



**EB Sanitary Survey 2017**  
**Effective Date 12/17/18**

**GROWING AREA EB**  
**Cape Rosier, Brooksville to Naskeag Point, Brooklin**  
**Sanitary Survey Report**  
**2009-2017**  
**Hannah Horecka**



## **Executive Summary**

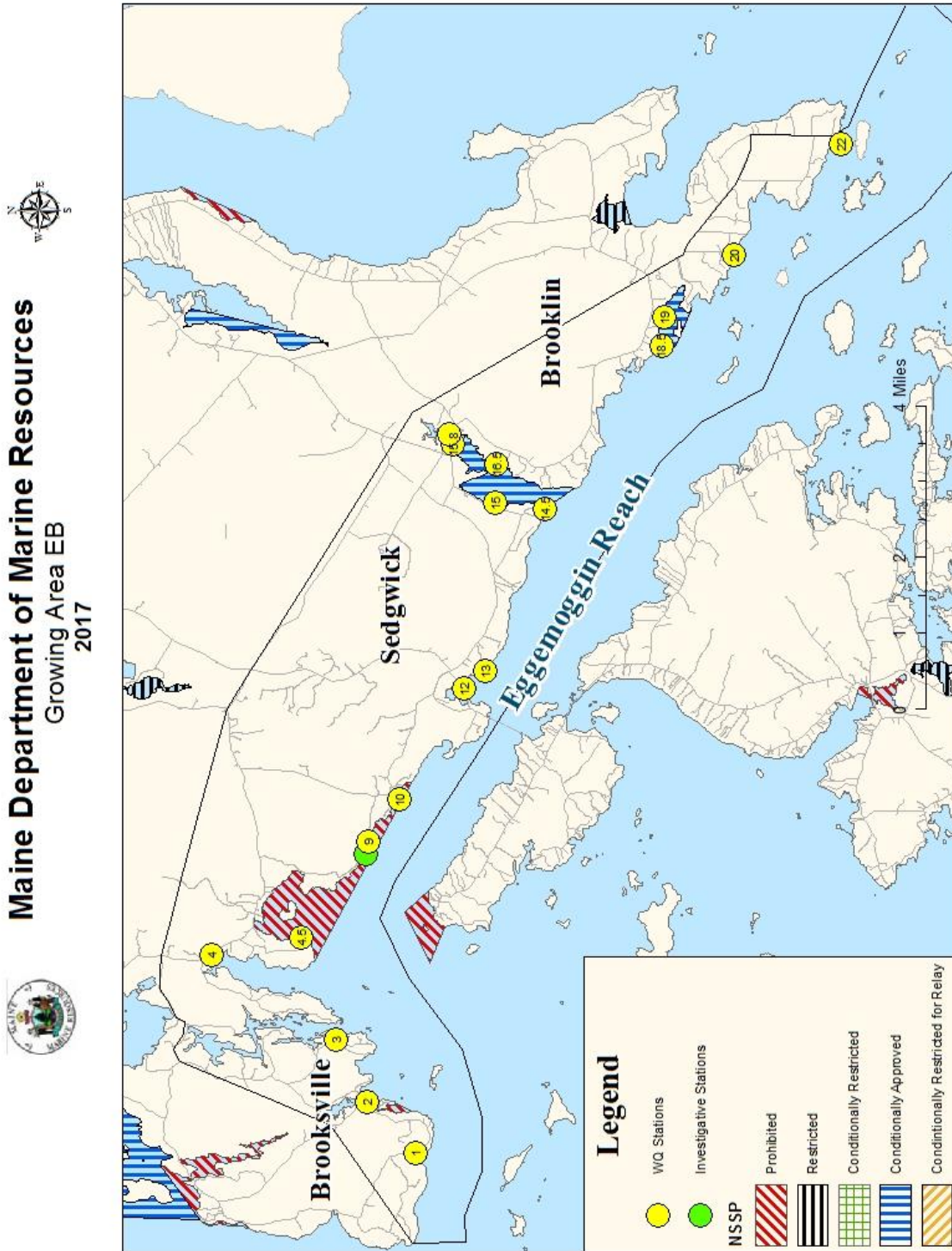
This is a Sanitary Survey report of Growing Area EB in Hancock County written in compliance with the requirements of the 2015 Model Ordinance and the National Shellfish Sanitation Program. Water Quality station EB15.8 continues to meet approved standards and can be upgraded from Restricted to Approved in early 2018. There were eight new actual or potential pollution sources found resulting in one new Prohibited Area. Access was denied at two properties. Investigatory water quality station EB8.1 was created in 2014 and then deactivated without being sampled because of access issues. In the same year it was replaced with investigatory water quality station EB8.6 which serves as the boundary station for the OBD zone. Water quality stations EB11 and EB17 were deactivated in 2013, and EB6 was deactivated in 2014. Water quality has declined very slightly or remained consistent overall. The next sanitary survey is due in 2029 and the next Triennial in 2020.

Growing Area EB is in the southwestern section of Hancock county and encompasses 44.4 square miles. The growing area extends from the Head of Cape Rosier, Brooksville to Naskeag Point, Brooklin and includes the towns of Brooksville (pop. 934), Sedgwick (pop. 1,196), and Brooklin (pop. 824) (2010 Census). Development is spotty along the shoreline with clusters of homes separated by undeveloped land. The villages of Brooksville, Sedgwick, and Brooklin have the largest population concentrations. Pollution areas are based on failing residential septic systems, licensed residential overboard discharges (OBD), and marina activity. There are no Waste Water Treatment Plants (WWTP) located in Growing Area EB, and two licensed OBDs. No OBDs were removed in the review period.

Shellfish Growing Area EB encompasses 44.4 square miles and includes the near sub-tidal waters, inter-tidal flats and a shoreline zone that extends inland to a defined upland boundary. The upland cover is predominately deciduous with some evergreens, and a wetland forest with minimal development. Blueberry and grass fields are scattered throughout Brooksville and Sedgwick. Freshwater influence along these shores is predominately from numerous small streams throughout the growing area. There are no large rivers or lakes impacting the area. Wildlife in the area includes migrating birds, various rodents, deer, harbor seals, etcetera. Areas most likely to contain significant populations of soft and hard shell clams, and mussels include Weir Cove, Orcutt harbor, Bucks Harbor, Benjamin River, Center Harbor, and Naskeag Point.



Figure 1. Growing Area EB, with Active Water Stations





## History of Growing Area Classification

### 2009

5/29/09 – Pollution Area 39-A Conditional Area at Center Harbor was enlarged to encompass an enlarged mooring field

### 2011

1/4/11 – Pollution Area 37 Orcutt Harbor was reclassified from Approved to seasonally Conditionally Approved based on water quality failing to meet the Approved standard year-round.

1/5/11 – Pollution Area 39-A Naskeag Harbor was reclassified from Restricted to Approved based on water quality meeting the Approved standard.

### 2014

7/10/14 – Pollution Area 38-B a portion of the upper Benjamin River was reclassified from Restricted to Approved due to water quality meeting Approved standards and an updated hotspot survey of the area.

### 2016

5/3/16 – Pollution Area 37 Orcutt Harbor was reclassified from seasonally Conditionally Approved to Approved based on water quality meeting the Approved standard year-round.

