's of the calibrators.
6. If the % B_0 of a sample is higher than that of the lowest calibrator, the sample must be reported as less than 0.4 ppb.
7. If the % B_0 of a sample is lower than that of the highest calibrator, the sample must be reported as greater than 2.5 ppb. If a concentration must be determined for these high level samples, dilute the sample 1:5 in distilled water. Run this dilution in a repeat of the immunoassay. If the result now falls within the range of the % B_0 's of the calibrators, you must then multiply the concentration measured in the diluted sample by a factor of 5.

**A-5 Standard
Operating Procedure
for the Collection of
Water Temperature**

Prepared by: _____ **Date:** _____
Program Coordinator

Reviewed by: _____ **Date:** _____
Watershed Management Bureau Administrator

Approved by: _____ **Date:** _____
Quality Assurance Officer

**N.H. DEPARTMENT OF ENVIRONMENTAL SERVICES
BEACH PROGRAM**

Procedures

1.0 Scope and Application

- 1.1 This Standard Operating Procedure encompasses data collected from aqueous media at all freshwater, inter-tidal, and coastal beaches by the NHDES Beach Program.

2.0 Equipment and Supplies

Thermometer
Field Data Sheet
Clipboard
Waterproof pen

2.0 Instrument Calibration and Standardization

- 2.1 Thermometer calibration follows NHDHHS PHL-WAL Standard Operating Procedures for Thermometer Calibration (Appendix I).
- 2.2 Thermometers are calibrated at 15°C respectively.

3.0 Data Collection

- 3.1 Wade into the water to knee depth (60 cm). Submerge the temperature probe two inches (~5 cm) below the water's surface.
- 3.2 Allow temperature reading to stabilize (about 30 seconds). Look squarely at the thermometer face; record reading in the temperature column on the field data sheet.
- 3.3 Proceed with bacteria sample collection.

4.0 Data and Records Management

- 4.1 All data collected is recorded on the Beach Program Field Data Sheet.
- 4.2 Data is stored in three ring binders and in the Beach Program Database.

5.0 Quality Control and Quality Assurance

- 5.1 Thermometer calibration will occur on an annual basis or more frequently if needed.

APPENDIX A-5-A
NHDHHS – Public Health Laboratories – Water Analysis Lab (PHL-WAL)
Standard Operating Procedures for Thermometer Calibration

Procedures

1.0 Scope and Application

- 1.1 The laboratory's thermometers are calibrated against an NIST traceable thermometer on a yearly basis for glass-liquid thermometers and quarterly for dial thermometers. The NIST thermometers are sent to the manufacturer or a service company for recalibration and re-certification every three years. The calibration records are kept in a bound record book. The working thermometers all have identification tags showing the thermometer name and serial number, date of calibration, and correction, if any.

2.0 Calibration check is performed as follows:

- 2.1 Calibration System: ERTCO Thermometer Calibration System, Model TCS 200-35
- 2.2 Solvent Bath: 50% Propylene Glycol + 50% tap water
- 2.3 Temperature Range: -30 to 100⁰C
- 2.4 NIST Traceable thermometers:
 - 2.4.1 Serial #1977, -1 to 201 ⁰C, scale divisions 0.2 ⁰C
 - 2.4.2 Serial #1157, -1 to 101 ⁰C, scale divisions 0.1 ⁰C
 - 2.4.3 Serial #F96-146, -36 to 54 ⁰C, scale divisions 0.2 ⁰C

3.0 Calibration System Operation and Correction Determination:

- 3.1 Turn on power by pressing ON button. Wait for self-test to conclude.
- 3.2 Select operating temperature by first pressing SET, and then use the number pad to enter the temperature. Digits on the display will move to the left. Enter a zero to advance past the decimal point.
- 3.3 When the display shows the desired temperature, again press SET to lock it in. The calibration bath will then heat or cool to reach the set temperature. The FLUID read-out tells you the temperature of the bath. Always use the temperature on the NIST traceable thermometer for calibration.
- 3.4 Insert NIST and test thermometers into the entry ports of the calibration system. Make sure the bulbs are properly immersed.
- 3.5 After the thermometers have reached stable readings, begin recording comparative readings. Take an initial reading, an intermediate reading after 10 minutes, and a final reading after another 10 minutes. Record all readings in the thermometer calibration bench book. Make corrections to the test thermometers based on their final readings compared to the NIST final reading. Prepare identification tags as described above and place on each thermometer. When no correction is needed, the tag lists "-0-".
- 3.6 To turn off calibration system, press the OFF button

**A-6 Standard Operating
Procedure for Risk-Based
Beach Evaluations**

Prepared by: _____ **Date:** _____
Program Assistant

Reviewed by: _____ **Date:** _____
Program Coordinator

Reviewed by: _____ **Date:** _____
Watershed Management Bureau Administrator

Approved by: _____ **Date:** _____
Quality Assurance Officer

**N.H. DEPARTMENT OF ENVIRONMENTAL SERVICES
BEACH PROGRAM**

1.0 Scope and Application

- 1.1. The Beach Program uses a risk-based ranking system to evaluate and classify designated coastal beaches. The system was developed to rank the sampling priority at each beach, as either Tier 1, Tier 2 or Tier 3. Each ranking determines sampling frequency at each public beach beach.
- 1.2. This Standard Operating Procedure (SOP) provides the Beach Program staff with guidance for completing risk-based beach evaluations.

2.0 Equipment and Supplies

- 2.1. The following supplies are necessary for evaluation of data:
 1. Pencil/pen
 2. Definitions (section 6)
 3. Beach Classification Checklist (Appendix)
 4. DES water quality data and reports (provided by Coastal Program, Shellfish Program, Beach Program, Clean Vessel Act Program, NPDES, and 305(b) and 303(d) reports).
 5. Data from the University of New Hampshire (UNH) and the National Oceanic and Atmospheric Administration (NOAA).
 6. Recreational water surveys for Towns, Beach Managers and Medical Facilities.

3.0 Data Collection-Preparation

1. Obtain a copy (electronic or printed) of the Classification Checklist for each beach to be evaluated.
2. Obtain copies of data and reports specific to each criterion and beach.

4.0 Data Collection-Method

- 4.1. Complete the Risk-Based Beach Evaluation form as follows. For each criterion in each of the three sections (Beach History, Beach Use and Microbial Pathogen Sources), place the value of the criteria next to the appropriate level of significance. The points will be awarded as follows:
 1. Not an Issue 0 points
 2. No Data/Low Priority 2 points
 3. High Priority 3 points (or 4 points if indicated on form)
- 4.2. Category Explanation:
 1. Microbial Pathogen Sources
 - a. Access the Shellfish Program Sanitary Survey reports, NPDES, and NOAA information to determine each criterion's significance.
 2. Beach Use
 - a. Access Beach Program files and beach survey results to determine each criterion's significance.
 3. Beach History
 - a. Access historical Beach Inspection data to determine each criterion's significance. Access information from other DES Programs, UNH, NOAA, or from municipal records if information cannot be found in the inspection data.
- 4.3. Additional beach considerations are determined as follows:
 1. The criterion "beach importance to the local economy" will be determined by surveying beach managers.

2. The criterion "beach importance to public" will be initially ranked according to historical beach inspection data and beach use knowledge. Public comments and opinions will serve to adjust criterion.
- 4.4. Based on beach derived specific information, determine if significant risk factors exist that should receive greater consideration. If so, explain and rank the consideration on a scale of one to three. One being the least significant and three the greatest.
- 4.5. Tally initial classification by summing the number for each level of significance and place the total points in the final row.
- 4.6. Determine the initial classification based on the following scoring criteria.
 - a. The Initial Tier 3 classification range is less than 38 points.
 - b. The Initial Tier 2 classification range is 38 to 52 points.
 - c. The Initial Tier 1 classification range is greater than 52 points.
- 4.7. Determine the final classification based on listing in the CALM or State Park status. If this beach was listed as "impaired" or "not supporting for primary contact recreation" in the most recent version of the Consolidated Assessment and Listing Methodology (CALM) or is a state park, increase the tier status as follows.
 - a. Tier 3 beaches are elevated to Tier 2 status
 - b. Tier 2 beaches are elevated to Tier 1 status

5.0 Data and Records Management

- 5.1. Upon completion of evaluations, the Program Coordinator will generate a sampling schedule based on the number of beaches ranked as Tier 1, Tier 2 or Tier 3. The schedule will follow the Beach Program Tiered Monitoring Plan.
- 5.2. The Beach Program Coordinator will compile the risk-based beach evaluation forms, data, and reports in beach specific folders at DES headquarters.
- 5.3. The Beach Program Coordinator will store evaluation results electronically in beach specific spreadsheets.

6.0 Definitions

Actual threat or source: an existing structure or conduit that contributes or transports contaminants to a beach area, thus causing negative health impacts to humans.

Potential threat or source: an existing structure or conduit that may contribute or transport contaminants to a beach area but sufficient data has not been collected to assess impacts on water quality.

CSO: Combined Sewer Overflow

TMDL: Total Maximum Daily Load

WWTF: Waste Water Treatment Facility

Tier 3 Beach: A beach area where there are minimal to no public health risks to those recreating at the beach.

