GROWING AREA WY
Islesboro

Sanitary Survey Report

Report Date: 03-20-2013

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APPROVAL

Division Director:

_____ _____ Date: _____
Print name signature

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Executive Summary

This is a Sanitary Survey report for Islesboro, Shellfish Growing Area WY for the years 1997-2012 written in compliance with the requirements of the 2009 Model Ordinance and the National Shellfish Sanitation Program. Due to the lack of a sanitary survey of the southern section of island, the majority of this section has remained closed. In 2012 a full scale survey of the area was performed to potentially open sections of this area to harvest. As a result of this survey, 5 new pollution sources were found ranging from unlicensed overboard discharges to straight pipes, three of which are located on the southern section of Islesboro. Due to the new pollution sources as well as findings on certain water quality monitoring stations poor performance based on tidal stage, no areas on the southern section of island will be upwardly classified at this time to Approved. No new stations were added or deactivated and overall water quality has remained consistent from years past. The next sanitary survey is due in 2024 and the next Triennial in 2016.

Shellfish growing area WY includes the shoreline on the island of Islesboro and several adjacent smaller islands (Figure 1). Islesboro is a long narrow island, approximately 10 miles long by 2.5 miles wide at its widest point, located in the upper Penobscot Bay. The shoreline of Islesboro consists of sand and cobble beaches, with few actual mud flat areas. A detailed boundary description of Shellfish Growing Area WY can be found in the Public Health Division growing area files in Lamoine, Maine.

The island of Islesboro has a year round population of 653 (2010-2011 Municipal Directory). The population of Islesboro more than doubles during the summer months. Islesboro is very rural; there are no marinas, or large businesses along the shore. There is a small municipal wastewater treatment facility that serves a total population of 140 residents in the vicinity of Dark Harbor, on the southeast side of the island. All of the remaining systems on the island are private in ground systems, licensed overboard discharge systems or out houses and composting toilet systems. The entire shore along the southern half of the island has been classified as prohibited, as most of this area has not been previously surveyed. The eastern side of the southern half of the island contains few shellfish resources and the western side is frequented by cruising boats during the summer months. A comprehensive map of growing area WY with active sampling stations is included in Figures 1-3.

The entire island of Islesboro as well as the southern islands were surveyed in the summer and autumn of 2012.

