Section 5-4
Kennebunk River (Mousam and Kennebunk Rivers Alliance)

Refer to Chapter 4 of this document for information about sampling methods, sampling sites, and quality assurance.

Overview

The Mousam and Kennebunk Rivers Alliance (MKA) began in 2009 with assistance from the Wells National Estuarine Research Reserve (NERR) and Maine Rivers, for the purpose of monitoring the Kennebunk and Mousam rivers. The Kennebunk River is located in Southern Maine and originates in Kennebunk Pond in Lyman. The river is 15 miles long and flows from Lyman in York County to the Gulf of Maine in the town of Kennebunk. The primary impacts to the river come from development, recreational use, and agriculture. In recent years, the Kennebunk River has experienced high bacteria counts believed to be associated with faulty septic systems, livestock, and overboard discharges. In 2012, MKA partnered with the DEP TMDL Streams staff to monitor bacteria in Duck Brook-a major tributary to Kennebunk River. The statutory water class of the Kennebunk River is Class B and below head of tide, the river is Class SB. In a 2005 DEP biomonitoring assessment, a monitoring location on the lower half of the river between Arundel and Kennebunk did not attain Class B standards.

The overall purpose of monitoring is to assess water quality data to determine whether the river is meeting water quality classification standards. The Kennebunk River Sampling and Analysis Plan states that the objectives of monitoring are to: (1) develop baseline data for expanded long-term water quality monitoring efforts; (2) provide information on current watershed conditions; and (3) identify areas with degraded water quality to focus best management practices.

Methods

The volunteers monitored the Kennebunk River in 2012 at five stations on the main stem and at one station on Ward Brook (Table 5-4-1 and Figure 5-4-1). Two of the stations [KB-01 and KB-02] are below head of tide, and four [KB-03, KB-04, KB-05and KB-03A] are freshwater sites. All of the Kennebunk River sites are VRMP approved sites.

Table 5-4-1: Mousam and Kennebunk Rivers Alliance sampling sites on the Kennebunk River.

VRMP Site ID	Organization Site Code	Sample Location	Class
Kennebunk River-SKE11-VRMP	KB-01	Route 9 Bridge	SB
Kennebunk River-SKE35-VRMP	KB-02	Durrell's Bridge	SB
Kennebunk River-SKE66-VRMP	KB-03	Route 1 Bridge	B
Kennebunk River-SKE103-VRMP	KB-04	Downing Road	B
Kennebunk River-SKE148-VRMP	KB-05	Perkins Lane	B
Ward Brook-SKEWD04-VRMP	KB-03A	Emmons Road	B

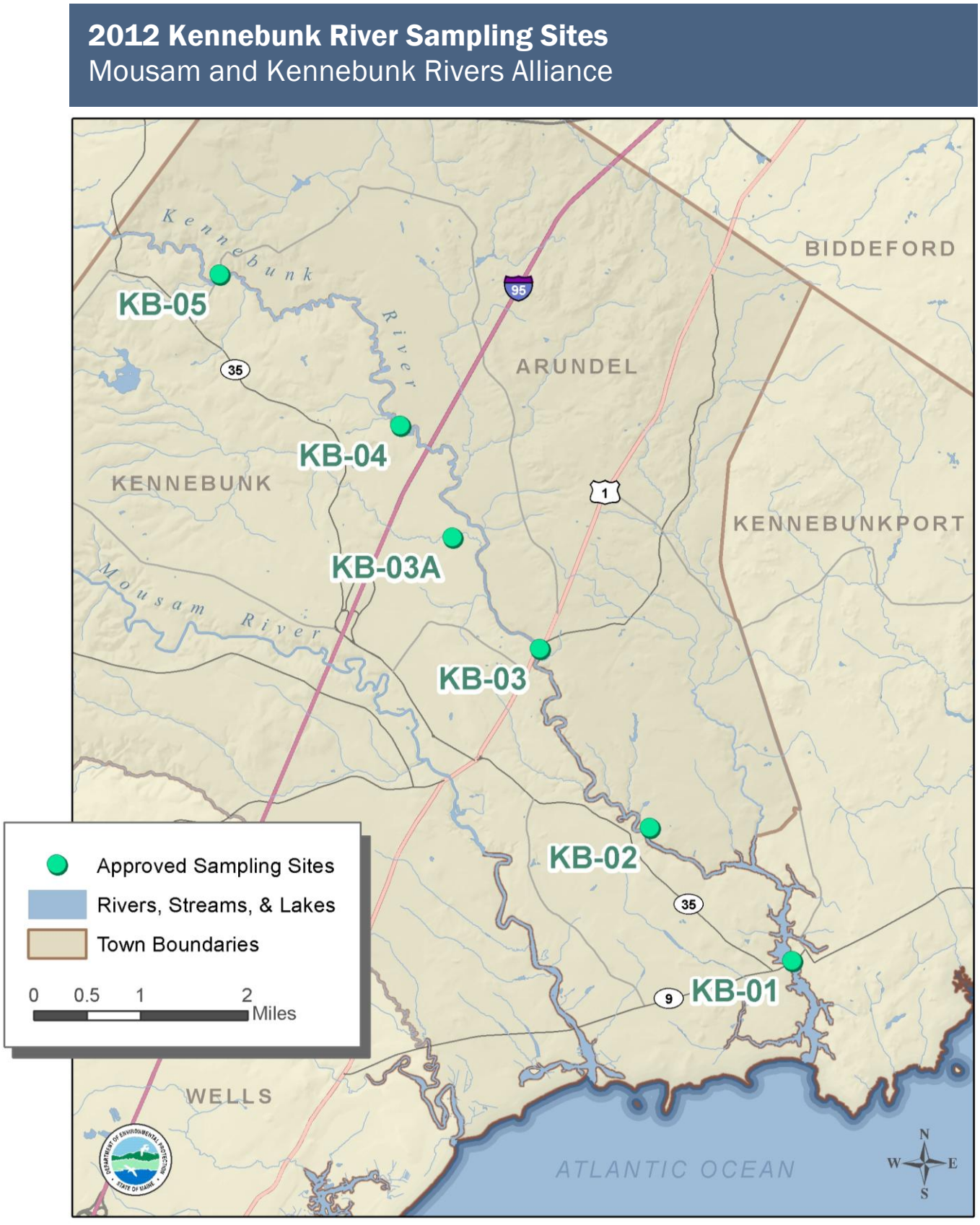

Figure 5-4-1: Map of Mousam and Kennebunk Rivers Alliance sampling sites on the Kennebunk River.

Monitoring was conducted from June through September 1-3 times per month. At each site, the monitors made direct measurements of water temperature and dissolved oxygen using a handheld YSI 550A meter. Conductivity was directly measured at the freshwater sites using an Oakton EC 11+ Testr conductivity pen and salinity was measured at the tidal sites. Grab samples were collected for *E. coli* bacteria at the freshwater sites and Enterococcus bacteria at the sites below head of tide. In 2012, MKA volunteers coordinated with DEP TMDL Streams staff to share sampling of bacteria on Duck Brook. Bacteria samples were transported to Nelson Labs for analysis.

Results

Refer to Appendices A-1 and A-2 in discussion of individual site data and trends, as well as graphed data (Figures 5-4-3 through 5-4-8) and data graphed by river mile (Figures 5-4-9 through 5-4-10), at the end of this section of the report.

Precipitation

Figure 5-4-2 provides a graph of rainfall and sampling dates for the monitoring period. Rainfall data was obtained from Weather Underground (http://www.wunderground.com). Weather station choice was based on proximity and station with most complete records. If there was an airport station close by, this was chosen. This information provides an overview of rainfall events and can be useful in interpreting monitoring results for some parameters.

