



## **GROWING AREA EC**

**Little Deer Isle, the Island of Deer Isle including Stonington, and various surrounding small uninhabited islands**

**Sanitary Survey Report**

**2012 - 2023**

**Grace Robie, Specialist**

**September 26, 2024**

A handwritten signature in dark ink, reading "David W. Miller". The signature is written in a cursive style with a large, looped "D" and "M".

**Sanitary Survey Officer signature:** \_\_\_\_\_

**Date:** September 30, 2024



## TABLE OF CONTENTS

Executive Summary .....	4
Description of Growing Area .....	4
History of Growing Area Classification .....	6
Pollution Sources Survey .....	6
Summary of Sources and Location .....	6
State and Federal Licensed Waste Discharge Permits .....	10
Residential .....	14
Industrial Pollution .....	14
Marinas .....	15
Storm water .....	15
Non-Point Pollution Sources .....	16
Agricultural Activities .....	17
Wildlife Activity .....	18
Recreation Areas (parks, beaches, trails, campgrounds, etc.) .....	18
Hydrographic and Meteorological Assessment .....	18
Tides .....	18
Rainfall .....	19
Winds .....	19
River Discharge .....	19
Hydrographic Influence .....	19
Water Quality Studies .....	20
Water Quality Discussion and Classification Determination .....	20
Reclassifications .....	22
CAMP Reviews, Inspection Reports, and Performance Standards .....	22
Recommendation for Future Work .....	28
References .....	30
Appendix A. ....	31
Reference Material .....	31

## LIST OF TABLES

Table 1. Overboard Discharges (OBDs) .....	11
Table 2. NPDES Permitted Discharges .....	11
Table 3. Growing Area EC Residential Pollution Sources .....	14
Table 4. Stream samples in Growing Area EC 2012-2023; Scores > 163 CFU/100ml are highlighted in red. ....	16
Table 5. Percent change of calculated P90 scores from 2022 to 2023 .....	20
Table 6. P90 calculations for stations with a minimum of 30 samples. Geomeans and P90s not meeting current classifications are highlighted in red .....	21



Table 7. P90s for Conditional Area stations calculated using data from the open status. Geomeans and P90s not meeting current classifications are highlighted in red. .... 27

Table 8. Count table of samples collected in growing area EC during the 2023 season. .... 28

**LIST OF FIGURES**

Figure 1. Growing Area EC Overview Map with Active and Investigative Water Quality Stations..... 5

Figure 2. Growing Area EC, Inset Map A ..... 7

Figure 3. Growing Area EC, Inset Map B ..... 8

Figure 4. Growing Area EC, Inset Map C ..... 9

Figure 5. Stonington, Growing Area EC, proposed Conditional Area (WWTP) for the Stonington Sanitary District..... 12

Figure 6. Stonington Sanitary District dilution calculation of the Prohibited area using outfall mean low tide depth of 20 ft. .... 13

Figure 7. Stonington Sanitary District dilution calculation of the Conditionally Approved (WWTP) area using a mean depth of 38 feet for the Deer Island Thorofare..... 14

Figure 8. CA1 Greenlaw Cove & CA2 Whig Island Conditionally Approved areas ..... 23

Figure 9. CA3 Crockett Cove Conditionally Approved area, Deer Isle & Stonington. .... 26



## Executive Summary

This is a Sanitary Survey report for Growing Area EC in Hancock County written in compliance with the requirements of the 2019 Model Ordinance and the National Shellfish Sanitation Program. One growing area section in Growing Area EC will be reviewed for a possible upgrade in 2024; Whig Island (Deer Isle). One growing area section will be reviewed for downgrade in 2024; Fish Creek (Deer Isle). One investigative station (EC015.50) now has the required 30 samples and can be changed to an active water quality station. There were no new actual or potential pollution sources found resulting in no new prohibited areas. Access was denied at 33 properties. One investigatory station was created during the review year, EC009.50. No water quality stations were deactivated during the review year. Water quality has varied with some declines in water quality shown in the eastern part of the growing area. The last complete sanitary survey was conducted in 2011 with triennial reports written for 2014, 2017, and 2020. The next sanitary survey is due in 2035 and the next triennial in 2026.

## Description of Growing Area

Growing Area EC encompasses 160 square miles and is centered on Deer Isle and Stonington in Hancock County, Maine (The shoreline included in this growing area stretches from Pumpkin Island Lighthouse in Deer Isle to small islands in the Stonington Thorofare and includes the towns of Deer Isle (pop. 2,194) and Stonington (pop. 1,056) (2020 Census). The area is primarily rural with low population density. The primary industries are commercial fishing and tourism. Development along the shoreline is spotty with clusters of homes separated by undeveloped land. There is one Wastewater Treatment Plant (WWTP) located in Stonington. There are 15 licensed overboard discharges (OBD's) (Table 1), one was reported removed from Mill Pond, Deer Isle during the 2023 season.

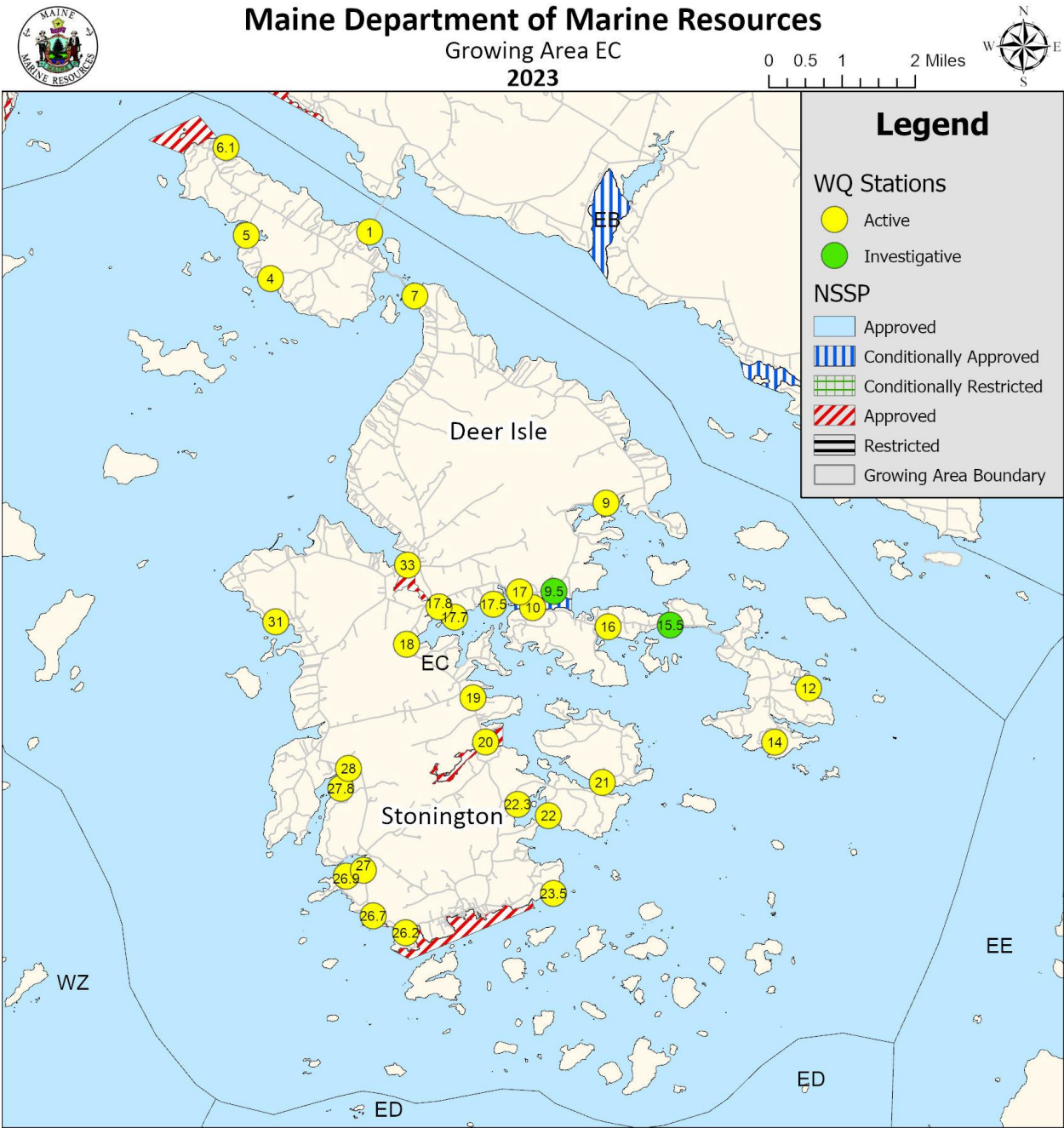
Shellfish Growing Area EC includes all the shores, flats, and coves across the islands of Little Deer Isle, Deer Isle, and several surrounding islands most of which are small and uninhabited. The upland cover is primarily deciduous, some evergreens and wetland forest with minimal development. Freshwater influence along these shores is predominately from numerous brooks and 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.

