



GROWING AREA WT
Towns of
Friendship and Cushing
2009
Sanitary Survey Report

Report Date: August 12, 2010

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APPROVAL

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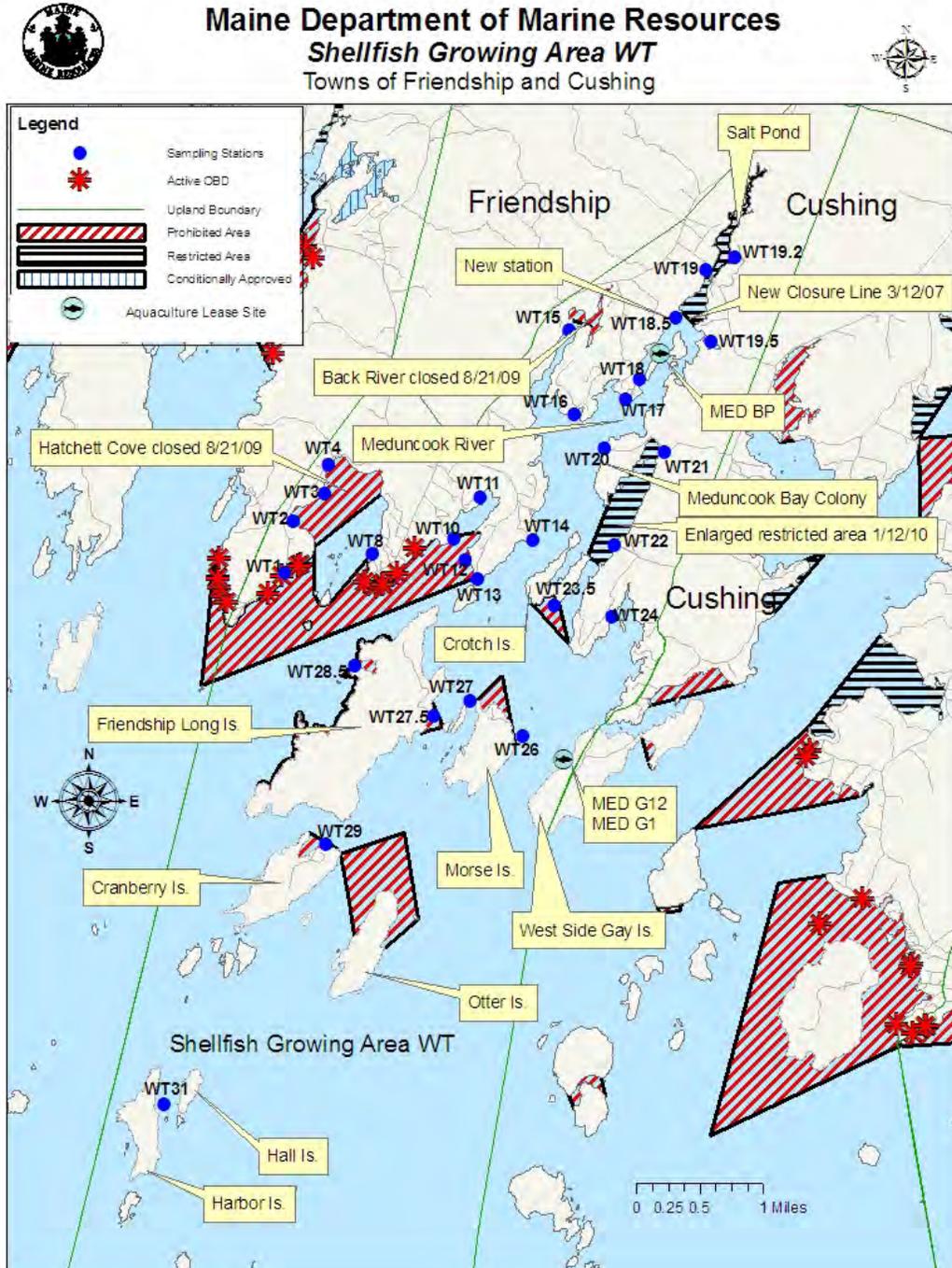
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Figure 1. Growing Area WT, with Active Water Stations





Executive Summary

This is a sanitary survey report for growing area WT written in compliance with the requirements of the 2007 Model Ordinance and the National Shellfish Sanitation Program. The next triennial report for growing area WT will review growing area activities from 2010 through 2012, and will be written in 2013. The next sanitary survey report for growing area WT will be written on or before 2021.

This report includes a water quality review, based on water quality data collected through 2009, as well as an evaluation of all pollution sources identified during the 2009 shoreline survey of the shores of the growing area. Pollution sources reviewed in this report include domestic waste, including private in-ground systems and over board discharge (OBDs), recreational areas, agricultural activities, domestic animal and wildlife areas, and non-point pollution transported by streams. Hydrographic and meteorological data are discussed in this report, including assessments of tides and currents, rainfall, salinity, and river discharge. A discussion of current classifications and recommendations for future work are also presented in this report.

As a result of the updated shoreline survey, several areas were downgraded in classification to prohibited, and will remain classified as such until the identified pollution sources are remediated. Otter Island, which was downgraded in classification (2008) due to an expired shoreline survey, is being proposed for upward classification to approved based on the 2009 survey of the area.

Growing Area Description

Growing Area WT is located in Knox County in the area between the southern tip of Martin Point Friendship and the southern tip of Gay Island Cushing (Figure 1). This growing area also contains numerous small islands. Islands with dwellings on them include: Harbor, Hall, Cranberry, Otter, Friendship, Morse, Gay, Garrison and Crotch. A detailed boundary description for growing area WT can be found in DMR central files.

The entire region is very rural. There are no municipal treatment facilities, marinas or industries in or near shellfish growing area WT. The dwellings in this area utilize private in-ground septic systems or licensed overboard discharge systems (OBDs); several outhouses can still be found in this growing area. Shellfish Growing Area WT has a total of 10 OBDs. All of the OBDs are located in Hatchet Cove and Friendship Harbor.

The town of Friendship has a year-round population of 1,204 as reported by the 2000 census. The most common sources of employment are construction, agriculture/forestry, and fishing. The town of Friendship has a municipal shellfish ordinance in place to manage the shellfish resources of the town. Friendship has 30 licensed, resident commercial diggers and four non-resident commercial diggers. The town of Cushing has a year-round population of 1,322 as reported by the 2000 census. The most common sources of employment are construction, agriculture/ forestry, and fishing. Clam harvesters from the town of Cushing also have a municipal shellfish ordinance in place to manage the shellfish resources of their town. Cushing clam harvesters are part of a five town management group which allows licensed diggers to dig in any of the participating five towns in the St George River management group. Towns



participating in the five town group include Cushing, Warren, Thomaston, South Thomaston and St George. The license breakdown for the St George River management group is: 107 resident commercial diggers, 11 non-residents, 9 resident students, and 1 non-resident student.

History of Growing Area Classification – Legal Notice Area No. 26B

The historical records of legal notices for area WT readily available to the author at the time of this report are presented below. Additional records can be obtained from the Maine State Archives in Augusta, ME.

The last Sanitary Survey of shellfish growing area WT was written in 1998.

1999 – February 22, 1999, this legal notice decreased the size of the closed area in Hatchet Cove, by opening a small section of water and shore around Sand and Little Sand Island.

2000 – No classification changes

2001 – No classification changes

2002 – No classification changes

2003 – No classification changes

2004 – No classification changes

2005 - No classification changes

2006 – No classification changes

2007 – June 20, 2007, station WT 19, the upper portion of Meduncook River was reclassified as restricted due to poor water quality with no known point sources. A new sampling station (WT18.5) was established at the site of the new closure line.

2008 – The northern half of Otter Island was reclassified from approved to prohibited on December 31, 2008 due to an expired shoreline survey. There are no sampling stations at Otter Island.

2009 – July 16, 2009: Two former legal notice areas (Area No. 26-O, Friendship Long Island, and Vicinity, and Closed Area No. 26-K, The upper Meduncook River and Crotch Island), were combined into one rule (26B); this notice also closed portions of Hatchet Cove, and Johnson Cove, Friendship due to the presence of malfunctioning septic systems. Stations changing classification from approved to prohibited include: WT2, WT3, WT4, WT10 and WT12.

August 21, 2009 This amendment closed the head of Back River, Friendship and outer Hornbarn Cove, Cushing for the harvest of shellfish due to malfunctioning septic systems in Back River and potential malfunctions in outer Hornbarn Cove, which were identified during the



shoreline survey of the area. The classification at station WT 22 was changed from approved to restricted.

Current Classification(s)

Shellfish growing area WT currently has areas classified as:

Approved

- 13 Approved stations – WT8, 11, 13, 14, 15, 16, 17, 18, 19.5, 20, 24, 27, and 31

Restricted

- Pollution Area No. 26B, Back River, Friendship and Cushing- four restricted stations 19, 19.2, 21 and 22 water quality scores do not meet approved standards, due to non-point pollution

Prohibited

- Pollution Area No. 26B, Friendship and Cushing, eleven prohibited stations, due to licensed OBDs, pollution sources identified during 2009 shoreline survey and potential pollution sources at island sites – Stations 1, 2, 3, 4, 10, 12, 23.5, 26, 27.5, 28.5, and 29

There is one new station (WT18.5) that was established at the border of an approved and restricted area (2007) to monitor the end of a closure line. This station has been sampled a total of 15 times; and currently does not have a classification assigned to it.

Please visit the DMR website to view legal notice 26B:

http://www.maine.gov/dmr/rm/public_health/closures/closedarea.htm#T

Current Management Plan(s) for Conditional Areas

There are no conditional areas in this growing area.

Pollution Sources Survey

The identification and evaluation of pollution sources is known as the shoreline survey. The information obtained by conducting a thorough shoreline survey is valuable in determining, evaluating and documenting the location of direct or indirect impact of actual and potential pollution sources. Sources of bacteria may include septic systems, overboard discharges, municipal and industrial discharges of wastewater, illegal sewage discharge from boats, agricultural activities, wildlife and polluted stormwater runoff.

The Growing Area WT shoreline survey was conducted by the DMR and DEP staff over the course of the spring and summer of 2009. Parcel-based tax maps from the towns of Friendship and Cushing were used to assign a unique identifier to each lot in the survey area. Basic information on each property (land use, ownership, address, seasonality, etc.) was documented from town information. Vacant lots were recorded for entry into the database in case of future



development. All properties within 500 feet of the shore or other water conduits were surveyed; each shoreline property underwent an on-site inspection, including an evaluation of shore-side development. Owners, if present, were asked to provide information about their septic system including age, routine maintenance details and description of any problems they had experienced. Information was recorded in the inspector's notes, and will be presented in this report if indicative of an actual or potential problem. Areas with expired sanitary surveys are re-classified to prohibited classification, until the field work can be completed. Properties that were surveyed in 2009 and were found to be potential sources of pollution but were not impacting the waters of shellfish growing area WT at the current time will be re-evaluated in 2012 and the updated information will be included in the next triennial report.

The following section of this Sanitary Survey Report, provide detailed descriptions of various pollution sources that were identified during the most recent sanitary survey field work. In each sub-section, a particular type of a pollution sources is listed, described and evaluated, and where applicable, is accompanied by maps and tables. The sources of pollution that are described in this report include: domestic waste, including private in ground systems and OBDs, marinas and mooring fields, stormwater discharges, non-point source pollution from streams, agricultural and domestic animal activity, wildlife and conservation/recreation areas

Domestic Waste

The majority of buildings in this growing area have private waste disposal systems, including inground septic systems, holding tanks, composting or incinerating toilets, and outhouses. Individual septic systems are the principal form of residential wastewater treatment in the towns in growing area WT. Many of the systems were installed before the plumbing code was updated in 1974 and may provide little or no treatment. Malfunctioning septic systems may cause sewage to back up in the home, break out at the surface, run off in surface water, or seep undetected into groundwater or cracks in the bedrock. Septic systems may malfunction due to inadequate maintenance, overloading or poor design and construction (e.g. septic systems installed before the plumbing code revision may not meet current public health standards because they are sited in areas with poor soil conditions and shallow depth to bedrock). Private waste disposal systems that were identified as actual or potential sources of pollution during the 2009 sanitary survey field inspections are presented in Table 1. All identified problems were reported to the respective town LPI for follow up work. Ten properties had systems that were not located. If the location of the septic system was not identified, the shore frontage of the property was walked and if no potential pollution threat was found, the dwelling was not considered a pollution source. Closures were made surrounding actual and potential pollution sources that were determined to have the potential to adversely impact water quality. Any property that was found to have visible, wet, seepage coming from any part of the septic system (pipes, tank, leach field or outhouse) to the ground that is able to be transported to the shore or any direct discharge of wastewater to the shore, was considered an actual pollution source capable of impacting the surrounding water quality. Pollution sources that have a means to get to the shore such as being located on a steep slope above the shore, bordering on a stream, or a pipe going directly overboard were considered "direct" pollution sources. Pollution sources that were located away from the shore with no direct mode of transport to the shore were considered "indirect". Problems which have been remediated or resolved are highlighted in yellow. DMR



will continue to work with towns, landowners and DEP to correct these problems, and will re-evaluate the closures as problems are abated.