### 2017

7/21/17 – Pollution Area 37 Stand Cove was reclassified from Approved to Prohibited due to the location of a failing septic system during the sanitary survey

## Current Classification(s)

At the end of the 2017 review year, shellfish growing area EB had areas classified as:

**Approved:** 10 stations: EB 1, 2, 3, 4, 12, 13, 14.5, 16, 20, and 22.

**Conditionally Approved:** 4 stations: EB 15, 16.5, 18.5, and 19.

**Restricted:** 1 station: EB 15.8.

**Prohibited:** 3 stations: EB 4.5, 9, and 10.

**Investigatory:** 1 station: EB 8.6.



## Activity during Review Period

### 2009

5/09 – It was noted that the mooring field in Center Harbor had been enlarged and the Conditionally Approved area no longer enclosed the moored boats. The conditional area was enlarged on May 29<sup>th</sup> to encompass the dilution zone for the additional boats.

### 2010

11/14 – Deer Isle bridge, reported paint on mussels. Bridge painting going on. “The paint I saw was under the bridge on the Little Deer Isle side. If you go over the bridge and pull off on the right, you can walk down under the bridge at low tide. There was a green froth along the low tide line for maybe 20 feet. It probably didn’t add up to all that much in terms of volume. I did walk along the shore away from the bridge past the dock with the little building on it and there was more paint there as well. Unfortunately, I didn’t have anything to document this with and the tide was coming in. Maybe it had collected in the two places I saw because the wind was blowing in that direction and the land juts out into the water. My cell number is 359-5005 if you have any questions. Also that day, though I don’t think this is related, even down by the water under the bridge, there was a pretty strong smell of paint.” Ryan Annis inspected bridge area for paint and didn’t see anything at low or high tide line. The contractor did not admit to any paint spill, etc. Bridge paint is zinc based (not lead) and not toxic from a heavy metal point of view. Ryan felt that tide had washed paint away. I’m not taking any action and closing the case.

### 2011

5/16 sampled 10 streams in growing area, heavy runoff

7/14 surveyed Orcutt Hbr and found? MS from seasonal house across road. Problem is limited to month of July. Will sample runoff.

7/18 sampled? MS at head of Orcutt Hbr has FC of >1600 Will retest and talk with home-owner.

7/27 sampled? MS at Orcutt Hbr cove edge again. Spoke with home-owner and reviewed the IG (back yard). Nothing ID’d. Home-owner agreed to let us dye system; optical brightener left at PS site; FC >1600; William (Rob) Loomis 326-4116

7/27 sampled Meadow Brk, Sedgwick

8/4 Dye tested Loomis property in Orcutt Hbr.

8/9 No dye ID’d at Loomis property. Will continue to survey.



### **2013**

Surveyed Upper Benjamin River area. No actual problems identified. House @ bridge crossing (Jon Woodward and Sons Construction) has a pile of dog waste ~100' from the water's edge. Owner will relocate the pile and dump in the back yard away from the water from now on.

EB 11 and 17 deactivated

### **2014**

Created station EB8.6 – a boundary station for the OBD zone

EB8.1 – monitoring the edge of Bucks Hbr Marina-NEVER COLLECTED – NO ACCESS

DEACTIVATED: EB 6 – in marina zone with no resources.

Streams sampled

### **2015**

12/22/15 – Drive through survey of area. No pollution sources found.

### **2016**

6/15/16 – Drive through survey of growing area. No pollution sources found.

### **2017**

5/4/17 – Stream sampling in Growing Area EB.

7/14/17 – Began Sanitary Survey

8/2/17 – Stream sampling in Growing Area EB.

10/23/17 – Completed Sanitary Survey

### **Pollution Sources Survey**

The following sections include information on pollution sources which do or may impact water quality in growing area EB. Pollution sources that are reviewed in this section include domestic waste, including both private inground systems and over board discharges (OBDs), marinas and mooring fields, stormwater and pollution from non-point sources (streams), farms and other agricultural activities, domestic animals and wildlife areas, and recreational areas.