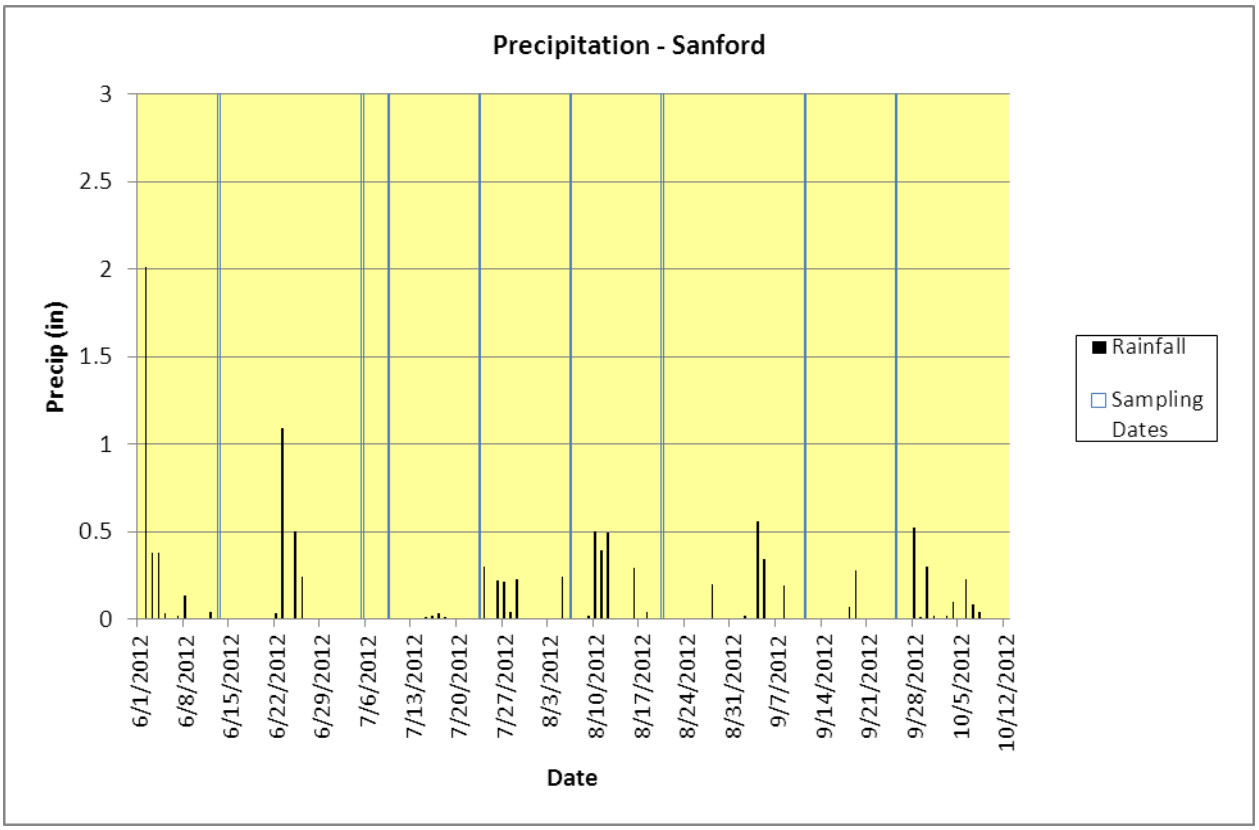

Figure 5-4-2: Seasonal Precipitation Measured at Sanford Airport

Dissolved Oxygen

Dissolved oxygen was measured 6-7 times at each of the six sampling sites (Table 5-4-2 and Table 5-4-3). Monitoring occurred from June through September. Class B criteria for dissolved oxygen are a minimum of 7 mg/l (milligrams/liter) or 75% saturation. To meet water quality criteria, both concentration and saturation standards must be met. The Class SB standard is 85% saturation.

Table 5-4-2: A summary of minimum, maximum, and average dissolved oxygen concentration (mg/l) values at Mousam and Kennebunk Rivers Alliance monitoring sites on the Kennebunk River and tributary.

Site	Approved Site	# of Samples	Minimum Value	Maximum Value	Average Value
KB-01	Y	7	7.1	11.4	9.2
KB-02	Y	7	6.8	8.5	7.7
KB-03	Y	7	8.6	10.9	9.3
KB-04	Y	7	7.2	8.8	7.9
KB-05	Y	7	8.4	10.2	9.0
KB-03A	Y	6	7.8	9.6	8.5

Table 5-4-3: A summary of minimum, maximum, and average dissolved oxygen saturation (%) values at Mousam and Kennebunk Rivers Alliance monitoring sites on the Kennebunk River and tributary.

Site	Approved Site	# of Samples	Minimum Value	Maximum Value	Average Value
KB-01	Y	7	78.4	115.4	94.1
KB-02	Y	7	72.8	92.3	84.0
KB-03	Y	7	93.4	107.5	99.1
KB-04	Y	7	77.3	87.6	82.5
KB-05	Y	7	86.0	97.6	92.3
KB-03A	Y	6	82.5	93.6	87.2

Dissolved oxygen concentrations measured at Kennebunk River sites ranged from 6.8 mg/l to 11.4 mg/l. At Site KB-01, the lowest readings occurred in late August. It dropped below the Class SB standard of 85% saturation on one date (8/20/12-78.4%). At Site KB-02 the lowest readings were late August and mid-September. Overall percent saturation was lower at this site and dropped below the saturation standard on 5 out of 7 sampling dates (ranging from 72.8-84.0% for these five events). Site KB-03 never fell below Class B standard of 7.0mg/l or 75% saturation. Site KB-04 also never dropped below standards, but overall was lower than at the other main stem freshwater sites. Site KB-05 overall looked

good and never dropped below standards. Site KB-03A (Ward Brook) met standards for all sampling dates. Overall the tidal sites (KB-01 and KB-02) followed the same patterns with KB-01 always being higher. For the freshwater sites, overall site KB-03 generally always had the highest values, KB-04 the lowest; and KB-03 and KB-03A were in-between. [See graphs at end of the report].

The fact that dissolved oxygen concentrations and percent saturation values were overall good may have been partly due to the fact that with the exception of Site KB-01,no measurements were collected early in the morning (before 8:00 am). Dissolved oxygen levels are generally lowest early in the morning and then increase during the day, peaking mid-late afternoon. Dissolved oxygen is also affected by flow conditions. During high flow conditions, more oxygen is added to the river from the atmosphere, as the water is moving faster and there is more opportunity for mixing. If flow during the summer months is higher or lower than generally normal, then this will affect the dissolved oxygen.

Water Temperature

Temperature was measured 6-7 times at each of the six sampling sites (Table 5-4-4). Monitoring occurred from June through September. Maine's Regulations Relating to Temperature (06-096 CMR Chapter 582) require that discharge of pollutants not raise the temperature of any river and stream above the EPA criteria for indigenous species (23°C maximum and 19°C weekly average) or 0.3°C (0.5°F) above the temperature that would naturally occur outside a mixing zone established by the Board of Environmental Protection. Pollutant is defined in statute as many things including dirt and heat. For tidal waters, discharge of pollutants may not raise the temperature more than 4°F (2.2°C) or more than 1.5°F (0.8°C) from June 1 to September 1, and may not cause the temperature of any tidal waters to exceed 85°F (29°C) at any point outside a mixing zone established by the Board of Environmental Protection.

Table 5-4-4: A summary of minimum, maximum, and water temperature (°C) values at Mousam and Kennebunk Rivers Alliance monitoring sites on the Kennebunk River and tributary.

Site	Approved Site	# of Samples	Minimum Value	Maximum Value	Average Value
KB-01	Y	7	14.7	20.2	16.8
KB-02	Y	7	15.0	22.4	19.4
KB-03	Y	7	11.7	23.0	18.6
KB-04	Y	7	11.9	20.4	17.5
KB-05	Y	7	10.3	19.5	16.8
KB-03A	Y	6	10.1	20.4	16.9

Temperatures measured at the Kennebunk River sites ranged from 10.1˚ to 23.0˚C (Celsius). For the two tidal sites, site KB-01 was always generally quite a bit colder by 2.0-4.0˚C than site KB-02, which was the warmest site overall. The four freshwater sites were similar with Sites KB-03 and KB-04 being generally a bit warmer. The highest temperatures for all these sites occurred in July and August. For Site KB-03, temperatures during July-August ranged from 19.6 ˚C-23.0 ˚C and for Site KB-04, it ranged from

18.9 ˚C-20.4 ˚C. Sites KB-05 and KB-03A for the same period ranged from 18.7 ˚C-20.4 ˚C. Overall, temperatures were somewhat high during the summer months, particularly for Sites KB-02 and KB-03.

Specific Conductance

Specific conductance was measured 6-7 times at each of the four freshwater sampling sites (Table 5-4-5). Monitoring occurred from June through September. Specific conductance is related to the amount of dissolved materials in the water. While there are no numerical standards, a relationship exists between conductivity and chloride which has numerical criteria. In general, streams located in urban areas tend to have high specific conductance due to polluted urban stormwater runoff. This may also in large part be due to salt buildup in surface and groundwater from road maintenance practices.

Table 5-4-5: A summary of minimum, maximum, and specific conductance (µS/cm) values at Mousam and Kennebunk Rivers Alliance monitoring sites on the Kennebunk River and tributary.

Site	Approved Site	# of Samples	Minimum Value	Maximum Value	Average Value
KB-01	Y				NA-Tidal
KB-02	Y				NA-Tidal
KB-03	Y	7	79	219	152
KB-04	Y	7	64	117	90
KB-05	Y	7	59	137	87
KB-03A	Y	6	62	103	90

Specific conductance at the main stem sites KB-04 and KB-05 as well as the tributary site-KB-03A were very similar. Values for these three sites ranged from 59-137 µS/cm and are overall low to moderate. At Site KB-03, specific conductance was overall higher than at the other three freshwater sites. With the exception of one value below 100 µS/cm (79 µS/cm-7/3/2012), the rest of the values were moderate to moderately high ranging from 129-219 µS/cm.

Bacteria

Enterococcus bacteria were sampled 8 times at sites KB-01 and KB-02 (Table 5-4-6). *Escherichia coli* bacteria were measured 7-8 times at sampling sites KB-03, KB-04, KB-05 and KB-03A (Table 5-4-6). Monitoring occurred from June through September. Most of the samples were taken during baseflow conditions. Enterococcus bacteria are used as the indicator organism for marine waters and *E. coli* bacteria are used for freshwaters. While these types of bacteria are not pathogens, their presence in the water may indicate the presence of other organisms including bacteria and viruses that can cause gastrointestinal illnesses. In 2012, MKA volunteers and DEP TMDL Streams' staff coordinated efforts to

do bacteria monitoring of Duck Brook-a major tributary to the Kennebunk River. That data and results will be available from DEP in a separate report.

Class B criteria for bacteria are as follows: "Between May 15th and Sept 30th, *E. coli* of human and domestic origin shall not exceed a geometric mean of 64/100 ml (milliliters) or an instantaneous level of 236/100 ml." Class SB criteria are as follows: "Between May 15th and September 30th, the numbers of enterococcus bacteria of human and domestic animal origin in these waters may not exceed a geometric mean of 8 per 100 milliliters or an instantaneous level of 54 per 100 milliliters." Geometric means are calculated instead of average because it is more appropriate to use this calculation for something like bacteria where there may be one or more very high or low values that can skew the mean.