Growing Area Description

Figure 1 Growing Area WY, with Active Water Stations

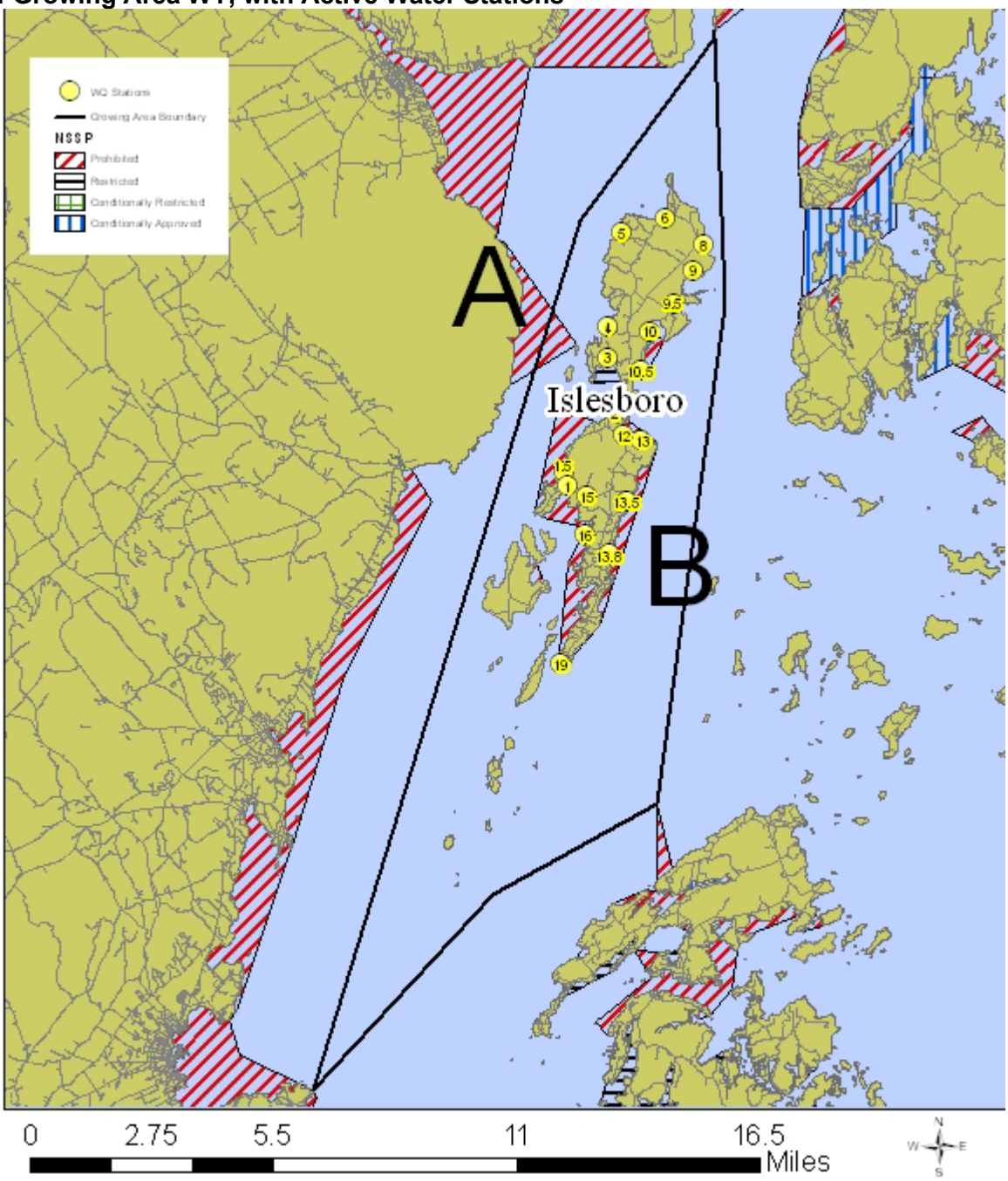


Figure 2 Growing Area WY Map A

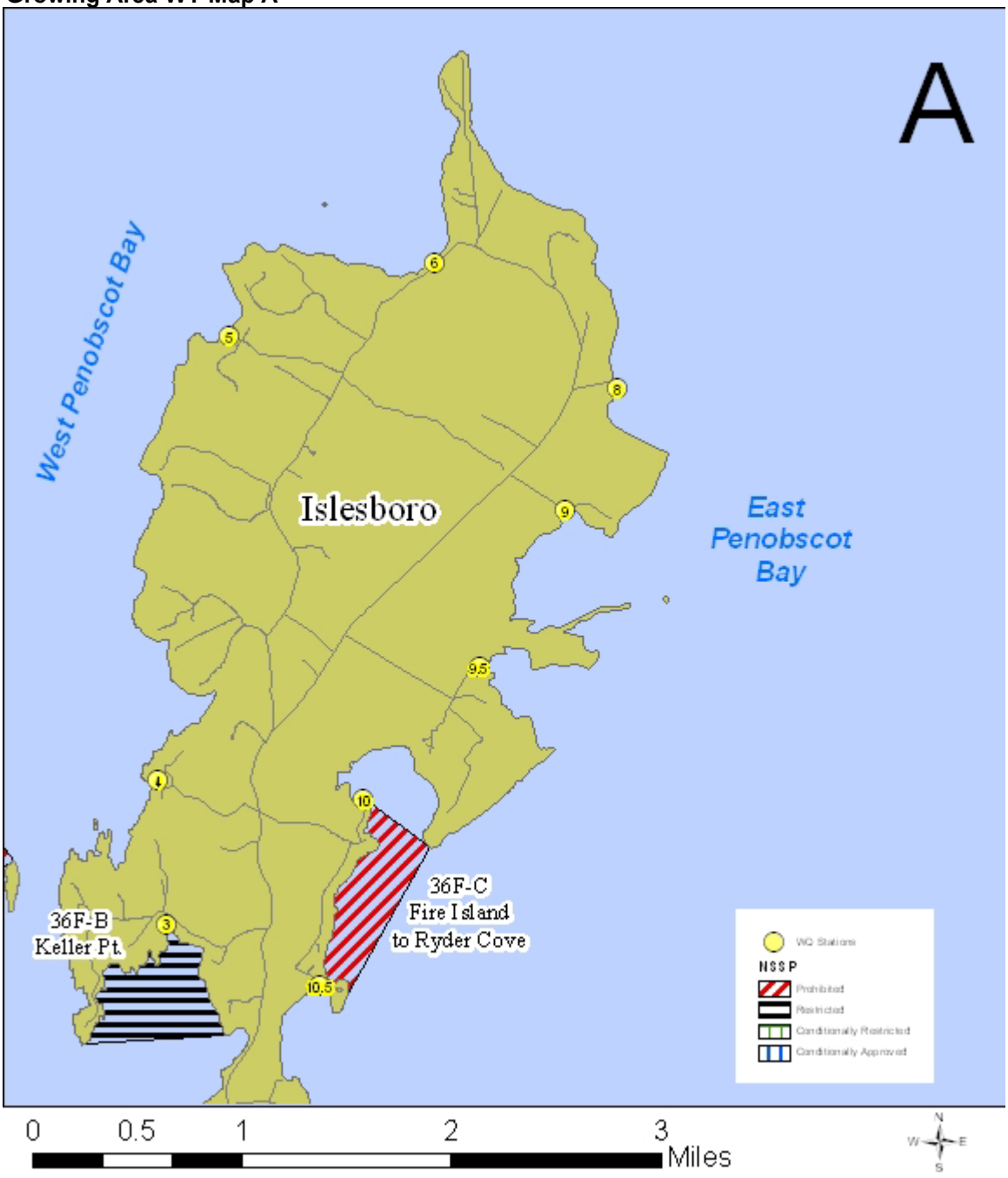
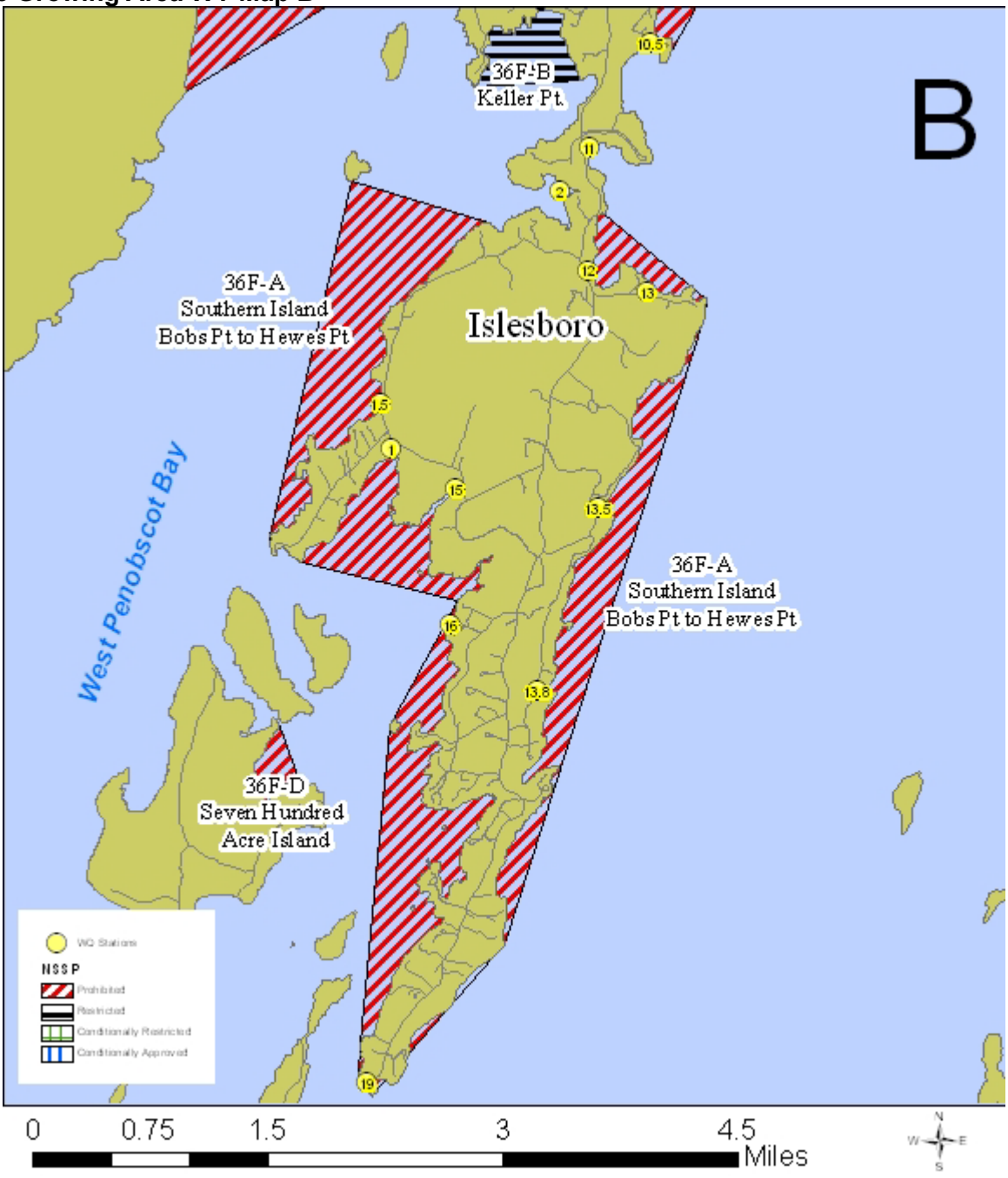


Figure 3 Growing Area WY Map B



History of Growing Area Classification

1999
February 11:

36F; … Bob's Point (at the mouth of Crow Cove) to the southern tip of Flat Island; then southwesterly to the southern tip of Grindel Point then easterly to red nun buoy #4, then northerly to the southern tip of a small unnamed point on the western shore of Broad Cove AND inside and easterly of a line drawn southerly from the tip of the unnamed point in the southern mouth of Jones Cove (locally known as Mill Cove) to the western shore of Thrumcap, then southerly to the prominent unnamed western point on Pendleton Point, then to the southern tip of Pendleton Point; then northeasterly to Gull Point near the southern end of Islesboro Island; then northerly to Hewes Point; then northerly to the Bluffs, AND inside and southerly of a line drawn southeast across Cradle Cove at Seven Hundred Acre Island from a red painted post located at the prominent unnamed point on the northwestern side of Cradle Cove to the end of the prominent stone pier on the eastern point of Cradle Cove.

EXCEPTION: The following northeastern shores, flats and waters of Islesboro area open for the taking of clams, mussels, oysters and quahogs: (1) that portion of Closed Area 36F north of a line beginning at the southern end of the Bluffs and running northwesterly to the northern end of Ryders Cove Rd,; and (2) that portion of Closed area 36F westerly of a line running from the southern tip of Fire Island to the northeast tip of Hewes Pt.

2000
October 20:

36F; Closes the south section of Islesboro from Bobs Point south to Grindle Point, then north to Broad Cove.

Closes Jones Cove (Mill Cove) to the Thrumcap, to Pendleton Pt to Bounty Cove.

Closes a section of Parker Cove from Point of Comfort to an unnamed point on Hutchins Island

Closes Fire Island from the Bluffs to the north end of Ryders Cove

Closes Cradle Cove on Seven Hundred Acre Island

2002
No changes made.

2003
No changes made.

2004
No changes made.

2005

July 22:

36F, Opened Parker Cove for shellfish harvest and closed Ryder Cove due to possible straight pipe at the mouth of Ryder Cove

2006
No changes made.

2007
June 13:

Closed Area No. 36-F, This new regulation opens Ryder Cove for shellfish harvest and closes the southern half of the island for shellfish harvest in the town of Islesboro.