Figure 2. Growing Area EB, Pollution Map A

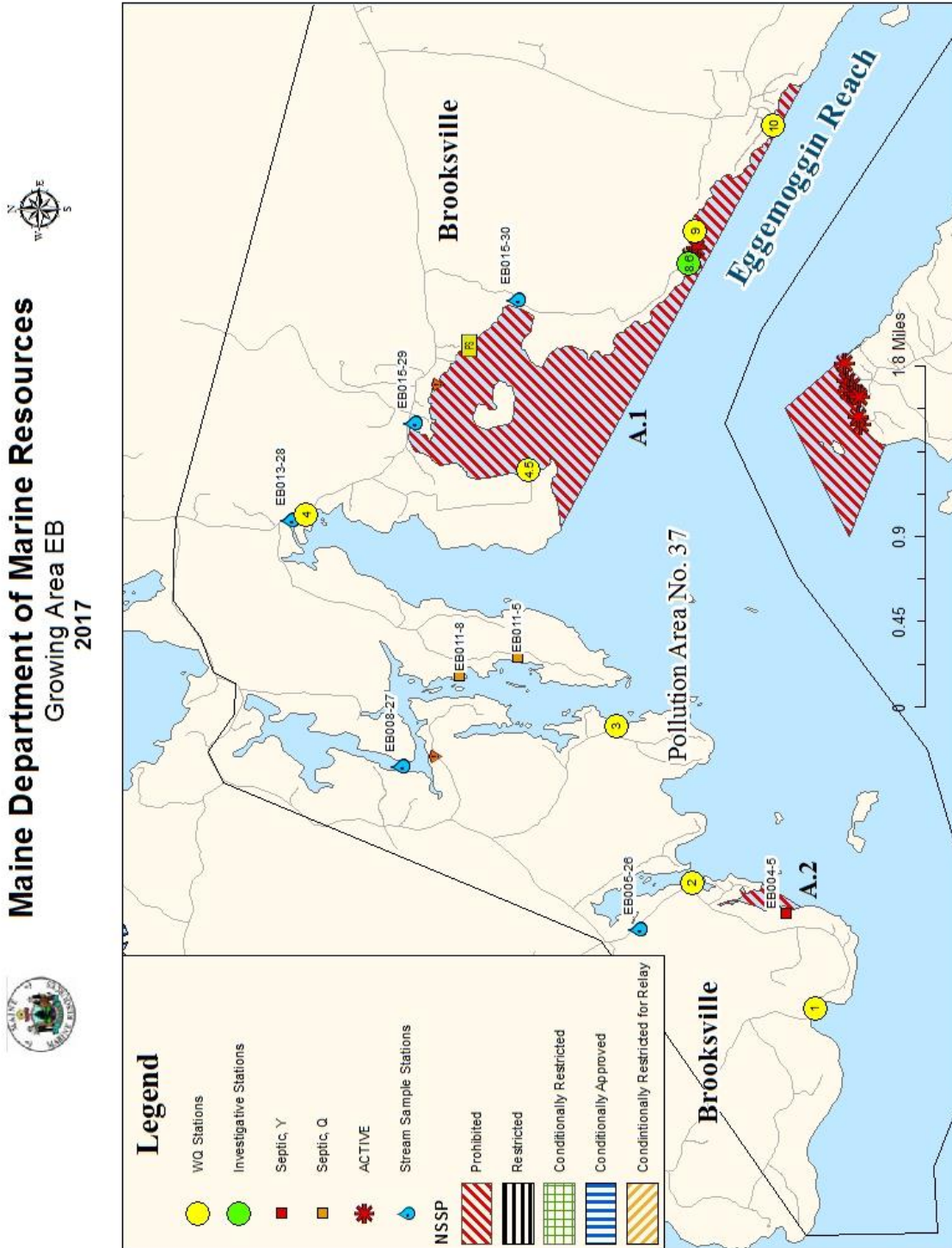
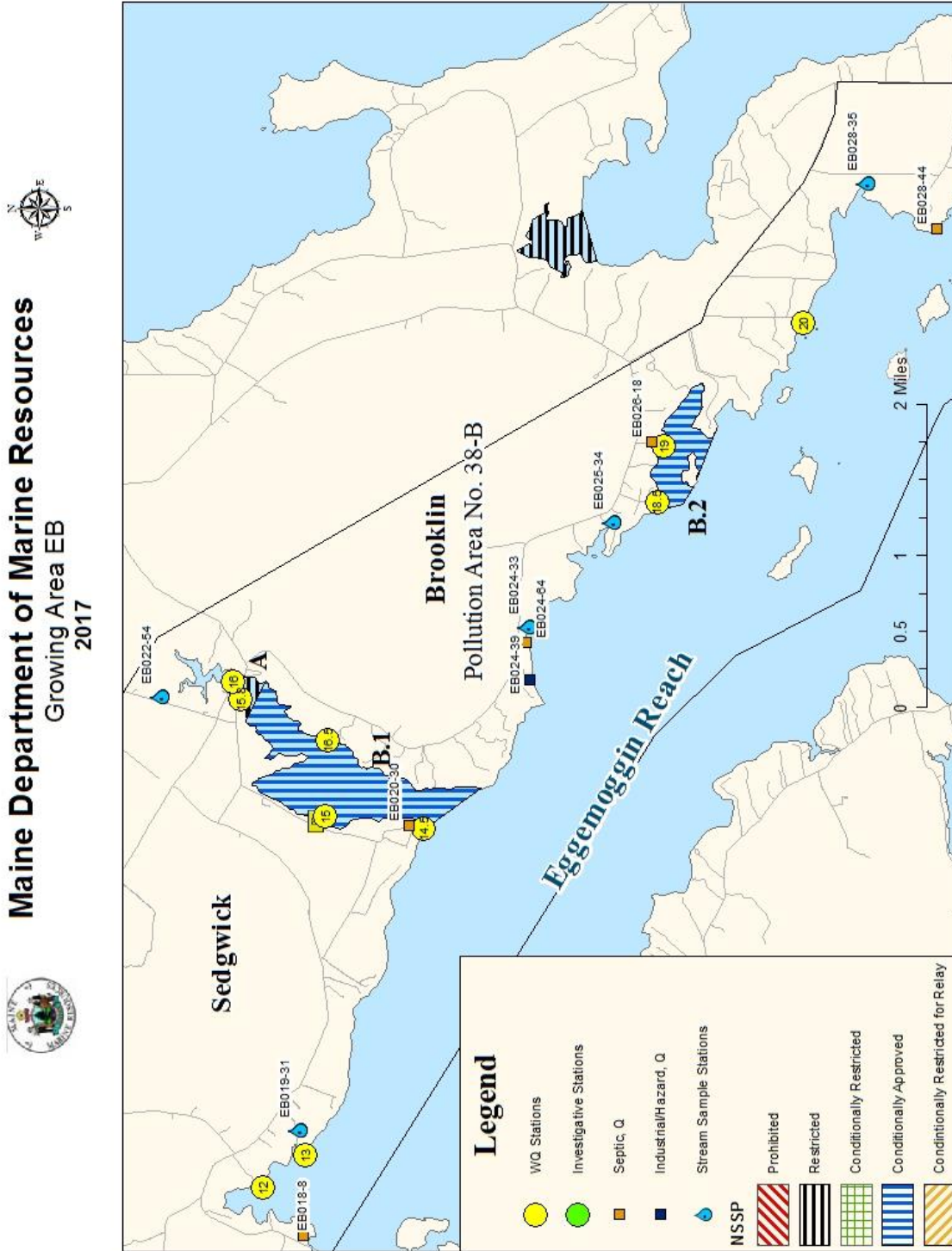




Figure 3. Growing Area EB, Pollution Map B







### **Domestic Waste (*IG Systems and OBDs*)**

Growing Area EB consists of 30 GASS IDs (2 mile segments), all within the towns of Brooksville, Sedgewick, and Brooklin. All domestic waste systems were inspected during the 2017 Shoreline Sanitary Survey. Seven problem forms were filed with the towns for potential or actual pollution sources during the 2017 survey and one of these resulted in a pollution area closure (Table 2). There was one failing residential system, two questionable outhouses, and two unknown systems. Two problem forms were filed due to access issues. There were no outstanding problem forms from previous surveys in Growing Area EB.

There are two over board discharges (OBDs) that seasonally discharge their treated effluent into the waters east of Bucks Harbor (Figure 2). No OBDs have been removed over this review period.

An overboard discharge (OBD) is the discharge of wastewater from residential, commercial, and publicly owned facilities to Maine's streams, rivers lakes, and the ocean. Commercial and residential discharges of sanitary waste have been regulated since the mid-1970's when most direct discharges of untreated waste were banned. Between 1974 and 1987 most of the "straight pipes" were connected to publicly-owned treatment works or replaced with standard septic systems. Overboard discharge treatment systems were installed for those facilities that were unable to connect to publicly-owned treatment works or unable to install a septic system because of poor soil conditions or small lot sizes.

All overboard discharge systems include a process to clarify the wastewater and disinfect it prior to discharge. There are two general types of treatment systems; mechanical package plants and sand filters. Sand filter systems consist of a septic tank and a sand filter. In such systems, the wastewater is first directed to a holding tank where the wastewater solids are settled out and undergo partial microbial digestion. The partially treated wastewater then flows from the tank into a sand filter, consisting of distribution pipes, layers of stone and filter sand, and collection pipes within a plastic liner. The wastewater is biologically treated as it filters down through the sand and is then collected and discharged to a disinfection unit. Mechanical package plants consist of a tank, where waste is mechanically broken up, mixed and aerated; mechanical systems require electric power, and must have an operating alarm on a separate electrical circuit that will activate if the treatment unit malfunctions due to a power failure. The aerated treated wastewater is held in a calm condition for a time, allowing for solids to settle and for the waste to be partially digested by naturally occurring bacteria. The clarified water from the tank is then pumped off the top into a disinfection unit. There are two types of disinfection units, UV and chlorinators (most common). In a chlorinator, the treated water contacts chlorine tablets and remains in a tank for at least 20 minutes where bacteria and other pathogens are killed. The treated and disinfected water is discharged from the disinfection unit to below the low water mark of the receiving waterbody (the ocean, a river, or a stream) via an outfall pipe.

OBDs are licensed and inspected by the Maine Department of Environmental Protection. At each inspection, DEP looks for tags on each treatment unit identifying the service contractor and the last date of service. If an OBD is not properly maintained, or if the OBD malfunctions, it has the potential to directly discharge untreated wastewater to the shore; therefore, preventative closures are implemented surrounding every OBD located in growing area EB (Table 1). The size of the closure is determined based on a dilution, using on the permitted flow rate of the OBDs (in gallons per day, GPD), and the depth of



the receiving water that each OBD discharges to; the fecal concentration used for this dilution calculation is  $1.4 \times 10^5$  FC /100 ml. All current closures are of adequate size to protect public health.