There are four shellfish aquaculture leases and eleven shellfish Limited Purpose Aquaculture permits (LPAs) in this growing area. These aquaculture activities are monitored in accordance with the model ordinance. There are no wet storage permits issued to certified shellfish dealers in this area.

Below is the map with growing area boundaries. Closures within the growing area can be found in legal notices in DMR central files and on the DMR website.



Figure 1. Growing Area EC Overview Map with Active and Investigative Water Quality Stations





## **History of Growing Area Classification**

Reclassification addendums to the sanitary survey report are in the DMR central files.

## **Pollution Sources Survey**

### **Summary of Sources and Location**

The growing area shoreline is divided into two-mile segments that are identified using unique Growing Area Shoreline Survey Identification (GASSID) numbers. All properties and potential pollution sources within 250 feet of the shoreline are identified and inspected. The inspection includes a property description, physical address, location of the septic system and any other relevant potential or actual pollution sources. A GPS point to identify the source location(s) and the data are entered electronically in the field and stored in DMR central files.

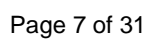






Figure 3. Growing Area EC, Inset Map B

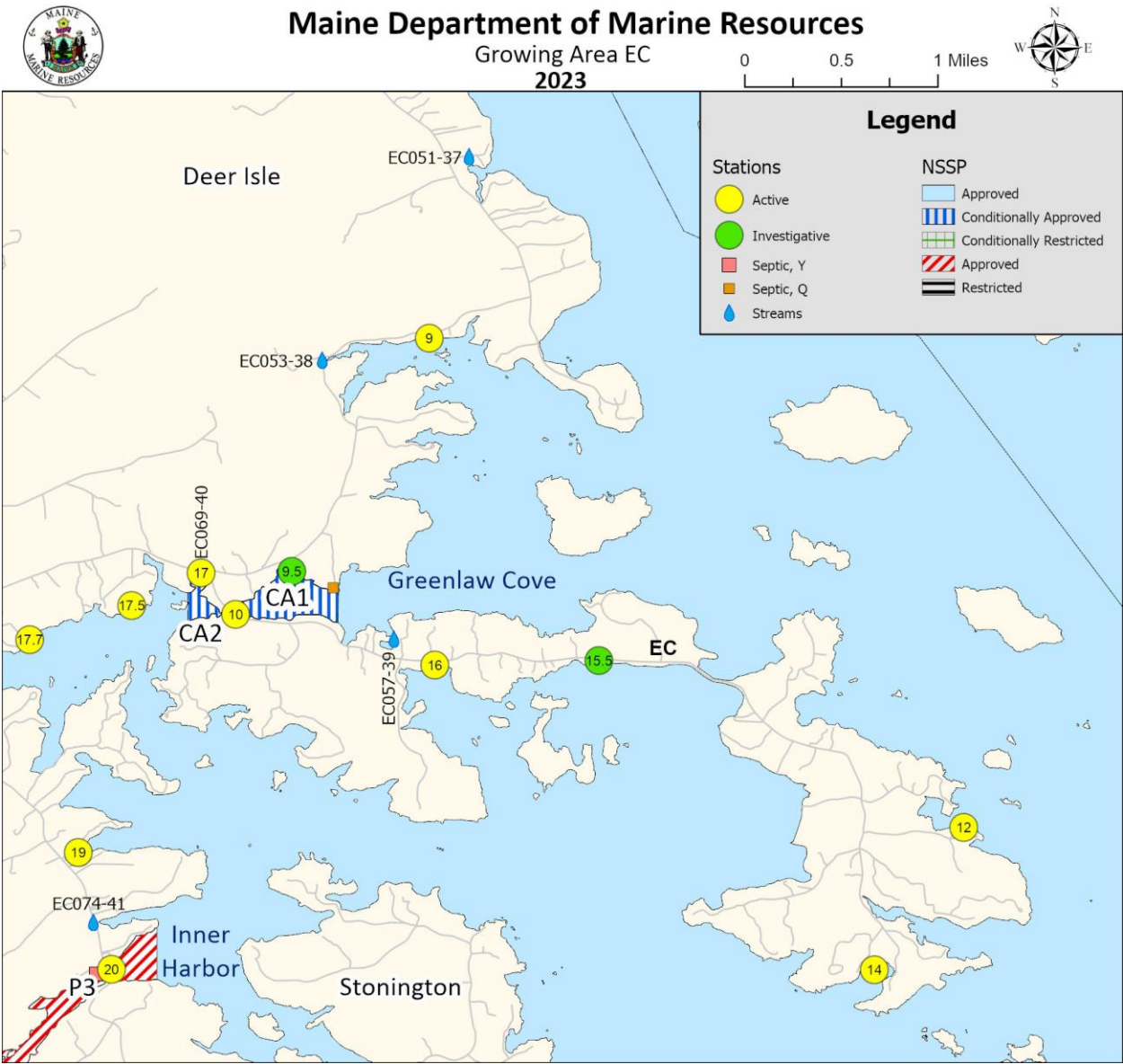
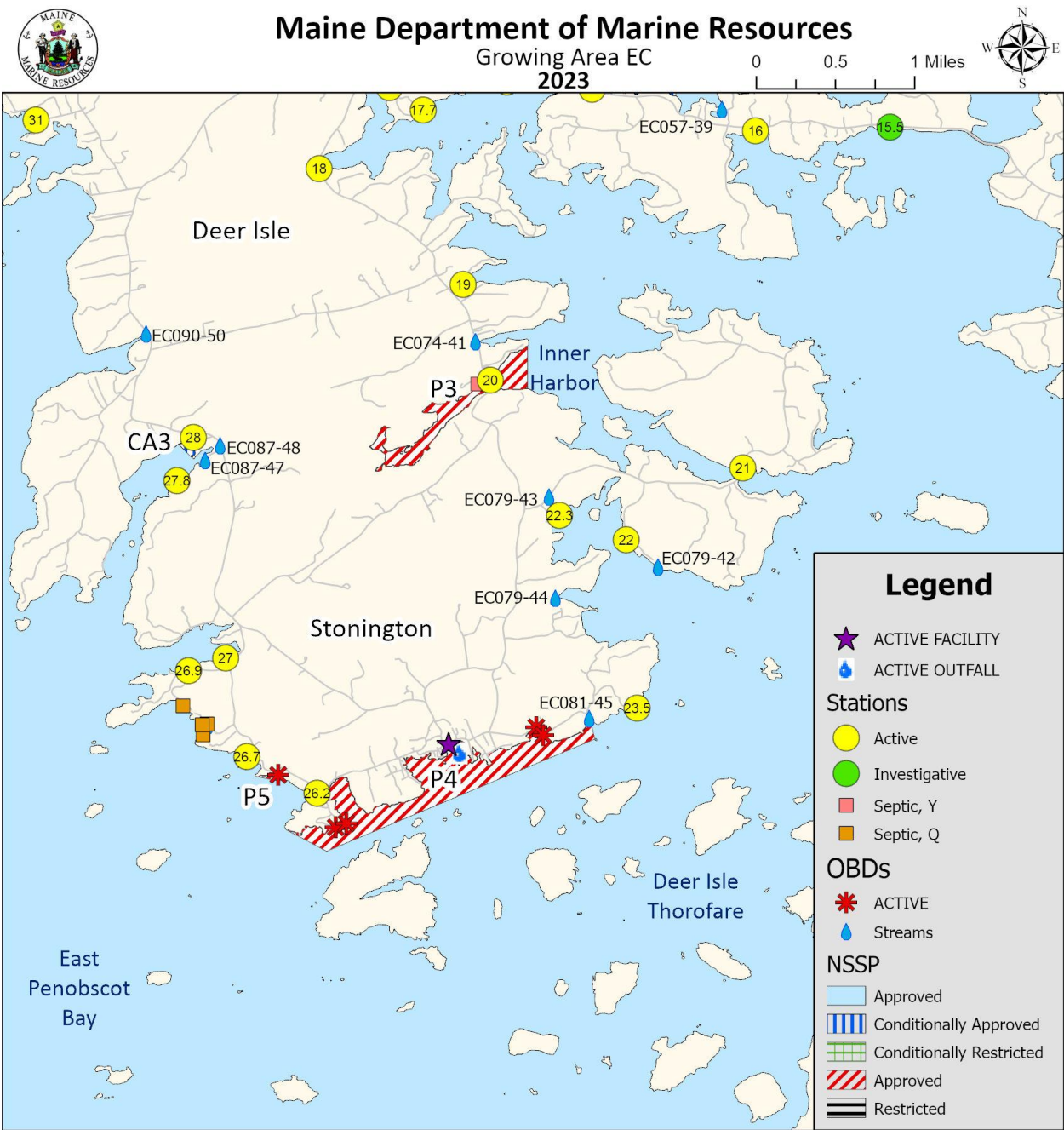