Department personnel have surveyed and sampled the newly opened area and have determined that Ryder Cove flats and waters can be opened for shellfish harvest without threat to public health. The areas that remain closed are still subject to microbiological contamination and remain closed to protect the public health.

2008
No changes made.

2009
No changes made.

2010
No changes made.

2011
No changes made.

2012
No changes made.

Current Classification(s)

At the end of the 2012 review year, shellfish growing area WY had areas classified as:

Prohibited: 9 stations: WY 1, 1.5, 12, 13, 13.5, 13.8, 15, 16 and 19
Restricted: 1 Station: WY 3
Approved: 10 stations: WY 2, 4, 5, 6, 8, 9, 9.5, 10, 10.5 and 11

Activity during Review Period

2001:
No classification changes were made this year. Drive thru surveys were conducted on same dates as sample collections.

2002:
No classification changes were made this year. Drive thru surveys were conducted on same dates as sample collections.

2003:
No classification changes were made this year. Drive thru surveys were conducted on same dates as sample collections.

2004:
No classification changes were made this year. Drive thru surveys were conducted on same dates as sample collections.

2005:
Opened Parker Cove for shellfish harvest and closed Ryder Cove due to possible straight pipe at the mouth of Ryder Cove.
Station WY9 reclassified from Prohibited to Approved due to the removal of a dwelling and pipe.
Station WY10 reclassified from Approved to Prohibited due to the presence of a pipe.
Station WY7 was deactivated.
Station WY 16 was created to better monitor the closure line.
Drive thru surveys were conducted on same dates as sample collections.

2006:
No classification changes were made this year. Drive thru surveys were conducted on same dates as sample collections.

2007:
Station WY10 reclassified from Prohibited to Approved. Reopened Ryder Cove to shellfish harvest due to a holding tank being installed to replace the straight pipe.
Stations WY1 and WY15 (Broad Cove) reclassified to Prohibited due to poor water quality.
Station WY3 reclassified from Approved to Restricted due to poor water quality.
Station WY1.5 reclassified from Approved to Prohibited due to poor water quality.
Drive thru surveys were conducted on same dates as sample collections.

2008:
Drive through survey conducted in November. Several streams sampled at this time.

2009:
Drive through survey conducted in May. No new pollution sources were identified at this time.

2010:

A shore line survey was completed on the islands of: Warren, Spruce, Seven Hundred Acre, Minot, Lassel and Ensign. The only pollution source identified was a small marina off the northeast side of Seven Hundred Acre Island. This area is currently classified as Prohibited.
Drive through surveys were conducted during the scheduled boat runs.

2011:
Drive through surveys were conducted during the scheduled boat runs.

2012:
A shoreline survey was completed for the entire growing area including the islands of Job, Seven Hundred Acre, Warren and Spruce Islands.
Drive through surveys were conducted during the scheduled boat runs.

Pollution Sources Survey

Figure 4 Pollution Source WY Map A

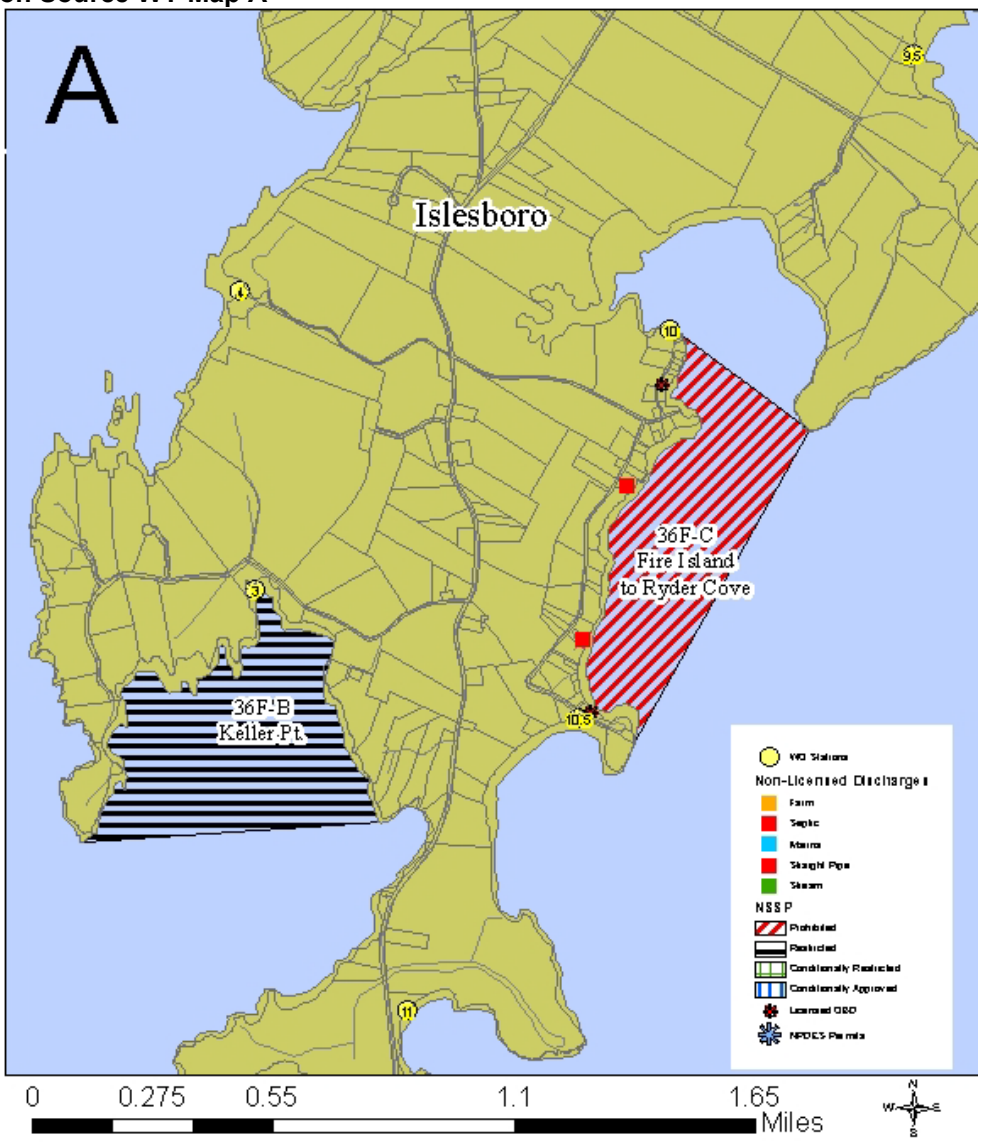
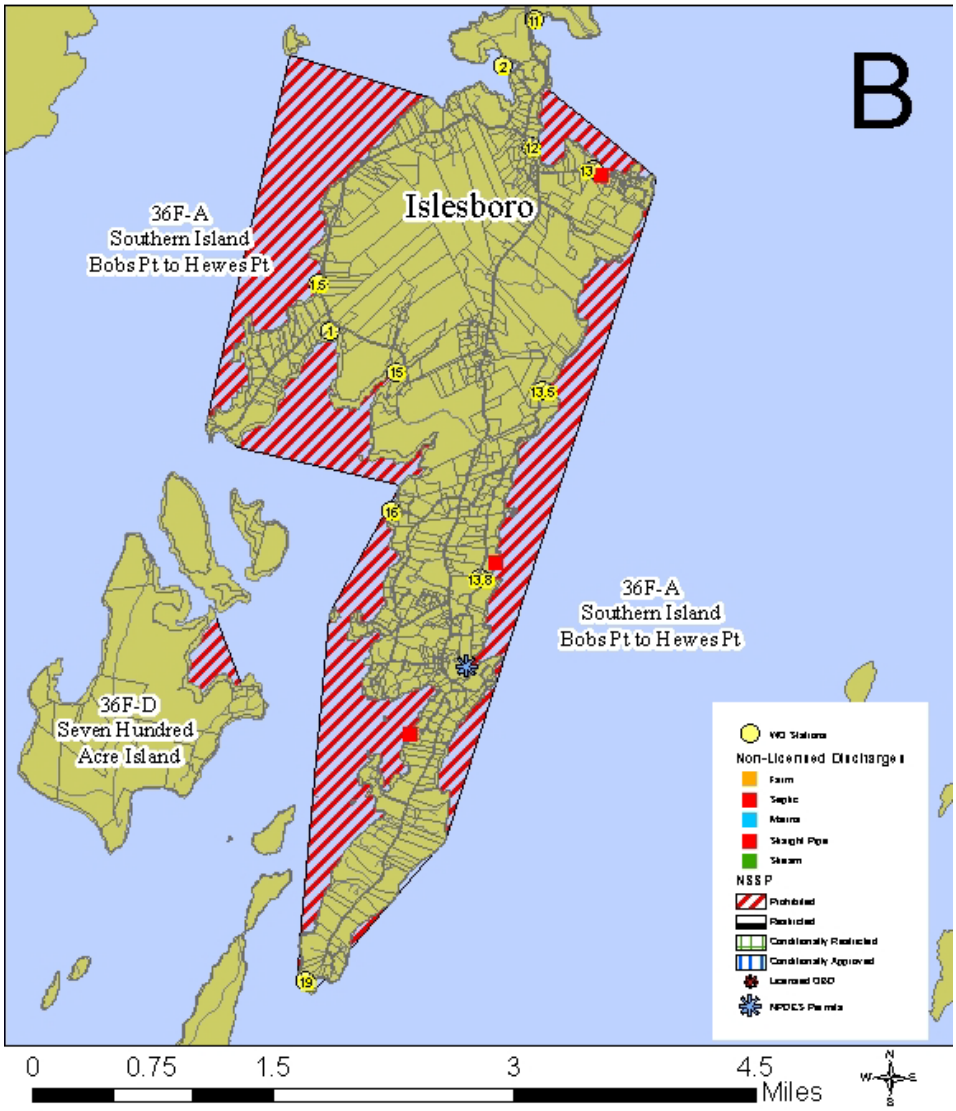


