GROWING AREA EJ

Schoodic Point, Winter Harbor to Dyer Point, Steuben

Sanitary Survey Report
2006-2018

Final

Erick Schaefer Scientist I


MAINE
MARINE RESOURCES

Executive Summary

This is a Sanitary Survey report for Growing Area EJ in Washington County written in compliance with the requirements of the 2017 Model Ordinance and the National Shellfish Sanitation Program. Seven pollution areas in Growing Area EJ will be reviewed for a possible upgrade in 2019; Birch Harbor (Gouldsboro), Long Mill Cove (Corea), West Bay (Gouldsboro), Grand Marsh Bay (Gouldsboro), Parrit Cove (Steuben), Tunk Stream (Steuben) and Prospect Harbor (Gouldsboro). Two investigative stations (EJ24.2) and (EJ24.70) now have the required 30 samples and can be changed to an active water quality station. There were no new actual or potential pollution sources found during this survey. Water quality has remained consistent overall with some improvement in water quality shown in the western part of the growing area. Triennial reviews were conducted in 2009, 2012, and 2015 with the last Sanitary Survey done in 2006. The next sanitary survey is due in 2030 and the next triennial in 2021.

Description of Growing Area

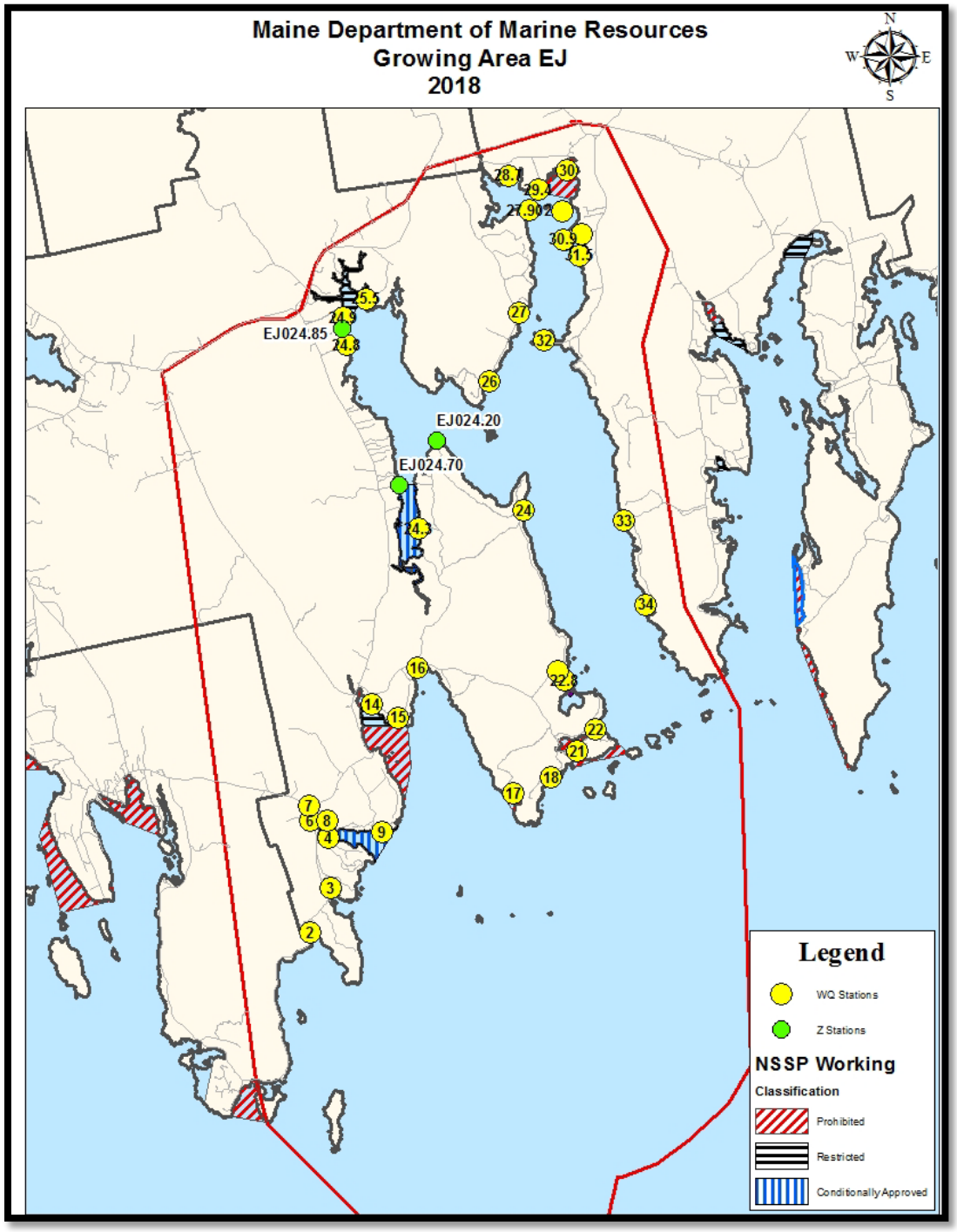
Growing Area EJ encompasses 81 square miles and straddles the county line between Hancock County and Washington County, Maine. The villages of Gouldsboro pop- 1,972 and Steuben pop-1,140 have the largest population concentrations (2006-2007 Maine Municipal Directory). Development along these shores is spotty with clusters of homes separated by undeveloped land. Heavier development is found at the head of the harbors including Birch Harbor, Prospect Harbor and Corea Harbor. All dwellings within 500 feet of the shore, water conduits-ditches or streams or pollution sources were surveyed. There are 13 licensed overboard discharges (OBD's), one OBD was removed during the 2018 season in Corea Harbor, Gouldsboro. This growing area also includes one licensed discharge belonging to a lobster processing facility.

The growing area includes the near sub-tidal waters, inter-tidal flats and a zone of shore property that extends inland to a definite up-land boundary. The shoreline included in this report stretches from Schoodic Point, Winter Harbor to Dyer Point, Steuben. The shoreline is typical to the convoluted shoreline of this section of Maine, with a series of shallow harbors with muddy and gravel bottoms separated by rock-bound points of land and bold shoreline. The up-land boundary of the growing area is enclosed by a line beginning at the tip of Schoodic Point; then extends north to the intersection of US Route 1-195; then follows US Route 1 east to Steuben Village; and then south to the tip of Dyer Point. The upland land cover is predominately evergreen, deciduous and wetland forest with minimal development. Blueberry fields are scattered through eastern Gouldsboro and Steuben. Fresh water influence along these shores is predominately from numerous brooks and small streams throughout the growing area. There are no significant rivers draining into this area.

There are two shellfish Limited Purpose Aquaculture permits (LPAs) in this growing area.