Table 5-4-6: A summary of minimum, maximum, and geometric means for bacteria (MPN/100 mL) values at Mousam and Kennebunk Rivers Alliance monitoring sites on the Kennebunk River and tributary.

Site	Bacteria Type	# of Samples	Minimum Value	Maximum Value	Geometric Mean
KB-01	Enterococcus	8	<10	146	40
KB-02	Enterococcus	8	<10	644	122
KB-03	*E. coli*	8	10	199	72
KB-04	*E. coli*	7	15	387	120
KB-05	*E. coli*	8	4	228	56
KB-03A	*E. coli*	7	3	326	60

Site KB-01 exceeded the geometric mean criterion of 8 MPN/100ml and the instantaneous criterion of 54 MPN/100ml on 2 out of 8 sampling events. The two high values were both in August (146 and 119 MPN/100 ml). Site KB-02 values were always higher than Site KB-01. It exceeded the geometric mean criterion and the instantaneous criterion on 5 out of 8 sampling events. The highest values occurred in August (345 MPN/100ml) and September (644 MPN/100 ml).

Sites KB-03, KB-05, and KB-03A were all similar with the exception of one date in August. Site KB-03 exceeded the geometric mean criterion of 64 MPN/100 ml, but never exceeded the instantaneous criterion of 236 MPN/100 ml. Site KB-04 exceeded the geometric mean criterion and the instantaneous criterion on 2 out of 8 sampling events. Site KB-05 did not exceed the geometric mean criterion or the instantaneous criterion. Site KB-03A did not exceed the geometric mean criterion and exceeded the instantaneous criterion on 1 out of 7 sampling events.

Most of the bacteria samples were taken during baseflow conditions. The only date that rainfall occurred close to sampling was the first sample event (0.5" rain-6/13/12). There were significant rain events in June, but for the rest of the summer-rain events were all 0.5" rain or less. Bacteria sampling over the season should include a mix of sampling during both dry and runoff conditions. The fact that 4 out of 6 sites exceeded the geometric mean criterion and instantaneous criterion suggests that they may be sources that are not runoff related. This could include wildlife and/or human sources.

Discussion and Recommendations

There are numerous sources of pollution and other stresses to the Kennebunk River sites monitored by the Mousam and Kennebunk Rivers Alliance that could potentially have an impact on water quality. Some of those sources of pollution and stress may include:

- Non-point source pollution (e.g., septic systems, eroded soil, fertilizers, pesticides, heavy metals, petroleum residues, road salt, wildlife and pet feces) and polluted stormwater originating from urban impervious surfaces (e.g., streets, parking lots, driveways, rooftops) (even though urban development and roads are fairly sparse in the watershed), agriculture, and forestry.
- Ponds and impoundments (which often create more pond-like aquatic habitat conditions that may have higher water temperatures and lower dissolved oxygen concentrations than free-flowing waters)
- Natural effects of wetlands (such as contributing waters to a stream/river that have low dissolved oxygen levels due to the decomposition of large amounts of organic matter, respiration of abundant plant matter, and low re-aeration rates that is characteristic of many wetlands).

The following are recommendations for future monitoring:

- If possible monitoring should include varied times of the day for monitoring. It is important to get some values early in the morning (before 8:00 am), particularly during the warmer summer months. Over a 24 hour period, the lowest readings occur in the early morning and highest readings in mid to late afternoon. This occurs because oxygen is used up during the night due to plant respiration and during the day, plant life is photosynthesizing.
- The VRMP met with Healthy Beaches Program staff, DEP monitoring staff, Wells NERR staff and volunteers in early 2012. Because of high bacteria levels, a new sampling scheme was made for bacteria monitoring. Instead of continuing sampling the same sites, the volunteers will monitor new sites in an effort to start trying to track down potential sources. For 2012, we focused on the Duck Brook watershed. Healthy Beaches will perhaps continue with bacteria sampling at the sites below head of tide to provide some continuity there.
- Continue monitoring at all stations to develop a long term trend database.

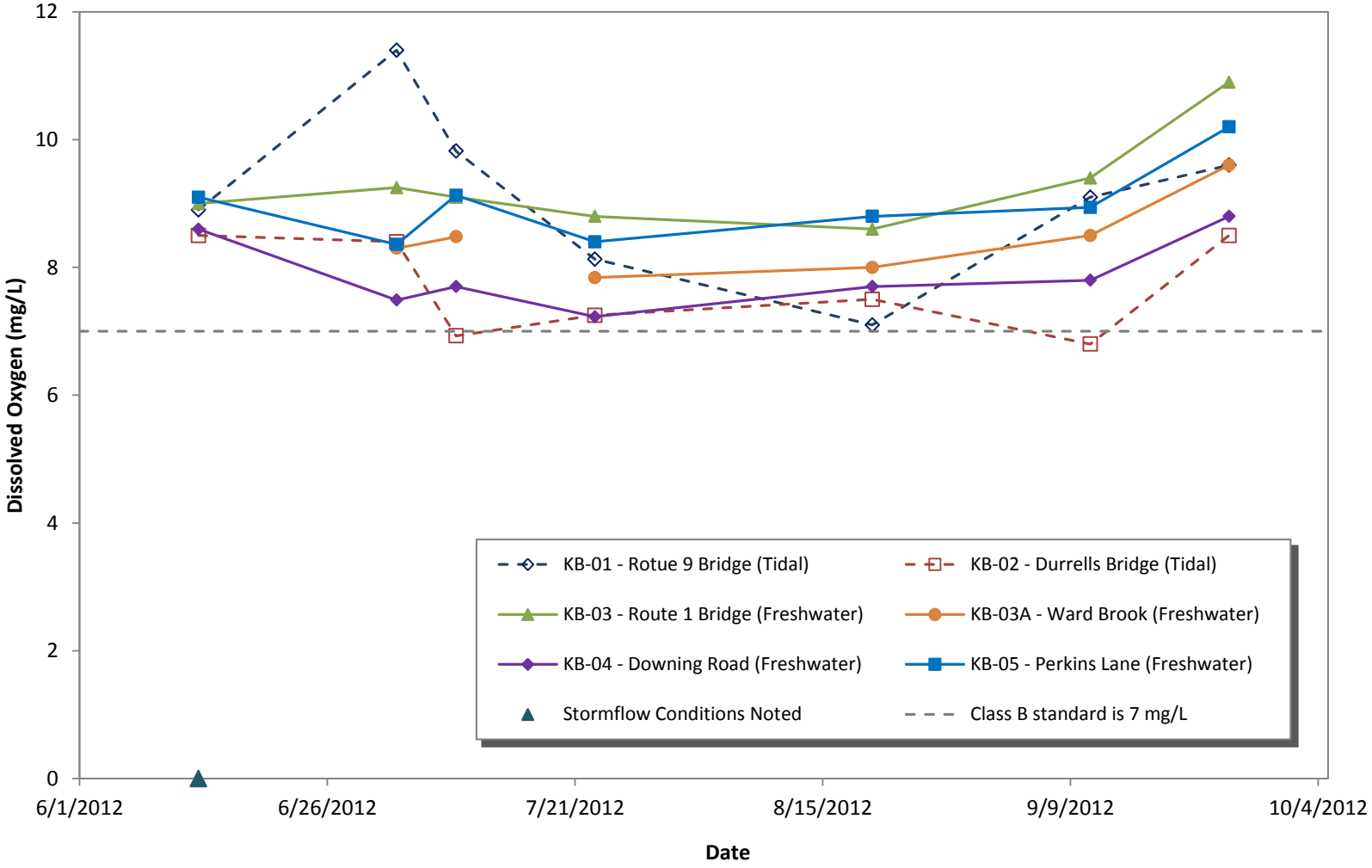

Figure 5-4-3. Dissolved oxygen concentrations of Mousam & Kennebunk Rivers Alliance approved monitoring sites on the Kennebunk River for 2012