Figure 2. Pollution Sources, Shellfish Growing Area WT

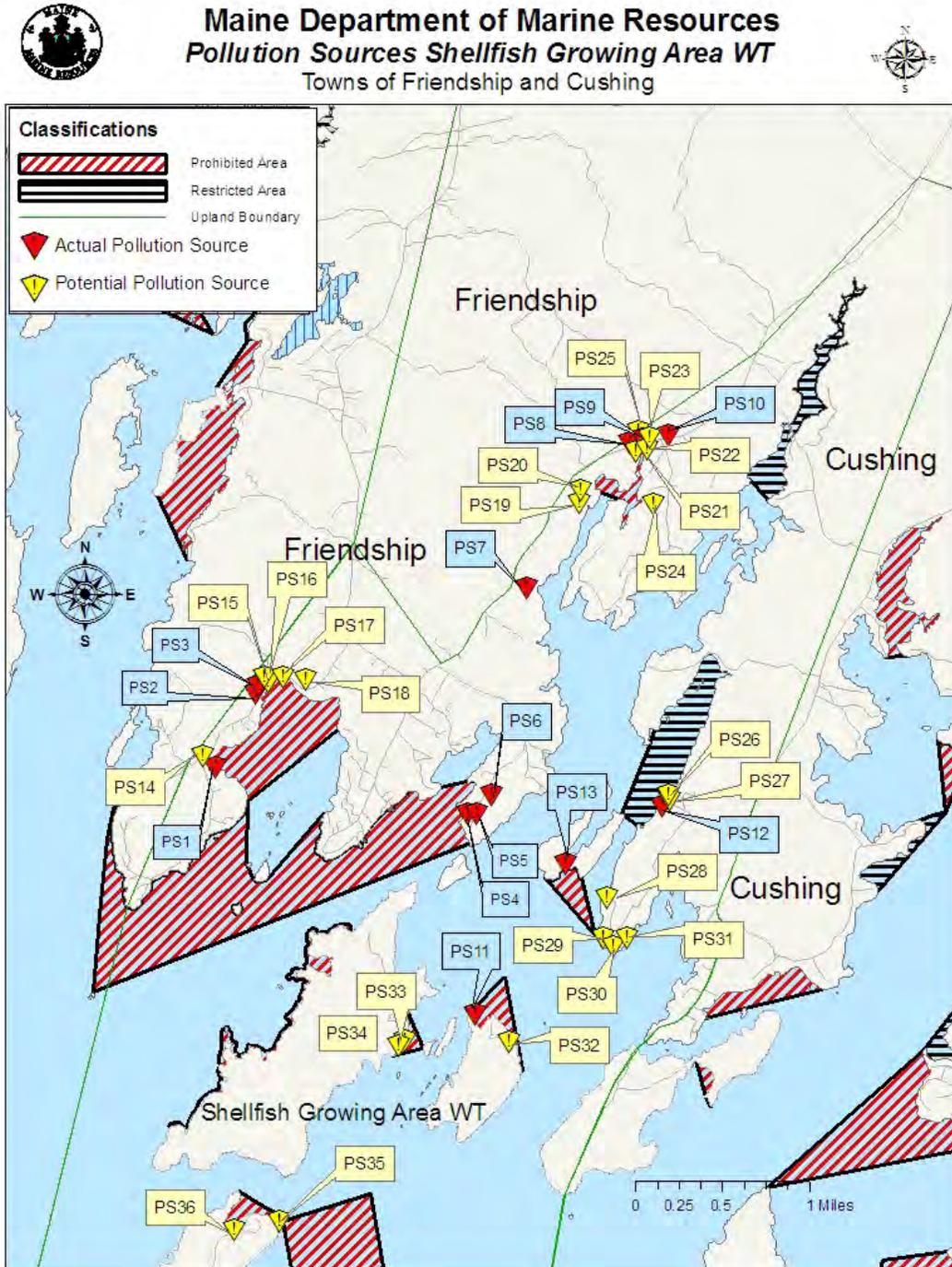




Table 1. Identified Domestic Waste, Actual (A) and Potential (P), (Direct (D) and Indirect (I)) Problems, Growing Area WT

Town	Pollution ID	Survey Date	Actual or Potential (A or P)	Direct or Indirect (D or I)	Pollution Description	Fixed Y/N	Class	Action Taken
Friendship	PS1	6/18/09	A	D	Pooling malfunction 35 ft from shore	N	P	Closure made Reported to LPI
	PS2		A	D	Breakout in drainage ditch	N	P	Closure made Reported to LPI
	PS3		A	D	Neighbor to above property, malfunction may be coming from system on this property	N	P	Closure made Reported to LPI
	PS4	6/26/09	A	D	Smelly water was puddled along driveway ditch below field, 10 feet from drainage to ocean	N	P	Closure made Reported to LPI
	PS5		A	I	Grey water /washing mach discharge to catch basin along driveway 100ft behind house	N	P	Closure made Reported to LPI
	PS6		A	D	Sewage is surfacing downhill, is 25 ft to stream	N	P	Closure made Reported to LPI
	PS7	7/23/09	A	I	South end of the raised bed is breaking out . System is >500 feet from shore	N	A	Reported to LPI
	PS8	7/28/09	A	I	Pooling malfunction	N	P	Closure made Reported to LPI
	PS9	7/29/09	A	D	Pooling malfunction	N	P	Closure made Reported to LPI
	PS10	7/31/09	A	D	Septic overflow or wash machine drain to drainage	N	P	Fixed
Morse Island	PS11	8/24/09	A	D	Drain flowing from compost toilet overboard	N	P	Reported to LPI
Cushing	PS12	8/6/09	A	D	Tank is very old and is breaking out on slope to the shore	Y	R	Fixed
Crotch Island	PS13	8/24/09	A	I	Pipes leading to tank not connected waste is leaking out, Leach field questionable	N	P	Reported to LPI



Town	Pollution ID	Survey Date	Actual or Potential (A or P)	Direct or Indirect (D or I)	Pollution Description	Fixed Y/N	Class	Action Taken
	PS14	6/18/09	P	I	Septic field sw of house below shed in roses. Area was very wet and had slight odor	N	P	Reported to LPI
	PS15		P	D	Tank under house pumps to???	N	P	Reported to LPI
	PS16		P	I	Wet area at south end of leach field, slight odor	N	P	Reported to LPI
	PS17		P	D	Septic goes out east end to tank with pump? (wires visible), leach location unknown	N	P	Reported to LPI
	PS18		P	I	New raised bed in front by road. Slight septic odor nearby green mailbox in drainage	N	P	Reported to LPI
	PS19	7/23/2009	P	I	Raised bed alongside house - was wet with slight odor at NE corner	N	A	Reported to LPI
	PS20		P	I	Tank and leach field in fenced in lawn area by small house - is used for grey water only. Owner has designed his own compost system and puts the piled waste in a wooded area NW of small house - is not covered	N	P	Reported to LPI
	PS21	7/28/09	P	I	Wet seep below deck away from leach field, has slight septic odor	N	P	Reported to LPI
	PS22		P	I	Base of raised bed very wet with septic odor	N	P	Reported to LPI
	PS23	7/29/2009	P	I	Grey water goes to lawn or bushes?	N	P	Reported to LPI



Town	Pollution ID	Survey Date	Actual or Potential (A or P)	Direct or Indirect (D or I)	Pollution Description	Fixed Y/N	Class	Action Taken
	PS24	8/6/2009	P	I	Does guest cabin have leach field/system??	N	P	Reported to LPI
	PS25		P	I	Drainage west of leach field smelled septic nearby large rose bush.	N	P	Reported to LPI
	PS26		P	D	Small Shingled camp, tank at NW corner close to shore (10ft), no leach field, possible septic overflow but none seen, has covered sink drain.	N	R	Reported to LPI
	PS27		P	D	Small camp with shed/workshop, has covered sink drain, slight septic odor nearby pipe exiting house. Old system	N	R	
	PS28		P	I	The leach field looked small and lumpy and there was a septic odor when poked with stick.	N	A	Reported to LPI
	PS29		P	I	Has septic like mound by entry but on shore side of house in slope below stone wall the area was wet and smelled slightly septic	N	A	Reported to LPI
	PS30		P	D	Old septic tank on shore side at left corner in indent in lawn, leach field in lawn sloping toward wet drainage to beach. System is 50+ years old	N	A	Reported to LPI
	PS31		P	I	In area below guesthouse field, there was a slight septic odor nearby wet drainage 250+ feet from shore. Revisit after ground	N	A	New system installed



Town	Pollution ID	Survey Date	Actual or Potential (A or P)	Direct or Indirect (D or I)	Pollution Description	Fixed Y/N	Class	Action Taken
					dries up a bit.			
Friendship Islands	PS32	8/24/09	P	D	Very old system on steep slope above shore, location unknown	N	P	Reported to LPI
	PS33	8/25/09	P	D	Outhouse very close to shore (10feet) may be compost toilet	N	P	Reported to LPI
	PS34		P	I	Grey water line from house to ground	N	P	Reported to LPI
	PS35	8/31/09	P	D	Suspect septic overflow from old tank to shore	N	P	Reported to LPI
	PS36		P	D	Outhouse located in wet area 30 feet from shore	N	P	Reported to LPI

Licensed Overboard Discharges

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 water body (the ocean, a river, or a stream) via an outfall pipe.

OBDs are licensed and inspected by the Maine Department of Environmental Protection. The DEP license standards for OBDs are presented in Appendix A. 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. The size of each closure is determined based on a dilution, using on the permitted flow rate of the OBD, and the depth of the receiving water that each OBD discharges to; the fecal concentration used for this dilution calculation is 1.4×10^5 FC/100 ml.

Friendship has 10 active licensed OBDs, located in Hatchet Cove and Friendship Harbor (Table 3 and Figure 2); the required closure size surrounding each OBD is provided in Table 3. The size of the entire closure area surrounding the OBDs in Hatchet Cove and Friendship Harbor is 586 acres. This large closure area is of adequate size to protect public health.

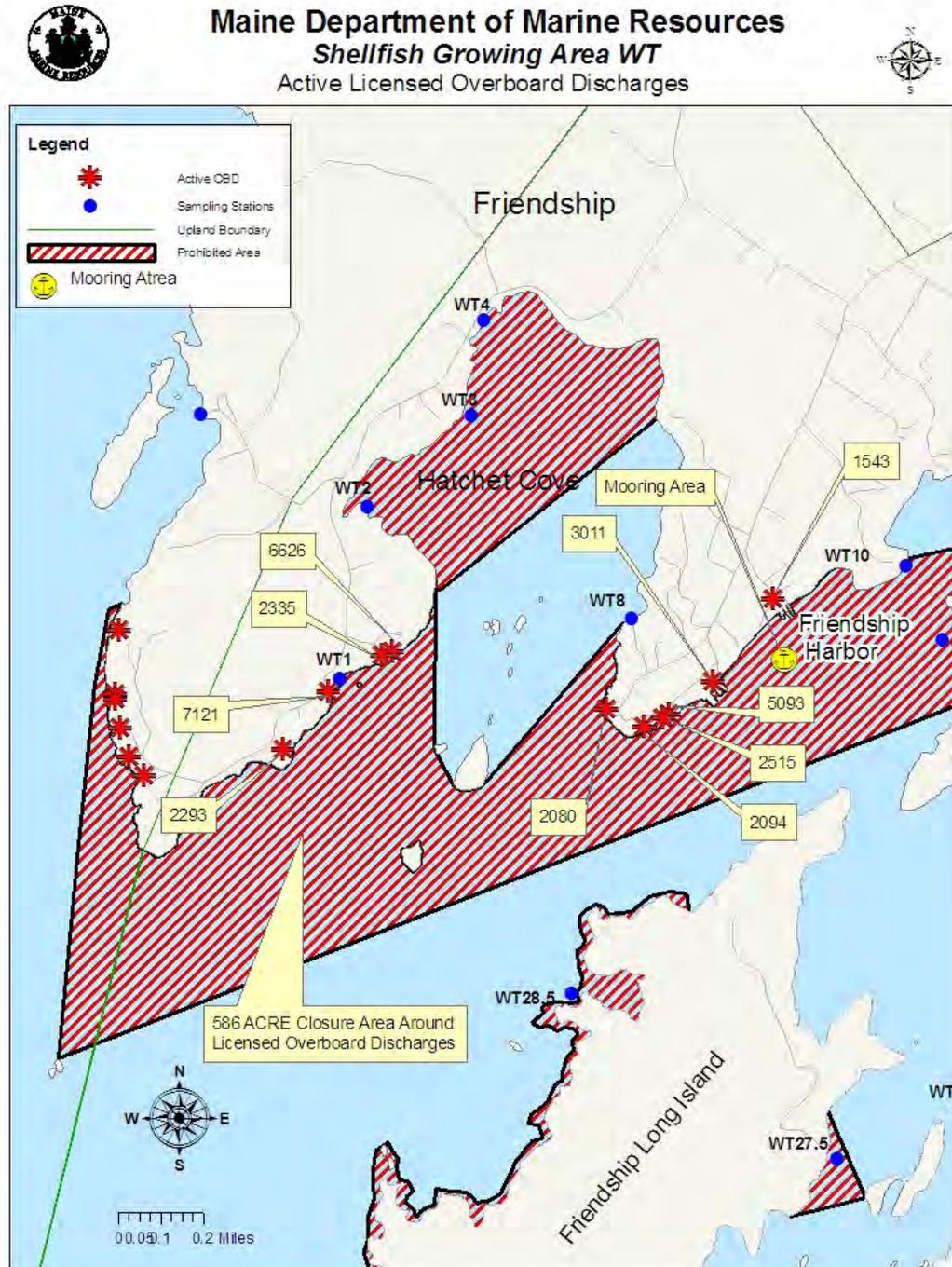
Table 2. Licensed Overboard Discharges, Design and Closure Size Information

Location	DEP_ID	Flow (gpd)	Required Closure Size (Acres)	Actual Closure Size (Acres)	Treatment*	Receiving Waters
Friendship	3011	300	1.02	586	M	FRIENDSHOP HARBOR
	6626	300	0.61		S	MUSCONGUS BAY
	2293	500	1.28		M	MUSCONGUS BAY
	2094	1100	2.41		S	FRIENDSHIP HARBOR
	1543	300	1.15		S	FRIENDSHIP HARBOR
	5093	150	0.38		S	FRIENDSHIP HARBOR
	7121	360	0.74		S	HATCHET COVE
	2080	540	2.76		M	HATCHET COVE
	2335	300	0.61		M	MUSCONGUS BAY
	2515	300	0.77		S	FRIENDSHIP HARBOR

* M= Mechanic, S= Sand filter



Figure 3. Active Licensed Overboard Discharges, Shellfish Growing Area WT





Municipal WWTP

There are no municipal Treatment Facilities in this growing area.