**Table 1.** Overboard Discharges

DEP ID	Town	Licensed Flow GPD	Impact	Treatment Type	Receiving Water Body	Dilution Acres	Receiving Water Closure Acres
2748	Brooksville	300	AD	S	Deep Cove, Eggemoggin Reach	0.7	PA 37 (A.1) 539 acres
6435	Brooksville	300	AD	S		0.7	

(Treatment Type: S-sand filter, M-mechanical)

**Table 2.** Potential or Actual Pollution sources associated with domestic waste

Location ID	Town	Year PS Found	Pollution Source	Problem Flag	Description
EB004-5	Brooksville	2017	IG	Y	Breakout front right of leach field; Closure: PA 37(A.2)
EB011-5	Brooksville	2017	OH	Q	Outhouse with bucket for small cabin in woods, where do they dispose of waste?
EB011-8	Brooksville	2017	OH	Q	Outhouse with bucket for small cabin in woods, <20ft from shore, where do they dispose of waste?
EB018-8	Sedgwick	2017	UK	Q	Property gated, need to know type of system and if functioning properly
EB024-64	Brooklin	2017	UK	Q	Unknown system, need to know type of system and if functioning properly. White pipe exiting bank on East side of house, Land drain?
EB026-18	Brooklin	2017	HT	Q	Owner denied access, neighbor informed staff of possible malfunction of holding tank.
EB028-44	Brooklin	2017	UK	Q	Unknown system, white pipe discharging to shore. Need to know type of system and if functioning properly.

**Municipal WWTP**

There are no waste water treatment plants in Growing Area EB.

**Industrial Pollution**

There are no major industrial pollution sites in Growing Area EB such as chemical plants, steel mills, ship yards, or refineries. None of the small industries (small boat builders and boat storage yards) were identified as pollution sources during the 2017 shoreline sanitary survey. All the shellfish areas adjacent to the businesses meet their present area classifications.



Small individual storage tanks for gasoline and diesel were noted at one location in the growing area. This tank is near the shore. Tanks should have containment walls and booms in the event of an accidental leak in a tank or spillage when unloading. One tank was identified as a potential problem and a referral form was sent to DEP to investigate the issue (Table 3). The oil response team from Maine DEP contacts Maine Marine Resources when a spill occurs, and a decision will be made whether a shellfish closure is necessary.

**Table 3.** Potential or Actual Pollution sources associated with industrial pollution

Location ID	Town	Year PS Found	Pollution Source	Problem Flag	Description
EB024-39	Brooklin	2017	IH	Q	Fuel tank at landing with fuel leaked around spout. No containment system.

**Table 4.** NPDES Permitted Discharges

Licensee	Town	Watershed	NPDES License #	Impact	Category	Notes
Seal Cove Boatyard Inc.	Brooksville	Seal Cove	MEG170006	PD	Boat Building and Repairing	
Buck's Harbor Marine and Charters	Brooksville	Bucks Harbor	MEU250644	PD	Boat Building and Repairing	

**Marinas and Mooring Fields**

The marina community in Maine only operates for a portion of the year due to adverse winter weather conditions. The management of marinas in Maine allows for shellfish growing areas to be available to harvesters, for at least a portion of the year, to direct market harvest by utilizing conditional area management plans. Small mooring fields are scattered throughout the growing area with the largest number of boats (groups of 10 or more moorings) in Horseshoe Cove, Bucks Harbor, Benjamin River, and Center Harbor. All marina areas meet their current classification standards.

**Benjamin River-**

A marina evaluation interview was conducted on 9/21/17 to determine current marina activity. The interview with harbormaster Bill Grant revealed that there are now 225 private moorings in the Benjamin River and approximately 60% of the boats have heads at peak season. Six of the boats are fishing boats with no head and represent no threat to water quality. 30 of these moorings are owned by Brooklin Boatyard and are only used for boat repair. These boats would not be used while waiting to be repaired and represent no threat to water quality. The remaining 189 moor pleasure boats. Approximately 40% of these pleasure boats are small day-sail boats that have no septic facilities. Peak operating season runs from mid/end of May through mid/end of September. There are no boats that are lived on for the season. Occasionally 1-2 liveaboards arrive in July and August, but primarily the people mooring pleasure boats only occasionally overnight on their vessel. Shoreside facilities include a port-a-potty, and no shower facilities. There are no fuel tanks or pump out facilities. The full interview sheet is in the DMR central files.



Based on a max of 113 boats (60% x 189) with heads in the marina area and an average depth of 15.1 feet, a dilution area of 87.1 acres would be required (Table 5, Figure 4). The current Conditionally Approved area encloses approximately 262 acres.

### **Center Harbor-**

A marina evaluation interview was conducted on 9/1/17 to determine current marina activity. The interview with Brooklin Boatyard owner, Frank Hull, revealed that there are now 120 private moorings in Center Harbor and approximately 80% of the boats have heads at peak season. Approximately 20 of these moorings are owned by Brooklin Boatyard and are only used for boat repair. These boats would not be used while waiting to be repaired and represent no threat to water quality. The remaining 100 boats are pleasure boats. Approximately 20% of these pleasure boats are small day-sail boats that have no septic facilities. Peak operating season runs from April or May through October. There are no boats that are lived on for the season. Users take the boats off mooring when they are being used as liveaboards. Primarily the people mooring pleasure boats spend weekends on their vessel. Shoreside facilities include a toilet with septic system, and no shower facilities. There are no fuel tanks or pump out facilities. A pump truck is occasionally used to pump out boats as necessary. The town is planning to put in a public landing in Center Harbor which may cause an increase in the number of moorings in this harbor in the future. The full interview sheet is in the DMR central files.

Based on a max of 80 boats (80% x 100) with heads in the marina area and an average depth of 10.2 feet, a dilution area of 91.0 acres would be required (Table 5, Figure 5). The current Conditionally Approved area encloses approximately 107 acres.

### **Bucks Harbor-**

A marina evaluation was conducted on 8/17/17 to determine current marina activity. The interview with harbormaster Sarah Cox revealed that there are now approximately 315 moorings in Bucks Harbor. 32 of these moorings are owned by Bucks Harbor Marina. Most these moorings moor pleasure boats. No information was given about the approximate amount of boats with heads. Peak operating season runs from mid/end of May through mid/end of September. There are no boats that are lived on for the season. Occasionally a couple liveaboards arrive in late summer, but primarily boat owners only occasionally overnight on their vessel. Shoreside facilities at Bucks Harbor Marina include two restrooms, two outdoor showers, one indoor shower, and a washer and dryer for clothing. There is a pump out facility at Bucks Harbor Marina center docking area. The full interview sheet is in the DMR central files.

Based on a max of 315 boats with heads in the marina area and an average depth of 20.7 feet, a dilution area of 176.6 acres would be required (Table 5, Figure 2). The current Prohibited area encloses approximately 539 acres.

### **Horseshoe Cove-**

A marina evaluation interview was conducted on 9/1/17 to determine current marina activity. The interview with owner Bob Vaughan revealed that there are now 26 private moorings in Horseshoe Cove and approximately 4 boats have heads at peak season. These moorings are owned by Seal Cove Boatyard and are only used for boat repair. These boats would not be used while waiting to be repaired, are required to be pumped out before arriving at facility for repairs and represent no threat to water quality. The operating season runs from April 15 through November 15. There are no boats that are lived on for the season. Shoreside facilities include a toilet for boatyard workers only, and no shower facilities. There are two 500-gallon fuel tanks near the shore. One contains gas and one contains diesel. There are no pump



out facilities, if needed a pump truck is brought in to pump out boats. The full interview sheet is in the DMR central files.