Figure 4. Growing Area EC, Inset Map C





## State and Federal Licensed Waste Discharge Permits

### Overboard Discharges (OBDs)

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.

There are 15 overboard discharges (OBDs) that discharge their treated effluent into the waters of Growing Area EC. Nine OBDs discharge into the waters of Eggemoggin Reach, one OBD discharges into Mill Pond (Figure 2), five OBDs discharge into Stonington Harbor (Figure 4). A total of seven OBDs have been removed over the past twelve review years. One OBD was removed from Heart Island (#7323 in 2012). One OBD was removed from Pumpkin Island (#2320 in 2015). One OBD was removed in the Stonington Thorofare on Devils Island (#2298 removed in 2015). One OBD was removed in Burnt Cove (#3840 in 2016). Three OBDs were removed in Mill Pond (#5357 removed in 2020, #2544 removed in 2022, and #2344 removed in 2023).

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 EC (Table 1). The size of each closure is determined based on a dilution, using the permitted flow rate of the OBD (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. Single OBD systems associated with more than one residence will have multiple permit IDs. All current closures are of adequate size to protect public health.

**Table 1. Overboard Discharges (OBDs).**

Growing Area Section	OBD ID	Location	Receiving Waterbody	Flow (gpd)	Acres Needed for Closure	Current Prohibited Acreage
P1	1862	Deer Isle	Eggemoggin Reach	360	3.2	144
P1	1869	Deer Isle	Eggemoggin Reach	400	3.6	144
P1	6030	Deer Isle	Eggemoggin Reach	300	2.7	144
P1	4319	Deer Isle	Eggemoggin Reach	300	2.7	144
P1	2762	Deer Isle	Eggemoggin Reach	300	2.7	144
P1	1861	Deer Isle	Eggemoggin Reach	360	3.2	144
P1	1366	Deer Isle	Eggemoggin Reach	400	3.6	144
P1	1312	Deer Isle	Eggemoggin Reach	450	4.1	144
P1	1545	Deer Isle	Eggemoggin Reach	630	5.7	144
P2	6770	Deer Isle	Mill Pond	300	9.7	61
P5	2328	Stonington	Stonington Harbor	300	2.0	2
P4	1300	Stonington	Stonington Harbor	400	4.9	223
P4	5262	Stonington	Stonington Harbor	300	3.7	223
P4	3563	Stonington	Stonington Harbor	315	3.9	223
P4	6143	Stonington	Stonington Harbor	300	3.7	223