Tier 2 Beach: A beach area where potential public health risks exist to those recreating at the beach.

Tier 1 Beach: A beach area where actual public health risks exist.

Impaired: A beach listed as "impaired" in the most recent 305(b)/303(d) Consolidated Assessment and Listing Methodology (CALM) submitted to EPA.

State Park: A beach managed by NH Department of Economic and Resource Development.

Risk Based Beach Evaluation and Classification Form

Criterion	Significance Category		
	Not an issue 0 points	Low Priority/No data 2 points	High Priority 3 points (or as noted)
Microbial Pathogen Sources			
Average annual precipitation	< 25 inches	Data not available	≥ 25 inches
Number of significant (> 3 inches) rainfall events in the past year	<2 events	Data not available	2 or more events (4 points)
Data available from monitoring rainfall vs. bacteria counts	No risk	Low detected risks or data not available	Moderate or high detected risks
Source of fecal contamination within 1 mile of beach-other than WWTF or septic fields	None	1 or more potential sources or data not available	1 or more actual sources (4 points)
Point sources: industrial waste within 1 mile of beach	None	1 or more potential sources or data not available	1 or more actual sources (4 points)
Number of CSOs within 5 miles of beach	None	≤ 2 or Data not available	> 2
Proximity of WWTF discharge to beach	None	≥ 5 miles or data not available	< 5 miles
Estimated number of septic systems within 1 miles of beach	None	< 25 or data not available	≥ 25
Do town ordinances allow domestic animals on this beach during bathing season?	No	Data not available	Yes
Marina with boat pumpout facilities within 1 mile of beach	No marina	Marina with pumpout facility or data not available	Marina without pumpout facility
Presence of boat mooring sites within 1 mile of beach	None	< 10 moorings present or data not available	≥ 10 moorings present (4 points)
Proximity to waterbody that requires a TMDL study for bacteria in the watershed of beach	None	> 2 miles or data not available	≤ 2 miles (4 points)

Beach Use				
Mean number of days in bathing season	<50		Data not available	≥ 50
Mean percentage of beach goers that enter the water	<25%		Data not available	≥ 25% (4 points)
Mean number of bathers during peak recreation days (weekends/ holidays)	<50		Data not available	≥ 50 (4 points)
Beach History				
Reported health issues	No issues reported		1-2 issues or data not available	≥3
Historical exceedance of bacteria standards in previous 5 years	No exceedances		1-5 exceedances or data not available	> 5 exceedances (4 Points)
Historical cyanobacteria advisories	No advisories		≤ 2 advisories issued	3 or more advisories issued
Mean time for public notification	< 24 hours		Data not available	≥ 24 hours
Mean number of days beach affected by advisory during bathing season	<2 days		2-3 days	> 3 days
Mean high water swim season temperature	<60°F		Data not available	≥ 60°F
Wildlife present on beach during inspections	Present at < 25% of inspections		Data not available	Present at ≥ 25% of inspections
Additional Criterion				
Beach importance to the local economy	Not important to economy		Moderately important to economy or not assessed	Highly important to economy
Beach importance to public	Beach not considered a popular area for tourists or residents		Moderately popular or not assessed	Beach is considered a highly popular area for tourists or residents
Based on beach derived specific information, determine if significant risk factors exist that should receive greater consideration. If so, explain and rank the consideration on a scale of one to three. One being the least significant and three the great			Initial Classification Points Total	
Initial Tier Evaluation (circle)	< or =37 points: Tier 3		38-52 Points: Tier 2	> or = 53points: Tier 1
Final Tier Evaluation Instructions			Final Tier	
If this beach was listed as "impaired" or "not supporting for primary contact recreation" in the most recent version of the Consolidated Assessment and Listing Methodology (CALM) OR is a state park, increase Tier 3 beaches to Tier 2 or Tier 2 beaches to T			Tier _____	

**A-7 Standard Operating
Procedure for Beach
Advisories**

Prepared by: _____ **Date:** _____

Program Coordinator

Reviewed by: _____ **Date:** _____

Watershed Management Bureau Administrator

Approved by: _____ **Date:** _____

Quality Assurance Officer

**N.H. DEPARTMENT OF ENVIRONMENTAL SERVICES
BEACH PROGRAM**

Procedures

1.0 Scope and Application

- 1.1 The purpose of this standard operating procedure is to develop consistency in the public beach advisory notification and posting process. The issuance and posting of a beach advisory requires a coordinated effort between the state, towns, and local beach managers. Through this effort the Beach Program will enhance public notification to better protect the public from contracting a water-borne disease.
- 1.2 Public beaches where water quality standards for primary recreation are exceeded require public notification that the water may not be suitable for recreation.

2.0 Definitions

Issue: The act of notifying the proper beach contact of a water quality violation that requires an advisory.

Advisory: A report based upon scientific data that provides written information about beach water quality. The advisory is issued through, signs, special websites and press releases and consists of wording notifying the public of high bacteria levels that statistically increase the chances of contracting a waterborne disease or ingesting cyanotoxins.

Posting: The act of physically attaching an advisory to an object at beach access areas. Postings must be placed on the affected beach at least 50 foot intervals and in areas that are visible to the public.

Primary Contact: The main contact person for a beach (may also be the advisory contact).

Advisory Contact: The person notified of a beach advisory (may also be the primary contact).

Scum: A film of cells that rises to or is formed on the surface of the water.

Secondary Contact: The person notified of a beach advisory if the primary or advisory contacts are unavailable.

3.0 Personnel Qualifications/Responsibilities

- 3.1 The following DES personnel may be responsible for issuing a beach advisory:

- DES Limnology Center Director
- DES Beach Program Coordinator
- DES Beach Program Assistant
- DES Freshwater Beach Inspector

- 3.2 The following personnel may be responsible for posting a beach advisory:

- DES Beach Program Coordinator
- DES Beach Program Assistant
- DES Freshwater Beach Inspector
- Town Health Officer

- Beach Owner/Manager
Advisory Contact (if different from health officer or beach owner/manager)
- 3.3 The following personnel may be responsible for collecting bacteria or cyanobacteria samples:

DES Beach Program Coordinator
DES Beach Program Assistant
DES Freshwater Beach Inspector
Beach Program Intern
Town Health Officer
Beach Owner/Manager
Advisory Contact (if different from health officer or beach owner/manager)

4.0 Issuing an advisory

- 4.1 Bacteria results for public beach water samples are obtained from the NHDHHS's Division of Public Health Services, Public Health Laboratories - Water Analysis Lab (or PHL-WAL) on a daily basis. The results may be received in report, electronic, or verbal format. Cyanobacteria samples are received via beach inspection or complaint.
- 4.2 The following describes the issuance, notification, and posting procedures for bacteria advisories.
- 4.2.1 Review report results for exceedences of state water quality standards (88cts/100mL *E. coli* and 104cts/100mL Enterococci). Exceedences may also be communicated by laboratory personnel prior to report review.
- 4.2.2 Notify the Limnology Center Director, Beach Program Coordinator, Beach Program Assistant or Freshwater Beach Inspector of any exceedences.
- 4.2.3 Record pertinent information on the appropriate Advisory Chain of Communication (Appendix A) at each step of this process.
- 4.2.4 Access the Beach Database Contacts. Find the primary and advisory contact associated with the beach.
- 4.2.5 Immediately contact both parties (if different) by phone and/or email. If you cannot get in touch with the primary or advisory contact, call the secondary contact. If no contact is available, leave messages and keep trying until you reach someone. If the beach is at a licensed youth camp, also contact the camp inspector supervisor in the WD Drinking Water & Groundwater Bureau by email.
- 4.2.6 Notify the contact(s) of the bacteria exceedance(s) at the public beach. Verbally communicate the sample results and inform the contact(s) that hard copies of the results are being mailed or can be faxed.
- 4.2.7 Inform the contact(s) that a bacteria advisory is being issued for the public beach. Briefly describe the content and means of the bacteria advisory.
- 4.2.8 If the contact(s) has a DES Beach Program Bacteria Advisory sign, instruct the individual to post the sign at a visible access point to the beach area and/or lifeguard stands. If the contact(s) does not have a sign,

fax the sign and instruct them to copy the sign on a bright yellow piece of paper. Or, bring the sign to the beach and post.