Industrial Pollution

There are no large industries in this growing area.

Marinas and Mooring Fields

Friendship harbor is the only portion of this growing area that contains large numbers of moorings. Moorings in this area are mainly used by commercial lobster boats. The mooring area in Friendship Harbor is inside a large closure area. There are no marinas or mooring fields for pleasure boats.

Stormwater

There are no municipal stormwater collection systems in this growing area. Stormwater drains via overland flow to streams and river, or percolates into the ground.

Non-Point Pollution Sources (streams, etc)

In the 2007 Annual report for this area it was noted that stations WT 19.5, 21 and 24 had deteriorating water quality that might be associated with non-point source pollution from nearby streams. Multiple streams were sampled on September 8, 2008 and again on October 8, 2008 (Figure 3). On September 7, 2008 the growing area was closed due to a flood closure of greater than four inches of rain in a twenty-four hour period. The stream scores for the sites sampled on September 8th were far more elevated than the scores for the same streams sampled on October 8th, suggesting that the extreme amount of rainfall on September 7th had flushed pollutants into the area.

All of the stream sites showed considerable variability in the data results from one sample date to the next. In 2009 all of the streams were sampled on August 27th. All of the streams were flowing on this date; however stream S1WT12 had a very low flow. Stream S1WT24 was unable to be sampled due to lack of access to this site during high tide. No flow rates are available for the stream samples, because the flow meter was broken at the time of sample collection. Streams with the highest estimated flows include stream S1WT15, S1WT19.5, S2WT4 and S1WT21. Closures were made around streams S2WT4, S1WT15 and S2WT15 due to actual pollution sources identified in the immediate area. No closure was made around S1WT19.5 or S1WT21 because no actual pollution sources were identified in these areas and both of these areas are monitored by nearby sampling stations. The farm at S1WT19.5 has one horse with no visible manure pile. Water quality at sample station WT21 has been variable especially following rainfall. The sample station is located at the mouth of stream site S1WT21. A new station will be created away from the stream and extra samples will be collected at the stream, station WT21 and the new sample location, to determine if water quality improves away from the stream. Extra samples will be collected at stream sites S1WT15, S2WT15, S1WT19.5



and S1WT21, in 2010. Dilution calculations will be done for all of these streams at the end of the 2010 sampling season.

Table 3. Growing Area WT Stream Results

Stream Site	Date Sampled	Fecal Score FC / 100ml	Classification At Shore	Comments
S1WT2	9/8/08	60	P	
	10/8/08	3.6		
	8/27/09	60		
S2WT2	10/8/08	2	P	Flows through horse pasture (AF1)
	8/27/09	31		
S1WT4	9/8/08	134	P	
	10/8/08	7.3		
	8/27/09	56		
S2WT4	9/8/08	1280	P	
	10/8/08	2		
	8/27/09	72		
S1WT12	8/27/09	>1600	P	Flows past animal enclosure (AF2)
S1WT15	9/8/08	200	P	
	10/8/08	12		
	8/27/09	46		
S2WT15	9/8/08	160	P	Nearby farm (AF3)
	10/8/08	29		
	4/27/09	4		
	8/27/09	142		
S1WT19	9/8/08	80	R	
	8/27/09	640		
1S1WT19.5	9/8/08	320	A	Flows past horse enclosure (AF4)
	10/8/08	15		
	8/27/09	69		
S1WT21	9/8/08	720	R	
	10/8/08	68		
	8/27/09	64		
S1WT24	10/8/08	29	A	
PS1	8/24/09	110	P	Small stream Morse Is.

Agricultural Activities

On Blueberry Lane, in east Friendship there is a blueberry field (Figure 3) consisting of approximately 50 acres on a rise above the Meduncook River. The blueberry fields are located at least 400 feet from the shore. A new sample station (WT18.5) was established at the end of Blueberry Lane. This site was established to monitor the site of a new closure line (June 20,



2007). Station WT18.5 has been sampled 15 times with the most elevated score to date being 31 FC/100ml. The fields at this site are burned annually. No information is available regarding fertilization practices.

Farming Operations

Shellfish Growing Area WT has very few farming operations near the shore (Figure 3). The farms consist of small back yard paddocks consisting of one or more horses, some chickens, sheep or a few goats. All of these sites have been visited and the importance of utilizing best farm practices has been explained to each property owner. An explanation of the number and types of animals at each farming operation and the distance from the shore is shown in Table 5. Nearby streams are also noted in Table 5; each stream was sampled twice in 2008, and again in 2009. Results from these streams are presented in Table 4. The stream in the vicinity of animal farm 2 (AF2) is extremely small and only flows after a heavy rainfall. This site was not sampled during the 2008 sample collections. Closures were made nearby animal farms AF1, 2 and 3 due to identified domestic pollution sources in the immediate area. At AF4 one horse grazes in a pasture above stream S1WT19.5. No manure pile was visible at this site and the property was very tidy. This stream will be sampled in 2010 and a dilution calculation will be done at the end of the 2010 sampling season.



Figure 4. Stream Sampling Sites and Farming Operations, Shellfish Growing Area WT

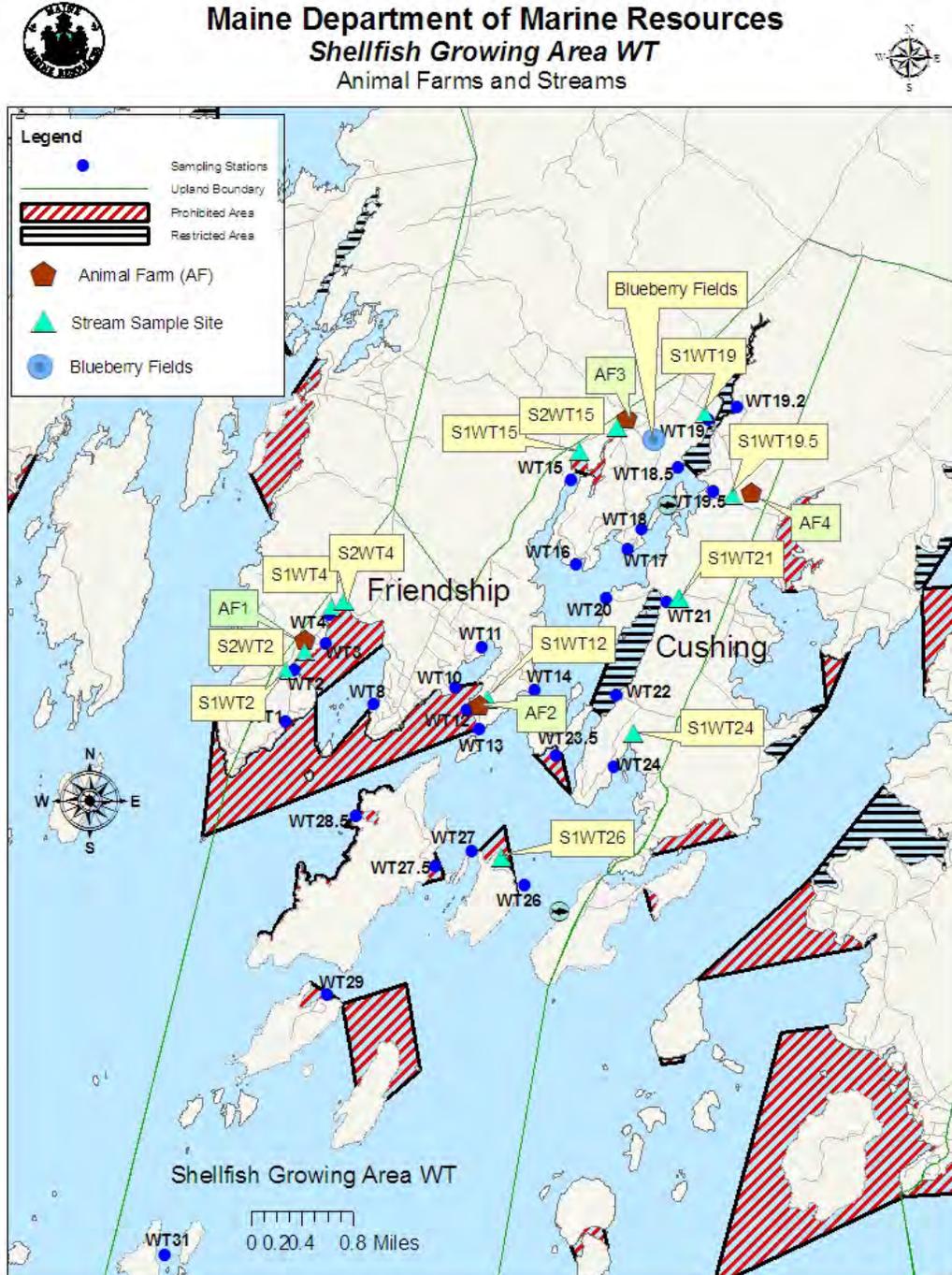




Table 4. Animal Farms and Nearby Streams, Shellfish Growing Area WT

Farm Site #	# And Type of Animals	Distance from Shore (ft)	Location	Stream Nearby?	Stream Site ID	Score 9/8/08 FC/100 ml	Score 10/8/08 FC/100 ml	Score 8/27/09 FC/100 ml
AF 1	1 Horse	300	Hatchet Cove	Yes	2S2	Not sampled	2	31
AF2	40 Chickens	30	Johnson Cove	Yes, but very small	12 S1	Stream was not sampled in 2008		>1600
	2 Goats	45						
AF 3	19 Sheep	450	Back River	Yes	15S2	160	29	142
	22 Goats	100						
	75 Chickens	80						
	Rabbits	caged						
AF 4	1 Horse	60 (distance from stream)	Meduncook River	Yes	19.5S1	320	15	69



Hydrographic and Meteorological Assessment

The NSSP program requires, as part of the sanitary survey, the evaluation of hydrographic and meteorological factors in order to determine the factors that may affect distribution and persistence of pollutants throughout the study area (WT). Climate and weather can affect the distribution of pollutants or can be the cause of pollutant delivery to a growing area. Prevailing winds can determine the distribution of pollutants in a growing area. Rainfall patterns and intensity can affect water quality through pollutant delivery in runoff or cause flooding which can affect the volume and duration of pollutant delivery. Examples of hydrographic factors that are evaluated in this report are tidal transport, and rainfall.

Tides

In order to investigate the frequency of elevated scores (those that surpass the variability standard) at various tidal stages, a tidal assessment for all stations located in growing area WT was completed (Table 5). For this assessment, all SRS data collected between 2003 and 2009 was grouped by tidal stage (ebb vs. flood); geometric means and P90 scores were recalculated using this data grouping. The specific tidal intervals that were grouped into the ebbing tide stage are ebb, high ebb, low, and low ebb. Tidal intervals that were grouped in the flood tide stage were flood, high flood, high and low flood. The only station that showed differences by tidal stage was station WT19.5; this station exceeded the P90 standard on a ebbing tide. This station was further assessed to determine at which specific stage of ebbing tide the station received elevated scores (Table 6). One potential explanation for this trend is an adverse impact from the stream (S1WT19.5) located at the head of the cove. The stream channel flows past station WT 19.5. A small farm consisting of one horse (AF4) borders on this stream. It is possible that the farm and stream are impacting the water quality at this site. Stream samples will be collected and a dilution calculation will be done at the end of the 2010 sampling season. If station WT19.5 fails to meet approved standards at the end of the 2010 sampling season, a closure will be made based on the dilution calculation for stream S1WT19.5. The remainder of the stations did not show differences in scores by tidal stages.