### National Pollutant Discharge Elimination System (NPDES)

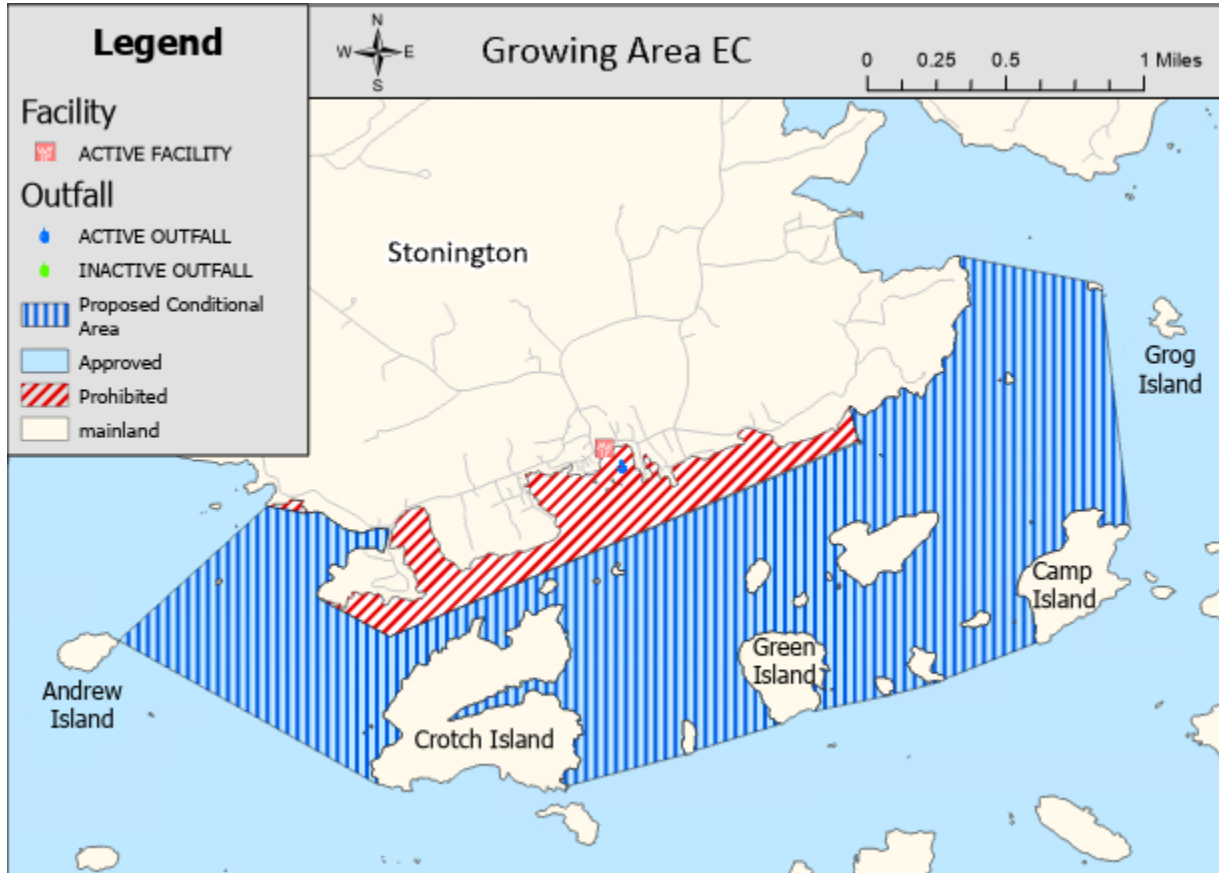
**Table 2. NPDES Permitted Discharges**

Growing Area Section	Permit ID	Type	Facility	Water Body
P4	ME0101851	WWTF	Stonington Sanitary District	Stonington Harbor

There is one wastewater treatment facility (WWTF) located in Growing Area EC in Stonington (Table 2). Since 2017 the WWTF inspection reports have been available in DMR central files. This facility discharges into a prohibited area, EC P4, which is larger in area than required for the 1,000:1 dilution zone. A Conditionally Approved area (WWTP) will be created to enclose the 1,413-acre 100,000:1 dilution zone required in the event of an overflow or malfunction at the Stonington Sanitary District (Figure 5).



**Figure 5.** Stonington, Growing Area EC, proposed Conditional Area (WWTP) for the Stonington Sanitary District.



**Stonington Sanitary District:** The Stonington Sanitary District (SSD) MEPDES permit issued in 2019 allows for an average daily flow of 175,000 GPD and the end of the outfall is in 20 feet of water at mean low water. No changes have occurred at this plant. A Prohibited area of 223 acres encompasses the outfall of the WWTF for the required 1,000:1 dilution zone (Figure 6). A WWTP Conditional Area will be added in 2024 to reflect DMR's interpretation of guidance from the 2019 ISSC Model Ordinance (Figure 5). This Conditional Area will be approximately 1,800 acres which covers more than the required 1,413 acres (Figure 7). This plant services the downtown Stonington area with 285 on-site septic tanks located on individually and publicly owned lots. The collection system network conveys the septic tank effluent from each lot to a common disinfection tank with chlorination and dechlorination capabilities prior to discharge to the Deer Island Thorofare. The outfall consists of a ductile iron/PVC discharge pipe measuring 8 inches in diameter that extends out into the receiving waters approximately 600 feet. The outfall discharges at minus 20.0 feet mean low tide elevation. The facility does not receive any flows from industrial sources but does receive backwash waters from a local public drinking water treatment facility. The Stonington treatment facility receives 2,000 gallons (150 gallons & 350 gallons 4x/year) of uranium brine backwash water from the two Stonington Water Company (local public drinking water



supplier) uranium removal units. The concentration of uranium at the point of discharge from SSD will be less than the naturally occurring sea water concentration of 3 µg/L (ME DEP).

**Figure 6.** Stonington Sanitary District dilution calculation of the Prohibited area using outfall mean low tide depth of 20 ft.

	Flow rate=	175,000	Gallons/day(GPD)	
There are 7.481 gallons in one cu.ft., so GPD divided by 7.481=		23,393	Cu.Ft./day	
There are 283 100ml units in one cu.ft., so 283 times Cu. Ft./day=		6,620,104	100ml. Units/day	
	Bacteria load=	1,400,000	FC colonies/100ml	
Bacteria load times the number of 100ml. Units/day=		9,268,145,969,790	Total FC/day	
	or	9.27E+12	Total FC/day	
Fecal coliform bacteria must be diluted down to <14 FC/100ml of water.				
FC colonies/day divided by 14=		662,010,426,414	100ml units of receiving waters for dilution.	
There are 283 100ml units per cu.ft., so 100ml. Units divided by 283=		2,339,259,457	cu.ft. of receiving waters for dilution.	
	Average depth of receiving waters =	20	Ft.	
Cu.ft. of receiving waters / by average depth=		116,962,973	Square ft. of surface water, or closure size.	
Square ft. times 0.092903 =		10,866,211	Square meters	
Square meters times 0.0002471=		2,685.0408	acres	
<b><u>VIRAL DILUTION</u></b>				
Effluent volume=	23,393	cu. ft./day		
Cu.ft./day times 400=	9,357,038	cu.ft. of receiving waters required for <b>400:1</b> dilution		
Cu.ft./depth of receiving waters=	467,852	square ft. of surface water		
Square ft. times 0.092903 =	43,465	square meters of surface		
Square meters times 0.0002471=	10.7	acres		
Cu.ft./day times 1000=	23,392,595	cu.ft. of receiving waters required for <b>1,000:1</b> dilution		
Cu.ft./depth of receiving waters=	1,169,630	square ft. of surface water		
Square ft. times 0.092903 =	108,662	square meters of surface		
Square meters times 0.0002471=	26.9	acres		



**Figure 7.** Stonington Sanitary District dilution calculation of the Conditionally Approved (WWTP) area using a mean depth of 38 feet for the Deer Island Thorofare.

	Flow rate=	175,000	Gallons/day(GPD)	
	There are 7.481 gallons in one cu.ft., so GPD divided by 7.481=	23,393	Cu.Ft./day	
	There are 283 100ml units in one cu.ft., so 283 times Cu. Ft./day=	6,620,104	100ml. Units/day	
	Bacteria load=	1,400,000	FC colonies/100ml	
	Bacteria load times the number of 100ml. Units/day=	9,268,145,969,790	Total FC/day	
	or	9.27E+12	Total FC/day	
Fecal coliform bacteria must be diluted down to <14 FC/100ml of water.				
	FC colonies/day divided by 14=	662,010,426,414	100ml units of receiving waters for dilution.	
	There are 283 100ml units per cu.ft., so 100ml. Units divided by 283=	2,339,259,457	cu.ft. of receiving waters for dilution.	
	Average depth of receiving waters =	38	Ft.	
	Cu.ft. of receiving waters / by average depth=	61,559,459	Square ft. of surface water, or closure size.	
	Square ft. times 0.092903 =	5,719,058	Square meters	
	Square meters times 0.0002471=	1,413.1793	acres	

## Residential

All residential pollution sources are reported to the local plumbing inspector (LPI). Once the system has been documented as being fixed, staff members from DMR can re-assess the water quality data and shoreline survey information to determine if the area is safe for shellfish harvest. Table 3 shows all new and pre-existing pollution sources in Growing Area EC that are considered discharges into the Growing Area and effect water quality. No new residential pollution sources were identified during the 2023 shoreline survey, however one continues to exist from 2014.

**Table 3.** Growing Area EC Residential Pollution Sources.

Closure Number	Location ID	Date Surveyed	Direct or Indirect	Problem	Description	Town
P3	EC075-11	5/19/2014	Indirect	Yes	LF Breakout	Deer Isle

## Industrial Pollution

There are no major industrial pollution sites in Growing Area EC such as chemical plants, steel mills, shipyards, or refineries. The only NPDES permitted waste discharge is for the Stonington Sanitary District (Table 2). None of the small industries (small boat builders and boat storage yards) were identified as a possible pollution source during previous surveys and none are considered possible pollution sources from this survey. All the shellfish areas adjacent to the businesses meet their present area classifications.





