Sanitary Survey Report
For Little Bay,
New Hampshire

December 2018

New Hampshire Department of Environmental Services
Water Division
Watershed Management Bureau

R-WD-19-13

Sanitary Survey Report For Little Bay, New Hampshire

Prepared by
Chris Nash, NHDES Shellfish Program Manager
Katherine Allman, Shellfish Program Specialist

NH Department of Environmental Services
29 Hazen Drive, Concord, New Hampshire 03301
(603) 271-3503 | https://www.des.nh.gov

Robert R. Scott, Commissioner
Clark Freise, Assistant Commissioner

December 2018

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Table of Contents

List of Figures

List of Tables

Acknowledgements

The New Hampshire Department of Environmental Services (NHDES) Shellfish Program wishes to thank the following people for their assistance with the field work and laboratory analyses used to prepare this report:

Carina Pearson, Angela Piemonte, Brooke Dejadon, Stefanie Giallongo, Brian Hauschild, and Mary Lenehan of the NH Department of Environmental Services.

Michael Eastman of the New Hampshire Fish and Game Department.

Mona Freese, Rachel Rainey, Denise Ambelas, Phillip Schuld, Oliver Beaumont, and Jayne Finnigan of the New Hampshire Department of Health and Human Services.

Amy Fitzpatrick, Valerie Potopsingh, David Lamoreaux, Greg Goblick, Kevin Calci and Yaping Ao of the US Food and Drug Administration.

Tim Bridges of the US Environmental Protection Agency.

Max Driscoll, Dave Lovely and Dan Peterson of the Town of Durham wastewater treatment facility.

Paula Anania, Tim Babkirk and Terry Desmarais of the City of Portsmouth Department of Public Works.

Sam Heffron of the Town of Newmarket wastewater treatment facility.

Steve Dalton of the Town of Exeter wastewater treatment facility.

Citizen volunteers Cody Cartnick and Eric Schroeder.

Dave Shay, Stephen Jones, Kari Hartman and Meghan Hartwick of the UNH Jackson Estuarine Laboratory.

The work of the NHDES Shellfish Program is funded by state general funds and by a grant from the U.S. Environmental Protection Agency.

I. Executive Summary

This report describes the results of a sanitary survey for Little Bay, New Hampshire, conducted in accordance with National Shellfish Sanitation Program (NSSP) guidelines. In July 2005, the NHDES published a sanitary survey of the area. Since that time, annual and triennial updates have been conducted on the growing area, resulting in periodic modifications to the growing area classification. NSSP guidelines state that a new sanitary survey should be conducted on a shellfish growing area every 12 years. This report summarizes data collected through the end of 2017.

Work for the sanitary survey began with a review and modification of the existing shellfish management area boundary. Updated digital tax maps were obtained where available, and property records for those lots within the revised management area were updated in the NHDES Environmental Monitoring Database (EMD). The entire shoreline of the Little Bay growing area was inspected by Shellfish Program staff in 2016 and 2017. Descriptions of each property and any new or existing pollution sources were updated in the EMD. Plans to evaluate, inspect, and/or sample all pollution sources were developed and implemented to allow for evaluation of sanitary conditions. Ambient monitoring of sites under a systematic random sampling program, as well as additional water sampling under various environmental conditions, was conducted.

The results of the sanitary survey indicate that the eastern third of Lower Little Bay (Dover Point to Broad Cove) should be included in a Prohibited/Safety Zone for the Portsmouth wastewater treatment facility, as well as for Great Bay Marine, the Little Bay Boat Club, and the Broad Cove mooring field. The remainder of Lower Little Bay, from Broad Cove to a line between Fox Point and Durham Point, should be classified as Conditionally Approved. The Conditionally Approved area should be placed in the closed status following rainfall events of more than 1.50 inches, as well as in response to significant discharges of raw or partially treated sewage from the Durham, Dover, or Portsmouth wastewater treatment facilities. A seasonal closure of this area is necessary for the period of early October to late March of each year, until the Portsmouth wastewater treatment facility upgrade to more advanced treatment is completed. Most of the area of Upper Little Bay, from a line between Fox Point and Durham Point, extending south to Adams Point, should be classified as Conditionally Approved. The Conditionally Approved area should be placed in the closed status following rainfall events of more than 1.50 inches, as well as in response to significant discharges of raw or partially treated sewage from the Durham, Dover, or Portsmouth wastewater treatment facilities. Three sections of Upper Little Bay cannot be classified as Conditionally Approved. The mouth of Branson Creek, as well as the area of Welsh Cove, should each be classified as Restricted because of the possibility of intermittently high bacteria levels. The area around the Adams Point North mooring field should be classified as Prohibited/Safety Zone because of the possibility of contamination (boat sewage and/or poisonous and deleterious substances) from the vessels moored at that location.

II. Introduction

The New Hampshire Department of Environmental Services (NHDES), under the authority granted by RSA 143:21, RSA 143:21-a and RSA 487:34, is responsible for classifying shellfish growing waters in the State of New Hampshire. The purpose of conducting shellfish water classifications is to determine if growing waters meet standards for human consumption of molluscan shellfish. The primary concern with the safety of shellfish growing waters is contamination from human sewage, which can contain a variety of disease-causing microorganisms. Shellfish pump large quantities of water through their bodies during normal feeding and respiration processes. During this time, shellfish also concentrate microorganisms that may include pathogens and a positive relationship between sewage pollution of shellfish growing areas and disease has been demonstrated many times (ISSC, 2017).

Though testing shellfish growing waters and/or shellfish meats for the pathogenic microorganisms themselves would seem to be the most direct method of determining whether or not growing waters meet consumption standards, several factors preclude this approach. Perhaps the most important is that the number of pathogens that may be in sewage is large, and laboratory methods that are practical, reliable, and cost effective are not available for all of the pathogens that may be present. Therefore, shellfish water classifications are based on evidence of human sewage contamination, which may include direct evidence (identification of actual pollution sources) or indirect evidence (elevated or highly variable indicator bacteria levels in the growing waters). If such evidence is found, then pathogens may be present, and the area is closed to harvesting. Areas may also be closed if contamination from animal waste or poisonous/toxic substances is found.

Under the authority granted by RSA 143:21, RSA 143:21-a and RSA 487:34, NHDES uses a set of guidelines and standards known as the National Shellfish Sanitation Program (NSSP) for classifying shellfish growing waters. These guidelines were collaboratively developed by state agencies, the commercial shellfish industry, and the federal government in order to provide uniform regulatory standards for the commercial shellfish industry. The NSSP is used by NHDES to classify all growing waters, whether used for commercial or recreational harvesting, because these standards provide a reliable methodology to protect public health. Furthermore, RSA 485-A:8 (V) states that “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 Food and Drug Administration.”

The key to the accurate classification of shellfish growing areas is the sanitary survey. The principal components of a sanitary survey include: (1) an evaluation of pollution sources that may affect the areas, (2) an evaluation of the meteorological and hydrographic factors that may affect distribution of pollutants throughout the area, and (3) an assessment of water quality. The development of each of these components was originally presented in the first sanitary survey for Little Bay, published July 2005 (Nash and Wood, 2005). The NSSP requires a new sanitary survey every 12 years. This report presents findings for a new sanitary survey for Little Bay.

III. Description of Growing Area

Little Bay is part of the Great Bay Estuary, the largest estuary in New Hampshire. Upper Little Bay begins at Adams Point in Durham, New Hampshire, and extends to Fox Point, where Lower Little Bay begins (Figure 1). Lower Little Bay extends to the east to the General Sullivan and Spaulding Turnpike bridges, where it meets the Piscataqua River at Dover Point. In comparison to Great Bay, Little Bay is a narrow, deep channeled, waterbody that is largely bordered by mud flats. At Dover Point, the channel is nearly 1,500 feet wide and approximately 30 feet deep, while deeper sections of the bay are nearly 70 feet deep at low tide. Little Bay includes approximately 1,834 acres of tidal waters, with 14 miles of tidal shoreline.

Land surrounding Little Bay is lightly developed or undeveloped. Developed areas along the shoreline are primarily large lot, single family residences. There are some commercial uses in Lower Little Bay near the General Sullivan Bridge, including two marinas and a restaurant. There are several commercial aquaculture operations in Little Bay, most of which focus on oyster farming. These are discussed below. Septic systems/leach fields are the predominant means of sewage disposal, except for the northeastern side of Lower Little Bay in Dover, which has municipal sewer. There are no direct municipal wastewater treatment facility discharges in Little Bay; however, the Durham and the Dover municipal WWTFs discharge to tidal tributaries of the Great Bay system, and dye studies of these facilities demonstrate that they have the potential to affect water quality in Little Bay (Nash and Bridges, 2003; Nash, Carr, and Bridges, 2005). A 2012 hydrographic dye study of the Portsmouth municipal WWTF on Peirce Island (Ao et al., 2017) showed that a low tide disinfection failure at this primary treatment could result in insufficiently diluted effluent reaching the Little Bay growing area during the first flood tide. In 2015 some classification changes were implemented, including expansion of the Prohibited/Safety zone in Lower Little Bay, and new conditions for recreational harvesting in the Conditional Area Management Plan. Specifically, the Management Plan now includes a restriction of recreational harvesting to Saturdays only, 9am to sunset, during the harvesting season. This restriction gives NHDES time to react to a Friday-overnight disinfection failure and implement a temporary harvest closure when needed. No adjustments to commercial harvesting were needed because commercial harvesters must gain NHDES permission for each harvesting event. When the Portsmouth WWTF is upgraded to secondary treatment over the next several years, its influence on Little Bay will be re-examined.

All but two commercial oyster aquaculture farms in coastal New Hampshire are located in Little Bay. In 2017 there were 21 licensed farms ranging in size from 1.5 to 4.5 acres (Figure 1), plus four additional sites licensed for the operation of upwellers to raise young oyster spat. Applications for several new aquaculture sites are expected in 2018. Larvae are acquired through a hatchery with an accompanying pathology certification (MSX and Dermo free) and are typically set on the aquaculture sites in the spring. All aquaculturists are required to contact the Shellfish Program prior to harvest to verify the open/closed status of the growing waters.
Land use for the 236 properties within the Little Bay Management Area is summarized in Table 1.

Table 1: Land Use for Properties in the Little Bay Management Area

	Agricultural	Commercial Industrial	Marina Mooring	Other	Residential	Vacant
Durham	3	0	3	4	64	1
Dover	0	1	4	2	60	7
Newington	3	1	5	2	66	10
TOTAL	6	2	12	8	190	18

Perhaps the most significant pollution sources with the potential to affect the management area are the nearby municipal wastewater treatment facilities. The Durham WWTF discharges to the Oyster River, which empties into Little Bay. The Dover WWTF discharges to the Upper Piscataqua River, which in turn flows into Little Bay at Dover Point. The Portsmouth WWTF is located much farther from the growing area than the Durham and Dover facilities; however, a 2012 hydrographic study of its outfall and effluent illustrate that this large, primary treatment facility can affect Little Bay water quality following a significant lapse in disinfection (Ao et. al, 2017). Subsequent studies documenting indicator virus concentrations in Portsmouth WWTF effluent have shown this facility has a chronic impact on virus levels in Little Bay that warrant a seasonal (cold weather) shellfish harvest closure. Although these influences are expected to lessen once the facility is upgraded to secondary treatment, they must be discussed in the present report for Little Bay. Each of these facilities is described in greater detail in Section IV., C of this report.

Little Bay provides recreational oyster (American oyster, *Crassostrea virginica)* harvesting opportunities in New Hampshire, although the resource is substantially less than it once was. The number of adult oysters in the entire estuary decreased from over 25 million in 1993 to 1.2 million in 2000. Since 2012, the population has averaged 2.1 million oysters, which is 28% of the Piscataqua Region Estuaries Partnership (PREP) goal for oyster recovery by 2020. This shows a decline from the previous reporting period (2009-2011), which averaged just over 2.8 million oysters (Piscataqua Region Estuaries Partnership, 2018). Other shellfish species such as softshell clam (*Mya arenaria*) and blue mussels (*Mytilus edulis)* are also present in scattered locations, but few comprehensive datasets are available.

A sanitary survey for Little Bay, developed in accordance with National Shellfish Sanitation Program guidelines, was initially published in July 2005 (Nash and Wood 2005). Figure 2 illustrates the most recent classifications of the area, taken from the 2016 Little Bay Management Area Annual Report (Nash, 2017).

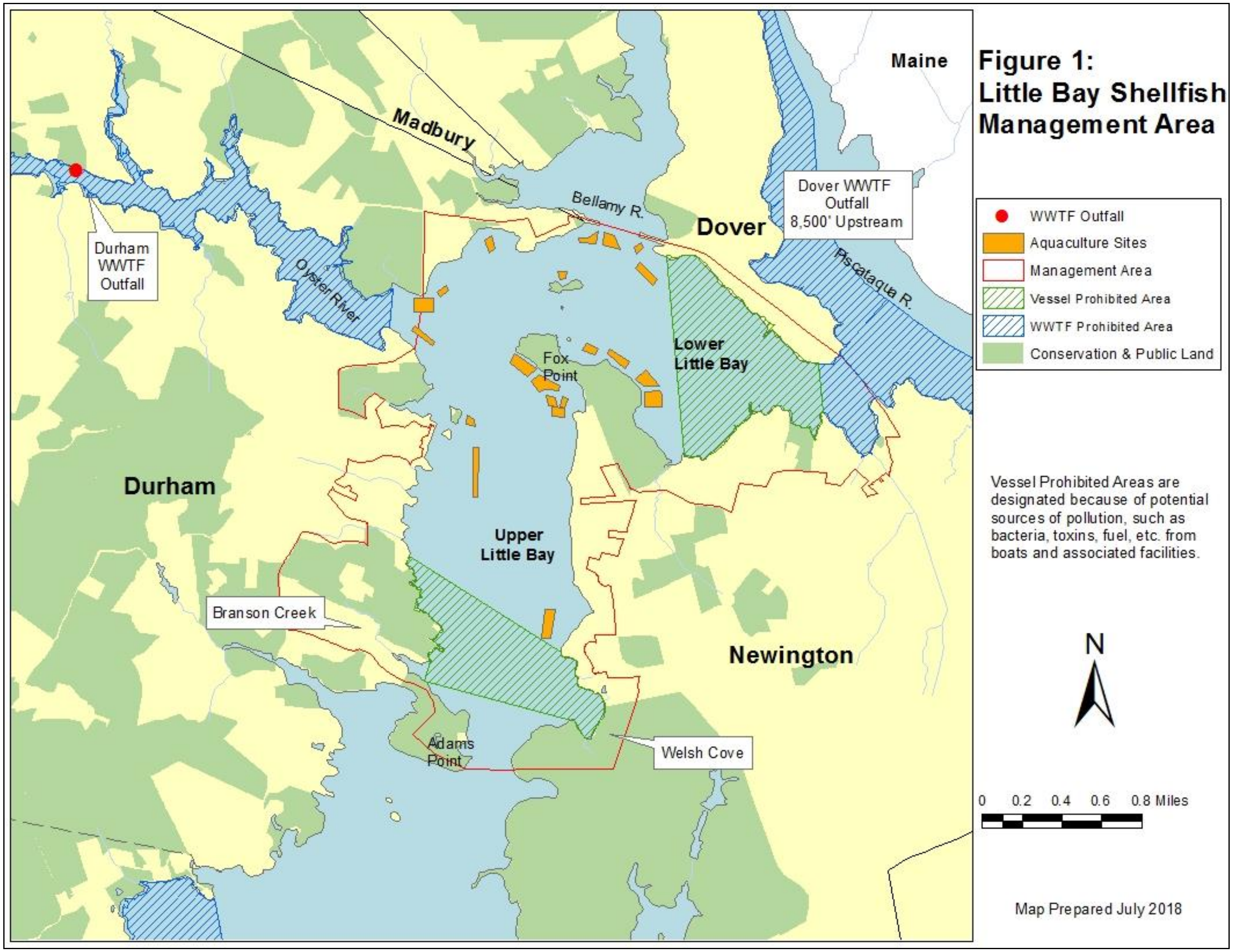


Figure 1:
Little Bay Shellfish Management Area
Maine
Madbury
Bellamy R.
Dover
Dover WWTF Outfall 8,500' Upstream
Durham WWTF Outfall
Oyster River
Piscataqua R.
Fox Point
Lower Little Bay
Durham
Upper Little Bay
Branson Creek
Newington
Adams Point
Welsh Cove
WWTF Outfall
Aquaculture Sites
Management Area
Vessel Prohibited Area
WWTF Prohibited Area
Conservation & Public Land
Vessel Prohibited Areas are designated because of potential sources of pollution, such as bacteria, toxins, fuel, etc. from boats and associated facilities.
N
0 0.2 0.4 0.6 0.8 Miles
Map Prepared July 2018

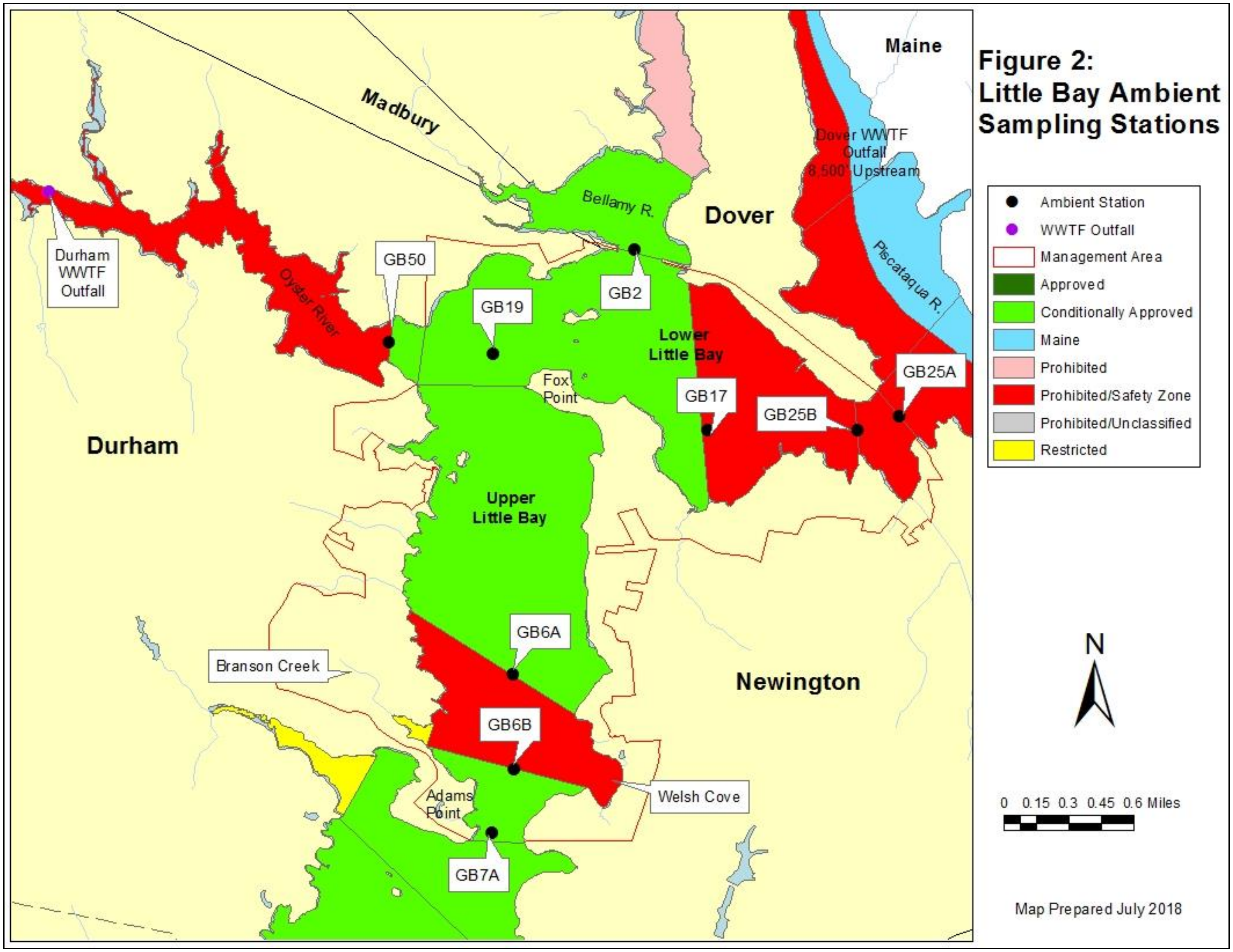


Figure 2:
Little Bay Ambient Sampling Stations
Maine
Madbury
Dover
Durham
Newington
Bellamy R.
Oyster River
Piscataqua R.
Dover WWTF Outfall 8,500' Upstream
Durham WWTF Outfall
GB50
GB19
GB2
Lower Little Bay
Fox Point
GB17
GB25B
GB25A
Upper Little Bay
GB6A
Branson Creek
GB6B
Welsh Cove
Adams Point
GB7A
Ambient Station
WWTF Outfall
Management Area
Approved
Conditionally Approved
Maine
Prohibited
Prohibited/Safety Zone
Prohibited/Unclassified
Restricted
N
0 0.15 0.3 0.45 0.6 Miles
Map Prepared July 2018

IV. Pollution Source Survey

Survey Area and Methodology

The shoreline survey for the present study was principally done in 2017. The survey focused on tidal shoreline properties. After review of the management area boundary, minor adjustments were made to the boundary to place emphasis on properties directly adjacent to the growing waters, which include all tidally influenced portions of Upper and Lower Little Bay and portions of its tributaries. Updated digital tax maps for the Towns of Durham, Madbury, Newington and Dover were obtained from municipalities and GIS software was used to compile a list of the properties inside the revised management area boundary. The properties and pollution sources that were no longer inside the management area and deemed to pose no risk to the growing waters were archived in the NHDES Environmental Monitoring Database (EMD) and were not inspected as part of the 2017 survey. Records for all properties within the revised management area boundary were reviewed and organized to prepare for a shoreline survey. Properties that had been subdivided since the last survey, according to tax map records, were flagged to be deactivated in the EMD and replaced with the list of new properties. The records of the deactivated properties were not deleted, but rather their waterbody designation was changed to “Archive” in order to exclude these properties from future Little Bay queries while preserving the historical property and pollution source information in the database.

Lot-by-lot walkthrough inspections of all properties within the management area boundary were completed by NHDES Shellfish Program Staff. Each property’s land use was checked against existing records and each known pollution source was re-inspected and/or sampled. Every property inspection also included a search for new sources not previously documented. Sevety-three pollution sources were previously identified in this management area in the 2005 sanitary survey. The 2017 survey resulted in the identification of four additional potential pollution sources, including two 3-inch PVC pipes that drain outdoor seawater research tubs at UNH Jackson Estuarine Laboratory, and two 2-inch PVC pipes that emanate from a stone wall on Cedar Point, which appear to be drains to allow water to pass through the wall. Source locations are illustrated in Figure 3.

Some pollution sources were targeted for sampling under specific weather conditions, based on previous data. Flow measurements were taken where practical and appropriate. Homes bordering the growing area were visually evaluated for malfunctioning septic systems, discharging pipes, outhouses, and other potential sources of pollution. Water samples were collected in sterilized Nalgene bottles, labeled, and kept on ice in coolers until deliver to the Department of Health and Human Services (DHHS) Water Analysis Laboratory in Concord, NH. Once all of the data had been collected and evaluated, previous categorization of each source as actual, potential, investigatory, or investigated/clean was reviewed based on the following criteria:

- Actual Pollution Source is a known source of pollution and is, or is capable of, causing a violation of NSSP microbiological standards for approved shellfish growing waters. A source can only be described as “Actual” if (1) It has been found to have consistently high bacteria levels and (2) It is determined, beyond a reasonable doubt, that the source is polluting, or capable of polluting, the surrounding area, e.g. a WWFT outfall or failing septic system. Actual pollution sources must be re-sampled and re-evaluated a minimum of every three years.

- Potential Pollution Source is a source that has the potential to infrequently and/or unpredictably release contaminants to the surrounding shellfish growing waters at levels that are in violation of NSSP bacteriological standards. Examples would include sources such as pipes, streams, road swales, etc. During an initial shoreline survey, all sources found will be classified as potential until further bacterial investigations can be conducted. Potential pollution sources must be re-evaluated, through sampling or other means, at least every three years.
- Investigatory Pollution Source is a source that meets the definition of “Potential” but has no likely means of impacting shellfish growing waters. Investigatory sources will not be followed up on in as much detail or in as timely a manner as “Potential” sources. Investigatory sources will be used to track down unexplained elevated bacterial values at ambient sampling stations. Examples would include sources like old broken pipes, salt marsh pannes, indirect sources far up in the watershed, sources within a prohibited area (WWTF safety zone), and sources that cannot be sampled (pipe with no outlet, or fuel dock).
- Investigated/Clean Source is a source that was initially identified in the field survey as a possible pollution source, but sampling data and /or other relevant information has shown that it does not have the capability of generating pollution sufficient to cause an exceedance of NSSP standards in nearby growing waters.

Sampling of identified pollution sources was carried out mainly during the 2017 field season, with additional sampling during the 2018 field season.

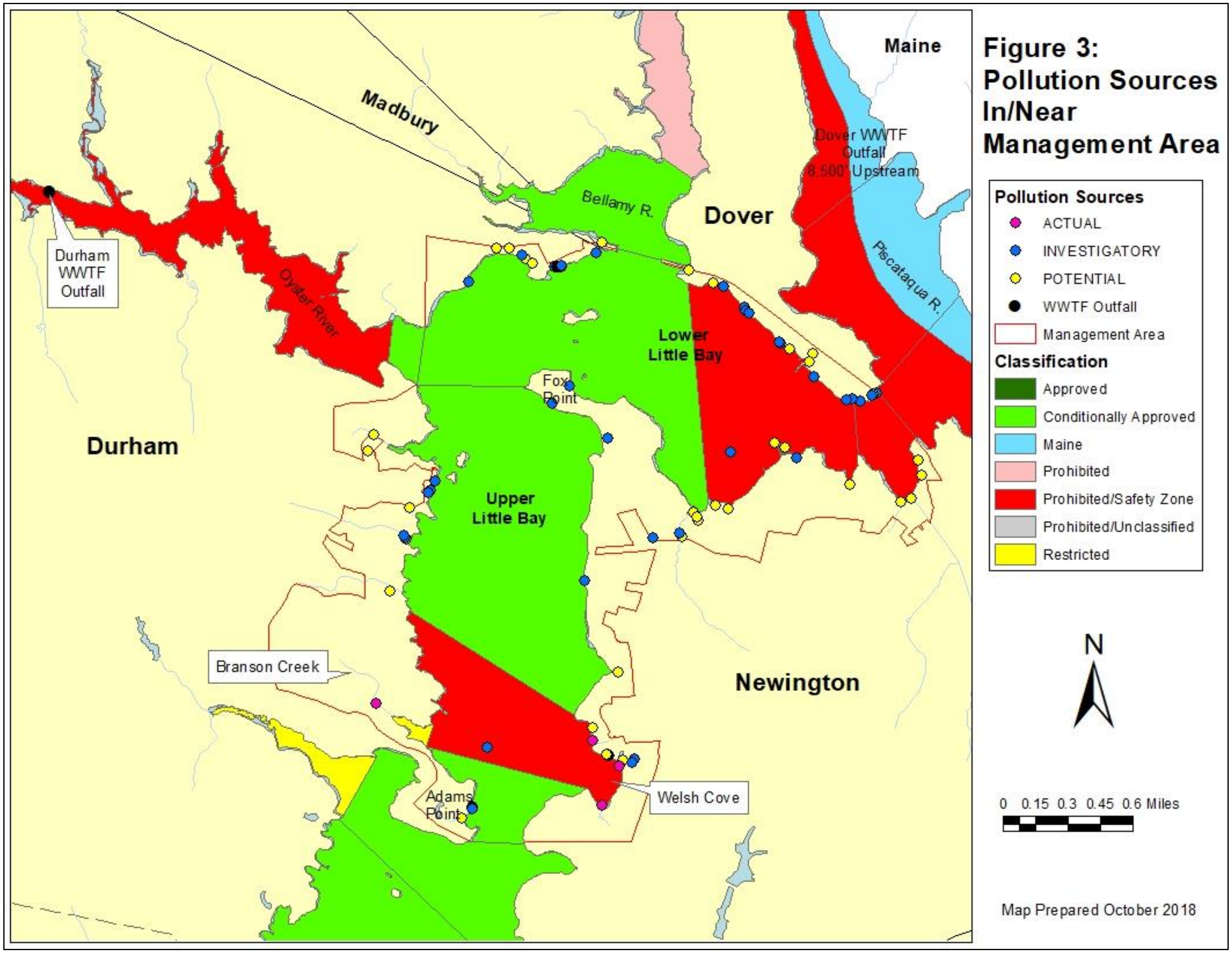


Figure 3:
Pollution Sources In/Near Management Area
Pollution Sources
ACTUAL
INVESTIGATORY
POTENTIAL
WWTF Outfall
Management Area
Classification
Approved
Conditionally Approved
Maine
Prohibited
Prohibited/Safety Zone
Prohibited/Unclassified
Restricted
N
0 0.15 0.3 0.45 0.6 Miles
Map Prepared October 2018
Maine
Madbury
Dover WWTF Outfall 8,500' Upstream
Bellamy R.
Dover
Piscataqua R.
Durham WWTF Outfall
Oyster River
Lower Little Bay
Fox Point
Durham
Upper Little Bay
Branson Creek
Newington
Adams Point
Welsh Cove

B. Summary of Sources and Locations

The property survey involved the on-site inspection of 236 shoreline properties, as well as a few non-shoreline properties which were in the survey area. Many of these properties are residential with on-site septic systems or municipal sewer, with the exception of some vacant/forested lots and some agricultural lots. Although not directly within the growing area, the Durham, Dover, and Portsmouth WWTFs were identified as sources of potential pollution that could adversely affect the sanitary quality of the growing waters. In 2002, a dye study to examine dilution and dispersion of the Durham WWTF effluent resulted in the delineation of a Prohibited area around the outfall, with an adjacent conditionally approved area (condition relating to proper WWTF performance). In 2017, a second dye study was conducted on the Durham WWTF in order to update the knowledge of this facility's impact on adjacent waters. An ebbing tide dye/dilution study of the Dover wastewater treatment facility effluent's impact on the Lower Piscataqua River and Little Bay was conducted in 2004. In 2012, a hydrographic dye study was conducted on the Portsmouth WWTF on Peirce Island. Construction of a new secondary facility on Peirce Island began in 2016 and is expected to continue until the end of 2019. The new facility will be bound by the terms of its new NPDES permit in April 2020. In the meantime, the facility remains a primary treatment facility. Information from the dye study and from sampling of the facility indicates that, under failure conditions, insufficiently diluted effluent would reach the Little Bay growing area. Previous shoreline investigations resulted in the detection of 73 pollution sources. An additional 49 sources have been identified since the original sanitary survey. The majority of these sources are mooring fields, tidal creeks/streams/wetland discharges, or pipe discharges.

A sampling plan was developed for each source to evaluate bacterial loading under dry and/or wet weather conditions. Dry weather samples were collected only after a period of at least three consecutive days with less than 0.25 inches of rainfall. Wet weather samples were collected following rainfall events of 0.25 inches or more, although in practice higher rain amounts were targeted. Sampling results for all of the potential sources of pollution are summarized in Appendix I. Most of the potential sources of pollution were found to be of little significance in terms of bacterial contamination of shellfish waters. Many showed no flow, even after repeated site visits after significant rainfalls. Some sources, however, may represent significant public health threats to the growing waters. A summary of sampling results for pollution sources is presented in Table 2. Location of these pollution sources is illustrated in Figure 3.

Table 2: Fecal Coliform (/100ml) Sampling Data for Pollution Sources

Station ID	Source Description	Range of Dry Weather FC/100mL	Range of Wet Weather FC/100mL
LLBPS001	Stormwater Outfall	no flow	no flow
LLBPS002	Stormwater Outfall	no flow	1,870 (one sample)
LLBPS003	Stormwater Outfall	no flow	< 10-90
LLBPS004	Pipe	no flow	no flow
LLBPS005	Stormwater Outfall	no flow	no flow
LLBPS006	Stormwater Outfall	no flow	< 10-19,000 (3 samples)
LLBPS007	Lobster Tank Discharge	< 10-2.5	< 10-60
LLBPS008	Stormwater Outfall	567.5- >20,000	58 - >20,000
LLBPS009	Stormwater Outfall	no flow	40-2900
LLBPS010	Pipe	no flow	no flow
LLBPS011	Pipe	no flow	no flow
LLBPS012	Stormwater Outfall	no flow	no flow
LLBPS013	Foundation Drain	0- < 10 (2 samples)	0-70
LLBPS014	Stormwater Culvert	60 (1 sample)	10-1500
LLBPS015	River	60-200 (2 samples)	0-10 (2 samples)
LLBPS016	Stormwater Outfall	no flow	4,900 (1 sample)
LLBPS017	Pipe	no flow	no flow
LLBPS018	Groundwater Seep	no flow	< 10 (1 sample)
LLBPS019	Road Culvert	< 10-160 (2 samples)	20- >20,000
LLBPS020	Road Culvert	170-4600	170- >20,000
LLBPS021	Stormwater Culvert	0- < 10 (2 samples)	0-3500
LLBPS024	Road Culvert	no flow	1,260-7,500 (2 samples)
LLBPS025	Perennial Stream	< 5-440	Sep-00
LLBPS026	Man-Made Pond Outlet	< 10-35	0-1800
LLBPS027	Pipe	no flow	no flow
LLBPS028	Road Culvert	no flow	200-5700
LLBPS029	Intermittent Stream	20-110	10- >2000
LLBPS030	Intermittent Stream	10-127.5	20-1200
LLBPS031	Foundation Drain	no flow	no flow
LLBPS032	Foundation Drain	< 10-147	< 10-160
LLBPS033	Foundation Drain	no flow	358 (1 sample)
LLBPS034	Intermittent Stream	no flow	200- >1,800 (2 samples)
LLBPS035	Stormwater Outfall	6.8- < 10	0-9100
LLBPS036	Tidal Creek	5-220	30-610

Station ID	Source Description	Range of Dry Weather FC/100mL	Range of Wet Weather FC/100mL
LLBPS037	Tidal Creek	< 10-510	100-2,800
LLBPS038	Perennial Stream	< 10-320	60-1,800
LLBPS039	Stormwater Outfall	< 10-20	980- >2,000
LLBPS040	Stormwater Outfall	no flow	850-15,000 (2 samples)
LLBPS041	Stormwater Culvert	< 10-10 (2 samples)	130-2700
LLBPS042	Foundation Drain	no flow	200-2740 (2 samples)
LLBPS043	Marina	< 10-33	no data
LLBPS044	Marina	< 10 (1 sample)	9 (1 sample)
LLBPS045	Marina	< 9-49	no data
LLBPS046	Mooring Field	10 (1 sample)	no data
LLBPS047	Road Culvert	no flow	1,100-6,500 (2 samples)
LLBPS048	Pipe	no flow	280 (1 sample)
LLBPS049	Pipe	no flow	no flow
LLBPS050	Pipe	no flow	no flow
LLBPS051	Pipe	no flow	no flow
LLBPS052	Pipe	no flow	no flow
LLBPS053	Pipe	no flow	no flow
LLBPS054	Pipe	no flow	no flow
LLBPS055	Pipe	no flow	no flow
LLBPS056	Pipe	no flow	9 (1 sample)
LLBPS057	Pipe	no flow	no flow
LLBPS058	Pipe	no flow	no flow
LLBPS059	Pipe	no flow	no flow
LLBPS060	Pipe	no flow	no flow
LLBPS061	Pipe	no flow	no flow
LLBPS062	Pipe	no flow	no flow
LLBPS063	Pipe	no flow	< 9 (1 sample)
LLBPS064	Pipe	no flow	no flow
LLBPS065	Pipe	no flow	no flow
LLBPS066	Pipe	no flow	no flow
LLBPS067	Pipe	no flow	no flow
LLBPS068	Road Culvert	no data	3300 (1 sample)
LLBPS069	Pipe	no data	50 (1 sample)
LLBPS070	Mooring Field	< 10 (1 sample)	no data
LLBPS071	Mooring Field	< 10 (1 sample)	no data
LLBPS072	Mooring Field	< 10 (1 sample)	no data
LLBPS073	Mooring Field	< 10 (1 sample)	no data
LLBPS074	Mooring Field	no data	no data
LLBPS075	Pipe	no data	no data

Station ID	Source Description	Range of Dry Weather FC/100mL	Range of Wet Weather FC/100mL
LLBPS076	Pipe	no data	no data
ULBPS001	Perennial Stream	1.8-79	4.5-650
ULBPS001A	Perennial Stream	< 2-< 10	< 2-9
ULBPS002	Stormwater Outfall	no flow	no flow
ULBPS003	Man-made Pond Outlet	< 10-30	40-280 (3 samples)
ULBPS004	Stormwater Outfall	<10 (1 sample)	no flow
ULBPS005	Intermittent Stream	1-240	1.8-950
ULBPS006	Pipe	no flow	< 9 (1 sample)
ULBPS007	Foundation Drain	no flow	no flow
ULBPS008	Foundation Drain	no flow	1,120 (1 sample)
ULBPS009	Foundation Drain	no flow	> 20,000 (1 sample)
ULBPS010	Intermittent Stream	2-110	20-10,300
ULBPS010A	Intermittent Stream	< 2- < 10	< 2-70
ULBPS010B	Intermittent Stream	< 2- < 9	< 2-20
ULBPS011	Pipe	6,500 (1 sample)	490-1,640 (2 samples)
ULBPS012	Perennial Stream	9-120	0-820
ULBPS013	Foundation Drain	no flow	no flow
ULBPS014	Road Culvert	no flow	no flow
ULBPS015	Foundation Drain	no flow	50 (1 sample)
ULBPS016	Intermittent Stream	4.5-13	30- > 20,000
ULBPS016A	Intermittent Stream	< 2-13	9-49 (2 samples)
ULBPS017	Intermittent Stream	< 2-550	580-2100
ULBPS017A	Intermittent Stream	< 2-17 (3 samples)	21-30 (2 samples)
ULBPS018	Intermittent Stream	< 5-40	< 10-1280
ULBPS019	Pipe	< 2- < 10	5-20
ULBPS020	Pipe	no flow	no flow
ULBPS021	Pipe	< 2- < 10	0-9
ULBPS022	Foundation Drain	no flow	no flow
ULBPS023	Pipe	no flow	no flow
ULBPS024	Foundation Drain	no flow	no flow
ULBPS025	Perennial Stream	2- > 1,600	2-18,100
ULBPS025A	Perennial Stream	< 2-4.5	< 2-20
ULBPS025B	Perennial Stream	< 2 (1 sample)	< 2-9 (3 samples)
ULBPS026	Road Culvert	4.5-7.8	4.5-11,300
ULBPS026A	Culvert (026), Stream (028)	2 - 7.8	7.8 - 9 (2 samples)
ULBPS027	Foundation Drain	no flow	no flow
ULBPS028	Intermittent Stream	9-1,500	20-6,400
ULBPS029	Mooring Field	< 10 (1 sample)	no data

Station ID	Source Description	Range of Dry Weather FC/100mL	Range of Wet Weather FC/100mL
ULBPS030	Intermittent Stream	< 2-2100	79-340
ULBPS030A	Intermittent Stream	< 2-20	2-410
ULBPS030B	Intermittent Stream	30-60 (2 samples)	80-210 (3 samples)
ULBPS030C	Intermittent Stream	< 10 (2 samples)	50-160 (3 samples)
ULBPS031	Foundation Drain	no flow	30 (1 sample)
ULBPS032	Foundation Drain	no flow	no flow
ULBPS033	Pipe	no samples listed in EMD (probable no flow)	no samples listed in EMD (probable no flow)
ULBPS034	Pipe	no samples listed in EMD (probable no flow)	no samples listed in EMD (probable no flow)
ULBPS035	Mooring Field	10 (1 sample)	no data
ULBPS036	Mooring Field	no data	no data

C. Identification of Pollution Sources

The following summarizes information on the potential pollution sources listed in Appendix I and Appendix II. These are categorized as Permitted NPDES Wastewater Discharges, Wastewater Treatment Infrastructure, Other Domestic Waste Discharges, Stormwater Outfalls, Road Culverts, Tidal Creeks, Tidal Rivers, Intermittent Streams, Marinas and Mooring Fields, Agricultural Sources, Wildlife Areas, Industrial Wastes, and Dredging.

Permitted NPDES Wastewater Discharges

Perhaps the most significant pollution sources with the potential to affect the growing area are the nearby municipal wastewater treatment facilities. No WWTFs discharge directly to Little Bay. The Durham WWTF discharges to the Oyster River, and the Dover WWTF discharges to the Piscataqua River. The Portsmouth WWTF discharges to the Piscataqua River and is located farther from the growing area than the Durham and Dover outfalls, but a 2012 hydrographic study of its outfall and effluent (Ao et al., 2017) illustrated that this large, primary treatment facility can affect Little Bay water quality following a significant lapse in disinfection. Although this influence is expected to lessen once the facility is upgraded to secondary treatment, it must be included in the present report for Little Bay.

Durham Wastewater Treatment Facility

The Durham Municipal Wastewater Treatment Facility (NPDES No. NH0100455) provides secondary treatment to wastewater from residents and businesses in the Town of Durham, as well as wastewater from the University of New Hampshire. The treatment plant is designed for a flow of 2.5 million gallons per day (mgd) and utilizes an activated sludge process, including secondary clarifiers, chlorine disinfection, scum collection, and sludge disposal. The outfall is an open pipe (no diffuser) in the Oyster

River and is located below the low tide line. In anticipation of limits on nitrogen in the next NPDES permit, the facility has been retrofitted in the aeration tanks with systems to remove nitrogen.

The most recent NPDES permit for Durham became effective on January 29, 2000 and expired on January 29, 2005. An application for permit renewal was received by EPA on June 11, 2004 and is still under review. The most recent compliance inspection report by the NHDES Wastewater Engineering Bureau (April 2017 shows no significant deficiencies in regards to effluent bacteria concentrations, plant flow levels, or operation of the disinfection system. Review of the facility's MORs shows the facility routinely meets its bacteria permit limits. Plant flows show seasonal characteristics, with highest values in the spring.