Based on the information provided in the interview, this mooring field poses no threat to public health and no closure is required in Horseshoe Cove at this time.

**Table 5.** Growing area Marina Dilution Calculations

<b>Marinas &amp; Mooring Fields</b>	<b>Benjamin River</b>	<b>Center Harbor</b>	<b>Bucks Harbor</b>
Max # of Boats	<b>113</b>	<b>80</b>	<b>315</b>
FC/100ml	2.00E+09	2.00E+09	2.00E+09
Water Depth (ft)	<b>15.1</b>	<b>10.2</b>	<b>20.7</b>
FC Load	2.27E+11	1.60E+11	6.30E+11
ml to dilute to 14FC/100ml	1.62E+12	1.14E+12	4.50E+12
ft <sup>3</sup> to dilute to 14FC/100ml	5.72E+07	4.04E+07	1.59E+08
Closed Area Required (ft <sup>2</sup> )	3788705.308	3956803.967	7677059.87
Acres	87.1	91.0	176.6

**Stormwater**

Stormwater runoff is generated when precipitation from rain and snowmelt events flows over land or impervious surfaces and does not percolate into the ground. As the runoff flows over the land or impervious surfaces (paved streets, parking lots, and building rooftops), it accumulates debris, chemicals, sediment or other pollutants that could adversely affect water quality if the runoff is discharged untreated (US EPA 2009). Thus, stormwater pollution is caused by the daily activities of people within the watershed. Currently, polluted stormwater is the largest source of water quality problems in the United States.

The primary method to control stormwater discharges is the use of best management practices (BMPs). In addition, most major stormwater discharges are considered point sources and require coverage under an NPDES permit. In 1990, under authority of the Clean Water Act, the U.S. EPA promulgated Phase I of its stormwater management program, requiring permitting through the National Pollution Discharge Elimination System (NPDES). The Phase I program covered three categories of discharges: (1) “medium” and “large” Municipal Separate Storm Sewer Systems (MS4s) generally serving populations over 100,000, (2) construction activity disturbing 5 acres of land or greater, and (3) ten categories of industrial activity. In 1999, US EPA issued Phase II of the stormwater management program, expanding the Phase I program to include all urbanized areas and smaller construction sites.

Although it is a federal program, in the state of Maine, the Phase II Stormwater permit is issued and regulated by the Maine DEP (Chapter 500 and 502). Under the MS4 regulations, each municipality must implement the following six Minimum Control Measures: (1) Public education and outreach, (2) Public participation, (3) Illicit discharge detection and elimination, (4) Construction site storm water runoff control, (5) Post-construction stormwater management, and (6) Pollution prevention/good housekeeping.



The permit required each city or town to develop a draft Stormwater Management Plan by September 3, 2003 that will establish measurable goals for each of the Minimum Control Measures. The Town must document the implementation of the Plan and provide annual reports to the Maine DEP. Currently the discharge of stormwater from 28 Maine municipalities is regulated under the Phase II permit requirements, however, no municipalities located within the boundaries of growing area EB fall under these regulations. Additionally, the Maine Stormwater Management Law provides stormwater standards for projects located in organized areas that include one acre of more of disturbed area (Maine DEP 2009).

**Non-Point Pollution Sources**

Non-point source (NPS) pollution is water pollution affecting a water body from diffuse sources, such as polluted runoff from agricultural areas draining into a river, or wind-borne debris blowing out to sea. Nonpoint source pollution can be contrasted with point source pollution, where discharges occur to a body of water at a single location, such as discharges from a chemical factory, urban runoff from a roadway storm drain or from ships at sea. NPS may derive from many different sources with no specific solution to rectify the problem, making it difficult to regulate. Freshwater streams, drainages and tidal creeks are the major source of non-point discharge into Growing Area EB. A total of 42 samples were taken from freshwater streams during the review period (Table 6, Figures 2-3).

Streams associated with consistently high scores are monitored to determine if they affect the water quality of growing area waters. The water quality near the mouth of stream EB019-31 is monitored by water quality station EB13, and water quality near stream EB022-54 is monitored by water quality station EB16. These water quality stations all show that there is little or no impact on the seawater from pollution being transported to the growing area by the stream.

**Table 6.** Stream Samples in Growing Area EB 2009-2017; Scores >100 cfu/100ml are highlighted in red.

Date	Pollution Source	Location ID	Score cfu/100ml
5/4/2017	Stream	EB005-26	27
5/16/2011	Stream	EB008-27	31
5/16/2011	Stream	EB013-28	102
5/5/2014	Stream	EB013-28	6
6/26/2014	Stream	EB013-28	1.9
6/26/2014	Stream	EB013-28	1700
9/17/2014	Stream	EB013-28	12
9/29/2014	Stream	EB013-28	12
5/4/2017	Stream	EB013-28	16
8/2/2017	Stream	EB013-28	10
5/16/2011	Stream	EB015-29	540
5/4/2017	Stream	EB015-29	64
5/4/2017	Stream	EB015-30	1.9
8/2/2017	Stream	EB015-30	2

Date	Pollution Source	Location ID	Score cfu/100ml
5/16/2011	Stream	EB019-31	500
7/19/2011	Stream	EB019-31	56
5/5/2014	Stream	EB019-31	1.9
6/26/2014	Stream	EB019-31	1700
9/17/2014	Stream	EB019-31	18
9/29/2014	Stream	EB019-31	240
8/23/2015	Stream	EB019-31	860
8/31/2016	Stream	EB019-31	1160
5/4/2017	Stream	EB019-31	70
8/2/2017	Stream	EB019-31	62
5/16/2011	Stream	EB022-54	1080
7/19/2011	Stream	EB022-54	1180
7/27/2011	Stream	EB022-54	90
8/31/2016	Stream	EB022-54	980



Date	Pollution Source	Location ID	Score cfu/100ml
5/4/2017	Stream	EB022-54	3.6
5/27/2009	Stream	EB024-33	1.9
6/25/2009	Stream	EB024-33	1.9
9/22/2009	Stream	EB024-33	13
6/30/2010	Stream	EB024-33	22
7/28/2010	Stream	EB024-33	14
5/16/2011	Stream	EB024-33	31

Date	Pollution Source	Location ID	Score cfu/100ml
5/4/2017	Stream	EB024-33	1.9
5/16/2011	Stream	EB025-34	240
5/4/2017	Stream	EB025-34	5
5/16/2011	Stream	EB028-35	500
8/31/2016	Stream	EB028-35	1700
5/4/2017	Stream	EB028-35	42
8/2/2017	Stream	EB028-35	124

**Agricultural Activities**

There are no large-scale agriculture activities in Growing Area EB. No smaller farms were identified in the shoreline zone during the 2017 shoreline survey. Pollution from small agriculture operations can be introduced into the growing area as nonpoint source pollution transported by runoff from large rainfall or snowmelt events. Smaller farms are encouraged to follow best management practices to help avoid effects animal waste and agricultural pollutants can have on water quality. No small farms appeared to be directly impacting the growing area during the 2017 shoreline survey.