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

Figure 1. Growing Area EJ Overview Map with Active Water 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 2-mile segments that are identified using unique Growing Area Shoreline Survey Identification (GASSID) numbers. All properties and potential pollution sources within 500 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 2. Growing Area EJ, Pollution Map A

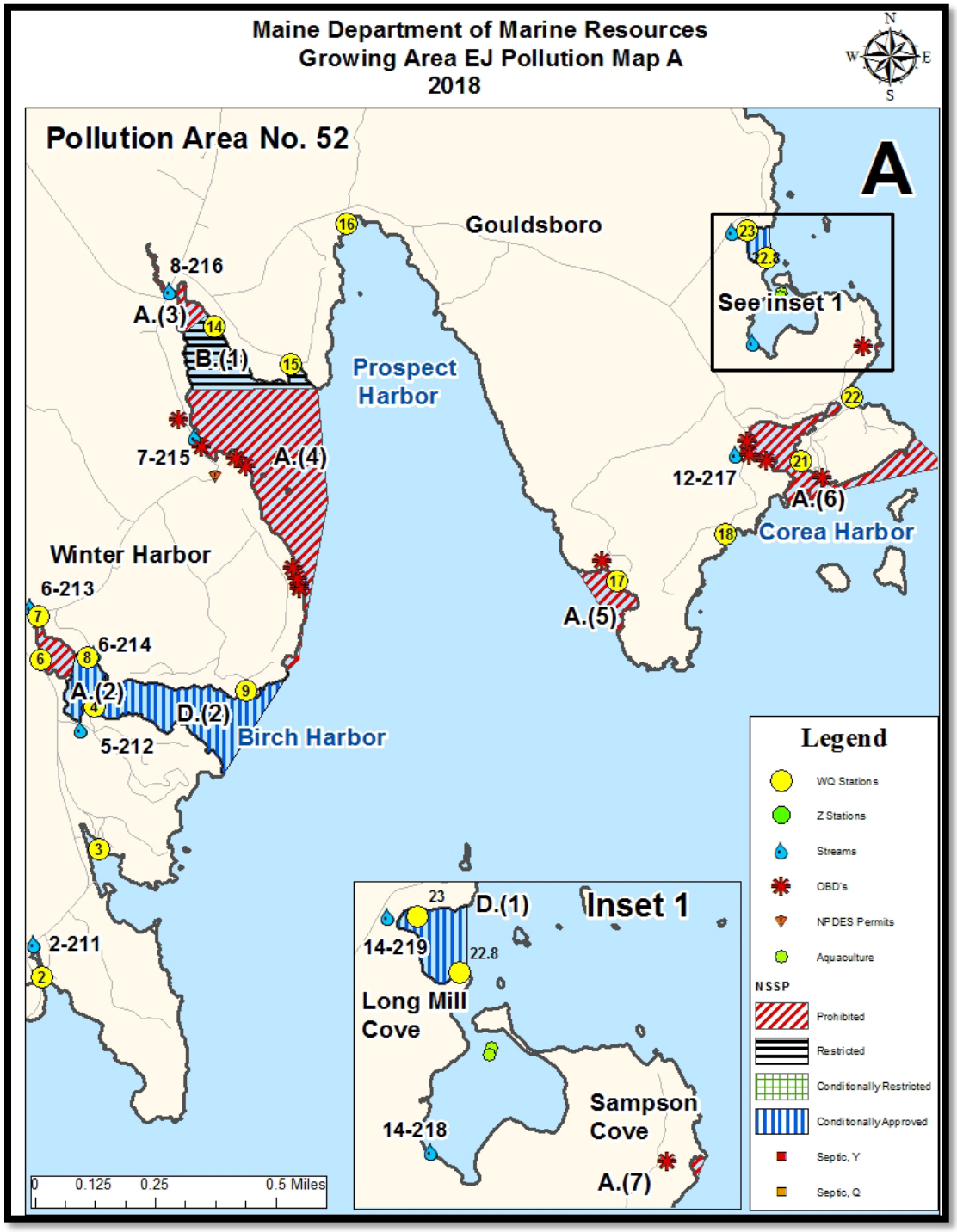


Figure 3. Growing Area EJ, Pollution Map B

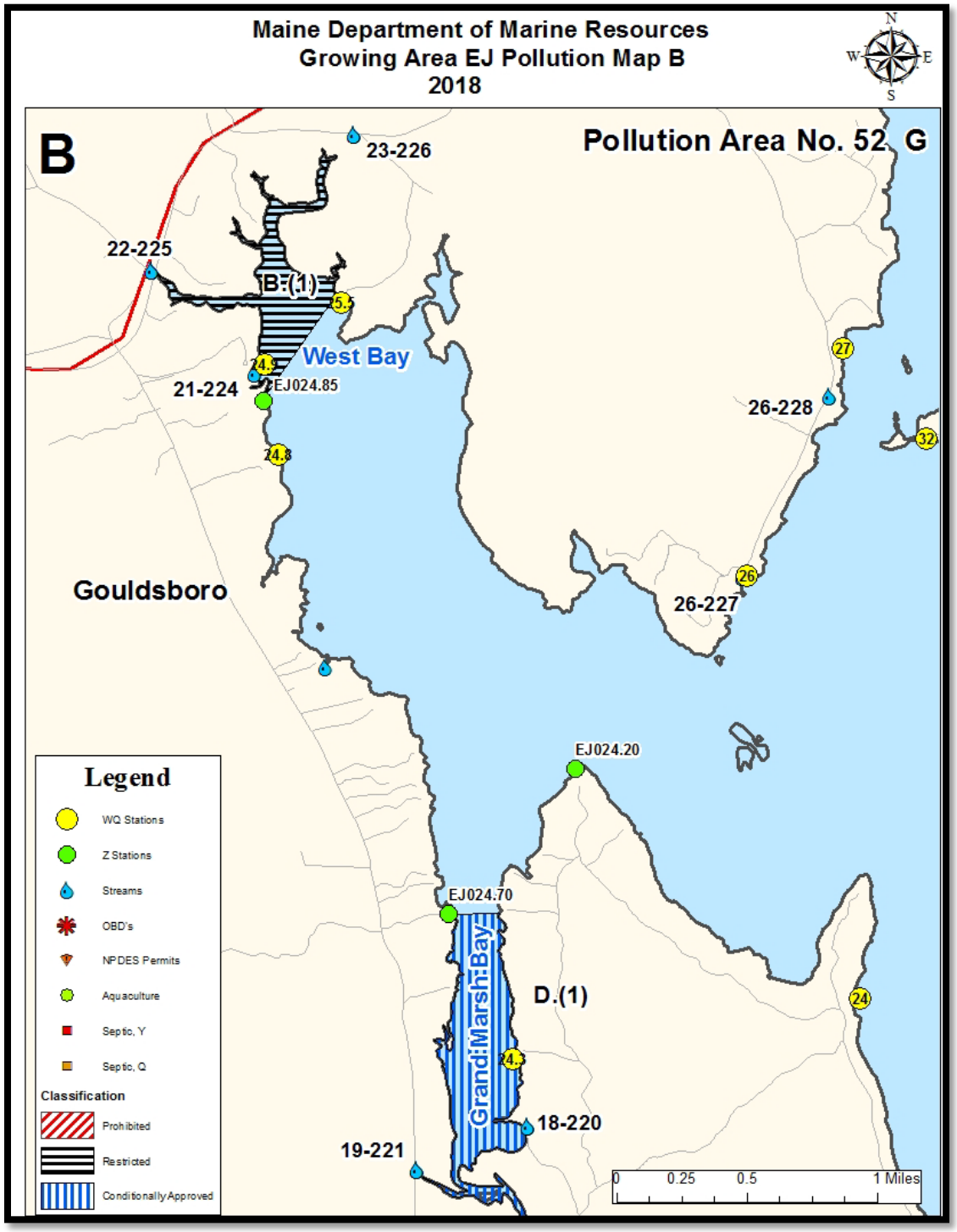
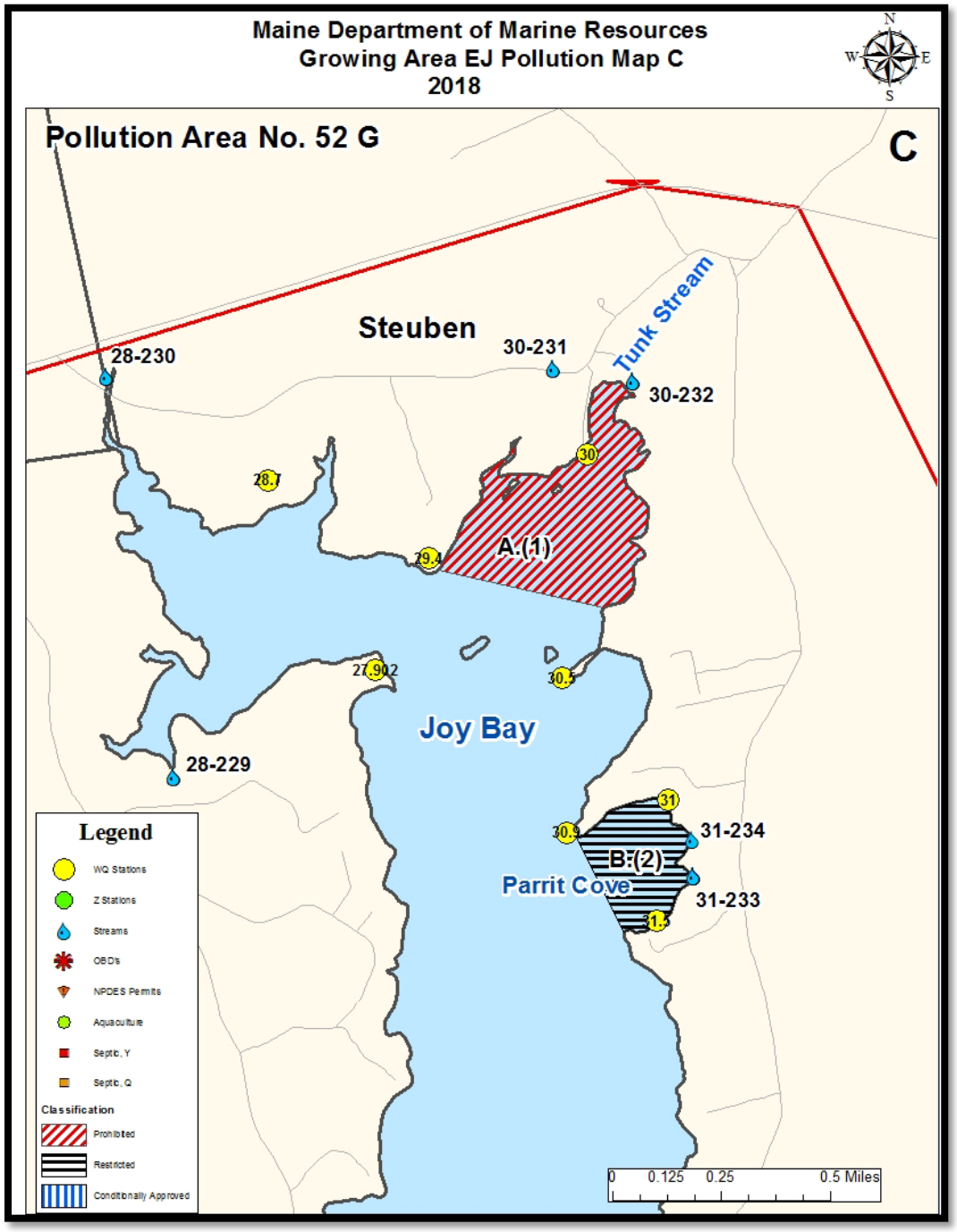