The permit sets limits on a number of parameters, including BOD, TSS, pH, fecal coliform, total residual chlorine, and others. Whole Effluent Toxicity Testing is required four times per year, and the permit requires the facility to immediately notify NHDES/Watershed Management Bureau/Shellfish Program in the event of a lapse in treatment at the WWTF or from the sewage collection system.

As raw sewage enters the plant, it flows into a grit removal chamber, and then moves through the following treatment steps:

Primary settling: four tanks (63,334 gallons each)
Aeration: four tanks (192,500 gallons each; typically 2-3 tanks online)
Clarification: two tanks (248,700 gallons each; only one used in low flow conditions)
Disinfection: two chlorine contact tanks (38,400 gallons each)

The plant has little capacity to hold/store treated sewage. The plant operator indicates that under the best circumstances (low flow, one aeration and one clarifier tank offline and therefore available for use as storage vessels) the plant might be able to hold a half day of treated effluent. Sludge is dewatered on site and transported for composting in Holderness, NH. Industrial users include the University of New Hampshire (although no industrial discharges, only sewage, are permitted to the system) and a minor discharge from Heidleberg-Harris Printing (approximately 13 gallons of pre-treated process water per day).

Disinfection is achieved with sodium hypochlorite and sodium bisulfite for dechlorination. Contact time is typically 1.5 hours when both tanks are online. A maximum of 3,000 gallons of sodium hypochlorite is stored on site, which typically provides for 2.5 months of disinfection. Chlorine injection pumps are backed up, and both primary and backup pumps are operational even in the event of a loss of power at the facility. The chlorine contact tanks are cleaned every 1-2 weeks.

The plant is staffed Monday-Friday, 8 hours per day, and checked every morning on the weekends and holidays (3 hours). Staff is on-call 24 hrs/day and typically responds in less than one hour of notification in the event of a problem at the plant. Loss of power, abnormally high flows, etc., trigger alarms that are tied to the police station, which in turn results in staff notification. Chlorination pump failures/abnormal chlorine residuals are also alarmed.

Table 3: Durham WWTF Flow and Bacterial Monitoring Data (from Monthly Operations Reports)

Month	2015 Flow (MGD)		2015 Fecal Coliform (per 100ml)		2016 Flow (MGD)		2016 Fecal Coliform (per 100ml)		2017 Flow (MGD)		2017 Fecal Coliform (per 100ml)	
	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Avg.	Num. of Samples >43 per 100ml	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Avg.	Num. of Samples >43 per 100ml	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Avg.	Num. of Samples >43 per 100ml
Jan	0.55	1.07	1.1	0	0.58	1.48	1.2	0	0.67	1.42	1	0
Feb	0.74	1.08	1.2	0	0.85	1.99	0	0	0.85	2.18	1.1	0
Mar	0.67	1.93	1.0	0	0.68	1.60	1.0	0	0.63	1.79	1.1	0
Apr	1.11	2.43	1.1	0	0.90	1.58	1.0	0	0.93	2.63	1.1	0
May	0.41	1.10	1.1	0	0.43	1.09	1.0	0	0.77	1.76	1.4	0
Jun	0.41	0.98	1.2	0	0.38	0.66	0	0	0.59	1.04	1.1	0
Jul	0.48	0.89	1.5	1 (491)	0.38	0.73	1.1	0	0.46	0.71	1.1	0
Aug	0.42	0.84	1.0	0	0.39	0.87	1.2	0	0.43	1.01	1.1	0
Sep	0.75	1.36	0	0	0.64	1.07	1.4	0	0.83	1.18	1.1	0
Oct	0.70	1.40	1	0	0.62	1.60	3.2	4 (51,125, 74,46)	0.79	1.71	1.0	0
Nov	0.43	1.19	1.1	0	0.55	1.45	1	0	0.49	1.19	1.1	0
Dec	0.59	1.02	0	0	0.45	1.75	1	0	0.45	1.01	1.0	0

A hydrographic dye study was initially conducted on the Durham WWTF in 2002 (Nash and Bridges, 2003). That study involved a relatively short (3-hour) injection time of dye into the effluent stream, and surface tracking of dye on the ebbing tide using fluorometers towed behind boats. That study established that insufficiently diluted effluent from the WWTF arrived at Bunker Creek after three hours and at the mouth of the Oyster River after four hours. A new hydrographic dye study of the Durham WWTF was conducted in May 2017. This study was designed to incorporate different injection and data analysis protocols more recently adopted in the NSSP, namely, a 12.4 hour injection of dye, in-situ measurements of dye concentration at fixed stations to allow for estimation of steady-state dilution, mobile fluorometer tracking, and vertical profiling of dye concentration at selected locations. The data from the 2017 study is currently under review and will be formulated into a report to help better understand the possible effects of the WWTF on the nearby growing waters. However, a preliminary review of the surface tracking data indicates a faster transport of insufficiently diluted dye than what was observed in the 2002 study. The in-situ fluorometer, moored in approximately 10 feet of water just downstream of Bunker Creek, registered dye at 9:50am (approximately 2.5 hours after slack high tide at the WWTF). Surface tracking data indicated the dye was present at this location before 9:50am. The in-situ fluorometer moored in approximately 15 feet of water at the mouth of the Oyster River, just downstream of Wagon Hill Farm, registered dye at 1:54pm (a little more than six hours after slack high tide at the WWTF). Surface tracking data indicated the dye was present at this location well before that time, with surface dye measurements observed around 10:15, about three hours after the time of high tide at the WWTF. Additionally, concurrent measurements of dye concentrations at the surface versus depth in the Oyster River itself indicate higher dye readings on the surface. Estimation of steady state dilution shows that bottom water dilution was over 1,000:1 at the mouth of the river during the study (note the WWTF flow was rather high, at approximately 1.5 mgd). However, it is likely that steady state surface and shallow-water dilution was probably less. Additional discussion of the 2017 study and its implications for classification is presented in Section IV., D of this report.

Dover Wastewater Treatment Facility

The Dover Municipal Wastewater Treatment Facility (NPDES No. NH0101311) is a secondary wastewater treatment facility located on the Upper Piscataqua River approximately 2.8 miles north (upstream) of Dover Point, Dover, New Hampshire. This facility has a design flow of 4.7 mgd, employs an activated sludge treatment process, and uses ultraviolet light for disinfection, with a backup chlorination disinfection system available. The outfall was originally a multiport diffuser, 260 feet long with 53 three-inch ports and a dilution factor of 78:1 under low tide conditions. Sedimentation and plugged/buried ports were corrected in a winter/spring 2004 outfall rehabilitation project which involved sediment dredging around the outfall, and construction on the outfall to include the installation of 26 duckbill pinch valves, along with the concurrent elimination/plugging of 27 ports. Dilution from the rehabilitated outfall is estimated to be greater than 100:1. Water depth at the outfall is in the range of 10-15 feet at low tide.

The most recent NPDES permit for Dover became effective on October 1, 2006 and expired on September 30, 2011. An application for permit renewal is under review. The most recent compliance inspection report by the NHDES Wastewater Engineering Bureau (December 2016) shows no significant deficiencies in regards to effluent bacteria concentrations, plant flow levels, or operation of the disinfection system. Review of the facility's Monthly Operations Reports shows the facility routinely meets its bacteria permit limits. Review of the facility's Monthly Operations Reports shows the facility routinely achieves suitable disinfection (Table 4).

The permit sets limits on a number of parameters, including BOD, TSS, fecal coliform, and several metals. In addition, Whole Effluent Toxicity (WET) testing is done annually using Mysid Shrimp and Inland Silversides. All tests are performed by an in-house, NELAC-certified laboratory. The plant is required to immediately notify NHDES/Watershed Management Bureau/Shellfish Program in the event of a discharge of raw or improperly treated sewage, as well as incidents of improperly disinfected effluent or invalid effluent test results. The plant is staffed by eight employees for nine hours per day during the week, and one to three hours on each weekend day. Four staff members are on-call with an automated dialer/pager system.

Following initial grit removal at the River Street pump station, raw effluent flows into the treatment plant and through the following treatment steps:

> Primary clarification: two tanks (315,000 gallons each; typically only one in use)
> Aeration: four tanks (252,000 gallons each)
> Secondary clarification: two tanks (713,000 gallons each; usually only one in use)
> Disinfection: Disinfection is achieved with a Trojan 3000 Plus, which is comprised of two channels (each sized to handle a flow of eight mgd). Each channel has two banks of UV lights.

Under typical operating conditions, effective disinfection is achieved with one channel operating, using one bank of lights operating at 60-100% of full UV intensity. The clarity of effluent entering the disinfection system is continuously monitored. If light transmission drops below 65%, the automated system will adjust by increasing the intensity of light banks already on and/or turning on the other light bank in the active channel. If flows approach 8 mgd, the system will activate the second channel. The facility is designed to handle a peak flow of approximately 16 mgd. Depending on flow conditions, the plant operator estimates that the facility has the capacity to store 1,500,000 gallons of flow if needed. The facility receives approximately 165,000 gallons of industrial effluent, for which pretreatment is required.

The plant is staffed Monday-Friday, 7am-3:30 pm. One staff member is typically at the plant on both weekend days, usually in the morning for approximately four hours, and the plant is checked every morning on the weekends. Staff is on-call 24 hrs/day. Issues at the WWTF (high flow, loss of power, etc.) are detected by the SCADA systems, which notifies the on-call staff.

Table 4: Dover WWTF Bacterial Monitoring Data (from Monthly Operations Reports)

Month	2015 Flow (MGD)		2015 Fecal Coliform (per 100ml)		2016 Flow (MGD)		2016 Fecal Coliform (per 100ml)		2017 Flow (MGD)		2017 Fecal Coliform (per 100ml)	
	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Geo-mean	Num. of Samples >43 per 100ml	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Geo-mean	Num. of Samples >43 per 100ml	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Geo-mean	Num. of Samples >43 per 100ml
Jan	2.11	2.94	11.61	1 (220)	2.41	6.83	3.89	0	2.22	7.73	6.77	2 (50, 70)
Feb	1.84	2.30	5.33	0	2.37	4.75	3.86	1 (50)	2.00	5.53	3.52	0
Mar	1.93	5.47	6.03	1 (50)	2.77	4.55	3.61	0	2.15	4.72	5.3	2 (50,110)
Apr	2.67	7.17	4.00	0	2.40	4.69	2.94	0	2.97	7.84	13.7	5 (50,80, 300,59, 280)
May	1.71	2.77	6.89	1 (80)	2.04	3.01	3.93	1 (50)	2.97	5.62	9.38	5 (300, 1600,59, 130,50)
Jun	1.81	3.75	6.06	2 (50, 50)	1.97	3.03	3.00	0	2.27	4.14	4.95	1 (170)
Jul	1.76	2.86	2.97	0	1.82	3.05	3.96	0	2.05	2.80	3.04	0
Aug	1.82	2.72	6.41	2 (110, 130)	1.22	2.14	5.01	1 (50)	2.01	3.69	3.29	0
Sep	1.46	4.09	4.15	0	1.48	2.30	5.78	1 (80)	1.83	3.02	10.09	3 (220, 500, 70)
Oct	1.83	3.22	4.93	1 (50)	1.65	3.81	5.66	0	1.64	4.46	4.88	1 (500)
Nov	1.95	3.08	5.46	2 (50, 90)	1.71	3.25	4.7	1 (50)	1.92	2.63	2.00	0
Dec	2.12	3.59	8.52	3 (50,86, 500)	1.87	4.00	4.3	1 (50)	1.89	2.36	3.4	0

There is an increased incidence of high fecal coliform in finished effluent in 2017. Facility staff attributes this to a combination of rainfall-related high flow events and processes related to operating a new nitrogen removal system, which requires more solids on hand. The higher solids levels can interfere with the effectiveness of UV disinfection.

An ebbing tide dye/dilution study of the impact of the Dover wastewater treatment facility effluent on the Lower Piscataqua River and Little Bay was conducted in September 2004 (Nash, Carr, and Bridges, 2005). The dye study determined that the Prohibited area should encompass an area in the Piscataqua River from the unnamed cove approximately 1,800 feet south of the powerline crossing to the red navigational buoy near Seal Rock. As time and resources allow, the dye study on the Dover facility should be revisited, using updated procedures and protocols to identify the steady state 1,000:1 dilution area.

Portsmouth Wastewater Treatment Facility

The Portsmouth Municipal Wastewater Treatment Facility is a 4.8 mgd primary treatment facility that discharges to the Lower Piscataqua River. Although the outfall is located several miles away from Great Bay, a 2012 hydrographic study (Ao et. al, 2017) illustrated that a disinfection failure occurring at low tide could result in insufficiently diluted effluent reaching Little Bay in approximately 4.5 hours.

The most recent NPDES permit (NH0100234) for the Portsmouth WWTF became effective on August 1, 2007 and expired on July 31, 2012. A new permit has not yet been issued. The most recent compliance inspection report by the NHDES Wastewater Engineering Bureau (August 2017) shows no significant deficiencies in regards to effluent bacteria concentrations or operation of the disinfection system. Review of the facility's Monthly Operations Reports shows the facility routinely meets its bacteria permit limit (Table 6), but frequently exceeds its design flow. The City of Portmsouth is currently operating under a consent decree to upgrade the existing primary treatment facility to secondary treatement. Construction is slated to begin in 2017. Because the process of upgrading the Portsmouth WWTF to secondary treatment will involve a substantial amount of time and money, the City has been given interim permit limits by the EPA. The new permit will not become active until the construction of a new secondary treatment plant is completed. Although the WWTF routinely exceeds its design flow of 4.8 mgd, their interim permit limits only require that they report effluent flow volumes. Therefore, as long as they report flow levels, they are in full compliance with their permit (S. Larson, NHDES Wastewater Engineering Bureau, personal communication).

In December 2012, the U.S. Food and Drug Administration and NHDES conducted a hydrographic dye study of the Portsmouth municipal WWTF on Peirce Island (Ao et.al, 2017). The 2012 study includes a simulation of a hypothetical disinfection failure at the WWTF, using an effluent fecal coliform concentration assumption of 1,000,000 FC/100ml. This rather high assumption is based on repeated sampling of pre-disinfection effluent at the facility, and is much higher than an assumption that would be appropriate for a secondary treatment facility. The 2012 study indicates that for a disinfection failure occurring at slack low tide, insufficiently diluted effluent would reach Little Bay during the first flooding tide, in approximately 4.5 hours, and would travel throughout Little Bay during that first flood tide. Dye concentrations in Lower Little Bay were higher than those observed in Upper Little Bay, where dye patches were more diffuse and diluted. Observed dilution was not enough to dilute effluent with 1,000,000 FC/100ml (a very high assumed fecal coliform concentration, deemed reasonable because Portsmouth is not currently a secondary treatment facility) down to 14 FC/100ml. For this reason, recreational harvest in Little Bay is now only allowed on Saturdays, 9:00am-sunset. This management strategy affords the City of Portsmouth and NHDES sufficient time to detect WWTF operational problems that might occur on Friday evening/early Saturday morning. If such problems result in the discharge of high bacteria effluent, NHDES can implement and communicate a harvest closure to recreational harvesters in a timely manner.

When the new secondary facility is operational, the classification of this area can be revisited because the assumed FC concentration of effluent under a disinfection failure scenario will probably be much lower than 1,000,000 FC/100ml.

Table 5: Portsmouth WWTF Flow and Bacterial Monitoring Data (from Monthly Operations Reports)

Month	2015 Flow (MGD)		2015 Fecal Coliform (per 100ml)		2016 Flow (MGD)		2016 Fecal Coliform (per 100ml)		2017 Flow (MGD)		2017 Fecal Coliform (per 100ml)	
	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Avg.	Num. of Samples >43 per 100ml	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Avg.	Num. of Samples >43 per 100ml	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Avg.	Num. of Samples >43 per 100ml
Jan	3.028	7.107	1.1	0	3.60	12.17	1.1	0	3.772	7.908	1.1	0
Feb	2.82	5.194	1.1	0	3.318	9.265	1.1	0	3.143	10.990	1.1	0
Mar	2.722	9.83	1.0	0	4.275	9.022	1.4	0	3.468	8.127	1.0	0
Apr	4.355	14.74	1.3	1 (43)	3.172	6.367	1.1	0	4.297	14.487	1.2	1 (60)
May	2.715	4.221	1.1	0	2.632	4.298	1.1	0	4.069	11.187	1.3	1 (115)
Jun	2.596	9.323	1.3	0	2.421	5.398	1.3	0	3.086	5.807	1.0	0
Jul	2.635	5.234	1.2	0	2.387	4.427	2	2 (194, 249)	2.465	4.104	1.1	0
Aug	2.535	4.353	1.4	0	2.308	3.767	1.3	1 (59)	2.331	5.305	1.2	1 (44)
Sep	2.319	9.032	1.2	0	2.113	4.223	1.5	2 (86, 78)	2.268	5.216	1.2	0
Oct	2.466	6.309	1.2	0	2.213	8.122	1.3	1 (135)	2.190	7.534	2.0	1 (75)
Nov	2.524	6.277	1.1	0	2.634	5.588	1.0	0	2.562	3.992	1.1	0
Dec	2.787	7.248	1.0	0	2.819	8.861	1.3	1 (80)	2.580	3.959	1.1	0

Another issue with respect to Portsmouth's influence on Little Bay water quality is the chronic loading of viruses to the estuary. The December 2012 dye study of the Portsmouth WWTF included multiple measurements of male-specific coliphage in the effluent. Male-specific coliphage (MSC) is a viral indicator, used as a means to assess the possible presence of viral pathogens in municipal wastewater streams. The December 2012 study found very high levels of MSC in Portsmouth effluent. This prompted a more robust, multi-year characterization of MSC concentration and variability in Portmouth effluent to examine MSC levels under various operational conditions. The multi-year study also included periodic measurements of MSC levels in Little Bay seawater and shellfish tissue, in order to gauge possible public health risks to consuming shellfish that may be affected by Portsmouth effluent.

The multi-year study showed that Portsmouth effluent typically has MSC concentrations well over 10,000 plaque-forming units per 100ml, and sometimes approached 1,000,000 pfu/100ml (Figure 4). This is a very high value compared to MSC levels in other coastal WWTFs, all of which employ more advanced treatment technologies. MSC values at these secondary treatment facilities typically range from <10 – 250 pfu/100ml, and rarely exceed a value of 1,000 pfu/100ml. Current NSSP guidance for well-run secondary treatment facilities calls for a Prohibited zone around the outfall large enough to provide a minimum of 1,000:1 dilution. Applying that dilution value to typical secondary treatment effluent MSC concentrations, the NSSP guidance would call for MSC concentration in the seawater at the Prohibited area boundary to be in the range of 250/1000 = 0.25 MSC/100ml. In the case of Portsmouth, the December 2012 dye study established a steady-state dilution value of approximately 4,600:1 at entrance to Little Bay at Dover Point. Achieving a 0.25 MSC/100ml in Dover Point seawater would mean Portsmouth effluent should not exceed 1,150 MSC/100ml. The muli-year study documented that Portsmouth effluent routinely exceeds this amount, often by a factor of 100. Indeed, seawater MSC concentrations in Little Bay, particularly in the cold weather months when MSC persists in the environment, are typically in the range of 10-40 pfu/100ml (Table 6). This is particularly concerning because the persistence of MSC in the seawater first occurs in the fall, when cooling water temperatures prompt more vigorous feeding activity in shellfish, leading to a more pronounced bio-accumulation of virus particles in their gut. This tissue accumulation was consistently documented in Little Bay shellfish during the fall/winters of 2013-2017.

The combination of high MSC concentration in Portsmouth effluent, insufficient dilution at Dover Point, and unacceptably high MSC concentration in seawater entering Little Bay during the fall and winter months, prompted NHDES to implement a seasonal closure of Lower Little Bay and the Bellamy River in October 2018. The seasonal closure will be lifted on April 1, 2019. A similar closure will be implemented October 2019-March 2020. The Portsmouth WWTF upgrade to secondary treatment, which is expected to dramatically reduce effluent MSC levels, is scheduled for completion in April 2020. The continuation of seasonal cold-weather closures in Lower Little Bay will be revisited once MSC levels in effluent from the upgraded facility are confirmed.

Figure 4: Comparison of MSC Wastewater Concentration in the Portsmouth and Durham Wastewater Treatment Facilities

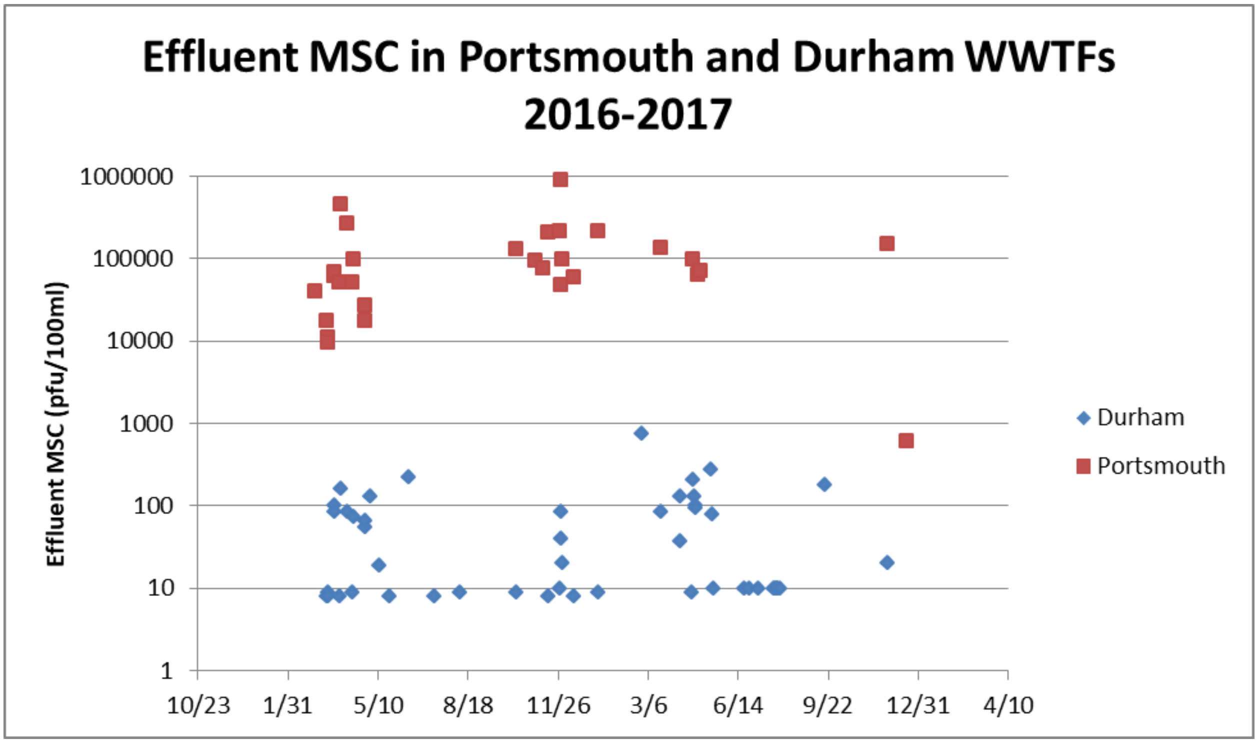


Table 6: Fall/Winter MSC Concentration in Little Bay Seawater

Year	Date	Little Bay Seawater MSC Concentration (pfu/100ml)
2016	10/11/16	5
	10/26/16	5
	11/2/16	30
	11/9/16	5
	11/28/16	25
	12/1/16	40
	12/13/16	10
2017	10/2/17	4.9
	10/11/17	10
	11/8/17	5
	11/27/17	10
	12/19/17	2.4
2018	2/14/18	15
	3/20/18	4.9

Wastewater Treatment Facility Infrastructure

In case of a discharge of improperly treated or raw sewage from a WWTF or from sewage collection infrastruction such as pump stations or sewer lines, WWTF staff is required to immediately contact the NHDES Shellfish Program.

In 2017, the Town of Durham reported no sewage overflow events, although they did have one instance of 56,000 gallons of undisinfected effluent discharged to the Oyster River. A May 2017 thunderstorm disrupted chlorine pumps. The City of Dover reported three instances of sewage overflows. Two occurred in the Bellamy River watershed, and the other occurred in the Cocheco River watershed. None were large enough to have affected Little Bay water quality. The City of Portsmouth reported six instances of sewage discharge. Most were minor in nature, although a February incident involving discharge of 58,000 gallons of raw sewage was significant. A contractor hit a 24-inch sewer line on Peirce Island, near the WWTF, with an excavator. Discharge went into the nearby Piscataqua River (Prohibited).

In 2016, the City of Dover reported two incidents of sewage overflow. One was a 1,000-gallon discharge in the upper reaches of the Bellamy River watershed, far from the Conditionally Approved waters of Little Bay. All discharge seeped to the ground with no surface water discharge. The other sewage release in Dover involving a blocked sewer line occurred near the Cocheco River and would not have affected Little Bay water quality. The Town of Durham reported no infrastructure overflows in 2016. The City of Portsmouth reported several minor discharges and two larger discharges in 2016. The largest involved 52,000 gallons of sewage discharge to the Piscataqua River (classified as Prohibited) from a failed pump station on Deer Street. Another 5,000-gallon discharge of combined sewage overflow to South Mill Pond (classified as Prohibited) occurred during a heavy rainfall event. None of the Portsmouth discharges were large enough to affect the water quality in Little Bay.

Two incidents of sewage overflow reported by Dover in 2015, including a significant release of up to 360,000 gallons of sewage from the Varney Brook pump station on the Bellamy River. This April 2015 incident from a broken pipe did cause the closure of the Bellamy River and Little Bay until the issue was cleared. Another smaller incident of 200-300 gallons of overflow from a sewer line on Cornerstone Drive occurred in June 2015. This area is well away from the Little Bay growing area and would not have affected water quality. The Town of Durham reported two 500-gallon infrastructure overflows in 2015, both occurring in November. The first involved 500 gallons released due to a Baghdad Road sewer line blockage. No discharge reached surface waters. The second involved 500 gallons of sludge from a blown end cap at the WWTF, some of which migrated offsite but did not reach surface waters. The City of Portsmouth reported no infrastructure overflows in 2015.

Other Domestic Waste Discharges

LLBPS020 is a culvert on Cedar Point that has been under investigation by NHDES Watershed Assistance for several years. The pipe carries flow from a small drainage creek/ditch and has shown high bacteria (>1600 FC/100ml) on multiple occasions, including flow during very cold weather when other nearby streams have been frozen over. Upstream investigations suggest the possibility of improperly functioning septic systems at two possible locations, but there is also evidence of a lot of deer activity in the area, with several piles of scat noted. The source remains under investigation and bracketed sampling of the source with ambient seawater sampling at a nearby oyster farm have shown no concurrent high bacteria levels at both locations. This type of evaluation sampling will continue. No other domestic waste discharges, such as failing septic systems, straight-pipe discharges of raw sewage, etc., were identified in the survey area.

Stormwater Discharges

Fourteen stormwater pipes of varying diameters were identified during the course of the previous and current shoreline surveys. Three of these were found to have been eliminated by construction of the new Spaulding Turnpike bridge at Dover Point. Eight of these sources were visited in wet weather during the present study and were found to have no flow. LLBPS008 (12 inch culvert near Little Bay Boat Club) and LLBPS035 (28 inch culvert near the boat launch at Great Bay Marine) have shown high fecal coliform in wet weather. LLBPS035 was recharacterized from an investigatory source to an actual pollution source due to multiple high bacteria counts with relatively high flows. LLBPS008 remains a potential pollution source because the occasional high wet weather FC values have been accompanied by relatively low flow, which limits FC loading.

Tidal Creeks, Rivers, and Intermittent Streams

Nineteen tidal creeks, streams, and wetland discharges were identified during the course of the shoreline surveys. Three of these (ULBPS001, ULBPS010, and ULBPS025) have all shown high wet weather bacteria levels in the past and were therefore characterized as actual pollution sources. During the present study, sampling did not show high bacteria levels.

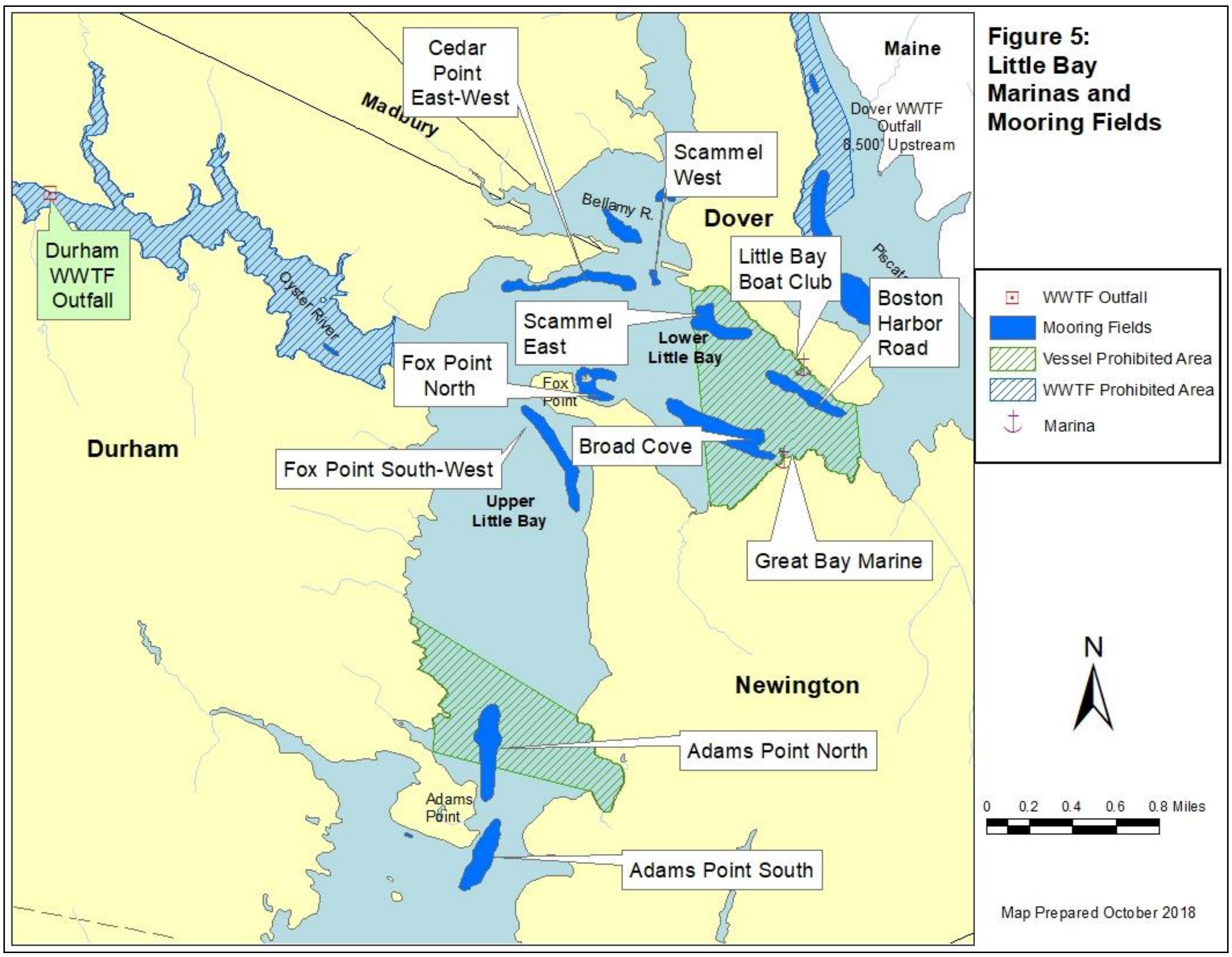
LLBPS025, LLBPS028, LLBPS029 and LLBPS030 also showed high bacteria in wet weather. All of these are located within a large Prohibited area, although LLBPS025 is near a Conditionally Approved line in Broad Cove in Newington. Commercial oyster farms are not far away, so additional characterization work is warranted. ULBPS0016, 017, and 026 are also near commercial farms and have received increased scrutiny because of occasional high bacterial levels, but sampling at these sites (along with concurrent transect sampling to establish a real extent of impact) have shown low bacteria levels.

Sampling data on all of sources are presented in Appendix II.

Marinas and Mooring Fields

During the summer months, the growing area experiences increased recreational boating activity. Power boats and sailing vessels of various sizes begin to occupy slips and moorings in mid-May, but recreational activity does not typically get underway in earnest until early June. By the end of September, boats are beginning to leave the water for the winter, which is a process that is typically complete by mid/late October. For the period of June through September each year, the discharge of sewage from these boats is considered to be a potential direct pollution source.

Since the initial sanitary survey, NHDES Shellfish Program has monitored eight mooring fields and two marinas in Little Bay (Figure 5). In addition to periodic seawater sampling for fecal coliform bacteria, monitoring activities have included monthly weekday inspections/boat counts during the boating season, with occasional weekend surveys to develop occupancy rate information. Late August/early September weekday surveys have included not only a count of boats present, but a count of unoccupied mooring balls. Multiple years of these total mooring ball counts serve as the basis for determining if the mooring field is being expanded, and if the expansion warrants a sewage risk evaluation.



Because of the potential discharge of sewage from the large number of boats located at Great Bay Marina, the Broad Cove mooring field, and the Adams Point North mooring field, oversized Prohibited areas have been delineated around them. Previously the areas adjacent to the mooring fields were opened and closed in accordance with a conditional area management plan, which called for the seasonal closure of Little Bay once the prescribed thresholds of the number of boats present was reached. NH Fish and Game Law Enforcement subsequently reported confusion among recreational harvesters because the date of closure was not consistent year-to-year, and requested a simpler way of controlling for boat sewage risk. A simplistic option of placing permanently closed, oversized Prohibited areas around the key boating areas was chosen to control boat sewage risk in the early 2000s, when demand for use of these waters for shellfish harvest was low. In recent years, demand for use of Little Bay for commercial aquaculture has grown, and ongoing discussions with Fish and Game Law Enforcement, Fish and Game Marine Fisheries, and U.S. Food and Drug Administration have prompted the NHDES Shellfish Program to explore alternative ways to classify the areas with boat sewage risk.

For the present sanitary survey, NHDES Shellfish inspected each mooring field shown in Figure 5, and re-assessed each area. The reassessment first involved GPS identification of the location of each mooring ball, then plotting the results on GIS. A 50-foot circle around each mooring ball was drawn to represent the variation in the mooring ball location over the course of an ebbing or flooding tide. To delineate an updated representation of a mooring field, mooring balls that were within 200-250 feet of each other were deemed to be part of a common mooring field. A polygon was then drawn around the 50-foot circles of all mooring balls in the group. Figure 6 illustrates how this was done for the Adams Point North mooring field. The result was a new representation of mooring fields in Little Bay (Figure 7, Table 7).

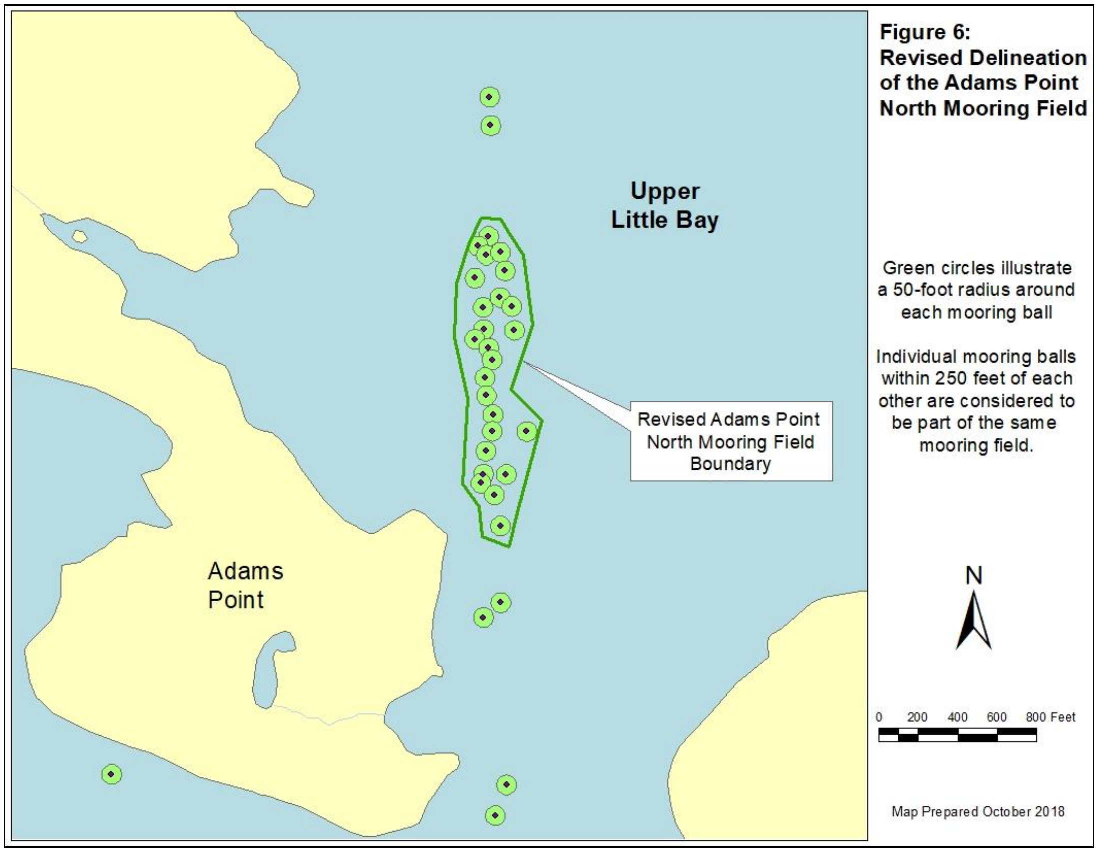
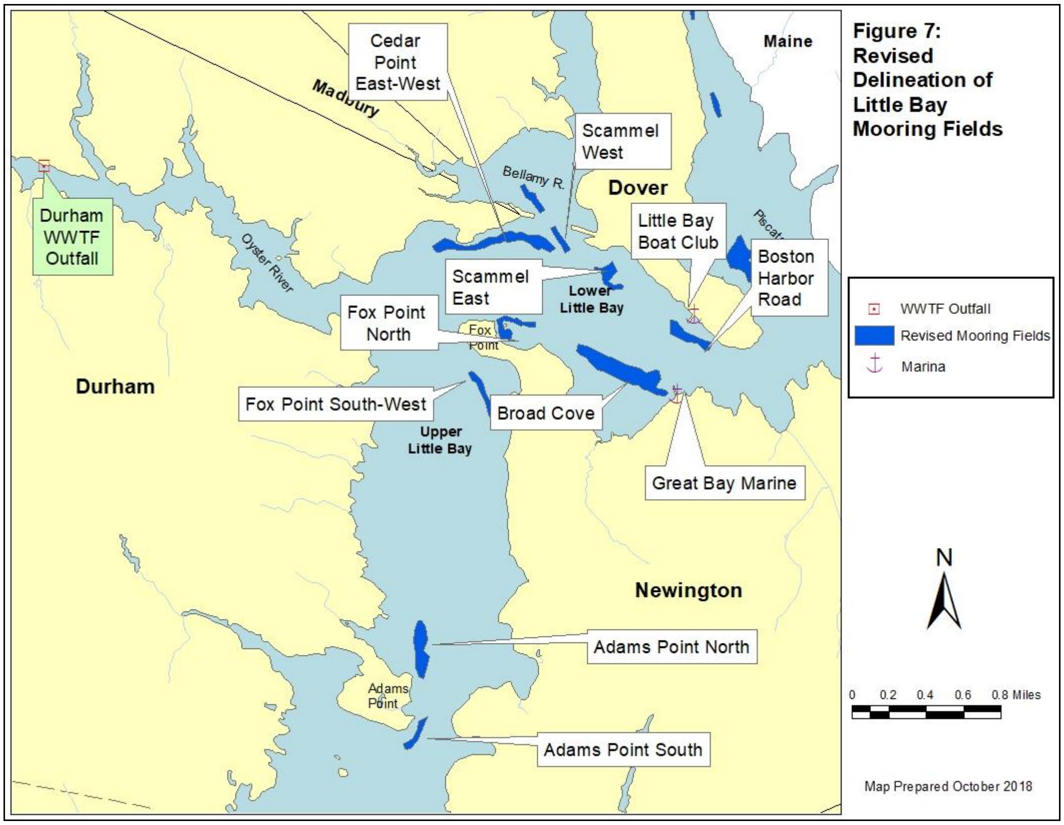


Figure 6: Revised Delineation of the Adams Point North Mooring Field

Table 7: Revised List of Mooring Fields in Little Bay

	Average Low Tide Water Depth (ft)	Maximum # Boats Observed, 2013-2018	Maximum # Boats with Sanitary Facilities Observed, 2013-2018	Hypothetical Mooring Field Fecal Coliform Load (per day)	Area of Mooring Field (sq ft)	Hypothetical FC per 100 mL in Mooring Field
Adams Point South	17	6	4	4.00E+09	165,825	5.2
Adams Point North	11	12	10	1.00E+10	484,006	6.8
Fox Point West-South	6	4	2	2.00E+09	255,148	4.4
Fox Point North	16	10	7	7.00E+09	270,334	5.7
Cedar Point West-East	20	16	9	9.00E+09	804,499	2.0
Royalls Cove	10	8	2	2.00E+09	174,766	4.2
Bellamy River	2	7	2	2.00E+09	103,507	42.6
Scammel West	9	1	1	1.00E+09	118,631	3.4
Scammel East	2	7	5	5.00E+09	249,132	30.4
Boston Harbor Road	20	12	6	6.00E+09	323,296	3.3
Broad Cove	20	62	56	5.60E+10	1,176,692	8.5



To evaluate the potential sewage risk in these areas, each marina and mooring field was evaluated according to the following procedure, using monthly boat count survey data from 2014, 2015, 2016 and 2017:

1. Over the four years, identify the maximum number of boats present. Areas with more than 10 vessels present were deemed to be a sewage risk and were further evaluated in Step 2.
2. Over the four years, identify the maximum number of boats with an onboard sanitary facility present (recreational vessels with enclosed cabins are assumed to have a sanitary facility). If there were more than 10 vessels with sanitary facilities, the sewage dilution calculation proceeded using steps 3-6 below. If there were 10 or less vessels with facilities, the mooring field was deemed to be a minimal sewage risk and no further evaluation was conducted.
3. For mooring fields with 11 or more boats with sanitary facilities, estimate the number of boats that may be discharging at any given time. A conservative assumption of 50% of the vessels with facilities has historically been used by the NHDES Shellfish Program. However, after reviewing over 10 years of survey and occupancy data, the assumed percentage of discharging boats is being modified to 25% for mooring fields, and 37% for marinas, to more closely reflect actual conditions. Marina occupancy on two Labor Day weekends surveyed were 20% and 37%, so the more conservative 37% figure is used. Mooring field occupancies on the weekend have typically been under 10%, so a conservative 25% figure is used.
4. Assume each boat has two people on board, and each person generates 2 billion fecal coliform per day, per standard NSSP assumptions.
5. Assume sewage discharge is completely mixed through the water column.