- 4.3 The following describes the issuance, notification, and posting procedures for cyanobacteria advisories at town, state, and other beaches sampled by Watershed Management staff.
 - 4.3.1 Analyze cyanobacteria scum samples to identify a dominant toxin producing cyanobacteria species.
 - 4.3.2 Notify the Limnology Center Director or Beach Program Coordinator of the toxin producing cyanobacteria scum.
 - 4.3.3 Record pertinent information on the appropriate Advisory Chain of Communication (Appendix A) at each step of this process.
 - 4.3.4 Access the Beach Database Contacts. Find the primary and advisory contact associated with the beach.
 - 4.3.5 Immediately contact both parties (if different) by phone and/or email. If you cannot get in touch with the primary or advisory contact, call the secondary contact. If no contact is available, leave messages and keep trying until you reach someone. If the beach is at a licensed youth camp, also contact the camp inspector supervisor in the WD Drinking Water & Groundwater Bureau by email.
 - 4.3.6 Notify the contact(s) that there is a toxin producing cyanobacteria scum at the beach. Verbally communicate the species identified and provide information on cyanobacteria.
 - 4.3.7 Inform the contact(s) that a cyanobacteria advisory is being issued for the public beach. Briefly describe the content and means of the cyanobacteria advisory.
 - 4.3.8 If the contact(s) has a DES Beach Program Cyanobacteria Advisory sign, instruct the individual to post the sign at visible access points to the beach area and/or lifeguard stands. Or, bring the sign to the beach and post.
 - 4.3.9 If the primary, advisory, or secondary contacts cannot be reached to issue the advisory on that day, Beach Program personnel must travel to the beach to post the advisory as soon as possible.
- 4.4 Coastal and freshwater beach advisories must be updated on the DES Beach Program web and twitter pages. Advisories at licensed youth camps will not be posted on internet via the beach web or twitter pages since those beaches are not open to the general public. The Beach Program Coordinator or Program Assistant is responsible for updating current beach advisories. The current password is "sonya". The webpage is: **<http://www2.des.state.nh.us/Advisories/Beaches/maintenance/Default.asp?pw=0>**. The twitter page is: **http://twitter.com/NHDES_Beaches**. The login email address is: sonya.carlson@des.nh.gov. The password is: beaches.
- 4.5 A Beach Advisory Chain of Communication Form must be completed for each advisory issued.

- 4.6 Along with the issuance and posting of a bacteria advisory, immediate re-sampling of the beach occurs within 24 hours for elevated results received Monday through Thursday. Due to limited access to laboratory services, only coastal beaches managed by the Division of Parks and Recreation will be sampled on Saturday or Sunday. Sampling must follow the Beach Program's Standard Operating Procedures (SOPs) for Bacteria Sampling.
- 4.7 Along with the issuance and posting of a cyanobacteria advisory, re-sampling should occur periodically until the scum has dissipated. Sampling must follow the Beach Program's SOPs for Algal Collection/Identification.

5.0 Removing advisories:

- 5.1 Re-sampling should occur immediately (within 24 hours) after notification of bacteria standard exceedances. Or, periodically until the cyanobacteria scum dissipates.
- 5.2 If Program personnel are available to re-sample the beach they should do so.
- 5.3 Record the data of re-sample on the Beach Advisory Chain of Communication Form.
- 5.4 If Program personnel are unavailable to re-sample the beach, discuss with the contact(s) if they can re-sample and transport the samples to the DES Laboratory.
- 5.5 Provide the contact(s) with the Beach Program's SOP for Bacteria Sampling or Cyanobacteria sample collection (email) or verbally communicate the sampling protocol if they are unaware of the procedure.
- 5.6 After the bacteria re-samples are analyzed by the lab (within 24 hours), check sample results for continued exceedance of standards.
- 5.7 Analyze cyanobacteria re-samples in the Limnology Center.
- 5.8 If bacteria sample results continue to exceed state standards, or if a dominant toxin producing cyanobacteria species exists, notify the beach contact(s) that the beach advisory must remain posted.
- 5.9 Re-sample the beach immediately (Follow procedure above).
- 5.10 If bacteria sample results are within the state standards or a toxin producing cyanobacteria species is not dominant, notify the beach contact(s) that the beach advisory may be removed. If the beach contacts are unavailable the beach advisory may be removed by Program personnel.
- 5.11 Complete the associated Advisory Chain of Communication Form and store in appropriate folder.
- 5.12 Coastal and freshwater beach advisory removal must be updated on the DES Beach Program web page. The DES Beach Program Coordinator or the DES Beach Program Assistant will be responsible for maintaining the Beach Advisory web and twitter page.
- 5.13 The Beach Advisory Chain of Communication Form must be completed when the advisory is removed.

6.0 Criteria

- 6.1 According to RSA 485 A:8, the State standard at freshwater beaches for *E. coli* in one sample is no more than 88 counts/100 mL of water, or no more than a geometric mean of 47 counts/100 mL of water in 3 samples over a sixty day period. The State standard at coastal beaches for Enterococci in one sample is 104 counts/100 mL of water or no more than a geometric mean of 35 counts/100 mL of water in 3 samples over a sixty day period.
- 6.2 DES posts beach advisories when one sample (there are two to three samples collected per beach) exceeds the State standards by greater than 70 counts or when two samples (collected on the same day) exceed the standards.
- 6.3 Beach advisories are posted during the swim season only. Pre and post season sampling may occur at select beaches, however if bacteria levels exceed state standards a beach advisory will only be posted at the discretion of the program coordinator or program assistant with input from the Bureau Administrator if needed.
- 6.4 According to the NH Code of Administrative Rules, Chapter Env-Wq1100: Public Bathing Places, cyanobacteria advisories are posted when a toxic cyanobacteria scum represents more than 50% of the algal cell count.

7.0 Data and Records Management

- 7.1 All data generated from the PHL-WAL is stored as hard copies in beach specific folders, and electronically in the Laboratory's database and the Environmental Monitoring Database's (EMD) Beach Module.
- 7.2 Advisory Chain of Communication forms are stored as hard copies in the Beach Programs files, and electronically in the Beach Program's files.

8.0 Quality Assurance and Quality Control

- 8.1 Quality assurance and quality control measures for the analysis of bacteria samples follow the steps outlined in the PHL-WAL Quality Systems Manual. The procedures followed are Enterococci Standard Method 9230 and *E. coli* By Membrane Filtration, mTEC and Modified mTEC. Copies of Standard Operating Procedures for the above tests are stored by
- 8.2 All data generated from the PHL-WAL is validated according to their Standard Operating Procedure for Data Validation and Verification.

9.0 References

- State of New Hampshire, Revised Statutes Annotated, *Title L Water Management and Protection, Chapter 485-A Water Pollution and Waste Disposal*, 1998.
- NHDES Beach Program Standard Operating Procedures, *Bacteria Sampling*, 2003.
- NHDES Laboratory Services Unit Standard Operating Procedure, *Data Validation and Verification*, 2003.

Appendix A-7-A Advisory Chain of Communication Forms

E. coli Beach Advisory Chain of Communication

		Town:			
Beach EPA ID:		Date 1 ^o Contact :			
Beach 1 ^o Contact:		How Contacted: ___Phone ___Cell ___Email			
1 ^o Contact Phone:		Date 2 ^o Contacted:			
1 ^o Contact Email:		2 ^o Contact Name:			
1 ^o Contact's Cell:		2 ^o Contact Phone:			
Sample Results:					
	Date	Left	Center	Right	Sampled by
Initial					
Resample 1					
Resample 2					
Resample 3					
Resample 4					
Enter Date & Initials Below Advisory Posted:					
Website Posted:			Website Removed:		
Entered in EMD:			Marked not current in EMD:		
Added to Twitter :			Removed from Twitter		
Entered in Excel sheet:			Updated in Excel sheet:		
Advisory Removed:					
NOTES:					

Cyanobacteria Beach Advisory Chain of Communication

Beach Name:		Town:		
Beach EPA ID:		Date 1 ^o Contact :		
Beach 1 ^o Contact:		How Contacted: ___Phone ___Cell ___Email		
1 ^o Contact Phone:		Date 2 ^o Contacted:		
1 ^o Contact Email:		2 ^o Contact Name:		
1 ^o Contact's Cell:		2 ^o Contact Phone:		
Sample Results:				
	Date	%/Concentration Species 1	%/Concentration Species 2	Limno ID #
Initial				
Resample 1				
Resample 2				
Resample 3				
Resample 4				
Enter Date & Initials Below				
Advisory Posted: _____				
Website Posted:		Website Removed:		
Entered in EMD:		Marked not current in EMD:		
Added to Twitter :		Removed from Twitter :		
Entered in Excel sheet:		Updated in Excel sheet:		
Advisory Removed: _____				
NOTES:				

Appendix B State of New Hampshire Revised Statutes

1.0

2.0 TITLE L

WATER MANAGEMENT AND PROTECTION

CHAPTER 485-A WATER POLLUTION AND WASTE DISPOSAL

Classification of Waters

Section 485-A:8

485-A:8 Standards for Classification of Surface Waters of the State. – It shall be the overall goal that all surface waters attain and maintain specified standards of water quality to achieve the purposes of the legislative classification. For purposes of classification there shall be 2 classes or grades of surface waters as follows:

I. Class A waters shall be of the highest quality and shall contain not more than either a geometric mean based on at least 3 samples obtained over a 60-day period of 47 *Escherichia coli* per 100 milliliters, or greater than 153 *Escherichia coli* per 100 milliliters in any one sample; and for designated beach areas shall contain not more than a geometric mean based on at least 3 samples obtained over a 60-day period of 47 *Escherichia coli* per 100 milliliters, or 88 *Escherichia coli* per 100 milliliters in any one sample; unless naturally occurring. There shall be no discharge of any sewage or wastes into waters of this classification. The waters of this classification shall be considered as being potentially acceptable for water supply uses after adequate treatment.