Figure 4. Growing Area EJ, Pollution Map C



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.

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.

There are 13 overboard discharges (OBDs) that discharge their treated effluent into the waters of Growing Area EJ. Eight OBDs discharge into the waters of Prospect Harbor, one OBD discharges into Shark Cove, three OBDs discharge into the waters of Corea Harbor, and one OBD discharges into Sampson Cove (Figure 2). One OBD was removed from Prospect harbor in 2018, and a total of five OBDs have been removed over the past twelve review years. 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 EI (Table 1). The size of each closure is determined based on a dilution, using on the permitted flow rate of the OBD (in gallons per day, GPD), and the mid tide depth of the receiving water that each OBD

discharges to; the fecal concentration used for this dilution calculation is $1.4X10^5$ FC /100 ml. All current closures are of adequate size to protect public health.

Table 1. Overboard Discharges (OBDs).

Pollution Area	OBD #	Town	Receiving Waterbody	Mid Tide Depth	Flow (gpd)	Acres Needed	Current Prohibited Acreage
52 A.(4)	2772	Goulds boro	Prospect Harbor	4	300	2.30	194
52 A.(4)	3370	Goulds boro		8	480	1.84	
52 A.(4)	3622	Goulds boro		4	300	2.30	
52 A.(4)	4652	Goulds boro		4	300	2.30	
52 A.(4)	4667	Goulds boro		4	315	2.42	
52 A.(4)	7934	Goulds boro		4	100	0.77	
52 A.(4)	7935	Goulds boro		4	2000	15.34	
52 A.(4)	6308	Goulds boro		4	300	2.30	
52 A.(5)	3298	Goulds boro	Shark Cove	6	300	1.53	21
52 A.(6)	1042	Goulds boro	Corea Harbor	4	300	2.30	65
52 A.(6)	3834	Goulds boro		4	600	4.60	
52 A.(6)	4886	Goulds boro		4	300	2.30	
52 A.(7)	4315	Goulds boro	Sampson Cove	19	315	0.51	1

National Pollutant Discharge Elimination System (NPDES)

Table 2. NPDES Permitted Discharges

Pollution Area	Type	Facility	Water Body
52 A. (4)	Lobster processing	Lobster Web	Prospect harbor

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. There are no known residential pollution sources in this growing area.

Industrial Pollution

There are no major industrial pollution sites in growing area EJ such as chemical plants, steel mills, ship yards, or refineries. None of the small industries (small boat builders and boat storage yards and lobster process plants) were identified as pollution sources during the 2018 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 five locations in the growing area. These tanks are near the shore. Tanks have containment walls and booms in the event of an accidental leak in a tank or spillage when unloading. The oil response team from the Maine DEP contacts Maine Marine Resources when a spill occurs and a decision will be made whether a shellfish closure is necessary.

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 (groups of 10 or more moorings) of boats in Corea Harbor, Bunkers Harbor and Prospect Harbor.

Mooring fields in Prospect Harbor, Bunkers Harbor and Corea Harbor are exclusively work boats (lobster boats, trawling vessels) without heads. 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. Water quality samples sites in the mooring area meets Approved classification criteria when in the open status. Marinas with wharfs, fuel, slips, etc. are in Corea Harbor and Prospect Harbor.

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 2009). 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.

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 5 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 EI 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).

Along roadways several ditches and stormwater drains were identified in Prospect Harbor. These drain into current prohibited area 52 (A.4). Water sampling stations on the margins of these closures meet Approved criteria. No specific impact from the storm drains has been identified.

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 EJ. A total of 111 samples were taken from freshwater streams during the review period (Table 3).

Table 3. Stream Samples in Growing Area EJ 2006-2018; Scores > 163 cfu/100ml are highlighted in red.