## Marinas

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 in Stonington Harbor Thorofare. Mooring areas exist in Conary Cove (Deer Isle), Sylvester Cove (Deer Isle), Webb Cove (Stonington), and Burnt Cove (Stonington). Mooring fields in Stonington are Deer Isle are predominately work boats (lobster boats, trawling vessels) without heads and few pleasure boats. These are not common overnight stopping areas for recreational boaters and not identified as pollution risks due to the number of boats and types of usage. There is one boat pump out facility at Billings Marine in the Stonington Thorofare. Billings is the only commercial marina in the growing area, focusing on boat repair with approximately 25 transient liveaboards and vessels at slips. Billings Marine, also, has two licensed OBDs (Table 1). This marina and mooring areas are contained within the large Prohibited area of the Stonington Thorofare.

## Storm water

Storm water 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 2024). Thus, storm water pollution is caused by the daily activities of people within the watershed. Currently, polluted storm water is the largest source of water quality problems in the United States (US EPA 2024).

The primary method to control storm water discharges is the use of best management practices (BMPs). In addition, most major storm water discharges are considered point sources and require coverage under a NPDES permit. In 1990, under authority of the Clean Water Act, the U.S. EPA promulgated Phase I of its storm water 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 five acres of land or greater, and (3) ten categories of industrial activity. In 1999, US EPA issued Phase II of the storm water management program, expanding the Phase I program to include all urbanized areas and smaller construction sites.

Although it is a federal program, EPA has delegated its authority to the Maine DEP to administer the Phase II Small MS4 General Permit. Under the Small MS4 GP, 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 storm water management, and (6) Pollution prevention/good housekeeping. The permit requires each city or town to develop a draft Storm Water Management Plan that establishes measurable goals for each of the Minimum Control Measures. The City or Town must document the implementation of the Plan and provide annual reports to the Maine DEP. Currently the discharge of storm water from 30 Maine municipalities is regulated under the Phase II Small MS4 General Permit however, no municipalities located within the boundaries of Growing Area EC fall under these regulations. Additionally, the Maine Storm Water Management Law provides storm water standards for projects located in organized areas that include one acre of more of disturbed area (Maine DEP 2009).

No towns in Growing Area EC have storm water management systems, other than a few small culverts. There is no significant development in this area with expansive impervious surfaces.

### 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, significant rainfall, high river flows or astronomical high tides. Nonpoint source pollution can be contrasted with point source pollution, where discharges occur to a body of water at a sole location, such as discharges from a chemical factory, urban runoff from a roadway storm drain or from ships at sea. NPS may derive from various sources with no specific solution to rectify the problem, making it difficult to regulate. Freshwater streams, drainage from rainstorm runoff and tidal creeks are the major source of non-point discharge into Growing Area EC. A total of 38 samples (Table 4) were taken from freshwater streams during the review period (Table 4, Figures 2-4). There are no closures in Growing Area EC related to consistently high stream sample scores.

**Table 4.** Stream samples in Growing Area EC 2012-2023; Scores > 163 CFU/100ml are highlighted in red.

Growing Area Section	Location ID	Date	Pollution Tye	Score
CA3	EC087-49	5/5/2014	Stream	1380
A	EC099-61	5/5/2014	Stream	15
A	EC079-43	6/26/2014	Stream	380
CA3	EC087-49	6/26/2014	Stream	>1600
CA3	EC087-49	6/26/2014	Stream	1580
A	EC099-61	6/26/2014	Stream	>1600
CA3	EC087-49	9/17/2014	Stream	1
CA3	EC087-49	9/29/2014	Stream	10
A	EC079-43	8/23/2015	Stream	>1600
CA3	EC087-49	8/23/2015	Stream	62
CA2	EC069-40	12/20/2016	Stream	106
A	EC079-42	12/20/2016	Stream	38



Growing Area Section	Location ID	Date	Pollution Tye	Score
A	EC079-44	12/20/2016	Stream	14
P4	EC081-45	12/20/2016	Stream	560
A	EC084-46	12/20/2016	Stream	98
CA3	EC087-49	12/20/2016	Stream	86
A	EC090-50	12/20/2016	Stream	33
P4	EC081-45	8/28/2017	Stream	1.9
A	EC090-50	8/28/2017	Stream	16
A	EC074-41	5/9/2018	Stream	1.9
A	EC079-42	5/9/2018	Stream	1.9
A	EC079-43	5/9/2018	Stream	88
A	EC079-44	5/9/2018	Stream	8
P4	EC081-45	5/9/2018	Stream	3.6
P4	EC081-45	5/9/2018	Stream	12
A	EC084-46	5/9/2018	Stream	12
A	EC087-47	5/9/2018	Stream	11
A	EC087-48	5/9/2018	Stream	20
CA3	EC087-49	5/9/2018	Stream	56
A	EC090-50	5/9/2018	Stream	1.9
CA2	EC069-40	11/7/2018	Stream	56
A	EC079-42	11/7/2018	Stream	4
A	EC079-43	11/7/2018	Stream	240
A	EC079-44	11/7/2018	Stream	22
P4	EC081-45	11/7/2018	Stream	24
A	EC084-46	11/7/2018	Stream	22
CA3	EC087-49	11/7/2018	Stream	18
A	EC090-50	11/7/2018	Stream	4

### Agricultural Activities

There are no large-scale agriculture activities in Growing Area EC. Small hobby farms with less than 10 chickens were observed during the 2023 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 the effects animal waste and agricultural pollutants can have on water quality. None of these small farms appeared to be directly impacting the growing area during the 2023 shoreline survey.



## 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, 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. Crockett Cove (Stonington) is an area classified as Conditionally Approved due to seasonal non-point pollution with populations of beaver upstream from the estuary. This area will continue to be monitored and any possible corrective action taken by local town officials.

## Recreation Areas (parks, beaches, trails, campgrounds, 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 EC surrounds Deer Isle and Stonington. The entire growing area is moderately used by recreational users in the summer months. There are several day use beaches and picnic areas including Sand Beach (Stonington), Mariners Memorial Park (Deer Isle), Reach Beach (Deer Isle), and Island Heritage Trust conservation areas (Deer Isle, Stonington, and surrounding small islands). Dogs are allowed in some of these areas and signs are posted saying they are to be leashed, and their feces collected and carried out. There are two commercial campgrounds in Deer Isle and Stonington. These areas are outside of the shoreland zone. Although there are a few sand and 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. Except for very few isolated areas with extensive saltwater marshes, tides are not considered to be contributors to fecal contamination. The National Oceanic and Atmospheric Administration data for a station at Eastport indicate a mean tidal range of 18.35 ft. The mean tidal



range for most of Maine is nine feet to 13 feet. Unlike areas with small diurnal tides, this extreme volume exchange results in significant bacterial dilutions. Currents in the area are predominantly driven by the tides.

## **Rainfall**

The mean annual precipitation in Growing Area EC is approximately 49 inches and the precipitation is not evenly distributed throughout the year. The wettest months are generally April and November while 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. Flood closures are implemented when areas receive greater than two inches of rainfall in a twenty-four-hour period. Rainfall is monitored by numerous rain gauges located along the entire Maine coast and reported primarily through the Weather Underground website. Some areas of Maine have documented fecal influences resulting from rainfall of three-quarters inch to greater than one inch in a 24-hour period. These areas are considered rainfall conditional areas and are Conditionally Approved based on a three-quarters or one-inch closure trigger. There is one rainfall conditional area in Growing Area EC, Greenlaw Cove, promulgated during 2023.