Figure 5 Pollution Source Map B



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

Domestic Waste *(IG Systems and OBDs) (make sure to confirm closure size for OBDs)*

Growing Area WY consists of 41 GASSIDs. In 2012, there were approximately 500 properties visited, consisting of approximately 16 outhouses and 340 in ground systems. There is one Licensed Plumbing Inspector (LPI) for the island and five problem forms were submitted to the town office and LPI.

The following survey information was gathered during the 2012 survey of the northern and southern portion of Islesboro as well as the surrounding islands. Survey work on the northern section began at Hewes Pt and continued northerly in a counter clockwise direction. The southern section was surveyed from the ferry terminal and south counter clockwise and back to the beginning. Surveys were done on foot on the islands of Seven Hundred Acre, Warren and Spruce. The following islands in Growing Area WY were determined uninhabited and not surveyed: Hutchins, Mouse, Goose, Saddle, Lime, Lasell, Mark, Little Bermuda, Flat, Seal and Ram. The shoreline survey started at the Islesboro Ferry Terminal and continued in a northerly direction along the shore to Turtle Head and around the island in a southerly direction along the eastern side of the island to Ryders Cove. All dwellings within 500 feet of the shore and or a drainage entering the shore were inspected. All of the dwellings utilize private systems consisting of either in ground, licensed overboard discharges, outhouses, or composting type systems.

Three problem forms were sent in to the Islesboro town office during the 2012 shoreline survey concerning questions on potentially unlicensed overboard discharges. All three of these questionable systems are currently located in prohibited areas, 36F-A and 36F-C (See Figures 4 and 5). There have been no updates from the town office or LPI regarding these questions as of April 2013.

A fourth problem form was sent into the town office regarding a pipe found discharging into a creek from a house located on Hewes Point Road. The pipe discharges in a creek and into a culvert into Islesboro Harbor. This area is in a prohibited area, 36F-A. There have been no updates from the town office or LPI regarding these questions as of April 2013.

The last problem form concerns a question on a potential straight pipe located on East Shore Drive. This pipe discharges directly into a prohibited area, 36F-A. There has not been a reply from the town office or LPI regarding this question as of April 2013.

Details of the problem forms filed are as follows:

Table 1 Description of Problems Identified During the 2012 Shoreline Survey

GASSID	MAP/LOT	DESCRIPTION	SURVEY DATE	LPI RESPONSE	Closure Area
WYA0296.00	43/29	766 Billy Shore Dr. Potentially unlicensed OBD	11/9/12	None	36F-A
WYA0309.00	42/9	850 Billy Shore Dr. Unlicensed OBD	11/15/12	None	36F-A
WYA0508.00	11/35	195 Jetty Rd. Appears to be an unlicensed OBD, black pipe goes overboard 25' south of clubhouse	12/12/12	None	36F-A
WYA0349.00	41/37	181 Hewes Pt. Rd Straight pipe SW corner of house, discharges into creek	11/1/12	None	36F-A
WYA0403.02	13/45B	378 E Shore Dr, potential straight pipe	11/29/12	None	36F-A

Domestic Waste Pollution Areas:

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

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

OBDs are licensed and inspected by the Maine Department of Environmental Protection. At each inspection, DEP looks for tags on each treatment unit identifying the service contractor and the last date of service. If an OBD is not properly maintained, or if the OBD malfunctions, it has the potential to directly discharge untreated wastewater to the shore; therefore, preventative closures are implemented surrounding every OBD located in growing area XX (Table X). 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 depth of the receiving water that each OBD discharges to; the fecal concentration used for this dilution calculation is 1.4X105 FC /100 ml. All current closures are of adequate size to protect public health.

There are 2 licensed over board discharges (OBDs) that discharge their treated effluent into the waters of the prohibited area 36F-C, including Ryder Cove and Sabbath Day Harbor. DEP ID 6426 discharging into Sabbath Day Harbor and DEP ID 5258 discharges into Ryder Cove, both are permitted discharge up to 600 GPD. OBD 6426 has a required dilution area of 0.04 acres and OBD 5258 has a dilution area requirement of 0.07 acres. Both OBDs are located in a prohibited zone comprised of 132 acres (Figure 4). No OBDs have been removed over the past three review years.

Municipal WWTP

The Dark Harbor Treatment Plant is located on the east side of Islesboro on Pendleton Point Road. The collection system was installed in 1908 and consists of approximately 3,400 feet of 6 and 8 inch clay pipe. Approximately