Pollution Area	Sample date	Location ID	Pollution Type	Score	Pollution Map
NA	10/25/06	EJ002-211	Stream	69	A
NA	12/7/09	EJ002-211	Stream	10	
NA	6/8/16	EJ002-211	Stream	10	
NA	8/2/16	EJ002-211	Stream	38	
NA	8/24/16	EJ002-211	Stream	80	
NA	10/17/18	EJ002-211	Stream	18	

Pollution Area	Sample date	Location ID	Pollution Type	Score	Pollution Map
52 (D.2)	10/25/06	EJ005-212	Stream	36	
52 (D.2)	12/7/09	EJ005-212	Stream	1.9	
52 (A.2)	10/25/06	EJ006-213	Stream	47	
52 (A.2)	12/7/09	EJ006-213	Stream	6	
52 (A.2)	7/12/10	EJ006-213	Stream	1180	
52 (A.2)	7/12/10	EJ006-213	Stream	56	
52 (A.2)	7/27/10	EJ006-213	Stream	520	
52 (A.2)	10/21/10	EJ006-213	Stream	24	
52 (A.2)	10/28/10	EJ006-213	Stream	1700	
52 (A.2)	10/28/10	EJ006-213	Stream	20	
52 (A.2)	10/28/10	EJ006-213	Stream	28	
52 (A.2)	12/31/10	EJ006-213	Stream	8	
52 (A.2)	6/8/16	EJ006-213	Stream	56	
52 (A.2)	4/26/18	EJ006-213	Stream	86	
52 (A.2)	10/17/18	EJ006-213	Stream	160	
52 (D.2)	12/7/09	EJ006-214	Stream	1.9	
52 (A.4)	10/25/06	EJ007-215	Stream	35	
52 (A.4)	8/24/09	EJ007-215	Stream	200	
52 (A.3)	10/25/06	EJ008-216	Stream	127	
52 (A.3)	8/24/09	EJ008-216	Stream	>1600	
52 (A.6)	12/7/09	EJ012-217	Stream	1.9	
NA	10/25/06	EJ014-218	Stream	36	
NA	12/7/09	EJ014-218	Stream	1.9	
52 (D.1)	12/7/09	EJ018-219	Stream	4	
52 G (D.1)	10/25/06	EJ018-220	Stream	7.3	
52 G (D.1)	12/7/09	EJ018-220	Stream	1.9	B
52 G (D.1)	10/25/06	EJ019-221	Stream	91	
52 G (D.1)	12/7/09	EJ019-221	Stream	1.9	

Pollution Area	Sample date	Location ID	Pollution Type	Score	Pollution Map
52 G (D.1)	6/8/16	EJ019-221	Stream	14	
52 G (D.1)	8/2/16	EJ019-221	Stream	2	
52 G (D.1)	10/17/18	EJ019-221	Stream	24	
52 G (D.1)	10/25/06	EJ020-222	Stream	5	
52 G (D.1)	8/24/09	EJ020-222	Stream	340	
52 G (B.1)	5/14/13	EJ021-224	Stream	2	
52 G (B.1)	9/8/14	EJ021-224	Stream	80	
52 G (B.1)	6/8/16	EJ021-224	Stream	10	
52 G (B.1)	8/24/16	EJ021-224	Stream	480	
52 G (B.1)	4/26/18	EJ021-224	Stream	520	
52 G (B.1)	10/25/06	EJ022-225	Stream	64	
52 G (B.1)	8/24/09	EJ022-225	Stream	27	
52 G (B.1)	10/28/10	EJ022-225	Stream	240	
52 G (B.1)	11/3/10	EJ022-225	Stream	1.9	
52 G (B.1)	11/15/10	EJ022-225	Stream	2	
52 G (B.1)	12/1/11	EJ022-225	Stream	1.9	
52 G (B.1)	6/8/16	EJ022-225	Stream	27	
52 G (B.1)	8/2/16	EJ022-225	Stream	6	
52 G (B.1)	8/24/16	EJ022-225	Stream	84	
52 G (B.1)	4/26/18	EJ022-225	Stream	1.9	
52 G (B.1)	10/17/18	EJ022-225	Stream	48	
52 G (B.1)	10/25/06	EJ023-226	Stream	42	B
52 G (B.1)	8/24/09	EJ023-226	Stream	520	
NA	1/11/06	EJ026-227	Stream	2.9	
NA	3/27/06	EJ026-227	Stream	2.9	
NA	8/7/06	EJ026-227	Stream	93	
NA	10/25/06	EJ026-227	Stream	28	
NA	12/11/06	EJ026-227	Stream	2	

Pollution Area	Sample date	Location ID	Pollution Type	Score	Pollution Map
NA	8/24/09	EJ026-227	Stream	680	
NA	8/24/09	EJ026-228	Stream	240	
NA	10/25/06	EJ028-229	Stream	4	
NA	8/24/09	EJ028-229	Stream	500	
NA	7/12/10	EJ028-229	Stream	520	
NA	7/27/10	EJ028-229	Stream	16	
NA	11/3/10	EJ028-229	Stream	2	
NA	6/8/16	EJ028-229	Stream	520	
NA	8/3/16	EJ028-229	Stream	440	C
NA	8/24/16	EJ028-229	Stream	260	
NA	10/17/18	EJ028-229	Stream	25	
NA	10/25/06	EJ028-230	Stream	44	
NA	8/24/09	EJ028-230	Stream	840	
NA	7/12/10	EJ028-230	Stream	128	
NA	7/27/10	EJ028-230	Stream	10	
NA	11/29/10	EJ028-230	Stream	4	
NA	6/8/16	EJ028-230	Stream	160	
NA	8/24/16	EJ028-230	Stream	60	
NA	4/26/18	EJ028-230	Stream	340	
NA	10/17/18	EJ028-230	Stream	42	
52 G (A.1)	10/25/06	EJ030-231	Stream	47	
52 G (A.1)	11/3/10	EJ030-231	Stream	1.9	C
52 G (A.1)	10/25/06	EJ030-232	Stream	25	
52 G (A.1)	8/24/09	EJ030-232	Stream	540	
52 G (A.1)	7/12/10	EJ030-232	Stream	80	
52 G (A.1)	10/28/10	EJ030-232	Stream	116	
52 G (A.1)	11/3/10	EJ030-232	Stream	1.9	
52 G (A.1)	4/26/18	EJ030-232	Stream	100	

Pollution Area	Sample date	Location ID	Pollution Type	Score	Pollution Map
52 G (A.1)	10/17/18	EJ030-232	Stream	28	
52 G (B.2)	1/11/06	EJ031-233	Stream	23	
52 G (B.2)	1/11/06	EJ031-233	Stream	43	
52 G (B.2)	1/18/06	EJ031-233	Stream	2.9	
52 G (B.2)	1/18/06	EJ031-233	Stream	240	
52 G (B.2)	1/25/06	EJ031-233	Stream	93	
52 G (B.2)	3/27/06	EJ031-233	Stream	2.9	
52 G (B.2)	3/27/06	EJ031-233	Stream	39	
52 G (B.2)	4/18/06	EJ031-233	Stream	2.9	
52 G (B.2)	4/18/06	EJ031-233	Stream	93	
52 G (B.2)	8/7/06	EJ031-233	Stream	43	
52 G (B.2)	10/25/06	EJ031-233	Stream	2	
52 G (B.2)	12/13/06	EJ031-233	Stream	1.9	
52 G (B.2)	1/24/07	EJ031-233	Stream	1.9	
52 G (B.2)	8/24/09	EJ031-233	Stream	440	
52 G (B.2)	7/12/10	EJ031-233	Stream	130	
52 G (B.2)	6/8/16	EJ031-233	Stream	2	
52 G (B.2)	8/24/16	EJ031-233	Stream	108	C
52 G (B.2)	4/26/18	EJ031-233	Stream	9.1	
52 G (B.2)	10/17/18	EJ031-233	Stream	260	
52 G (B.2)	1/11/06	EJ031-234	Stream	2.9	

Agricultural Activities

There are no large-scale agriculture activities in Growing Area EJ. 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.

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. Joy Bay and West Bay were both impacted from seasonal waterfowl impacts. The town worked with the Department of Agriculture and instituted a program where geese were removed from the area. Since the adoption of the program water quality in both areas has improved to the point where most of these areas are now Approved.