**Domestic Animals and Wildlife Activity**

The salt marshes and mudflats of the growing area 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. Maine Inland Fish and Wildlife 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 the growing area water quality, such occurrences are very difficult to document. The upper Benjamin River (Sedgwick and Brooklin) was previously classified Restricted due to non-point pollution, but no longer shows any negative impacts on water quality due to nonpoint source pollution. This area will continue to be monitored for future impacts.

**Conservation/Recreation Areas (beaches, trails, etc.)**

The concern for actual or potential pollution from recreational areas is because many of them allow dogs and some have bathroom facilities. Activities at the recreational areas may contribute to water quality problems by placing added pressure on the watershed. For instance, they may contribute to erosion (trails, building footbridges, etc.), dog waste not picked up may accumulate and wash off after rainfall, new trails may be put into areas that didn't have human activity before and they may put added pressure on wildlife to congregate in other places where we may see water quality decline.

Growing area EB spans along Eggemoggin Reach. The entire growing area is heavily used by recreational users year-round. There are several day use beaches and picnic areas throughout the growing area including Bakeman Cove (Brooksville), Bucks Harbor (Brooksville), and Naskeag



Point (Brooklin). Dogs are allowed in these areas and signs are posted saying they are to be leashed and their feces collected and carried out. There are commercial campgrounds in Brooksville and Brooklin. These areas are monitored by routine water sampling sites. None of these recreation areas have shown any negative effect on the water quality and no management plan is necessary. Although there are a few gravel beaches in the area, swimming in the ocean in this area is relatively rare, as the water temperatures rarely exceed 65°F.

## **Hydrographic and Meteorological Assessment**

### **Tides**

Coastal Maine 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 Eastport indicate a mean tidal range of 18.35 ft.

Currents in the area are predominantly driven by the tides. All along the coast of eastern Maine, the tide generally floods to the north and east and ebbs to the south and west. Along the coast and in the wider bays, the current seldom exceeds 2 knots. Weather conditions affect tidal ranges and current speeds, sometimes very strongly. Strong winds may reverse the direction of currents.

### **Rainfall**

The mean annual precipitation in growing area EB is approximately 44 inches. The precipitation is not evenly distributed throughout the year. The wettest months are November and April. August is typically the driest month. Much of the precipitation in the winter comes as snow and may affect runoff rates in spring upon melting. It is likely that after prolonged periods of dry weather, significant rainfall (>1" over 24 hours) will cause some pollution from non-point runoff. It is unclear how much of an effect major rainfall events have on water quality due to variability of ground water saturation, history of recent significant rainfall that may have washed non-point pollution sources away, hard ground or ledge, wildlife activity, or agriculture activity. No rainfall areas have been identified in growing area EB.

### **Winds**

Migratory weather systems cause winds that frequently change in strength and direction. Gulf of Maine winds are generally westerly, but often take on a northerly component in winter and a southerly one in summer. Strongest winds are generated by lows and cold fronts in fall and winter and by fronts and thunderstorms during spring and summer. Extreme winds are usually associated with a hurricane or severe nor'easter and can reach 125 knots. Sustained winds of 100 knots occur about every 50 years on average; gusts are usually about 30 percent higher.

Coastal winds are complex since they are influenced by the topography. Over land speeds are reduced, however, channels and headlands can redirect the wind and even increase the speed by funneling the wind. In general, winds have southerly components in summer and northerly ones in winter. In sheltered waters near Rockland, Portland, and Brunswick, there are a large percentage of calms, particularly during the morning hours. When the existing circulation is weak and there is a difference between land and water temperatures, a land-sea breeze circulation may be set up. Because the land heats faster than the water, a sea breeze is established during the day; this onshore flow may reach 15 knots or more. At night, the land





cools more rapidly, often resulting in a weak breeze off the land. In many locations, the sea breeze serves to reinforce the prevailing summer wind. Analysis of GOMOOS data (2001-2006) show winter winds along coastal Maine are typically from the west-northwest during clear periods and from the northeast during storms. In the spring, summer and fall, predominant winds are from the south-southwest. West, northwest and north winds are common during fall and winter. Although less frequent, winds from the northeast, north and northwest directions are typically stronger than winds from the south. In the summer, winds tend to be on shore due to heated, rising air over land and cooler ocean air flowing into the void.

**River Discharge**

Stream flow in Maine 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). There are no large river discharges into growing area EB. There are many small streams that discharge into the growing area and these streams are discussed in the section about nonpoint source pollution.

**Water Quality Review**

There are presently 18 active water sampling sites in Growing Area EB and 1 investigative station which does not currently have enough data to calculate a P90. They are collected from near-shore sites on Sample Runs 2, 5, and CA1. Sample sites are established to monitor known or potential pollution sources and on the margins of established pollution areas. It is recognized that access, icing, and safety considerations prevent some stations from being sampled on scheduled dates. Currently all stations in Growing Area EB meet their current NSSP classification standard. One water quality station, EB15.8, has water quality that meets approved standards and will be evaluated for an upgrade in 2018.

**Water Quality Discussion and Classification Determination**

P90s for all active stations with a minimum of 30 samples were calculated and all stations meet their classification standards (Tables 7, 8). The percent change in P90 from 2016 to 2017 was calculated and 10 stations showed a large increase in P90 score (Table 9). These stations all had very low P90 values, all less than 13, so any increase shows as a large percentage change. None of these stations area at risk of failing their classification standards. Overall the water quality in growing area EB appears to be declining very slightly or remaining consistent.

**Table 7.** P90 calculations for stations with a minimum of 30 samples; P90s that do not meet their classification standards are highlighted in red.

Station	Class	Count	MFCCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std
EB001.00	A	30	30	2.6	0.29	26	6.3	31	163
EB002.00	A	30	30	3.1	0.38	50	9.8	31	163
EB003.00	A	30	30	2.3	0.2	12	4.3	31	163
EB004.00	A	30	30	3.3	0.52	80	16.1	31	163
EB004.50	P	30	30	2.8	0.42	78	10	31	163
EB009.00	P	30	30	2.2	0.18	10	3.8	31	163



Station	Class	Count	MFCCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std
EB010.00	P	30	30	2.1	0.14	7.3	3.2	31	163
EB012.00	A	30	30	2.2	0.23	27	4.5	31	163
EB013.00	A	30	30	2.5	0.35	60	7.4	31	163
EB014.50	A	30	30	2.8	0.48	400	11.9	31	163
EB015.80	R	30	30	3.9	0.51	620	17.9	31	163
EB016.00	A	30	30	3.6	0.42	52	12.7	31	163
EB020.00	A	30	30	2.5	0.31	46	6.3	31	163
EB022.00	A	30	30	1.9	0.05	4	2.3	31	163

**Table 8.** P90s for Conditional Area stations calculated using data from the open period; P90s that do not meet the classification standard in the open period are highlighted in red.

Station	Class	Count	MFCCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std
EB015.00	CA	30	30	2.6	0.32	20	6.8	31	163
EB016.50	CA	30	30	3	0.4	52	10	31	163
EB018.50	CA	30	30	2.6	0.34	62	7.1	31	163
EB019.00	CA	30	30	3.9	0.55	200	20.2	31	163

**Table 9.** P90 comparison 2016-2017, a negative percentage shows an improvement in water quality and a positive percentage shows a decline in water quality. Declines of >20% are highlighted in red.