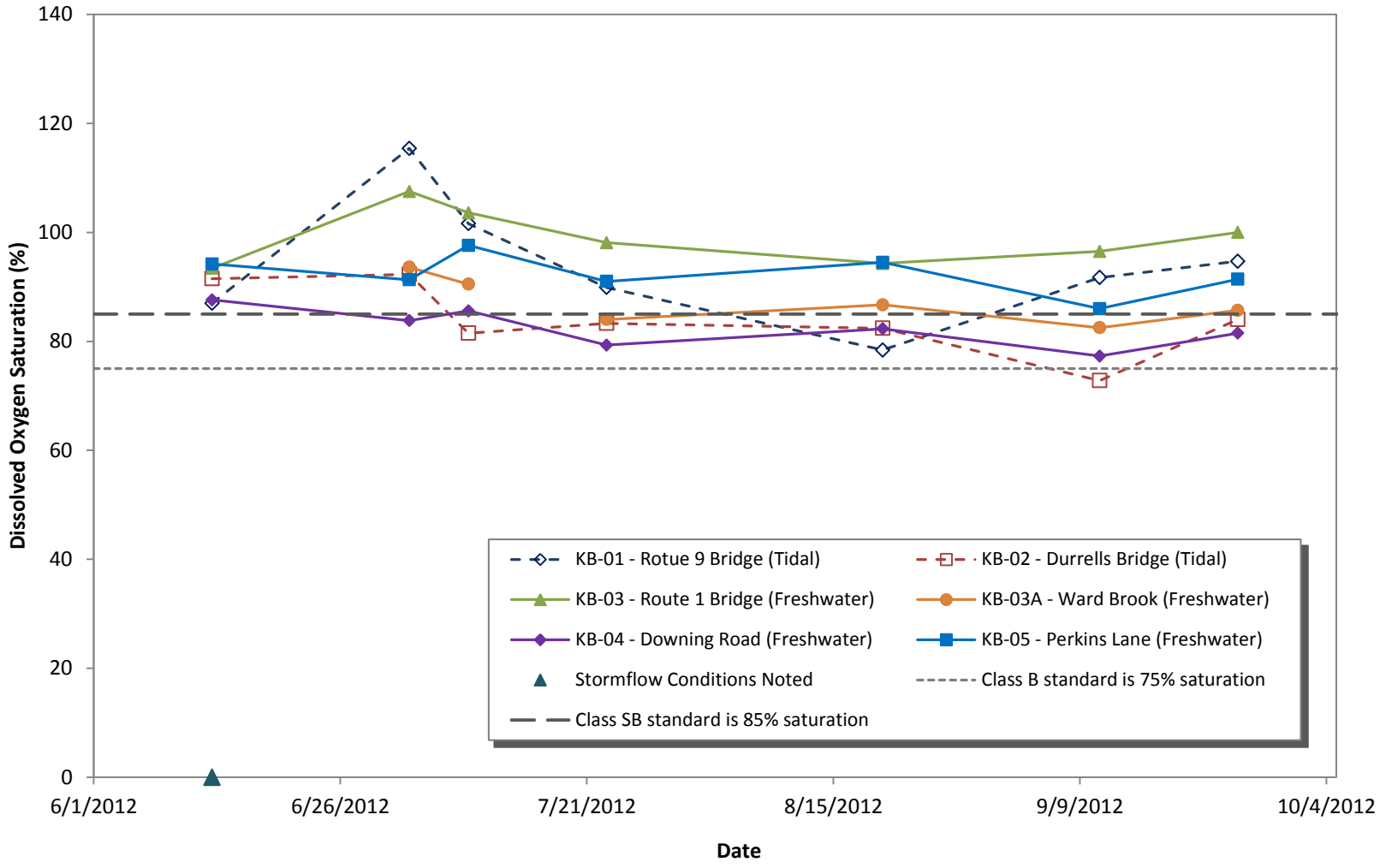

Figure 5-4-4. Dissolved oxygen % saturation of Mousam & Kennebunk Rivers Alliance approved monitoring sites on the Kennebunk River for 2012

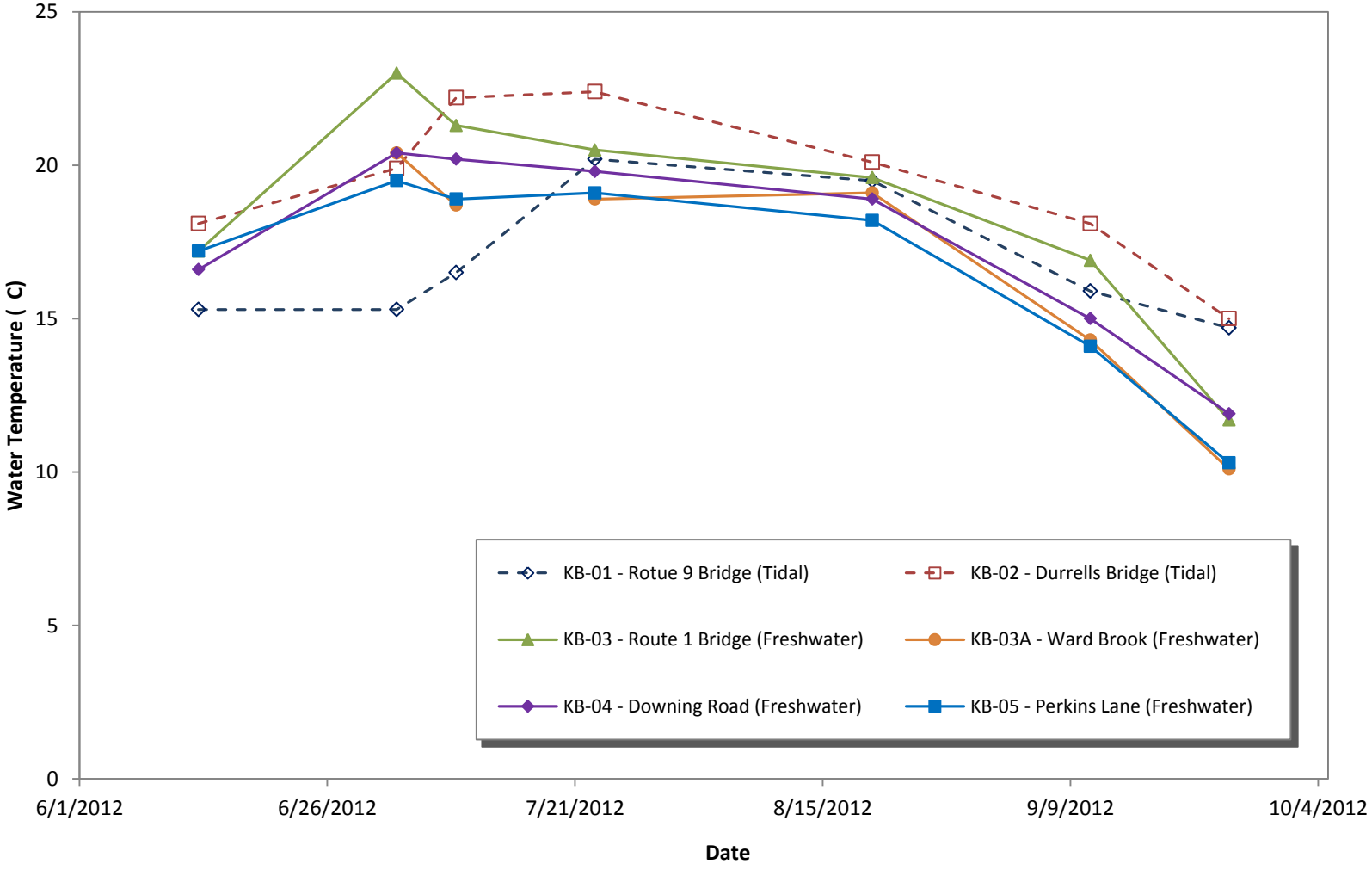

Figure 5-4-5. Water temperatures of Mousam & Kennebunk Rivers Alliance approved monitoring sites on the Kennebunk River for 2012

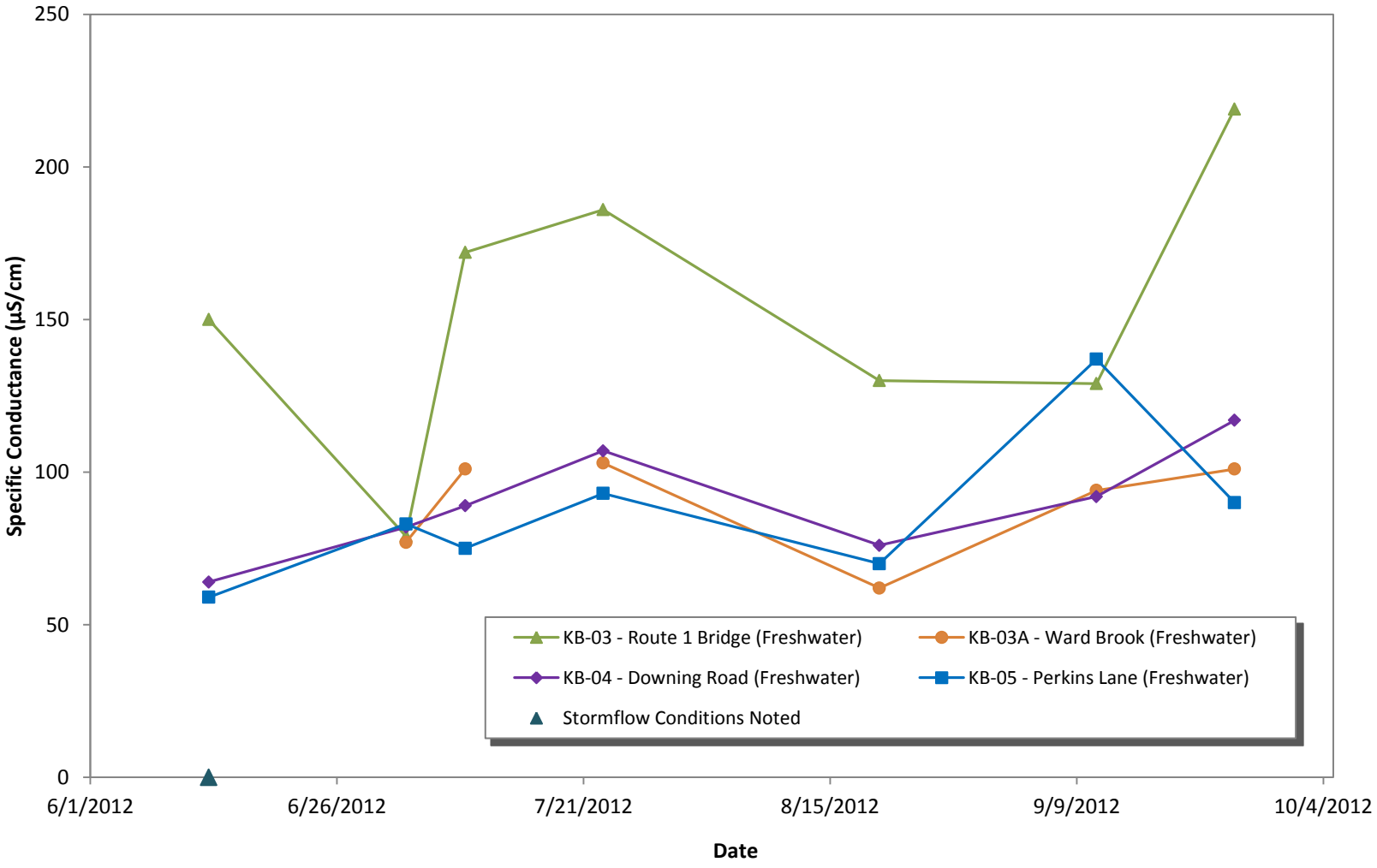

Figure 5-4-6. Specific conductance at Mousam & Kennebunk Rivers Alliance approved freshwater monitoring sites on the Kennebunk River for 2012