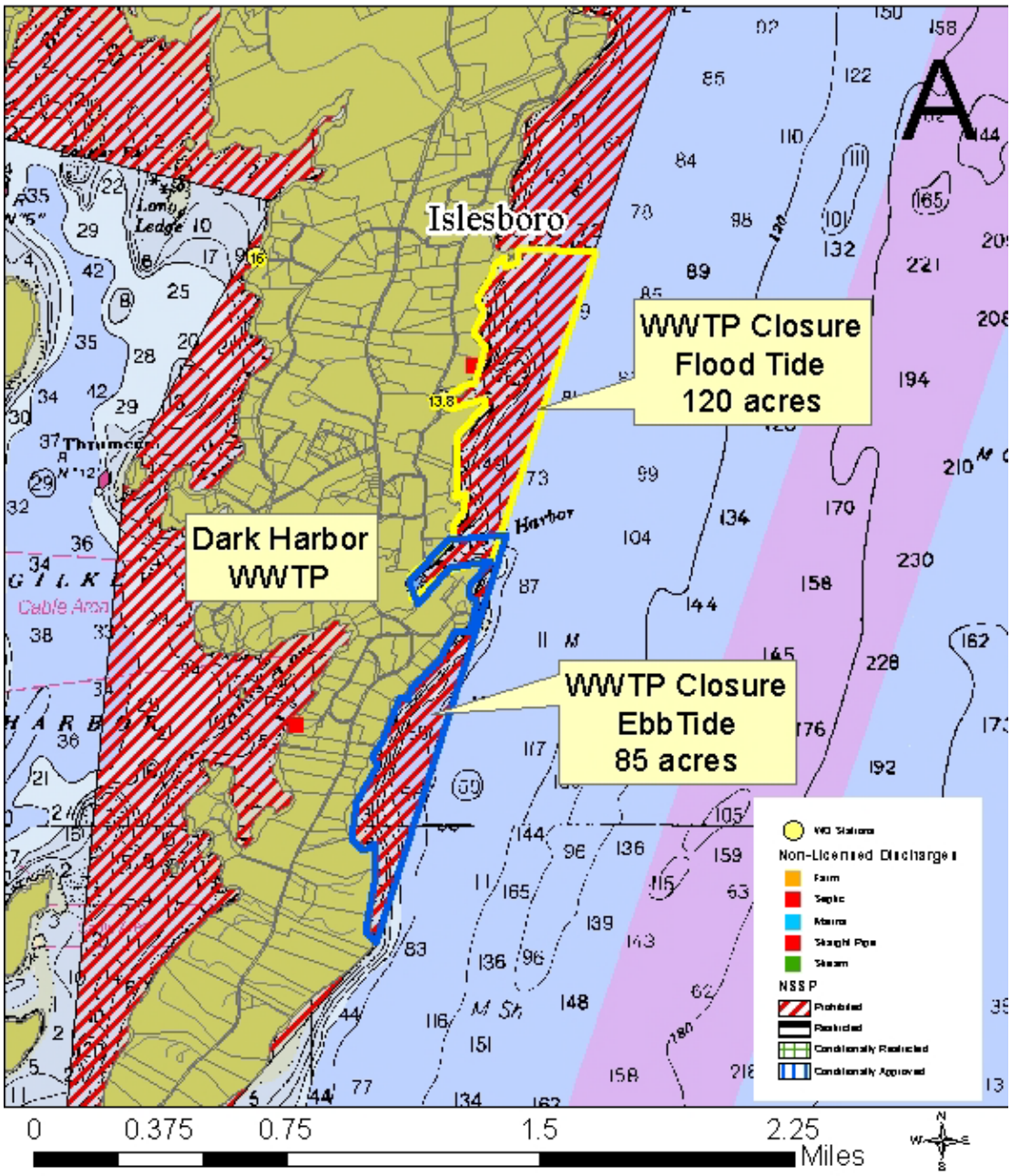
2,800 feet of the collection system serves Main Street and the remaining 600 feet serves Derby Road. The collection system does not have any combined sewer overflow points, however there is considerable inflow and infiltration which flows to the waste water treatment facility. The treatment facility commenced operations in 1980. The facility provides a secondary level of treatment via three sand filters, each 70 feet wide and 100 feet long. The sand filters are covered with a 24-30 inch thick layer of clay and these are used in rotation, two on and one off. There are three series of septic tanks, each having a 5,000 gallon capacity, a pump station having two 100 gallons per minute submersible pumps, a force main, a splitter box and a 1,000 gallon chlorine contact chamber for disinfection.

The treatment facility presently serves 25 residential dwellings, four seasonal businesses and one year round boat yard for a total population of approximately140 people, with fifty percent of this population being seasonal. During 2011 and 2012, repairs were made to the outfall pipe which was so deteriorated that it discharged into the Dark Harbor Pool. The upgraded pipe now discharges out beyond the Pool and into approximately 20 feet of water. Other upgrades to the plant during last three years include relocating the chlorinator further from the discharge site and closer to the filter bed and the three sand filters were upgraded at this time.

There is continuous chlorination only during the summer months, from May 15th –September 30th. Sludge is pumped every year and spread on Islesboro's sludge site in the center of the north end of the island (tax map 3L, lot #3; license # S-05751-53-C-R). The treatment facility has no overflow points as the sewers were sealed in 1994. Dilution calculations based on the treatment facility's average wet weather flows, which is also the license agreement figure of 63,700 GPD discharge, requires a closure zone of 78.2 acres around the outfall. As a result of the 2012 shoreline survey, there is a 120 acre dilution north of the plant to take into consideration the average wet weather flows on the flooding tide and an 85 acre dilution on the south shore of the island taking into consideration the average wet weather flows on an ebbing tide. Figure 6 below shows the two dilution zones for the Dark Harbor plant. This section of island is bold shore and does not contain clam or mussel resource. The currents travel north and south along the shore due to the currents of the rivers systems. Any effluent coming out of the cove will be swept along the shore and be well contained within the prohibited areas. The bathymetric contours along the southeast shore of Islesboro drop off to 70 feet and more right offshore of "the pool" where the WWTP discharge is located resulting in rapid mixing.

Additional information regarding the current operations at the Dark Harbor Treatment Plant can be found in the treatment plant review form and the 2012 license agreement which are filed in the Area WY, Sewage Treatment Plant File in the Public Health Division's Offices in Lamoine, Maine.

Figure 6 Dark Harbor WWTP Dilution Zones



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Industrial Pollution

There are no industrial pollution areas in Shellfish Growing Area WY.

Marinas and Mooring Fields

There are three small boatyards in this growing area that are "storage and repair" yards, and none of these facilities have marinas. Two of the yards have a few (6-8) moorings that are used primarily for seasonal day-sailors. One of these mooring fields is located on Seven Hundred Acre Island and is located within the prohibited zone 36F-D. The other is located near sample station WY16 and is found within the prohibited zone 36F-A. The third yard, which is located away from the shore, only has a launching railway on the shore. The water quality in the vicinity of this boatyard is classified as approved and water quality is monitored by sampling station WY5.

Stormwater

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

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

Although it is a federal program, in the state of Maine, the Phase II Stormwater permit is issued and regulated by the Maine DEP (Chapter 500 and 502). Under the MS4 regulations, each municipality must implement the following six Minimum Control Measures: (1) Public education and outreach, (2) Public participation, (3) Illicit discharge detection and elimination, (4) Construction site storm water runoff control, (5) Post-construction stormwater management, and (6) Pollution prevention/good housekeeping. The permit required each city or town to develop a draft Stormwater Management Plan by September 3, 2003 that will establish measurable goals for each of the Minimum Control Measures. The Town must document the implementation of the Plan, and provide annual reports to the Maine DEP. Currently the discharge of stormwater from 28 Maine municipalities is regulated under the Phase II permit requirements, however, no municipalities located within the boundaries of growing area WY fall under these regulations. Additionally, the Maine Stormwater Management Law provides stormwater standards for projects located in organized areas that include one acre of more of disturbed area (Maine DEP 2009).

Non-Point Pollution Sources *(streams, etc)*

Non-point source (NPS) pollution is water pollution affecting a water body from diffuse sources, such as polluted runoff from agricultural areas draining into a river, or wind-borne debris blowing out to sea. Nonpoint source pollution can be contrasted with point source pollution, where discharges occur to a body

of water at a single location, such as discharges from a chemical factory, urban runoff from a roadway storm drain or from ships at sea. NPS may derive from many different sources with no specific solution to rectify the problem, making it difficult to regulate.

A total of 10 samples were taken from freshwater streams during the last 3 year review period. It was a dry time as not all streams were running, so sampling was limited to 10 streams. Only one stream sampled had a fecal coliform score greater than 100FC/100mL. This unnamed stream located at water quality sample station 8 continues to meet approved water quality standards at the time.