Table 5. Growing Area WT EBB and Flood Tide Stage Impact

Station	Class	Ebb Tide						Flood Tide					
		Count	GM	MAX	P90	Appd Std	Restr Std	Count	GM	MAX	P90	Appd Std	Restr Std
WT001.00	P	16	4.7	70	23.4	41	238	26	3.6	43	11.6	38	216
WT002.00	P	18	3.6	240	15.6	42	244	24	4.4	93	18.7	37	210
WT003.00	P	18	3.8	93	13.2	42	244	24	3.2	62	9.2	37	210
WT004.00	P	18	5.2	460	28.9	43	253	24	4.2	93	18.9	36	204
WT008.00	A	20	3.6	240	13.7	42	249	22	4.1	1100	25.8	36	203
WT010.00	P	19	5.9	93	25	43	255	23	4.1	156	19.2	36	201
WT011.00	A	17	3.6	460	18.9	42	250	25	4.1	43	14.2	37	208
WT012.00	P	19	5	240	23.2	42	247	23	4.4	93	18.2	37	206
WT013.00	A	20	4.9	43	16.4	42	249	22	3.2	58	10	36	203
WT014.00	A	19	3.5	43	9.1	43	255	23	2.9	76	8.9	36	201



Station	Class	Ebb Tide						Flood Tide					
		Count	GM	MAX	P90	Appd Std	Restr Std	Count	GM	MAX	P90	Appd Std	Restr Std
WT015.00	A	22	5.4	1100	41.5	42	247	20	3.2	50	9.7	36	201
WT016.00	A	22	3.6	23	9.5	41	240	20	3.2	18	7.7	37	208
WT017.00	A	22	4.2	93	15.5	41	240	20	2.5	13	4.5	37	208
WT018.00	A	23	4.4	1100	24.4	40	236	19	2.9	7.3	4.8	37	210
WT018.50	R	7	3	8	6.9	31	163	8	2.9	31	10.7	31	163
WT019.00	R	22	8.9	240	62.9	40	233	20	6	200	35.5	38	214
WT019.20	R	23	11.9	460	118.2	42	249	19	5.5	210	28.7	35	197
WT019.50	A	23	7.9	400	60.2	40	236	19	3.3	114	11.7	37	210
WT020.00	A	23	4.8	240	23.7	40	230	18	2.4	4	3.4	37	213
WT021.00	R	22	7.1	150	47.8	41	240	20	5	960	38.2	37	208
WT022.00	R	24	3.4	240	12.2	41	238	18	2.6	15	5.1	37	206
WT023.50	P	20	2.2	2.9	3	38	214	22	2.4	3.6	3.4	39	227
WT024.00	A	24	4.9	711	34.6	41	238	18	3.3	23	10.3	37	206
WT026.00	P	21	2.5	23	5.1	37	211	21	2.4	3.6	3.2	40	230
WT027.00	A	19	2.3	3.6	3.2	37	210	23	2.4	3.6	3.4	40	230
WT027.50	P	19	2.3	4	3.1	36	204	23	2.7	43	6.3	40	236
WT028.50	P	20	2.3	6.6	3.6	37	208	22	2.5	9.1	4	40	233
WT029.00	P	17	2.3	9.1	3.8	35	195	25	2.7	9.1	4.7	41	240
WT031.00	A	17	2.4	9.1	4.6	35	195	25	2.6	9.1	4.1	41	240

Table 6. Station WT 19.5 Ebb Tide data 2003-2009

Collect_Date	Coliform_Score	Strategy	Tide Stage	Temp C	Salinity PCT	Rain 0Hrs	Rain 24Hrs	Rain 48Hrs	Rain 72Hrs
24-Jul-03	7.3	R	E	23	28	0.03	0.78	0.02	0
08-Sep-03	2.9	R	E	20	30	0	0	0	0
05-Jan-04	2.9	R	E	2	15	0	0.02	0.33	0.11
01-Mar-04	2.9	R	E	1	30	0	0	0	0
12-May-04	290	R	E	12	30	0	0.12	0	0
27-Jul-04	23	R	E	19	29	0	0	0	1.32
30-Jun-05	23	R	E	19	30	0.34	0.02	0	0
29-Aug-05	23	R	E	20	30	2.03	0	0	0
23-May-06	23	R	E	10	6	0	0.36	0.03	0
12-Jul-06	23	R	E	24	25	0.01	1.3	0	0
17-Oct-06	1.9	R	E	12	30	999	999	999	999
11-Jun-07	33	R	E	17	21	0.04	0	0	0
14-Sep-09	3.6	R	E	17	30	0	0.12	0.01	0
03-Apr-03	2.9	R	HE	5	23	0.03	0.05	0	0.43
12-Aug-03	3.6	R	HE	24	30	0.1	0	0	0.01



Collect _Date	Coliform_Score	Strategy	Tide Stage	Temp C	Salinity PCT	Rain 0Hrs	Rain 24Hrs	Rain 48Hrs	Rain 72Hrs
25-Oct-04	2.9	R	HE	9	30	0.04	0	0	0
07-Apr-05	2.9	R	HE	5	30	0	0	0	0.02
14-May-07	16	R	HE	13	26	0	0	0	0.4
27-Jun-07	2	R	HE	19	32	0.02	0	0	0
26-Sep-07	1.9	R	HE	15	32	0	0	0	0
10-Feb-09	1.9	R	HE	0	31	0	0	0	0
25-Mar-09	1.9	R	HE	2	25	0	0	0	0
20-Jul-09	400	R	HE	21	25	0	0	0.6	0

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 WT was completed. For this assessment, the geometric mean and P90 scores were recalculated using only data points which were collected after 0.50 or more inches of cumulative rainfall 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 7). In this calculation, all random data collected between 2003 and 2009 were included. In completing this assessment, the data collected under dry or near dry conditions (<0.50 inches of rainfall in 72 hours), was omitted from the calculation. While the results of this calculation show that all stations that are classified as approved retain geometric mean scores of less than 14 when using data collected after rainfall, the P90 scores for multiple stations increase, indicating that multiple approved stations are impacted by intermittent pollution that occurs after rain events. Stations that showed the greatest increase in P90 scores include WT 8, 11, 15, 18, 19.5 and 24.

Table 7. Rainfall Analysis, Cumulative Rainfall of ≥ 0.50 inches (72 hours) 2003-2009

Station	Class	Count	MFCCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std
WT002.00	P	14	8	5.9	0.65	240	41.3	37	211
WT003.00	P	14	8	4.5	0.55	93	23.8	37	211
WT004.00	P	15	9	5.9	0.71	460	50.2	37	208
WT008.00	A	13	7	7.5	0.87	1100	103.5	38	216
WT010.00	P	13	7	5.4	0.59	93	31.9	38	216
WT011.00	A	12	7	6	0.7	460	50.5	37	210
WT012.00	P	13	7	7.1	0.62	240	45.9	38	216
WT013.00	A	13	7	6.6	0.56	58	36	38	216
WT014.00	A	12	6	4.9	0.52	76	24	38	221
WT015.00	A	12	7	8.7	0.92	1100	138.6	37	210
WT016.00	A	12	7	3.8	0.37	23	11.9	37	210
WT017.00	A	12	7	3.3	0.34	15	9.5	37	210
WT018.00	A	12	7	5.5	0.77	1100	55.9	37	210
WT018.50	R	5	5	4.1	0.53	31	20.8	31	163



Station	Class	Count	MFCCount	GM	SDV	MAX	P90	Appd_Std	Restr_Std
WT019.00	R	12	6	15.8	0.85	240	206	38	221
WT019.20	R	15	7	14.1	0.69	460	112.2	39	225
WT019.50	A	13	6	9.6	0.73	400	86.8	39	226
WT020.00	A	15	6	5.2	0.6	240	31.6	40	235
WT021.00	R	14	6	9.6	0.81	960	110.1	40	230
WT022.00	R	13	7	4	0.58	240	23.5	38	216
WT023.50	P	14	8	2.3	0.1	3.6	3.1	37	211
WT024.00	A	13	7	8.4	0.77	711	86.9	38	216
WT026.00	P	14	8	2.6	0.28	23	6.1	37	211
WT027.00	A	14	8	2.3	0.12	3.6	3.4	37	211
WT027.50	P	14	8	2.3	0.1	3.6	3.1	37	211
WT028.50	P	14	8	2.4	0.15	6.6	3.8	37	211
WT029.00	P	14	8	2.9	0.27	9.1	6.7	37	211
WT031.00	A	14	8	2.6	0.23	9.1	5.4	37	211

A further assessment of rainfall and seasonal impact was completed for the six stations that exceeded their P90 standard (Tables 8- 13). These assessments considered individual fecal scores using data collected over the seven years (2003-2009 data range) for each potentially impacted station in comparison to the cumulative rainfall and the season. Based on the approved standard of the year of sample collection, a score of 49 or higher is considered elevated for data up to August of 2006 when samples were analyzed using the MPN method. After this date samples have been analyzed using a membrane filtration method; a score of 31 and higher is considered elevated and was hi-lighted in the table and discussed. Five out of the six evaluated stations showed impact following a rainfall event of 2.03 inches that occurred on the date of sample collection on August 29, 2005.

Station WT8 has two elevated scores following heavy rainfall (Table 8). One of these scores is following >2 inches of rain which fell on the sample date. A second elevated score occurred following 1.31 inches of rain in 24 hours. Additionally a clean score occurred following 1.68 inches of rainfall in 72 hours. While both of the elevated scores occurred during the summer (July and August), none of the other scores collected during these months was elevated. There are no streams in this immediate area and no pollution sources were identified at this site during the shoreline survey of the area. The data suggests that while a heavy amount of rainfall in 24 hours may impact the site, smaller more intermittent rainfall events do not. However, additional data is needed to better evaluate the rainfall impact at this site. Samples should be collected following rainfall events of \geq .50 inches of rain.



Table 8. Rainfall and Seasonal Impact, Station WT8

Rain Range	Sum Rain	Date	Salinity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec
	No Data	17-Oct-06	30										1.9	
	No Data	07-Jul-08	30							4				
0	0	08-Sep-03	30									2.9		
	0	01-Mar-04	32			2.9								
	0	26-Aug-04	31								3.6			
	0	01-Aug-07	32								1.9			
	0	26-Sep-07	33									1.9		
	0	12-May-08	30					1.9						
	0	25-Aug-08	31								4			
	0	10-Feb-09	33		1.9									
	0	25-Mar-09	32			1.9								
	0.01-0.50	0.01	10-Jul-03	30							2.9			
0.02		22-Apr-04	31				2.9							
0.02		07-Apr-05	26				2.9							
0.02		27-Jun-07	32						1.9					
0.02		28-Jan-08	32	6										
0.03		17-Mar-05	31			2.9								
0.03		20-Oct-08	32										2	
0.04		06-Oct-05	32										2.9	
0.04		11-Jun-07	30						1.9					
0.08		21-Jun-06	29						2.9					
0.11		12-Aug-03	30								9.1			
0.12		12-May-04	30					2.9						
0.13		14-Sep-09	30									12		
0.16		29-Jan-03	32	2.9										
0.17		13-Jul-05	27							3.6				
0.35		13-May-09	30					1.9						
0.36		30-Jun-05	31						2.9					
0.39		23-May-06	29					2.9						
0.4		14-May-07	30					1.9						
0.46		05-Jan-04	32	2.9										
0.51-1.00	0.51	03-Apr-03	30				2.9							
	0.6	20-Jul-09	31							18				
	0.79	06-Dec-07	30										1.9	
	0.83	24-Jul-03	30							2.9				
	0.97	06-Sep-06	32									10		
1.00-1.50	1.22	04-Apr-06	32				3.6							
	1.31	12-Jul-06	29							1100				
	1.32	27-Jul-04	31							3.6				



Rain Range	Sum Rain	Date	Salinity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec
	1.36	07-Oct-09	30										1.9	
1.51-2.00	1.68	11-Mar-08	29			1.9								
2.01-2.50	2.03	29-Aug-05	30								240			

Station WT 11 has one elevated score following 2.03 inches of rain which occurred on the date of sample collection. All of the remaining scores were low. The data suggests there is no seasonal impact at this site and if there is a rainfall impact it occurs following more elevated rainfall amounts.



Table 9 Rainfall and Season Impact Station WT11

Rain Range	Sum Rain	Date	Salinity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec
	No Data	17-Oct-06	30										2	
	No Data	07-Jul-08	30							6				
0	0	08-Sep-03	31									2.9		
	0	01-Mar-04	32			3								
	0	26-Aug-04	30								3.6			
	0	01-Aug-07	32								4			
	0	26-Sep-07	32									24		
	0	12-May-08	30					1.9						
	0	25-Aug-08	31								1.9			
	0	10-Feb-09	33		2									
	0	25-Mar-09	32			2								
0.01-0.50	0.01	10-Jul-03	31							4				
	0.02	22-Apr-04	30				3							
	0.02	07-Apr-05	30				3							
	0.02	27-Jun-07	32						2					
	0.02	28-Jan-08	32	2										
	0.03	17-Mar-05	30			3								
	0.03	20-Oct-08	32										6	
	0.04	06-Oct-05	32										43	
	0.04	11-Jun-07	30						2					
	0.08	22-Jun-06	28						4					
	0.11	12-Aug-03	30								3.6			
	0.12	12-May-04	30					2.9						
	0.13	14-Sep-09	30									11		
	0.16	29-Jan-03	32	3										
	0.17	13-Jul-05	30							3				
	0.29	25-Apr-06	30				3							
	0.35	13-May-09	30					1.9						
	0.36	30-Jun-05	31							4				
	0.39	23-May-06	25						2.9					
	0.4	14-May-07	30					1.9						
0.46	05-Jan-04	32	3											
0.51-1.00	0.51	03-Apr-03	30				3							
	0.6	20-Jul-09	30							4				
	0.79	06-Dec-07	32										1.9	
	0.83	24-Jul-03	30							4				
	0.97	06-Sep-06	32									24		
1.01-1.50	1.31	12-Jul-06	30							23				
	1.32	27-Jul-04	30							3				
	1.36	07-Oct-09	30										2	
1.51-2.00	1.68	11-Mar-08	30			2								
2.01-2.50	2.03	29-Aug-05	30								460			



Station WT15 is a boundary station that is located nearby the head of Back River, where several malfunctioning septic systems and an animal farm (PS8, 9, and 10 and animal farm AF3) were identified during the 2009 shoreline survey. This site has received three elevated scores after heavy rainfall. One of these scores is following >2 inches of rain which occurred on the sample date (1100 FC/100ML). This site may be receiving impact from pollution flowing into two streams located above the sample site (S1WT15 and S2WT15). Dilution calculations were not able to be done for these streams because a flow meter was not available to measure the flow rate. Samples will be collected in 2010 and dilution calculations will be done for both of these streams to determine if the closure size is adequate.