II. Class B waters shall be of the second highest quality and shall have no objectionable physical characteristics, shall contain a dissolved oxygen content of at least 75 percent of saturation, and shall contain not more than either a geometric mean based on at least 3 samples obtained over a 60-day period of 126 *Escherichia coli* per 100 milliliters, or greater than 406 *Escherichia coli* per 100 milliliters in any one sample; and for designated beach areas shall contain not more than a geometric mean based on at least 3 samples obtained over a 60-day period of 47 *Escherichia coli* per 100 milliliters, or 88 *Escherichia coli* per 100 milliliters in any one sample; unless naturally occurring. There shall be no disposal of sewage or waste into said waters except those which have received adequate treatment to prevent the lowering of the biological, physical, chemical or bacteriological characteristics below those given above, nor shall such disposal of sewage or waste be inimical to aquatic life or to the maintenance of aquatic life in said receiving waters. The pH range for said waters shall be 6.5 to 8.0 except when due to natural causes. Any stream temperature increase associated with the discharge of treated sewage, waste or cooling water, water diversions, or releases shall not be such as to appreciably interfere with the uses assigned to this class. The waters of this classification shall be considered as being acceptable for fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies. Where it is demonstrated to the satisfaction of the department that the class B criteria cannot reasonably be met in certain surface waters at all times as a result of combined sewer overflow events, temporary partial use areas shall be established by rules adopted under RSA 485-A:6, XI-c, which meet, as a minimum, the standards specified in paragraph III.

III. The waters in temporary partial use areas established under paragraph II shall be free from slick, odors, turbidity, sludge deposits, and surface-floating solids of unreasonable kind or quantity, shall contain not less than 5 parts per million of dissolved oxygen; shall have a hydrogen ion

concentration within the range of pH 6.0 to 9.0 except when due to natural causes; and shall be free from chemicals and other materials and conditions inimical to aquatic life or the maintenance of aquatic life. These criteria shall apply during combined sewer overflow discharges and up to 3 days following cessation of said discharge. At all other times the standards and uses specified in paragraph II shall apply.

IV. Notwithstanding anything contained in this chapter, the department in submitting classifications relating to interstate waters to the New England Interstate Water Pollution Control Commission for review and approval, as provided for under the terms of Article V of the compact whereby the interstate commission was created by RSA 484, shall submit such classifications in accordance with the standards of water quality as currently adopted by said interstate water pollution control commission provided, however, that the standards for any classification thus submitted for review and approval shall not be less than, nor exceed the standards of the classification duly adopted by the General Court as provided for in RSA 485-A:9 or 10.

V. Tidal waters utilized for swimming purposes shall contain not more than either a geometric mean based on at least 3 samples obtained over a 60-day period of 35 Enterococci per 100 milliliters, or 104 Enterococci per 100 milliliters in any one sample, unless naturally occurring. Those tidal waters used for growing or taking of shellfish for human consumption shall, in addition to the foregoing requirements, be in accordance with the criteria recommended under the National Shellfish Program Manual of Operation, United States Department of Food and Drug Administration.

VI. Notwithstanding anything contained in this chapter, the commissioner shall have the authority to adopt such stream classification criteria as may be issued from time to time by the federal Environmental Protection Agency or its successor agency insofar as said criteria may relate to the water uses specified in RSA 485-A:8, I and II, provided, however, that the criteria thus issued shall not result in standards that are less than nor exceed the standards of the classification duly enacted by the general court as provided for in RSA 485-A:9 or 485-A:10.

VII. All tests and sampling for the purposes of examination of waters shall be performed and carried out in a reasonable manner and whenever practicable, in accordance with the commonly accepted scientific method as selected by the department. The waters in each classification shall satisfy all the provisions of all lower classifications. The minimum treatment for the lowest classification shall be as follows:

(a) For sewage, secondary treatment and disinfection as necessary to comply with water quality standards.

(b) For industrial wastes and combined sewer overflows, such treatment as the department shall determine. Appeal from any such determination shall be in the manner provided for in RSA 21-O:14.

VIII. In prescribing minimum treatment provisions for thermal wastes discharged to interstate waters, the department shall adhere to the water quality requirements and recommendations of the New Hampshire fish and game department, the New England Interstate Water Pollution Control Commission, or the United States Environmental Protection Agency, whichever requirements and recommendations provide the most effective level of thermal pollution control.

IX. Subject to the provisions of RSA 485-A:13, I(a), the fish and game department may use rotenone or similar compounds in the conduct of its program to reclaim the public waters of the state for game fishing.

Source. 1989, 339:1. 1991, 371:3-5. 1996, 228:77, 106, 110. 1998, 63:1, eff. July 11, 1998.

Appendix C Documentation Forms

**C-1: Training Document
BEACH PROGRAM TRAINING FORM**

To be conducted by the Beach Program Coordinator or sufficiently trained staff equivalent on at least three occasions, and until all tasks are successfully completed prior to independent sampling

Trainee Name: _____

Title: _____

DES Staff: _____

Training Site: _____

Date: _____

Time: _____

SAMPLING ISSUE	ASSESSMENT RATING		COMMENTS
	Needs Improvement	Good	
I. Preparation For Sampling			
1. Proper Equipment Pack-up			
Sterile bacteria bottles			
Cooler with ice			
Regular and waterproof pens			
Thermometer <i>checked QA/QC up to date</i>			
Bottles for algal collection			
Preprinted station labels.			
Shoulder length polyethylene gloves			
Sampling pole			
2. Number of Bottles for "Routine" Sampling Event			
Pack 2 to 3 sample bottles per beach for bacteria collection			
Pack 1 sample bottle per beach for algal collection			
Extra sample bottles in case of contamination or pollution sources			
3. Proper Paperwork			
Field Data Sheets – 1 per day, <i>clipboard</i>			
Complaint forms			
Illness report forms			
Three ring binder with Beach Program SOPs and QAPP			
Advisory Posters – for bacteria and algae			
Fact sheets			
Log-in Forms – 1 per beach			
Beach Coordinator/Beach Inspector business cards			
Directions and/or NH Gazetteer			
II. Sample Collection			
1. Trip Blanks			
Prepare one coastal trip blank daily, and two freshwater trip blanks weekly. Sterile bacteria bottle is filled with D.I. water from faucet in Limnology Center.			

SAMPLING ISSUE	ASSESSMENT RATING		COMMENTS
	Needs Improvement	Good	
Bottle is labeled trip blank, date, time			
Inside of bottle cap or neck not touched			
Blank is stored on ice until sample log-in			
2. Bacteria Sample Collection			
Bottles labeled correctly – sample site, station, date, time			
Water temperature is measured using the thermometer at each sample location			
Just prior to sample collection, bottle cap removed and inside of bottle cap or neck was not touched			
Sample bottle was not rinsed			
Care taken to ensure no cross-contamination of the sample – sample area undisturbed, sample motion away from body, water flow towards body			
Proper sampling technique was followed: a u-shaped motion at least 1 foot below water surface and sample collected at knee depth of water			
Samples collected at correct stations			
If known or suspected sewage contamination at beach, samples collected using a sampling pole and/or shoulder length gloves as described in Beach Program SOP for Bacteria Sampling			
Samples immediately put on ice			
3. Field Duplicates			
Duplicate samples collected for 10% of samples			
Bottles labeled correctly: sample site, duplicate, date, time			
Duplicate sample obtained immediately after original: both sample bottles brought to sample station			
Just prior to sample collection, bottle cap removed and inside of bottle cap or neck was not touched			
Sample bottle was not rinsed			
Care taken to ensure no cross-contamination of the sample – <i>sample area undisturbed, sample motion away from body, water flow towards body</i>			
Proper sampling technique was followed: a u-shaped motion at least 1 foot below water surface and sample collected at knee depth same as original			

SAMPLING ISSUE	ASSESSMENT RATING		COMMENTS
	Needs Improvement	Good	
Sample immediately put on ice			
4. Algal Collection			
Sample bottles labeled with site, location, date, time			
Station information recorded: station ID, OR description, directions, and GPS coordinates for a new station			
Samples immediately put on ice			
III. Paperwork			
1. Proper Paperwork Completed/Distributed			
Introduce yourself to beach manager, lifeguards, and public			
Complete all sections of the field data sheet			
Complaint forms are filled out if necessary			
Fact sheets are distributed if necessary			
IV. Sample Handling/Custody			
1. Sample Log-in			
Samples are returned to the Laboratory within proper holding times and on ice			
Samples are placed in order according to lab procedures and appropriate labels placed on the bottle caps			
Sample log-in and custody sheet is filled out completely			
If suspected sewage contamination samples taken, indicate dilution factor needed on bottle and in the notes section on the log-in sheet - X1, X10, or X100,			
Sign custody section of form to relinquish samples to the laboratory			
Notify laboratory personnel that samples are relinquished – <i>lab personnel must review log-in sheet and sign</i>			
V. Corrective Actions			
Did the Program Coordinator notify the trainee that methods need improvement? (Elaborate if "Yes") Yes _____ No _____			
Did the Program Coordinator re-train the in the area(s) where improvement was needed? (Elaborate if "Yes") Yes _____ No _____			