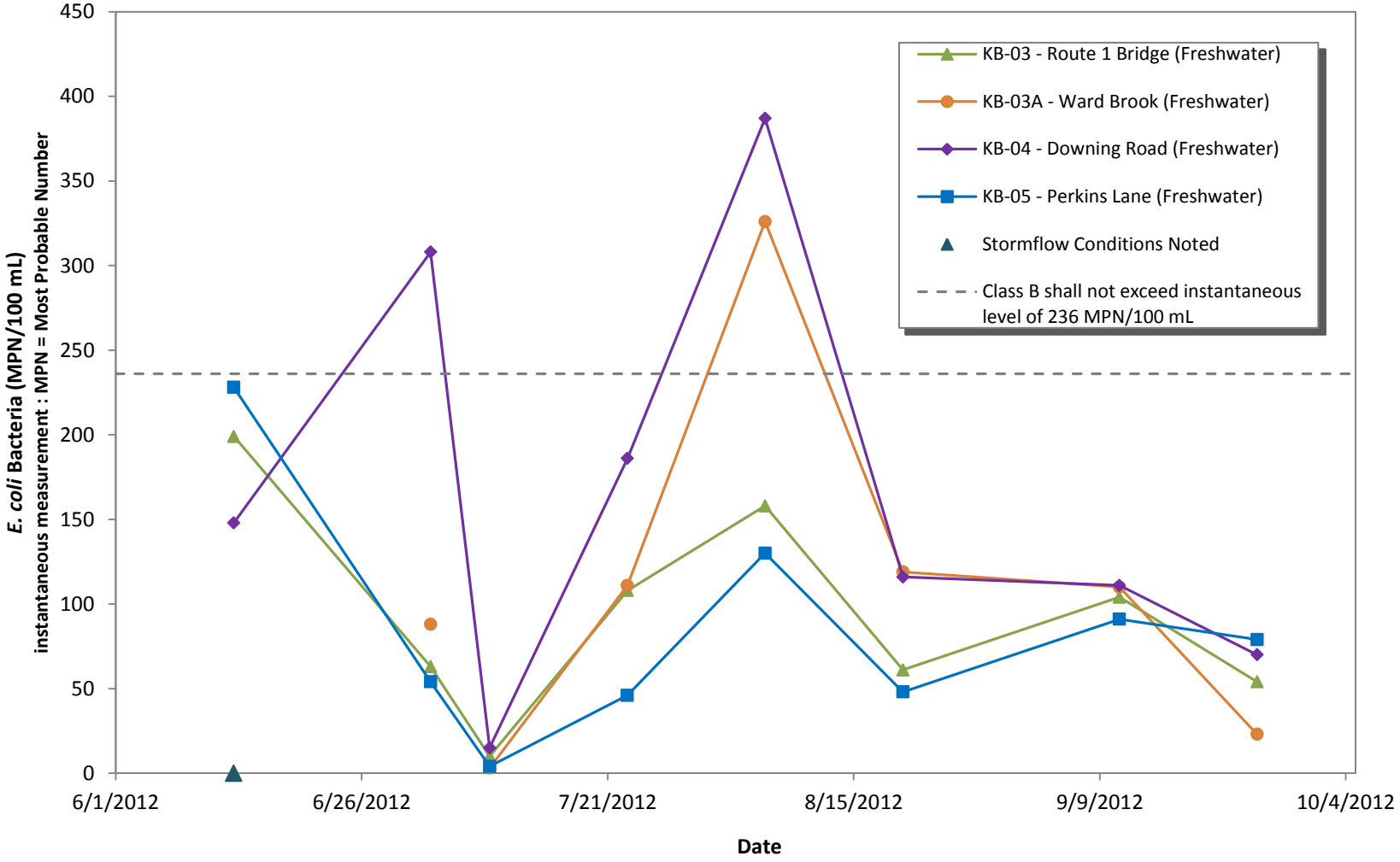

Figure 5-4-7. *E. Coli* bacteria at Mousam & Kennebunk Rivers Alliance approved freshwater monitoring sites on the Kennebunk River for 2012

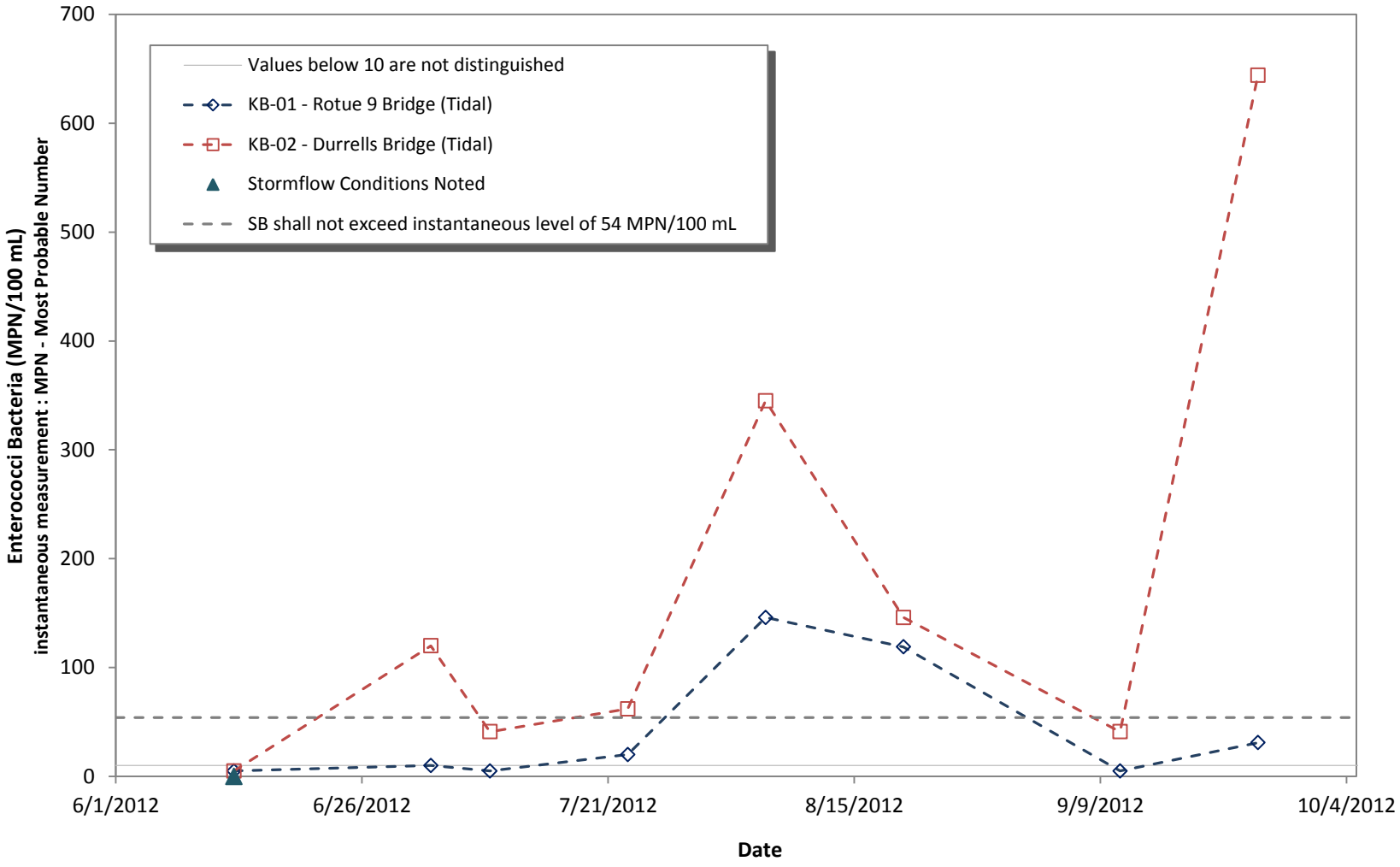

Figure 5-4-8. Enterococci values at Mousam and Kennebunk Rivers Alliance approved tidal monitoring sites on the Kennebunk River in 2012