Table 10. Rainfall and Seasonal Impact, Station WT15

Rain Range	Sum Rain	Date	Salinity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec
	No Data	17-Oct-06	30										6	
	No Data	07-Jul-08	30							2				
0	0	08-Sep-03	30									2.9		
	0	01-Mar-04	31			2.9								
	0	26-Aug-04	29								7.3			
	0	01-Aug-07	32								1.9			
	0	26-Sep-07	33									2		
	0	12-May-08	28					1.9						
	0	25-Aug-08	32								1.9			
	0	10-Feb-09	32		1.9									
	0	25-Mar-09	31			1.9								
0.01-0.50	0.01	10-Jul-03	30							3.6				
	0.02	22-Apr-04	30				2.9							
	0.02	07-Apr-05	27				2.9							
	0.02	27-Jun-07	32						2					
	0.02	28-Jan-08	29	1.9										
	0.03	17-Mar-05	30			2.9								
	0.03	20-Oct-08	31										2	
	0.04	06-Oct-05	32										9.1	
	0.04	11-Jun-07	30						2					
	0.08	22-Jun-06	29						3.6					
	0.11	12-Aug-03	30								2.9			
	0.12	12-May-04	30					2.9						
	0.13	14-Sep-09	30										14	
	0.16	29-Jan-03	32	2.9										
	0.17	13-Jul-05	28								9.1			
	0.29	25-Apr-06	30				9.1							
	0.35	13-May-09	30					1.9						
0.36	30-Jun-05	31							2.9					
0.39	23-May-06	26					3.6							
0.4	14-May-07	28					1.9							
0.46	05-Jan-04	30	9.1											



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Rain Range	Sum Rain	Date	Salinity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec
0.51-1.00	0.51	03-Apr-03	30				3.6							
	0.6	20-Jul-09	28							4				
	0.79	06-Dec-07	30											1.9
	0.83	24-Jul-03	28							240				
	0.97	06-Sep-06	32									2		
1.01-1.50	1.31	12-Jul-06	29							3.6				
	1.32	27-Jul-04	30							3.6				
	1.36	07-Oct-09	30										50	
1.51-2.00	1.68	11-Mar-08	28			1.9								
2.01-2.50	2.03	29-Aug-05	30								1100			



Station WT18 received one elevated score following greater than two inches of rainfall which occurred on the date of sample collection (Table 11). All of the remaining scores are low. There is no apparent rainfall or season impact on this station.

Table 11. Rainfall and Seasonal Impact, Station WT18

Rain Range	Sum Rain	Date	Salinity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	No Data	17-Oct-06	30										1.9		
	No Data	07-Jul-08	31							2					
0	0	08-Sep-03	30									2.9			
	0	01-Mar-04	32			2.9									
	0	26-Aug-04	30								6.1				
	0	01-Aug-07	32								4				
	0	26-Sep-07	32									4			
	0	12-May-08	28					1.9							
	0	05-Nov-08	31											1.9	
	0	10-Feb-09	32		1.9										
	0	25-Mar-09	32			1.9									
	0.01-0.50	0.01	10-Jul-03	31							2.9				
0.01		20-Feb-07	32		1.9										
0.02		22-Apr-04	31				2.9								
0.02		07-Apr-05	30				2.9								
0.02		28-Jan-08	31	4											
0.03		17-Mar-05	32			2.9									
0.03		20-Oct-08	31										4		
0.04		06-Oct-05	32										2.9		
0.04		11-Jun-07	30						7.3						
0.08		22-Jun-06	28						7.3						
0.11		12-Aug-03	30								3.6				
0.12		12-May-04	28					2.9							
0.13		14-Sep-09	30									10			
0.16		29-Jan-03	32	2.9											
0.17		13-Jul-05	30							2.9					
0.29		25-Apr-06	30				2.9								
0.35		13-May-09	30					1.9							
0.36		30-Jun-05	31						2.9						
0.39		23-May-06	27					2.9							
0.4		14-May-07	28					1.9							
0.46	05-Jan-04	32	3												
0.51-1.00	0.51	03-Apr-03	30				2.9								
	0.6	20-Jul-09	29							6					
	0.79	06-Dec-07	30											1.9	
	0.83	24-Jul-03	30							15					
	0.97	06-Sep-06	31									4			
1.00-1.50	1.31	12-Jul-06	30							3.6					
	1.32	27-Jul-04	29							2.9					
	1.36	07-Oct-09	30										5.5		
1.51-2.00	1.68	11-Mar-08	28			1.9									



Rain Range	Sum Rain	Date	Salinity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2.01-2.50	2.03	29-Aug-05	28								1100				

Station WT19.5 has received four elevated scores during the period from 2003-2009 (Table 12). Two of the elevated scores occurred in 2009. This site has also received five scores of 23 FC/100ML following 0.36-2.03 inches of rainfall. This site appears to become more elevated following rainfall events $\geq .30$. Additional data should be collected at this site following rainfall. Stream site S1WT19.5 flows into the cove and meanders past this site. Additional stream data should be collected and a dilution calculation should be done for this stream.

Table 12. Rainfall and Seasonal Impact, Station WT19.5

Rain Range	Sum Rain	Date	Salinity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	No Data	17-Oct-06	30										1.9		
	No Data	07-Jul-08	30							1.9					
0	0	08-Sep-03	30									2.9			
	0	01-Mar-04	30			2.9									
	0	01-Aug-07	31								2				
	0	26-Sep-07	32									1.9			
	0	12-May-08	26					1.9							
	0	05-Nov-08	30											1.9	
	0	10-Feb-09	31		1.9										
	0	25-Mar-09	25			1.9									
0.01-0.50	0.02	22-Apr-04	29				2.9								
	0.02	07-Apr-05	30				2.9								
	0.02	27-Jun-07	32						2						
	0.02	28-Jan-08	30	1.9											
	0.03	17-Mar-05	2			2.9									
	0.03	20-Oct-08	31										2		
	0.04	25-Oct-04	30										2.9		
	0.04	06-Oct-05	31										3.6		
	0.04	11-Jun-07	21							33					
	0.08	21-Jun-06	27							2.9					
	0.11	12-Aug-03	30								3.6				
	0.12	12-May-04	30					290							
	0.13	14-Sep-09	30									3.6			
	0.17	13-Jul-05	30							2.9					
	0.29	25-Apr-06	30				2.9								
	0.34	11-Dec-07	18												1.9
	0.35	13-May-09	28					9.1							
	0.36	30-Jun-05	30							23					
	0.39	23-May-06	6					23							
	0.4	14-May-07	26					16							
0.46	05-Jan-04	15	2.9												
0.51-1.00	0.51	03-Apr-03	23				2.9								
	0.59	04-Aug-03	32								3.6				



Rain Range	Sum Rain	Date	Salinity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.6	20-Jul-09	25							400					
	0.83	24-Jul-03	28							7.3					
	0.97	06-Sep-06	30									8			
1.01-1.50	1.31	12-Jul-06	25							23					
	1.32	27-Jul-04	29							23					
	1.36	07-Oct-09	26										114		
	1.39	23-Nov-03	28											2.9	
1.51-2.00	1.68	11-Mar-08	18		1.9										
2.01-2.50	2.03	29-Aug-05	30								23				

Station WT24 has received two elevated scores over the five year period (Table 13). One of these scores was following greater than two inches of rainfall which occurred on the date of sample collection. The other score occurred following 0.36 inches of rainfall. Additionally there are four scores between 20 FC/100ML and 43FC/100ML which occur at the higher levels of rainfall. This suggests that rainfall does elevate the score but at the present time it doesn't appear to be enough to cause the area to exceed the approved standard.

Table 13. Rainfall and Seasonal Impact, Station WT24

Rain Range	Sum Rain	Date	Salinity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec
	No Data	17-Oct-06	30										2	
	No Data	07-Jul-08	30							1.9				
0	0	08-Sep-03	30									2.9		
	0	01-Mar-04	32			2.9								
	0	26-Aug-04	30								2.9			
	0	01-Aug-07	32								1.9			
	0	26-Sep-07	33									25		
	0	12-May-08	28					1.9						
	0	25-Aug-08	32								1.9			
	0	10-Feb-09	32		1.9									
	0	25-Mar-09	31			1.9								
0.01-0.50	0.01	10-Jul-03	30							2.9				
	0.01	20-Feb-07	32		1.9									
	0.02	22-Apr-04	31				2.9							
	0.02	07-Apr-05	27				2.9							
	0.02	28-Jan-08	32	1.9										
	0.03	17-Mar-05	30			2.9								
	0.03	20-Oct-08	32										1.9	
	0.04	06-Oct-05	32										4.7	
	0.04	11-Jun-07	30						1.9					
	0.08	21-Jun-06	28						3.6					
	0.11	12-Aug-03	30								3.6			
	0.12	12-May-04	30					2.9						
	0.13	14-Sep-09	29									2		
	0.16	29-Jan-03	33	2.9										



Rain Range	Sum Rain	Date	Salinity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec
	0.17	13-Jul-05	29							2.9				
	0.35	13-May-09	30					1.9						
	0.36	30-Jun-05	30						93					
	0.39	23-May-06	26					2.9						
	0.4	14-May-07	30					1.9						
	0.46	05-Jan-04	32	2.9										
0.51-1.00	0.51	03-Apr-03	28				2.9							
	0.6	20-Jul-09	28							1.9				
	0.79	06-Dec-07	32											1.9
	0.83	24-Jul-03	30							43				
	0.97	06-Sep-06	32									18		
1.01-1.50	1.22	04-Apr-06	22				23							
	1.31	12-Jul-06	29							20				
	1.32	27-Jul-04	31							2.9				
	1.36	07-Oct-09	30										20	
1.51-2.00	1.68	11-Mar-08	30			2								
2.01-2.50	2.03	29-Aug-05	29								711			

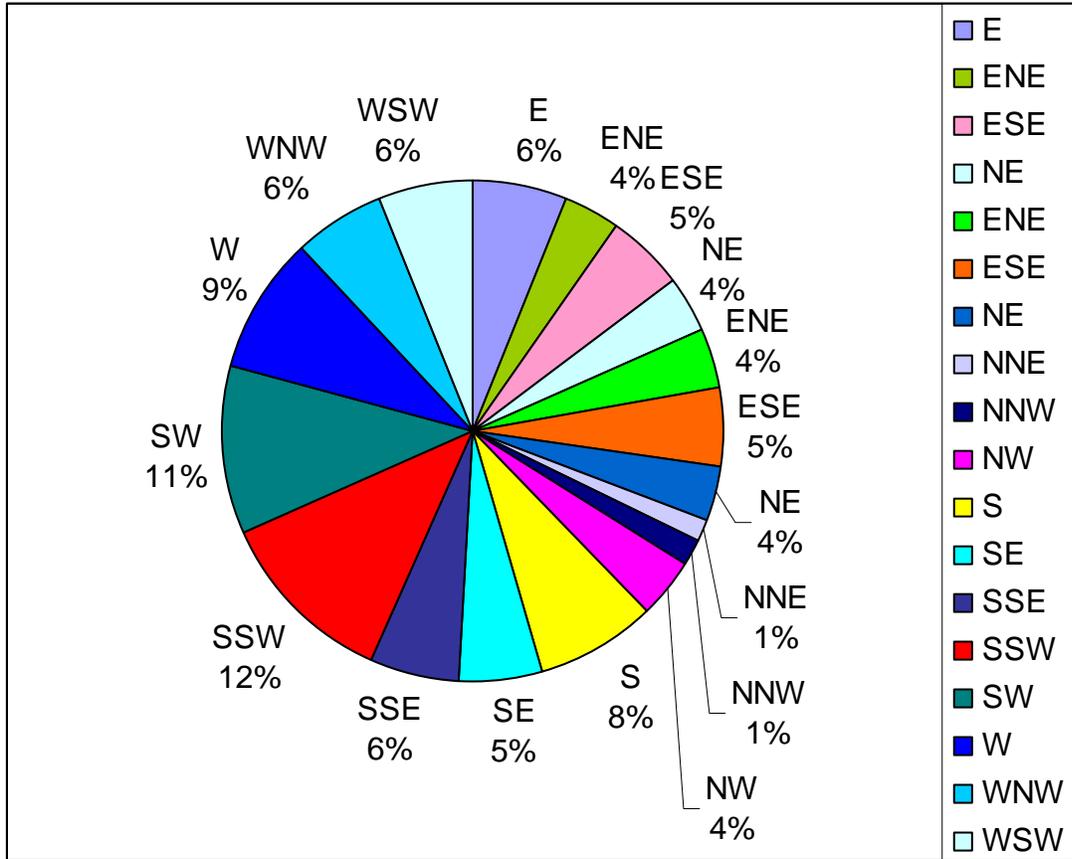
Winds

Wind direction data has been recorded at the time of sample collection since 2005 and is now being collected at each station at the time of sample collection. Wind speed is not being noted. Wind directions can vary greatly throughout the day, and among the stations. Stations that are located in long narrow coves often have little to no wind impact, due to the protected nature of the cove. Stations located in more open areas tend to be impacted by ocean breezes. The time of the day that the station is sampled can also impact the wind reported. Samples collected in the early morning hours often are collected during calm wind conditions. Since there are no sewage treatment facilities, major industries, or large point sources of pollution located along the shores of this growing area, it is unlikely that wind direction would have a significant impact on major pollution dispersal within this growing area.

There is currently not enough DMR wind data available to assess wind impact at each station. Figure 4 illustrates the 2009 daily average wind directions for Penobscot Bay (GOMOOS weather buoy data system, 364 days). Each wind direction is expressed as a percentage of total days for the year. In 2009, the wind was predominantly from southerly directions. The least frequent wind direction was north northeast and north northwest. A predominantly southern wind direction would push ocean waters into the growing area.