6. Estimate the fecal coliform load from each mooring field:

$$\text{FC load} = (\#\text{ boats with facilities}) * (0.25) * (2 \times 10^9 \text{ FC/person}) * (2 \text{ persons/boat})$$

The next step involves determining the volume of water available for dilution within the mooring field, calculated by using the GIS to determine the area of the mooring field, and multiplying the area by low tide water depth. To determine low tide water depth, the mooring points in the mooring field were plotted on a NOAA navigation chart (shows depth at mean lower low water). For small mooring fields with few boats, the depths of all mooring points were determined, and an average was calculated. For large mooring fields with many boats, one-third of the total mooring points, representative of the range of depths in the mooring field, were selected. The average depth of the selected mooring points was calculated, then divided into the FC load to yield a value of FC per milliliter. That value was multiplied by 100 to give a value of FC per 100ml. If that value was less than 14, then the conclusion is that there is sufficient water within the mooring field to dilute the sewage risk. The resulting classification would then include a Prohibited zone encompassing the mooring field.

Of all the Little Bay mooring fields, only the Broad Cove mooring field had more than 10 vessels with sanitary facilities. The Adams Point North mooring field had a maximum number of exactly 10 vessels with sanitary facilities. Because historically this mooring field has shown a greater number of vessels with sanitary facilities, it is evaluated here as if it has more than 10 such vessels. Both the Broad Cove mooring field and the Adams Point North mooring field (Figure 7, Table 7) have enough water to dilute the hypothetical FC load. A Prohibited area around each is recommended. Monthly surveys for the other mooring fields should continue to ensure that any mooring fields that grow in size are identified, and evaluated for sewage contamination risk as appropriate.

Agricultural Sources

No significant water quality impacts from agricultural pollution sources were identified in the survey area. The Little Bay Buffalo Company, located on Durham Point (southern side of the mouth of the Oyster River, on the shores of Little Bay), used to produce buffalo meat for the commercial market. NHDES Shellfish staff has rarely seen any animals on the fields in recent years (ambient water quality monitoring site GB50 is adjacent to the farm). Attempts to contact the owner were unsuccessful, as the phone number on the internet and on file with the NH Department of Agriculture now connect to a health care office. The buffalo operation therefore appears to no longer be in production.

Wildlife Areas

The salt marshes and mudflats of Little Bay provide valuable habitat to a variety of wildlife. Commonly observed bird species include a variety of gulls, sea and inland ducks, cormorants, geese, great blue herons, egrets, swans, and others. Mammals living within the growing area include dogs, cats, whitetail deer, muskrat, squirrels, chipmunks, rabbits, moles, mice, bats, shrews, weasels, skunks, raccoons and others. New Hampshire Fish and Game surveys indicate that migratory waterfowl numbers begin to increase in the early autumn months, and typically peak in late fall or early winter. Although large numbers of birds can, in theory, pose a threat to the water quality of the growing area, such occurrences are very difficult to conclusively document. No such significant water quality impacts have been documented for the area to date.

Industrial Wastes

Commercial/industrial activities on the shores of the survey area are minimal. Besides the two marinas, there are two commercial/industrial properties. One is a restaurant, and the other is a direct sales distributor of commercial aviation spare parts (aftermarket). There are industrial activities and other pollution sources outside of the management area which in theory could affect Little Bay water quality. Periodic monitoring of blue mussel tissue through the NH GulfWatch program provides information on tissue concentrations of various contaminants, such as heavy metals, PCBs, PAHs, etc. GulfWatch data also provides information on possible trends in contaminant concentrations. Summary graphs of data from the GulfWatch site at Dover Point (Appendix III) do not show any tissue concentrations above the action levels set forth in the NSSP.

Dredging

No large-scale channel maintenance dredging activity has recently occurred in the survey area; however, a potentially significant project may occur in the near future. The electric utility Eversource has proposed a transmission line project to ensure future adequate capacity of the regional electricity transmission system. The project calls for burial of new transmission lines across Upper Little Bay at a site formerly used as a (buried) electric cable crossing. Eversource proposes to use “jet plowing” to bury the cables. This technology uses water jets to essentially liquify and suspend sediment through a trench, which simultaneously pulls the new electrical cable through the newly-formed trench. The process will suspend sediments up to 8 feet under the seabed. The company indicates that 70% of the suspended sediment will fall back into the trench. The remainder will be carried away by tidal currents and will settle at other locations in the bay. The work would need to occur during the fall months of September and October, and is tentatively planned for fall 2019.

Such energy projects fall under the purview of the NH Site Review Committee, which will determine if the project will move forward, and if so, what conditions will need to be met by Eversource to ensure that impacts to affected parties are prevented and/or mitigated. The resuspension of sediments represents a potential public health issue for filter feeding shellfish that could accumulate poisonous or deleterious substances buried in the sediment. Sediment resuspension could also generate elevated fecal coliform concentrations in the water column. The NHDES Shellfish Program has proposed a number of monitoring conditions for the SEC to consider, including water column monitoring of fecal coliform bacteria during the dredging, and before/after sampling of shellfish tissue for a wide variety of contaminants.

Marine Biotoxins

The waters of the Gulf of Maine are prone to “blooms” of microscopic algae that can produce potent neurotoxins, and filter-feeding shellfish can accumulate concentrations of these toxins such that the shellfish themselves become a public health threat to consumers. This phenomenon typically occurs in the waters of the Atlantic and in Hampton/Seabrook, and NHDES maintains a biotoxin monitoring program, focused on Paralytic Shellfish Poisoning (PSP) in blue mussels, these areas. Harvest closures are initiated when PSP toxin levels exceed 80 µg toxin/100g tissue. PSP and other harmful algal blooms do not typically cause shellfish toxicity in Little Bay, but it has occurred in the past. When high PSP toxicity levels are observed in the nearshore Atlantic area, sampling at secondary monitoring stations in Little Bay is initiated.

Elevated shellfish tissue toxicity levels on the coast have prompted sampling of Little Bay blue mussels in the following years:

2005: (2 samples, one “elevated” result of 57 µg toxin/100g)
2007: (1 sample, < 44 µg toxin/100g)
2008: (12 samples, several “elevated” result, and three very high results of 754, 678, and 497µg toxin/100g, all in blue mussels collected in separate weeks)
2009: (6 samples, three “elevated” results of 45, 51, 53 µg toxin/100g, one high result of 133 µg toxin/100g)
2011: (3 samples, all < 44 µg toxin/100g)
2014: (1 sample, < 44 µg toxin/100g))
2017: (5 samples, three “elevated” results of 45, 48, and 58 µg toxin/100g)

Two harvest closures have been implemented in Little Bay: June 4, 2008 – July 3, 2008, and July 16, 2009 to July 21, 2009.

In addition to PSP tissue toxicity monitoring, NHDES and its volunteers conduct weekly sampling of seawater to monitor phytoplankton concentrations, focusing on genus and species that can be harmful to humans consuming shellfish. The weekly phytoplankton sampling is done at four primary locations (two shore-based in New Castle and in the Hampton/Seabrook Estuary, and two done offshore by boat – one in Gosport Harbor, Isles of Shoals, and the other at an open ocean site halfway between Gosport Harbor and the mainland). Secondary sites in Little Bay are activated as needed, starting at the docks of Great Bay Marine in Lower Little Bay, and moving farther into the estuary as conditions dicatate.

D. Evaluation of Pollution Sources

Durham Wastewater Treatment Facility

An updated hydrographic dye study for the Durham WWTF was conducted in May 2017. This study was designed to incorporate different injection and data analysis protocols more recently adopted in the NSSP, namely, a 12.4-hour injection of dye, in-situ measurements of dye concentration at fixed stations to allow for estimation of steady-state dilution, mobile fluorometer tracking, and vertical profiling of dye concentration at selected locations. The injection began at 1:53am on 5/3/17 (slack low tide), continued through the flooding tide (slack high at the WWTF was around 7:20am on 5/3/17), and then continued through the ebbing tide. The injection was terminated at 2:17pm on 5/3/18.

The data from the 2017 study is currently under review and will be formulated into a report to help better understand the possible effects of the WWTF on the nearby growing waters. However, a preliminary review of the data allows some decisions regarding the proper classification and management of Little Bay.

Fluorometers at fixed locations were placed in various locations in the Oyster River, Little Bay, Bellamy River, and Great Bay. Station locations, as well as the estimated steady state dilution for each station, are illustrated in Figure 8. Note that Station 9 was located at Fox Point and the instrument never turned on, so no data are available at that site. Data for Station 8 in the Bellamy River, and Station 6 in Great Bay at Nannie Island, are still being developed.

The station data, as well as mobile fluorometer tracking, are helpful for estimating time of travel of effluent discharged to the Oyster River. Figure 9 presents information on time of travel on the first ebbing tide between the WWTF and the mouth of the Oyster River. The in-situ fluorometer at Station 2, moored in approximately 10 feet of water just downstream of Bunker Creek, registered dye at 9:50am (approximately 2.5 hours after slack high tide at the WWTF). Surface tracking data indicated the dye was present at this location before 9:50am. The in-situ fluorometer at Station 3, moored in approximately 15 feet of water at the mouth of the Oyster River, just downstream of Wagon Hill Farm, registered dye at 1:54pm (a little more than six hours after slack high tide at the WWTF). Surface tracking data indicated the dye was present at this location well-before that time, with surface dye measurements observed around 10:15, about three hours after the time of high tide at the WWTF.

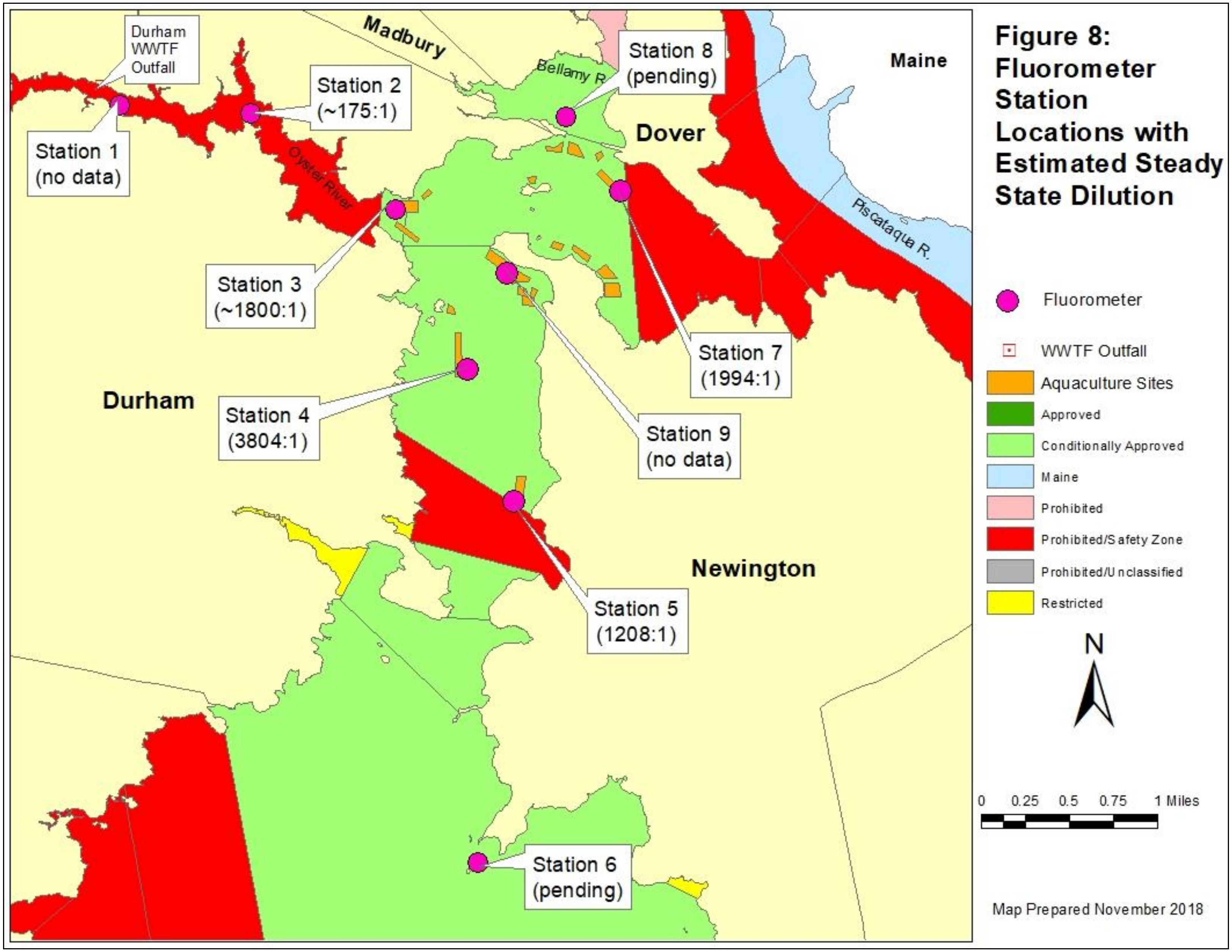
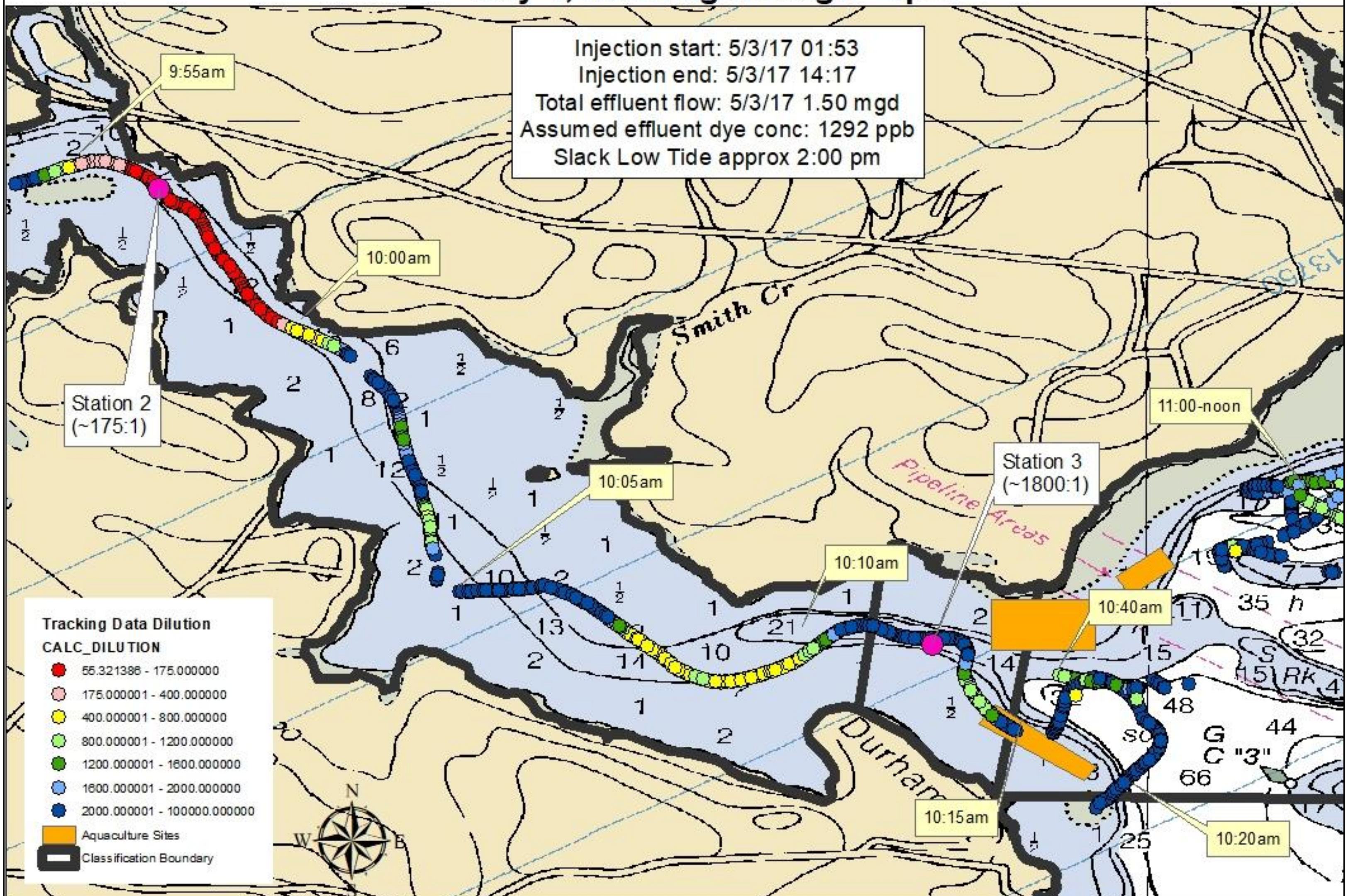


Figure 8: Fluorometer Station Locations with Estimated Steady State Dilution
Durham WWTF Outfall
Station 1 (no data)
Station 2 (~175:1)
Station 3 (~1800:1)
Station 4 (3804:1)
Station 5 (1208:1)
Station 6 (pending)
Station 7 (1994:1)
Station 8 (pending)
Station 9 (no data)
Madbury
Bellamy R.
Dover
Maine
Oyster River
Piscataqua R.
Durham
Newington
Fluorometer
WWTF Outfall
Aquaculture Sites
Approved
Conditionally Approved
Maine
Prohibited
Prohibited/Safety Zone
Prohibited/Unclassified
Restricted
N
0 0.25 0.5 0.75 1 Miles
Map Prepared November 2018

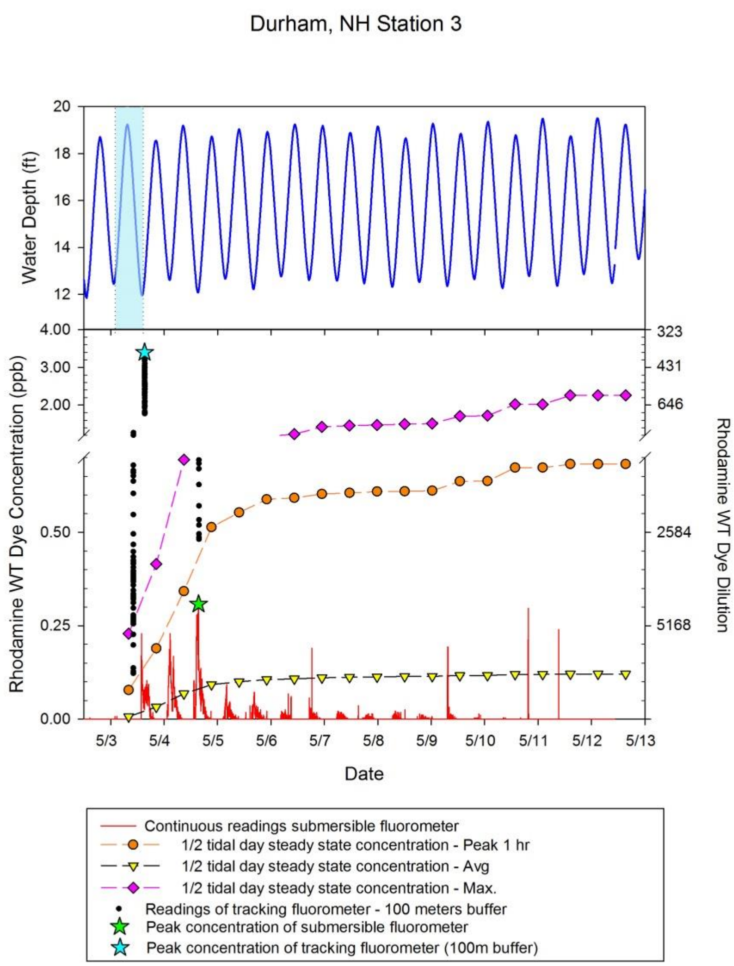
Figure 9: Surface Dye Tracking, Ebbing Tide
Day 1, morning through ~1pm



Pink Dots are stations with in situ fluorometers (estimated peak 1-hr steady state dilution in parentheses)

Additionally, concurrent measurements of dye concentrations at the surface versus depth in the Oyster River itself indicate higher dye readings on the surface. Figure 10 shows the dye concentrations measured by the stationary fluorometer on the bottom of the Oyster River at Station 3 (red lines), as well as concurrent surface measurements near the surface at the same time and location, taken from the towed tracking fluorometer (black dots). The surface estimates are up to 10 times higher than the corresponding depth measurements.

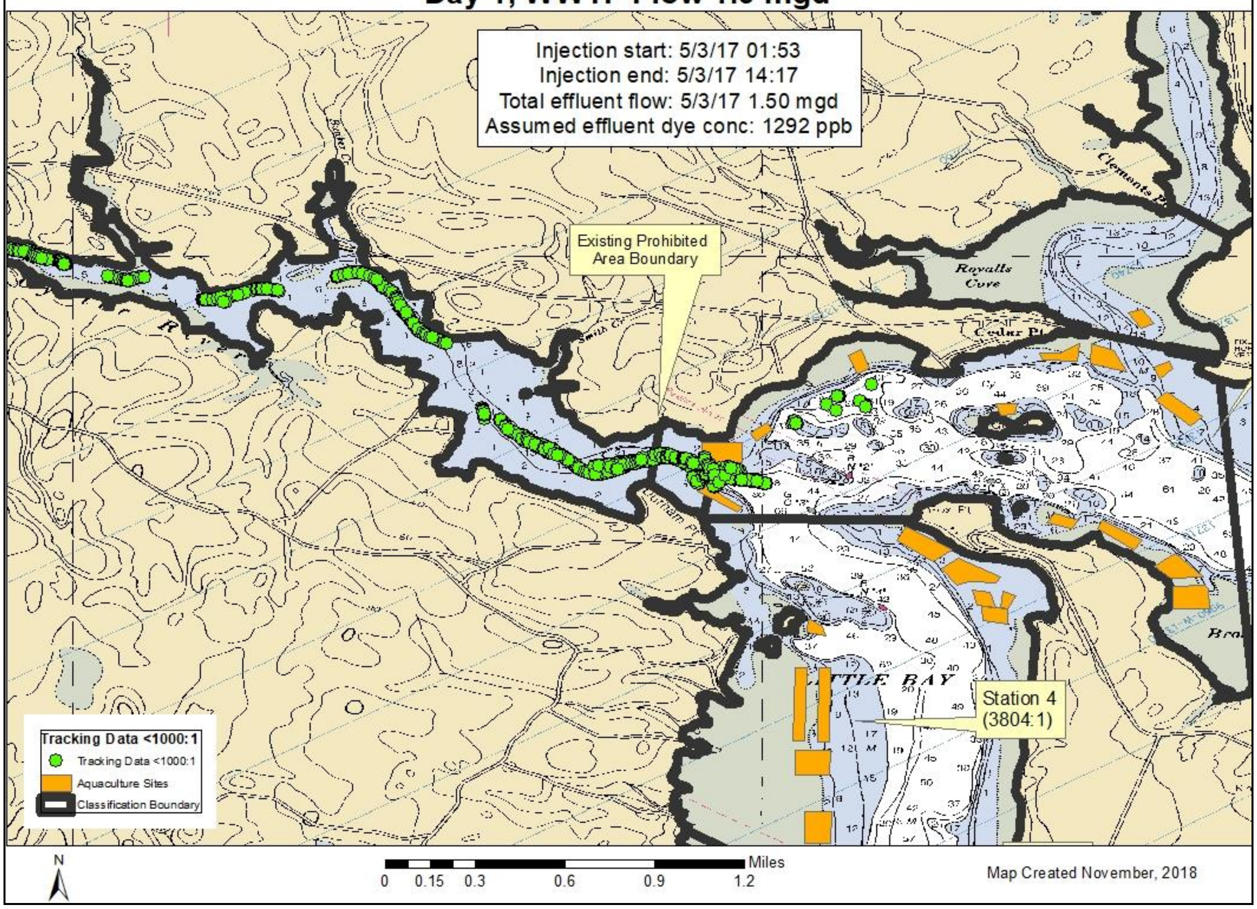
Figure 10: Dye Concentrations and Projected Steady State Dilution at Station 3



Estimation of steady state dilution shows that bottom water dilution was over 1,000:1 at the mouth of the river during the study (note the WWTF flow was rather high, at approximately 1.5 mgd). Steady state dilution numbers for more shallow waters, where aquaculture activity would be occurring, is not available (stationary fluorometers are typically not deployed in these shallow environments as there is a risk of them being exposed at low tide during the study). A conservative approach to considering the surface data would be to regard those data as steady state. This is done in Figures 11 and 12.

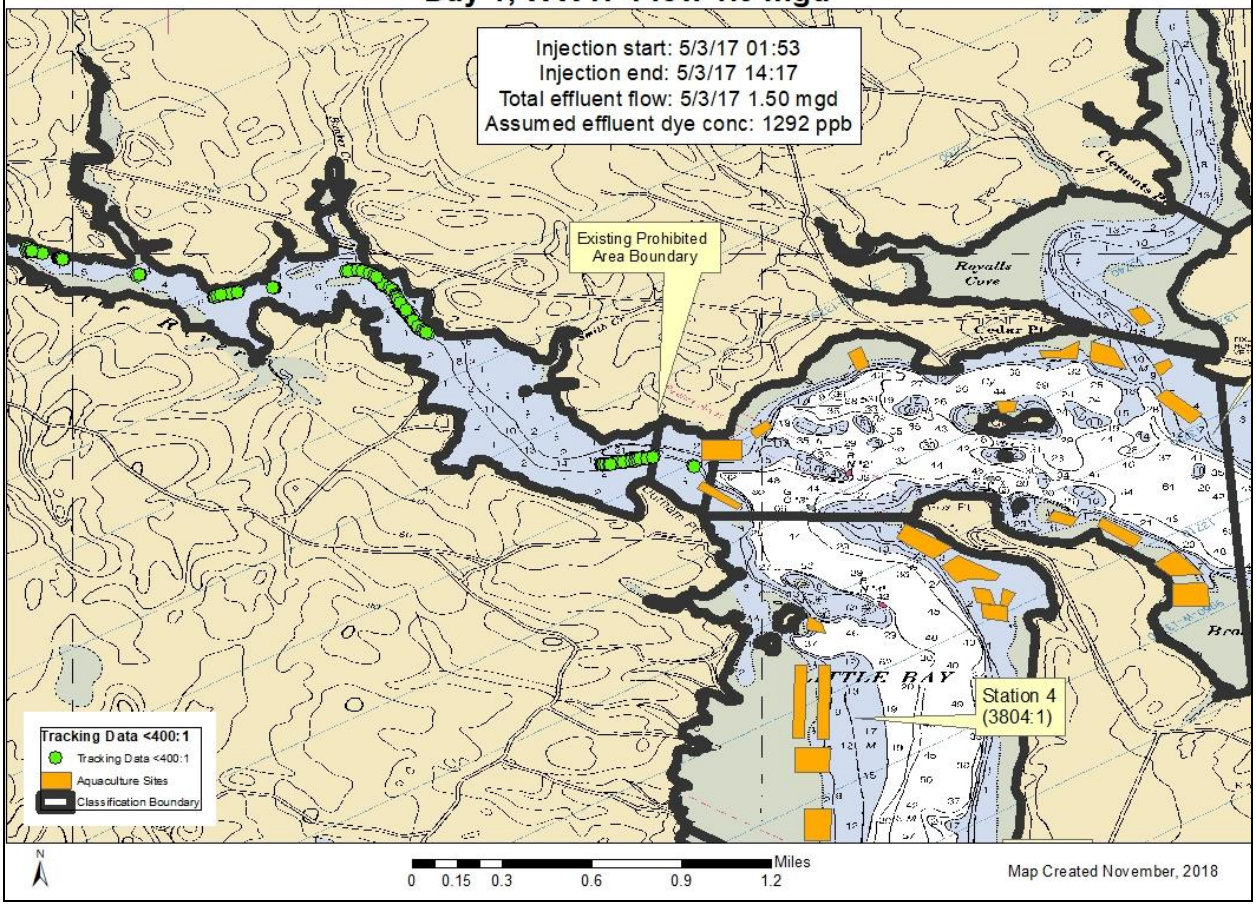
Standard NSSP guidance for a secondary treatment facility under normal operating conditions is to delineate a Prohibited area around the outfall that provides for at least 1,000:1 dilution. In Figure 11, tracking data points on Day 1 with dilution <1,000:1 are shown. Several points occurred in the area that is Conditionally Approved.

Figure 11: Surface Dye Tracking Data with Dilution <1000:1
Day 1, WWTF Flow 1.5 mgd



For WWTFs that are very efficient at removing viruses from the final effluent, the 1,000:1 dilution standard can be relaxed. A standard of 400:1 has been used for some highly efficient plants in other parts of the country, and may be appropriate when a reliable and predictable level of removal efficiency is documented (FAO and WHO, 2018). A great deal of sampling effort has been directed at documenting the MSC removal efficiency of the Durham WWTF under different operational conditions (some of those data are presented in Figure 4). Examination of the data suggests that as long as the facility is not under operational stress from high flows (or perhaps even with rapidly changing flows such as when UNH students return to campus after the summer session or some other extended break), a 400:1 standard is appropriate for the Durham WWTF outfall. The data in Figure 11 were requeried to show only points with dilution of less than 400:1 (Figure 12).

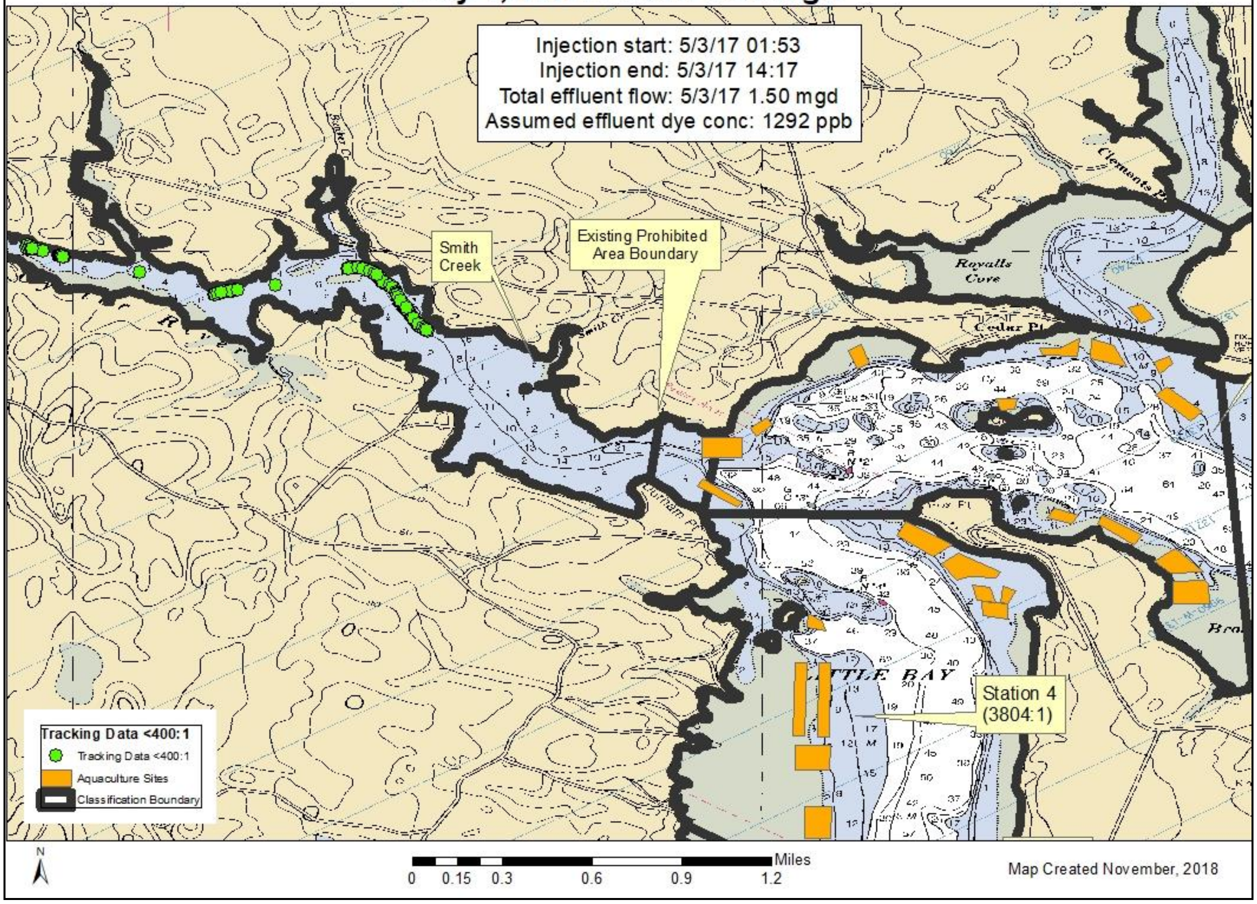
Figure 12: Surface Dye Tracking Data with Dilution <400:1
Day 1, WWTF Flow 1.5 mgd



The 400:1 map in Figure 12 illustrates surface measurements with less than 400:1 when the WWTF is flowing at 1.5 mgd. That is a relatively high flow, not typical of WWTF operations during most of the year. During the main harvest season of summer and early fall, the plant is typically operating in the range of 0.5 – 1.0 mgd.

When the dilution values are adjusted for a lower flow value of 1.0 mgd, and even 1.25 mgd, the green points near the existing Prohibited area boundary shown in Figure 12 disappear (Figure 13). This suggests an area of the Oyster River upstream of that boundary, in the vicinity of Smith Creek, is appropriate for conditional harvest, so long as the WWTF flow is low enough to not compromise MSC removal efficiency. Such an adjustment is ultimately adopted in the present sanitary survey report, and is shown in the final classification map in Figure 22.

Figure 13: Surface Dye Tracking Data with Dilution <400:1
Day 1, WWTF Flow 1.25 mgd



During episodes of high flow, MSC removal efficiency appears to degrade. At some flow level above 1.5 mgd, the use of 400:1 dilution is no longer appropriate in the Oyster River, and the use of 1,000:1 may no longer be appropriate in the Oyster River and/or portions of Little Bay. This issue will be more closely examined in the dye study report currently being drafted for the May 2017 dye study. Should a flow higher than 1.5 mgd present a public health issue for the Conditionally Approved waters of Little Bay, the Little Bay Conditional Area Management Plan will be adjusted accordingly.

Dover Wastewater Treatment Facility

Flooding tide dye/dilution studies of the Dover wastewater treatment facility effluent's impact on the Upper Piscataqua River, Cocheco River and Salmon Falls River were conducted in June 2004, while an ebb tide study was performed in September 2004 (Nash, Carr and Bridges, 2005). The study simulated a hypothetical disinfection system failure at the plant, and recommended boundaries for a Prohibited/Safety Zone, using assumptions of WWTF flow of 4.02 MGD and an effluent bacteria concentration of 281,000 FC/100ml.

The ebbing tide study showed that for a worst-case discharge beginning near the time of high tide, insufficiently diluted effluent would be located near Dover Point, and farther downstream in sections of the Piscataqua River, at low tide. Approximately halfway into the next flood tide, insufficiently diluted dye was observed throughout Lower Little Bay, thus indicating the facility's potential to adversely impact the water quality of Little Bay following a prolonged lapse in disinfection.

Portsmouth Wastewater Treatment Facility

As noted previously, the Portsmouth WWTF is currently a primary treatment facility that will be upgraded to secondary treatment over the next several years. When the new secondary facility is operational, the effect of a disinfection failure on the Little Bay growing area can be revisited because the assumed fecal coliform concentration of effluent under a disinfection failure scenario will probably be much lower than 1,000,000 FC/100ml. The current primary treatment facility does have the potential to impact Little Bay water quality under a disinfection failure scenario.

The current primary treatment facility has very high levels of male specific coliphage in finished effluent. A multi-year study showed levels were typically well over 10,000 plaque-forming units per 100ml, and sometimes approached 1,000,000 pfu/100ml (Figure 4). This is a very high value compared to MSC levels in other coastal WWTFs, all of which employ more advanced treatment technologies. MSC values at these secondary treatment facilities typically range from <10 – 250 pfu/100ml, and rarely exceed a value of 1,000 pfu/100ml. The 2012 dye study of this facility established a steady state dilution value at Dover Point (entrance to Little Bay) of approximately 4,600:1, which is not sufficient to adequately dilute the virus levels, especially in the colder months of the year when MSC particles persist in the environment. This is confirmed by cold-weather sampling of seawater in Little Bay (Table 6)

The combination of high MSC concentration in Portsmouth effluent, insufficient dilution at Dover Point, and unacceptably high MSC concentration in seawater entering Little Bay during the fall and winter months, prompted NHDES to implement a seasonal closure of Lower Little Bay and the Bellamy River in October 2018. The seasonal closure will be lifted on April 1, 2019. A similar closure will be implemented October 2019-March 2020. The Portsmouth WWTF upgrade to secondary treatment, which is expected to dramatically reduce effluent MSC levels, is scheduled for completion in April 2020. The continuation of seasonal cold-weather closures in Lower Little Bay will be revisited once MSC levels in effluent from the upgraded facility are confirmed.

Marinas and Mooring Fields

Marinas and mooring fields in Little Bay are listed in Table 8. Evaluation of these areas' boat sewage risk and their potential to impact FC levels in the growing waters is necessary for facilities with more than 10 boats. Two of the mooring fields, Adams Point North and Broad Cove, have had over 10 vessels with sanitary facilities present during the boating season. Thus, they represent a potential risk of boat sewage contamination to the surrounding waters. The sewage risk posed by vessels in Broad Cove may be less than vessels in other mooring fields for several reasons. First, these moorings are controlled by Great Bay Marine, and vessel owners sign an annual mooring contract which includes a prohibition of sewage discharge. Additionally, these vessels have direct access to the free sewage pumpout facility at the Great Bay Marine fueling dock, which is adjacent to the mooring field. Nonetheless, the assumed rate of discharge for Broad Cove is 25%, the same assumption used for other mooring fields. Hypothetical dilution analyses indicate the volume of water within the Broad Cove and Adams Point North mooring fields is sufficient to adequately dilute the adverse effects of potential sewage release. Thus, harvest restrictions should apply to the mooring fields themselves.

The two marinas in the growing area, Great Bay Marine, Inc. and the Little Bay Boat Club, provide docking to a concentrated number of vessels. During the boating season both have been observed to have more than 10 vessels with sanitary facilities. Additionally, each has a fueling station, so the risk of exposure to poisonous and deleterious substances such as petroleum products, boat paints, etc. is also present. Harvest within the marina proper at each location should be Prohibited.

Shoreline Pollution Sources

In the 2005 sanitary survey, ULBPS025, ULBPS001, ULBPS005 and ULBPS010 were identified as pollution sources with the greatest potential to negatively impact growing waters. For the 2017 survey, all pollution sources in the growing area were reevaluated using sampling data from the last 10 years. Using the highest observed fecal coliform level and the highest observed flow from that period (not necessarily data from the same sample date), a hypothetical radius for a semicircular area necessary to achieve dilution to 14/100ml was calculated, assuming the discharge is mixed through an area with a depth of four feet (Table 8). Note: The dilution radii in Table 8 are not intended to predict the spatial extent of these sources' water quality impact. Rather, they are intended to identify which sources have flow and fecal coliform characteristics that might cause significant water quality impacts. Those impacts are then subsequently explored through repetitive water quality sampling at and around the sources.