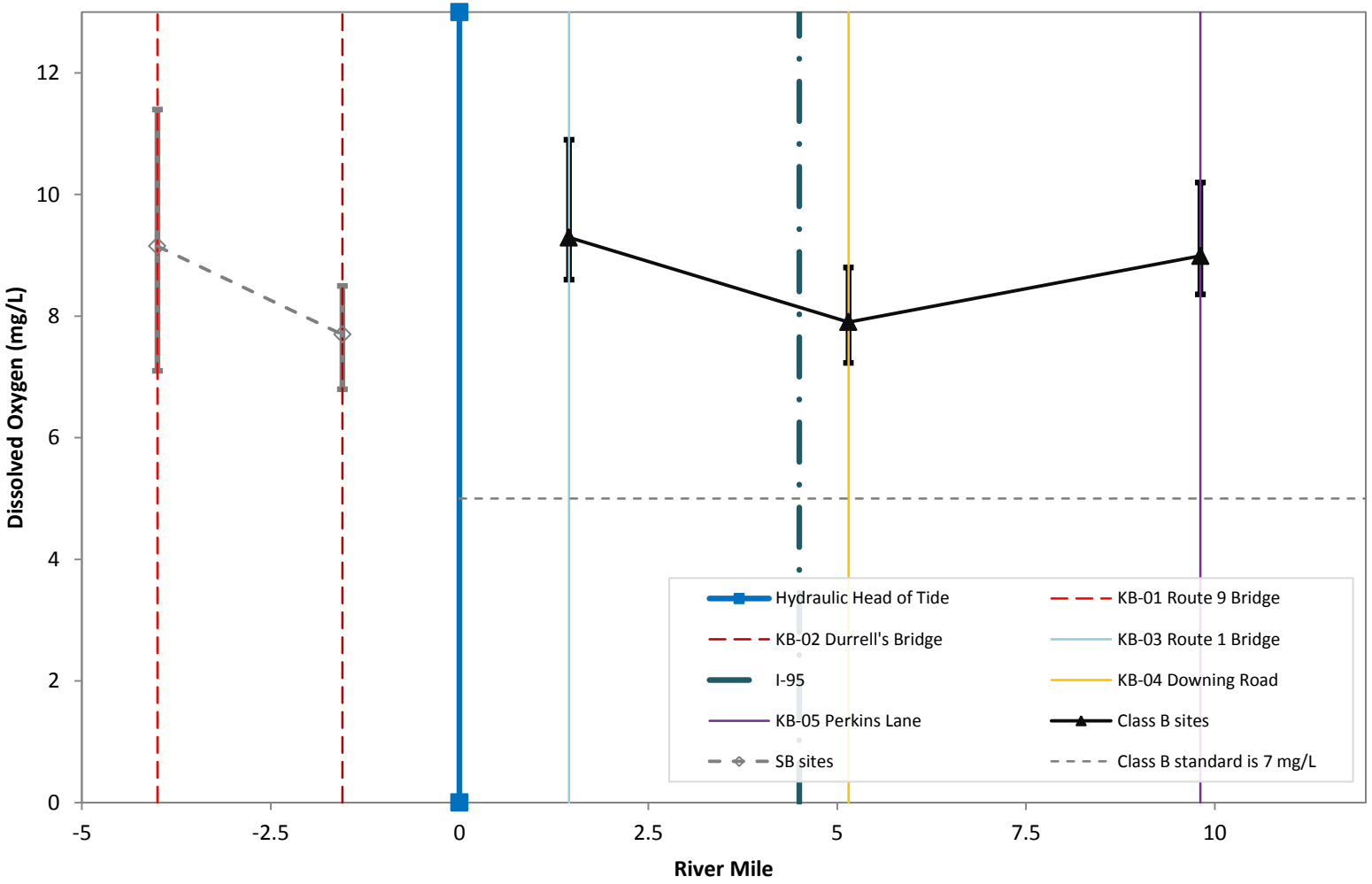

Figure 5-4-9. Dissovled oxygen concentraions per river mile at Mousam & Kennebunk Rivers Alliance monitoring sites on the Kennebunk River in 2012.
Points represent mean values. Error bars represent range of values.

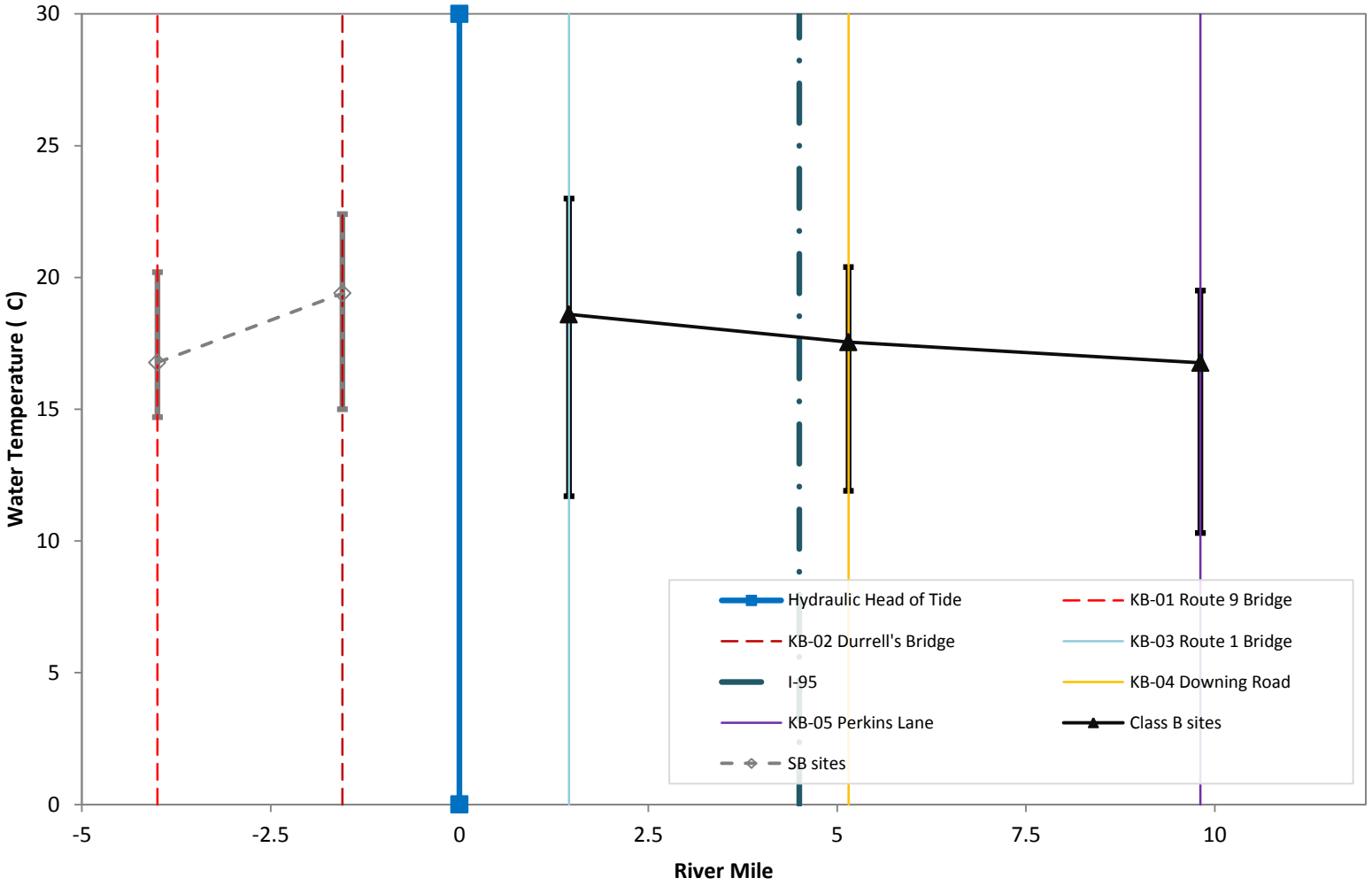

Figure 5-4-10. Water temperature changes per river mile at Mousam & Kennebunk Rivers Alliance monitoring sites on the Kennebunk River in 2012.
Points represent mean values. Error bars represent range of values.

Appendix A-1. 2012 water quality data for "Approved" and "Non-Approved" sites. Non-Approved sites do not yet meet official VRMP sample location criteria and/or require further inspection and review.
* Sampling depths are only reported for Tier 1 VRMP sites.
** "N" = normal environmental sample ; "D" = field duplicate; "L" = lab duplicate; "D.O." = dissolved oxygen; "Spec. Cond" = specific conductance; "Turb" = turbidity; "TSS" = total suspended solids"
Refer to Appendix A-2 for observational data and quality assurance/quality control (QA/QC) notes.

Organization Site Code	VRMP Site ID	Date	Time	** Sample Type Qualifier	* Sample Depth	Depth Unit	Water Temp (DEG C)	** D.O. Sat. (%)	** D.O. (MG/L)	** Spec. Cond. (US/CM)	Salinity (PPTH)	Turb-idity (NTU)	Optical Bright-eners (ug/L)	E Coli Bacteria (MPN/ 100ML)	Entero-cocci (MPN/ 100ML)
Kennebunk River, Mousam & Kennebunk Rivers Alliance - Approved Sites:															
KB-01 - RTE 9 BRIDGE	KENNEBUNK RIVER - SKE11 - VRMP	6/13/2012	7:45 AM	N			15.3	87	8.9		23		52.6		U<10
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	7/3/2012	11:45 AM	N			15.3	115.4	11.4		30				10
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	7/3/2012	11:45 AM	L									17.3		U<10
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	7/9/2012	7:55 AM	N			16.5	101.6	9.82		30		27.2		U<10
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	7/23/2012	7:40 AM	N			20.2	89.9	8.13		28				20
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	8/6/2012	7:55 AM	N											146
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	8/20/2012	7:45 AM	N			19.5	78.4	7.1		15				119
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	9/11/2012	10:30 AM	N			15.9	91.7	9.1		32				U<10
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	9/25/2012	8:10 AM	N			14.7	94.7	9.6		35				31
KB-02 - DURRELLS BRIDGE	KENNEBUNK RIVER - SKE35 - VRMP	6/13/2012	8:40 AM	N			18.1	91.5	8.5				111		U<10
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	7/3/2012	11:10 AM	N			19.9	92.3	8.4		20		65		120
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	7/3/2012	11:10 AM	D			19.6	93.2	8.6		20				169
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	7/9/2012	8:35 AM	N			22.2	81.5	6.93		7		100		41
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	7/23/2012	8:05 AM	N			22.4	83.3	7.25		8				62
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	7/23/2012	8:05 AM	L											120
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	8/6/2012	8:35 AM	N											345
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	8/6/2012	8:35 AM	L											262
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	8/20/2012	8:40 AM	N			20.1	82.4	7.5						146
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	8/20/2012	8:40 AM	L											107
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	9/11/2012	9:55 AM	N			18.1	72.8	6.8		11				41
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	9/25/2012	8:40 AM	N			15	84	8.5		25				
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	9/25/2012	9:40 AM	N											644
KB-03 - RTE 1 BRIDGE	KENNEBUNK RIVER - SKE66 - VRMP	6/13/2012		D									106		
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	6/13/2012	9:05 AM	N			17.2	93.4	9	150			105	199	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	7/3/2012	10:50 AM	N			23	107.5	9.25	79			105	63	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	7/9/2012	9:05 AM	N			21.3	103.6	9.1	172			97.6	10	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	7/9/2012		D									99.8		
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	7/23/2012	8:30 AM	N			20.5	98.1	8.8	186				108	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	8/6/2012	9:05 AM	N										158	