Maine DMR is working collaboratively with the University of Maine on a statewide coastal project determining how various watershed characteristics influence fecal contamination of marine waters during rainfall events. This research clusters watersheds based on similar characteristics then models how rainfall and associated pollution is distributed. The model is being refined to incorporate margin watershed influences.

## **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. In Maine, wind is not a contributor to fecal pollution because marine currents are primarily influenced by the size and duration of the normal tidal cycle.

## **River Discharge**

There are no major rivers impacting Growing Area EC.

## **Hydrographic Influence**



Water circulation in Growing Area EC, eastern Penobscot Bay, is dominated by tides. Tides are caused by the gravitational effects of the moon and sun on the ocean; other influences are heavy rainfall, low barometric pressure and strong onshore winds which will increase tides. Tide levels fluctuate during the month based on the positions of the sun, moon and earth. These fluctuations and the speed and direction of the tidal currents constantly change during a tidal cycle. Tidal currents have the greatest energy when water is pushed in and out of bays and channels during the highest and lowest tide levels. Growing Area EC is subject to a semidiurnal tidal cycle with two high tides and two low tides per day. The tidal cycle is 12 hours and 25 minutes long, so that high and low tides are 50 minutes later each day.

## Water Quality Studies

### Water Quality Sampling Stations

Most marine fecal pollution of Maine waters comes from non-point sources. DMR uses Systematic Random Sampling (SRS) to monitor this influence and uses a pre-established schedule at an adequate frequency to capture all meteorological, hydrographic and/or other pollution events that trigger non-point pollution contribution. Using SRS will detect intermittent and unfavorable change in water quality and the program accepts the estimated 90<sup>th</sup> percentile (P90) as the standard to measure variance of a data set.

There are 29 active water sampling sites in Growing Area EC and 2 investigative stations (EC009.50 and EC015.50). Investigative station EC009.50 does not currently have enough data to calculate a P90; however, EC015.50 now has the required 30 samples and can be evaluated to be an active water quality station in 2024. It is recognized that access, icing, and safety considerations prevent some stations from being sampled on scheduled dates. Currently all stations in Growing Area EC, except EC009.00, meet their current NSSP classification standard. One water quality station EC017.00 now has water quality that meets approved standards and will be evaluated for an upgrade in 2024.

### Water Quality Discussion and Classification Determination

P90s for all active stations with a minimum of 30 samples were calculated and all stations (except EC009.00) meet their classification standards (Tables 6, 7). The percent change in P90 from 2022 to 2023 was calculated (Table 5). The greatest percent change is associated with station EC010.00, a result of a classification change. Overall, the water quality in Growing Area EC continues to be variable.

**Table 5.** Percent change of calculated P90 scores from 2022 to 2023.

Station	% Change 2022-2023	Station	% Change 2022-2023	Station	% Change 2022-2023
EC001.00	0.00	EC017.00	25.41	EC023.50	31.48
EC004.00	1.49	EC017.50	-0.61	EC026.20	-1.74
EC005.00	28.44	EC017.70	-3.12	EC026.70	-23.89
EC006.10	0.00	EC017.80	8.47	EC026.90	-9.09





Station	% Change 2022-2023	Station	% Change 2022-2023	Station	% Change 2022-2023
EC007.00	-13.53	EC018.00	-9.39	EC027.00	-4.33
EC009.00	3.56	EC019.00	4.86	EC027.80	-4.37
EC010.00	-80.27	EC020.00	0.00	EC028.00	19.47
EC012.00	-3.09	EC021.00	-6.52	EC031.00	-2.17
EC014.00	0.00	EC022.00	6.41	EC033.00	-4.26
EC016.00	-10.94	EC022.30	22.18		

**Table 6.** P90 calculations for stations with a minimum of 30 samples. Geomeans and P90s not meeting current classifications are highlighted in red.

Station	Class	Count	GM	SDV	MAX	P90	Min_Date
EC001.00	A	30	2.5	0.37	82	7.7	6/25/2019
EC004.00	A	30	3.9	0.55	180	20.4	6/10/2019
EC005.00	A	30	3.2	0.49	108	14	6/10/2019
EC006.10	A	30	2.2	0.27	54	5	6/10/2019
EC007.00	A	30	3.8	0.45	54	14.7	6/10/2019
EC009.00	A	30	3.7	0.72	1200	32	6/25/2019
EC012.00	A	30	3.7	0.48	92	15.7	6/10/2019
EC014.00	A	30	3.1	0.36	33	9.2	6/10/2019
EC016.00	A	30	3.6	0.52	112	17.1	3/15/2021
EC017.50	A	30	3.6	0.51	158	16.4	11/12/2019
EC017.70	A	30	2.7	0.42	126	9.3	6/25/2019
EC017.80	A	30	4.6	0.59	160	26.9	12/10/2019
EC018.00	A	30	3.7	0.55	1360	19.3	12/9/2019
EC019.00	A	30	3.8	0.54	160	19.4	6/25/2019
EC020.00	P	30	3.5	0.66	760	25.6	6/25/2019
EC021.00	A	30	2.6	0.4	120	8.6	4/30/2019
EC022.00	A	30	3.1	0.33	18	8.3	6/10/2019
EC022.30	A	30	4.6	0.63	500	30.3	6/25/2019
EC023.50	A	30	2.6	0.33	29	7.1	6/10/2019
EC026.20	A	30	3.1	0.43	120	11.3	6/10/2019
EC026.70	A	30	3	0.51	680	13.7	6/10/2019
EC026.90	A	30	3.4	0.45	120	13	6/10/2019
EC027.00	A	30	4.1	0.56	400	22.1	6/10/2019
EC027.80	A	30	4.3	0.55	180	21.9	6/10/2019
EC031.00	A	30	2.9	0.38	42	9	6/10/2019



Station	Class	Count	GM	SDV	MAX	P90	Min_Date
EC033.00	P	30	3.1	0.49	136	13.5	6/10/2019

**Emergency Closures:** The reports summarizing emergency closures such as flood and biotoxin closures for the entire state are in the DMR central files.

#### **Reclassifications**

Reclassification addendums to the sanitary survey report are in the DMR central files.