Recreation Areas (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 EJ has one commercial campground located at the head of Joy Bay in Steuben. There are several day use areas with hiking trails. Dogs are allowed in these areas and signs are posted saying they are to be leashed and their feces collected and carried out. These areas are monitored by routine water sampling sites. 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. 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 9 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 EJ is approximately 44 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 greater than one inch in a twenty-four-hour period. These areas are considered rainfall conditional areas and are

Conditionally Approved based on the one-inch closure trigger. No rainfall areas have been identified in growing are EJ.

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

Stream flow in Maine exhibits seasonal variation, with the highest flows occurring in the spring and the mid-to late fall. There are no large river discharges into growing area EJ. There are many small streams that discharge into the growing area and these streams are discussed in the section about nonpoint source pollution.

Hydrographic Influence

Water circulation in this part of Gouldsboro Bay is dominated by tides. The tidal range in Gouldsboro Bay is ten to thirteen feet. 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 EJ 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

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 90th percentile (P90) as the standard to measure variance of a data set.

There are presently 34 active water sampling sites in Growing Area EJ and 3 investigative stations which do not currently have enough data to calculate a P90. It is recognized that access, icing, and safety

considerations prevent some stations from being sampled on scheduled dates. Currently all stations in Growing Area EJ, except EJ 6, meet their current NSSP classification standard. Four water quality stations (EJ 4, 8, 22.8, 24.8, 24.9and 30.5) now have water quality that meets approved standards and will be evaluated for an upgrade in 2019. Station EJ 30 meets the standard for restricted harvest and will also be evaluated for an upgrade.

Water Quality Discussion and Classification Determination

P90s for all active stations with a minimum of 30 samples were calculated and all stations except EJ 6 meet their classification standards (Table 4). The percent change in P90 from 2017 to 2018 was calculated and only two stations showed a substantial increase in P90 score (Table 5). Any station that showed a 50% or greater increase in P90 is highlighted in yellow. Only two stations EJ 22.8 and 23 showed an increase in P90 of 50% or more. These stations still have low scores and are not in danger of failing to meet their classification standards. Overall the water quality in growing area EJ appears to be improving.

Table 4. P90 calculations for stations with a minimum of 30 samples. Geomeans and P90s not meeting current classifications are highlighted in red. CA P90's are using open period data only

Station	Class	Count	MFCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std
EJ002.00	A	30	30	2.3	0.21	10	4.3	31	163
EJ003.00	A	30	30	3.5	0.46	140	14	31	163
EJ009.00	A	30	30	2.3	0.27	36	5.4	31	163
EJ016.00	A	30	30	2.6	0.47	300	10.6	31	163
EJ018.00	A	30	30	2.2	0.18	11	3.8	31	163
EJ022.00	A	30	30	2.2	0.22	16	4.4	31	163
EJ024.00	A	30	30	2.3	0.4	300	7.8	31	163
EJ024.20	A	30	30	2.6	0.31	52	6.5	31	163
EJ024.70	A	30	30	2.3	0.24	16	4.8	31	163
EJ026.00	A	30	30	3.8	0.44	58	14.3	31	163
EJ027.00	A	30	30	2.5	0.3	22	6.3	31	163
EJ027.902	A	30	30	4.6	0.44	40	17.2	31	163
EJ028.70	A	30	30	3.5	0.41	27	11.7	31	163
EJ030.90	A	30	30	3.3	0.36	60	9.7	31	163
EJ033.00	A	30	30	2.1	0.23	27	4.3	31	163

Station	Class	Count	MFCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std
EJ034.00	A	30	30	2	0.15	14	3.2	31	163
EJ004.00	CA	30	30	3.4	0.42	42	11.9	31	163
EJ006.00	CA	30	30	6.2	0.62	360	39.2	31	163
EJ008.00	CA	30	30	5	0.58	90	28.1	31	163
EJ022.80	CA	30	30	3.3	0.45	82	13	31	163
EJ023.00	CA	30	30	3.2	0.53	700	15.5	31	163
EJ024.30	CA	30	30	3.5	0.38	24	11	31	163
EJ017.00	P	30	30	2	0.1	5.5	2.7	31	163
EJ021.00	P	30	30	4.9	0.65	1700	34.7	31	163
EJ030.00	P	30	30	10.1	0.55	160	52.1	31	163
EJ014.00	R	30	30	4.7	0.65	460	32.5	31	163
EJ015.00	R	30	30	3.6	0.54	340	18.4	31	163
EJ024.80	R	30	30	3.8	0.42	56	13.5	31	163
EJ024.90	R	30	30	3.8	0.46	64	15.3	31	163
EJ025.50	R	30	30	3.3	0.38	120	10.5	31	163
EJ029.40	R	30	30	5.1	0.58	360	29.2	31	163
EJ030.50	R	30	30	4.3	0.46	54	17	31	163
EJ031.00	R	30	30	3.5	0.41	36	21.8	31	163
EJ031.50	R	30	30	3.3	0.33	20	9	31	163

Table 5. Percent change in P90 2017-2018; Positive numbers show improvement negative numbers indicate decline

Station	2017P90	2018P90	%change
EJ002.00	11.2	4.3	160.47%
EJ003.00	16.8	14	20.00%
EJ004.00	11.3	11.9	-5.04%
EJ006.00	23.7	39.2	-39.54%
EJ008.00	15.6	28.1	-44.48%

Station	2017P90	2018P90	%change
EJ009.00	5.9	5.4	9.26%
EJ014.00	17.5	32.5	-46.15%
EJ015.00	16.2	18.4	-11.96%
EJ016.00	12.6	10.6	18.87%
EJ017.00	2.7	2.7	0.00%
EJ018.00	3	3.8	-21.05%
EJ021.00	37.1	34.7	6.92%
EJ022.00	4.4	4.4	0.00%
EJ022.80	5.3	13	-59.23%
EJ023.00	2.6	15.5	-83.23%
EJ024.00	11.4	7.8	46.15%
EJ024.30	11.4	11	3.64%
EJ024.80	15.5	13.5	14.81%
EJ024.90	36	15.3	135.29%
EJ025.50	11.8	10.5	12.38%
EJ026.00	20.3	14.3	41.96%
EJ027.00	6.2	6.3	-1.59%
EJ027.902	20.3	17.2	18.02%
EJ028.70	14.8	11.7	26.50%
EJ029.40	37.4	29.2	28.08%
EJ030.00	93.3	52.1	79.08%
EJ030.50	16.4	17	-3.53%
EJ030.90	8.5	9.7	-12.37%
EJ031.00	40.1	21.8	83.94%
EJ031.50	12.5	9	38.89%
EJ033.00	5.2	4.3	20.93%
EJ034.00	4.2	3.2	31.25%