Figure 5. 2009 Daily Average Wind Directions





River Discharge

Shellfish growing area WT has two small river systems within the growing area boundaries. Back River and Meduncook River both flat out at low tide and both river systems flow from wetland areas. Back River has two streams that flow into the head of the river (S1WT15 and S2WT15). Both of these streams were sampled in 2008 and 2009. Stream site S2WT15 has four documented pollution sources bordering on it that are contributing to elevated scores at this site. The Meduncook River flows from a large wetland area that forms a salt pond before draining into the river at sampling station WT19. This area was downgraded in classification from approved to restricted on June 20, 2007 due to deteriorating water quality.

Due to the small size of both of these river systems, no river flow monitoring has been done. The greatest fresh water impact to the water quality in this area comes from the streams at the head of these small rivers (S1WT15 and S2WT15), the stream at station WT19.5 and the stream at the head of Hornbarn Cove in Cushing (station WT21). All of these streams should have their flow rates measured to more accurately determine their potential impact on the surrounding areas.

Water Quality Review

Table 14 lists all active approved, restricted and prohibited stations in Growing Area WT, with their respective Geomean and P90 calculations for 2009. Please refer to Appendix A for a key to interpreting the headers on the columns of Table 14. The approved and restricted standards for each station are also displayed in Table 14. These standards will fluctuate yearly as a result of the DMR transition from a most probable number (MPN) fecal coliform test method to a membrane filtration (MF) method and are dependent on the number of sample analyzed by MPN versus MF. The total number of data points used in the calculations is displayed in the Count column and includes both MPN and MF values. The number of data points analyzed by MF is displayed in the MFCNT column. This fluctuating standard will cease when all 30 data points have been analyzed by the MF method. A more detailed explanation of this transition can be found in DMR central files.

With the exception of station WT21, all of the stations in shellfish growing area WT met their NSSP classification standards. The inner portion of Hornbarn Cove (WT21) was reclassified as restricted on January 12, 2010. This area was surveyed in 2009 and no pollution sources were identified in the area. However, there is a large stream that enters the cove at the sample location that is the most likely source of the elevated scores. A new sample site will be located away from the stream to see if water quality away from the stream meets approved standards. Stream flow rates will be collected and station WT21 will continue to be sampled. At the end of the 2010 sampling season a dilution calculation will be done for stream S1WT21 to determine how large the closure size needs to be around the stream.



Table 14. Shellfish Growing Area WT Geomean and P90 Data, 2003-2009

Station	Class	Count	MFCOUNT	GM	SDV	MAX	P90	Appd_Std	Restr_Std	Min_Date
WT001.00	P	30	20	3.9	0.5	70	17.3	36	199	3/17/2005
WT002.00	P	30	20	3.5	0.48	240	14.8	36	199	3/17/2005
WT003.00	P	30	20	3.4	0.43	93	12.4	36	199	3/17/2005
WT004.00	P	30	20	4	0.53	460	19.4	36	199	3/17/2005
WT008.00	A	30	20	4.1	0.63	1100	26.6	36	199	3/17/2005
WT010.00	P	30	20	4.7	0.54	156	23.3	36	199	3/17/2005
WT011.00	A	30	20	4.3	0.54	460	22.1	36	199	3/17/2005
WT012.00	P	30	20	4.6	0.51	240	20.9	36	199	3/17/2005
WT013.00	A	30	20	3.8	0.41	58	13	36	199	3/17/2005
WT014.00	A	30	20	3.1	0.39	76	10.3	36	199	3/17/2005
WT015.00	A	30	20	3.9	0.57	1100	21.1	36	199	3/17/2005
WT016.00	A	30	20	3.1	0.31	23	7.8	36	199	3/17/2005
WT017.00	A	30	20	2.7	0.28	24	6.3	36	199	3/17/2005
WT018.00	A	30	11	3.8	0.5	1100	17.3	41	239	1/29/2003
WT018.50	R	15	15	3	0.35	31	8.5	31	163	8/1/2007
WT019.00	R	30	20	7.6	0.62	240	48.6	36	199	3/17/2005
WT019.20	R	30	20	9.4	0.72	460	80.6	36	199	4/7/2005
WT019.50	A	30	20	5.3	0.61	400	32.2	36	199	3/17/2005
WT020.00	A	30	20	3.2	0.44	240	12	36	199	8/26/2004
WT021.00	A	30	20	7.4	0.74	960	66.9	36	199	3/17/2005
WT022.00	A	30	20	3	0.41	240	10.6	36	199	3/17/2005
WT023.50	P	30	21	2.1	0.09	3.6	2.9	35	195	8/18/2005
WT024.00	A	30	20	4.4	0.62	711	27.7	36	199	3/17/2005
WT026.00	P	30	21	2.3	0.2	23	4.2	35	195	8/18/2005
WT027.00	A	30	21	2.2	0.1	3.6	3	35	195	8/18/2005
WT027.50	P	30	21	2.2	0.1	4	3	35	195	8/18/2005
WT028.50	P	30	21	2.2	0.12	6.6	3.2	35	195	8/18/2005
WT029.00	P	30	21	2.4	0.2	9.1	4.4	35	195	8/18/2005
WT031.00	A	30	21	2.4	0.2	9.1	4.4	35	195	8/18/2005



Table 15 shows the sampling effort for shellfish growing area WT in 2009. All of the stations were sampled a minimum of six times following the systematic random sampling strategy (SRS) over the course of the sampling season. Several stations were also sampled during adverse (flood closure) conditions. Data collected during adverse conditions is not used when calculating the P90 score. SRS sampling effort for 2009 is presented in Appendix B.

Table 15. WT Sampling Effort, 2009

Station	Class	Adverse	Random		Total	Comments
		Closed	Closed	Open		
WT001.00	P		6		6	
WT002.00	A			3	3	
	P		3		3	Reclassified to P 7/16/09
WT003.00	A			3	3	
	P		3		3	Reclassified to P 7/16/09
WT004.00	A			3	3	
	P		3		3	Reclassified to P 7/16/09
WT008.00	A			6	6	
WT010.00	A			3	3	
	P		3		3	Reclassified to P 7/16/09
WT011.00	A			6	6	
WT012.00	A			3	3	
	P		3		3	Reclassified to P 7/16/09
WT013.00	A			6	6	
WT014.00	A			6	6	
WT015.00	A	32		6	38	Flood Station
WT016.00	A			6	6	
WT017.00	A			6	6	
WT018.00	A	35		6	41	Flood Station
WT018.50	R			6	6	
WT019.00	R			6	6	
WT019.20	R			6	6	
WT019.50	A			6	6	
WT020.00	A			6	6	
WT021.00	A	35		6	41	Flood Station
WT022.00	A			6	6	
WT023.50	P		6		6	
WT024.00	A			6	6	
WT026.00	P		6		6	
WT027.00	A			6	6	
WT027.50	P		6		6	
WT028.50	P		6		6	
WT029.00	P		6		6	

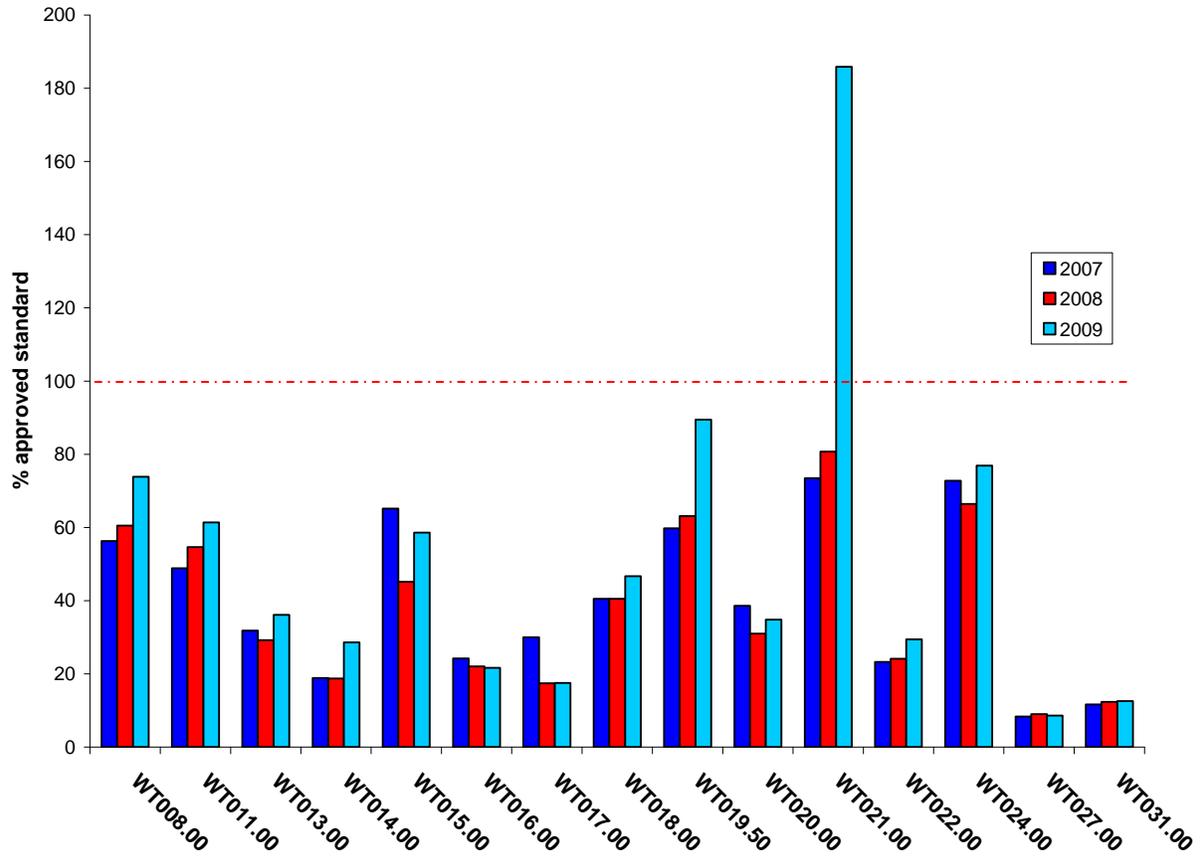


Station	Class	Adverse	Random		Total	Comments
		Closed	Closed	Open		
WT031.00	A			6	6	

Figures 6, 7 and 8 show the P90 trends over the past three years, for all approved, restricted and prohibited stations in growing area WT. During the transition from MPN to MF analysis method, the approved standard will decrease every year, until all samples have been analyzed by the MF method. In order to show the trend of the P90 value over the years, the calculated P90 scores are expressed as a percentage of the approved standard; any station showing the 2009 column on or above 100 percent does not meet the standard for approved classification. Generally, most approved stations in WT have shown an increase in scores over the past year. In 2009, several of the sampling dates fell during periods of moderately heavy rain, which contributed to an increase of run-off, and more elevated fecal coliform scores across many stations in the growing area. At the end of 2009, station WT 21 (Figure 6), did not meet the approved standard and was downgraded in classification to restricted. Stations WT 8, WT 11 and WT 19.5 currently meet approved standards, but have shown increases in scores over the past three years. No actual pollution sources were identified in the vicinity of these stations, and follow up survey work in the vicinity of these stations may be required in the coming review year to further investigate the sources of the pollution. There are no streams nearby stations WT8 and WT11; however there is a stream nearby station WT19.5 that may be impacting the water quality. None of the approved stations had a significant decrease in scores (improvement in water quality) over the past year, while stations WT 16, 17, 27, and 31 have shown no or little change in the scores.



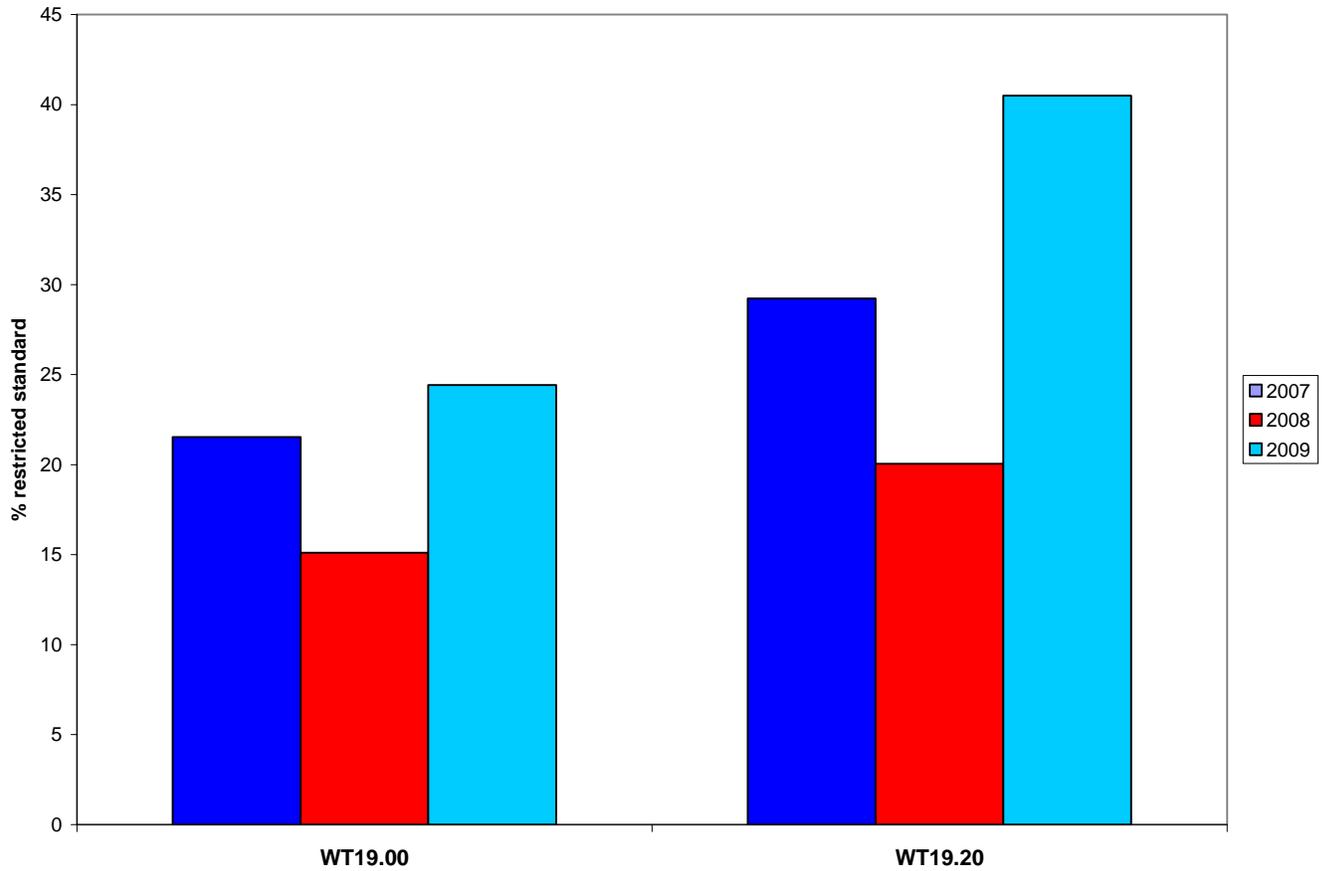
Figure 6. Approved Stations, P90 Scores expressed as percent of approved standard, 2007-2009





The P90 trends for restricted stations in growing area WT (Figure 7) show an increase in scores for stations WT 19 and WT 19.2 in the past year. This could be attributed to the extremely wet conditions in 2009.