Signature (Trainee): _____
Date: _____

Signature (Coordinator): _____
Date: _____

C-2: Field Data Sheets

Beach Inspection Form

Date: _____ Inspector: _____

Lab ID:	EPA ID:	Beach:	Town:						
Time:	Weather:		Inspection Type: Initial Subsequent Advisory Safety Complaint Off Season						
Station ID	Water Level	Water Conditions	Water Temp	# Bathers	# Dogs	# Birds	# Other	Dup?	Comments

C-3: Sample Log-in and Custody Sheet

NH DES LABORATORY SERVICES LOGIN AND CUSTODY SHEET

AQUEOUS SAMPLE RECEIPT CHECKLIST (TO BE COMPLETED BY DES LABORATORY STAFF ONLY)
NA = Not Applicable

	Yes	No	NA	
Physical Inspection of the sample containers and submitted paperwork				Inspection Comments and Sample Information
LAB ACCOUNT PROJECT (EPA) # current?/ Name				Project (EPA) # or name _____
Description: Collected by: Temperature of the sample or temperature blank				Temperature _____ Deg. C
Condition of sample(s) acceptable? (Check for leakage, breakage, and volume)				
San Location /	Was the paperwork submitted adequate and completely filled out? Hold times acceptable?			
	Do the paperwork and sample labels agree?			
	Preservation listed on the sample bottle(s)?			
	Do VOAs or Radon have air bubbles ?			
	For EPA 504.1 and 524.2 , was the lab-provided Field Reagent Blank returned with samples to the lab?			
	Yes No NA			How did the laboratory receive the sample(s)? <input type="checkbox"/> Hand delivered or <input type="checkbox"/> Mail
				Was the sample(s) received in a cooler ? What was used to lower the temp? <input type="checkbox"/> Ice <input type="checkbox"/> Cold Packs(s) <input type="checkbox"/> Nothing
	Complete the lines below if applicable			
	Was the Client contacted by phone?			Date _____ Time _____
	Reason _____			Initials _____
	Additional Comments:			
	If present, was the Custody of Seal intact?			
Relinquished Relinquished	Was the sample(s) subcontracted ? List the samples which were sent and tests requested:			Contract Lab: _____ Date/Time Name of Staff Releasing Sample: _____

Matrix: A=Aii Rev 4
5-15-08

Completed By _____ Date _____

Page ___ Of ___

Data Reviewed By _____ Date _____

C-4: Illness Report Form



N.H. Department of Environmental Services Beach Program

Illness Report

Please fill out this form only if you, your child, or a family member became sick from swimming at a public bathing area. Please fill out the form as completely as possible.

Name:

Date:

Address (Optional):

Telephone #:

E-mail (Optional):

Gender (circle one): Male Female

Age (circle one): 0-2 yrs 3-6 yrs 7-12 yrs 13-18 yrs 19-30 yrs

 31-50 yrs 51-65 yrs 66-80 yrs Over 80

Public bathing area where illness was contracted (list beach name, lake/pond/ocean beach name, and town):

What type of contact was made with the water? (circle one)

1. Full body contact over the head
2. Full body contact up to the neck
3. Partial body contact up to the waist
4. Partial body contact up to the knees

Did the illness require a doctor's visit? If so, did the doctor diagnose the illness as being caused by a water-borne pathogen?

Did you inform the doctor that you recently participated in water-contact activities at a beach area?

Type of Illness (circle illness type as diagnosed by the doctor or list illness symptoms):

Gastroenteritis

Swimmer's Itch

Eye Infection

Skin Irritation/Infection

Giardiasis

Cryptosporidiosis

Illness Symptoms:

How long did the illness last?

Were there other bathers in the water at the specific beach? If so, how many would you estimate?

Did anyone else in your group exhibit similar symptoms?

Did you notice any of the following while recreating at the public bathing area? (circle all that apply)

1. Foul odors
2. Waterfowl (ducks, geese, gulls) on or near beach
3. Domestic animals (dogs) on beach
4. Scum on water's surface
5. Cloudy/turbid water
6. Public facilities
7. Trash

Did you observe anything else that you feel may have contributed to an illness?

Thank you for taking the time to complete this form. Your response is greatly appreciated and will aide the Beach Program in tracking swimmer related illnesses throughout the state. Please fax (603-271-7894) or mail (address below) the completed form to the Beach Program. If you have any comments or questions please feel free to contact the Beach Program.

Sonya Carlson
Program Coordinator
(603) 271-0698
sonya.carlson@des.nh.gov

Teresa Ptak
Program Assistant
(603) 271-8803
tptak@des.state.nh.us

NHDES Beach Program
29 Hazen Drive
P.O. Box 95
Concord, NH 03301-0095

Appendix D Sampling and Analysis Plan

Sampling and Analysis Plan

Sampling and Analysis Plans (SAPs) will be prepared by the Program Coordinator, reviewed and approved by the Bureau Administrator prior to field work, and a copy retained in the Beach Program files. A copy of the approved plan will be sent to the DES Quality Assurance Manager. The Program Coordinator is responsible for communicating the SAP and other QA/QC requirements to other field sampling staff that may be working on the project.

The SAPs will reference its parent Generic QAPP. Deviations from and stipulations not addressed in the Generic QAPP will be incorporated into the SAPs. These will include site information, rationale, project description and schedule, analysis, and reporting. Additional information will be considered and added when applicable. Also, the Program Coordinator will be responsible to locate or produce procedures for any deviations and stipulations, in particular, sampling and testing required for a project that is not described in the Generic QAPP, in which case the Bureau Administrator will review and approve. An example of possible information per deviation and/or stipulations is as follows:

Site Information

- Site map
- Sample location map
- Personnel identification and organization

Rationale

- Problem Definition
- Historic Data
- Matrix of Concern

Project Description and Schedule

- Sampling Design (sampling location, Sampling and Analysis Method/SOP requirements)
- Sampling Procedures and Requirements
- Data Analysis

Reporting

- To whom results and discussion are reported

Appendix E Public Notification and Risk Communication Plan

1.0 Problem Definition

The New Hampshire Department of Environmental Services' (NHDES) recognizes the public health threats associated with recreating in waters containing pathogenic organisms. As a result of this threat to public health, NHDES operates a Public Beach Inspection Program (Beach Program) during the swim season (mid-June to Labor Day). Beach inspectors monitor the water quality of all public beaches by collecting bacteria samples.

In accordance with Environmental Protection Agency (EPA) guidelines, New Hampshire uses indicator organisms to predict the presence of pathogenic organisms in surface waters of the state. Pathogenic organisms are those that cause waterborne diseases and result in illnesses to the water user.

NHDES has followed the EPA recommendations published in the *Ambient Water Quality Criteria for Bacteria-1986* that incorporate a bacterial standard for freshwater and coastal waters. The New Hampshire standard for public freshwater beaches is 88 counts of *E. coli* /100 mL in a single sample or a geometric mean of 47 counts/100 mL of at least 3 samples over a 60 day-period. The state standard at public coastal beaches is 104 counts of Enterococci /100 mL in a single sample or a geometric mean of 35 counts/100 mL of at least 3 samples over a 60-day period.

The program goals include increased public awareness and a higher level of public protection against pathogenic organisms. This can be achieved by communicating public health threats in a quick, effective manner.

Audience

New Hampshire coastal beaches are popular sites for out-of-town visitors. The majority of our coastal beaches attract tourists from the New England states, other areas of the country, and even from other countries. Some coastal beaches, while supporting use by out-of-town visitors, are great congregational areas for the towns' residents. New Hampshire's coastal beaches are also popular gathering places for families, local college students, field trips, festivals, and much more.

The state's freshwater beaches attract a variety of beach users as well. Some beaches are open only to town residents while others are used by residents, tourists, local schools, and summer camps.

The popularity of New Hampshire's beaches makes the protection of public health a main goal of the Beach Program. When sample analyses reveal an exceedance of water quality standards, public health may be compromised. A quick response to the public is necessary to warn swimmers of the potential health risks.

The first step in developing an effective notification plan is to determine the target audience.

Therefore, the Beach Program will need to identify the most appropriate means of communicating with the variety of beach users when samples exceed water quality standards at their respective beaches. Public notification to the target audience and the most appropriate means of communication are key elements to protect public health.

2.0 Types of Notifications

The Beach Program has established a process that details the factors used to determine a beach advisory (Beach Program Standard Operating Procedure for Beach Advisories). In addition to a DES beach advisory, local governments may issue beach closures. A beach closure may restrict all activities at that particular beach.

2.1 Beach Advisories

An advisory is a recommendation to the public to avoid water contact activities in areas where bacteria results exceed the state's water quality standards or when a potential toxic cyanobacteria scum is present. A beach advisory allows the public to recreate at the beach, but advises them to stay out of the water. Currently the Beach Program displays two types of advisories:

A *bacteria advisory* notifies the public that fecal bacteria levels exceeded state water quality standards during routine monitoring/inspections of beach areas.