Organization Site Code	VRMP Site ID	Date	Time	** Sample Type Qualifier	* Sample Depth	Depth Unit	Water Temp (DEG C)	** D.O. Sat. (%)	** D.O. (MG/L)	** Spec. Cond. (US/CM)	Salinity (PPTH)	Turb-idity (NTU)	Optical Bright-eners (ug/L)	E Coli Bacteria (MPN/ 100ML)	Entero-cocci (MPN/ 100ML)
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	8/6/2012	9:05 AM	L										154	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	8/20/2012	8:55 AM	N			19.6	94.3	8.6	130				61	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	8/20/2012	8:55 AM	L										68	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	9/11/2012	9:30 AM	N			16.9	96.5	9.4	129				104	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	9/11/2012	9:30 AM	L										51	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	9/11/2012	9:30 AM	D			17.1	98.1	9.4	111					
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	9/25/2012	9:00 AM	N			11.7	100	10.9	219				54	
KB-03A -	WARD BROOK - SKEWD04 - VRMP	7/3/2012	10:25 AM	N			20.4	93.6	8.3	77			93.6	88	
KB-03A	WARD BROOK - SKEWD04 - VRMP	7/9/2012	9:20 AM	N			18.7	90.5	8.48	101					
KB-03A	WARD BROOK - SKEWD04 - VRMP	7/9/2012	9:30 AM	N									89.5	3	
KB-03A	WARD BROOK - SKEWD04 - VRMP	7/23/2012	8:50 AM	N			18.9	84	7.84	103				111	
KB-03A	WARD BROOK - SKEWD04 - VRMP	8/6/2012	9:30 AM	N										326	
KB-03A	WARD BROOK - SKEWD04 - VRMP	8/20/2012	9:15 AM	N			19.1	86.7	8	62				119	
KB-03A	WARD BROOK - SKEWD04 - VRMP	9/11/2012	9:15 AM	N			14.3	82.5	8.5	94				110	
KB-03A	WARD BROOK - SKEWD04 - VRMP	9/25/2012	9:20 AM	N			10.1	85.7	9.6	101				23	
KB-03A	WARD BROOK - SKEWD04 - VRMP	9/25/2012	9:20 AM	L										34	
KB-04 - DOWNING ROAD	KENNEBUNK RIVER - SKE103 - VRMP	6/13/2012	9:25 AM	N			16.6	87.6	8.6	64			102	148	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	7/3/2012	10:00 AM	N			20.4	83.8	7.49	82			101	308	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	7/9/2012	9:50 AM	N			20.2	85.6	7.7	89			91.2	15	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	7/23/2012	9:20 AM	N			19.8	79.3	7.23	107				186	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	7/23/2012	9:20 AM	L										142	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	7/23/2012	9:20 AM	D			19.8	79.7	7.3	104					
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	7/23/2012	9:25 AM	D										186	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	8/6/2012	10:05 AM	N										387	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	8/20/2012	9:40 AM	N			18.9	82.3	7.7	76				116	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	9/11/2012	8:45 AM	N			15	77.3	7.8	92				111	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	9/25/2012	9:45 AM	N			11.9	81.5	8.8	117				70	
KB-05 - PERKINS LANE	KENNEBUNK RIVER - SKE148 - VRMP	6/13/2012	9:45 AM	N			17.2	94.2	9.1	59			98.1	228	
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	7/3/2012	9:30 AM	N			19.5	91.3	8.36	83			102	54	
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	7/9/2012	10:15 AM	N			18.9	97.6	9.13	75			91.4	4	
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	7/23/2012	9:50 AM	N			19.1	91	8.4	93				46	
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	8/6/2012	10:30 AM	N										130	
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	8/6/2012	10:35 AM	D										126	
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	8/20/2012	10:00 AM	N			18.2	94.5	8.8	70				48	
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	9/11/2012	8:20 AM	N			14.1	86	8.94	137				91	
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	9/25/2012	10:05 AM	N			10.3	91.4	10.2	90				79	

Appendix A-2. 2012 observational data and quality assurance/quality control (QA/QC) notes for "approved" and "non-approved" sites.
** "N" = normal environmental sample; "D" = field duplicate; "L" = lab duplicate; "D.O." = dissolved oxygen; "Spec. Cond" = specific conductance; "Turb"= turbidity
Refer to Appendix A-1 for water quality data

Organization Site Code	VRMP Site ID	Date	Time	** Sample Type Qualifier	Flow	Stage	Air Temp (°C)	Sample Location	Current Weather	Air Condition	Past 24HR Weather	Habitat	Tide Stage	Water Appearance	Comments
Kennebunk River, Mousam & Kennebunk Rivers Alliance - Approved Sites:															
KB-01 - RTE 9 BRIDGE	KENNEBUNK RIVER - SKE11 - VRMP	6/13/2012	7:45 AM	N	BASE FLOW	HIGH	15.56	BRIDGE	HEAVY RAIN, LIGHT RAIN	BREEZE	LIGHT RAIN, MOSTLY CLOUDY, PARTLY CLOUDY	RUN	HIGH EBB	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE D.O. CALIBRATION READING APPEARED HIGH (>103%)- VALUE WAS 103.5%.
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	7/3/2012	11:45 AM	N	BASE FLOW	HIGH	21	BRIDGE	CLEAR, PARTLY CLOUDY		CLEAR, PARTLY CLOUDY, SHOWERS	RUN	HIGH	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	7/9/2012	7:55 AM	N	BASE FLOW	LOW	26	BRIDGE	CLEAR	CALM	CLEAR, PARTLY CLOUDY	RUN	EBB	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	7/23/2012	7:40 AM	N	BASE FLOW	LOW	20.8	BRIDGE	CLEAR, PARTLY CLOUDY	BREEZE	CLEAR, PARTLY CLOUDY	RUN	LOW EBB	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	8/20/2012	7:45 AM	N	BASE FLOW	LOW	18.6	BRIDGE	PARTLY CLOUDY	CALM	CLEAR, PARTLY CLOUDY	RIFFLE	LOW	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	9/11/2012	10:30 AM	N	BASE FLOW	HIGH	15	BRIDGE	CLEAR	CALM	CLEAR, MOSTLY CLOUDY	RUN	HIGH EBB	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE DID NOT COMPLETE CHAIN OF CUSTODY FOR DATASHEET.
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	9/25/2012	8:10 AM	N	BASE FLOW	HIGH	14	BRIDGE	CLEAR	BREEZE	CLEAR, PARTLY CLOUDY	RUN	HIGH	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE DID NOT COMPLETE CHAIN OF CUSTODY FOR DATASHEET.
KB-02 - DURRELLS BRIDGE	KENNEBUNK RIVER - SKE35 - VRMP	6/13/2012	8:40 AM	N	BASE FLOW	HIGH	15.56	BRIDGE	HEAVY RAIN, LIGHT RAIN	BREEZE	LIGHT RAIN, MOSTLY CLOUDY, PARTLY CLOUDY	RUN	HIGH EBB	MED STAINED	NON-WADEABLE/3 FT BELOW SURFACE D.O. CALIBRATION APPEARED HIGH (>130%) - VALUE WAS 103.5%.
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	7/3/2012	11:10 AM	N	BASE FLOW	MED	21	BRIDGE	CLEAR, PARTLY CLOUDY		CLEAR, PARTLY CLOUDY, SHOWERS	RIFFLE	HIGH FLOOD	CLEAR	NON-WADEABLE/MID-DEPTH
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	7/3/2012	11:10 AM	D				BRIDGE							NON-WADEABLE/MID-DEPTH
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	7/9/2012	8:35 AM	N	BASE FLOW	LOW	26	BRIDGE	CLEAR	CALM	CLEAR, PARTLY CLOUDY	RIFFLE	EBB	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	7/23/2012	8:05 AM	N	BASE FLOW	LOW	20.8	BRIDGE	CLEAR, PARTLY CLOUDY	BREEZE	CLEAR, PARTLY CLOUDY	RIFFLE	LOW EBB	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	8/20/2012	8:40 AM	N	BASE FLOW	LOW	18.6	BRIDGE	PARTLY CLOUDY	CALM	CLEAR, PARTLY CLOUDY	RIFFLE	LOW	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	9/11/2012	9:55 AM	N	BASE FLOW	HIGH	15	BRIDGE	CLEAR	CALM	CLEAR, MOSTLY CLOUDY	RUN	HIGH EBB	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE DID NOT COMPLETE CHAIN OF CUSTODY FOR DATASHEET.
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	9/25/2012	8:40 AM	N	BASE FLOW	HIGH	14	BRIDGE	CLEAR	BREEZE	CLEAR, PARTLY CLOUDY	RUN	HIGH	CLEAR	OIL SLICK RUNNING EAST UNDER BRIDGE NON-WADEABLE/3 FT BELOW SURFACE DID NOT COMPLETE CHAIN OF CUSTODY FOR DATASHEET.