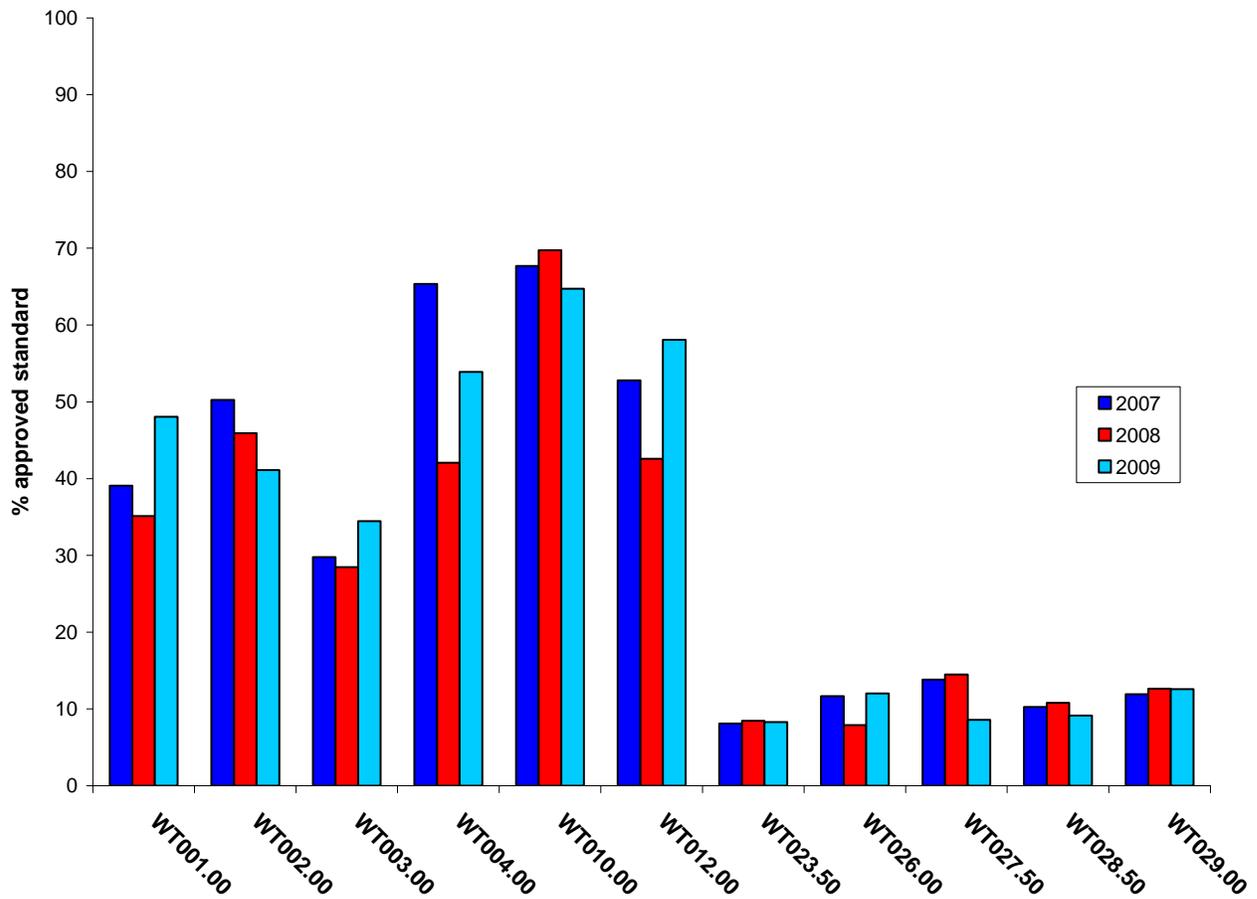
Figure 7. Restricted Stations, P90 Scores expressed as percent of restricted standard, 2007-2009





All of the prohibited stations (Figure 8) currently meet the approved standards, however all of these stations have pollution sources nearby that necessitate the classification. Stations WT 2, 3, 4, 10, and 12 were downgraded in classification following the shoreline survey of the area. All of these stations are located in Hatchet Cove or Johnson Cove, and multiple septic system malfunctions were noted in these areas during the recent shoreline survey. It is likely that any recent increases in scores among these stations were caused by these malfunctions.

Figure 8. Prohibited Stations, P90 Scores expressed as percent of approved standard, 2007-2009



Water Quality Discussion and Classification Determination

As a result of the current 2009 shoreline survey of growing area WT and the findings of this report, several changes in classification were made (Figure 9). More detailed explanations of changes in classification that have occurred to date, as well as possible re-classifications that may be implemented in the future, once the recommended follow up work is completed, are presented later in this report.



Hatchet Cove, Friendship

Hatchet Cove, Friendship was reclassified as prohibited on July 16, 2009 following the shoreline survey of the area. This was a precautionary closure due to pollution sources identified during the survey of the area. All of the stations in the cove currently meet approved standards. When pollution sources in this area have been remediated, this area will be reassessed and may be able to be reclassified to approved

Johnson Cove, Friendship

The closure in this area was enlarged on July 16, 2009 following the shoreline survey of the area. This was a precautionary closure due to pollution sources identified during the survey of the area. All of the stations in the cove currently meet approved standards. When pollution sources in this area have been remediated, this area will be reassessed and may be able to be reclassified to approved

Back River, Friendship

The head of Back River, Friendship was reclassified as prohibited on August 21, 2009, following the shoreline survey of the area. Several pollution sources were identified that bordered on drainages flowing into Back River. The closure extended out to station WT15 which was still meeting approved standards and was not found to have any actual sources of pollution in the immediate area.

Hornbarn Cove, Cushing

Outer Hornbarn Cove, Cushing was classified as restricted on August 21, 2009 due to potential pollution sources in the vicinity of the area around water sampling station WT22. Inner Hornbarn Cove was reclassified as restricted on January 12, 2009 when a review of water quality scores revealed that the area no longer met approved standards. No actual pollution sources were identified during the 2009 survey of the area. A large stream nearby sample station WT21 is the suspected cause of the elevated scores in this area. A new sample site has been established away from the stream. Samples will be collected biweekly at station WT21, stream site S1WT21 and the new sample location WT 20.8. The flow rate for the stream will be measured and a dilution calculation will be done to determine the required size of the closure in Hornbarn Cove.

Otter Island, Friendship

Otter Island was classified as prohibited on December 31, 2008 due to an expired shoreline survey. The island was inspected in 2009 during the shoreline survey of the growing area. Otter Island has one seasonal dwelling on it that is at least 150 feet from the shore. No pollution sources were identified on the island during the survey. There are no sample stations along the shore of Otter Island. Otter Island may be reclassified as approved.

Aquaculture/Wet Storage Activity



There are three aquaculture sites in shellfish growing area WT (Figure 1). Information on these lease sites is shown below. This information is also available at the DMR aquaculture website at:

<http://www.maine.gov/dmr/aquaculture/leaseinventory/index.htm>

Site MED GI

Located on the west side of Gay Island in the town of Cushing

Species Cultivated: oyster eastern / American (*Crassostrea virginica*) - scallop sea (*Placopecten magellanicus*)

Cultivation Technique(s): Suspended

Expiration Date: 8/25/2014

Site MED G12

Located on the west side of Gay Island in the town of Cushing

Species Cultivated: mussel blue sea (*Mytilus edulis*) - scallop sea (*Placopecten magellanicus*) - oyster eastern / American

(*Crassostrea virginica*)

Cultivation Technique(s): Suspended

Expiration Date: Application for renewal currently under review

Site MED BP

Located North of Bradford Point Meduncook River Cushing

Species Cultivated: oyster eastern / American (*Crassostrea virginica*)

Cultivation Technique(s): Suspended

Expiration Date: 2/5/2016

Conclusion

Over the past review year, water quality has declined in many areas of growing area WT. As a result of this water quality decline, Hornbarn Cove, Cushing was downgraded in classification to restricted (Station WT21, January 12, 2010). In addition to poor water quality scores, portions of the coastline in growing area WT (Hatchet Cove, Johnson Cove and the head of Back River) were classified as prohibited due to the presence of identified pollution sources which could impact water quality, especially under adverse weather conditions when run-off from the land to the shore increases. These areas will remain prohibited until the pollution sources are abated.

Further testing of water quality monitoring station WT21 under adverse weather conditions, in conjunction with testing of stream site S1WT21, is recommended. Flow rates and a dilution calculation should be done on this stream site. Additionally a new sample station should be established in Hornbarn Cove that is located away from the mouth of the stream. Stream sites S1WT15 and S2WT15 should also have flow rates and dilution calculations done to determine if the closure at the head of Back River is large enough.

Based on the review completed in this report, a closure will be repealed at Otter Island (Figure 8). No additional upgrades are being proposed at this time.



Recommendation for Future Work

Back River, Friendship

Stream sample sites S1WT15 and S2WT15 should be sampled several times over the course of the year during various weather conditions and following rainfall events. Worst case scenario flow rates (following heavy rainfall events) should be taken for both streams and a final dilution calculation should be done to determine if the closure area above sample station WT15 is appropriate.

Meduncook River, Friendship and Cushing

The water quality scores at station WT19.5 have been rising for the past three years. This area should be revisited to see if pollution sources were overlooked during the 2009 survey of the area. Additional stream data should be collected following rainfall at stream site S1WT19.5 to determine if the stream is contributing to the elevated scores at station WT19.5. Stream flow rates and a dilution calculation should also be done.

Hornbarn Cove, Cushing

A new sample site will be located away from stream S1WT21 to see if water quality away from the stream meets approved standards. Stream flow rates will be collected and station WT21 will continue to be sampled. At the end of the 2010 sampling season a dilution calculation will be done for stream S1WT21 to determine how large the closure size needs to be around the stream.

Water monitoring station WT 1 will be deactivated. There are three licensed overboard discharges in this area. The shore is rocky and not suitable for soft shelled clams. This area will remain classified as prohibited for shellfish resources.

References

U.S. Census Bureau. (2000) *Population Finder*. Retrieved April 5, 2009, from <http://www.census.gov/>



Appendix A. DEP Overboard Discharge License Conditions

OBD license conditions for less than 2,000 gallons per day

Effluent Characteristic	Discharge Limitations	
	Monthly <u>Average</u>	Daily <u>Maximum</u>
Flow		as licensed
5-Day Biochemical Oxygen Demand (BOD)	30 mg/L	50 mg/L
Total Suspended Solids (TSS)	30 mg/L	50 mg/L
Settleable Solids		0.1 ml/L
Fecal coliform Bacteria	15col/100ml	
pH	The pH of the effluent shall not be less than 6.0 or greater than 8.5	

OBD license conditions for less than 2,000 gallons per day

Effluent Characteristic	Discharge Limitations					
	Monthly <u>Average</u>			Daily <u>Maximum</u>		
Water Classification	SB/SC	B	C	SB/SC	B	C
Flow	As licensed					
5-Day Biochemical Oxygen Demand (BOD)	30 mg/L			50 mg/L		
Total Suspended Solids (TSS)	30 mg/L			50 mg/L		
Settleable Solids	report only			0.1 ml/L		
<input type="checkbox"/> Fecal coliform Bacteria per 100ml. or <input type="checkbox"/> Eschericia coli Bacteria per 100ml.	15col /100ml	64col /100ml	142 col /100ml.	50 col /100ml.	427 col /100ml.	949 col /100ml.
Residual Chlorine	chlor: 1.0 mg/L dechlor: 0.1 mg/L					
pH	The pH of the effluent shall not be less than 6.0 or greater than 8.5 at any time					

Tables courtesy of Maine DEP



Appendix B. 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.