A *cyanobacteria advisory* notifies the public of the presence of a potentially toxic cyanobacteria scum in the bathing area.

2.1 Lake Warnings

A *cyanobacteria lake warning* is issued when of the presence of a potentially toxic cyanobacteria scum in a lake without a public beach or on large lake which has areas far away from a public beach.

3.0 When to Notify

3.1 Beach Advisories

A beach advisory will be issued by the Beach Program when:

Enterococci levels exceed the state standard of 104 counts per 100 milliliters (mL) of water by greater than 70 counts in one sample, or when Enterococci levels exceed the state standard of 104 counts per 100 mL in two or more samples on one day, or when Enterococci levels exceed the geometric mean of 35 counts per 100 mL based on at least 3 samples obtained over a 60-day period. (NHDES collects two to three samples per beach per inspection depending on beach length.) Re-sampling will occur on the next business day following the return of elevated results as listed above. Resampling will occur on weekends only at coastal beaches managed by the Division of Parks and Recreation, per order of the Governor.

E. coli levels exceed the state standard of 88 counts per 100 mL of water by greater than 70 counts in one sample, or when *E. coli* levels exceed the state standard of 88 counts per 100 mL in two or more samples on one day, or when *E. coli* levels exceed the geometric mean of 47 counts per 100 mL based on at least 3 samples obtained over a 60-day period. Re-sampling will occur on the next business day for all situations stated above.

A dominant, potential toxin-producing cyanobacterial scum is present at the bathing area. Dominance is considered 50% or more of the cell count. A cell count is equivalent to a colony of cyanobacteria (most are colonial). Re-sampling will occur until dominance of the alga is determined to be less than 50% of the cell count.

3.2 Cyanobacteria Lake Warnings

A cyanobacteria lake warning will be issued when a potentially toxin-producing cyanobacterial scum is present in a lake away from a beach or if no beach is present. Dominance is either greater than 50% of the cell count is cyanobacteria or the cell concentration is greater than 70,000 cells per milliliter. Re-sampling will occur until dominance of the scum is determined to be less than 50% of the cell count or 70,000 cells per milliliter.

4.0 How to Notify

The Bureau Administrator, Program Coordinator, or Program Assistant will be responsible for issuing beach advisories. The Beach Program will also utilize other methods of public notification, such as a press release to a local newspaper or radio station, a posting on the Beach Program website, or a message on the Beach Program contact phone numbers if necessary.

Advisories are immediately issued upon published results from NHDHHS Laboratory Services. Once standards are exceeded, Beach Program personnel will contact the local health official, beach manager, or town administrator. Advisories are posted by the health official, beach manager, or Beach

Program personnel. Posting will occur at all access points to the beach. Town health officials, beach managers, or Beach Program staff will notify all lifeguards of the advisory.

4.1 Signs

The Beach Program has developed four signs for display at designated beaches. A yellow sign stating that the beach may not be suitable for swimming due to high bacteria is required to be posted during a beach bacteria advisory. A green sign is available to post at beaches notifying the public that the beach is monitored during the swim season and most recent samples did not exceed the state standards for fecal bacteria. A red sign is to be displayed at freshwater beaches to warn the public when a potential cyanobacteria scum is present. An orange sign is available to post at beaches or access points notifying the public that the area is not monitored on a routine basis by the Beach Program.

4.2 Web Site

A DES beach advisory webpage is available at <http://www2.des.state.nh.us/Advisories/Beaches/> and updated during the swim season. The page will include information about the reason for the advisory and the area affected. Beach Program contact information is also available on the webpage.

The Beach Program also uses a twitter feed to notify the public of advisory postings and removals. The address is www.twitter.com/NHDES_Beaches. The Beach Program provides information and data to the website on a regular basis during the summer months. Advisory information is posted on the website as soon as it is received.

4.2 Press Release

Cyanobacteria lake warnings will be issued as a press release in an effort to alert the public to the conditions on a lake. Unless special circumstances are presented, no press release will be issued for a beach advisory.

4.3 Technical Reports

The Beach Program produces an annual report listing all the beach advisories issued during the year. The report includes the beach name, number of advisories issued, duration of the advisories, and whether the advisories were due to excessive bacteria or the presence of cyanobacteria.

5.0 Notification Removal

Beach Program personnel will resample the beach until the bacteria concentration falls within the state's water quality standards. Once samples reflect data within the state standard for public beaches the advisory is removed either by the state or local officials.

If the advisory was issued due to the presence of cyanobacteria, the bathing area will be resampled until the cyanobacteria species is less than 50% of the total cell count. Removal of cyanobacteria lake warnings will also occur once the cyanobacteria presence in the lake is reduced below 50% or less than 70,000 cells per ml of water.

Public notification of advisory removal will be made through contact with the beach manager or local town official. The Beach Program website will be updated to indicate the advisory has been removed. Unless special circumstances are present, only removal of lake warnings will be issued via a press release.

6.0 Evaluation of Notification Process

Beach Program personnel will conduct evaluations to determine whether the notification process is effective. The Beach Program may conduct surveys with the public to determine which source of information (i.e., signs, hotline, press releases, and website) was most successful in public notification.

Beach Program personnel, along with local beach managers and town officials, will assess the effectiveness of the communication methods used in the notification process.

Comments or requests from local beach managers will be assessed to determine changes needed in the notification process.

7.0 Notification Report Submission and Delegation

The local government will be authorized by DES to post and remove signs at beaches during and after an advisory. If the local government determines that a beach closure is most appropriate, the town official or beach manager will be responsible for reporting this decision to the Beach Program Coordinator.

The NHDES Beach Program will be responsible for annual reporting of data, including the notification data, to the Environmental Protection Agency.

Appendix F Beach Program Tiered Monitoring Plan

1.0 Purpose

The New Hampshire Department of Environmental Services (DES) Beach Program has been monitoring water quality at public beaches for over twenty years. The Beach Program monitors coastal and freshwater beaches during its swim season from June through Labor Day. DES recognizes the threat of contracting water-borne diseases at public beaches and makes protecting public health its main priority. Protection of public health requires the identification of designated beach areas, evaluation of risks associated with a beach area, and the development of a sampling design specific for each beach.

The Beach Program's definition of a designated beach area is as follows:

"A public bathing place that comprises an area on a water body and associated buildings and equipment, intended or used for bathing, swimming, or other primary water contact purposes. The term includes, but is not limited to, beaches or other swimming areas at hotels, motels, health facilities, water parks, condominium complexes, apartment complexes, youth recreation camps, public parks, and recreational campgrounds or camping parks as defined in RSA 216-I:1, VII. The term does not include any area on a water body which serves 3 or fewer living units and which is used only by the residents of the living units and their guests."

2.0 Sampling Design

Coastal and freshwater designated beach areas will be considered primary contact recreation areas as defined by the most recent version of the New Hampshire 305(b)/303(d) Consolidated Assessment and Listing Methodology (CALM). Coastal areas identified as secondary contact recreation areas as defined by the CALM (Appendix A), are not subject to routine monitoring by the Beach Program and will not be evaluated, or assigned a Tier ranking. Refer to Appendix A for a list of coastal recreational waters and primary/secondary contact recreation areas.

Coastal waters throughout the state are surveyed to identify beach areas which comply with the above definition. Risk-based beach evaluations are performed for each designated beach area identified along the coast. Beaches will be evaluated using specific criteria for available information, pollution threats, sanitary survey information, exposure conditions, and monitoring data. Each beach will then be ranked and placed into a Tier I, Tier II, or Tier III category. Tier I beaches will be of the highest priority, while Tier II beaches will be of medium priority, and Tier III beaches will be of lower priority.

Freshwaters throughout the state are also surveyed for compliance with the designated beach definition. Freshwater beaches are not subject to risk-based evaluations and are placed into the Tier IV category. All youth recreation camps having a designated beach area are not subject to risk-based evaluations and are placed into the Tier V category. Freshwater and youth camp designated beach tier lists are maintained in the Environmental Monitoring Database's Beach Module.

Minimum sampling requirements vary for Tier I, Tier II, Tier III, Tier IV, and Tier V beaches (Table 1). Additional sampling will occur as needed (Table 2). Staffing to meet sampling requirements is consistent with the Generic Beach Program Quality Assurance Project Plan (QAPP) section A 4.0 Project Organization. Staff training abides by section A 8.0 Special Training/Certification of the QAPP.

Beaches meeting the minimum sampling requirements for their assigned tier will display a sign which indicates the beach is *Monitored* and most recent sampling met state water quality bacteria standards for swimming and recreation. Beaches that do not meet the tier designation for minimum sampling requirements will display a sign indicating the beach area is *Not Monitored* and bacteria levels are not sampled routinely by the NHDES Beach Program. When sampling indicated that water does not meet state standards for acceptable bacteria levels or an excessive amount of toxic cyanobacteria are present, signs indicating the beach is under *Advisory* must be displayed and cover the *Monitored* signs.