Organization Site Code	VRMP Site ID	Date	Time	** Sample Type Qualifier	Flow	Stage	Air Temp (°C)	Sample Location	Current Weather	Air Condition	Past 24HR Weather	Habitat	Tide Stage	Water Appearance	Comments
KB-03 - RTE 1 BRIDGE	KENNEBUNK RIVER - SKE66 - VRMP	6/13/2012	9:05 AM	N	STORM FLOW	HIGH	15.56	WADING	HEAVY RAIN, LIGHT RAIN	BREEZE	LIGHT RAIN, MOSTLY CLOUDY, PARTLY CLOUDY	CASCADE		MED STAINED	WADEABLE/1.5 FT BELOW SURFACE D.O. CALIBRATION READING APPEARED HIGH (>103%)- VALUE WAS 103.5%.
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	7/3/2012	10:50 AM	N	BASE FLOW	MED	21	WADING	CLEAR, PARTLY CLOUDY		CLEAR, PARTLY CLOUDY, SHOWERS	CASCADE		MED STAINED	WADEABLE/1.5 FT BELOW SURFACE
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	7/9/2012	9:05 AM	N	BASE FLOW	MED	26	WADING	CLEAR	CALM	CLEAR, PARTLY CLOUDY	CASCADE		CLEAR	WADEABLE/1.5 FT BELOW SURFACE
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	7/23/2012	8:30 AM	N	BASE FLOW	LOW	20.8	WADING	CLEAR, PARTLY CLOUDY	BREEZE	CLEAR, PARTLY CLOUDY	CASCADE		CLEAR	WADEABLE/MID-DEPTH
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	8/20/2012	8:55 AM	N	BASE FLOW	MED	18.6	WADING	PARTLY CLOUDY	CALM	CLEAR, PARTLY CLOUDY	CASCADE		CLEAR	WADEABLE/1.5 FT BELOW SURFACE
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	9/11/2012	9:30 AM	N	BASE FLOW	MED	15	WADING	CLEAR	CALM	CLEAR, MOSTLY CLOUDY	CASCADE		CLEAR	WADEABLE/MID-DEPTH DID NOT COMPLETE CHAIN OF CUSTODY FOR DATASHEET.
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	9/11/2012	9:30 AM	D				WADING							WADEABLE/MID-DEPTH DID NOT COMPLETE CHAIN OF CUSTODY FOR DATASHEET.
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	9/25/2012	9:00 AM	N	BASE FLOW	MED	14	WADING	CLEAR	BREEZE	CLEAR, PARTLY CLOUDY	CASCADE	HIGH EBB	CLEAR	WADEABLE/MID-DEPTH DID NOT COMPLETE CHAIN OF CUSTODY FOR DATASHEET.
KB-03A - WARD BROOK	WARD BROOK - SKEWD04 - VRMP	7/3/2012	10:25 AM	N	BASE FLOW	MED	21	BRIDGE	CLEAR, PARTLY CLOUDY		CLEAR, PARTLY CLOUDY, SHOWERS	RIFFLE		MED STAINED	
KB-03A	WARD BROOK - SKEWD04 - VRMP	7/9/2012	9:20 AM	N	BASE FLOW	LOW	26	BRIDGE	CLEAR	CALM	CLEAR, PARTLY CLOUDY	RIFFLE		CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-03A	WARD BROOK - SKEWD04 - VRMP	7/23/2012	8:50 AM	N	BASE FLOW	MED	20.8	BRIDGE	CLOUDY, PARTLY CLOUDY	BREEZE	CLEAR, PARTLY CLOUDY	RIFFLE		CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-03A	WARD BROOK - SKEWD04 - VRMP	8/20/2012	9:15 AM	N	BASE FLOW	MED	18.6	BRIDGE	PARTLY CLOUDY	CALM	CLEAR, PARTLY CLOUDY	RIFFLE		CLEAR	NON-WADEABLE/MID-DEPTH
KB-03A	WARD BROOK - SKEWD04 - VRMP	9/11/2012	9:15 AM	N	BASE FLOW	MED	15	BRIDGE	CLEAR	CALM	CLEAR, MOSTLY CLOUDY	RIFFLE		CLEAR	NON-WADEABLE/MID-DEPTH DID NOT COMPLETE CHAIN OF CUSTODY FOR DATASHEET.
KB-03A	WARD BROOK - SKEWD04 - VRMP	9/25/2012	9:20 AM	N	BASE FLOW	MED	14	BRIDGE	CLEAR	BREEZE	CLEAR, PARTLY CLOUDY	RIFFLE		CLEAR	NON-WADEABLE/3 FT BELOW SURFACE DID NOT COMPLETE CHAIN OF CUSTODY FOR DATASHEET.
KB-04 - DOWNING ROAD	KENNEBUNK RIVER - SKE103 - VRMP	6/13/2012	9:25 AM	N	BASE FLOW	MED	15.56	CULVERT	HEAVY RAIN, LIGHT RAIN	BREEZE	LIGHT RAIN, MOSTLY CLOUDY, PARTLY CLOUDY	RIFFLE		MED STAINED	WADEABLE/MID-DEPTH D.O. CALIBRATION READING APPEARED HIGH (>103%)- VALUE WAS 103.5%.
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	7/3/2012	10:00 AM	N	BASE FLOW	MED	21	CULVERT	CLEAR, PARTLY CLOUDY		CLEAR, PARTLY CLOUDY, SHOWERS	RIFFLE		MED STAINED	NON-WADEABLE/MID-DEPTH
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	7/9/2012	9:50 AM	N	BASE FLOW	LOW	26	CULVERT	CLEAR	CALM	CLEAR, PARTLY CLOUDY	RIFFLE		CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	7/23/2012	9:20 AM	N	BASE FLOW	MED	20.8	CULVERT	CLOUDY, PARTLY CLOUDY	BREEZE	CLEAR, PARTLY CLOUDY	RIFFLE		CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	7/23/2012	9:20 AM	D				CULVERT							NON-WADEABLE/3 FT BELOW SURFACE

Organization Site Code	VRMP Site ID	Date	Time	** Sample Type Qualifier	Flow	Stage	Air Temp (°C)	Sample Location	Current Weather	Air Condition	Past 24HR Weather	Habitat	Tide Stage	Water Appearance	Comments
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	8/20/2012	9:40 AM	N	BASE FLOW	MED	18.6	CULVERT	PARTLY CLOUDY	CALM	CLEAR, PARTLY CLOUDY	RUN		CLEAR	NON-WADEABLE/MID-DEPTH
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	9/11/2012	8:45 AM	N	BASE FLOW	MED	15	CULVERT	CLEAR	CALM	CLEAR, MOSTLY CLOUDY	RIFFLE		CLEAR	NON-WADEABLE/MID-DEPTH DID NOT COMPLETE CHAIN OF CUSTODY FOR DATASHEET.
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	9/25/2012	9:45 AM	N	BASE FLOW	MED	14	CULVERT	CLEAR	BREEZE	CLEAR, PARTLY CLOUDY	RIFFLE		CLEAR	NON-WADEABLE/3 FT BELOW SURFACE DID NOT COMPLETE CHAIN OF CUSTODY FOR DATASHEET.
KB-05 - PERKINS LANE	KENNEBUNK RIVER - SKE148 - VRMP	6/13/2012	9:45 AM	N	BASE FLOW	HIGH	15.56	BANK	HEAVY RAIN, LIGHT RAIN	BREEZE	LIGHT RAIN, MOSTLY CLOUDY, PARTLY CLOUDY	RIFFLE		MED STAINED	NON-WADEABLE/3 FT BELOW SURFACE D.O. CALIBRATION READING APPEARED HIGH (>103%)-VALUE WAS 103.5%.
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	7/3/2012	9:30 AM	N	BASE FLOW	MED	21	BANK	CLEAR, PARTLY CLOUDY		CLEAR, PARTLY CLOUDY, SHOWERS	RIFFLE		MED STAINED	NON-WADEABLE/MID-DEPTH
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	7/9/2012	10:15 AM	N	BASE FLOW	MED	26	WADING	CLEAR	CALM	CLEAR, PARTLY CLOUDY	RIFFLE		CLEAR	WADEABLE/1.5 FT BELOW SURFACE
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	7/23/2012	9:50 AM	N	BASE FLOW	MED	20.8	WADING	CLOUDY, PARTLY CLOUDY	BREEZE	CLEAR, PARTLY CLOUDY	RIFFLE		CLEAR	WADEABLE/MID-DEPTH
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	8/20/2012	10:00 AM	N	BASE FLOW	MED	18.6	WADING	PARTLY CLOUDY	CALM	CLEAR, PARTLY CLOUDY	RIFFLE		CLEAR	WADEABLE/1.5 FT BELOW SURFACE
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	9/11/2012	8:20 AM	N	BASE FLOW	MED	15	WADING	CLEAR	CALM	CLEAR, MOSTLY CLOUDY	RIFFLE		CLEAR	WADEABLE/MID-DEPTH DID NOT COMPLETE CHAIN OF CUSTODY FOR DATASHEET.
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	9/25/2012	10:05 AM	N	BASE FLOW	MED	14	WADING	CLEAR	BREEZE	CLEAR, PARTLY CLOUDY	RIFFLE		CLEAR	WADEABLE/1.5 FT BELOW SURFACE DID NOT COMPLETE CHAIN OF CUSTODY FOR DATASHEET.