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

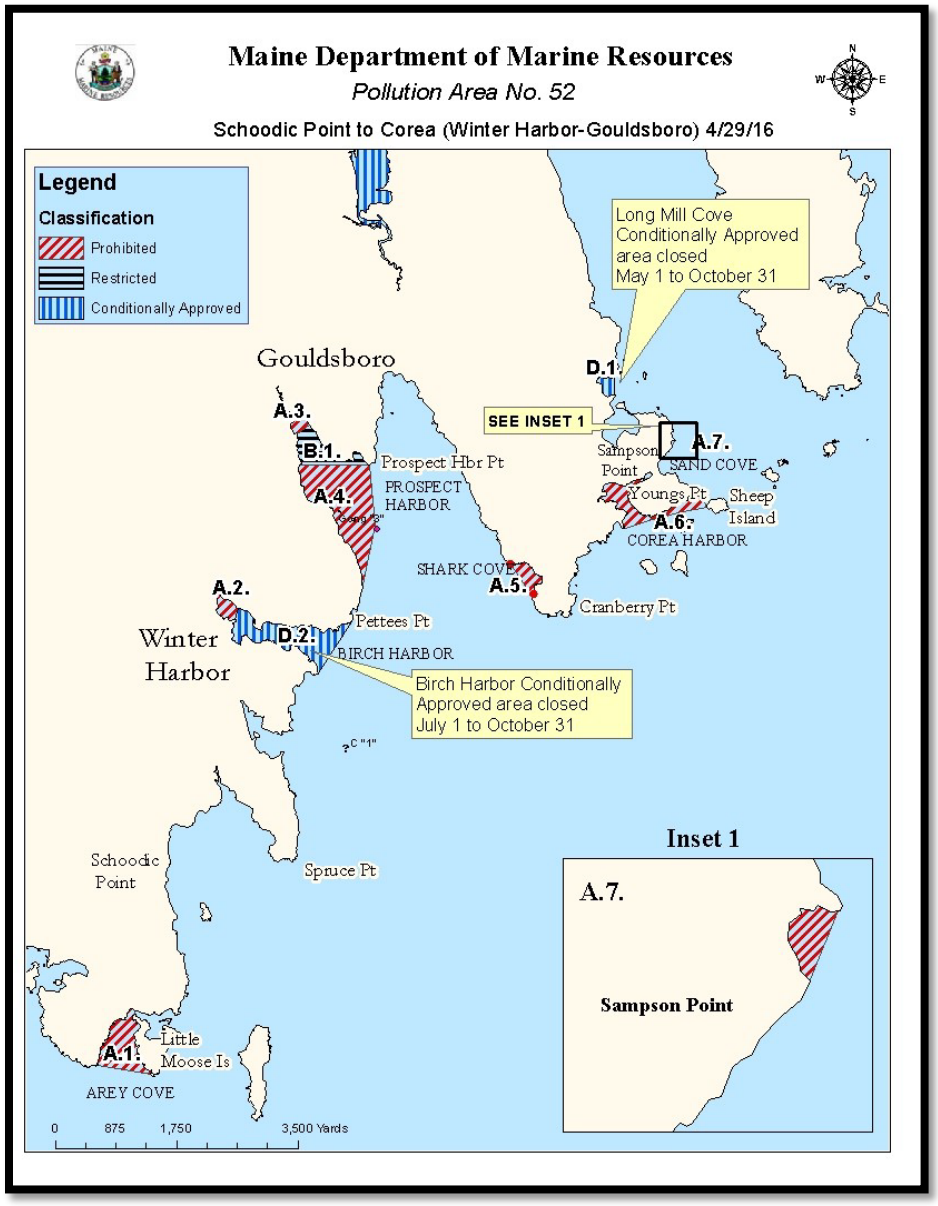
Reclassifications: Reclassification addendums to the sanitary survey report are in the DMR central files.

CAMP Reviews, Inspection Reports, and Performance Standards

Annual Review of Area 52 (D.2) Birch Harbor, Gouldsboro Conditional Area Management Plan

Scope
Birch Harbor: east of a line starting at the eastern tip of an unnamed point on the southwest shore of Birch Harbor located approximately 600 yards southeast of the Rt. 186 bridge at the head of the harbor, running northeast to another unnamed point on the north shore located approximately 467 yards southeast of the Rt. 186 bridge; AND west of a line beginning on the southeast tip of Pettees Point, running southwest to an unnamed point on the south side of the mouth of Birch Harbor. This area is closed from July 1 to October 31 and monitored by stations EJ 4, 6, and 8.

Figure 5. 52(**D.2) Seasonal Conditionally Approved Area Birch Harbor**



Compliance with management plan

All stations except EJ 6 within the conditional area meet approved standards during the open status. All conditional sampling stations except EJ 6 meet open approved criteria. EJ 6 and EJ 8 are on the Prohibited area margin and EJ 4 monitors the Conditionally Approved-Approved margin. Table 6 below shows sample results for the Conditionally Approved area during the open period in 2018.

Table 6. Birch Harbor CA P90 during current open Period November through June

Station	Class	Count	MFCount	GM	SDV	MAX	P90	Appd_Std
EJ004.00	CA	30	30	3.4	0.42	42	11.9	31
EJ006.00	CA	30	30	6.2	0.62	360	39.2	31
EJ008.00	CA	30	30	5	0.58	90	28.1	31

The Conditionally Approved portion of Birch Harbor no longer meets approved standards during the open period in 2018. The area was reevaluated and it was determined that the open period dates should be changed from November through June to October through May.

Table 7. Open date's October through May

Station	Class	Count	MFCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std	Min_Date
EJ004.00	CA	30	30	3	0.41	42	10.2	31	163	10/1/2015
EJ006.00	CA	30	30	3.6	0.45	98	13.7	31	163	5/12/2015
EJ008.00	CA	30	30	3.5	0.5	90	15.5	31	163	5/12/2015

Adequacy of reporting and cooperation of involved persons

The management plan for this conditional area does not require reporting. Marine law enforcement efforts and illegal harvester activity determines the compliance level for this growing area during the prohibited period.

Water sampling compliance history

Water samples are collected at least monthly during the open status and throughout the year.

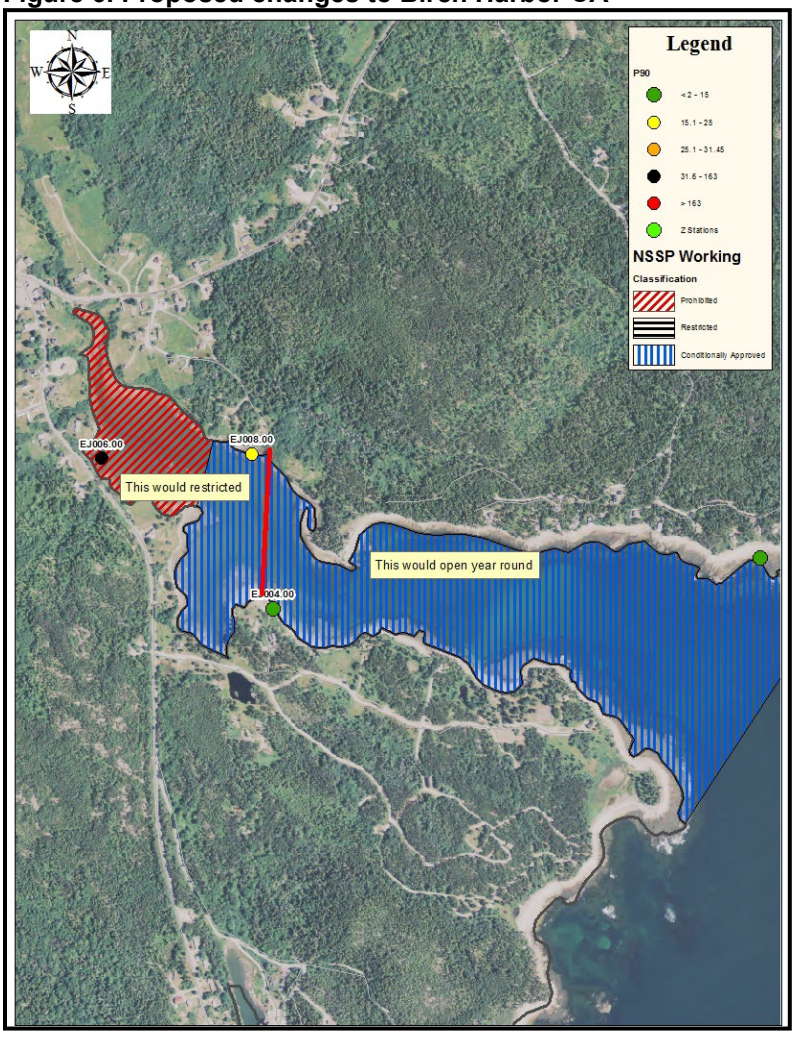
Table 8. 2018 sampling history Birch Harbor CA

		Adverse	Random		Total	Comments
Station	Class	Closed	Closed	Open		
EJ004.00	CA		4	8	12	
EJ006.00	CA		4	8	12	
EJ008.00	CA		4	8	12	

Analysis-Recommendations

No new pollution issues were identified during this review period. The current CA is being recommended for a decrease in size to just include that portion west of station EJ 6 and the open dates will be changed from October through May.