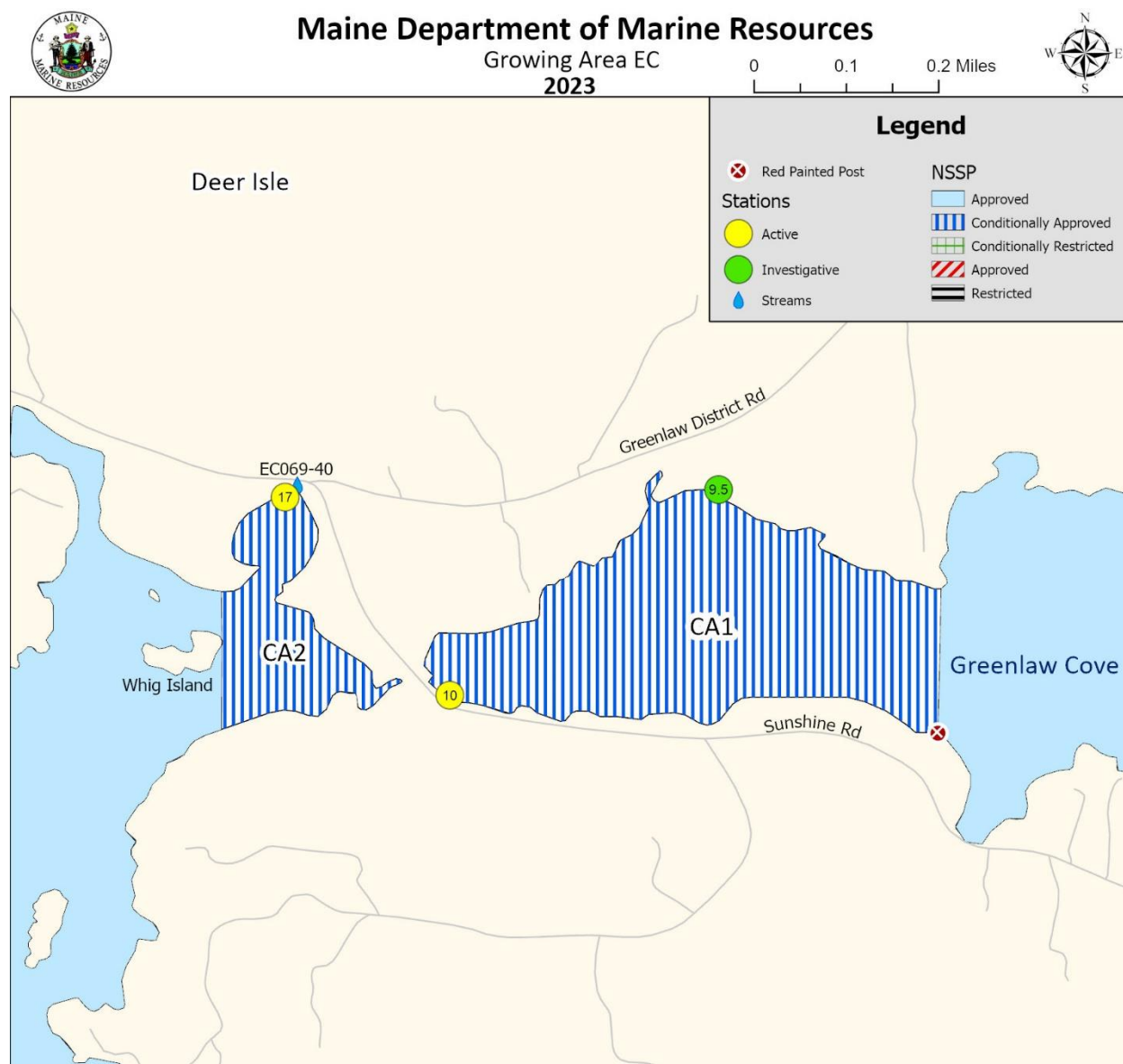
#### **CAMP Reviews, Inspection Reports, and Performance Standards**

##### **Greenlaw Cove Conditional Area**

Growing Area Section EC CA1 Greenlaw Cove in Deer Isle is classified as Conditionally Approved based on rainfall and season. This area is in the open status October 1 through May 31. If there is rainfall greater than 1" in a 24-hour period from June 1 to September 30, then the area is closes for 14 days. This area is west of a line beginning at the tip of a prominent point of land on the north shore of Greenlaw Cove running south to a red painted post on the opposite shore (Figure 8). This area is classified as Conditionally Approved based on rainfall greater than 1" in a 24-hour period and season. Water quality station EC010.00 monitors this conditional area.



**Figure 8.** CA1 Greenlaw Cove & CA2 Whig Island Conditionally Approved areas



### Compliance with management plan

The Greenlaw Cove Conditional Area remains in compliance with the current conditional area management plan (CAMP). DMR staff adequately report all rainfall events, and the area is closed to harvest within the reactionary window for emergency events. See CAMP annual reviews for information on annual compliance with the current CAMP.



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

The scientist on duty monitors weather gauges KMEDEERI23, KMEDEERI27, and KMESTONI5 and reports if there is greater  $\geq 1$ " of rainfall in a 24-hour period. No reporting outside of DMR staff is required.

### **Compliance with approved growing area criteria**

The area continues to meet the criteria for Approved harvest during the open status of October 1 through May 31 based on a P90 calculation of 16.7 cfu/100ml during the open status (Table 7) and no other known point sources of pollution.

### **Water sampling compliance history**

Water samples are collected at least monthly throughout the year during the open status (Table 8). The P90 value meets the standard for Approved harvest during the open status (Table 7).

### **Analysis-Recommendations**

The Greenlaw Cove Conditionally Approved area meets the standards for Rainfall Seasonal Approved harvest during the open status and remains in compliance with the CAMP. Recommend continued water quality monitoring to ensure continued compliance with the CAMP.

## **Annual Review of CA2 Whig Island, Deer Isle, Conditional Area Management Plan**

### **Scope**

Growing Area EC CA2 Whig Island is classified as Conditionally Approved seasonally with the open status for harvest from October 1 through June 30. This area is east of a line beginning at the eastern tip of Whig Island, running north to a red painted post on the southern point of the prominent point of land on the northern shore of this cove; AND east of a line beginning at the eastern tip of Whig Island, running south to a red painted post on the southern shore of this cove (Figure 8). This area is classified as Conditionally Approved based on seasonal pollution. This Conditional Area is monitored by water quality station EC017.00.

### **Compliance with management plan**

The Whig Island Conditional Area remains in compliance with the current conditional area management plan (CAMP). The data continues to show winter pollution levels do 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 restricted growing area criteria**

The area continues to meet the criteria for Approved harvest during the open status of October 1 through June 30 based on P90 calculations (EC017.00 at 18.8 cfu/100ml) during the open status and no other known sources of pollution in the area.

**Water sampling compliance history**

Water samples are collected at least monthly during the open status and throughout the year (Table 8). The P90 value meets the standard for Approved harvest during the open status (Table 7).