Table 2 Stream Samples 2010-2012

Town	ID	Pollution Area	Date	Flow CFS	Fecal
Islesboro	WY13.8S1	36-F(A.2)	11/28/12	0.08	1.9
Islesboro	WY 13S1	36-F(A.2)	11/28/12	0.30	16
Islesboro	WY 13S1	36-F(A.2)	11/18/15	0.72	4
Islesboro	WY 12S1		11/28/12	NA	NA
Islesboro	WY 12S1		11/18/15	1.20	1.9
Islesboro	WY 9.5S1		11/18/15	0.039	1.9
Islesboro	WY 8S1		11/28/12	0.004	280
Islesboro	WY 8S1		11/18/15	0.01	2
Islesboro	WY 6S1		11/28/12	NA	NA
Islesboro	WY 6S1		11/18/15	1.79	1.9
Islesboro	WY 5S1		11/28/12	0.07	1.9
Islesboro	WY 5S1		11/18/15	0.12	1.9
Islesboro	WY 4S1		11/28/12	0.42	40
Islesboro	WY 4S1		11/18/15	0.40	1.9
Islesboro	WY 3S1	36-F(B.1)	11/18/15	0.139	6
Islesboro	WY PS1		11/28/12	0.049	20
Islesboro	WY 1.5S4		11/18/15	0.00012	20
Islesboro	WY 1.5S2		11/28/12	0.04	36
Islesboro	WY 1.5S2		11/18/15	0.017	12
Islesboro	WY 1.5S1		11/28/12	0.05	14
Islesboro	WY 1.5S1		11/18/15	0.56	18

Agricultural Activities

There are no large scale agricultural activities on the island. There are some small scale places with chickens, goats and horses but these locations do not impact the receiving waters.

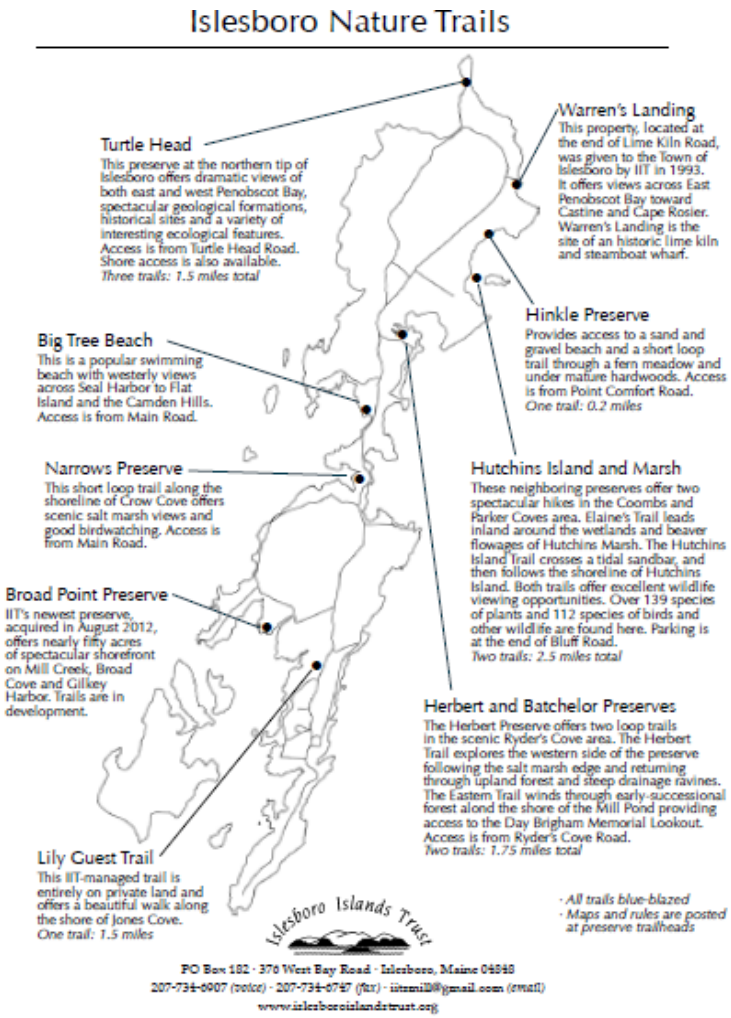
Domestic Animals and Wildlife Activity

The shores have normal populations of upland game, waterfowl and deer. Large numbers of sea birds are noted in the fall and spring as this area is on the migration flyway. No impact to surrounding water quality has been detected.

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

Islesboro has nine nature trails; Turtle Head, Big Tree Beach, Narrows Preserve, Broad Point Preserve, Lily Guest Trail, Herbert and Batchelor Preserves, Huthins Island and Marsh, Hinkle Preserve and Warren's Landing. None of these nature conservation/ recreation areas directly impact the growing area. The map below shows the location of each area. Figure 7 below shows from the Islesboro Islands Trust, www.islesboroislandstrust.org/documents/IIT%20Newsletter%202010.pdf

Figure 7 Islesboro Island Trust Nature Trails



Hydrographic and Meteorological

Tides

Coastal Maine experiences a mixed, semi-diurnal tide, with diurnal inequalities that are more pronounced on spring tides. National Oceanic and Atmospheric Administration data for station at Stonington, Maine indicate a mean tidal range of over 10 ft. Currents in the area are predominantly driven by the tides. All along the coast of Maine, the tide flows generally to the north and east and ebbs to the south and west. Weather conditions effect tidal ranges and current speeds, sometimes very strongly.

In order to explore the effect of tide on water quality in growing area WY, samples collected at flood and ebb tides were analyzed and are presented in the tables below.

Figure 8 WY P90 Most Rescent 30 vs. Tide Stage

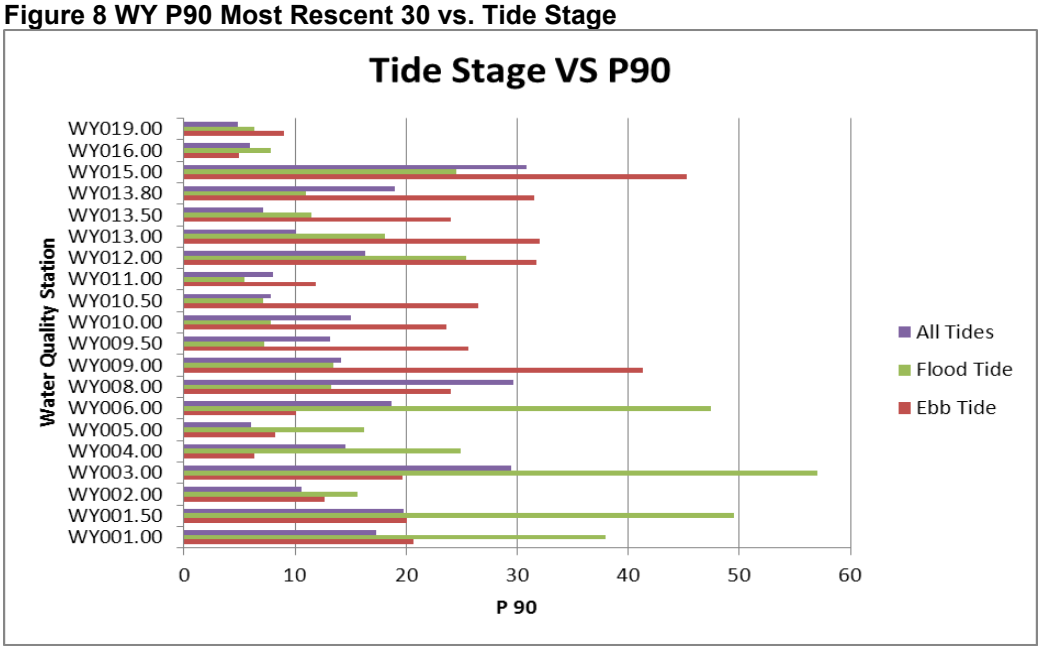


Figure 9 WY P90 Most Recent 30 vs. Tide Stage with Classifications

Station	ALL P90	EBB P90	FLOOD P90	Current Classification
WY001.00	17.3	20.7	38	P
WY001.50	19.8	20.1	49.5	P
WY002.00	10.6	12.7	15.6	A
WY003.00	29.5	19.7	57	R
WY004.00	14.5	6.3	24.9	A
WY005.00	6	8.2	16.2	A
WY006.00	18.7	10.1	47.4	A
WY008.00	29.7	24	13.3	A
WY009.00	14.1	41.3	13.5	A
WY009.50	13.2	25.6	7.2	A
WY010.00	15	23.6	7.8	P
WY010.50	7.8	26.5	7.1	A
WY011.00	8	11.9	5.5	A
WY012.00	16.3	31.7	25.4	P
WY013.00	10.1	32	18.1	P
WY013.50	7.1	24	11.5	P
WY013.80	19	31.5	11	P