Figure 6. Proposed changes to Birch Harbor CA

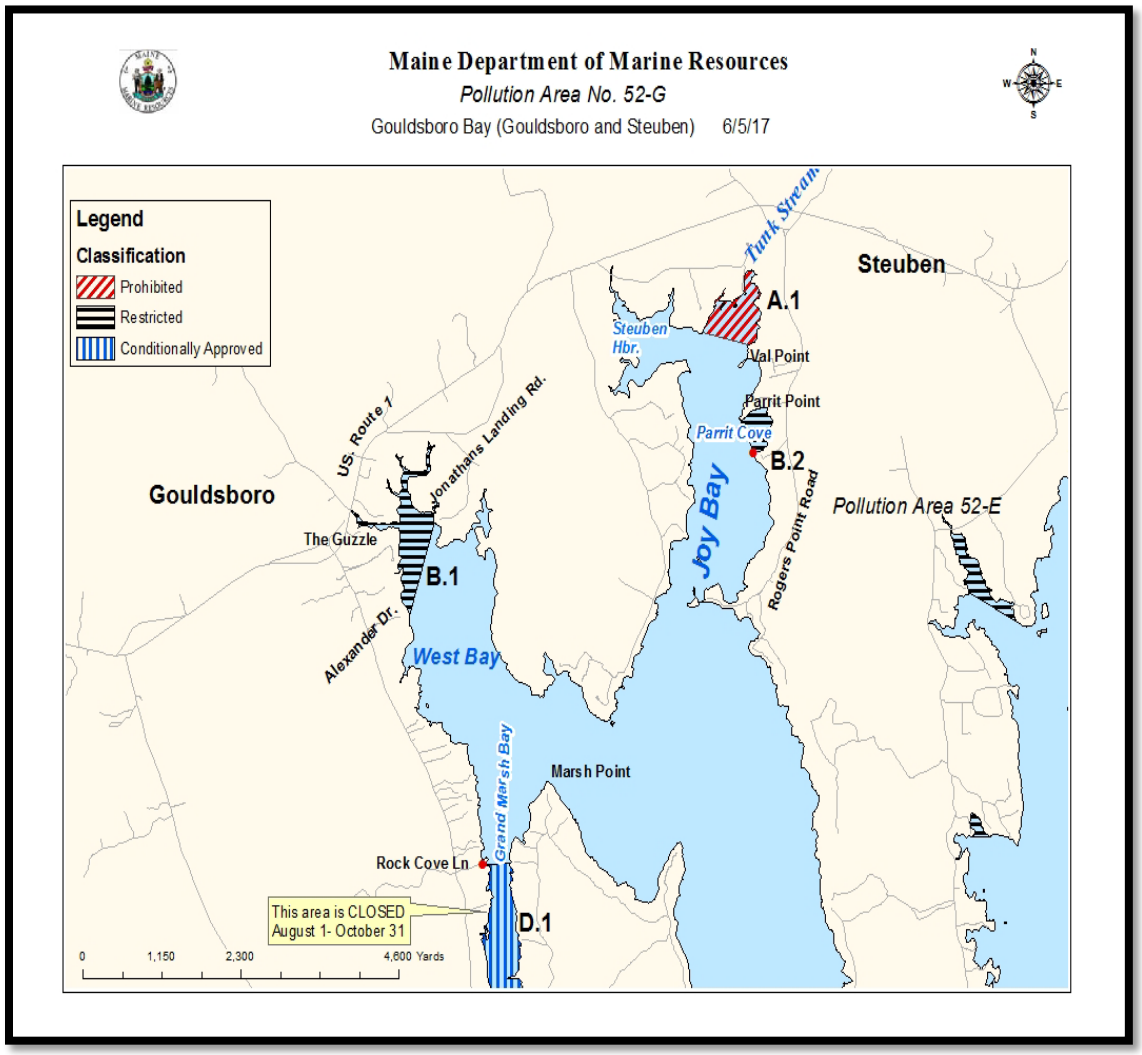


Annual Review of Area 52G (D. 1) Grand Marsh Bay, Gouldsboro Conditional Area Management Plan

Scope

Pollution Area 52G (D.1) Grand Marsh Bay in Gouldsboro is classified as Conditionally Approved seasonally with the open period from November 1 through July 31. The area is Conditionally Approved because water quality (Station EJ 24.3) scores are elevated during summer months. Grand Marsh Bay- south of a line that begins at a red painted post located on the western shore of Grand Marsh Bay at the end of Rock Cove lane, then running east to the opposite shore. This area is closed from August 1st to October 31st.

Figure 7. 52-G (D.1) Grand Marsh Bay Conditionally Approved Area



Compliance with management plan

The Grand Marsh Bay Conditional Area remains in compliance with the current conditional area management plan (CAMP). The area meets approved standards 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 growing area criteria

The area continues to meet the criteria for Approved harvest during the open status of November 1 through July 31 based on P90 calculations during the open status and no other known sources of pollution in the area.

Table 9. 2018 P90 EJ 24.3 open period

Station	Class	Count	MFCount	GM	SDV	MAX	P90	Appd_Std
EJ024.30	CA	30	30	3.5	0.38	24	11	31

Water sampling compliance history

This area was made Conditionally Approved in February 2014. Conditional area sampling is attempted monthly during the open status. The monitoring station is part of a scheduled monthly conditional area sampling run, CA3. The monitoring station (EJ24.3) was sampled monthly in the open status, meeting the NSSP Model Ordinance and Conditional Area Management Plan requirements.

Table 10. 2018 Sample Count

		Adverse	Random		Total	Comments
Station	Class	Closed	Closed	Open		
EJ024.30	CA		3	9	12	