The Environmental Protection Agency's Clean Water Act (CWA) section 502(12), as amended by the BEACH Act, defines coastal recreational waters as:

"The Great Lakes and marine coastal waters (including coastal estuaries) that are designated under section 303(c) by a state or tribe for use for swimming, bathing, surfing, or similar water contact activities. Coastal recreation waters do not include either inland waters or waters upstream of the mouth of a river or stream having an unimpaired natural connection with the open sea" (US EPA, 2002).

The Beach Program is required to identify beaches or similar points of access along coastal recreational waters used for swimming or similar water-contact activities. Coastal designated beach areas were identified as primary contact recreation areas, or those waters suitable for recreational uses that require or are likely to result in full body contact and/or incidental ingestion of water.

The DES Beach Program has identified coastal recreational waters that support primary contact recreation areas (Table 3).

3.0 Quality Control

Quality assurance and quality control elements are consistent with sections A 7.0, A 7.1, B 4.0, and B 5.0 of the Beach Program QAPP.

4.0 Data Management

Data management elements are consistent with sections B 9.0, B 10.0, D 1.0, D 2.0, and D 3.0 of the Beach Program QAPP.

5.0 Program Assessment

Program assessment elements are consistent with sections C 1.0, and C 2.0 of the Beach Program QAPP.

Table 1: Tiered for New Hampshire Public Beaches with routine sampling activities

	Tier I	Tier II	Tier III	Tier IV	Tier V
Definition	Tier I beaches have been evaluated using the risk-based beach evaluation process and have been identified as beach areas where actual public health risks exist or intense public use occurs	Tier II beaches have been evaluated using the risk-based beach evaluation process and have been identified as beach areas where potential public health risks exist to those recreating at the beach.	Tier III beaches have been evaluated using the risk-based beach evaluation process and have been identified as beach areas where there are minimal to no public health risks to those recreating at the beach.	Tier IV beaches are all freshwater designated beach areas (excluding juvenile camps). They have not been evaluated and pose an unknown risk to those recreating at the beach.	Tier V beaches consist of all beach areas at juvenile recreation camps. They have not been evaluated and pose an unknown risk to those recreating at the beach.
Sampling Season	Season begins the day after Memorial Day. The season ends the day before Labor Day.			Sampling occurs June 15th through Labor Day.	Sampling occurs from the start of juvenile camp season through the end of juvenile camp season.
Minimum Swim Season Sampling Frequency	2 samples per station per week.	1 sample per station per week.	1 sample per station every other week.	1 sample per station once per month.	1 sample per station per season.
Designated Sample Location	a. Beach length \geq 100 ft.: 3 samples per beach at left, center and right locations. b. Beach length < 100 ft.: 2 samples per beach 1/3 of the distance from either end of the beach. c. Beach on flowing body of water: 3 samples per beach upstream, center, and downstream of the beach.				a. Beach of any length requires 2 samples per beach 1/3 of the distance from either end of the beach.
Sample Depth	Knee Depth				

Table 2: Triggers for additional sampling

Tier I	Tier II	Tier III	Tier IV	Tier V
Event: Water quality violation				
Actions: Public notification and re-sampling water.				Actions: Notify camp and re-sampling water.
Event: Sewage spill or pollution event				
Actions: Public notification and re-sampling water.				Actions: Notify camp and re-sampling water.
Event: Rain >1.0 inches in 24 hours at beaches with point sources such as culverts, drainage pipes, or CSOs				
Action: DES recommends that additional samples be collected after such rain events.				
Event: Surface scums observed				
Event not observed in coastal areas. No action necessary			Scum samples are collected and analyzed for the presence of toxic cyanobacteria. Advisories issued if indicated.	
Event: Waterfowl congregate on the beach or in the designated beach area				
Action: DES recommends that additional samples be collected if waterfowl congregate on the beach for long periods of time.				
Event: Marinas within 250 feet of beach area				
DES recommends additional samples be collected at beaches that are potentially impacted by marinas.		No actions necessary		

Table 3. Recreational Waters and associated Primary Contact Recreation Areas

Coastal Recreational Waters	Town	Primary Contact Recreation Area
Atlantic Ocean (Atlantic Coast/Gulf of Maine)	Hampton	Hampton Beach State Park North Beach Northside Park (a.k.a. Plaice Cove) Sun Valley Beach
	North Hampton	North Hampton State Beach
	Rye	Bass Beach Cable Beach Foss Beach Jenness Beach State Park Wallis Sands Beach at Wallis Road Sawyer Beach Star Island Beach Wallis Sands State Park
	Seabrook	Seabrook Town Beach
Hampton/Seabrook Harbor	Hampton	Hampton Harbor Beach
	Seabrook	Seabrook Harbor Beach
Portsmouth Harbor	New Castle	New Castle Town Beach

Appendix G Addendum #1: Volunteer Sampling
New Hampshire Department of Environmental Services
Beach Program
Generic Quality Assurance Project Plan
RFA #06193 Addendum #1
Volunteer Monitoring

1.0 Project Description

A New Hampshire Chapter of Surfrider Foundation was formed in 2006 with the main goal to monitor environmental health and organize local efforts to protect New Hampshire’s beaches. Surfrider and the New Hampshire Department of Environmental Services’ (NHDES) Beach Program recognize that volunteer water quality monitoring during the beach off season (Labor Day to Memorial Day) will provide a healthier recreational environment for surfers. The surfing population frequently chooses off season surfing as conditions are more favorable. Coastal beach water quality assessments are limited during the off season putting surfers at risk for contracting water borne illnesses. Volunteers select popular surfing beaches and collect beach water samples during the periods of September through November and March through May. Volunteers are provided a copy of and adhere to specifications of the NHDES Beach Program’s Generic Quality Assurance Project Plan (QAPP), RFA #06193, approved April, 2006, on file at EPA.

2.0 Project Personnel

The NHDES Beach Program Coordinator is responsible for project management and oversight of volunteer monitoring (Table 1). The Beach Program Coordinator is also responsible for documenting any deviations from the project plan and reporting deviations in the annual program audit. The Volunteer Field Coordinator, New Hampshire Surfrider Foundation, is responsible for field coordination of volunteers and acts as the liaison between volunteers and the Beach Program Coordinator (Table 1). The Volunteer Coordinator is responsible for communicating any problems that arise during beach sampling to The Beach Program Coordinator. All other project personnel, such as the PHL-WAL, follow the responsibilities listed in the Beach Program Generic QAPP. A current list of trained volunteer monitors is stored electronically in the Beach Program’s files and updated bi-annually.

Table 1. Project Personnel

Name	Title	Organization	Telephone Number	Email Address
Sonya Carlson	Beach Program Coordinator	NH DES	603-271-0698	sonya.carlson@des.nh.gov
TBD	Volunteer Coordinator	NH Surfrider Foundation	TBD	<u>TBD</u>

3.0 Monitoring Design

Beaches selected for volunteer monitoring are routinely monitored by the Beach Program from June 1st through Labor Day. Volunteer monitoring occurs from September through November and March through May, the beach “off” season. Beach sample station GPS coordinates are pre-established by the Beach Program. Volunteers maintain consistency with Beach Program sample stations. Volunteers collect one sample per established beach sample station at the select beach (es). If available, volunteers sample Jenness Beach State Park in Rye and North Beach in Hampton. Anticipated volunteer recruitment and growth may lead to additional beaches selected for monitoring. Additional beaches are selected based on the number of advisories during the swimming season. Sample collection occurs at a frequency of once per week, once every other week, or once per month, established by the Beach Program Coordinator and Volunteer Group based on volunteer availability. Monitoring design follows the basic design described in the Beach Program Generic QAPP, Section B 1.0. Random or ambient sampling does not require specific conditions to be met prior to sample collection (i.e. rainfall, tidal stage, bather load). An ambient monitoring schedule may be produced in

advance and revised as necessary due to volunteer, laboratory or program coordinator constraints (i.e. sampler availability, collection times, transportation). The ambient sample schedule must be submitted to and approved by the Beach Program Coordinator. Enhanced beach monitoring may include, but is not limited to, storm event monitoring, tidal stage monitoring and point source monitoring. Enhanced monitoring is at the discretion of the Volunteer Group and coordinated with the Beach Program Coordinator.

A beach inspection is performed during each monitoring event and volunteers complete the pre-populated beach inspection forms provided by the Beach Program. The inspection form and beach water samples are returned to NHDES within the required specifications listed in Table 3. Sterile bacteria bottles are provided by the NHDES Beach Program and are sterilized by the NHDHHS Laboratory Service Unit (Beach Program Generic QAPP, Section B 2.0, on file at EPA). Duplicate sample collection is performed by the Volunteer Group at a frequency of 10%. Trip blank samples are not required as sterile water is inaccessible prior to field deployment. Appropriate training measures emphasize cross contamination concerns and sample inspection prior to placement in the cooler for transportation. Sample transportation and laboratory delivery is the responsibility of the Volunteer Group and coordinated with the Beach Program Coordinator.

The Beach Program Coordinator is responsible for communicating sample results to the Volunteer Group. Sample results may require beach advisory postings to warn the public of potentially elevated bacteria levels. The Volunteer Group may be responsible for posting the beach advisories; signage is provided by the Beach Program. Additional sample collection may be required during a beach advisory event; usually occurring 24 hours after the advisory posting until bacteria levels are within the state standards for designated beaches. If additional sample collection cannot occur, the advisory will remain posted until the next ambient monitoring results are obtained.