Station	2016 P90	2017 P90	% Change 2016-2017
EB001.00	6	6.3	5%
EB002.00	6.8	9.8	44%
EB003.00	3.8	4.3	13%
EB004.00	11	16.1	46%
EB004.50	10.9	10	-8%
EB009.00	2.8	3.8	36%
EB010.00	2.3	3.2	39%
EB012.00	9.9	4.5	-55%
EB013.00	7	7.4	6%

Station	2016 P90	2017 P90	% Change 2016-2017
EB014.50	9.9	11.9	20%
EB015.80	12.6	17.9	42%
EB016.00	12.2	12.7	4%
EB020.00	3.7	6.3	70%
EB022.00	1.9	2.3	21%
EB015.00	4.4	6.8	55%
EB016.50	6.1	10	64%
EB018.50	6	7.1	18%
EB019.00	9.7	20.2	108%

### Aquaculture/Wet Storage Activity

There are no aquaculture or limited purpose aquaculture (LPA) lease sites in growing area EB.



### Recommendation for Future Work

Water quality station EB15.8 meets approved standards at end of year 2017 and will be evaluated for an upgrade in 2018. No stations in growing area EB required a downgrade due to end of year 2017 P90 scores.

**Table 10.** Count table of samples collected in growing area EB during 2017

Station	Class	Adverse	Extra	Random		Total	Comments
		Closed	Open	Closed	Open		
EB001.00	A	4			6	10	
EB002.00	A				6	6	
EB003.00	A				6	6	
EB004.00	A				7	7	
EB004.50	P			6		6	
EB009.00	P			6		6	
EB010.00	P			6		6	
EB012.00	A				6	6	
EB013.00	A				6	6	
EB014.50	A		1		6	7	
EB015.00	CA			6	6	12	
EB015.80	R				6	6	
EB016.00	A		1		6	7	
EB016.50	CA			6	6	12	
EB018.50	CA			6	6	12	
EB019.00	CA			6	6	12	
EB020.00	A		1		6	7	
EB022.00	A	5	1		6	12	

**Table 11.** Count table of investigatory station samples collected in growing area EB during 2017

Station	Class	Investigative	Total	Comments
EB008.60	X	6	6	



## References

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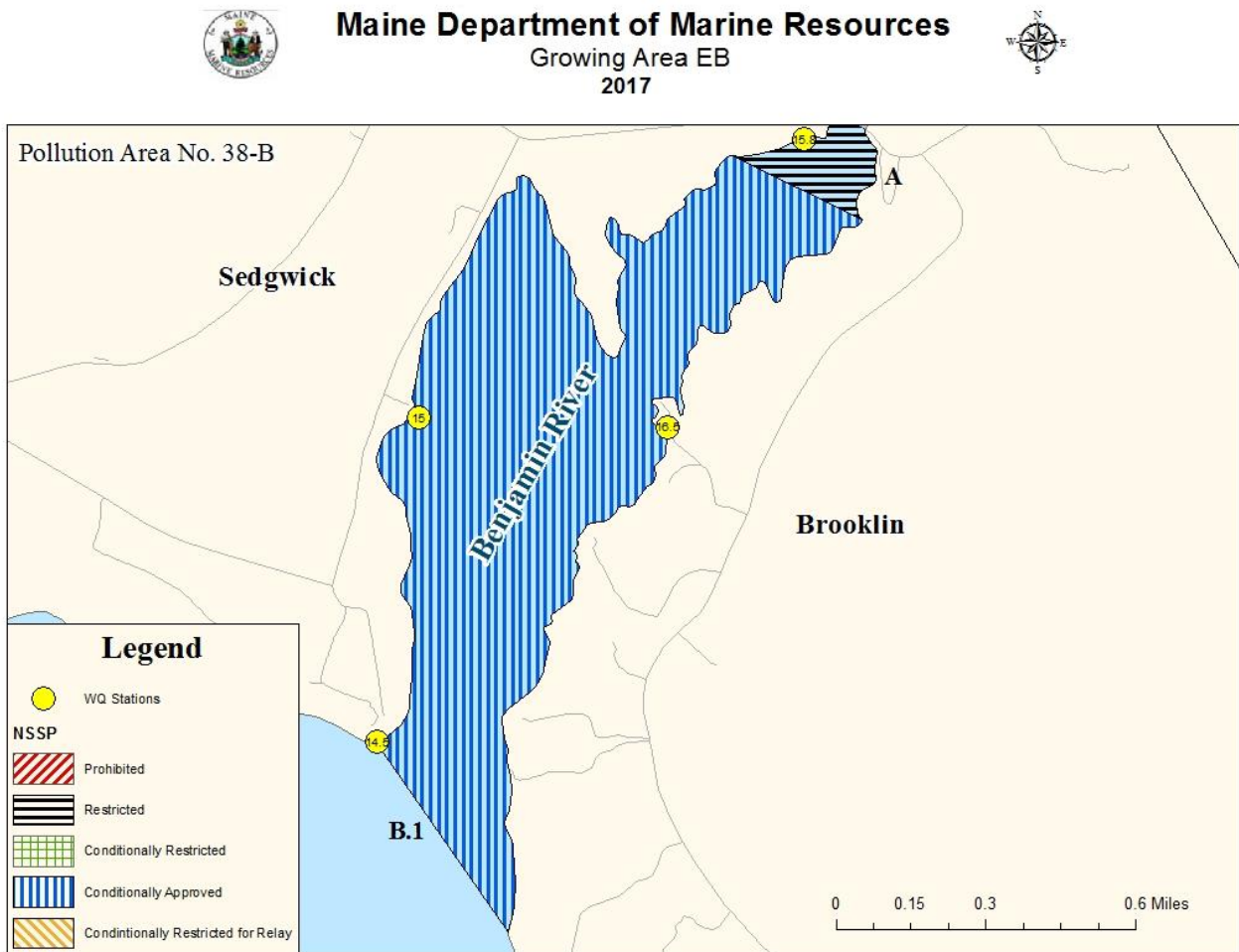


## Appendix A. Annual Review of C38-B Benjamin River, Sedgwick and Brooklin Conditional Area Management Plan

### Scope

Pollution Area 38-B (B.1) Benjamin River in Sedgwick and Brooklin is classified as Conditionally Approved seasonally with the open period for harvest from November 1 through April 30 (Figure 4). This area is south of a line beginning at the mouth of an unnamed brook on the Brooklin shore, approximately 300 yards south of the Route 175 road causeway crossing the Benjamin River, then running in a northwesterly direction to a red painted post located on the Sedgwick shore, approximately 120 yards south of the Route 175/172 intersection; and north of a line beginning at the westernmost point of Cape Carter (Brooklin), then running northwest across the mouth of the river, to the nearest point of land on the Sedgwick shore. This area is classified as Conditionally Approved based on Marina operation. This Conditional Area is monitored by water quality stations EB15 and EB16.5.

Figure 4. C38-B Benjamin River, Sedgwick and Brooklin Conditionally Approved area





**Compliance with management plan**

The Benjamin River Conditional Area remains in compliance with the current conditional area management plan (CAMP). The marina is not operating during the open period and does not pose a risk to public health. See CAMP annual reviews for information on annual compliance with the current CAMP.

**Adequacy of reporting and cooperation of involved persons**

No reporting is required for this Conditional Area.

**Compliance with approved (or restricted) growing area criteria**

The area continues to meet the criteria for Approved harvest during the open period of November 1 through April 30 based on P90 calculations (EB15 at 6.8 cfu/100ml; EB16.5 at 10 cfu/100ml) during the open period and no other known sources of pollution in the area.