**Analysis-Recommendations**

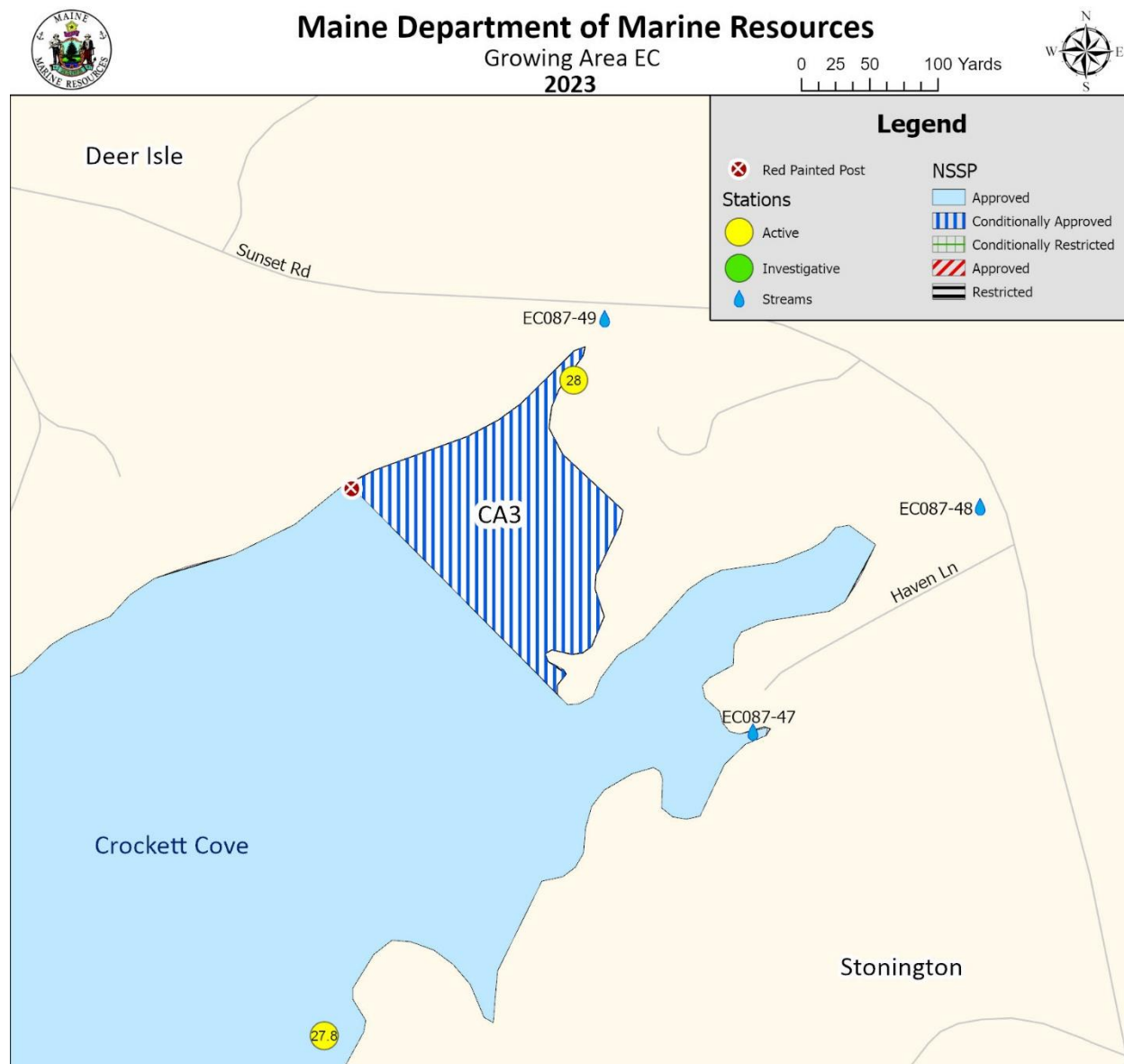
The Whig Island Conditionally Approved area continues to meet the standards for seasonal Approved harvest during the open status and remains in compliance with the CAMP. This area continues to show improving water quality year-round and now meets standards for Approved harvest year-round. Recommend continued water quality monitoring and the area should be reviewed for a potential upgrade in 2024.

**Annual Review of CA3 Crockett Cove, Deer Isle & Stonington, Conditional Area Management Plan****Scope**

Growing Area CA3 Crockett Cove is classified as Conditionally Approved seasonally with the open status for harvest from September 1 through May 31. This area is north and east of a line beginning at a red painted post on the shore approximately 250 yards southwest of where the Stonington town line crosses Burnt Cove Rd, running southeast to the head of the nearest peninsula in Stonington (Figure 9). This area is classified as Conditionally Approved based on seasonal pollution. This Conditional Area is monitored by water quality station EC028.00.



**Figure 9.** CA3 Crockett Cove Conditionally Approved area, Deer Isle & Stonington.



#### Compliance with management plan

The Crockett Cove Conditional Area remains in compliance with the current conditional area management plan (CAMP). The data continues to show winter pollution levels do 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 restricted growing area criteria**

The area continues to meet approved standards during the open status of September 1 through May 31 based on P90 calculations (EC028.00 at 31.3 cfu/100ml) during the open status and no other known sources of pollution in the area.

#### **Water sampling compliance history**

Water samples are collected at least monthly during the open status and throughout the year (Table 8). The P90 value meets the standard for Approved harvest during the open status (Table 7).

#### **Analysis-Recommendations**

The Crockett Cove Conditionally Approved area continues to meet the standards for seasonal Approved harvest during the open status and remains in compliance with the CAMP. Recommend continued water quality monitoring and reviews of the CAMP.

**Table 7.** P90s for Conditional Area stations calculated using data from the open status. Geomeans and P90s not meeting current classifications are highlighted in red.

Station	Class	Count	GM	SDV	MAX	P90	Min_Date
EC010.00	CA	30	3.9	0.40	160	16.7	7/16/2019
EC017.00	CA	30	4.2	0.50	96	18.8	2/11/2020
EC028.00	CA	30	5.5	0.58	78	31.3	2/11/2020



## Recommendation for Future Work

Water quality station EC009.00 fails to meet Approved standards year-round and will be downgraded. Investigative stations should be added to monitor the decline of water quality in Fish Creek (EC009.00) and Greenlaw Cove (EC010.00). Water quality station EC017.00 now meets approved standards year-round and should be reviewed for an upgrade. Investigative station EC015.50 has met the minimum 30 samples required and should be classified.

**Table 8.** Count table of samples collected in growing area EC during the 2023 season.

Station	Class	Closed	Open	Total	Samples Required	Comments
EC001.00	A		6	6	6	
EC004.00	A		6	6	6	
EC005.00	A		6	6	6	
EC006.10	A		6	6	6	
EC007.00	A		6	6	6	
EC009.00	A	10	6	16	6	Flood Station
EC009.50	X		1	1	0	Investigative Station
EC010.00	A		4	4	12	Reclass A to CA
	CA	1	5	6		
EC012.00	A	8	6	14	6	Flood Station
EC014.00	A		6	6	6	
EC015.50	X		11	11	0	Investigative Station
EC016.00	CA	3	5	8	6	Reclass CA to A
EC017.00	CA	2	9	11	9	
EC017.50	A		6	6	6	
EC017.70	A		6	6	6	
EC017.80	A		6	6	6	
EC018.00	A		6	6	6	
EC019.00	A		6	6	6	
EC020.00	P	6		6	6	
EC021.00	A		6	6	6	
EC022.00	A		6	6	6	
EC022.30	A		6	6	6	
EC023.50	A		6	6	6	
EC026.20	A	12	6	18	6	Flood Station
EC026.70	A		6	6	6	
EC026.90	A		6	6	6	
EC027.00	A		6	6	6	



Station	Class	Closed	Open	Total	Samples Required	Comments
EC027.80	A		6	6	6	
EC028.00	CA	3	8	11	9	
EC031.00	A	8	6	14	6	Flood Station
EC033.00	P	6		6	6	



## References

National Shellfish Sanitation Program: Guide for the Control of Molluscan Shellfish, 2019;

Climatic and hydrographic information, US Coast Guard Coastal Pilot, 2005 edition

U.S. Food and Drug Administration (2001). Applied Concepts in Sanitation Surveys of Shellfish Growing Areas: Course #FD2042 (Training Manual), Volumes I and II.

Licensed discharge information, Maine Department of Environmental Protection, Augusta, Maine.

Data Layers, Maine Office of GIS, Augusta, Maine

Rainfall data, National Weather Service, Belfast, Maine

Polluted Runoff: Nonpoint Source (NPS) Pollution, Stormwater Management for Federal Facilities under Section 438 of the Energy Independence and Security Act, US EPA 2024.

ME DMR, EC Sanitary Survey Report, 2011.

Population data, Maine City/Town Census Data 2010 and 2020, Maine Department of Environmental Protection, Augusta, Maine.

Recreational area information, Preserves and Islands, Island Heritage Trust Internet Site.



## Appendix A.

### 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.

GM = 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 = 90th percentile, Approved standard is 31, Restricted standard is 163

Min\_Date = oldest date sampled included in the calculations.

X = investigative station

### Reference Material

An interactive map is available on the DMR website for reference. This map includes water quality station locations, end of year P90 scores, current classifications, and other information. <https://www.maine.gov/dmr/fisheries/shellfish/shellfish-closures-and-aquaculture-leases-map>