Appendix C. Growing Area WT 2009 Data

Station	Date	Collector	Tide	Wind	Temp	Salin	Strat	Adv	Status	Class	MFCOL
WT001.00	2/10/2009	FP	E	CL	0	32	R		C	P	<2
	3/25/2009	EXT	HF	CL	1	32	R		C	P	<2
	5/13/2009	MLP	F	S	12	30	R		C	P	<2
	7/20/2009	MLP	HF	CL	19	31	R		C	P	6
	9/14/2009	EXT	E	CL	15	30	R		C	P	70
	10/7/2009	EXT	F	S	13	30	R	P	C	CA	2
WT002.00	2/10/2009	FP	E	CL	0	32	R		O	A	<2
	3/25/2009	EXT	HF	NE	1	30	R		O	A	<2
	5/13/2009	MLP	F	S	13	30	R		O	A	<2
	7/20/2009	MLP	HF	CL	19	31	R		C	P	31
	9/14/2009	EXT	E	CL	16	30	R		C	P	2
	10/7/2009	EXT	F	S	14	30	R	P	C	P	5.5
WT003.00	2/10/2009	FP	E	S	0	32	R	W	O	A	<2
	3/25/2009	EXT	HF	NE	2	32	R		O	A	<2
	5/13/2009	MLP	F	SW	11	30	R		O	A	<2
	7/20/2009	MLP	HF	CL	18	30	R		C	P	10
	9/14/2009	EXT	E	CL	16	30	R		C	P	9.1
	10/7/2009	EXT	F	SE	13	30	R	P	C	P	4
WT004.00	3/25/2009	EXT	HF	NE	1	32	R		O	A	<2
	5/13/2009	MLP	F	SW	19	30	R		O	A	<2
	6/1/2009	FP	F	W	19	29	R	P	O	A	<2
	7/20/2009	MLP	HF	CL	20	28	R		C	P	<2
	9/14/2009	EXT	E	NW	16	30	R		C	P	4
	10/7/2009	EXT	F	SE	13	26	R	P	C	P	60
WT008.00	2/10/2009	FP	E	CL	0	33	R		O	A	<2
	3/25/2009	EXT	HF	NE	1	32	R		O	A	<2
	5/13/2009	MLP	F	SW	11	30	R		O	A	<2
	7/20/2009	MLP	HF	CL	17	31	R		O	A	18
	9/14/2009	EXT	H	CL	15	30	R		O	A	12
	10/7/2009	EXT	F	CL	13	30	R	P	O	A	<2
WT010.00	2/10/2009	FP	E	S	0	32	R	W	O	A	<2
	3/25/2009	EXT	HF	CL	2	32	R		O	A	<2
	5/13/2009	MLP	F	SW	13	30	R		O	A	<2
	7/20/2009	MLP	HF	CL	19	29	R		C	P	2
	9/14/2009	EXT	H	CL	15	30	R		C	P	14
	10/7/2009	EXT	F	CL	13	31	R	P	C	P	<2



Station	Date	Collector	Tide	Wind	Temp	Salin	Strat	Adv	Status	Class	MFCOL
WT011.00	2/10/2009	FP	E	S	0	33	R		O	A	<2
	3/25/2009	EXT	H	CL	3	32	R		O	A	<2
	5/13/2009	MLP	F	S	16	30	R		O	A	<2
	7/20/2009	MLP	H	CL	19	30	R		O	A	4
	9/14/2009	EXT	H	CL	15	30	R		O	A	11
	10/7/2009	EXT	F	CL	13	30	R	P	O	A	<2
WT012.00	2/10/2009	FP	E	S	0	33	R		O	A	<2
	3/25/2009	EXT	H	NE	2	32	R		O	A	<2
	5/13/2009	MLP	F	S	10	31	R		O	A	<2
	7/20/2009	MLP	H	CL	17	30	R		C	P	54
	9/14/2009	EXT	HE	CL	16	30	R		C	P	13
	10/7/2009	EXT	F	CL	13	31	R	P	C	P	3.6
WT013.00	2/10/2009	FP	E	S	0	32	R	W	O	A	<2
	3/25/2009	EXT	H	CL	2	32	R		O	A	<2
	5/13/2009	MLP	F	S	15	30	R		O	A	<2
	7/20/2009	MLP	H	CL	16	28	R		O	A	6
	9/14/2009	EXT	HE	CL	16	30	R		O	A	6
	10/7/2009	EXT	F	SE	13	30	R	P	O	A	22
WT014.00	2/10/2009	FP	E	S	0	32	R	W	O	A	<2
	3/25/2009	EXT	H	CL	3	32	R		O	A	<2
	5/13/2009	MLP	F	S	12	31	R		O	A	<2
	7/20/2009	MLP	H	SE	18	29	R		O	A	2
	9/14/2009	EXT	HE	CL	16	30	R		O	A	<2
	10/7/2009	EXT	F	SE	13	30	R	P	O	A	76
WT015.00	2/10/2009	FP	E	S	0	32	R		O	A	<2
	3/25/2009	EXT	H	NE	2	31	R		O	A	<2
	5/13/2009	MLP	F	SW	15	30	R		O	A	<2
	7/20/2009	MLP	H	CL	19	28	R		O	A	4
	9/14/2009	EXT	HE	CL	16	30	R		O	A	14
	10/7/2009	EXT	F	CL	14	30	R	P	O	A	50
WT016.00	2/10/2009	FP	E	CL	0	32	R		O	A	<2
	3/25/2009	EXT	H	CL	3	32	R		O	A	<2
	5/13/2009	MLP	HF	SW	16	30	R		O	A	<2
	7/20/2009	MLP	HE	CL	20	28	R		O	A	2
	9/14/2009	EXT	HE	W	16	30	R		O	A	<2
	10/19/2009	LSM	HF	N	10	32	R		O	A	<2
WT017.00	2/10/2009	FP	E	SW	0	32	R		O	A	<2
	3/25/2009	EXT	H	CL	2	32	R		O	A	<2
	5/13/2009	MLP	HF	SW	18	30	R		O	A	2
	7/20/2009	MLP	HE	CL	20	28	R		O	A	<2
	9/14/2009	EXT	HE	CL	15	30	R		O	A	2
	10/7/2009	EXT	HF	CL	14	30	R	P	O	A	2



Station	Date	Collector	Tide	Wind	Temp	Salin	Strat	Adv	Status	Class	MFCOL
WT018.00	2/10/2009	FP	E	CL	0	32	R		O	A	<2
	3/25/2009	EXT	HE	NE	2	32	R		O	A	<2
	5/13/2009	MLP	HF	SW	14	30	R		O	A	<2
	7/20/2009	MLP	HE	CL	19	29	R		O	A	6
	9/14/2009	EXT	HE	CL	16	30	R		O	A	10
	10/7/2009	EXT	HF	SE	14	30	R	P	O	A	5.5
WT018.50	2/10/2009	FP	HE	CL	0	31	R		O	R	<2
	3/25/2009	EXT	HE	CL	2	30	R		O	R	<2
	5/13/2009	MLP	HF	SW	13	30	R		O	R	<2
	7/20/2009	MLP	HE	SE	21	28	R		O	R	6
	9/14/2009	EXT	E	CL	16	30	R		O	R	4
	10/7/2009	EXT	HF	SE	14	26	R	P	O	R	31
WT019.00	2/10/2009	FP	HE	CL	0	18	R	W	O	R	<2
	3/25/2009	EXT	HE	CL	3	31	R		O	R	<2
	5/13/2009	MLP	HF	SW	18	16	R		O	R	<2
	7/20/2009	MLP	HE	CL	22	20	R		O	R	12
	9/14/2009	EXT	E	CL	18	24	R		O	R	15
	10/7/2009	EXT	HF	CL	15	26	R	P	O	R	200
WT019.20	5/13/2009	MLP	HF	SW	19	12	R		O	R	2.8
	6/1/2009	FP	LF	W	18	3	R	P	O	R	11
	7/20/2009	MLP	HE	CL	22	2	R		O	R	22
	9/14/2009	EXT	E	CL	14	4	R		O	R	70
	10/7/2009	EXT	HF	CL	15	10	R	P	O	R	210
	10/21/2009	FP	H	N	10	6	R		O	R	13
WT019.50	2/10/2009	FP	HE	CL	0	31	R		O	A	<2
	3/25/2009	EXT	HE	CL	2	25	R		O	A	<2
	5/13/2009	MLP	HF	S	17	28	R		O	A	9.1
	7/20/2009	MLP	HE	CL	21	25	R		O	A	400
	9/14/2009	EXT	E	CL	17	30	R		O	A	3.6
	10/7/2009	EXT	HF	CL	15	26	R	P	O	A	114
WT020.00	2/10/2009	FP	HE	CL	0	32	R		O	A	<2
	3/25/2009	EXT	HE	N	3	31	R		O	A	<2
	5/13/2009	MLP	H	SW	10	30	R		O	A	<2
	7/20/2009	MLP	E	SE	18	28	R		O	A	4
	9/14/2009	EXT	E	NW	15	30	R		O	A	9.1
	10/7/2009	EXT	H	E	14	30	R	P	O	A	4
WT021.00	2/10/2009	FP	H	CL	0	31	R		O	A	<2
	3/25/2009	EXT	E	CL	2	27	R		O	A	<2
	5/13/2009	MLP	H	SW	19	28	R		O	A	<2
	7/20/2009	MLP	E	S	19	25	R		O	A	10
	9/14/2009	EXT	E	NW	15	22	R		O	A	72
	10/7/2009	EXT	H	CL	14	26	R	P	O	A	960



Station	Date	Collector	Tide	Wind	Temp	Salin	Strat	Adv	Status	Class	MFCOL
WT022.00	2/10/2009	FP	H	CL	0	32	R		O	A	<2
	3/25/2009	EXT	E	CL	3	32	R		O	A	<2
	5/13/2009	MLP	H	SW	10	30	R		O	A	<2
	7/20/2009	MLP	E	S	17	29	R		O	A	<2
	9/14/2009	EXT	E	NW	15	30	R		O	A	7.3
	10/7/2009	EXT	H	E	14	30	R	P	O	A	15
WT023.50	5/4/2009	FP	LE	S	6	30	R		C	P	<2
	6/2/2009	FP	LE	N	8	30	R		C	P	<2
	8/10/2009	FP	H	S	13	30	R		C	P	<2
	9/21/2009	AB	H	CL		32	R		C	P	<2
	10/5/2009	FP	H	W	14	31	R		C	P	2
	10/26/2009	FP	LF	NW	9	30	R	P	C	P	<2
WT024.00	2/10/2009	FP	H	CL	0	32	R		O	A	<2
	3/25/2009	EXT	E	NE	3	31	R		O	A	<2
	5/13/2009	MLP	H	SW	13	30	R		O	A	<2
	7/20/2009	MLP	E	S	18	28	R		O	A	<2
	9/14/2009	EXT	E	CL	17	29	R		O	A	2
	10/7/2009	EXT	H	E	14	30	R	P	O	A	20
WT026.00	5/4/2009	FP	LE	S	5	30	R		C	P	<2
	6/2/2009	FP	LE	N	9	32	R		C	P	<2
	8/10/2009	FP	H	S	14	30	R		C	P	<2
	9/21/2009	AB	H	CL		32	R		C	P	<2
	10/5/2009	FP	HE	W	14	31	R		C	P	<2
	10/26/2009	FP	LF	NW	9	31	R	P	C	P	<2
WT027.00	5/4/2009	FP	LE	S	8	30	R		O	A	<2
	6/2/2009	FP	LE	N	8	30	R		O	A	<2
	8/10/2009	FP	HF	S	15	30	R		O	A	<2
	9/21/2009	AB	H	CL		32	R		O	A	<2
	10/5/2009	FP	H	W	15	32	R		O	A	<2
	10/26/2009	FP	LF	NW	10	31	R	P	O	A	<2
WT027.50	5/4/2009	FP	LE	S	7	30	R		C	P	<2
	6/2/2009	FP	LE	CL	8	30	R		C	P	<2
	8/10/2009	FP	HF	S	14	30	R	W	C	P	<2
	9/21/2009	AB	H	CL		32	R		C	P	<2
	10/5/2009	FP	H	CL	15	31	R		C	P	<2
	10/26/2009	FP	LF	NW	10	31	R	P	C	P	2
WT028.50	5/4/2009	FP	LE	S	6	30	R		C	P	<2
	6/2/2009	FP	LE	N	8	30	R		C	P	<2
	8/10/2009	FP	HF	S	14	30	R		C	P	<2
	9/21/2009	AB	H	CL		32	R		C	P	<2
	10/5/2009	FP	H	W	14	31	R		C	P	<2
	10/26/2009	FP	LF	NW	10	31	R	P	C	P	<2



Station	Date	Collector	Tide	Wind	Temp	Salin	Strat	Adv	Status	Class	MFCOL
WT029.00	5/4/2009	FP	E	CL	8	30	R		C	P	<2
	6/2/2009	FP	E	CL	7	30	R		C	P	<2
	8/10/2009	FP	F	S	13	30	R		C	P	2
	9/21/2009	AB	F	CL		32	R		C	P	<2
	10/5/2009	FP	HF	W	13	30	R		C	P	<2
	10/26/2009	FP	LE	W	9	32	R	P	C	P	<2
WT031.00	5/4/2009	FP	E	S	6	30	R		O	A	<2
	6/2/2009	FP	E	N	7	30	R		O	A	<2
	8/10/2009	FP	F	S	13	30	R	B	O	A	<2
	9/21/2009	AB	F	CL		32	R	B	O	A	<2
	10/5/2009	FP	HF	W	13	31	R		O	A	<2
	10/26/2009	FP	LE	NW	9	32	R	P	O	A	<2