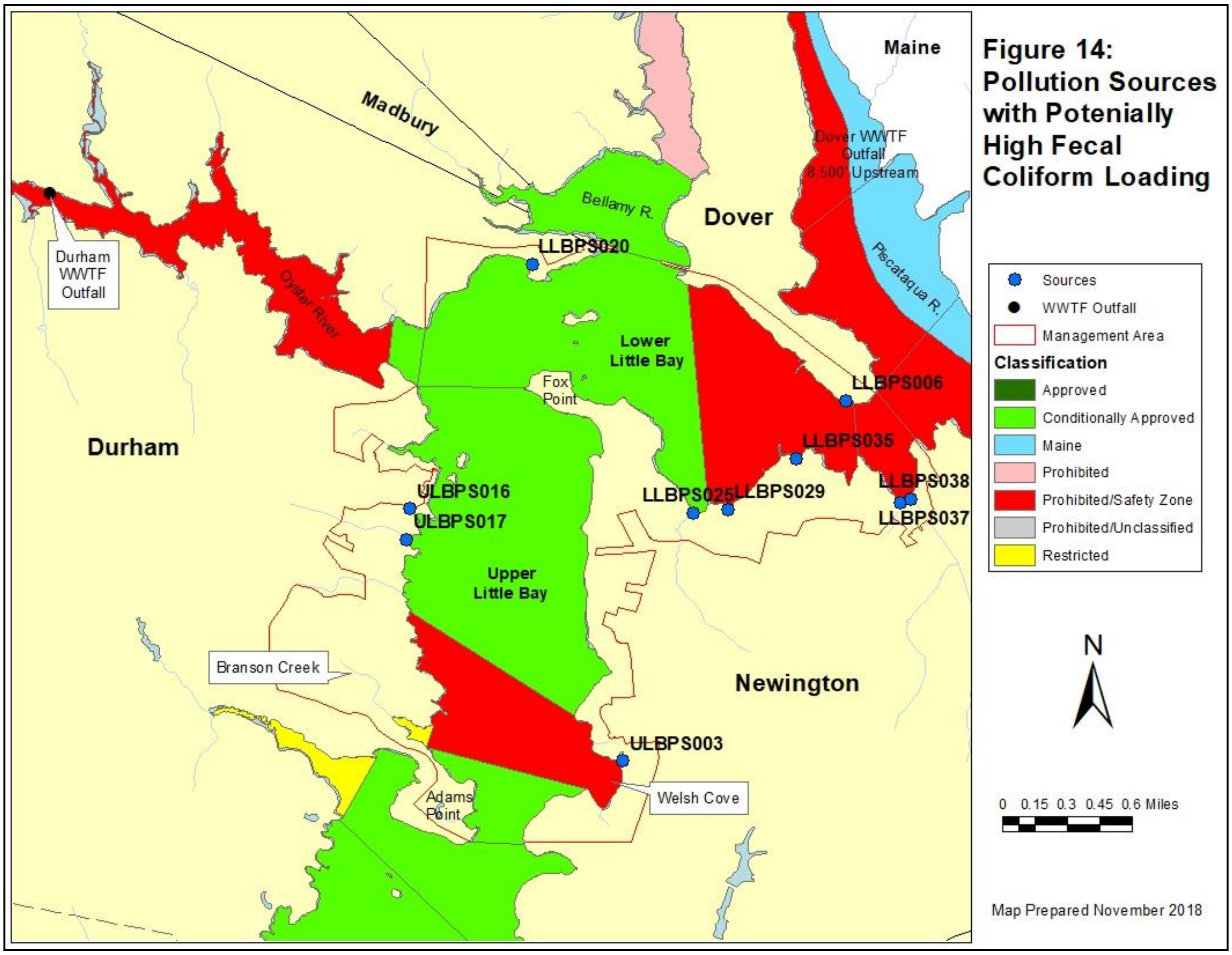
The calculations summarized in Table 8 indicate that ULBPS003, ULBPS016, ULBPS017, LLBPS006, LLBPS020, LLBPS025, LLBPS029, LLPBS035, LLBPS037 and LLBPS038 showed the potential to negatively impact growing waters. The locations of these sources are illustrated in Figure 14. Because they are in areas classified as prohibited safety zones, ULBPS003, LLBPS006, LLBPS029, LLBPS035, LLBPS037 and LLBPS038 were determined to pose little concern to active growing areas. However, ULBPS016, ULBPS017, LLBPS020 and LLBPS025 exhibited high FC loading and potentially large areas of impact within the conditionally approved growing area. As such, they were targeted for preferential sampling during the 2017 field season and future targeted sampled is recommended to determine the meteorological factors that contribute to their high fecal coliform loading values.

Table 8: Hypothetical Fecal Coliform Loading and Dilution Radii for Selected Pollution Sources

StationID	FC (per 100ml)	Flow (cfs)	Dilution Radius (ft)*
ULBPS003	170	0.557	108
ULBPS010	110	0.002	5
ULBPS012	170	0.761	126
ULBPS016	20,000	0.694	1306
ULBPS017	2,100	2.004	719
ULBPS025	1,100	0.470	252
ULBPS026	11,300	0.049	260
ULBPS030	2,100	0.022	76
LLBPS006	19,000	0.022	228
LLBPS008	20,000	0.002	74
LLBPS009	2,900	0.001	20
LLBPS014	1,500	0.001	14
LLBPS016	4,900	0.001	26
LLBPS019	20,000	0.022	234
LLBPS020	20,000	0.249	782
LLBPS021	3,500	0.002	31
LLBPS024	7,500	0.002	45
LLBPS025	2,200	1.490	635
LLBPS026	1,800	1.490	574
LLBPS028	5,700	0.003	45
LLBPS029	2,000	0.203	223
LLBPS030	1,200	0.027	63
LLBPS032	160	0.011	15
LLBPS034	1,800	0.002	22
LLBPS035	9,100	0.536	774
LLBPS036	610	0.130	99
LLBPS037	2,800	3.070	1028
LLBPS038	1,800	1.030	477
LLBPS039	1,900	0.037	93
LLBPS041	2,700	0.022	86
LLBPS042	200	0.002	7
LLBPS047	1,100	0.022	17
LLBPS048	280	0.002	9
LLBPS068	3,300	0.022	95

*dilution radius calculations assume a water depth of four feet and a loading time of 6 hours.

All of these sources will also undergo further investigation to better understand their influence on the shellfish management area. It should be noted that the potential areas of impact depicted are most likely oversized, as they represent a combination not actually observed.



V. Hydrographic and Meteorological Characteristics

Little Bay is part of the Great Bay Estuary, the largest estuary in New Hampshire. Upper Little Bay begins at Adams Point in Durham, New Hampshire, and extends to Fox Point, where Lower Little Bay begins (Figure 1). Tidal flow into Little Bay comes from the Piscataqua River at Dover Point, through a 30-foot deep channel that gets deeper as it extends toward Adams Point. Little Bay includes approximately 1,834 acres of tidal waters, with 14 miles of tidal shoreline.

Little Bay receives tributary freshwater input from the Oyster and Bellamy Rivers, while fresh water from Lamprey, Squamscott (Exeter), and Winnicut rivers enters Little Bay via Great Bay. Additional freshwater influence comes from the Cocheco and Salmon Falls rivers via the Piscataqua River. Fresh water represents 2% or less of the tidal prism for Great Bay (Short, 1992). A percentage for Little Bay is probably similar to that for Great Bay.

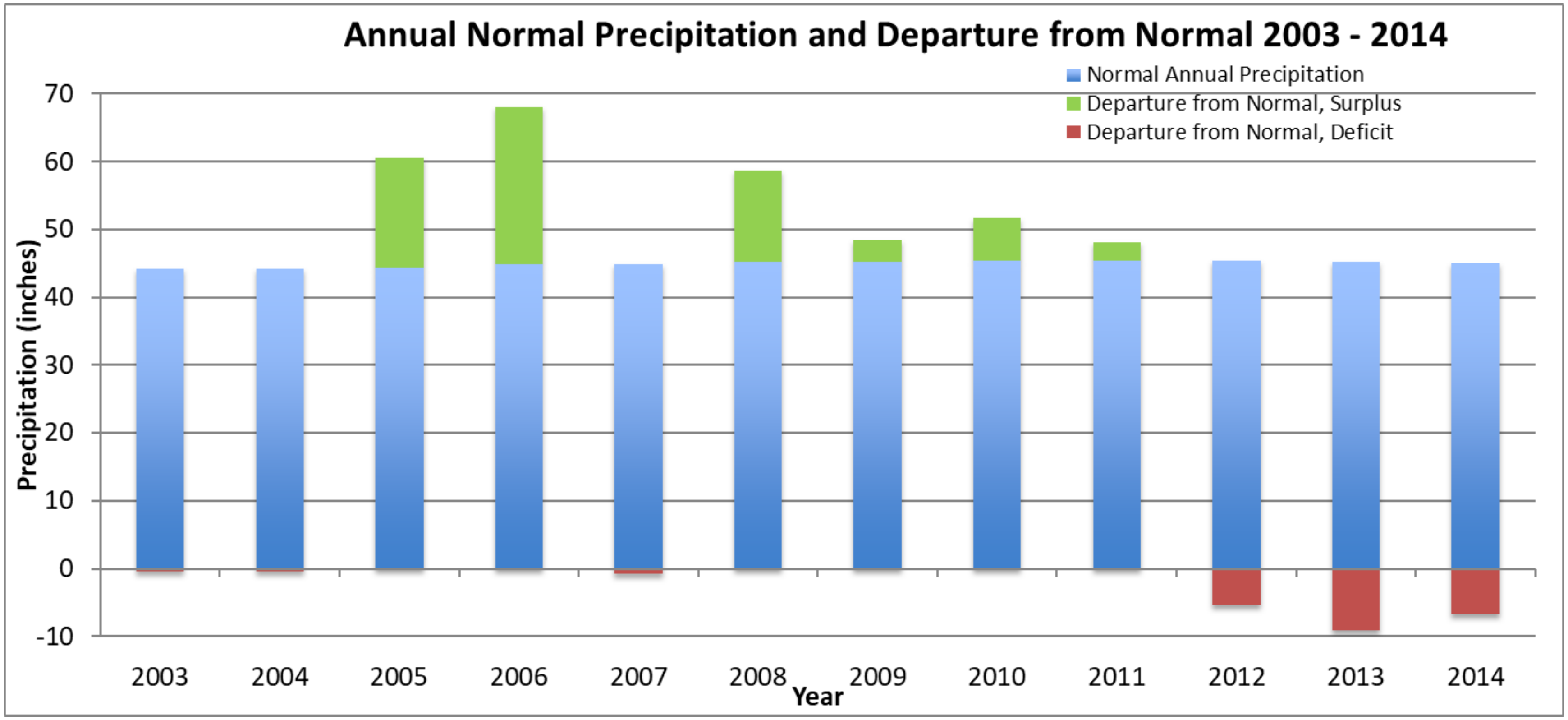
A. Tides

Coastal New Hampshire experiences a mixed, semi-diurnal tide, with diurnal inequalities that are more pronounced on spring tides. National Oceanic and Atmospheric Administration data for a station at Dover Point indicate a mean tidal range of 6.4 feet, a spring tidal range of 7.4 feet, and a mean tide level of 3.4 feet above mean lower low water. Currents in the area are predominantly driven by the tides. Short (1992) summarizes a number of studies which examined current profiles throughout the system, and notes velocities of 1.5 to 2.0 meters per second at Dover Point and the Piscataqua River, 0.75 meters per second within Little Bay, and 1.0 meters per second in the constricted channel of Furber Strait near Adams Point. In most areas, ebb currents tend to be higher than flood currents.

B. Rainfall

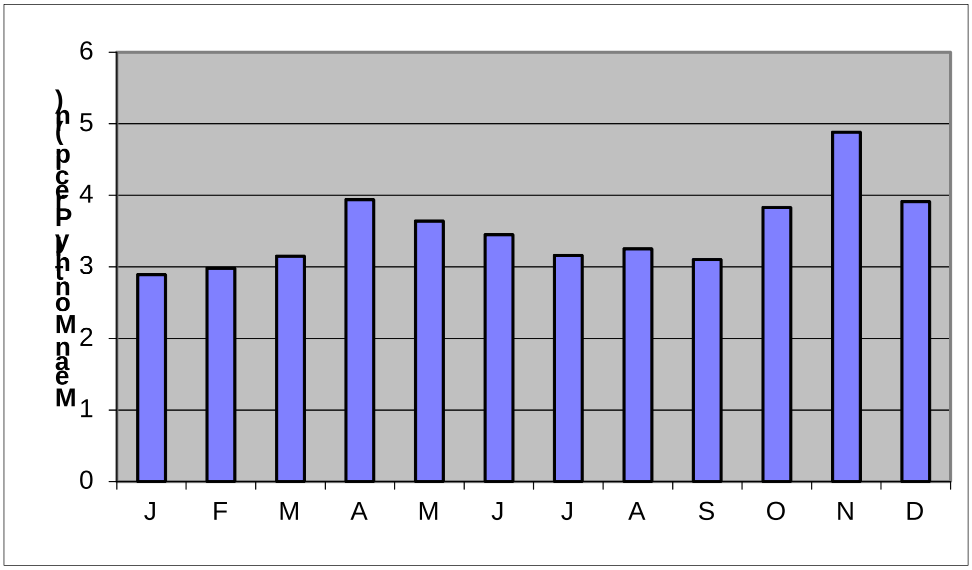
The Portsmouth weather station at the Pease International Tradeport indicates a long term average annual precipitation value of approximately 45 inches. Total precipitation for each year for the period of 2003 through 2014 is shown in Figure 15. This figure depicts long-term annual mean precipation (blue bars), along with departures from the annual mean (surplus precipitation in green, and deficits in red).

Figure 15: Portsmouth, New Hampshire Annual Normal Precipitation and Departure from Normal, 2003-2014



Precipitation is not evenly distributed throughout the year, with spring and fall having higher monthly averages of precipitation than other seasons (Figure 16).

Figure 16: Portsmouth, New Hampshire Mean Monthly Precipitation



An analysis of precipitation events recorded at the Pease/Portsmouth, New Hampshire, station over a seven-year period from 2008 to 2014 was used to examine the frequency of various-sized storms, where size is defined as total precipitation of the storm (Figure 17a). The histogram in Figure 10a is further broken down by season to help identify if various-sized storms occur with greater frequency in a particular season. The reader should note that sizes of storms which occurred over more than one day are characterized in terms of total cumulative precipitation, not precipitation per 24 hours. Figure 17b presents the same data, although the y-axis scale is adjusted to improve readability of the graph for storms over one inch, as the larger storms are of greater interest because they often warrant harvest closures.

The Little Bay Conditional Area Management Plan calls for rainfall closures following storms of over 1.5 inches. Figure 10b shows that such storms have occurred 49 times over the seven years examined or, on average, seven times per year. These large storms occur, on average, once in the winter, once in the spring, three times in the summer, and twice in the fall.

Figure 17a: Distribution of Rainfall Events by Total Rainfall by Season (based on data from Pease/Portsmouth Weather Station, 2008-2014)

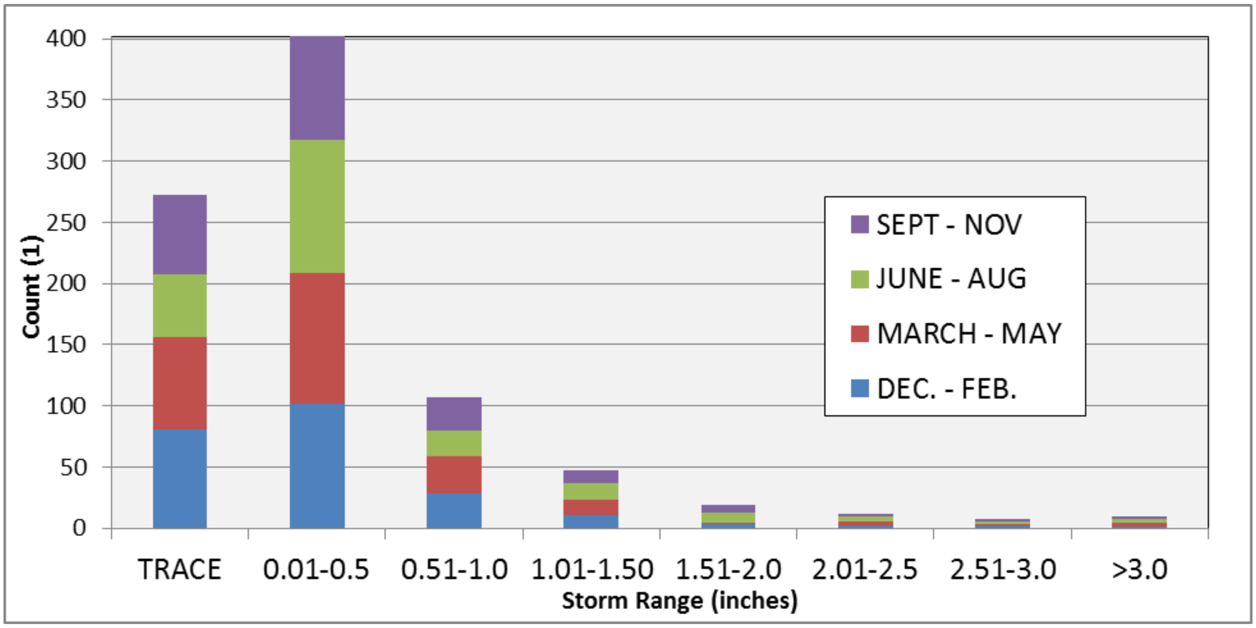
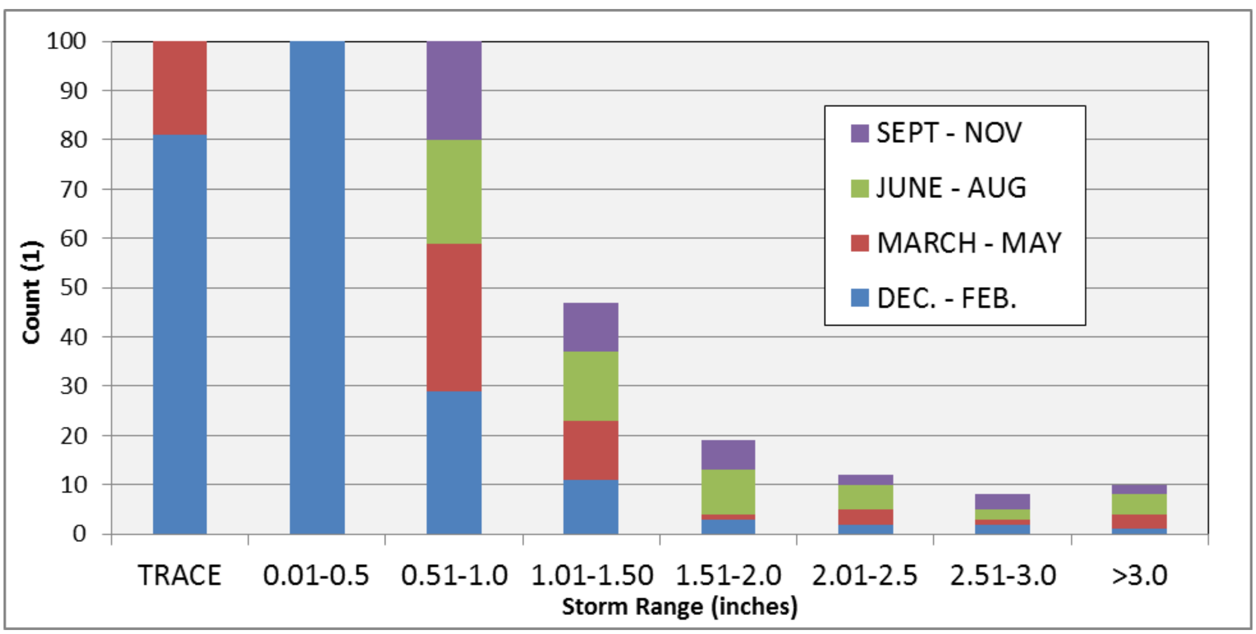


Figure 17b: Scale-Adjusted Distribution of Rainfall Events by Total Rainfall by Season (based on data from Pease/Portsmouth Weather Station, 2008-2014)



C. Winds

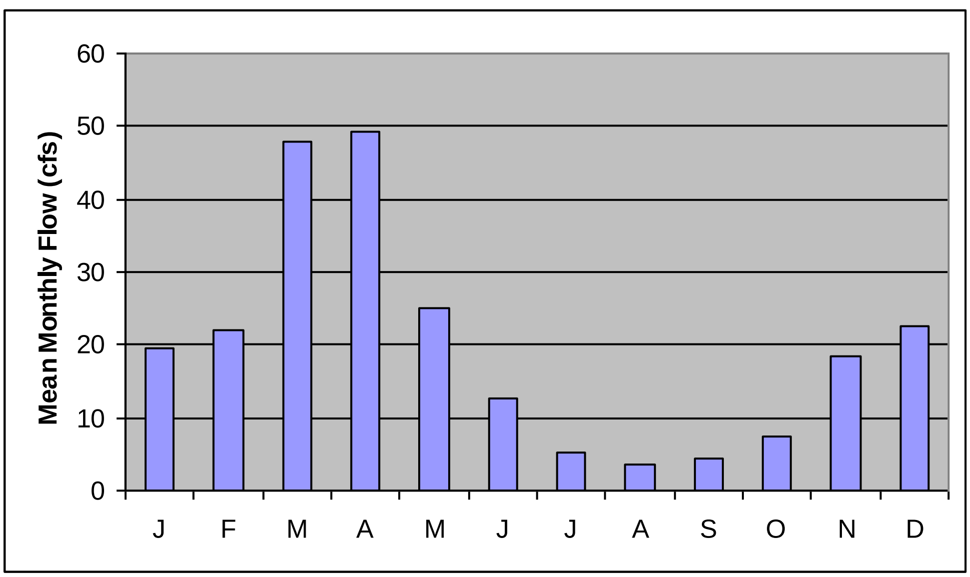
According to Normandeau Associates Inc. (1975), winter winds in coastal NH are typically from the west and northwest. In the spring, predominant winds are from the northwest, but northeast and southeast winds become more prevalent during this season. Wind from the NE and SE direction, although less frequent, are typically stronger than winds from the northwest. In the summer, winds tend to be from either the southwest and northwest or southeast and are weaker than at other times of the year.

In general, circulation in the growing area is tidally driven. However, sustained winds have been observed to modify current speed and direction. This is especially true of a sustained wind from the west, as such a wind would have a relatively long fetch down the river corridor.

D. River Discharges

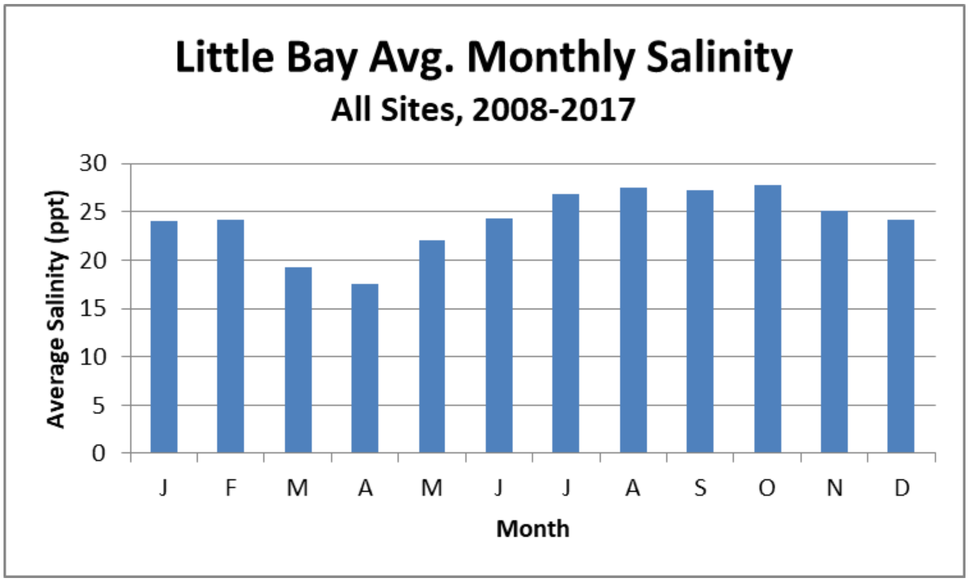
Streamflow in southeastern New Hampshire exhibits seasonal variation, with the highest flows occurring in the spring (due to snowmelt, spring rains, and low evapotranspiration) and the mid-to late fall (due to fall rains and low evapotranspiration). To illustrate the seasonality of streamflow in southeastern New Hampshire, mean monthly flow for the Oyster River, Durham, New Hampshire, gauged by the U.S. Geological Survey, is plotted in Figure 18. Other rivers that flow into Little Bay show a similar seasonal pattern.

Figure 18: Mean Monthly Flow, Oyster River, Durham, New Hampshire



Salinity data from monitoring sites in Little Bay were queried from the NHDES Shellfish monitoring database for the period of 2008-2017 and sorted by month. Average salinity for each month approximates the seasonal streamflow pattern and influence of fresh water inputs on the growing area (Figure 19).

Figure 19: Average Monthly Salinity at All Little Bay Sites, 2008-2017



Salinity tends to be lowest in the spring, due to spring rains and snowmelt/runoff. Summer and (early) autumn show the highest values of salinity, due to the relatively low streamflows at this time of year.

E. Stratification

Little Bay is generally well-mixed due to its strong tidal currents and relatively small freshwater inputs (Short, 1992). However, partial salinity stratification can occur during times of heavy rainfall and runoff, which typically occurs in spring, as well as in the late fall. Following a period of prolonged snowmelt in late March 2005, NHDES Shellfish Program staff measured changes in water column salinity and temperature (two-foot intervals) at several sites throughout Little Bay. Maximum top-to-bottom salinity differences were in the range of two parts per thousand (high tide measurements). Temperature generally varied by less than one degree Centigrade.

F. Summary Discussion Concerning Actual or Potential Transport Effects on Pollution to the Harvest Area

One of the most important aspects of hydrography and its influence on pollutant transport in the Oyster River is the pattern of tidal current speed and direction, and how that influences the dispersion of effluent from the wastewater treatment facilities, especially if the Durham, Dover, or Portsmouth WWTF experiences a lapse in normal treatment. Because of its proximity to the Little Bay growing area, the travel time from the Durham WWTF is particularly important. Perhaps the “worst-case scenario” for such an event occurring at the Durham facility would be to have the discharge begin near the time of high tide. As currents around the outfall begin to slow toward high slack tide, improperly disinfected effluent discharged to the river at that time would begin to build a plume of high-bacteria water around the outfall in the river. As the tide turns and begins to ebb, Durham effluent would be carried down the

Oyster River towards Little Bay, reaching the mouth of the Oyster River in just a few hours, before the end of the ebbing tide.

The NHDES Shellfish Program maintains a pager for WWTF operator use to facilitate immediate notification regarding discharges of improperly treated sewage. Because Shellfish staff is on call from 6am-9pm, problems at the WWTFs occurring after 9pm may not be responded to until the following morning. Experience with the WWTFs that can affect Little Bay water quality show they detect and report issues quickly, allowing NHDES and NH Fish and Game to implement harvest closures quickly. However, overnight issues would not be acted upon until the following morning, which means harvest areas could potentially be adversely affected before a harvest closure is put in place. This reality requires strict control of harvest practices. For recreational harvesting in Little Bay, this control is achieved by only allowing harvest on Saturdays, 9am-sunset. The 9am start time gives the WWTF, NHDES, and NHF&G staff sufficient time to discover any WWTF treatment lapses that might have occurred overnight on Friday, and to implement any necessary harvest closures before recreational harvesting begins on Saturday. For commercial harvesting in Little Bay, aquaculturists must seek approval for each harvest from NHDES, so there is already adequate control over harvest practices. For that reason, commercial harvesting is not limited to Saturdays as recreational harvesting is. Commercial harvest can occur 7 days per week, as long as other performance standards in the Little Bay Conditional Area Management Plan are met.

Several tidal creeks, road culverts and intermittent streams were evaluated during the shoreline survey. Most show levels of fecal coliform loading that do not pose a water quality issue. Some showed an increase in bacterial concentration after rainfall events. Bacterial loading from significant sources at Branson Creek and from smaller creeks discharging to Welsh Cove call for Restricted areas around these sources. Similar Restricted areas may be appropriate for other shoreline sources that currently discharge to areas classified as Prohibited. Some of these Prohibited areas may be reclassified after the Portsmouth WWTF upgrade is complete (estimated to be done by April 2020). The potential reclassification should take into account the fecal coliform loading of these shoreline sources. One potential source of improperly treated sewage from possible failing septic systems on Cedar Point (LLBPS020) is currently under investigation, and impact evaluations to nearby growing areas (seawater and shellfish tissue testing for fecal coliform) continues.

VI. Water Quality Studies

A. Sampling Stations

The majority of Upper and Lower Little Bay are classified as Conditionally Approved with the exception of Prohibited areas around the Adams Point North Mooring Field and Great Bay Marina/Broad Cove area. There is also a small Restricted area north of Adams Point, which encompasses Branson Creek (Figure 2). These areas are sampled by boat for fecal coliform bacteria under the Systematic Random Sampling Strategy (Table 9 and Figure 2).

Table 9: Little Bay Ambient Sampling Stations

Site	Latitude	Longitude	General Description	Rationale for Selection
GB2	43°07’46”N	70°50’58”W	Mouth of Bellamy River at Scammel Bridge, Lower Little Bay	Document general water quality from Bellamy River
GB6A	43°06’04”N	70°51’39”W	The northern boundary of the Prohibited area near Adams Point (cable crossing)	Document general water quality; boundary site on Prohibited line
GB6B	43°05’41”N	70°51’39”W	The southern boundary of the Prohibited area near Adams Point (between the Adams Point boat launch and Welsh Cove)	Document general water quality; boundary site on Prohibited line
GB7A	43°05’26”N	70°51’47”W	Near Adams Point, boundary with Great Bay	Document general water quality; boundary site with Great Bay
GB17	43°07’05”N	70°50’31”W	Broad Cove, Lower Little Bay	Document general water quality in the vicinity of Broad Cove; boundary site on Prohibited line
GB19	43°07’16”N	70°51’53”W	Boundary of Upper and Lower Little Bay, near Fox Point at red navigation buoy N2	Document general water quality
GB25A	43°07’06”N	70°49’31”W	The eastern boundary of the Conditionally Approved area near Dover Point	Document general water quality; boundary site with Piscataqua River
GB25B	43°07’02”N	70°49’45”W	The eastern boundary of the Prohibited area near Great Bay Marine and Broad Cove	Document general water quality; boundary site on Prohibited line

B. Sampling Plan and Justification

Little Bay is sampled using a Systematic Random Sampling strategy. The Systematic Random strategy is favored over the Adverse Condition strategy because it provides for a better evaluation of the effects of intermittent, random sources of pollution. New Hampshire’s classification procedures account for the significant impacts of major point source pollution to shellfish growing areas through the establishment of Prohibited Zones around the discharges. These zones define the area of impact of the discharges; therefore, ambient monitoring need not be designed to evaluate water quality within these zones, as they are closed to all harvesting. The primary concern for the ambient program is detecting random, intermittent occurrences of pollution, and the Systematic Random Sampling Strategy is better suited for this purpose. The Systematic Random Strategy should also detect the impacts of any unidentified, chronic sources of pollution (point and nonpoint) that might affect growing area water quality.

Per the NSSP guidelines for systematic random sampling, a monitoring schedule was established at the start of the year to ensure sample collection under a variety of environmental (seasonal, tidal, meteorological, etc.) conditions. Runs are scheduled to begin between 7am and 10am to randomize the tidal stage at which samples are collected. Sampling runs were rescheduled as a result of extenuating circumstances or when conditions were deemed unsafe. All samples were analyzed for fecal coliform MPN/100ml (5-tube method) by the New Hampshire DHHS/Public Health Laboratory.

Because the Little Bay Conditional Area Management Plan includes provisions for closure related to issues with the operation and performance of wastewater treatment facilities, monthly water samples are required when the growing area is in the Open status (ISSC, 2017). If the area happened to be in the Closed status when the prescheduled systematic random sampling run was conducted, a second sampling run is done during the same month when the area is in the Open status.

C. Sample Data Analysis and Presentation

NSSP statistics for systematic random and open status samples collected from 2014 through 2017 are presented in Table 10. All sites meet NSSP fecal coliform criteria for Approved waters (geometric mean $\leq$ 14/100ml and the estimated 90th percentile statistic $\leq$ 43/100ml). However, analysis of the data clearly illustrates rainfall effects, as well as the potential for adverse effects from a lapse in treatment at various WWTFs, so an Approved classification would not be appropriate. Due to rainfall and other effects, this site is classified as Conditionally Approved. When the conditions specified in the Conditional Area Management Plan are applied to the data (i.e., exclusion of samples collected during times when the area was in the Closed status, indicated by shading in Table 10), all stations meet NSSP criteria for Approved waters.

Table 10: NSSP Bacterial Data and Statistics for Little Bay Monitoring Stations, 2014-2017

4-Day Rain Total (in)	Collection Date	GB2	GB6A	GB6B	GB7A	GB17	GB19	GB25A	GB25B	GB50
0.30	1/13/2014	**49**	**49**	33	-	**110**	**79**	**46**	**46**	**79**
0.71	2/24/2014	4	7.8	6.8	2	2	2	2	2	4.5
0.00	3/11/2014	<2	2	2	2	4.5	13	7.8	7.8	<2
0.95	4/8/2014	2	2	7.8	2	2	4.5	13	2	2
0.05	5/6/2014	<2	2	2	2	4	4	4	2	<2
0.09	6/11/2014	<2	2	2	2	4.5	2	7.8	2	4.5
2.44	7/7/2014	9.3	7.8	11	7.8	7.8	23	17	4.5	17
0.25	8/6/2014	4.5	2	4.5	2	2	2	2	2	2
0.09	9/2/2014*	7.8	2	2	2	7.8	11	33	2	6.8
0.61	10/6/2014	2	2	4	1.8	4.5	13	4.5	4.5	4.5
0.41	11/5/2014	6.8	4.5	14	4.5	13	11	11	7.8	7.8
0.00	12/1/2014	2	17	6.8	13	22	22	11	6.8	32
0.14	1/20/2015	49	23	13	23	17	33	13	**110**	17
0.72	3/30/2015	49	11	7.8	4.5	14	**79**	17	13	6.1
0.13	4/6/2015	4.5	2	2	6.8	1.8	2	2	7.8	23
0.02	4/15/2015	2	<2	7.8	2	2	<2	<2	6.8	7.8
0.00	5/5/2015	<2	4.5	6.8	2	2	<2	4	2	<2
0.00	6/9/2015	4.5	4	2	2	<2	<2	<2	2	4.5
0.13	7/13/2015	<2	<2	2	2	2	<2	4.5	4.5	<2
0.74	8/13/2015	2	<2	4.5	1.8	1.8	1.8	4.5	11	7.8
1.60	9/14/2015	17	33	23	11	13	31	23	33	**49**
0.00	10/15/2015	<2	2	2	2	2	2	2	2	<2
0.00	11/9/2015	<2	4.5	7.8	2	2	4.5	4.5	6.8	<2
0.30	12/4/2015	7.8	7.8	13	13	21	11	13	7.8	7.8
0.00	1/6/16	23	33	17	13	33	23	14	33	13
0.00	2/2/16	7.8	7.8	23	13	**79**	33	14	17	17
0.00	2/22/16	<2	7.8	<2	<2	7.8	6.8	4.5	4	1.8
0.00	3/9/16	4.5	2	7.8	7.8	7.8	9.2	2	13	6.8
0.31	4/6/16	27	17	7.8	13	23	**49**	14	17	7.8
0.17	5/17/16	<2	<2	<2	<2	2	<2	<2	<2	2
0.09	6/13/16	2	4	<2	<2	4	4	2	4.5	<2
0.73	7/13/16	<2	<2	<2	<2	<2	<2	4.5	2	<2
0.62	8/17/16	7.8	4.5	4.5	9.3	7.8	11	2	4.5	<2
0.23	9/12/16	4.5	2	2	4.5	2	2	7.8	4.5	2
1.28	10/10/16	17	6.8	4.5	2	13	7.8	23	23	23
0.00	11/14/16	2	2	2	4.5	3.7	2	2	<2	2
0.00	12/8/16	7.8	7.8	7.8	6.8	31	27	23	33	11
0.00	1/22/17	7.8	<2	13	4.5	13	4.5	13	7.8	2
0.00	2/21/17	2	13	2	2	6.1	7.8	4.5	13	<2
0.00	3/6/17	2	6.1	2		1.8	2	<2	4.5	<2
0.00	4/3/17	1.8	<2	11	2	6.8	2	2	<2	<2
0.34	5/23/17*	7.8	7.8	4.5	4.5	2	6.8	17	7.8	11
1.25	6/7/17	33	23	33	**70**	17	17	4	7.8	23

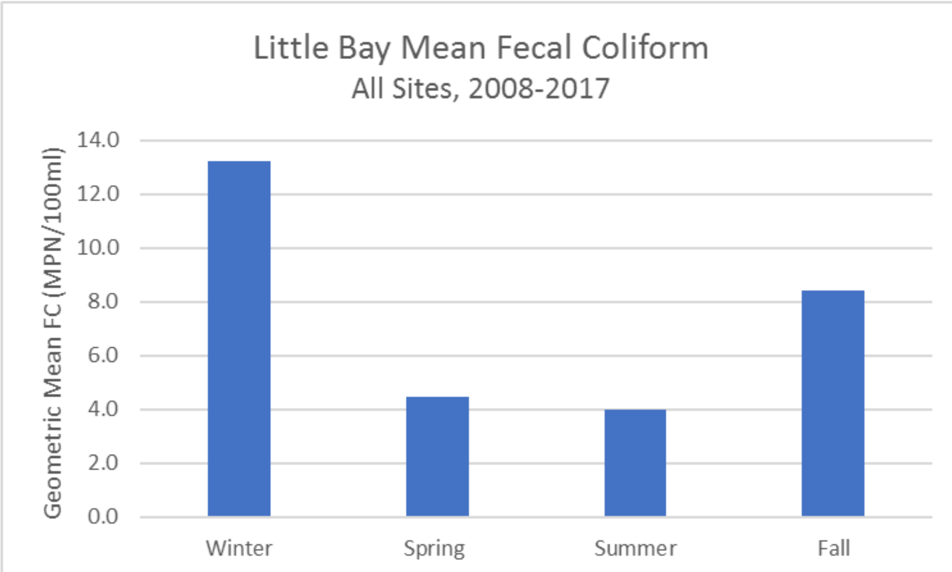
4-Day Rain Total (in)	Collection Date	GB2	GB6A	GB6B	GB7A	GB17	GB19	GB25A	GB25B	GB50
0.00	7/5/17	2	<2	2	<2	2	2	6.8	4.5	<2
0.00	8/1/17	<2	<2	<2	2	<2	1.8	2	<2	2
0.19	9/19/17	2	<2	4.5	11	4.5	4.5	4.5	3.7	4
0.00	10/17/17	13	4.5	6.8	4.5	7.8	7.8	2	7.8	4.5
2.42	11/1/17	**170**	**240**	**220**	**95**	**240**	**240**	**540**	**540**	**110**
0.15	11/15/17	6.8	7.8	7.8	4.5	4.5	6.1	7.8	4.5	<2
0.07	12/4/17	13	2	33	23	23	7.8	33	13	17
Statistics for All Data	Count	50	50	50	48	50	50	50	50	50
	Geomean	5.2	4.9	5.7	4.4	6.3	6.8	6.6	6.7	5.4
	Est 90th	22.4	19.7	21.5	15.9	29.3	32.7	28.4	29.6	22.5
	Water Quality	A	A	A	A	A	A	A	A	A
	Classification	CA	P	P	CA	P	CA	P	P	P
Statistics for Open Status Data Only	Count	47	47	47	45	47	47	47	47	47
	Geomean	4.8	4.6	5.2	4.1	6.0	6.3	6.1	6.3	5.1
	Est 90th	18.4	15.4	16.8	13.3	24.4	26.5	20.4	22.4	19.0
	Water Quality	A	A	A	A	A	A	A	A	A
	Classification	CA	P	P	CA	P	CA	P	P	P

*per NSSP, two runs used to reopen a closed area may be used for stats.

Seasonal Effects on Fecal Coliform Concentrations

To examine how FC levels may vary with the seasons, the historical FC data from the systematic random and Open status sampling programs (2008-2017) were categorized by season (Figure 20). Winter tends to have a higher mean than the other seasons. Winter also has more samples over 43 FC MPN/100ml than other seasons. Higher winter fecal coliform levels are normal for sites in the Great Bay Estuary. The adverse effects of events such as heavy rainfall tend to persist in these waters during the colder months, as the flushing time for this part of the estuary is several tidal cycles, and bacterial reduction through exposure to UV radiation, predation by microorganisms, and other mechanisms is less pronounced during the winter months.

Figure 20: Mean Fecal Coliform Concentration by Season, All LB Sites Combined, 2008-2017



Rainfall Effects on Fecal Coliform Concentrations

To examine the effects of rainfall and runoff on FC levels in the growing area, bacterial data at the Little Bay monitoring stations, collected for the period of 2014-2017, were queried. Data collected as part of routine systematic random sampling, as well as data collected in response to rainfall events, were included in the analysis. Data collected after WWTF treatment lapses were excluded. For the purposes of this analysis, it is assumed that rainfall events would impact the growing areas for a period of up to four days following the end of the event. Accordingly, rainfall data associated with water samples in the NHDES Shellfish database were examined in the context of rainfall that had occurred in the four days prior to sample collection. Data from the the Pease Tradeport weather station in Portsmouth, NH, was used for the analysis.

Specifically, the data were broken up into different ranges of rainfall and the number of high bacteria results (fecal coliform > 43/100ml) were examined in each group. The result of this analysis is presented in Table 11.

Table 11: Little Bay Fecal Coliform (MPN/100ml) Data for Varying Levels of Rainfall

Amount of Rain Prior to Sample Collection	Number of Samples	Number of Samples with FC > 43/100ml	% Samples with FC > 43/100ml
0.00”	262	2	0.8
0.01-0.50"	269	11	4.1
0.51-1.00"	86	3	3.5
1.01-1.5"	42	6	14.3
1.51-2.00"	75	14	18.7
2.00-2.5"	51	16	31.4
Over 2.5”	29	12	41.4

Examination of the fecal coliform data for storms in different ranges of rainfall suggests that adverse fecal coliform concentrations become more frequent when rainfall exceeds 1.51 inches. Above this amount, the number of samples showing high fecal coliform approaches 20% or higher. The number of samples with high FC takes a noticeable jump when rainfall exceeds two inches. This suggests that a rainfall closure threshold of 1.5 inches continues to be an appropriate conservative rainfall closure threshold. Efforts to collect more data, especially for storms in the 1.0-2.0-inch range, should continue so the rainfall closure threshold can be verified for the next triennial report.