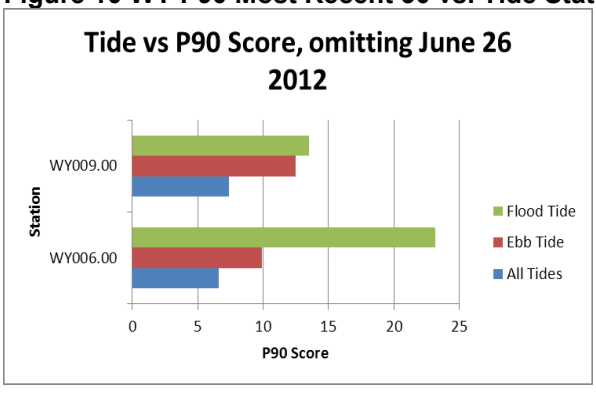
Station	ALL P90	EBB P90	FLOOD P90	Current Classification
WY015.00	30.8	45.3	24.5	P
WY016.00	5.9	5	7.8	P
WY019.00	4.9	9	6.3	P

As seen in Figures 8 and 9 above, there are stations that exhibit higher P90's on certain tidal stages (the classification of the station is noted in the brackets). Stations seemingly affected on the flood are WY 1[P], 1.5[P], 3[R] and 6[A] and stations adversely impacted by the ebbing tide are WY 9[A], 13[P] and15[P]. Only two of these stations are currently classified as Approved (WY6 and WY9), all others are classified as Prohibited or Restricted.

The sanitary survey conducted in 2012 did not identify point sources in the stations most affected by tidal stage (excepting station WY13, a straight pipe was found discharging from a house and a problem form was sent to the LPI). Stations WY1, 1.5 and 15 are currently prohibited or restricted and as a result of these stations not meeting approved standards on flooding tides, this section of island will remain closed to harvest. Water quality station WY2 monitors the northern aspect of this closure and this station currently meets approved standards during all tidal stages.

The stations with failing P 90s during flood tides are primarily located on the west side of Islesboro (excepting station WY 15) whereas the stations affected by ebb tides are primarily located on the eastern shore of the island. Two approved stations, WY6 and WY9 have p90s that are seemingly affected by tide, however the geomean continue to meet Approved standards. Water quality station WY 6 has a p90 of 47.4 and geomean of 5.4 on flood stage and WY9 has a p90 of 41.3 and geomean of 5.3 on the ebb. Two large rain events occurred in June of 2012; 3.3 inches of rain fell over a 3 day period. During the first event, 1.9 inches of rain fell, and two days later, 1.4 inches of rain fell. Due to the size of the Penobscot River watershed as well as the Passagassawakeag watershed, the two large rain events could potentially affect Islesboro for many days after consecutive heavy rainfalls. When the data from 26 June 2012 is discounted, the p90 scores for both approved stations meet approved classification standards. If the rain event was actually greater than what was recorded by the nearest rain gauge, thus necessitating a flood closure, the data would be collected as an adversity and not used for classification. The graph below shows the P90 scores for the two impacted approved stations when the sample impacted with 3.3 inches of rain is removed from the dataset. Both stations continue to meet approved classification standards.

Figure 10 WY P90 Most Recent 30 vs. Tide State - Omitting 3.3 inch Rain Event



Rainfall

In order to investigate how water quality is impacted by rainfall events which do not necessitate an emergency flood closure, a rainfall assessment for all stations in growing area WY was completed. For this assessment, the maximum fecal coliform score related to each rain event per station are displayed using data points which were collected

during rainfall events; cumulative rainfall events were recorded up to 72 hours prior to sample collection (sum of rainfall recorded in the AM on day of sample, day before sample and two days before sample was taken; Table 3). In this calculation, all random data collected between 2008 and 2012 were included.

Table 3 Rain Amounts vs. FC/100mL 72 Hour Rain Events: 2008-2012

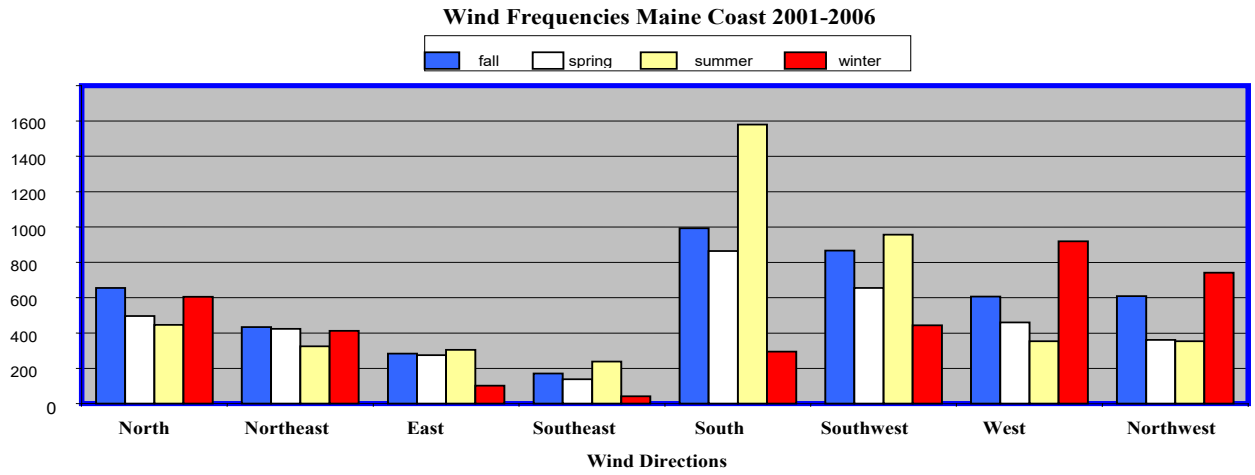
STATION	0.02	0.1	0.19	0.31	0.43	0.49	0.63	0.73	0.95	1.03	1.37	1.5	1.67	3.3
WY001.00	1.9	1.9	1.9	1.9	41	1.9	85	1.9		16	2	2	1.9	66
WY001.50	1.9	1.9	1.9	1.9	62	1.9	6	1.9			6	2	2	1700
WY002.00	1.9	1.9	1.9	1.9		1.9	24	1.9	4		20	4	1.9	82
WY003.00	1.9	1.9	1.9	1.9	20	1.9	70	1.9			1.9	140	2	1160
WY004.00	1.9	1.9	1.9	1.9	1.9	1.9	92	1.9			4	4	14	340
WY005.00	1.9	1.9	1.9	1.9	4	1.9	1.9	1.9		2	8	2	1.9	14
WY006.00	2	1.9	1.9	5.4	4	2	4	1.9			2	20	12	1700
WY008.00	1.9	1.9	2	2	102	1.9	36	6			2	4	14	1700
WY009.00	1.9	1.9	1.9	1.9	6	1.9	100	1.9			1.9	1.9	1.9	380
WY009.50	1.9	1.9	1.9	2	2	1.9	42	1.9			1.9	2	29	340
WY010.00	1.9	1.9	1.9	1.9	7.3	1.9	8	1.9			1.9	4	4	1700
WY010.50	1.9	1.9	1.9	1.9	2	1.9	50	1.9			1.9	2	4	74
WY011.00	1.9	2	1.9	1.9	1.9	1.9	8	1.9			2	1.9	8	180
WY012.00	1.9	1.9	1.9	2	2	1.9	1.9	6			6	2	88	580
WY013.00	1.9	1.9	1.9	1.9	1.9	4	1.9	2			6	2	54	12
WY013.50	1.9	1.9	1.9	1.9	2	1.9	1.9	1.9		1.9	1.9	1.9	48	6
WY013.80	1.9	1.9	1.9	1.9	1.9	1.9	10	2		4	1.9	1.9	62	1700
WY015.00	1.9	1.9	1.9	1.9	4	1.9	20	1.9		62	2	62	60	1700
WY016.00	1.9	1.9	1.9	1.9	1.9	1.9	6	2		1.9	2	11	9.1	36
WY019.00	1.9	1.9	1.9	1.9	1.9	1.9	13	1.9		1.9	1.9	1.9	4	24

This chart shows the score at each station during recorded rain events in growing area WY. The rain data above is from single rain events, with no repeatability found within the dataset. Due to insufficient data and the variability within the scores during rainfall events, a rainfall closure is not necessitated for this area.