Analysis-Recommendations

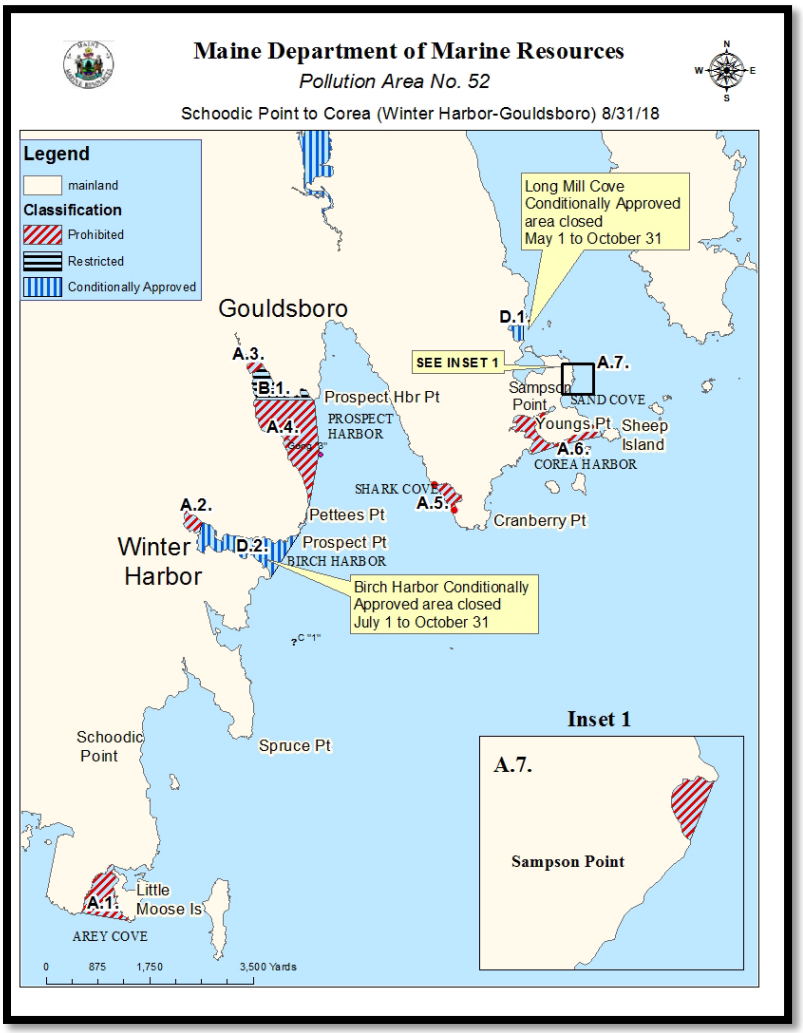
The Grand Marsh Bay Conditionally Approved area continues to meet the standards for seasonal Approved harvest during the open status and remains in compliance with the CAMP. This area has also met the approved standard using year-round data for the last three years. Based on this and the lack of pollution sources found during the 2018 shoreline survey this area is being recommended for an upgrade to Approved.

Annual Review of Area 52 (D. 1) Long Mill Cove, Gouldsboro Conditional Area Management Plan

Scope

The area is Conditionally Approved because water quality (Station EJ 23) scores are elevated during summer months. The conditional area is west of a line beginning on the shore at the southeastern tip of an unnamed point on the north shore of Long Mill Cove, running south to the opposite shore. This area is closed from May 1 to October 31.

Figure 8. 52 (D.1) Seasonal Conditionally Approved Area Long Mill Cove.



Compliance with management plan

The Long Mill Cove Conditional Area remains in compliance with the current conditional area management plan (CAMP). See CAMP annual reviews for information on annual compliance with the current CAMP.

Adequacy of reporting and cooperation of involved persons-

The management plan for this conditional area does not require reporting.

Marine law enforcement efforts and illegal harvester activity determines the compliance level for this growing area during the prohibited period.

Compliance with growing area criteria

Station EJ 22.8 and 23 meet approved criteria based on geometric means and P90 values during the open status.

Table 11. Open period P90 most recent 30

Station	Class	Count	MFCount	GM	SDV	MAX	P90	Appd_Std
EJ022.80	CA	30	30	3.3	0.45	82	13	31
EJ023.00	CA	30	30	3.22	0.53	700	15.5	31

Water sampling compliance history

Water samples are collected at least monthly during the open status and throughout the year.

Table 12. Area 52(D.1) 2018 Water sampling compliance history.

		Adverse	Random		Total
Station	Class	Closed	Closed	Open	
EJ022.80	CA		6	6	12
EJ023.00	CA		6	6	12

Analysis-Recommendations

The area is currently monitored by two stations EJ 22.8 and 23. It is open during the months of November through April. Based on observations made over the last three years, the 2018 shoreline survey and water quality meeting approved standards year-round this seasonal conditional area should be repealed. The complete write up for this reclassification can be found in the DMR central files.

Recommendation for Future Work

Water quality stations EJ 4 and 8 in the Birch Harbor conditional area 52 (D.2), meet approved standards year-round and this area will be recommended for a reduction in the current conditional area. The area to the west of EJ 6 is currently classified as Prohibited and based on the results of the 2018 shoreline survey and water quality standards this area will be upgraded to Restricted. The conditional area in Long Mill Cove, 52 (D.1) is being recommended for an upgrade to Approved based on stations EJ 22.8 and 23 meeting approved standards year-round and no point sources of pollution found during the 2018 shoreline survey. The current restricted area in West Bay (52G (B.1) is being recommended for an upgrade to Approved based on water quality meeting approved standards at station EJ 24.9 and the 2018 shoreline survey finding no points sources of pollution. The conditional area 52G (D) Grand Marsh Bay now meets approved standards using year-round data and will be suggested for an upgrade to Approved based on water quality data at station EJ 24.3. Water quality in Parrit Cove in Joy Bay 52G (B.2) meets approved standards at station EJ 31 and the shoreline survey in 2018 found no pollution sources in this area. This area is being recommended for an upgrade to Approved. The mouth of Tunk Stream 52G (A.4) is currently classified as prohibited. No point sources of pollution were identified during the 2018 shoreline survey and water quality at station EJ 30 now meets restricted standards. This area will be suggested for an upgrade to Restricted. The prohibited area in Prospect Harbor 52 (A.3) was surveyed in 2018 and no point sources of pollution were identified. EJ 14 is the station monitoring this area and meets the standard for restricted harvest. Based on these two factors the area is being suggested for an upgrade to Restricted. No stations in growing area EJ required a downgrade due to end of year 2018 P90 scores. The addendums for each of these proposed upgrades can be found in the DMR central files.

Table 13. Count table of samples collected in growing area EJ during the 2018 season.

		Adverse		Investigative	Random		Total	
Station	Class	Closed	Open	X	Closed	Open		Comments
EJ002.00	A					6	6	
EJ003.00	A					6	6	
EJ004.00	CA				4	8	12	
EJ006.00	CA				4	8	12	
EJ008.00	CA				4	8	12	
EJ009.00	A					6	6	
EJ014.00	R					6	6	
EJ015.00	R					6	6	

		Adverse		Investigative	Random		Total	
Station	Class	Closed	Open	X	Closed	Open		Comments
EJ016.00	A					6	6	
EJ017.00	P				6		6	
EJ018.00	A	5				6	11	flood
EJ021.00	P				6		6	
EJ022.00	A				6		6	
EJ022.80	CA				6	6	12	
EJ023.00	CA				6	6	12	
EJ024.00	A					6	6	
EJ024.20	A			6			6	
EJ024.30	CA				3	9	12	
EJ024.70	Z			6			6	
EJ024.80	R					6	6	
EJ024.85	Z			6			6	
EJ024.90	R					6	6	
EJ025.50	R					6	6	
EJ026.00	A	4	1			6	11	flood
EJ027.00	A					6	6	
EJ027.902	A					6	6	
EJ028.70	A					6	6	
EJ029.40	R					6	6	
EJ030.00	P				6		6	
EJ030.50	R					6	6	
EJ030.90	A					6	6	
EJ031.00	R					6	6	
EJ031.50	R					6	6	
EJ033.00	A	2				6	8	
EJ034.00	A	2				6	8	flood

References

National Shellfish Sanitation Program: Guide for the Control of Molluscan Shellfish, 2017 Revision;

Tide and Wind data, GOMOSS Internet site, West Penobscot Bay Buoy, 2001-2003.

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.

Town information, 2007-2008 Maine Municipal Directory, Maine Municipal Association, Augusta, Maine 04330

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

Data Layers, Maine Office of GIS, Augusta, Maine

Rainfall data, National Weather Service, Caribou, Maine

Maine Combined Sewer Overflow 2016 Status Report, Maine Department of Environmental Protection, April 2017

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.