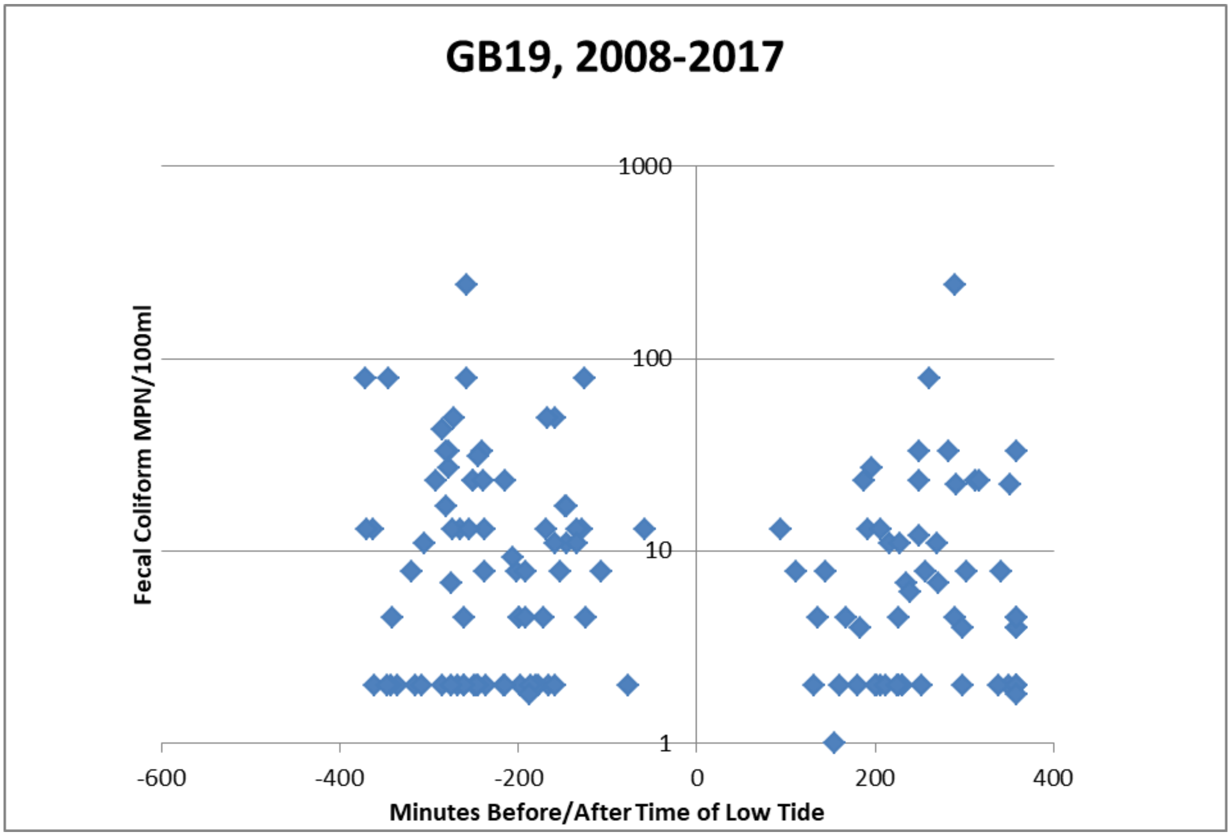
Tidal Effects on Fecal Coliform Concentrations

To examine the effects that tidal stage might have on FC concentrations, data collected under the Systematic Random sampling program, as well as targeted “Open status” sampling, over the last 10 years (2008-2017) were queried for all Little Bay sites. Figure 21 illustrates the relationship between fecal coliform MPN/100ml and the number of minutes before/after low tide the sample was collected at Site GB19. Plots for all sites are presented in Appendix III.

The pattern illustrated in Figure 14 does not illustrate a relationship between tide stage and FC concentrations that would warrant targeting future systematic random sampling on a particular tide stage. The ebbing tide data and flooding tide data seem to be equally scattered. The highest values may have had more to do with rainfall effects than with tidal effects:

- 9/9/2008 FC=240/100ml. Flooding tide sample was collected three days after a 5-inch rainstorm associated with Tropical Storm Hannah.
- 11/1/2017 FC=9200/100ml. Ebbing tide sample was collected a few days after a heavy rainfall event. Pease weather records show 2.42 inches of rain had fallen on 10/29/17 and 10/30/17.

Figure 21: Fecal Coliform Concentration vs. Tide Stage at Site GB19



VII. Interpretation of Data in Determining Area Classification

The shoreline survey data, pollution source impact evaluations, analyses of tidal, seasonal, and rainfall effects, ambient water quality data, and the hydrographic information support the following statements regarding the sanitary quality of Little Bay:

- The waters of Little Bay can be adversely impacted by releases of improperly treated sewage from the wastewater treatment facilities in Durham, Dover and Portsmouth.
- Impacts from the Portsmouth WWTF include rapid transport of insufficiently diluted effluent in the event of a lapse in disinfection, as well as chronic input of viral indicators during the fall, winter, and spring. These impacts require restrictions on the timing of recreational harvest in Upper Little Bay and in Lower Little Bay (Saturday only, 9am-sunset). Furthermore, due to chronic input of viral indicators from Portsmouth and their persistence in the environment during cold weather months, no commercial or recreational shellfish harvest during the period of October through March should be allowed in Lower Little Bay.
- Rainfall events of over 1.5 inches appear to adversely affect the water quality of Little Bay.
- Risk of contamination from pollution from recreational boating, including potential boat sewage exposure as well as poisonous/deleterious substances such as fuel spills, require harvest restrictions. This is particularly true for marinas such as Great Bay Marine, Inc., and the Little Bay Boat Club, as well as the large mooring areas in Broad Cove and in the area north of Adams Point.
- The waters of Branson Creek show high fecal coliform concentrations after heavy rainfall events. Limited data under other meteorological conditions suggests possible high fecal coliform values as well. Although repeated seawater sampling around the mouth of the creek illustrates little impact with respect to fecal coliform levels, the potential for high fecal coliform after some rainfall events warrants harvest restrictions near Branson Creek.
- Multiple creeks entering Welsh Cove have shown high fecal coliform concentrations, particularly after heavy rainfall events. Although repeated seawater sampling around the mouth of the creeks and in Welsh Cove itself illustrates little impact with respect to fecal coliform levels, the potential for high fecal coliform after some rainfall events warrants harvest restrictions in Welsh Cove.

The aforementioned statements suggest the following classifications are appropriate:

- A Prohibited/Safety Zone area in the eastern third of Lower Little Bay (364.8 acres), from the Spaulding Turnpike Bridge at Dover Point to the middle of Broad Cove, should be established for potential impacts from boat sewage discharges or contamination from poisonous/deleterious substances (accidental fuel spills, bilge water, other toxins) from Great Bay Marine, the Little Bay Boat Club, and the Broad Cove mooring field.
- The area between the Lower Little Bay Prohibited/Safety Zone area and the Lower Little Bay/Upper Little Bay boundary near Fox Point and Durham Point (499.1 acres) shall be classified as Conditionally Approved, with one of the conditions relating to proper facility operation and treatment of effluent at the Durham, Dover and Portsmouth WWTFs, in accordance with the facilities' most recent National Pollutant Discharge Elimination System permit. This area should also be placed in the closed status for all harvest for the period of early October to end of March each year, until the Portsmouth WWTF upgrade is complete (projected to be done by April

2020). The area should also be closed following rainfall events of greater than 1.50 inches per 24 hours, although closures may be implemented for other storms (for example, storms of 1.50 inches occurring over more than 24 hours).

- Most of Upper Little Bay between the area at Fox Point-Durham Point, south to Adams Point, shall be classified as Conditionally Approved (936.8 acres), with one of the conditions relating to proper facility operation and treatment of effluent at the Durham, Dover and Portsmouth WWTFs, in accordance with the facilities' most recent National Pollutant Discharge Elimination System permit. The area should also be closed following rainfall events of greater than 1.50 inches per 24 hours, although closures may be implemented for other storms (for example, storms of 1.50 inches occurring over more than 24 hours).
- A Prohibited/Safety Zone area in Upper Little Bay (19.2 acres), encompassing the Adams Point North mooring field, should be established for potential impacts from boat sewage discharges or contamination from poisonous/deleterious substances (accidental fuel spills, bilge water, other toxins).
- A Restricted area at Branson Creek, located north of the Adams Point boat launch, should be established to encompass all waters potentially affected by high fecal coliform loading from the stream. This Restricted area shall extend to the small point of land approximately 500 feet north and west of the Adams Point boat launch (6.2 acres).
- A Restricted area encompassing all of Welsh Cove (27.7 acres), should be established to encompass all waters potentially affected by high fecal coliform loading from multiple nearby streams.

VIII. Conclusions

A. Legal Description

The eastern half of Lower Little Bay (Scammel Bridge/Broad Cove to Little Bay/Spaulding Turnpike Bridge) shall be classified as Prohibited/Safety Zone. For the purposes of this classification, the eastern boundary of the Prohibited/Safety Zone is defined by the Little Bay/Spaulding Turnpike bridge (the easternmost bridge (43^{0}07’11.8”N, 70^{0}49’38.2”W to 43^{0}07’00.63”N, 70^{0}49’25.4”W). The western boundary of the Prohibited area is defined by a line running southeasterly from the easternmost side of the Scammel Bridge (43^{0}07’41.5”N, 70^{0}50’40.6”W) to a point in Little Bay at 43^{0}07’9.2”N, 70^{0}50’37.0”W, then running northeasterly to a point in Little Bay at 43^{0}07’11.6”N, 70^{0}50’57.2”W, then running southwesterly to a point in Little Bay at 43^{0}07’9.1”N, 70^{0}50’49.5”W, then running southeasterly to a point in Little Bay at 43^{0}07’1.4”N, 70^{0}50’36.2”W, then running southeasterly to the rocky peninsula in Broad Cove (43^{0}06’46.2”N, 70^{0}50’34.5”W).

The western half of Lower Little Bay (Scammel Bridge/Broad Cove to Fox Point/Durham Point to the mouth of the Oyster River to the mouth of the Bellamy River) shall be classified as Conditionally Approved. For the purposes of this classification, the eastern boundary of the Conditionally Approved area is defined by a line running southeasterly from the easternmost side of the Scammel Bridge (43^{0}07’41.5”N, 70^{0}50’40.6”W) to a point in Little Bay at 43^{0}07’9.2”N, 70^{0}50’37.0”W, then running northeasterly to a point in Little Bay at 43^{0}07’11.6”N, 70^{0}50’57.2”W, then running southwesterly to a point in Little Bay at 43^{0}07’9.1”N, 70^{0}50’49.5”W, then running southeasterly to a point in Little Bay at 43^{0}07’1.4”N, 70^{0}50’36.2”W, then running southeasterly to the rocky peninsula in Broad Cove (43^{0}06’46.2”N, 70^{0}50’34.5”W). The southern boundary of the Conditionally Approved Area is defined by a line starting at Fox Point (43^{0}07’14.0”N, 70^{0}51’34.1”W), then running through the green navigational buoy at 43^{0}07’15.1”N, 70^{0}51’50.1”W, then continuing westerly to Durham Point (43^{0}07’14.3”N, 70^{0}52’10.0”W). The western boundary of the Conditionally Approved Area is at the mouth of the Oyster River, defined by a line starting at Durham Point (43^{0}07’14.4”N, 70^{0}52’10.1”W) and running northeasterly to the northern shore of the Oyster River mouth at 43^{0}07’28.6”N, 70^{0}52’7.1”W. The northern boundary of the Conditionally Approved Area is at the mouth of the Bellamy River, defined by a line starting at the western side of the Route 4/Scammel Bridge (43^{0}07’47.0”N, 70^{0}51’3.4”W) and running easterly to the eastern side of the Scammel Bridge (43^{0}07’44.0”N, 70^{0}50’49.2”W).

With the exception of the waters near Branson Creek, the waters near Welsh Cove, and the waters around the Adams Point North mooring field, the waters of Upper Little Bay shall be classified as Conditionally Approved. For the purposes of this classification, the northern boundary of the Conditionally Approved Area is defined by a line starting at Fox Point (43^{0}07’14.0”N, 70^{0}51’34.1”W), then running through the green navigational buoy at 43^{0}07’15.1”N, 70^{0}51’50.1”W, then continuing westerly to Durham Point (43^{0}07’14.3”N, 70^{0}52’10.0”W). The southern boundary of the Conditionally Approved Area is defined by a line starting at Adams Point (43^{0}05’24.0”N, 70^{0}51’53.6”W), then running easterly to the eastern shore of Upper Little Bay at 43^{0}05’23.2”N, 70^{0}51’36.2”W.

The area around the Adams Point North mooring field shall be classified as Prohibited/Safety Zone. For the purposes of this classification, the rectangular area of the Prohibited/Safety Zone shall be defined by its four corners: the northwest corner located at 43^{0}05’55.0”N, 70^{0}51’51.9”W, the northeast corner located at 43^{0}05’55.0”N, 70^{0}51’45.0”W, the southeast corner located at 43^{0}05’37.6”N, 70^{0}51’45.2”W, and the southwest corner located at 43^{0}05’37.6”N, 70^{0}51’51.1”W.

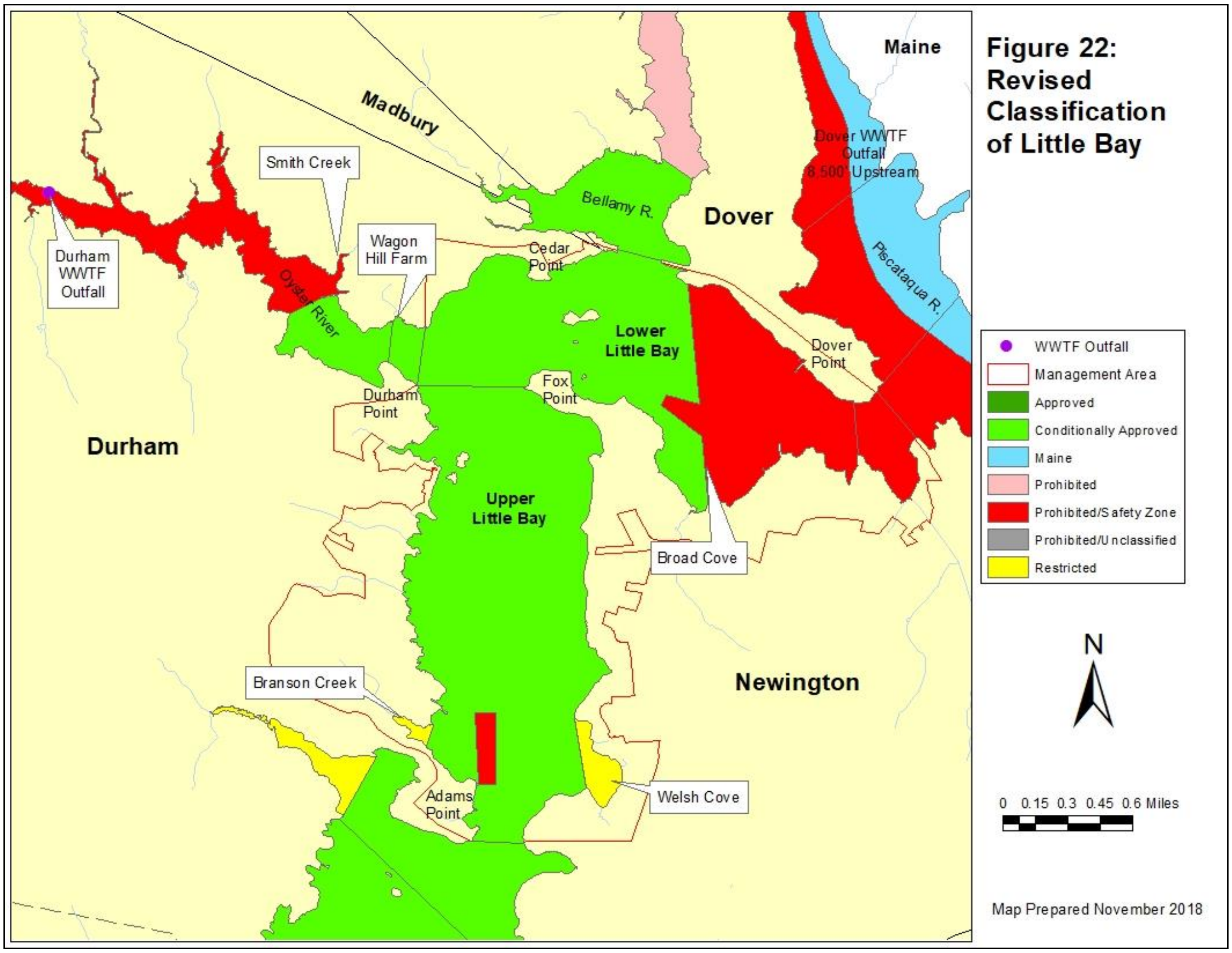
The waters of Branson Creek, located north of Adams Point, shall be classified as Restricted. For the purposes of this classification, all tidal waters west of a line drawn between the the northern boundary of the mouth of Branson Creek at 43^{0}05’52.2”N, 70^{0}52’5.9”W and the southern boundary of the mouth of Branson Creek at 43^{0}05’47.0”N, 70^{0}52’8.3”W, shall be Restricted.

The waters of Welsh Cove shall be classified as Restricted. For the purposes of this classification, all tidal waters east of a line drawn between the the northern boundary of Welsh Cove at 43^{0}05’53.8”N, 70^{0}51’19.3”W and the southern boundary of Welsh Cove at 43^{0}05’36.6”N, 70^{0}51’15.4”W, shall be Restricted.

For the purposes of this classification, all Conditionally Approved waters are closed for harvesting following rainfall events of over 1.50 inches. These waters will also be closed following discharges of improperly treated sewage from the Durham WWTF, the Dover WWTF and the Portsmouth WWTF. Furthermore, the Conditionally Approved waters of Lower Little Bay shall be placed in the closed status for the period of early October to the end of March each year.

Figure 22 depicts revised classifications. Appendix 5 describes the conditions under which the Conditionally Approved area will be placed in the closed status. The specific conditions under which the Conditionally Approved areas will be placed in the closed status for calendar years 2017 and 2018 are described in Appendix V. The specific conditions under which the Conditionally Approved areas will be placed in the closed status for calendar year 2019 are described in Appendix VI.

At the discretion of NHDES, some or all of the Conditionally Approved waters may be placed in the closed status, per emergency closure protocols, when unusual or rare conditions that may endanger public health exist. Such conditions include but are not limited to episodes of high shellfish toxicity from harmful algal blooms, spills of petroleum products or other poisonous/deleterious substances, or other conditions. NHDES will determine when the areas will be re-opened for harvest on a case-by-case basis, utilizing procedures outlined in the National Shellfish Sanitation Program and/or State of New Hampshire Interagency Memoranda of Agreement regarding NSSP implementation in New Hampshire.



B. Recommendations for Sanitary Survey Improvement

1. Complete a final report on the May 2017 Durham Wastewater Treatment Facility Dye Study, and amend the Little Bay Conditional Area Management Plan (particularly with respect to performance standards for WWTF flow) as appropriate.
2. When the Portsmouth WWTF is upgraded to secondary treatment (and the assumed bacteria concentration in undisinfected effluent can be reduced), revisit the classification and Conditional Area Management Plan for Little Bay.
3. When Dover Point bridge and roadway construction is done, conduct a shoreline survey to document any new pollution sources and deactivate any pollution sources that were eliminated as part of the construction.
4. Consider conducting a 1,000:1 steady state dye study at the Pease WWTF. This study should be designed to examine effluent time-of-travel and concentrations on a spring flooding tide. Particular emphasis should be placed on quantifying dye concentrations in the vicinity of Dover Point and in other areas of Little Bay and Great Bay.

5. Consider updating the hydrographic studies of the Dover WWTF, using new procedures recommended by the USFDA to delineate the steady state 1,000:1 zone of dilution (or 400:1, if appropriate) around the outfall.
6. Continue to develop background data on male-specific coliphage levels in Little Bay shellfish in various seasons, and from WWTFs affecting Little Bay, to be used to help determine when the area can be reopened for harvest following a significant release of sewage from local WWTF and/or sewage collection infrastructure.
7. Continue monthly boat counts on Little Bay marinas and mooring fields in the summer and fall. As time and funding allow, conduct weekend boat occupancy surveys.
8. Continue to document the water quality impacts of rainfall events in the 1-1.5-inch range, as well as storms over 1.5 inches, to maintain updated information to evaluate the 1.5-inch rainfall closure threshold for Little Bay.
9. Follow up on the high bacterial counts and possible septic system failure at station LLBPS020 by working with the landowners and the NHDES Watershed Assistance Section.
10. Discontinue ambient sampling at site GB6B, as it is no longer on a Prohibited/Conditionally Approved Boundary. Although site GB6A is also no longer on a Prohibited/Conditionally Approved boundary, this site should remain part of the systematic random sampling program as it has a long term dataset, and provides water quality information in the center of several commercial harvest areas.
11. Establish new monitoring sites at the new Prohibited/Conditionally Approved boundaries at Welsh Cove (GB6C), Adams Point North mooring field (GB6D), and at the mouth of Branson Creek (GB6E). Evaluate the practicality of sampling at GB6C at GB6E, as these shallow sites may not be accessible at all tides.

IX. References

Ao, Yaping, G. Goblick, K. Calci, and W. Nash (March 2017). *Hydrographic Study of Peirce Island Wastewater Treatment Plant Effluent in the Piscataqua River of Portsmouth, New Hampshire*; *Report of Findings from the December 10 – 14, 2012 Study Period.* FDA Technical Assistance and Training Project Report. 57 pages.

FAO and WHO (Food and Agriculture Organization of the United Nations, World Health Organization, 2018). *Technical Guidance for the Development of the Growing Area Aspects of Bivalve Mollusc Sanitation Programmes*. Food Safety and Quality Series No. 5. Rome. 292 pp. License: CC BY-NC-SA 3.0 IGO.

Interstate Shellfish Sanitation Conference. *National Shellfish Sanitation Program: Guide for the Control of Molluscan Shellfish, 2017 Revision*.

Nash, C. (October 2016). *2015 Annual Shellfish Management Area Update for Little Bay, New Hampshire*. 53 pages.

Nash, C. and M. Wood (July 2005). *New Hampshire Department of Environmental Services Shellfish Program: Sanitary Survey Report for Little Bay, New Hampshire*. NHDES Report R-WD-05-24. 53 pages.

Nash, Chris and T. Bridges (January 2003). *Dilution, Dispersion, and Transport of Durham, New Hampshire Wastewater Treatment Plant Effluent in the Oyster River*. NHDES Report Number R-WD-03-1. 66 pages.

Nash, Chris, V. Carr, and T. Bridges (December 2005). Dilution, Dispersion, and Transport of Dover, New Hampshire Wastewater Treatment Plant Effluent in the Piscataqua, Cocheco, and Salmon Falls Rivers. NHDES Report R-WD-06-25. 52 pages.

NAI (Normandeau Associates, Inc.), September 1975. *Summary Report of Hydrographic Studies off Hampton Beach, New Hampshire, Including the Hampton Harbor Estuary and the Western Gulf of Maine; September 1972 to March 1975* (Technical Report VI-8).

Short, F.T., ed. (1992). *The Ecology of the Great Bay Estuary, New Hampshire and Maine: An Estuarine Profile and Bibliography.* NOAA – Coastal Ocean Program Publ., 222 pages.

Appendix I: Shoreline Survey Pollution Source Sampling Plan

StationID	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Source Type
LLBPS001	Sample	Site visit 9/8/17 confirm site no longer exists	Inactivate and archive	Dover	12 " METAL	STORMWATER OUTFALL
LLBPS002	Sample	Site visit 9/8/17 confirm site no longer exists	Inactivate and archive	Dover	12 " METAL	STORMWATER OUTFALL
LLBPS003	Sample	Site visit 9/8/17 confirm site no longer exists	Inactivate and archive	Dover	15 " CONCRETE	STORMWATER OUTFALL
LLBPS004	Sample	Possibly removed during construction. Return with photos of old sources to verify	Return to verify removal	Dover	12 " CONCRETE W/ STONE MORTAR HEADWALL	PIPE
LLBPS005	Sample with a focus on wet weather	9/8/17 (wet weather, no flow) 10/26/2017 (wet weather; no flow)	Repeat 2017 plan	Dover	12 " CONCRETE W/ STONE MORTAR HEADWALL	STORMWATER OUTFALL
LLBPS006	Sample with a focus on wet weather	9/8/2017 (wet weather; no flow) 10/26/2017 (wet weather; no flow)	Repeat 2017 plan	Dover	12 " RUSTED METAL PIPE	STORMWATER OUTFALL
LLBPS007	Sample	9/8/17 (wet weather, flowing, no sample taken) 10/26/2017 (wet weather, FC = 60 CTS, MSC = 13 PFU)	Repeat 2017 plan	Dover	10 " GREEN, STEADY FLOW, DISCHARGE FROM LOBSTER TANKS. CONTINUOUS FLOW THROUGH SYSTEM.	LOBSTER TANK DISCHARGE

StationID	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Source Type
LLBPS008	Sample with a focus on wet weather	9/8/2017 (Wet weather, no flow) 10/26/2017 (wet weather, FC = 2400 CTS, MSC = 13 PFU)	Repeat 2017 plan	Dover	PROBABLY 12 IN STORMWATER OUTFALL. CAN'T SEE THE OUTLET IT IS UNDER WATER. DISCHARGES > 100' FROM THE HIGH TIDE LINE.	STORMWATER OUTFALL
LLBPS009	Sample	9/8/17 (wet weather, no flow)	Repeat 2017 plan	Dover	15 " CONCRETE STORMWATER OUTFALL	STORMWATER OUTFALL
LLBPS010	Visit to confirm source removal	Could not find 9/8/17	Inactivate and archive	dover	4" WHITE PVC, PROBABLY FOUNDATION DRAIN, NOT FLOWING	PIPE
LLBPS011	Visit to confirm source removal	Could not find 9/8/17	Inactivate and archive	Dover	4" GREY PVC, PROBABLY WASHING MACHINE GREY WATER	PIPE
LLBPS012	Sample with a focus on wet weather	7/26/17 (wet weather; no flow) 10/26/2017 (wet weather; no flow)	Repeat 2017 plan	Dover	12" GREEN PVC STORMWATER OUTFALL	STORMWATER OUTFALL
LLBPS013	Sample with a focus on wet weather	7/26/17 (wet weather; no flow) 10/26/2017 (wet weather; no flow)	Repeat 2017 plan	Dover	4" PIPE SLOPEING DOWN OUT OF BANK.	FOUNDATION DRAIN
LLBPS014	Sample with a focus on wet weather		Repeat 2017 plan	Newington	24" METAL STORMWATER OUTFALL	PIPE
LLBPS015	No need to sample. Assessed through GB2		Repeat 2017 plan	Dover	BELLAMY RIVER	RIVER

StationID	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Source Type
LLBPS016	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	24" CONCRETE W/STONE & MORTAR HEADWALL	STORMWATER OUTFALL
LLBPS017	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	4" WHITE PVC FOUNDATION DRAIN WITH METAL MESH OVER OUTLET	FOUNDATION DRAIN
LLBPS018	Site visit to confirm inactive	inactive		Durham	SEEP FROM POSSIBLE FAILING SEPTIC, STEADY LOW FLOW W/ BROWN FOAM & BUBBLES ON 8/30/01 ATC SPOKE WITH GREGG GENTILE WHO SAID THAT THE DISCHARGE IS FROM A WATER FILTRATION SYSTEM, NOT A SEPTIC SYSTEM	GROUNDWATER SEEP
LLBPS019	Sample	7/13/17 (wet weather; no flow) 9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	12 IN. CONCRETE STORMWATER CULVERT UNDER CEDAR PT. RD.	ROAD CULVERT

StationID	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Source Type
LLBPS020	Periodic sampling targeting wet weather events	2/6/17 (dry weather; no flow) 2/22/17 (dry weather, FC = 1100 MPN) 2/27/2017 (dry weather, FC = 4600 MPN) 6/21/2017 (dry weather, FC = 170 MPN) 6/28/2017 (dry weather; no flow) 7/13/17 (wet weather, FC = 3600 CTS) 7/25/2017 (wet weather, FC = >20000 CTS) 9/29/2017 (dry weather; no flow) 11/16/2017 (dry weather, FC = 3100, MSC = <13)	Repeat 2017 plan	Durham	12 IN. BL. PLASTIC STORMWATER CULVERT UNDER CEDAR PT. RD.	ROAD CULVERT
LLBPS021	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	15" CONCRETE STORMWATER CULVERT	STORMWATER OUTFALL
LLBPS022	Attempt to access		Repeat 2017 plan	Durham	6" IRON,WET	PIPE
LLBPS024	Sample	8/8/2017 (wet weather; no flow) 10/25/2017 (wet weather; no flow)	Repeat 2017 plan	Newington	12 INCH CLASTIC ROAD CULVERT	ROAD CULVERT

StationID	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Source Type
LLBPS025	Sample (via boat), focus on dry weather	8/8/2017 (wet weather, FC = 240 CTS) 10/25/2017 (wet weather, FC = >2000 CTS, MSC = 1227 PFU) 11/16/2017 (dry weather, FC = 40, MSC = 13) 11/29/2017 (dry weather, FC = 20 CTS, MSC = 40 PFU)	Repeat 2017 plan	Newington	PERENNIAL STREAM 8-10 FT. WIDE	PERENNIAL STREAM
LLBPS026	Sample	8/8/2017 (wet weather, FC = 20 CTS) 10/25/2017 (wet weather, FC = 1000 CTS, MSC = <13.4 PFU)	Repeat 2017 plan	Newington	36 IN. PIPE/ OUTLET FROM POND ON KNIGHT BROOK	MAN-MADE POND OUTLET
LLBPS027	Sample	8/8/2017 (wet weather, no flow) 10/25/2017 (wet weather; no flow)	Repeat 2017 plan	Newington	18 IN. CLAY PIPE/OVERFLOW FROM POND ON KNIGHT BROOK	PIPE
LLBPS028	Sample	8/8/2017 (wet weather, no flow) 10/25/2017 (wet weather, FC = 1200 CTS, MSC = < 13.4 PFU)	Repeat 2017 plan	Newington	24 IN. PIPE, TRIB TO KNIGHT BROOK	INTERMITTENT STREAM

StationID	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Source Type
LLBPS029	Sample	8/8/2017 (wet weather, FC = 1000 CTS) 10/25/2017 (wet weather, FC = >2000 CTS, MSC = 2200 PFU), 11/29/2017 (dry weather, FC = 20 CTS, MSC = 53 PFU)	Repeat 2017 plan	Newington	INTERMITTENT STREAM	INTERMITTENT STREAM
LLBPS030	Sample	8/8/2017 (wet weather, no flow) 10/25/2017 (wet weather, FC = 1200 CTS, MSC = < 13.4 PFU)	Repeat 2017 plan	Newington	INTERMITTENT STREAM	INTERMITTENT STREAM
LLBPS031	Sample	8/8/2017 (wet weather, no flow) 10/25/2017 (wet weather; no flow)	Repeat 2017 plan	Newington	2" WHITE PVC, FOUNDATION DRAIN, ACCESS VIA #29 CARTERS LN.	FOUNDATION DRAIN
LLBPS032	Sample	8/8/2017 (wet weather, FC = <10 CTS) 10/25/2017 (wet weather, FC = 160, MSC = <13.4)	Repeat 2017 plan	Newington	3" GREEN PLASTIC PIPE, REPLACED THAT 4" DIRTY ASBESTOS FOUNDATION DRAIN,	FOUNDATION DRAIN
LLBPS033	Sample	8/8/2017 (wet weather, no flow) 10/25/2017 (wet weather; no flow)	Repeat 2017 plan	Newington	3" BLACK PVC FOUNDATION DRAIN, ACCESS VIA #29 CARTERS LN.	FOUNDATION DRAIN
LLBPS034	Sample	8/8/2017 (wet weather, no flow) 10/25/2017 (wet weather; no flow)	Repeat 2017 plan	Newington	INTERMITTENT STREAM BED	INTERMITTENT STREAM

StationID	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Source Type
LLBPS035	Sample	8/8/2017 (wet weather, FC = 9100 CTS) 10/25/2017 (wet weather, FC = >2000 CTS, MSC = <13.4) 11/29/2017 (dry weather, FC = <10 CTS, MSC = 67 PFU)	Repeat 2017 plan	Newington	36" METAL	STORMWATER OUTFALL
LLBPS036	Sample	11/29/2017 (dry weather, FC = 9 CTS, MSC =)	Repeat 2017 plan	Newington	TIDAL CREEK	TIDAL CREEK
LLBPS037	Sample	11/29/2017 (dry weather, FC = <10 CTS, MSC =)	Repeat 2017 plan	Newington	TIDAL CREEK	TIDAL CREEK
LLBPS038	Sample	11/29/2017 (dry weather, FC = 60 CTS, MSC =)	Repeat 2017 plan	Newington	FRESHWATER PORTION ~4' WIDE	PERENNIAL STREAM
LLBPS039	Sample	11/29/2017 (dry weather, FC = 20 CTS, MSC =)	Repeat 2017 plan	Newington	24" METAL STORMWATER OUTFALL W/SPLASH GUARD	STORMWATER OUTFALL
LLBPS040	Sample	11/29/2017 (dry weather; no flow)	Repeat 2017 plan	Newington	24" CMP STORMWATER OUTFALL WITH METAL WINGWALLS. HIDDEN IN BUSHES, SOME TRASH, NO HOUSES VISIBLE FROM SOURCE LOCATION	STORMWATER OUTFALL

StationID	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Source Type
LLBPS041	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	18 IN. CONCRETE AT INTERSECTION OF BACK R. ROAD AND RTE. 4 (SOUTH SIDE NEAR UTILITY BOX AND TEL. POLE	PIPE
LLBPS042	Sample	7/26/17 (wet weather; no flow) 10/26/2017 (wet weather; no flow)	Repeat 2017 plan	Dover	2" BLACK PIPE UNDER DOCK. PERIMETER PIPE/DRAIN FROM LAWNA ND FOUNDATION	FOUNDATION DRAIN
LLBPS043	Sample	8/7/2017 (dry weather, FC = 9 CTS) 9/25/2017 (dry weather, FC = <10 CTS)	Repeat 2017 plan	Newington	GREAT BAY MARINA	MARINA
LLBPS044	Sample	8/8/2017 (wet weather, FC = 9 CTS) 9/25/2017 (dry weather, FC = <10 CTS)	Repeat 2017 plan	Dover	LITTLE BAY BOAT CLUB	MARINA
LLBPS045	Sample	8/7/2017 (dry weather, FC = <10) 9/25/2017 (dry weather, FC = <10 CTS)	Repeat 2017 plan	Newington	GREAT BAY MARINA	MARINA

StationID	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Source Type
LLBPS046	Sample	9/25/2017 (dry weather, FC =)	Repeat 2017 plan	Newington	"BROAD COVE" MOORING FIELD. ESTIMATED #MOORINGS (COUNTED DURING FIELD INSPECTION) IS 69. ESTIMATED MID TIDE WATER DEPTH (AVG VALUE FROM BOAT'S DEPTH FINDER) IS 38 FT.	MOORING FIELD
LLBPS047	Sample	7/13/2017 (wet weather; no flow) 9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	12 IN. CONCRETE CULVERT, UNDER CEDAR POINT ROAD	ROAD CULVERT
LLBPS048	Sample	7/26/17 (wet weather; no flow) 10/26/2017 (wet weather, FC = 280 CTS, MSC = <13.4 PFU)	Repeat 2017 plan			
LLBPS049	Sample	7/26/17 (wet weather; no flow) 10/26/2017 (wet weather; no flow)	Repeat 2017 plan			
LLBPS050	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	1.5 INCH GREY PVC IN STONE AND MORTAR WALL	PIPE
LLBPS051	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	1.5 INCH WHITE PVC IN STONE AND MORTAR WALL	PIPE
LLBPS052	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	1.5 INCH WHITE PVC IN STONE AND MORTAR WALL	PIPE

StationID	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Source Type
LLBPS053	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	2 IN. WHITE PVC IN STONE AND MORTAR WALL	PIPE
LLBPS054	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	2 IN. WHITE PVC IN STONE AND MORTAR WALL	PIPE
LLBPS055	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	2 IN. WHITE PVC IN STONE AND MORTAR WALL	PIPE
LLBPS056	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	2 IN. WHITE PVC IN STONE AND MORTAR WALL	PIPE
LLBPS057	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	2 IN. WHITE PVC IN STONE AND MORTAR WALL	PIPE
LLBPS058	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	2 IN. WHITE PVC IN STONE AND MORTAR WALL	PIPE
LLBPS059	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	2 IN. WHITE PVC IN STONE AND MORTAR WALL	PIPE
LLBPS060	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	2 IN. WHITE PVC IN STONE AND MORTAR WALL	PIPE
LLBPS061	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	2 IN. WHITE PVC IN STONE AND MORTAR WALL	PIPE
LLBPS062	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	2 IN. WHITE PVC IN STONE AND MORTAR WALL	PIPE
LLBPS063	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	2 IN. WHITE PVC IN STONE AND MORTAR WALL	PIPE

StationID	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Source Type
LLBPS064	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	2 IN. WHITE PVC IN STONE AND MORTAR WALL	PIPE
LLBPS065	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	2 IN. WHITE PVC IN STONE AND MORTAR WALL	PIPE
LLBPS066	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	2 IN. WHITE PVC IN STONE AND MORTAR WALL	PIPE
LLBPS067	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	1.5 INCH WHITE PVC IN STONE AND MORTAR WALL	PIPE
LLBPS068	Sample	10/26/2017 (wet weather; flow too low to sample)	Repeat 2017 plan			
LLBPS069	Sample		Repeat 2017 plan			
LLBPS070	Sample	9/25/2017 (dry weather, FC = <10 CTS)	Repeat 2017 plan			FOX POINT NORTH MOORING FIELD
LLBPS071	Sample	9/25/2017 (dry weather, FC = <10 CTS)	Repeat 2017 plan			CEDAR POINT WEST-EAST MOORING FIEL
LLBPS072	Sample	9/25/2017 (dry weather, FC = <10 CTS)	Repeat 2017 plan			SCAMMEL EAST MOORING FIELD
LLBPS073	Sample	9/25/2017 (dry weather, FC = <10 CTS)	Repeat 2017 plan			BOSTON HARBOR ROAD MOORING FIEL
LLBPS074	Sample	9/25/2017 (dry weather, no boats)	Repeat 2017 plan			SCAMMEL WEST MOORING FIELD
LLBPS075	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan			
LLBPS076	Sample	9/29/2017 (dry weather; no flow)	Repeat 2017 plan			

StationID	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Source Type
ULBPS001	Sample (via boat), focus on dry weather	7/19/17 (dry weather, by boat, FC = 1.8 MPN)	Sample with a focus on wet weather	Newington	PERENNIAL STREAM	PERENNIAL STREAM
ULBPS001A	Sample (via boat), focus on dry weather	7/19/17 (dry weather, by boat, FC = <2 MPN)	Sample with a focus on wet weather	Newington	PERENNIAL STREAM	PERENNIAL STREAM
ULBPS002	Visit/observe		Repeat 2017 plan	Newington	24" METAL STORMWATER OUTFALL	PIPE
ULBPS003	Sample		Repeat 2017 plan	Newington	1 FOOT WIDE POND OUTLET	MAN-MADE POND OUTLET
ULBPS004	Visit/observe		Repeat 2017 plan	Newington	12" METAL STORMWATER OUTFALL, FROM A CATCH BASIN	STORMWATER OUTFALL
ULBPS005	Sample		Repeat 2017 plan	Newington	OUTLET OF SEVERAL SOURCES	INTERMITTENT STREAM
ULBPS006	Sample		Repeat 2017 plan	Newington	2" BLACK PVC W/HOSE CLAMP & WHITE PLASTIC EXTENSION	PIPE
ULBPS007	Inactive no need to sample	inactive	Inactive	Newington	4" BLACK CORRIGATED PIPE, FOUNDATION DRAIN	FOUNDATION DRAIN
ULBPS008	Inactive no need to sample	inactive	Inactive	Newington	4" AQUA PVC	FOUNDATION DRAIN
ULBPS009	Inactive no need to sample	inactive	Inactive	Newington	4" WHITE PVC	FOUNDATION DRAIN
ULBPS010	Sample (via boat), focus on dry weather	7/19/17 (dry weather, by boat, FC = 11 MPN)	Sample with a focus on wet weather	Newington	INTERMITTENT STREAM	INTERMITTENT STREAM
ULBPS010A	Sample (via boat), focus on dry weather	7/19/17 (dry weather, by boat, FC = 4.5 MPN)	Sample with a focus on wet weather	Newington	INTERMITTENT STREAM	INTERMITTENT STREAM

StationID	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Source Type
ULBPS010B	Sample (via boat), focus on dry weather	7/19/17 (dry weather, by boat, FC = 2 MPN)	Sample with a focus on wet weather	Newington	INTERMITTENT STREAM	INTERMITTENT STREAM
ULBPS011	Visit/observe		Repeat 2017 plan	Newington	BLACK, CORRUGATED; PER MS. COCHRANE, PIPE USED FOR PROPERTY DRAINAGE	PIPE
ULBPS012	Sample		Repeat 2017 plan	Newington	2-3 FOOT WIDE PERENNIAL STREAM	PERENNIAL STREAM
ULBPS013	Sample	7/31/17 (dry weather, no flow; by boat)	Repeat 2017 plan	Newington	4 IN. WHITE PVC (NORTH)-DRAINS WATER AWAY FROM WALL	FOUNDATION DRAIN
ULBPS014	Visit/observe		Repeat 2017 plan	Newington	2" FOUNDATION DRAIN	FOUNDATION DRAIN
ULBPS015	Inactive no need to sample		Repeat 2017 plan	Newington	6" BLACK PLASTIC FOUNDATION DRAIN	FOUNDATION DRAIN
ULBPS016	Sample (via boat), focus on dry weather	7/19/17 (dry weather, by boat, FC = 7.8 MPN) 10/13/2017 (dry weather, site visit only; low flow)	Sample with a focus on wet weather	Durham	INTERMITTENT STREAM	INTERMITTENT STREAM
ULBPS016A	Sample (via boat), focus on dry weather	7/19/17 (dry weather, by boat, FC = 13 MPN)	Sample with a focus on wet weather			
ULBPS017	Sample (via boat), focus on dry weather	7/19/2017 (dry weather, by boat, FC = 4.5 MPN) 10/13/2017 (dry weather, site visit only; low flow)	Sample with a focus on wet weather	Durham	INTERMITTENT STREAM	INTERMITTENT STREAM
ULBPS017A	Sample (via boat), focus on dry	7/19/17 (dry weather, by boat, FC	Sample with a focus on wet weather			