**Water sampling compliance history**

Water samples are collected at least monthly during the open period and throughout the year (Table 10). The P90 value meets the standards for Approved harvest during the open period (Table 8).

**Analysis-Recommendations**

The Benjamin River Conditionally Approved area continues to meet the standards for seasonal Approved harvest during the open period and remains in compliance with the CAMP. Recommended continued water quality monitoring and open communication with the harbor master to ensure continued compliance with the CAMP. Conditional Area acreage can be reduced and remain in compliance. Recommended to evaluate a reduction of the Conditionally Approved when evaluating the upgrade of water quality station EB15.8 in 2018.

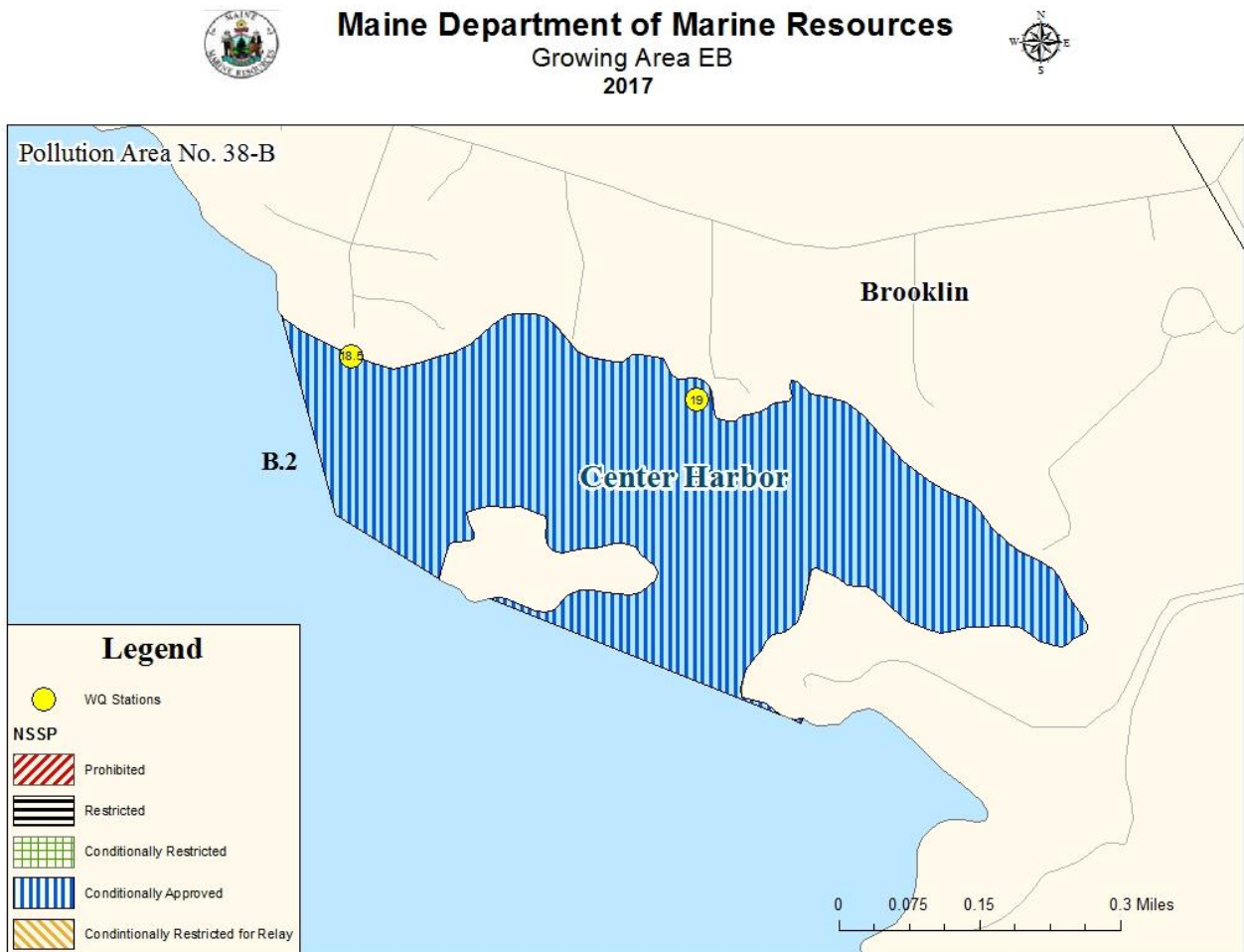


## Appendix B. Annual Review of C38-B Center Harbor, Brooklin Conditional Area Management Plan

### Scope

Pollution Area 38-B (B.2) Center Harbor in Brooklin is classified as Conditionally Approved seasonally with the open period for harvest from November 1 through April 30 (Figure 5). This area is north of a line beginning at the shoreward end of the 1<sup>st</sup> wharf on the south shore of Kane Point, located approximately 130 yards southeast of the eastern tip of Kane Point, then running in a northwesterly direction to the most western point of Chatto Island, then continuing northwest to the U.S. Coast Guard navigation aid “N2”, then running in a northerly direction to shoreward end of the 1<sup>st</sup> wharf located approximately 150 yards west of the end of the Steamboat Road in Haven Village. This area is classified as Conditionally Approved based on Marina operation. This Conditional Area is monitored by water quality stations EB18.5 and EB19.

Figure 5. C38-B Center Harbor, Brooklin Conditionally Approved area





**Compliance with management plan**

The Center Harbor Conditional Area remains in compliance with the current conditional area management plan (CAMP). The marina is not operating during the open period and does not pose a risk to public health. See CAMP annual reviews for information on annual compliance with the current CAMP.

**Adequacy of reporting and cooperation of involved persons**

No reporting is required for this Conditional Area.

**Compliance with approved (or restricted) growing area criteria**

The area continues to meet the criteria for Approved harvest during the open period of November 1 through April 30 based on P90 calculations (EB18.5 at 7.1 cfu/100ml; EB19 at 20.2 cfu/100ml) during the open period and no other known sources of pollution in the area.

**Water sampling compliance history**

Water samples are collected at least monthly during the open period and throughout the year (Table 10). The P90 value meets the standards for Approved harvest during the open period (Table 8).

**Analysis-Recommendations**

The Center Harbor Conditionally Approved area continues to meet the standards for seasonal Approved harvest during the open period and remains in compliance with the CAMP. Recommended continued water quality monitoring and open communication with the harbor master to ensure continued compliance with the CAMP.





## **Appendix C. Key to Water Quality Table Headers**

Station = water quality monitoring station

Class = classification assigned to the station; prohibited (P), restricted (R), conditionally restricted (CR), conditionally approved (CA) and approved (A).

Count = the number of samples evaluated for classification, must be a minimum of 30.

MFCNT = the number of samples evaluated with the MTec method (included in the total Count column)

Geo\_Mean = means the antilog (base 10) of the arithmetic mean of the sample result logarithm (base 10).

SDV = standard deviation

Max = maximum score of the 30 data points in the count column

P90 = 90<sup>th</sup> percentile

APPD\_STD = the 90<sup>th</sup> percentile, at or below which the station would meet approved criteria in the absence of pollution sources or poisonous and deleterious substances.

RESTR\_STD = the 90<sup>th</sup> percentile, at or below which the station would meet restricted criteria.