4.0 Training Requirements

The Beach Program Coordinator or appropriately trained program personnel is responsible for training volunteers on sample collection techniques, transport and laboratory log-in. Training is held bi-annually according to the schedule in Table 2. All volunteers involved in sample collection are required to complete bi-annual training. Training is held at the beach(es) selected for volunteer monitoring. Volunteers are required to sign-in prior to training and must provide contact information (form located in Appendix A). Volunteers are required to sign off on the training form (Appendix A) upon training completion. A current list of volunteers, contact information, and training dates are stored electronically and updated bi-annually. Completed training forms are retained in Beach Program files for two years. A training evaluation form is provided for volunteer completion and retained in the Beach Program's files.

Table 2. Volunteer Monitoring Training Requirements

Project Function	Training Provided by	Training Schedule (per year)		Training Description
Bacteria Sample Collection	Beach Program Coordinator	March	September	Beach monitoring training will occur prior to sample collection in March and again prior to sample collection in September.

5.0 Sample Requirements

5.1 Sample Collection

Bacteria sample collection follows the Beach Program’s Standard Operating Procedure (SOP) for Bacteria Sample Collection (Beach Program Generic QAPP, on file at EPA). Water temperature collection follows the Beach Program’s SOP for Temperature Collection (Beach Program Generic QAPP, on file at EPA). Bacteria samples must meet the required specifications listed in Table 3.

Table 3. Sample Requirements

Activity	Sample Volume	Container Size and Type	Sample Preservation	Sample Holding Time	Duplicate Frequency	Absolute Difference Between Log-Transformed Values
Enterococci Sample Collection	250 mL	8 oz. sterile plastic bottle	Immediately put on ice	≤ 24 hours	10%	≤ 0.8

5.2 Sample Analysis

Samples are analyzed for Enterococci. All analyses are conducted by the NHDHHS Public Health Laboratory – Water Analysis Laboratory (PHL-WAL). The SOPs for bacteria sample analysis are on file at EPA. Enterococci using EPA Method 1600 (Beach Program Generic QAPP, on file at EPA). In the event that the media is unavailable from the supplier, the method for analysis will be Enterolert ASTM 6503-99.

5.3 Quality Assurance/Quality Control

Samples collected for this project meet measurement performance criteria as stated in the Beach Program Generic QAPP, Section A 7.0 (on file at EPA).

Precision-Field: The Beach Program Coordinator communicates any non-conformances with the stated duplicate absolute difference between log-transformed values to the Volunteer Group. Non-conformances is documented and stored in the Beach Program’s files, but will not result in questionable sample validity.

Accuracy/Bias-Field: Trip blanks are not collected for this project. Sample inspection upon Laboratory arrival will be required to ensure cross contamination has not occurred. Sample volume discrepancies (from the field to the laboratory) results in sample rejection. Sample rejection is recorded on the field data sheet.

Accuracy/Bias-Laboratory: Verification of Enterococci colonies are not performed for this project. The low sample size combined with only few positive results during the off season make Enterococci verification difficult.

Sample holding times are extended past eight hours for the purpose of this project due to volunteer availability and transportation time. Attainment of the eight hour holding time is stressed to volunteers and best efforts are made to meet that requirement.

5.4 Sample Custody

Volunteers are responsible for bacteria sample collection. Volunteers immediately pack samples on ice to initiate the preservation process. Throughout the transport process, samples should not be totally immersed in water. Volunteers transport samples to NHDES Limnology Laboratory in Concord, NH. Upon arrival volunteers inspect and reject samples for cross-contamination. Volunteers log-in and record transfer of samples using the log-in form in Appendix C. Volunteers may transport samples to NH DES coastal staff for delivery to NHDHHS Laboratory Services in Concord, NH.

6.0 Beach Advisory Actions

Enterococci samples are required to meet state standards for designated beaches as outlined in the Beach Program Generic QAPP (on file at EPA). Beach advisory postings must adhere to the SOP for Beach Advisories (Beach Program Generic QAPP, on file at EPA). Beach advisories are issued by the Beach Program Coordinator and communicated to the beach owner/manager and the Volunteer Group. Beach advisories are posted by the beach owner/manager. If the beach owner/manager is unavailable for advisory posting, advisories are posted by the Volunteer Group or the Beach Program. Beach advisories are also posted on the Beach Program's website at <http://www2.des.state.nh.us/Advisories/Beaches/> and the DES Twitter feed at http://twitter.com/NHDES_Beaches. If bacteria levels exceed standards and sample holding times exceed 8 hours, immediate re-sampling may be recommended. A beach advisory would only be issued in extraordinary circumstances.

7.0 Auditing Actions

Field sampling audits are performed by the Beach Program Coordinator bi-annually, once between March and May and once between September and November. Non-conformances with the QAPP or SOPs are documented, stored in the Beach Program's files, and corrective measures verbally communicated.

BEACH PROGRAM VOLUNTEER TRAINING FORM

*To be conducted by the Beach Program staff once before commencement of each sampling season
(Sheet to be filed by the Beach Coordinator in QA/QC files)*

DES Staff: _____ Volunteer _____ Training Site: _____
Date: _____ Time: _____

SAMPLING ISSUE	ASSESSMENT		COMMENTS
	Retrain	Good	
I. Preparation For Sampling			
1. Proper Equipment (Provided by DES)			
Sterile bacteria bottles			
Cooler with ice			
Regular and waterproof pens			
Thermometer			
Preprinted station labels.			
Shoulder length polyethylene gloves			
Sampling pole (optional)			
2. Number of Bottles for "Routine" Sampling Event (Provided by DES)			
Pack 2 to 3 sample bottles per beach for bacteria collection			
Extra sample bottles in case of contamination or pollution sources			
3. Proper Paperwork			
Field Data Sheets – 1 per beach, <i>clipboard</i>			
Three ring binder with Beach Program SOPs and QAPP			
Fact sheets			
Laboratory Log-in Forms			
Beach Coordinator/Beach Inspector business cards			
II. Sample Collection			
1. Bacteria Sample Collection			
Bottles labeled with site, station, date, time			
Use thermometer to measure water temperature at each sample location			
Bottle cap removed just prior to sample collection			
Inside of bottle cap or neck not touched			
Sample bottle was not rinsed			
Care taken to ensure no cross-contamination of the sample – sample area undisturbed, sample motion away from body, water flow towards body			
Proper sampling technique was followed: a u-shaped motion at least 1 foot below water surface and sample collected at knee depth of water			
Samples collected at correct stations			
If known or suspected sewage contamination at beach, samples collected using a sampling pole and/or shoulder length gloves as described in Beach Program SOP for			

SAMPLING ISSUE	ASSESSMENT		COMMENTS
	Retrain	Good	
Bacteria Sampling			
Samples immediately put on ice			
2. Field Duplicates			
Duplicate samples collected for 10% of samples			
Bottles labeled correctly: sample site, duplicate, date, time			
Duplicate sample obtained immediately after original: both sample bottles brought to sample station			
Just prior to sample collection, bottle cap removed and inside of bottle cap or neck was not touched			
Sample bottle was not rinsed			
Care taken to ensure no cross-contamination of the sample – <i>sample area undisturbed, sample motion away from body, water flow towards body</i>			
Proper sampling technique was followed: a u-shaped motion at least 1 foot below water surface and sample collected at knee depth same as original			
Sample immediately put on ice			
III. Paperwork			
1. Proper Paperwork Completed/Distributed			
Complete all sections of the field data sheet			
Complaint forms are filled out if necessary			
Fact sheets are distributed if necessary			
IV. Sample Handling/Custody			
1. Sample Log-in			
Samples are returned to the Laboratory within proper holding times and on ice			
Sample log-in and custody sheet is filled out completely			
Sign custody section of form to relinquish samples to the laboratory			
Notify laboratory personnel that samples are relinquished – <i>lab personnel must review log-in sheet and sign</i>			
V. Corrective Actions			
Did the Program Coordinator notify the trainee that methods need improvement? (Elaborate if “Yes”) Yes _____ No _____			
Did the Program Coordinator re-train the in the area(s) where improvement was needed? (Elaborate if “Yes”) Yes _____ No _____			

Signature (Trainee): _____
Date: _____

Signature (Coordinator): _____
Date: _____

Volunteer Training Signature & Registration Form

*The Volunteer acknowledges attendance at the training session and agrees to adhere to specific requirements outlined in the Beach Program Quality Assurance Project Plan and Volunteer Addendum
(Hard copies distribute to volunteers at training)*

Name	Signature & Date	Address	Phone	Email

Field Data Sheet

Beach Inspection Form

Date: _____ **Inspector:** _____

Lab ID:		EPA ID:		Beach:				Town:	
Time:	Weather:			Inspection Type: Initial Subsequent Advisory Safety Complaint Off Season					
Station ID	Water Level	Water Conditions	Water Temp	# Bathers	# Dogs	# Birds	# Other	Dup?	Comments