StationID	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Source Type
	weather	= 17 MPN)				
ULBPS018	Sample		Repeat 2017 plan	Durham	STREAM, 2-4 FT. WIDE	INTERMITTENT STREAM
ULBPS019	Sample	7/19/2017 (dry weather, FC = <2 MPN)	Repeat 2017 plan	Durham	8" METAL OUTFALL PIPE WITH ROCK HEADWALL.	PIPE
ULBPS020	Sample	7/19/2017 (dry weather, no flow)	Repeat 2017 plan	Durham	4" GREY PVC W/PLUG	PIPE
ULBPS021	Sample	7/19/2017 (dry weather, FC = <2 MPN)	Repeat 2017 plan	Durham	5" WHITE PVC PIPE WITH ROCK HEADWALL	PIPE
ULBPS022	Sample	10/13/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	4" WHITE PVC FOUNDATION DRAIN	FOUNDATION DRAIN
ULBPS023	Sample	10/13/2017 (dry weather; no flow; found in field)	Repeat 2017 plan	Durham	3" METAL, PROBABLY WASHER DRAIN	PIPE
ULBPS024	Sample	10/13/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	6" CLAY, BROKEN, RELIEVES BASEMENT OF GROUNDWATER PER SYBLE CARLSON, OWNER, ON 9/6/01. ONLY FLOWS DURING SPRING TIME OR LONG PERIODS OF RAIN.	FOUNDATION DRAIN
ULBPS025	Sample (via boat), focus on dry weather	7/19/17 (dry weather, by boat, FC = 4.5 MPN)	Sample with a focus on wet weather	Durham	SAMPLE AT THE STONE DAM IN BRANSON CREEK	PERENNIAL STREAM
ULBPS025A	Sample (via boat), focus on dry weather	7/19/17 (dry weather, by boat, FC = <2 MPN)	Sample with a focus on wet weather	Durham	SAMPLE AT THE STONE DAM IN BRANSON CREEK	PERENNIAL STREAM

StationID	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Source Type
ULBPS025B	No need to sample			Durham	SAMPLE AT THE STONE DAM IN BRANSON CREEK	PERENNIAL STREAM
ULBPS026	Sample (via boat), focus on dry weather	7/19/17 (dry weather, by boat, FC = 6.8 MPN) 10/13/2017 (site visit only; low flow)	Sample with a focus on wet weather	Durham	CULVERT UNDER DRIVEWAY, FLOWS INTO TIDAL WATER NEAR WILLEY CREEK	INTERMITTENT STREAM
ULBPS026A	Sample (via boat), focus on dry weather	7/19/17 (dry weather, by boat, FC = 4 MPN)	Sample with a focus on wet weather			
ULBPS027	Sample	7/31/2017 (dry weather, no flow; by boat)	Repeat 2017 plan	Newington	4 IN. WHITE PVC (SOUTH)- DRAINS WATER AWAY FROM WALL	FOUNDATION DRAIN
ULBPS028	Sample	10/13/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	WILLEY CREEK	INTERMITTENT STREAM
ULBPS029	Sample	9/25/2017 (dry weather, FC = <10 CTS)	Repeat 2017 plan	Durham	"ADAMS POINT NORTH" MOORING FIELD. ESTIMATED #MOORINGS (COUNTED DURING FIELD INSPECTION) IS 39. ESTIMATED MID TIDE WATER DEPTH (AVG VALUE FROM BOAT'S DEPTH FINDER) IS 18 FT.	MOORING FIELD
ULBPS030	Sample (via boat), focus on dry weather	7/19/17 (dry weather, by boat, FC = <2 MPN)	Sample with a focus on wet weather	Durham	INTERMITTENT STREAM	INTERMITTENT STREAM
ULBPS030A	Sample (via boat), focus on dry	7/19/17 (dry weather, by boat, FC	Sample with a focus on wet weather	Durham	INTERMITTENT STREAM	INTERMITTENT STREAM

StationID	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Source Type
	weather	= 4.5 MPN)				
ULBPS030B	No need to sample			Durham	INTERMITTENT STREAM	INTERMITTENT STREAM
ULBPS030C	No need to sample			Durham	INTERMITTENT STREAM	INTERMITTENT STREAM
ULBPS031	Sample	10/13/2017 (dry weather, site visit only; low flow)	Repeat 2017 plan	Durham	4 IN. GREEN PVC FOUNDATION DRAIN	FOUNDATION DRAIN
ULBPS032	Sample	10/13/2017 (dry weather; no flow)	Repeat 2017 plan	Durham	4 IN. GREEN PVC FOUNDATION DRAIN	FOUNDATION DRAIN
ULBPS033	Sample	not flowing at time of visit (disconnected)	Repeat 2017 plan	Durham		NEW PIPE OUTSIDE JEL (land-based eelgra tanks)
ULBPS034	Sample	not flowing at time of visit (disconnected)	Repeat 2017 plan	Durham		NEW PIPE OUTSIDE JEL (land-based eelgra tanks)
ULBPS035	Sample	9/25/2017 (dry weather, FC = 10 CTS)	Repeat 2017 plan			ADAMS POINT SOUTH MOORING FIELD
ULBPS036	Sample if boats present	9/25/2017 (dry weather, no boats)	Repeat 2017 plan			FOX POINT WEST-SOUTH MOORING FIEL

Appendix II: Shoreline Pollution Source Sampling Data

StationID	Date	Pollution Source	Project Sampling Conditions	FC/100ml	FC Units
ULBPS001	5/10/2011	PERENNIAL STREAM	DRY	79	MPN/100ML
ULBPS001	6/9/2011			23	MPN/100ML
ULBPS001	8/3/2015			<2	MPN/100ML
ULBPS001	5/21/2008			<10	#/100ML
ULBPS001	9/22/2008			10	#/100ML
ULBPS001	7/19/2017			1.8	MPN/100ML
ULBPS001	9/17/2001			20	#/100ML
ULBPS001	10/5/2001			20	#/100ML
ULBPS001	9/8/2011	PERENNIAL STREAM	WET	50	#/100ML
ULBPS001	6/1/2015			79	MPN/100ML
ULBPS001	7/29/2008			30	#/100ML
ULBPS001	3/28/2005			500	#/100ML
ULBPS001	3/28/2005			200	#/100ML
ULBPS001	3/29/2005			4.5	MPN/100ML
ULBPS001	4/27/2005			13	MPN/100ML
ULBPS001	4/27/2005			79	MPN/100ML
ULBPS001	4/27/2005			79	MPN/100ML
ULBPS001	9/21/2001			650	#/100ML
ULBPS001	10/17/2001			400	#/100ML
ULBPS001	6/22/2015				#/100ML
ULBPS001A	6/9/2011	PERENNIAL STREAM	DRY	<2	MPN/100ML
ULBPS001A	8/3/2015			<2	MPN/100ML
ULBPS001A	9/22/2008			<10	#/100ML
ULBPS001A	7/19/2017			<2	MPN/100ML
ULBPS001A	9/8/2011	PERENNIAL STREAM	WET	9	#/100ML
ULBPS001A	6/1/2015			7.8	MPN/100ML
ULBPS001A	6/22/2015			9	#/100ML
ULBPS001A	7/29/2008			9	#/100ML
ULBPS001A	3/29/2005			4.5	MPN/100ML
ULBPS001A	3/29/2005			<2	MPN/100ML
ULBPS002	9/17/2001	STORMWATER OUTFALL	DRY		
ULBPS002	10/5/2001				
ULBPS002	5/21/2008				#/100ML
ULBPS002	5/10/2011				#/100ML

ULBPS002	9/21/2001	STORMWATER OUTFALL	WET		
ULBPS002	10/17/2001				
ULBPS002	9/8/2011				#/100ML
ULBPS003	5/12/2011	MAN-MADE POND OUTLET	DRY	30	#/100ML
ULBPS003	5/21/2008			<10	#/100ML
ULBPS003	9/17/2001			18	#/100ML
ULBPS003	10/5/2001			30	#/100ML
ULBPS003	9/22/2008				#/100ML
ULBPS003	9/8/2011	MAN-MADE POND OUTLET	WET	170	#/100ML
ULBPS003	9/21/2001			40	#/100ML
ULBPS003	10/17/2001			280	#/100ML
ULBPS004	9/17/2001	STORMWATER OUTFALL	DRY		
ULBPS004	10/5/2001			<10	#/100ML
ULBPS004	5/21/2008				#/100ML
ULBPS004	5/10/2011				#/100ML
ULBPS004	9/21/2001	STORMWATER OUTFALL	WET		
ULBPS004	10/17/2001				
ULBPS004	9/8/2011				#/100ML
ULBPS005	5/10/2011	INTERMITTENT STREAM	DRY	13	MPN/100ML
ULBPS005	7/12/2005			1	MPN/100ML
ULBPS005	7/18/2005			4.5	MPN/100ML
ULBPS005	8/1/2005			17	MPN/100ML
ULBPS005	8/9/2005			<2	MPN/100ML
ULBPS005	8/25/2005			6.8	MPN/100ML
ULBPS005	9/17/2001			240	#/100ML
ULBPS005	10/5/2001			20	#/100ML
ULBPS005	5/21/2008				#/100ML
ULBPS005	9/22/2008				#/100ML
ULBPS005	9/8/2011	INTERMITTENT STREAM	WET	<9	#/100ML
ULBPS005	7/29/2008			5	#/100ML
ULBPS005	7/6/2005			56	MPN/100ML
ULBPS005	7/25/2005			1.8	MPN/100ML
ULBPS005	7/28/2005			2	MPN/100ML
ULBPS005	8/15/2005			360	MPN/100ML
ULBPS005	8/30/2005			2	MPN/100ML
ULBPS005	9/21/2001			950	#/100ML
ULBPS005	10/17/2001			175	#/100ML
ULBPS006	9/17/2001	PIPE	DRY		
ULBPS006	10/5/2001				
ULBPS006	5/21/2008				#/100ML
ULBPS006	5/12/2011				#/100ML

ULBPS006	10/13/2011	PIPE	WET	<9	#/100ML
ULBPS006	9/21/2001				
ULBPS006	10/17/2001				
ULBPS007	9/17/2001	FOUNDATION DRAIN	DRY		
ULBPS007	10/5/2001				
ULBPS007	5/21/2008				#/100ML
ULBPS007	9/21/2001	FOUNDATION DRAIN	WET		
ULBPS007	10/17/2001				
ULBPS008	9/17/2001	FOUNDATION DRAIN	DRY		
ULBPS008	10/5/2001				
ULBPS008	5/21/2008				#/100ML
ULBPS008	10/8/2008				#/100ML
ULBPS008	9/21/2001	FOUNDATION DRAIN	WET		
ULBPS008	10/17/2001			1120	#/100ML
ULBPS009	9/17/2001	FOUNDATION DRAIN	DRY		
ULBPS009	10/5/2001				
ULBPS009	10/8/2008				#/100ML
ULBPS009	9/21/2001	FOUNDATION DRAIN	WET	>20000	#/100ML
ULBPS009	10/17/2001				
ULBPS009	6/12/2008				#/100ML
ULBPS010	5/10/2011	INTERMITTENT STREAM	DRY	110	MPN/100ML
ULBPS010	6/9/2011			79	MPN/100ML
ULBPS010	8/3/2015			22	MPN/100ML
ULBPS010	9/22/2008			9	#/100ML
ULBPS010	10/8/2008			30	#/100ML
ULBPS010	7/19/2017			11	MPN/100ML
ULBPS010	9/17/2001			2	#/100ML
ULBPS010	10/5/2001				
ULBPS010	9/8/2011	INTERMITTENT STREAM	WET	50	#/100ML
ULBPS010	6/1/2015			22	MPN/100ML
ULBPS010	7/29/2008			20	#/100ML
ULBPS010	3/28/2005			<100	#/100ML
ULBPS010	3/28/2005			<100	#/100ML
ULBPS010	3/29/2005			22	MPN/100ML
ULBPS010	4/27/2005			30	MPN/100ML
ULBPS010	4/27/2005			49	MPN/100ML
ULBPS010	4/27/2005			95	MPN/100ML
ULBPS010	9/21/2001			10300	#/100ML
ULBPS010	10/17/2001			898	#/100ML
ULBPS010	6/22/2015				#/100ML
ULBPS010A	6/9/2011	INTERMITTENT STREAM	DRY	<2	MPN/100ML

ULBPS010A	8/3/2015			<2	MPN/100ML
ULBPS010A	9/22/2008			<10	#/100ML
ULBPS010A	7/19/2017			4.5	MPN/100ML
ULBPS010A	9/8/2011	INTERMITTENT STREAM	WET	30	#/100ML
ULBPS010A	6/1/2015			<2	MPN/100ML
ULBPS010A	6/22/2015			<10	#/100ML
ULBPS010A	7/29/2008			70	#/100ML
ULBPS010A	3/29/2005			2	MPN/100ML
ULBPS010A	3/29/2005			6.8	MPN/100ML
ULBPS010B	6/9/2011	INTERMITTENT STREAM	DRY	<2	MPN/100ML
ULBPS010B	8/3/2015			<2	MPN/100ML
ULBPS010B	9/22/2008			<9	#/100ML
ULBPS010B	7/19/2017			2	MPN/100ML
ULBPS010B	9/8/2011	INTERMITTENT STREAM	WET	20	#/100ML
ULBPS010B	6/1/2015			2	MPN/100ML
ULBPS010B	6/22/2015			<10	#/100ML
ULBPS010B	7/29/2008			9	#/100ML
ULBPS010B	3/29/2005			<2	MPN/100ML
ULBPS010B	3/29/2005			2	MPN/100ML
ULBPS011	9/17/2001	PIPE	DRY		
ULBPS011	10/5/2001			6500	#/100ML
ULBPS011	5/10/2011				#/100ML
ULBPS011	9/21/2001	PIPE	WET	490	#/100ML
ULBPS011	10/17/2001			7640	#/100ML
ULBPS011	6/12/2008				#/100ML
ULBPS011	9/8/2011				#/100ML
ULBPS012	5/4/2011	PERENNIAL STREAM	DRY	50	#/100ML
ULBPS012	5/21/2008				#/100ML
ULBPS012	6/9/2008			9	#/100ML
ULBPS012	10/8/2008			30	#/100ML
ULBPS012	9/17/2001			120	#/100ML
ULBPS012	10/5/2001			30	#/100ML
ULBPS012	9/8/2011	PERENNIAL STREAM	WET	110	#/100ML
ULBPS012	7/23/2008			80	#/100ML
ULBPS012	9/15/2008			170	#/100ML
ULBPS012	9/21/2001			820	#/100ML
ULBPS012	10/17/2001			0	#/100ML
ULBPS013	9/17/2001	FOUNDATION DRAIN	DRY		
ULBPS013	10/5/2001				

ULBPS013	10/8/2008				#/100ML
ULBPS013	5/10/2011				#/100ML
ULBPS013	7/31/2017				#/100ML
ULBPS013	9/21/2001	FOUNDATION DRAIN	WET		
ULBPS013	10/17/2001				
ULBPS013	6/12/2008				#/100ML
ULBPS013	9/8/2011				#/100ML
ULBPS014	9/17/2001	ROAD CULVERT	DRY		
ULBPS014	10/5/2001				
ULBPS014	10/8/2008				#/100ML
ULBPS014	5/4/2011				#/100ML
ULBPS014	9/21/2001	ROAD CULVERT	WET		
ULBPS014	10/17/2001				
ULBPS014	6/12/2008				#/100ML
ULBPS014	9/7/2011				#/100ML
ULBPS015	9/17/2001	FOUNDATION DRAIN	DRY		
ULBPS015	10/5/2001				
ULBPS015	10/8/2008				#/100ML
ULBPS015	5/4/2011				#/100ML
ULBPS015	9/21/2001	FOUNDATION DRAIN	WET	50	#/100ML
ULBPS015	10/17/2001				
ULBPS015	6/12/2008				#/100ML
ULBPS016	5/3/2011	INTERMITTENT STREAM	DRY	<10	#/100ML
ULBPS016	4/1/2013			4.5	MPN/100ML
ULBPS016	8/3/2015			13	MPN/100ML
ULBPS016	5/21/2008			<10	#/100ML
ULBPS016	7/19/2017			7.8	MPN/100ML
ULBPS016	9/17/2001				
ULBPS016	10/5/2001				
ULBPS016	9/23/2008				#/100ML
ULBPS016	10/13/2017				#/100ML
ULBPS016	9/7/2011	INTERMITTENT STREAM	WET	>20000	#/100ML
ULBPS016	10/13/2011			3400	#/100ML
ULBPS016	6/1/2015			79	MPN/100ML
ULBPS016	6/12/2008			470	#/100ML
ULBPS016	10/28/2008			30	#/100ML
ULBPS016	9/21/2001			590	#/100ML
ULBPS016	10/17/2001			2990	#/100ML
ULBPS016	9/3/2008				#/100ML
ULBPS016	6/22/2015				#/100ML
ULBPS016A	4/1/2013	INTERMITTENT STREAM	DRY	2	MPN/100ML

ULBPS016A	8/3/2015			<2	MPN/100ML
ULBPS016A	7/19/2017			13	MPN/100ML
ULBPS016A	6/1/2015	INTERMITTENT STREAM	WET	49	MPN/100ML
ULBPS016A	6/22/2015			9	#/100ML
ULBPS017	5/12/2011	INTERMITTENT STREAM	DRY	550	#/100ML
ULBPS017	4/1/2013			7.8	MPN/100ML
ULBPS017	8/3/2015			<2	MPN/100ML
ULBPS017	5/21/2008			9	#/100ML
ULBPS017	7/19/2017			4.5	MPN/100ML
ULBPS017	9/17/2001				
ULBPS017	10/5/2001				
ULBPS017	9/23/2008				#/100ML
ULBPS017	10/13/2017				#/100ML
ULBPS017	9/8/2011	INTERMITTENT STREAM	WET	580	#/100ML
ULBPS017	10/13/2011			2100	#/100ML
ULBPS017	6/1/2015			920	MPN/100ML
ULBPS017	9/21/2001			1600	#/100ML
ULBPS017	10/17/2001			2050	#/100ML
ULBPS017	6/12/2008				#/100ML
ULBPS017	9/3/2008				#/100ML
ULBPS017	10/28/2008				#/100ML
ULBPS017	6/22/2015				#/100ML
ULBPS017A	4/1/2013	INTERMITTENT STREAM	DRY	<2	MPN/100ML
ULBPS017A	8/3/2015			<2	MPN/100ML
ULBPS017A	7/19/2017			17	MPN/100ML
ULBPS017A	6/1/2015	INTERMITTENT STREAM	WET	21	MPN/100ML
ULBPS017A	6/22/2015			30	#/100ML
ULBPS018	5/3/2011	INTERMITTENT STREAM	DRY	20	#/100ML
ULBPS018	5/21/2008			<10	#/100ML
ULBPS018	9/3/2008			30	#/100ML
ULBPS018	9/23/2008			<5	#/100ML
ULBPS018	9/17/2001				
ULBPS018	10/5/2001			40	#/100ML
ULBPS018	9/8/2011	INTERMITTENT STREAM	WET	50	#/100ML
ULBPS018	6/12/2008			<10	#/100ML
ULBPS018	10/28/2008			50	#/100ML
ULBPS018	9/21/2001			500	#/100ML
ULBPS018	10/17/2001			1280	#/100ML
ULBPS019	5/3/2011	PIPE	DRY	<10	#/100ML

ULBPS019	5/22/2008			<10	#/100ML
ULBPS019	7/19/2017			<2	MPN/100ML
ULBPS019	9/17/2001			2	#/100ML
ULBPS019	10/5/2001			<10	#/100ML
ULBPS019	9/7/2011	PIPE	WET	20	#/100ML
ULBPS019	6/2/2015			20	#/100ML
ULBPS019	9/21/2001			<10	#/100ML
ULBPS019	10/17/2001			5	#/100ML
ULBPS020	9/17/2001	PIPE	DRY		
ULBPS020	10/5/2001				
ULBPS020	5/22/2008				#/100ML
ULBPS020	5/3/2011				#/100ML
ULBPS020	7/19/2017				#/100ML
ULBPS020	9/21/2001	PIPE	WET		
ULBPS020	10/17/2001				
ULBPS020	9/7/2011				#/100ML
ULBPS021	5/3/2011	PIPE	DRY	<10	#/100ML
ULBPS021	5/22/2008			<10	#/100ML
ULBPS021	7/19/2017			<2	MPN/100ML
ULBPS021	9/17/2001			2	#/100ML
ULBPS021	10/5/2001			<10	#/100ML
ULBPS021	9/7/2011	PIPE	WET	9	#/100ML
ULBPS021	6/2/2015			<10	#/100ML
ULBPS021	9/21/2001			<10	#/100ML
ULBPS021	10/17/2001			0	#/100ML
ULBPS022	9/17/2001	FOUNDATION DRAIN	DRY		
ULBPS022	10/5/2001				
ULBPS022	10/13/2017				#/100ML
ULBPS022	9/21/2001	FOUNDATION DRAIN	WET		
ULBPS022	10/17/2001				
ULBPS022	9/3/2008				#/100ML
ULBPS022	9/8/2011				#/100ML
ULBPS023	9/17/2001	PIPE	DRY		
ULBPS023	10/5/2001				
ULBPS023	10/13/2017				#/100ML
ULBPS023	9/21/2001	PIPE	WET		
ULBPS023	10/17/2001				
ULBPS023	9/8/2011				#/100ML
ULBPS024	9/17/2001	FOUNDATION DRAIN	DRY		
ULBPS024	10/5/2001				
ULBPS024	5/3/2011				#/100ML

ULBPS024	10/13/2017				#/100ML
ULBPS024	9/21/2001	FOUNDATION DRAIN	WET		
ULBPS024	10/17/2001				
ULBPS024	9/3/2008				#/100ML
ULBPS024	9/8/2011				#/100ML
ULBPS025	5/3/2011	PERENNIAL STREAM	DRY	17	MPN/100ML
ULBPS025	6/9/2011			79	MPN/100ML
ULBPS025	8/3/2015			13	MPN/100ML
LLBPS024	9/19/2006			46	MPN/100ML
ULBPS025	10/25/2006			110	MPN/100ML
ULBPS025	1/29/2008			49	MPN/100ML
ULBPS025	3/17/2008			2	MPN/100ML
ULBPS025	4/1/2008			17	MPN/100ML
ULBPS025	4/23/2008			140	MPN/100ML
ULBPS025	5/22/2008			130	MPN/100ML
ULBPS025	5/28/2008			4.5	MPN/100ML
ULBPS025	9/22/2008			2	MPN/100ML
ULBPS025	7/6/2005			220	MPN/100ML
ULBPS025	7/12/2005			240	MPN/100ML
ULBPS025	7/18/2005			49	MPN/100ML
ULBPS025	7/25/2005			>1600	MPN/100ML
ULBPS025	8/1/2005			15	MPN/100ML
ULBPS025	8/9/2005			130	MPN/100ML
ULBPS025	8/25/2005			70	MPN/100ML
ULBPS025	7/19/2017			4.5	MPN/100ML
ULBPS025	9/17/2001				
ULBPS025	10/5/2001			170	#/100ML
ULBPS025	7/24/2007				MPN/100ML
ULBPS025	4/13/2011	PERENNIAL STREAM	WET	7.8	MPN/100ML
ULBPS025	9/8/2011			160	#/100ML
ULBPS025	6/1/2015			23	MPN/100ML
ULBPS025	8/21/2006			350	MPN/100ML
ULBPS025	7/29/2008			20	#/100ML
ULBPS025	9/3/2008			1100	MPN/100ML
ULBPS025	10/28/2008			110	MPN/100ML
ULBPS025	3/28/2005			100	#/100ML
ULBPS025	3/28/2005			<100	#/100ML
ULBPS025	3/29/2005			2	MPN/100ML
ULBPS025	4/27/2005			920	MPN/100ML
ULBPS025	4/27/2005			920	MPN/100ML
ULBPS025	4/27/2005			350	MPN/100ML

ULBPS025	7/28/2005			540	MPN/100ML
ULBPS025	8/15/2005			>1600	MPN/100ML
ULBPS025	8/30/2005			23	MPN/100ML
ULBPS025	9/21/2001			18100	#/100ML
ULBPS025	10/17/2001			2050	#/100ML
ULBPS025	6/22/2015				#/100ML
ULBPS025A	6/9/2011	PERENNIAL STREAM	DRY	<2	MPN/100ML
ULBPS025A	8/3/2015			<2	MPN/100ML
ULBPS025A	9/22/2008			4.5	MPN/100ML
ULBPS025A	7/19/2017			<2	MPN/100ML
ULBPS025A	9/8/2011	PERENNIAL STREAM	WET	<10	#/100ML
ULBPS025A	6/1/2015			4	MPN/100ML
ULBPS025A	6/22/2015			<10	#/100ML
ULBPS025A	7/29/2008			20	#/100ML
ULBPS025A	3/29/2005			9.3	MPN/100ML
ULBPS025A	3/29/2005			<2	MPN/100ML
ULBPS025B	9/22/2008	PERENNIAL STREAM	DRY	<2	MPN/100ML
ULBPS025B	7/29/2008	PERENNIAL STREAM	WET	9	#/100ML
ULBPS025B	3/29/2005			6.1	MPN/100ML
ULBPS025B	3/29/2005			<2	MPN/100ML
ULBPS026	5/3/2011	ROAD CULVERT	DRY	<10	#/100ML
ULBPS026	4/1/2013			7.8	MPN/100ML
ULBPS026	8/3/2015			4.5	MPN/100ML
ULBPS026	7/19/2017			6.8	MPN/100ML
ULBPS026	9/17/2001				
ULBPS026	10/5/2001				
ULBPS026	9/23/2008				#/100ML
ULBPS026	10/8/2008				#/100ML
ULBPS026	10/13/2017				#/100ML
ULBPS026	9/7/2011	ROAD CULVERT	WET	11300	#/100ML
ULBPS026	10/13/2011			5200	#/100ML
ULBPS026	6/1/2015			4.5	MPN/100ML
ULBPS026	6/22/2015			30	#/100ML
ULBPS026	6/12/2008			60	#/100ML
ULBPS026	9/21/2001			5700	#/100ML
ULBPS026	10/17/2001			8	#/100ML
ULBPS026	9/3/2008				#/100ML
ULBPS026A	4/1/2013	ROAD CULVERT	DRY	7.8	MPN/100ML
ULBPS026A	8/3/2015			2	MPN/100ML
ULBPS026A	7/19/2017			4	MPN/100ML
ULBPS026A	4/1/2013	INTERMITTENT STREAM		7.8	MPN/100ML

ULBPS026A	8/3/2015			2	MPN/100ML
ULBPS026A	7/19/2017			4	MPN/100ML
ULBPS026A	6/1/2015	ROAD CULVERT	WET	7.8	MPN/100ML
ULBPS026A	6/22/2015			9	#/100ML
ULBPS026A	6/1/2015	INTERMITTENT STREAM		7.8	MPN/100ML
ULBPS026A	6/22/2015			9	#/100ML
ULBPS027	9/17/2001	FOUNDATION DRAIN	DRY		
ULBPS027	10/8/2008				#/100ML
ULBPS027	5/10/2011				#/100ML
ULBPS027	7/31/2017				#/100ML
ULBPS027	9/21/2001	FOUNDATION DRAIN	WET		
ULBPS027	6/12/2008				#/100ML
ULBPS027	9/8/2011				#/100ML
ULBPS028	5/3/2011	INTERMITTENT STREAM	DRY	20	#/100ML
ULBPS028	5/21/2008			<10	#/100ML
ULBPS028	9/3/2008			30	#/100ML
ULBPS028	9/23/2008			9	#/100ML
ULBPS028	10/8/2008			9	#/100ML
ULBPS028	9/17/2001				
ULBPS028	10/5/2001			1500	#/100ML
ULBPS028	10/13/2017				#/100ML
ULBPS028	9/8/2011	INTERMITTENT STREAM	WET	20	#/100ML
LLBPS024	6/12/2008			50	#/100ML
ULBPS028	10/28/2008			30	#/100ML
ULBPS028	9/21/2001			6400	#/100ML
ULBPS028	10/17/2001			1810	#/100ML
ULBPS029	9/25/2017	MOORING FIELD	DRY	<10	#/100ML
ULBPS030	5/3/2011	INTERMITTENT STREAM	DRY	30	#/100ML
ULBPS030	6/9/2011			6.8	MPN/100ML
ULBPS030	8/3/2015			22	MPN/100ML
ULBPS030	5/22/2008			2100	#/100ML
ULBPS030	10/8/2008			<10	#/100ML
ULBPS030	7/19/2017			<2	MPN/100ML
ULBPS030	9/8/2011	INTERMITTENT STREAM	WET	120	#/100ML
ULBPS030	6/1/2015			79	MPN/100ML
ULBPS030	6/12/2008			330	#/100ML
ULBPS030	7/22/2008			340	#/100ML
ULBPS030	10/28/2008			240	#/100ML
ULBPS030	6/22/2015				#/100ML
ULBPS030A	6/9/2011	INTERMITTENT STREAM	DRY	<2	MPN/100ML

ULBPS030A	8/3/2015			4.5	MPN/100ML
ULBPS030A	10/8/2008			20	#/100ML
ULBPS030A	7/19/2017			4.5	MPN/100ML
ULBPS030A	9/8/2011	INTERMITTENT STREAM	WET	20	#/100ML
ULBPS030A	6/1/2015			2	MPN/100ML
ULBPS030A	6/12/2008			9	#/100ML
ULBPS030A	7/22/2008			410	#/100ML
ULBPS030A	10/28/2008			60	#/100ML
ULBPS030A	6/22/2015				#/100ML
ULBPS030B	5/3/2011	INTERMITTENT STREAM	DRY	30	#/100ML
ULBPS030B	10/8/2008			60	#/100ML
ULBPS030B	6/12/2008	INTERMITTENT STREAM	WET	80	#/100ML
ULBPS030B	7/22/2008			90	#/100ML
ULBPS030B	10/28/2008			210	#/100ML
ULBPS030C	5/3/2011	INTERMITTENT STREAM	DRY	<10	#/100ML
ULBPS030C	10/8/2008			<10	#/100ML
ULBPS030C	6/12/2008	INTERMITTENT STREAM	WET	90	#/100ML
ULBPS030C	7/22/2008			50	#/100ML
ULBPS030C	10/28/2008			160	#/100ML
ULBPS031	5/12/2011	FOUNDATION DRAIN	DRY		#/100ML
ULBPS031	10/13/2017				#/100ML
ULBPS031	10/13/2011	FOUNDATION DRAIN	WET	30	#/100ML
ULBPS032	5/12/2011	FOUNDATION DRAIN	DRY		#/100ML
ULBPS032	10/13/2017				#/100ML
ULBPS032	10/13/2011	FOUNDATION DRAIN	WET		#/100ML
LLBPS001	9/24/2001	STORMWATER OUTFALL	DRY		
LLBPS001	10/5/2001				
LLBPS001	6/9/2008				#/100ML
LLBPS001	10/17/2001	STORMWATER OUTFALL	WET		
LLBPS001	5/13/2002				
LLBPS001	7/21/2008				#/100ML
LLBPS002	9/24/2001	STORMWATER OUTFALL	DRY		
LLBPS002	10/5/2001				
LLBPS002	6/9/2008				#/100ML
LLBPS002	10/17/2001	STORMWATER OUTFALL	WET		
LLBPS002	5/13/2002			1870	#/100ML
LLBPS002	7/21/2008				#/100ML

LLBPS003	9/24/2001	STORMWATER OUTFALL	DRY		
LLBPS003	10/5/2001				
LLBPS003	6/9/2008				#/100ML
LLBPS003	7/21/2008	STORMWATER OUTFALL	WET	90	#/100ML
LLBPS003	10/17/2001			28	#/100ML
LLBPS003	5/13/2002			<10	#/100ML
LLBPS004	9/24/2001	PIPE	DRY		
LLBPS004	10/5/2001				
LLBPS004	5/12/2011				#/100ML
LLBPS004	10/17/2001	PIPE	WET		
LLBPS004	5/13/2002				
LLBPS004	9/7/2011				#/100ML
LLBPS005	9/24/2001	STORMWATER OUTFALL	DRY		
LLBPS005	10/5/2001				
LLBPS005	6/9/2008				#/100ML
LLBPS005	5/12/2011				#/100ML
LLBPS005	10/17/2001	STORMWATER OUTFALL	WET		
LLBPS005	5/13/2002				
LLBPS005	7/21/2008				#/100ML
LLBPS005	9/7/2011				#/100ML
LLBPS005	9/8/2017				#/100ML
LLBPS006	9/24/2001	STORMWATER OUTFALL	DRY		
LLBPS006	10/5/2001				
LLBPS006	6/9/2008				#/100ML
LLBPS006	5/12/2011				#/100ML
LLBPS006	9/7/2011	STORMWATER OUTFALL	WET	16400	#/100ML
LLBPS006	10/23/2014			19000	#/100ML
LLBPS006	10/17/2001				
LLBPS006	5/13/2002			<10	#/100ML
LLBPS006	7/21/2008				#/100ML
LLBPS006	10/13/2011				#/100ML
LLBPS006	9/8/2017				#/100ML
LLBPS006	10/26/2017				#/100ML
LLBPS007	5/12/2011	LOBSTER TANK DISCHARGE	DRY	<10	#/100ML
LLBPS007	6/9/2008			<10	#/100ML
LLBPS007	9/24/2001			2.5	#/100ML
LLBPS007	10/5/2001			<10	#/100ML
LLBPS007	10/26/2017	LOBSTER TANK DISCHARGE	WET	60	#/100ML
LLBPS007	10/17/2001			10	#/100ML
LLBPS007	5/13/2002			<10	#/100ML
LLBPS007	9/8/2017				#/100ML

LLBPS008	9/23/2008	STORMWATER OUTFALL	DRY	>20000	#/100ML
LLBPS008	10/8/2008			10200	#/100ML
LLBPS008	9/24/2001			567.5	#/100ML
LLBPS008	10/5/2001			5000	#/100ML
LLBPS008	5/12/2011				#/100ML
LLBPS008	10/23/2014	STORMWATER OUTFALL	WET	8800	#/100ML
LLBPS008	7/22/2008			>20000	#/100ML
LLBPS008	10/26/2017			2400	#/100ML
LLBPS008	10/17/2001			58	#/100ML
LLBPS008	5/13/2002			950	#/100ML
LLBPS008	9/7/2011				#/100ML
LLBPS008	9/8/2017				#/100ML
LLBPS009	9/24/2001	STORMWATER OUTFALL	DRY		
LLBPS009	10/5/2001				
LLBPS009	9/23/2008				#/100ML
LLBPS009	10/8/2008				#/100ML
LLBPS009	5/12/2011				#/100ML
LLBPS009	10/5/2011	STORMWATER OUTFALL	WET	480	#/100ML
LLBPS009	7/22/2008			2900	#/100ML
LLBPS009	10/17/2001				
LLBPS009	5/13/2002			40	#/100ML
LLBPS009	10/23/2014				#/100ML
LLBPS009	9/8/2017				#/100ML
LLBPS010	9/24/2001	PIPE	DRY		
LLBPS010	10/5/2001				
LLBPS010	10/17/2001	PIPE	WET		
LLBPS010	5/13/2002				
LLBPS010	10/5/2011				#/100ML
LLBPS011	9/24/2001	PIPE	DRY		
LLBPS011	10/5/2001				
LLBPS011	10/17/2001	PIPE	WET		
LLBPS011	5/13/2002				
LLBPS011	10/5/2011				#/100ML
LLBPS012	9/24/2001	STORMWATER OUTFALL	DRY		
LLBPS012	10/5/2001				
LLBPS012	9/23/2008				#/100ML
LLBPS012	5/12/2011				#/100ML
LLBPS012	10/17/2001	STORMWATER OUTFALL	WET		
LLBPS012	5/13/2002				
LLBPS012	7/22/2008				#/100ML
LLBPS012	10/5/2011				#/100ML

LLBPS012	10/23/2014				#/100ML
LLBPS012	7/26/2017				#/100ML
LLBPS012	10/26/2017				#/100ML
LLBPS013	9/24/2001	FOUNDATION DRAIN	DRY	0	#/100ML
LLBPS013	10/5/2001			<10	#/100ML
LLBPS013	6/9/2008				#/100ML
LLBPS013	9/23/2008				#/100ML
LLBPS013	5/12/2011				#/100ML
LLBPS013	7/22/2008	FOUNDATION DRAIN	WET	70	#/100ML
LLBPS013	10/17/2001			0	#/100ML
LLBPS013	5/13/2002			10	#/100ML
LLBPS013	10/5/2011				#/100ML
LLBPS013	10/23/2014				#/100ML
LLBPS013	7/26/2017				#/100ML
LLBPS013	10/26/2017				#/100ML
LLBPS014	5/10/2011	STORMWATER CULVERT	DRY	60	#/100ML
LLBPS014	9/24/2001				
LLBPS014	10/5/2001				
LLBPS014	6/9/2008				#/100ML
LLBPS014	9/23/2008				#/100ML
LLBPS014	9/7/2011	STORMWATER CULVERT	WET	1100	#/100ML
LLBPS014	10/23/2014			1500	#/100ML
LLBPS014	10/17/2001			10	#/100ML
LLBPS014	5/13/2002			720	#/100ML
LLBPS014	5/13/2002			920	#/100ML
LLBPS014	7/22/2008				#/100ML
LLBPS014	9/15/2008				#/100ML
LLBPS015	9/24/2001	RIVER	DRY	200	#/100ML
LLBPS015	10/5/2001			60	#/100ML
LLBPS015	10/17/2001	RIVER	WET	0	#/100ML
LLBPS015	5/13/2002			10	#/100ML
LLBPS016	5/10/2011	STORMWATER OUTFALL	DRY		#/100ML
LLBPS016	9/24/2001				
LLBPS016	10/5/2001				
LLBPS016	6/9/2008				#/100ML
LLBPS016	9/29/2017				#/100ML
LLBPS016	8/28/2018				#/100ML
LLBPS016	7/21/2008	STORMWATER OUTFALL	WET	4900	#/100ML
LLBPS016	10/17/2001				
LLBPS016	5/13/2002				
LLBPS016	9/15/2008				#/100ML

LLBPS016	9/7/2011				#/100ML
LLBPS016	10/23/2014				#/100ML
LLBPS017	9/24/2001	PIPE	DRY		
LLBPS017	10/5/2001				
LLBPS017	6/9/2008				
LLBPS017	10/8/2008				#/100ML
LLBPS017	10/12/2011				#/100ML
LLBPS017	9/29/2017				#/100ML
LLBPS017	10/17/2001	PIPE	WET		
LLBPS017	5/13/2002				
LLBPS017	7/22/2008				#/100ML
LLBPS017	10/5/2011				#/100ML
LLBPS017	10/23/2014				#/100ML
LLBPS018	9/24/2001	GROUNDWATER SEEP	DRY		
LLBPS018	10/5/2001				
LLBPS018	10/8/2008				#/100ML
LLBPS018	10/12/2011				#/100ML
LLBPS018	10/17/2001	GROUNDWATER SEEP	WET		
LLBPS018	5/13/2002			<10	#/100ML
LLBPS018	10/5/2011				#/100ML
LLBPS001	6/9/2008	ROAD CULVERT	DRY	<10	#/100ML
LLBPS019	9/24/2001			160	#/100ML
LLBPS019	10/5/2001				
LLBPS019	10/12/2011				#/100ML
LLBPS019	9/29/2017				#/100ML
LLBPS019	8/28/2018				#/100ML
LLBPS019	10/23/2014	ROAD CULVERT	WET	>20000	#/100ML
LLBPS019	7/22/2008			320	#/100ML
LLBPS019	9/15/2008			20	#/100ML
LLBPS019	10/17/2001			55	#/100ML
LLBPS019	5/13/2002			20	#/100ML
LLBPS019	10/13/2011				#/100ML
LLBPS019	7/13/2017				#/100ML
LLBPS019	8/23/2018				#/100ML
LLBPS020	12/20/2016	ROAD CULVERT	DRY	1600	MPN/100ML
LLBPS020	2/22/2017			1100	MPN/100ML
LLBPS020	2/27/2017			4600	MPN/100ML
LLBPS020	6/21/2017			170	MPN/100ML
LLBPS020	11/16/2017			3100	#/100ML
LLBPS020	9/24/2001				
LLBPS020	10/5/2001			>200	#/100ML

LLBPS020	6/9/2008				#/100ML
LLBPS020	10/8/2008				#/100ML
LLBPS020	10/12/2011				#/100ML
LLBPS020	2/6/2017				#/100ML
LLBPS020	6/28/2017				#/100ML
LLBPS020	9/29/2017				#/100ML
LLBPS020	5/30/2018				#/100ML
LLBPS020	6/12/2018				#/100ML
LLBPS020	8/28/2018				#/100ML
LLBPS020	10/13/2011	ROAD CULVERT	WET	4800	#/100ML
LLBPS020	10/23/2014			8500	#/100ML
LLBPS020	7/13/2017			3600	#/100ML
LLBPS020	7/25/2017			>20000	#/100ML
LLBPS020	6/25/2018			1140	CFU/100ML
LLBPS020	8/23/2018			3200	CFU/100ML
LLBPS020	9/11/2018			>1600	MPN/100ML
LLBPS020	10/17/2001			1300	#/100ML
LLBPS020	5/13/2002			1530	#/100ML
LLBPS020	7/22/2008				#/100ML
LLBPS020	9/15/2008				#/100ML
LLBPS021	9/24/2001	STORMWATER CULVERT	DRY	0	#/100ML
LLBPS021	10/5/2001			<10	#/100ML
LLBPS021	6/9/2008				#/100ML
LLBPS021	5/10/2011				#/100ML
LLBPS021	9/29/2017				#/100ML
LLBPS021	8/28/2018				#/100ML
LLBPS021	9/7/2011	STORMWATER CULVERT	WET	3500	#/100ML
LLBPS021	10/23/2014			680	#/100ML
LLBPS021	10/17/2001			0	#/100ML
LLBPS021	5/13/2002			>1800	#/100ML
LLBPS021	7/22/2008				#/100ML
LLBPS021	9/15/2008				#/100ML
LLBPS021	8/23/2018				#/100ML
LLBPS024	9/24/2001	ROAD CULVERT	DRY		
LLBPS024	10/5/2001				
LLBPS024	5/4/2011				#/100ML
LLBPS024	9/8/2011	ROAD CULVERT	WET	7500	#/100ML
LLBPS024	10/17/2001			1260	#/100ML
LLBPS024	5/13/2002				
LLBPS024	7/22/2008				#/100ML
LLBPS024	8/8/2017				#/100ML