Winds

An analysis of GOMOOS data (2001-2006) show winter winds along coastal Maine are typically from the west-northwest during clear periods and from the northeast during storms. 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 (Figure 10). 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 northeaster and can reach 125 knots. Sustained winds of 100 knots occur about every 50 years on average; gusts are usually about 30 percent higher.

Figure 11 Wind Direction Frequenices Along the Maine Coast



In the open seas, away from the influence of land, winds are stronger and less complex. From December through March, winds are mainly out of the west through north with gales occurring about 6 to 12 percent of the time. In general, wind speeds increase with distance from the coast. If winds persist for a long time over a long fetch they will generate rough seas. In the Gulf of Maine, winter wind speeds of 15 knots or more persist for more than 12 hours about 70 to 80 percent of the time. However these winds often shift and a new fetch is established. Summer winds are usually out of the south through southwest, and gales are infrequent. During the spring and fall, winds are more variable.

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

River Discharge

Streams and Drainages: Freshwater streams, drainages and tidal creeks are not currently known to be a major source of non-point discharge into Growing Area WY. Because of this, the Penobscot and Passagassawakeag watersheds are not managed like point source discharges.
The data showing the effects of tidal stage in relation to fecal coliform scores may indicate that the Penobscot and Passagassawakeag systems may have an impact on Islesboro. The stations with failing P90s during flood tides are primarily located on the west side of Islesboro (excepting station WY 15) whereas the stations affected by ebb tides are primarily located on the eastern shore of Islesboro. It is hypothesized that pollution loading based on tide stage may be related to the Penobscot and Passagassawakeag Rivers. Current data provided by NOAA states the average speed and direction of the currents in Islesboro Harbor (east side of the island) run 334° (NW) at 0.1 knots on the flooding tide. The ebbing tide runs at 0.3 knots at 154° (SE). The currents are similar at the northern tip of the island, Turtle Head, Islesboro. The current in this area runs in a northwest direction, 338° at 0.7 knots on a flooding

tide, and the ebbing tide runs south southeasterly, 171° at 0.8 knots. When the data is broken down by tidal stage, the direction of the currents in this area correlates with the increased pollution load if the flooding tide is pushing the water up and around the east side of the island thus creating eddies on the west which work to keep the pollution tied up along the shore opposite the direction of the current, and vice versa for the ebb tide. If pollution is coming out of these river systems and in fact eddying around the shores of Islesboro, this may be why some stations exhibit marked increases in scores based on certain tide stages. However, more data is required to be able to take these watersheds into consideration with future management decisions.

Water Quality Review

There are presently twenty (20) active water sampling sites in Growing Area WY. They are typically collected by boat from near-shore sites in Random Boat Run 03B, however when necessary, the samples are collected by land. Sample sites are established to monitor known or potential pollution sources as well as monitor closure boundaries.

These sample stations are mapped in Figures 1, 2 and 3.

Table 4 lists all active stations in Growing Area WY, with their respective Geomean and P90 calculations for 2012. Please refer to Appendix A for a key to interpreting the headers on the columns of Table 4. The approved and restricted standards for each station are also displayed in Table 4.

All approved stations, met their NSSP classification standard in 2012. Water quality station WY8 is currently classified as Approved and is nearing the threshold of no longer meeting Approved classification standards.

Table 4 P90 Most Recent 30 Samples

Station	Class	Count	MFCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std	Min_Date
WY001.00	P	30	30	3.4	0.54	85	17	31	163	1/28/2008
WY001.50	P	30	30	3.2	0.61	1700	20	31	163	1/28/2008
WY002.00	A	30	30	3	0.42	82	11	31	163	1/28/2008
WY003.00	R	30	30	3.9	0.68	1160	30	31	163	1/28/2008
WY004.00	A	30	30	3	0.52	340	15	31	163	1/28/2008
WY005.00	A	30	30	2.5	0.29	24	6	31	163	3/24/2008
WY006.00	A	30	30	3.3	0.58	1700	19	31	163	1/28/2008
WY008.00	A	30	30	4.1	0.66	1700	30	31	163	1/28/2008
WY009.00	A	30	30	2.9	0.53	380	14	31	163	1/28/2008
WY009.50	A	30	30	2.9	0.51	340	13	31	163	1/28/2008
WY010.00	A	30	30	2.9	0.55	1700	15	31	163	1/28/2008
WY010.50	A	30	30	2.5	0.38	74	7.8	31	163	1/28/2008
WY011.00	A	30	30	2.5	0.39	180	8	31	163	1/28/2008
WY012.00	P	30	30	3.2	0.54	580	16	31	163	1/28/2008
WY013.00	P	30	30	3	0.4	54	10	31	163	1/28/2008
WY013.50	P	30	30	2.5	0.35	48	7.1	31	163	1/28/2008
WY013.80	P	30	30	3.1	0.61	1700	19	31	163	1/28/2008
WY015.00	P	30	30	4	0.69	1700	31	31	163	1/28/2008
WY016.00	P	30	30	2.4	0.29	36	5.9	31	163	1/28/2008
WY019.00	P	30	30	2.3	0.25	24	4.9	31	163	1/28/2008

Table 5 Sample Count Area WY

Station	Random Closed	Open	Random sample Total
WY001.00	6		6
WY001.50	6		6
WY002.00		6	6
WY003.00		6	6
WY004.00		6	6
WY005.00		6	6
WY006.00		6	6
WY008.00		6	6
WY009.00		6	6
WY009.50		6	6
WY010.00		6	6
WY010.50		6	6
WY011.00		6	6
WY012.00	6		6
WY013.00	6		6
WY013.50	6		6
WY013.80	6		6
WY015.00	6		6
WY016.00	6		6
WY019.00	6		6

Water Quality Discussion and Classification Determination

Fecal coliform data for the most recent 30 samples, collected under the Systematic Random sampling program, are presented in Table 4. NSSP criteria require sample sites meeting approved criteria to have geometric means below 14 CFU/100ml and estimated 90th percentiles below the approved standard. Some sample stations are classified prohibited, regardless of p90 values that meet approved criteria, because of known actual point sources that require closed areas. Data collected after extreme weather events (Flood Events), defined as rainfall >2.0 inches, were excluded from the analyses because automatic “emergency” closures are usually implemented in all Maine shellfish waters following such heavy rainfall events.

Table 5 above shows our sampling effort for the 2012 sampling season. All stations were collected the required amount of times as mandated by the NSSP random sampling method.

No classification changes were made to Growing Area WY in 2012. Due to new pollution sources identified as well as the potential effects from tidal stages detected on some of the monitoring stations, no upward classification changes will be made to water quality monitoring stations in Growing Area WY. Regarding the stations whose

overall p90 and geomean results meet Approved standards when all tidal ranges are taken into consideration, but p90 results are not meeting during the ebb or flood tides, these areas will remain prohibited
There are no present plans to change surveying and sampling schedules in the future. This area is properly classified. There are no changes to classification required in Growing Area WY at this time.

Aquaculture/Wet Storage Activity

There are no aquaculture or wet storage activities in this Growing Area WY.

Recommendation for Future Work

Recommendations for future work include following up known pollution sources on the island.

References

National Shellfish Sanitation Program: Guide for the Control of Molluscan Shellfish, 2007

Revision; National Shellfish Sanitation Program, 1999.

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

Town information, 2010-2011 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

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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.

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

Geo_Mean = means the antilog (base 10) of the arithmetic mean of the sample result logarithm (base 10).

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

P90 = 90th percentile

APPD_STD = the 90th percentile, at or below which the station would meet approved criteria in the absence of pollution sources or poisonous and deleterious substances.

RESTR_STD = the 90th percentile, at or below which the station would meet restricted criteria.