LLBPS024	10/25/2017				#/100ML
LLBPS025	5/4/2011	PERENNIAL STREAM	DRY	<10	#/100ML
LLBPS025	2/6/2012			49	MPN/100ML
LLBPS025	5/19/2008			<5	#/100ML
LLBPS025	9/3/2008			<10	#/100ML
LLBPS025	11/16/2017			40	#/100ML
LLBPS025	11/29/2017			20	#/100ML
LLBPS025	9/24/2001			440	#/100ML
LLBPS025	10/5/2001			200	#/100ML
LLBPS025	9/8/2011	PERENNIAL STREAM	WET	60	#/100ML
LLBPS025	7/21/2008			2200	#/100ML
LLBPS025	9/15/2008			9	#/100ML
LLBPS025	10/28/2008			110	#/100ML
LLBPS025	8/8/2017			240	#/100ML
LLBPS025	10/25/2017			>2000	#/100ML
LLBPS025	10/17/2001			20	#/100ML
LLBPS025	5/13/2002			140	#/100ML
LLBPS026	5/4/2011	MAN-MADE POND OUTLET	DRY	10	#/100ML
LLBPS026	5/19/2008			<10	#/100ML
LLBPS026	9/24/2001			35	#/100ML
LLBPS026	10/5/2001			20	#/100ML
LLBPS026	9/7/2011	MAN-MADE POND OUTLET	WET	230	#/100ML
LLBPS026	7/21/2008			1800	#/100ML
LLBPS026	9/15/2008			20	#/100ML
LLBPS026	10/28/2008			140	#/100ML
LLBPS026	8/8/2017			20	#/100ML
LLBPS026	10/25/2017			1000	#/100ML
LLBPS026	10/17/2001			0	#/100ML
LLBPS026	5/13/2002			<10	#/100ML
LLBPS027	9/24/2001	PIPE	DRY		
LLBPS027	10/5/2001				
LLBPS027	5/4/2011				#/100ML
LLBPS027	10/17/2001	PIPE	WET		
LLBPS027	5/13/2002				
LLBPS027	9/7/2011				#/100ML
LLBPS027	8/8/2017				#/100ML
LLBPS027	10/25/2017				#/100ML
LLBPS028	9/24/2001	ROAD CULVERT	DRY		
LLBPS028	10/5/2001				
LLBPS028	5/19/2008				#/100ML
LLBPS028	5/4/2011				#/100ML

LLBPS028	9/7/2011	ROAD CULVERT	WET	5700	#/100ML
LLBPS028	7/21/2008			1800	#/100ML
LLBPS028	10/25/2017			1200	#/100ML
LLBPS028	10/17/2001			200	#/100ML
LLBPS028	5/13/2002				
LLBPS028	9/15/2008				#/100ML
LLBPS028	8/8/2017				#/100ML
LLBPS029	5/4/2011	INTERMITTENT STREAM	DRY	20	#/100ML
LLBPS029	2/6/2012			46	MPN/100ML
LLBPS029	11/29/2017			20	#/100ML
LLBPS029	9/24/2001			60	#/100ML
LLBPS029	10/5/2001			110	#/100ML
LLBPS029	5/19/2008				#/100ML
LLBPS029	9/8/2011	INTERMITTENT STREAM	WET	30	#/100ML
LLBPS029	8/8/2017			1000	#/100ML
LLBPS029	10/25/2017			>2000	#/100ML
LLBPS029	10/17/2001			260	#/100ML
LLBPS029	5/13/2002			10	#/100ML
LLBPS029	7/21/2008				#/100ML
LLBPS029	9/3/2008				#/100ML
LLBPS029	9/15/2008				#/100ML
LLBPS030	5/4/2011	INTERMITTENT STREAM	DRY	10	#/100ML
LLBPS030	2/6/2012			46	MPN/100ML
LLBPS030	9/24/2001			127.5	#/100ML
LLBPS030	10/5/2001				
LLBPS030	9/8/2011	INTERMITTENT STREAM	WET	20	#/100ML
LLBPS030	10/25/2017			1200	#/100ML
LLBPS030	10/17/2001				
LLBPS030	5/13/2002			30	#/100ML
LLBPS030	7/21/2008				#/100ML
LLBPS030	9/3/2008				#/100ML
LLBPS030	9/15/2008				#/100ML
LLBPS030	8/8/2017				#/100ML
LLBPS031	9/24/2001	FOUNDATION DRAIN	DRY		
LLBPS031	10/5/2001				
LLBPS031	5/19/2008				#/100ML
LLBPS031	10/8/2008				#/100ML
LLBPS031	5/4/2011				#/100ML
LLBPS031	10/17/2001	FOUNDATION DRAIN	WET		
LLBPS031	5/13/2002				
LLBPS031	10/13/2011				#/100ML

LLBPS031	8/8/2017				#/100ML
LLBPS031	10/25/2017				#/100ML
LLBPS032	5/4/2011	FOUNDATION DRAIN	DRY	<10	#/100ML
LLBPS032	9/24/2001			147	#/100ML
LLBPS032	10/5/2001			50	#/100ML
LLBPS032	5/19/2008				#/100ML
LLBPS032	10/8/2008				#/100ML
LLBPS032	10/13/2011	FOUNDATION DRAIN	WET	<10	#/100ML
LLBPS032	8/8/2017			<10	#/100ML
LLBPS032	10/25/2017			160	#/100ML
LLBPS032	10/17/2001			23	#/100ML
LLBPS032	5/13/2002			<10	#/100ML
LLBPS033	9/24/2001	FOUNDATION DRAIN	DRY		
LLBPS033	10/5/2001				
LLBPS033	5/19/2008				#/100ML
LLBPS033	10/8/2008				#/100ML
LLBPS033	5/4/2011				#/100ML
LLBPS033	10/17/2001	FOUNDATION DRAIN	WET	358	#/100ML
LLBPS033	5/13/2002				
LLBPS033	10/13/2011				#/100ML
LLBPS033	8/8/2017				#/100ML
LLBPS033	10/25/2017				#/100ML
LLBPS034	9/24/2001	INTERMITTENT STREAM	DRY		
LLBPS034	10/5/2001				
LLBPS034	5/19/2008				#/100ML
LLBPS034	5/4/2011				#/100ML
LLBPS034	10/13/2011	INTERMITTENT STREAM	WET	>1800	#/100ML
LLBPS034	10/17/2001				
LLBPS034	5/13/2002			200	#/100ML
LLBPS034	9/15/2008				#/100ML
LLBPS034	8/8/2017				#/100ML
LLBPS034	10/25/2017				#/100ML
LLBPS035	5/4/2011	STORMWATER OUTFALL	DRY	<10	#/100ML
LLBPS035	2/6/2012			6.8	MPN/100ML
LLBPS035	11/29/2017			<10	#/100ML
LLBPS035	9/24/2001				
LLBPS035	10/5/2001				
LLBPS035	5/21/2008				#/100ML
LLBPS035	9/8/2011	STORMWATER OUTFALL	WET	3200	#/100ML
LLBPS035	10/13/2011			5600	#/100ML
LLBPS035	7/21/2008			1500	#/100ML

LLBPS035	9/15/2008			100	#/100ML
LLBPS035	8/8/2017			9100	#/100ML
LLBPS035	10/25/2017			>2000	#/100ML
LLBPS035	10/17/2001			0	#/100ML
LLBPS035	5/13/2002			<5	#/100ML
LLBPS036	5/10/2011	TIDAL CREEK	DRY	220	#/100ML
LLBPS036	5/19/2008			<10	#/100ML
LLBPS036	9/3/2008			<10	#/100ML
LLBPS036	10/8/2008			5	#/100ML
LLBPS036	11/29/2017			9	#/100ML
LLBPS036	9/24/2001			140	#/100ML
LLBPS036	10/5/2001			90	#/100ML
LLBPS036	9/8/2011	TIDAL CREEK	WET	30	#/100ML
LLBPS036	7/21/2008			610	#/100ML
LLBPS036	9/15/2008			50	#/100ML
LLBPS036	10/28/2008			160	#/100ML
LLBPS036	10/17/2001			205	#/100ML
LLBPS036	5/13/2002			60	#/100ML
LLBPS037	5/10/2011	TIDAL CREEK	DRY	130	#/100ML
LLBPS037	5/19/2008			510	#/100ML
LLBPS037	9/3/2008			<10	#/100ML
LLBPS037	10/8/2008			9	#/100ML
LLBPS037	11/29/2017			<10	#/100ML
LLBPS037	9/24/2001			200	#/100ML
LLBPS037	10/5/2001			40	#/100ML
LLBPS037	9/8/2011	TIDAL CREEK	WET	190	#/100ML
LLBPS037	7/21/2008			2800	#/100ML
LLBPS037	9/15/2008			110	#/100ML
LLBPS037	10/28/2008			100	#/100ML
LLBPS037	10/17/2001			1880	#/100ML
LLBPS037	5/13/2002			280	#/100ML
LLBPS038	5/10/2011	PERENNIAL STREAM	DRY	50	#/100ML
LLBPS038	5/19/2008			120	#/100ML
LLBPS038	9/3/2008			<10	#/100ML
LLBPS038	10/8/2008			20	#/100ML
LLBPS038	11/29/2017			60	#/100ML
LLBPS038	9/24/2001			160	#/100ML
LLBPS038	10/5/2001			320	#/100ML
LLBPS038	9/8/2011	PERENNIAL STREAM	WET	410	#/100ML
LLBPS038	7/21/2008			1800	#/100ML
LLBPS038	9/15/2008			90	#/100ML

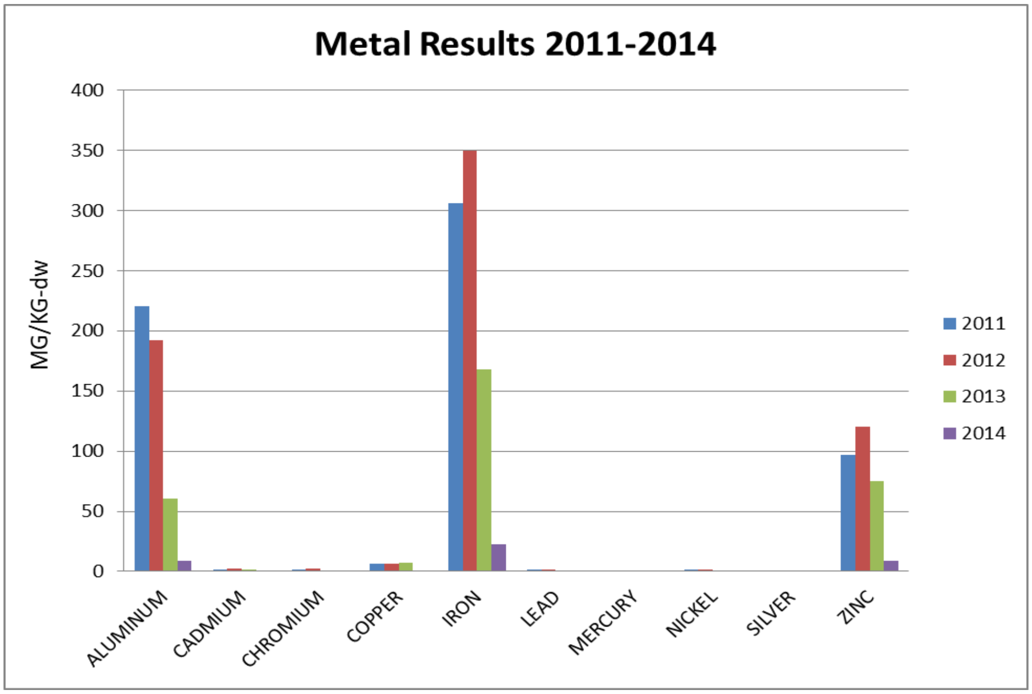
LLBPS038	10/28/2008			60	#/100ML
LLBPS038	10/17/2001			300	#/100ML
LLBPS038	5/13/2002			60	#/100ML
LLBPS039	5/10/2011	STORMWATER OUTFALL	DRY	<10	#/100ML
LLBPS039	5/19/2008			<10	#/100ML
LLBPS039	11/29/2017			20	#/100ML
LLBPS039	9/24/2001				
LLBPS039	10/5/2001				
LLBPS039	10/8/2008				#/100ML
LLBPS039	9/8/2011	STORMWATER OUTFALL	WET	1000	#/100ML
LLBPS039	7/21/2008			1900	#/100ML
LLBPS039	9/15/2008			980	#/100ML
LLBPS039	10/17/2001				
LLBPS039	5/13/2002			>2000	#/100ML
LLBPS039	9/3/2008				#/100ML
LLBPS039	10/28/2008				#/100ML
LLBPS040	9/24/2001	STORMWATER OUTFALL	DRY		
LLBPS040	10/5/2001				
LLBPS040	5/19/2008				#/100ML
LLBPS040	10/8/2008				#/100ML
LLBPS040	5/10/2011				#/100ML
LLBPS040	11/29/2017				#/100ML
LLBPS040	10/17/2001	STORMWATER OUTFALL	WET	15000	#/100ML
LLBPS040	5/13/2002			850	#/100ML
LLBPS040	7/21/2008				#/100ML
LLBPS040	9/3/2008				#/100ML
LLBPS040	9/15/2008				#/100ML
LLBPS040	10/28/2008				#/100ML
LLBPS040	9/8/2011				#/100ML
LLBPS041	6/21/2004	STORMWATER CULVERT	DRY	<10	#/100ML
LLBPS041	7/7/2004			10	#/100ML
LLBPS041	5/10/2011				#/100ML
LLBPS041	9/29/2017				#/100ML
LLBPS041	8/28/2018				#/100ML
LLBPS041	9/7/2011	STORMWATER CULVERT	WET	2700	#/100ML
LLBPS041	10/23/2014			1500	#/100ML
LLBPS041	10/17/2001			250	#/100ML
LLBPS041	5/13/2002			130	#/100ML
LLBPS041	7/14/2004			190	#/100ML
LLBPS041	7/21/2008				#/100ML
LLBPS041	9/15/2008				#/100ML

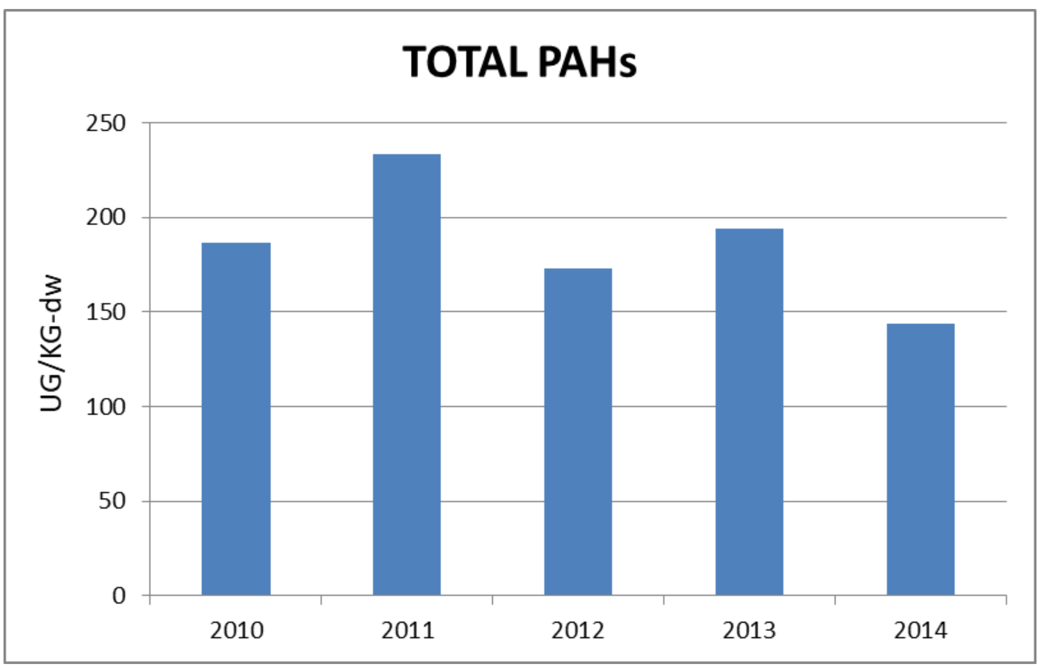
LLBPS041	10/13/2011				#/100ML
LLBPS041	8/23/2018				#/100ML
LLBPS042	6/21/2004	FOUNDATION DRAIN	DRY		#/100ML
LLBPS042	7/7/2004				#/100ML
LLBPS042	6/9/2008				#/100ML
LLBPS042	9/23/2008				#/100ML
LLBPS042	10/8/2008				#/100ML
LLBPS042	10/12/2011				#/100ML
LLBPS042	7/22/2008	FOUNDATION DRAIN	WET	200	#/100ML
LLBPS042	10/17/2001			2740	#/100ML
LLBPS042	7/14/2004				#/100ML
LLBPS042	10/5/2011				#/100ML
LLBPS042	7/26/2017				#/100ML
LLBPS042	10/26/2017				#/100ML
LLBPS043	5/4/2011	MARINA	DRY	10	#/100ML
LLBPS043	9/19/2011			9	#/100ML
LLBPS043	2/6/2012			33	MPN/100ML
LLBPS001	9/1/2008			<10	#/100ML
LLBPS043	7/19/2016			10	#/100ML
LLBPS043	8/7/2017			9	#/100ML
LLBPS043	9/25/2017			<10	#/100ML
LLBPS043	6/16/2003			10	#/100ML
LLBPS043	7/7/2003			<10	#/100ML
LLBPS043	8/11/2003			10	MPN/100ML
LLBPS043	8/18/2003			<10	#/100ML
LLBPS043	6/9/2003	MARINA	SURVEY	<10	#/100ML
LLBPS043	6/23/2003			20	#/100ML
LLBPS044	9/25/2017	MARINA	DRY	<10	#/100ML
LLBPS044	8/8/2017	MARINA	WET	9	#/100ML
LLBPS045	5/4/2011	MARINA	DRY	<10	#/100ML
LLBPS045	9/19/2011			<10	#/100ML
LLBPS045	2/6/2012			49	MPN/100ML
LLBPS001	9/1/2008			<9	#/100ML
LLBPS045	7/19/2016			10	#/100ML
LLBPS045	8/7/2017			<10	#/100ML
LLBPS045	9/25/2017			<10	#/100ML
LLBPS045	6/16/2003			10	#/100ML
LLBPS045	7/7/2003			<10	#/100ML
LLBPS045	8/11/2003			<10	MPN/100ML
LLBPS045	8/18/2003			10	#/100ML
LLBPS045	6/9/2003	MARINA	SURVEY	5	#/100ML

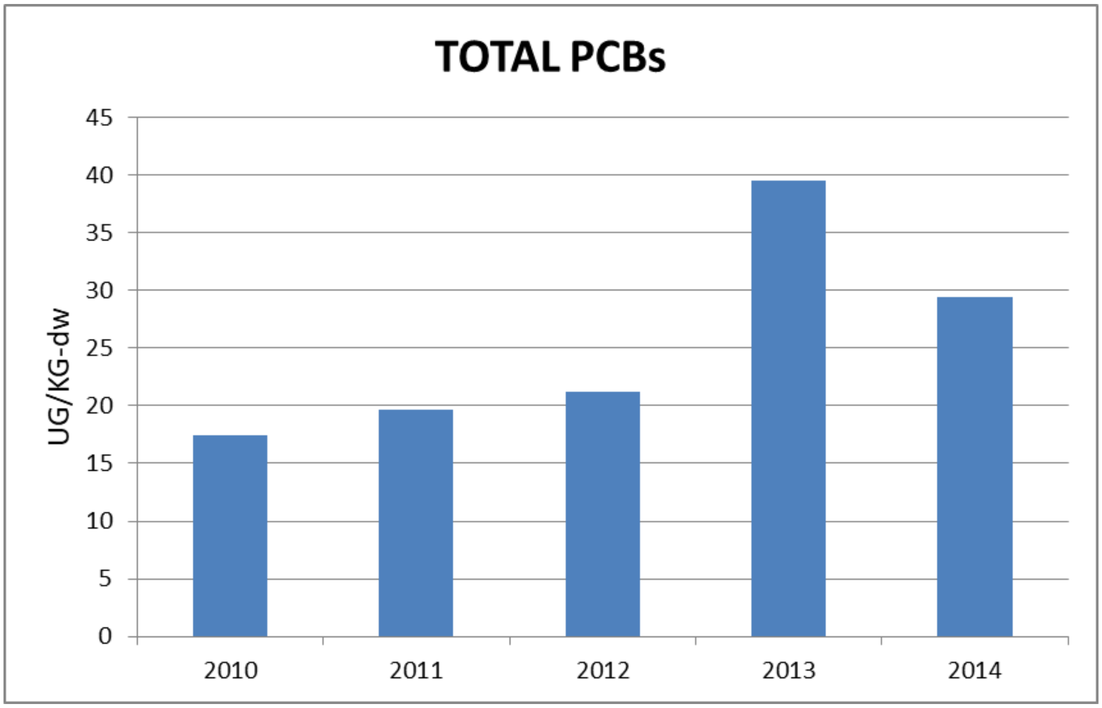
LLBPS045	6/23/2003			10	#/100ML
LLBPS046	9/25/2017	MOORING FIELD	DRY	10	#/100ML
LLBPS047	10/12/2011	ROAD CULVERT	DRY		#/100ML
LLBPS047	9/29/2017				#/100ML
LLBPS047	8/28/2018				#/100ML
LLBPS047	10/23/2014	ROAD CULVERT	WET	1100	#/100ML
LLBPS047	8/23/2018			6500	CFU/100ML
LLBPS047	10/13/2011				#/100ML
LLBPS047	7/13/2017				#/100ML
LLBPS048	10/12/2011	PIPE	DRY		#/100ML
LLBPS048	10/26/2017	PIPE	WET	280	#/100ML
LLBPS048	10/5/2011				#/100ML
LLBPS048	10/23/2014				#/100ML
LLBPS048	7/26/2017				#/100ML
LLBPS049	10/12/2011	PIPE	DRY		#/100ML
LLBPS049	10/5/2011	PIPE	WET		#/100ML
LLBPS049	10/23/2014				#/100ML
LLBPS049	7/26/2017				#/100ML
LLBPS049	10/26/2017				#/100ML
LLBPS050	10/12/2011	PIPE	DRY		#/100ML
LLBPS050	9/29/2017				#/100ML
LLBPS050	10/5/2011	PIPE	WET		#/100ML
LLBPS051	10/12/2011	PIPE	DRY		#/100ML
LLBPS051	9/29/2017				#/100ML
LLBPS051	10/5/2011	PIPE	WET		#/100ML
LLBPS052	10/12/2011	PIPE	DRY		#/100ML
LLBPS052	9/29/2017				#/100ML
LLBPS052	10/5/2011	PIPE	WET		#/100ML
LLBPS053	10/12/2011	PIPE	DRY		#/100ML
LLBPS053	9/29/2017				#/100ML
LLBPS053	10/5/2011	PIPE	WET		#/100ML
LLBPS054	10/12/2011	PIPE	DRY		#/100ML
LLBPS054	9/29/2017				#/100ML
LLBPS054	10/5/2011	PIPE	WET		#/100ML
LLBPS055	10/12/2011	PIPE	DRY		#/100ML
LLBPS055	9/29/2017				#/100ML
LLBPS055	10/5/2011	PIPE	WET		#/100ML
LLBPS056	10/12/2011	PIPE	DRY		#/100ML
LLBPS056	9/29/2017				#/100ML
LLBPS056	10/5/2011	PIPE	WET	9	#/100ML
LLBPS057	10/12/2011	PIPE	DRY		#/100ML

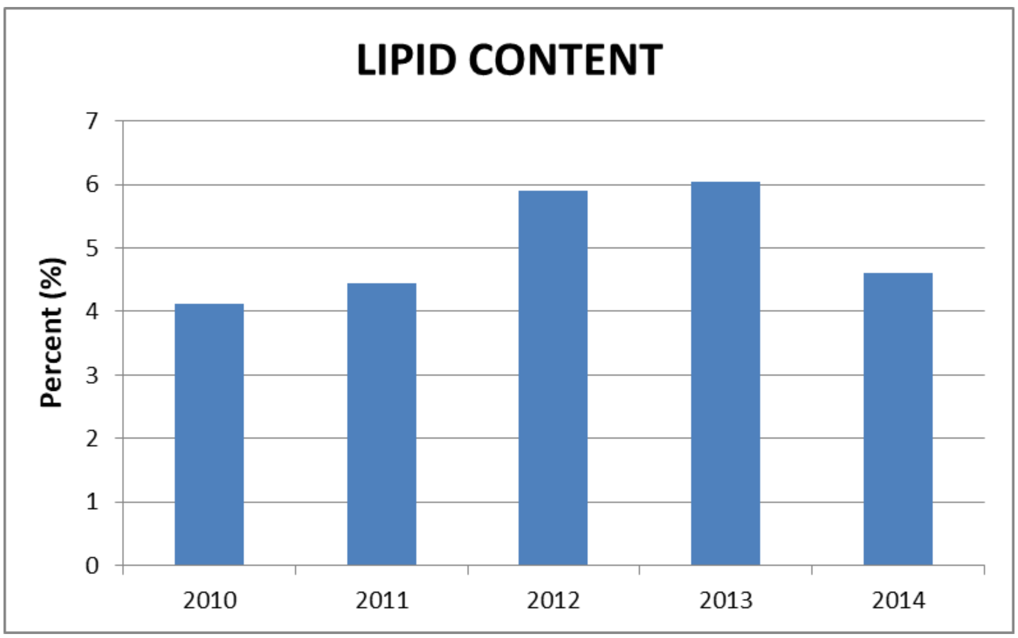
LLBPS057	9/29/2017				#/100ML
LLBPS057	10/5/2011	PIPE	WET		#/100ML
LLBPS058	10/12/2011	PIPE	DRY		#/100ML
LLBPS058	9/29/2017				#/100ML
LLBPS058	10/5/2011	PIPE	WET		#/100ML
LLBPS059	10/12/2011	PIPE	DRY		#/100ML
LLBPS059	9/29/2017				#/100ML
LLBPS059	10/5/2011	PIPE	WET		#/100ML
LLBPS060	10/12/2011	PIPE	DRY		#/100ML
LLBPS060	9/29/2017				#/100ML
LLBPS060	10/5/2011	PIPE	WET		#/100ML
LLBPS061	10/12/2011	PIPE	DRY		#/100ML
LLBPS061	9/29/2017				#/100ML
LLBPS061	10/5/2011	PIPE	WET		#/100ML
LLBPS062	10/12/2011	PIPE	DRY		#/100ML
LLBPS062	9/29/2017				#/100ML
LLBPS062	10/5/2011	PIPE	WET		#/100ML
LLBPS063	10/12/2011	PIPE	DRY		#/100ML
LLBPS063	9/29/2017				#/100ML
LLBPS063	10/5/2011	PIPE	WET	<9	#/100ML
LLBPS064	10/12/2011	PIPE	DRY		#/100ML
LLBPS064	9/29/2017				#/100ML
LLBPS064	10/5/2011	PIPE	WET		#/100ML
LLBPS065	10/12/2011	PIPE	DRY		#/100ML
LLBPS065	9/29/2017				#/100ML
LLBPS065	10/5/2011	PIPE	WET		#/100ML
LLBPS066	10/12/2011	PIPE	DRY		#/100ML
LLBPS066	9/29/2017				#/100ML
LLBPS066	10/5/2011	PIPE	WET		#/100ML
LLBPS067	10/12/2011	PIPE	DRY		#/100ML
LLBPS067	9/29/2017				#/100ML
LLBPS067	10/5/2011	PIPE	WET		#/100ML
LLBPS068	10/23/2014	ROAD CULVERT	WET	3300	#/100ML
LLBPS068	10/26/2017				#/100ML
LLBPS069	10/23/2014	PIPE	WET	50	#/100ML

Appendix III: Summary of Gulfwatch mussel tissue toxin concentration data, dover point station, 2010-2014

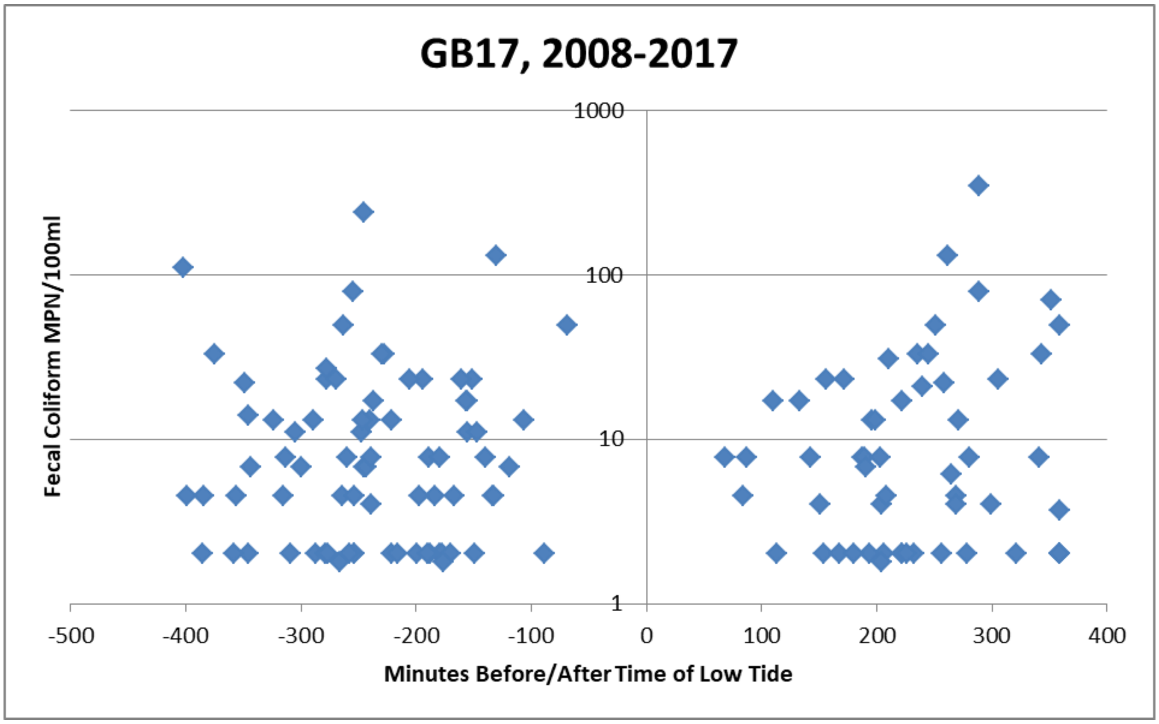


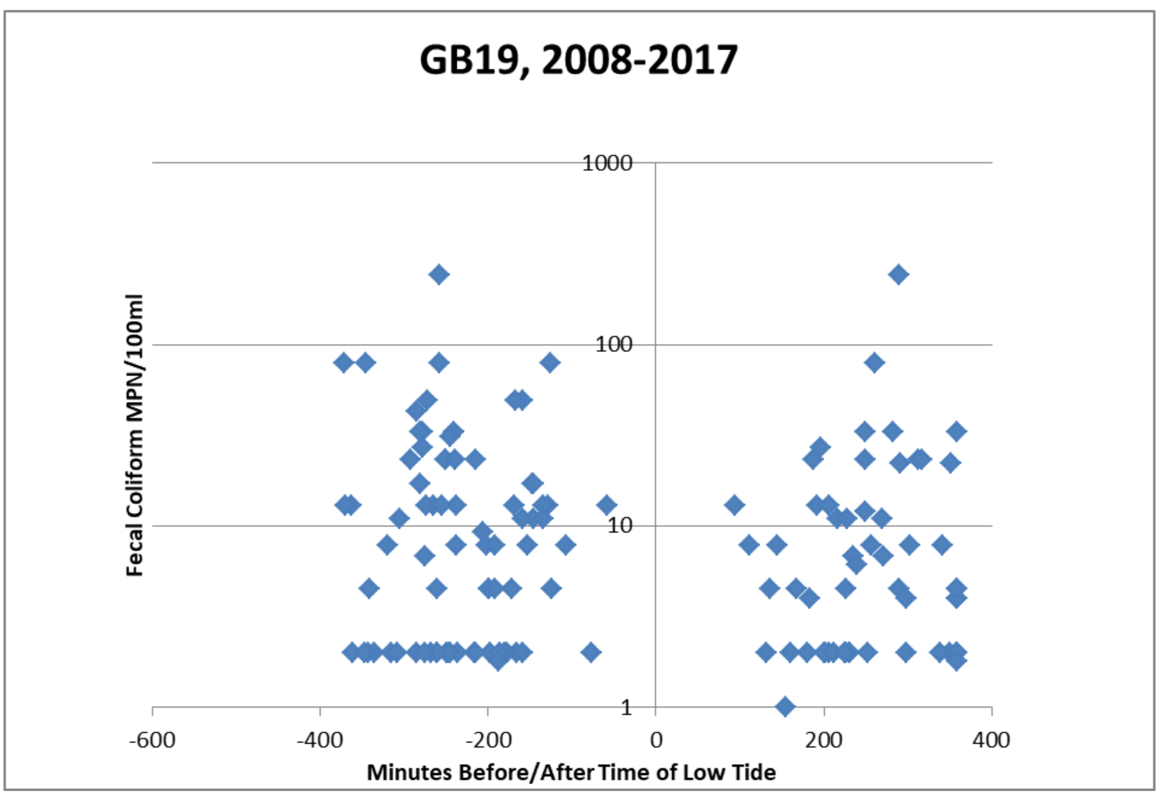


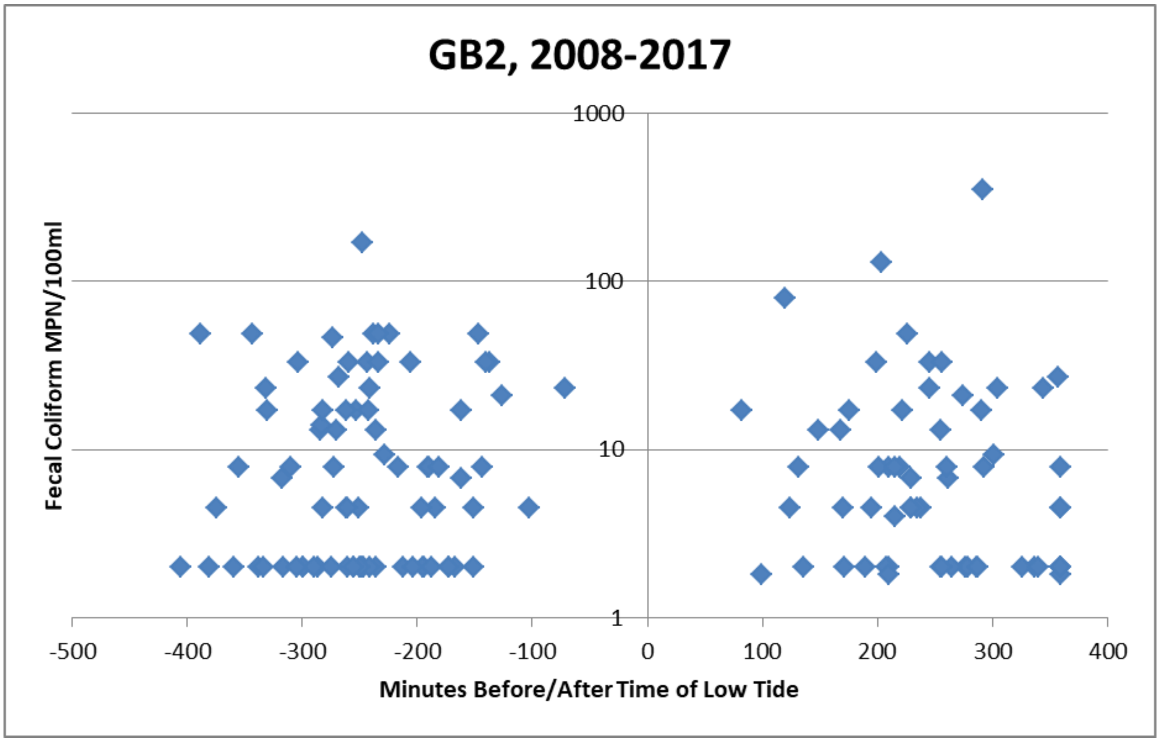

TOTAL PCBs
UG/KG-dw
45
40
35
30
25
20
15
10
5
0
2010
2011
2012
2013
2014

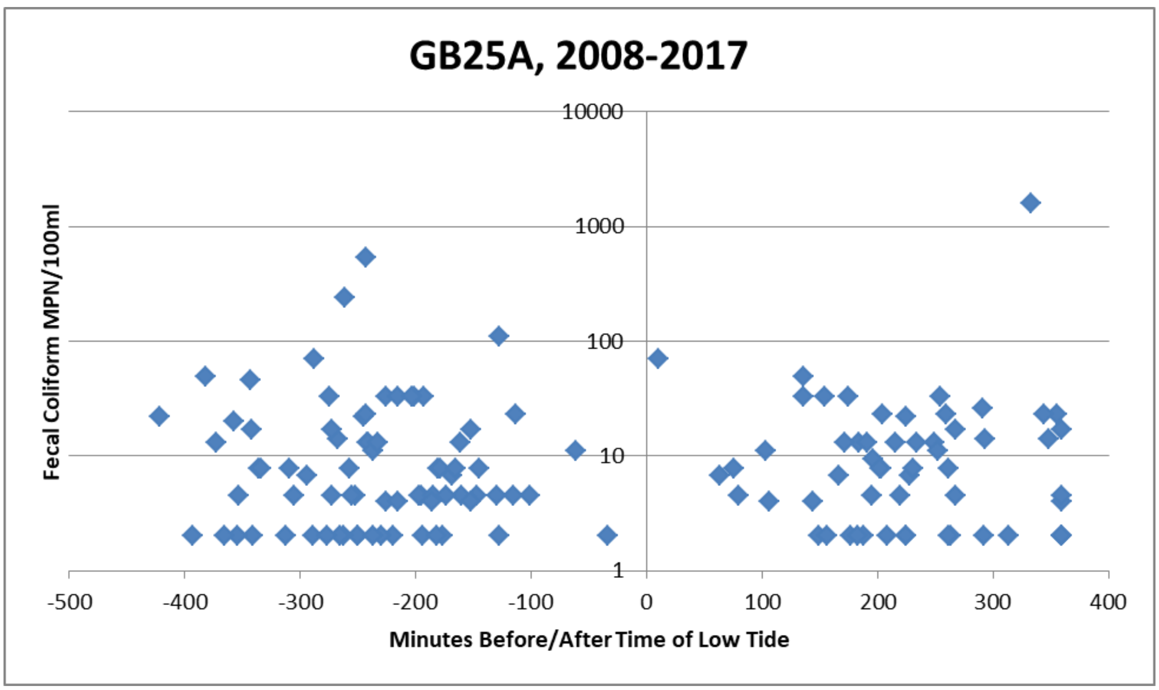

LIPID CONTENT
Percent (%)
7
6
5
4
3
2
1
0
2010
2011
2012
2013
2014

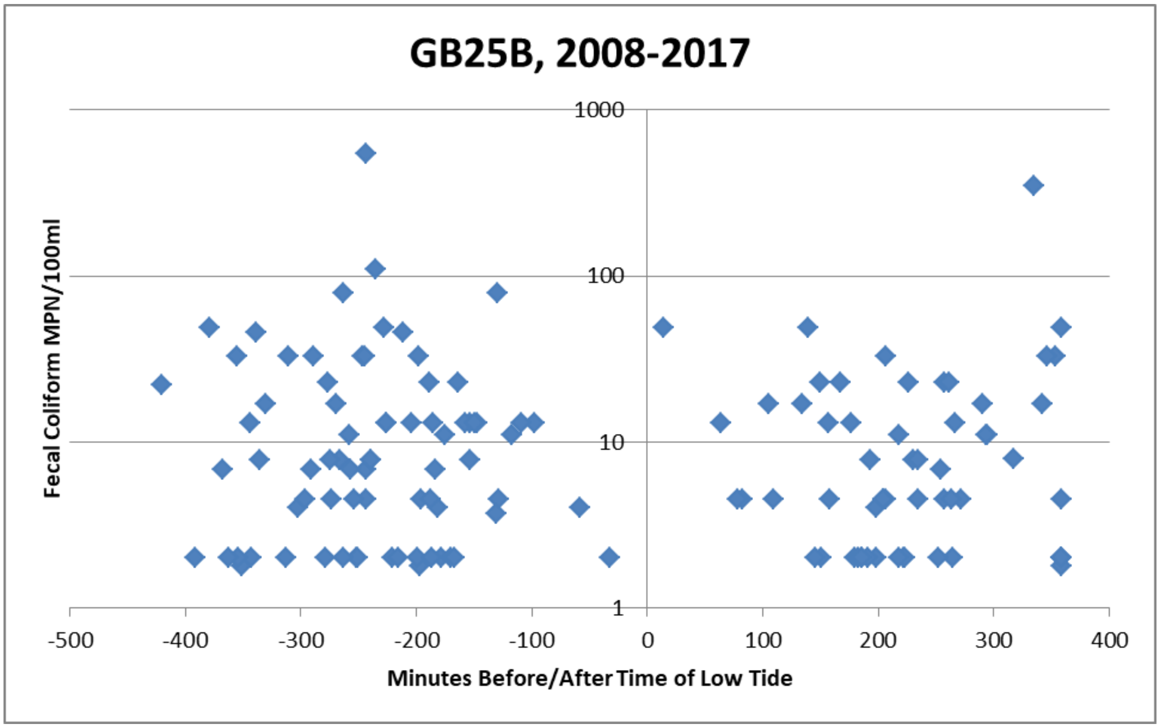
Appendix IV: Relationship of Fecal Coliform to Tide Stage, 2008-2017, All Little Bay Sites

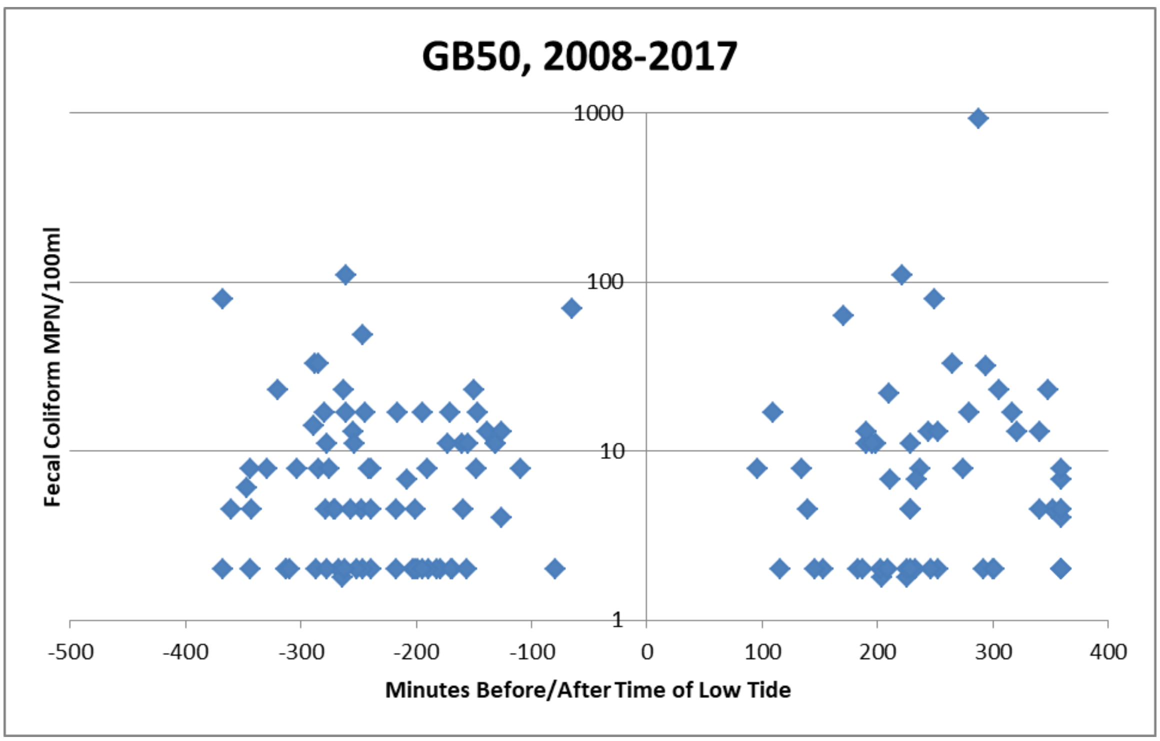


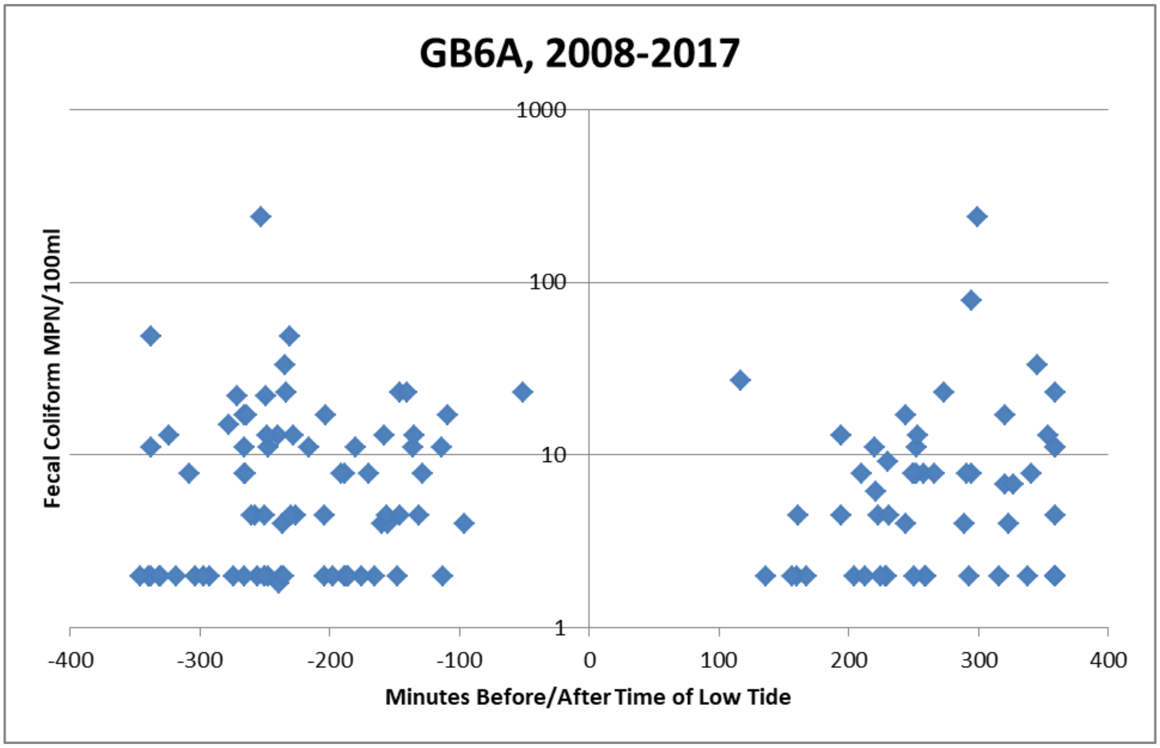


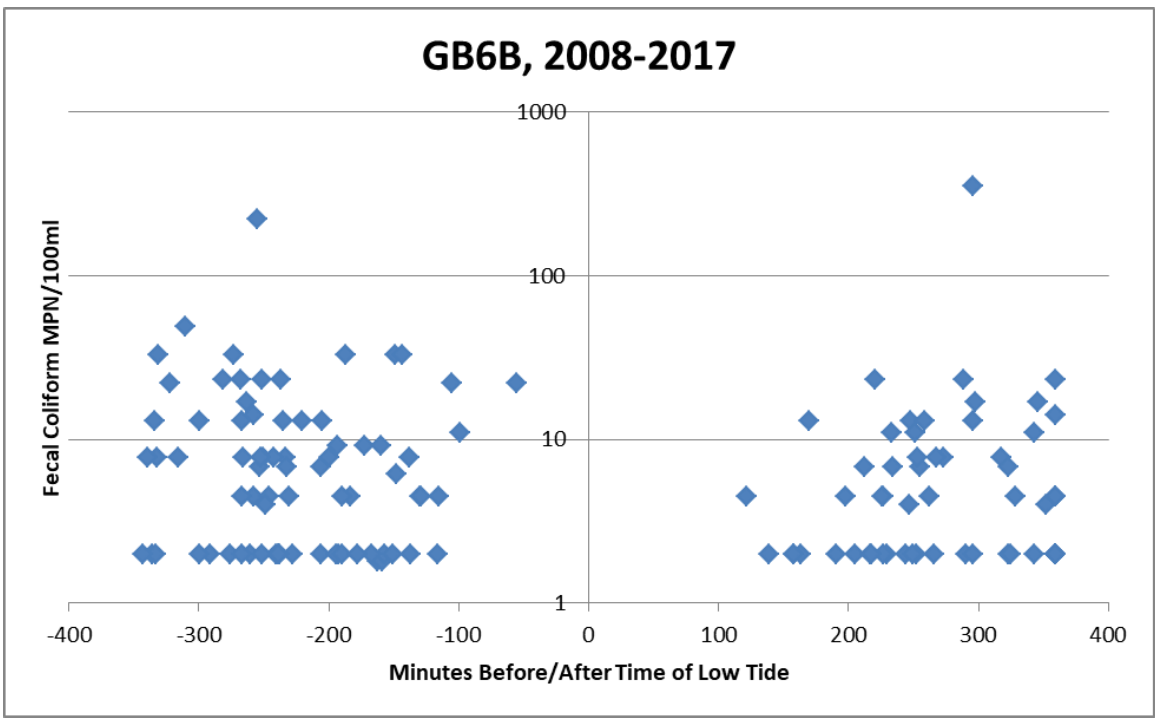

GB2, 2008-2017
Fecal Coliform MPN/100ml
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide

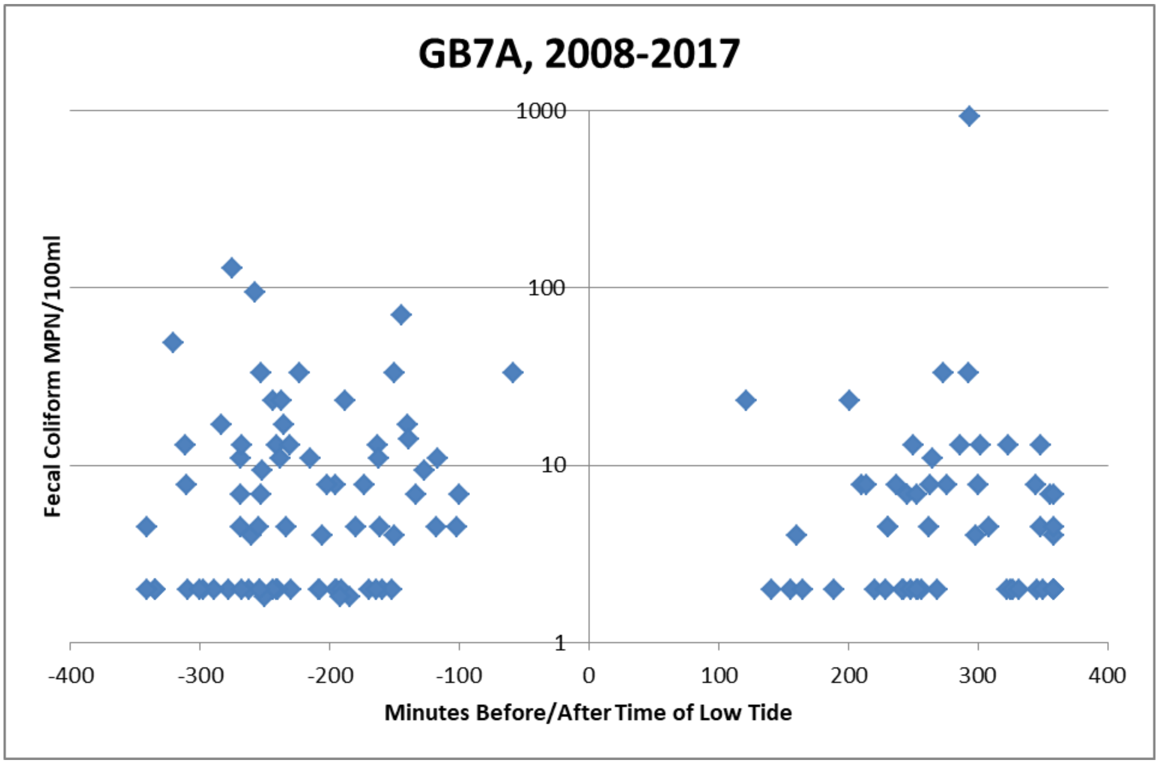

GB25A, 2008-2017
Fecal Coliform MPN/100ml
10000
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide


GB25B, 2008-2017
1000
100
10
1
Fecal Coliform MPN/100ml
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide


GB50, 2008-2017
1000
100
10
1
Fecal Coliform MPN/100ml
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide


GB6A, 2008-2017
Fecal Coliform MPN/100ml
1000
100
10
1
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide


GB6B, 2008-2017
Fecal Coliform MPN/100ml
1000
100
10
1
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide


GB7A, 2008-2017
1000
100
10
1
-400
-300
-200
-100
0
100
200
300
400
Fecal Coliform MPN/100ml
Minutes Before/After Time of Low Tide

Appendix V: Conditional Area Management Plan for Little Bay (2017-2018)

DESCRIPTION OF CONDITIONALLY APPROVED AREA

Two sections of the Little Bay growing area are classified as Conditionally Approved. These areas include Upper Little Bay from Adams Point to Fox Point/Durham Point, and the western portion of Lower Little Bay from Fox Point/Durham Point to the Prohibited area in Lower Little Bay.

FACTORS INDICATING SUITABILITY OF PORTIONS OF LITTLE BAY AS CONDITIONALLY APPROVED

1. The major pollution source(s) with the potential to adversely affect water quality in Little Bay are point source in origin, namely, the wastewater treatment facilities in Dover, Durham, and Portsmouth. The Conditionally Approved area is separated spatially from each wastewater treatment facility outfall by a Prohibited/Safety Zone. National Pollutant Discharge Elimination System (NPDES) permit requirements for the facilities require the plant operators to immediately notify NHDES when discharges of improperly treated sewage occur, and experience to date has shown the plant operators do provide timely notification to NHDES. There are no other significant point sources in the Conditionally Approved area.
2. The waters of Little Bay can be affected by nonpoint sources of pollution following heavy (>1.50 inches) rainfall events. Weather information is available in real-time from the Pease airport weather tower in Portsmouth, which is staffed 24 hours a day.
3. Little Bay can be adversely affected very quickly by a discharge of improperly disinfected effluent from the Portsmouth WWTF. Therefore, there must be very tight control over when recreational and commercial harvesting can occur.
4. Little Bay exhibits a tidal range that indicates substantial exchange with coastal ocean waters.

POLLUTION EVENTS THAT MAY TRIGGER CONDITIONAL AREA CLOSURE

Durham Wastewater Treatment Facility (100 Stone Quarry Drive, Durham, New Hampshire 03824. Max Driscoll, Operator, 868-2274)

The following performance standards may be used to trigger a closure of the Conditionally Approved areas in Little Bay. Exceedence of any of the following shall trigger immediate notification of the NHDES Shellfish Program by the Town of Durham:

- Effluent flow: total daily flow shall not exceed 2 mgd.
- Bacteriological quality of the effluent: shall not exceed 43 fecal coliform/100ml after disinfection. Notification of results over 43/100ml shall occur as soon as the laboratory test results are completed.

- Bypasses: any discharge of raw sewage or partially treated sewage from the WWTF or from any part of the sewage collection system. For the purposes of this performance standard, “partially treated sewage” means sewage/effluent that has been released to the environment before undergoing all aspects of treatment required by the most recent NPDES permit.
- Failure of the WWTF to complete its required effluent monitoring, such that the biological, physical, and/or chemical quality of the effluent is unknown.

Dover Wastewater Treatment Facility (484 Middle Road, Dover, New Hampshire 03820. Raymond Vermette, Operator, 516-6475)

The following performance standards may be used to trigger a closure of the Conditionally Approved areas in Little Bay. Exceedence of any of the following shall trigger immediate notification of the NHDES Shellfish Program by the City of Dover:

- Effluent flow: total daily flow shall not exceed 4.02 mgd.
- Bacteriological quality of the effluent: shall not exceed 43 fecal coliform/100ml after disinfection. Notification of results over 43/100ml shall occur as soon as the laboratory test results are completed.
- Bypasses: any discharge of raw sewage or partially treated sewage from the WWTF or from any part of the sewage collection system. For the purposes of this performance standard, “partially treated sewage” means sewage/effluent that has been released to the environment before undergoing all aspects of treatment required by the most recent NPDES permit.
- Failure of the WWTF to complete its required effluent monitoring, such that the biological, physical, and/or chemical quality of the effluent is unknown.

Portsmouth Wastewater Treatment Facility (Peirce Island, Portsmouth, New Hampshire 03801. Timothy Babkirk, Operator, 603-957-8780)

The following performance standards may be used to trigger a closure of the Conditionally Approved areas in Little Bay. Exceedence of any of the following shall trigger immediate notification of the NHDES Shellfish Program by the City of Portsmouth:

- Effluent flow: total daily flow shall not exceed 4.8 mgd.
- Bacteriological quality of the effluent: shall not exceed 43 fecal coliform/100ml after disinfection. Notification of results over 43/100ml shall occur as soon as the laboratory test results are completed.
- Bypasses: any discharge of raw sewage or partially treated sewage from the WWTF or from any part of the sewage collection system. For the purposes of this performance standard, “partially treated sewage” means sewage/effluent that has been released to the environment before undergoing all aspects of treatment required by the most recent NPDES permit.
- Failure of the WWTF to complete its required effluent monitoring, such that the biological, physical, and/or chemical quality of the effluent is unknown.

Meteorological or Hydrological Events

Rainfall events of more than 1.50 inches total precipitation shall trigger a closure of the Conditionally Approved areas in Little Bay. The 1.50-inch criterion is intended to generally apply to a 24-hour period; however, rainfall events that occur over a longer period of time may also warrant closure. Analysis of precipitation records from Portsmouth, NH, suggests that on average, such events will occur approximately 5-10 times per year. Analyses of the relationship between rainfall and bacteria levels are presented in the sanitary survey report.

For the purpose of this performance standard, rainfall data will be obtained from the meteorological observation station at the Pease International Tradeport Airport in Portsmouth, New Hampshire. Real-time checks of rainfall data are made via phone calls to the weather observation station at the airport tower. Data from other coastal New Hampshire weather stations (e.g., Seabrook) may also be used to institute a closure.

Closures will be instituted for precipitation events that fall primarily as rainfall. Precipitation that falls primarily as snow and/or ice will generally not trigger a closure, as these events do not produce the runoff that transports bacterial contamination to the growing waters. However, precipitation events that fall as a mix of rain and snow/ice, or snow/ice events that are immediately followed by a significant melting period, may trigger a closure. The potential for growing area contamination by such events will be evaluated by NHDES Shellfish Program staff on a case-by-case basis, and closure decisions will be made accordingly.

Other Events

Recreational shellfish harvest will only be allowed on Saturdays, 9am-sunset. The delayed start time gives NHDES and the WWTF time to communicate any overnight treatment issues to recreational harvesters via the Clam Hotline and the NH Coastal Atlas, and initiate temporary harvest closures as needed. Commercial harvesting (where allowed by NH Fish and Game) is controlled by NHDES through direct communication with each harvester on a harvest-by-harvest basis, so commercial harvesting can be allowed any day of the week, provided that conditions in the Conditional Area Management Plan are being met.

IMPLEMENTATION OF A CONDITIONALLY APPROVED AREA CLOSURE

Notification of Management Plan Violation

The Durham, Dover and Portsmouth WWTFs are responsible for immediately notifying NHDES in the event of a violation of the aforementioned performance standards. The response time between management plan violation and notification of NHDES can vary, depending on the sewage discharge. However, historical experience with these WWTFs indicates notification can be expected within four to six hours of the management plan violation. Notification time is shortened by the availability of a pager maintained by NHDES staff (Chris Nash, Shellfish Program Manager, 222 International Drive, Suite 175, Pease Tradeport, Portsmouth, New Hampshire 03801). The Shellfish Program pager is to be used for notification (603/771-9826).

The Shellfish Program also maintains a cell phone (603/568-6741) to be used by WWTF as needed (if direct contact with Shellfish staff is not made via cellphone, a page must be sent).

The Prohibited/no-harvest zone around each outfall is based in part on the time of travel notification time (response time) by each WWTF. WWTF response times will be reviewed annually to determine if a change in the size of the zone is warranted.

NHDES Shellfish Program staff are responsible for monitoring weather forecasts and conditions, and acquiring real-time rainfall data from the Pease Airport or other sources for the purposes of determining when a rainfall closure is necessary.

Implementation of Closure

Response time between management plan violation notification and legal closure by NHDES is relatively short for all facilities, typically within four to six hours. The short response times are aided by the automated alarm systems at the facilities and the fact that the NHDES Shellfish Program staff are on call (cellphone and pager) every day, 6am-9pm. Rainfall closures are also implemented quickly, as NHDES maintains direct contact with the Pease airport weather observation station. Notification of NHF&G (patrol agency) by NHDES typically occurs immediately following NHDES notification. Implementation of closure by NHF&G is often immediate as well, and typically occurs immediately after notification by NHDES. The following notification protocol is followed for each closure:

> Initiation of Closure: Each week, the NHDES Shellfish Program calls the NHF&G Law Enforcement Division and sends a "Clam Hotline update" email to NHF&G Marine Fisheries Division/Durham, NHF&G Law Enforcement Division/Durham, and NHF&G Public Affairs Division in Concord. The email makes note of any management plan violations that have occurred, as well as any necessary closures. These emails typically outline the more common types of temporary closures, such as those occurring after rainfall events. For the rarer management plan violations that could involve prolonged closures (e.g., significant discharges of improperly treated waste from a WWTF), an informational email is sent not only to NHF&G Marine Fisheries Division/Durham, NHF&G Law Enforcement Division/Durham, and NHF&G Public Affairs Division in Concord, but also to the DHHS/Bureau of Food Protection, the DHHS Public Health Laboratory in Concord, and the NHDES Public Information Office in Concord.
>
> NHF&G will enforce provisions of Fis 606.02(b) once NHDES has placed the area in the closed status.
>
> Public Dissemination of Closure Information: NHF&G will serve as the lead agency to inform recreational harvesters and the general public of any closures and subsequent reopenings. Procedures to inform the public may include such vehicles as the Clam Hotline, press releases and website updates, and alerting the public during patrol activities. NHDES will assist with informing the general public via updates to the NH Coastal Atlas. DHHS will serve as the lead agency to inform the commercial shellfish industry of any closures and subsequent reopenings.

Enforcement of Closure

The New Hampshire Fish and Game Department is the agency responsible for patrolling waters closed for public health reasons. The frequency of patrols will be at the discretion of NH Fish and Game Department/Law Enforcement Division staff (Lt. Michael Eastman, Sgt. Jeremy Hawkes, Conservation Officer James Benvenuti, Conservation Officer Graham Courtney), NHF&G Region 3 Office, 225 Main Street, Durham, New Hampshire 03824, 603/868-1095).

REOPENING A CONDITIONALLY APPROVED AREA AFTER CLOSURE

Wastewater Treatment Plant/Collection System-Related Closures: Following closures triggered by discharges of raw or partially treated sewage from a wastewater treatment facility and/or any part of its sewage collection system, NHDES will be the lead agency for identifying necessary sampling locations and frequency needed to reopen the shellfish beds. At a minimum, water sampling will be conducted at monitoring sites GB25B, GB17, GB19, GB6A and GB7A. If site access is limited by ice cover or other conditions, alternative shoreline sites will be used. Because access to shellfish tissue sampling sites can vary with tide stage, ice, and daylight considerations, shellfish tissue sampling sites will be determined on a case-by-case basis. NHDES will be the lead agency in collecting water and shellfish tissue samples and will notify the DHHS lab of its intention to sample. All samples will be held on ice and will be delivered to the DHHS Laboratory in Concord by the collecting agency as soon as practical, but always within 24 hours of collection. Upon completion of the laboratory tests, DHHS laboratory personnel will promptly inform the NHDES Shellfish Program of the results. NHDES will then decide whether or not the sample results support a reopening of the area and will notify NHF&G/Law Enforcement Division of the decision. Sampling will continue until meat samples show a FC MPN of 230/100g or less (or a different baseline value established for a particular site) and confirmatory water samples show FC of 43/100ml or less. When sampling demonstrates that the area was in fact impacted by a significant sewage discharge, the area will remain closed for a period of at least three weeks, per U.S. FDA recommendations relating to the time required for viral pathogens to be purged from shellfish. Reopening may alternatively be driven by sampling of shellfish meats for male-specific coliphage, per NSSP guidelines (<50 pfu/100g tissue, or higher if documented background levels dictate). Reopening after the three-week closure will be done in concert with water and meat samples that show sufficiently low fecal coliform results.

Rainfall-Related Closure Periods: Because water quality impacts can vary among storms of the same size, NHDES may elect to conduct an initial round of sampling, involving water samples only, of the Conditionally Approved area in the day(s) following closures from rainfall events. The purpose of such sampling is to determine if the rainfall event did in fact cause bacterial contamination of the growing area, and therefore to determine if a closure was warranted. At a minimum, water sampling will be conducted at monitoring sites GB25B, GB17, GB19, GB6A, and GB7A. If site access is limited by ice cover or other conditions, alternative shoreline sites will be used. If these water samples show low fecal coliform levels (i.e., the samples indicate that there was no water quality impact from the storm to begin with), then the closure may be lifted with no additional sampling of waters or shellfish meats. If high FC levels are observed, then the area will remain in the closed status until post-rainfall meat samples show a FC MPN of 230/100g or less (or a different baseline value established for a particular site), and confirmatory water samples show FC of 43/100ml or less, or until fourteen consecutives days with no storms >1.50 inches have elapsed and confirmatory water samples show FC of 43/100ml or less, whichever is less.

NHDES will be the lead agency in collecting samples from sites in the Conditionally Approved area and will notify the DHHS laboratory, as well as the NHF&G Law Enforcement Division of its intention to sample. All samples will be collected as soon as practical after the rainfall event has ended, will be held on ice, and will be delivered to the DHHS Laboratory in Concord, or an appropriate contracting laboratory, by the collecting agency within 24 hours of collection. Upon completion of the laboratory tests, DHHS will promptly inform the NHDES Shellfish Program of the results. NHDES will then decide whether or not to close the area for harvesting and will notify NHF&G/Law Enforcement Division of the decision.

Notification of Reopening: NHDES will promptly rescind the closure after it is determined that the shellfish growing waters meet NSSP standards. Upon this determination, NHDES will email a reopening notice to the NHF&G Marine Fisheries Division/Durham, NHF&G Law Enforcement Division/Durham, and the NHF&G Public Affairs Division, as well as to the other individuals/organizations that received a closure notice. NHF&G will serve as the lead agency to inform recreational harvesters and the general public of any closures and subsequent reopenings. Procedures to inform the public may include such vehicles as the Clam Hotline and press releases. NHDES will assist with informing the general public via updates to the NH Coastal Atlas. NHDHHS will serve as the lead agency to inform the commercial shellfish industry of any closures and subsequent reopenings.

MANAGEMENT PLAN EVALUATION

This plan shall be evaluated once per year as part of the NHDES Shellfish Program's annual report.

Appendix VI: Conditional Area Management Plan for Little Bay (October 2018-2019)

DESCRIPTION OF CONDITIONALLY APPROVED AREA

Two sections of the Little Bay growing area are classified as Conditionally Approved. These areas include Upper Little Bay from Adams Point to Fox Point/Durham Point, and the western portion of Lower Little Bay from Fox Point/Durham Point to the Prohibited area in Lower Little Bay.

FACTORS INDICATING SUITABILITY OF PORTIONS OF LITTLE BAY AS CONDITIONALLY APPROVED

5. The major pollution source(s) with the potential to adversely affect water quality in Little Bay are point source in origin, namely, the wastewater treatment facilities in Dover, Durham, and Portsmouth. The Conditionally Approved area is separated spatially from each wastewater treatment facility outfall by a Prohibited/Safety Zone. National Pollutant Discharge Elimination System (NPDES) permit requirements for the facilities require the plant operators to immediately notify NHDES when discharges of improperly treated sewage occur, and experience to date has shown the plant operators do provide timely notification to NHDES. There are no other significant point sources in the Conditionally Approved area.
6. The waters of Little Bay can be affected by nonpoint sources of pollution following heavy (>1.50 inches) rainfall events. Weather information is available in real-time from the Pease airport weather tower in Portsmouth, which is staffed 24 hours a day.
7. Little Bay can be adversely affected very quickly by a discharge of improperly disinfected effluent from the Portsmouth WWTF. Therefore, there must be very tight control over when recreational and commercial harvesting can occur.
8. The waters of Lower Little Bay can be adversely affected by chronic inputs of viral indicators from Portsmouth WWTF effluent, particularly during the months of October-March.
9. Little Bay exhibits a tidal range that indicates substantial exchange with coastal ocean waters.

POLLUTION EVENTS THAT MAY TRIGGER CONDITIONAL AREA CLOSURE

Durham Wastewater Treatment Facility (100 Stone Quarry Drive, Durham, New Hampshire 03824. Max Driscoll, Operator, 868-2274)

The following performance standards may be used to trigger a closure of the Conditionally Approved areas in Little Bay. Exceedence of any of the following shall trigger immediate notification of the NHDES Shellfish Program by the Town of Durham:

- Effluent flow: total daily flow shall not exceed 2 mgd.

- Bacteriological quality of the effluent: shall not exceed 43 fecal coliform/100ml after disinfection. Notification of results over 43/100ml shall occur as soon as the laboratory test results are completed.
- Bypasses: any discharge of raw sewage or partially treated sewage from the WWTF or from any part of the sewage collection system. For the purposes of this performance standard, "partially treated sewage" means sewage/effluent that has been released to the environment before undergoing all aspects of treatment required by the most recent NPDES permit.
- Failure of the WWTF to complete its required effluent monitoring, such that the biological, physical, and/or chemical quality of the effluent is unknown.

Dover Wastewater Treatment Facility (484 Middle Road, Dover, New Hampshire 03820. Raymond Vermette, Operator, 516-6475)

The following performance standards may be used to trigger a closure of the Conditionally Approved areas in Little Bay. Exceedence of any of the following shall trigger immediate notification of the NHDES Shellfish Program by the City of Dover:

- Effluent flow: total daily flow shall not exceed 4.02 mgd.
- Bacteriological quality of the effluent: shall not exceed 43 fecal coliform/100ml after disinfection. Notification of results over 43/100ml shall occur as soon as the laboratory test results are completed.
- Bypasses: any discharge of raw sewage or partially treated sewage from the WWTF or from any part of the sewage collection system. For the purposes of this performance standard, "partially treated sewage" means sewage/effluent that has been released to the environment before undergoing all aspects of treatment required by the most recent NPDES permit.
- Failure of the WWTF to complete its required effluent monitoring, such that the biological, physical, and/or chemical quality of the effluent is unknown.

Portsmouth Wastewater Treatment Facility (Peirce Island, Portsmouth, New Hampshire 03801. Timothy Babkirk, Operator, 603-957-8780)

The following performance standards may be used to trigger a closure of the Conditionally Approved areas in Little Bay. Exceedence of any of the following shall trigger immediate notification of the NHDES Shellfish Program by the City of Portsmouth:

- Effluent flow: total daily flow shall not exceed 4.8 mgd.
- Bacteriological quality of the effluent: shall not exceed 43 fecal coliform/100ml after disinfection. Notification of results over 43/100ml shall occur as soon as the laboratory test results are completed.
- Bypasses: any discharge of raw sewage or partially treated sewage from the WWTF or from any part of the sewage collection system. For the purposes of this performance standard, "partially treated sewage" means sewage/effluent that has been released to the environment before undergoing all aspects of treatment required by the most recent NPDES permit.

- Failure of the WWTF to complete its required effluent monitoring, such that the biological, physical, and/or chemical quality of the effluent is unknown.

Meteorological or Hydrological Events

Rainfall events of more than 1.50 inches total precipitation shall trigger a closure of the Conditionally Approved areas in Little Bay. The 1.50-inch criterion is intended to generally apply to a 24-hour period; however, rainfall events that occur over a longer period of time may also warrant closure. Analysis of precipitation records from Portsmouth, NH suggests that on average, such events will occur approximately 5-10 times per year. Analyses of the relationship between rainfall and bacteria levels are presented in the sanitary survey report.

For the purpose of this performance standard, rainfall data will be obtained from the meteorological observation station at the Pease International Tradeport Airport in Portsmouth, New Hampshire. Real-time checks of rainfall data are made via phone calls to the weather observation station at the airport tower. Data from other coastal New Hampshire weather stations (e.g., Seabrook) may also be used to institute a closure.

Closures will be instituted for precipitation events that fall primarily as rainfall. Precipitation that falls primarily as snow and/or ice will generally not trigger a closure, as these events do not produce the runoff that transports bacterial contamination to the growing waters. However, precipitation events that fall as a mix of rain and snow/ice, or snow/ice events that are immediately followed by a significant melting period, may trigger a closure. The potential for growing area contamination by such events will be evaluated by NHDES Shellfish Program staff on a case-by-case basis, and closure decisions will be made accordingly.

Seasonal Events

Viral inputs from the Portsmouth WWTF, a primary treatment facility, are much higher than viral inputs from the other WWTFs in the region, all of which employ secondary or tertiary treatment. Documentation of effluent Male Specific Coliphage (MSC) levels in effluent shows that Portsmouth effluent typically has MSC concentrations well over 10,000 plaque-forming units per 100ml, and sometimes approaches 1,000,000 pfu/100ml. The 4,600:1 dilution available at the entrance of Little Bay at Dover Point is not sufficient to dilute these concentrations to levels that protect public health, particularly in the colder weather months when MSC persists in the environment. This is particularly problematic in autumn, when shellfish are rapidly pumping seawater and bioaccumulating pollutants in the ambient seawater. This accumulation has consistently been observed to be underway by mid-October.

The combination of high MSC concentration in Portsmouth effluent, insufficient dilution at Dover Point, and unacceptably high MSC concentration in seawater entering Little Bay during the fall and winter months, prompted NHDES to implement a seasonal closure of Lower Little Bay and the Bellamy River in October 2018. The seasonal closure will be lifted on April 1, 2019. A similar closure will be implemented October 2019-March 2020. The Portsmouth WWTF upgrade to secondary treatment, which is expected to dramatically reduce effluent MSC levels, is scheduled for completion in April 2020. The continuation of seasonal cold-weather closures in Lower Little Bay will be revisited once MSC levels in effluent from the upgraded facility are confirmed.

Other Events

Recreational shellfish harvest will only be allowed on Saturdays, 9am-sunset. The delayed start time gives NHDES and the WWTF time to communicate any overnight treatment issues to recreational harvesters via the Clam Hotline and the NH Coastal Atlas, and initiate temporary harvest closures as needed. Commercial harvesting (where allowed by NH Fish and Game) is controlled by NHDES through direct communication with each harvester on a harvest-by-harvest basis, so commercial harvesting can be allowed any day of the week, provided that conditions in the Conditional Area Management Plan are being met.

IMPLEMENTATION OF A CONDITIONALLY APPROVED AREA CLOSURE

Notification of Management Plan Violation

The Durham, Dover, and Portsmouth WWTFs are responsible for immediately notifying NHDES in the event of a violation of the aforementioned performance standards. The response time between management plan violation and notification of NHDES can vary, depending on the sewage discharge. However, historical experience with these WWTFs indicates notification can be expected within four-to-six hours of the management plan violation. Notification time is shortened by the availability of a pager maintained by NHDES staff (Chris Nash, Shellfish Program Manager, 222 International Drive, Suite 175, Pease Tradeport, Portsmouth, New Hampshire 03801). The Shellfish Program pager is to be used for notification (603/771-9826). The Shellfish Program also maintains a cell phone (603/568-6741) to be used by WWTF as needed (if direct contact with Shellfish staff is not made via cellphone, a page must be sent).

The Prohibited/no-harvest zone around each outfall is based in part on the time of travel notification time (response time) by each WWTF. WWTF response times will be reviewed annually to determine if a change in the size of the zone is warranted.

NHDES Shellfish Program staff are responsible for monitoring weather forecasts and conditions, and acquiring real-time rainfall data from the Pease Airport or other sources for the purposes of determining when a rainfall closure is necessary.

Implementation of Closure

Response time between management plan violation notification and legal closure by NHDES is relatively short for all facilities, typically within four to six hours. The short response times are aided by the automated alarm systems at the facilities and the fact that the NHDES Shellfish Program staff are on call (cellphone and pager) every day, 6am-9pm. Rainfall closures are also implemented quickly, as NHDES maintains direct contact with the Pease airport weather observation station. Notification of NHF&G (patrol agency) by NHDES typically occurs immediately following NHDES notification. Implementation of closure by NHF&G is often immediate as well, and typically occurs immediately after notification by NHDES. The following notification protocol is followed for each closure:

> Initiation of Closure: Each week, the NHDES Shellfish Program sends a “Clam Hotline update” email to NHF&G Marine Fisheries Division/Durham, NHF&G Law Enforcement Division/Durham, and F&G Public Affairs Division in Concord. The email makes note of any management plan violations that have occurred, as well as any necessary closures. These emails typically outline the more common types of temporary closures, such as those occurring after rainfall events. For the rarer management plan violations that could involve prolonged closures (e.g., significant discharges of improperly treated waste from a WWTF), an informational email is sent not only to NHF&G Marine Fisheries Division/Durham, NHF&G Law Enforcement Division/Durham, and NHF&G Public Affairs Division in Concord, but also to the NHDHHS/Bureau of Food Protection, the NHDHHS Public Health Laboratory in Concord, and the NHDES Public Information Office in Concord.
>
> NHF&G will enforce provisions of Fis 606.02(b) once NHDES has placed the area in the closed status.
>
> Public Dissemination of Closure Information: NHF&G will serve as the lead agency to inform recreational harvesters and the general public of any closures and subsequent reopenings. Procedures to inform the public may include such vehicles as the Clam Hotline, press releases and website updates, and alerting the public during patrol activities. NHDES will assist with informing the general public via updates to the NH Coastal Atlas. NHDHHS will serve as the lead agency to inform the commercial shellfish industry of any closures and subsequent reopenings.

Enforcement of Closure

The New Hampshire Fish and Game Department is the agency responsible for patrolling waters closed for public health reasons. The frequency of patrols will be at the discretion of NH Fish and Game Department/Law Enforcement Division staff (Lt. Michael Eastman, Sgt. Jeremy Hawkes, Conservation Officer James Benvenuti, Conservation Officer Graham Courtney), NHF&G Region 3 Office, 225 Main Street, Durham, New Hampshire 03824, 603/868-1095).

REOPENING A CONDITIONALLY APPROVED AREA AFTER CLOSURE

<u>Wastewater Treatment Plant/Collection System-Related Closures</u>: Following closures triggered by discharges of raw or partially treated sewage from a wastewater treatment facility and/or any part of its sewage collection system, NHDES will be the lead agency for identifying necessary sampling locations and frequency needed to reopen the shellfish beds. At a minimum, water sampling will be conducted at monitoring sites GB25B, GB17, GB19, GB6A and GB7A. If site access is limited by ice cover or other conditions, alternative shoreline sites will be used. Because access to shellfish tissue sampling sites can vary with tide stage, ice, and daylight considerations, shellfish tissue sampling sites will be determined on a case-by-case basis. NHDES will be the lead agency in collecting water and shellfish tissue samples and will notify the DHHS lab of its intention to sample. All samples will be held on ice and will be delivered to the DHHS Laboratory in Concord by the collecting agency as soon as practical, but always within 24 hours of collection. Upon completion of the laboratory tests, NHDHHS laboratory personnel will promptly inform the NHDES Shellfish Program of the results. NHDES will then decide whether or not the sample results support a reopening of the area and will notify NHF&G/Law Enforcement Division of the decision. Sampling will continue until meat samples show a FC MPN of 230/100g or less (or a different baseline value established for a particular site) and confirmatory water samples show FC of 43/100ml or less. When sampling demonstrates that the area was in fact impacted by a significant sewage discharge, the area will remain closed for a period of at least three weeks, per USFDA recommendations relating to the time required for viral pathogens to be purged from shellfish. Reopening may alternatively be driven by sampling of shellfish meats for male-specific coliphage, per NSSP guidelines (<50 pfu/100g tissue, or higher if documented background levels dictate). Reopening after the three-week closure will be done in concert with water and meat samples that show sufficiently low fecal coliform results.

<u>Rainfall-Related Closure Periods</u>: Because water quality impacts can vary among storms of the same size, NHDES may elect to conduct an initial round of sampling, involving water samples only, of the Conditionally Approved area in the day(s) following closures from rainfall events. The purpose of such sampling is to determine if the rainfall event did in fact cause bacterial contamination of the growing area, and therefore to determine if a closure was warranted. At a minimum, water sampling will be conducted at monitoring sites GB25B, GB17, GB19, GB6A and GB7A. If site access is limited by ice cover or other conditions, alternative shoreline sites will be used. If these water samples show low fecal coliform levels (i.e., the samples indicate that there was no water quality impact from the storm to begin with), then the closure may be lifted with no additional sampling of waters or shellfish meats. If high FC levels are observed, then the area will remain in the closed status until post-rainfall meat samples show a FC MPN of 230/100g or

less (or a different baseline value established for a particular site), and confirmatory water samples show FC of 43/100ml or less, or until fourteen consecutives days with no storms >1.50 inches have elapsed and confirmatory water samples show FC of 43/100ml or less, whichever is less.

NHDES will be the lead agency in collecting samples from sites in the Conditionally Approved area and will notify the NHDHHS laboratory, as well as the NHF&G Law Enforcement Division of its intention to sample. All samples will be collected as soon as practical after the rainfall event has ended, will be held on ice, and will be delivered to the NHDHHS Laboratory in Concord, or an appropriate contracting laboratory, by the collecting agency within 24 hours of collection. Upon completion of the laboratory tests, NHDHHS will promptly inform the NHDES Shellfish Program of the results. NHDES will then decide whether or not to close the area for harvesting and will notify NHF&G/Law Enforcement Division of the decision.

Notification of Reopening: NHDES will promptly rescind the closure after it is determined that the shellfish growing waters meet NSSP standards. Upon this determination, NHDES will email a reopening notice to the NHF&G Marine Fisheries Division/Durham, NHF&G Law Enforcement Division/Durham, and the NHF&G Public Affairs Division, as well as to the other individuals/organizations that received a closure notice. NHF&G will serve as the lead agency to inform recreational harvesters and the general public of any closures and subsequent reopenings. Procedures to inform the public may include such vehicles as the Clam Hotline and press releases. NHDES will assist with informing the general public via updates to the NH Coastal Atlas. NHDHHS will serve as the lead agency to inform the commercial shellfish industry of any closures and subsequent reopenings.

MANAGEMENT PLAN EVALUATION

This plan shall be evaluated once per year as part of the NHDES Shellfish Program's annual report.