

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 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 Kennebunk. The primary impacts to the river come from development of the landscape, 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. The Maine Healthy Beaches Program has collected fluorometry data to identify sources of bacterial contamination. 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 2011 at five stations on the main stem (Table 5-4-1 and Figure 5-4-1). Two of the stations [KB-01 and KB-02] are below head of tide, and three [KB-03, KB-04 and KB-05] 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

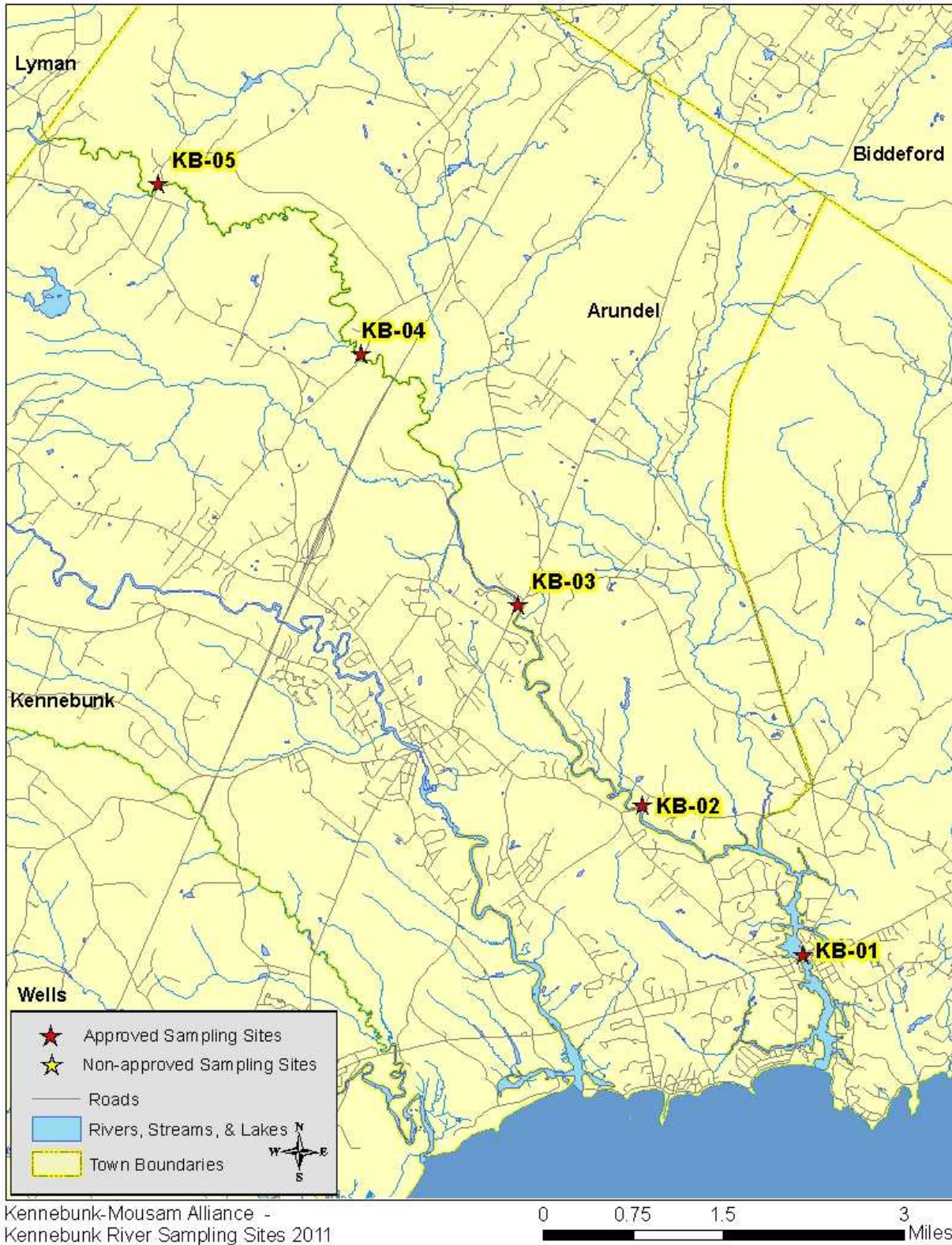


Figure 5-4-1: Map of Mousam and Kennebunk Rivers Alliance sampling sites on the Kennebunk River.

Monitoring was conducted from June through September twice 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. Grab samples were collected for *E. coli* bacteria at the freshwater sites and Enterococcus bacteria at the sites below head of tide. 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 5-4-13), at the end of this section of the report.

Dissolved Oxygen

Dissolved oxygen was measured 7-8 times at each of the five 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. 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.

Site	Approved Site	# of Samples	Minimum Value	Maximum Value	Average Value
KB-01	Y	8	8.0	10.7	9.6
KB-02	Y	8	6.7	8.7	7.8
KB-03	Y	7	8.8	10.7	9.4
KB-04	Y	8	6.6	9.2	7.8
KB-05	Y	8	7.8	10.0	8.9

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.

Site	Approved Site	# of Samples	Minimum Value	Maximum Value	Average Value
KB-01	Y	8	84.0	112.0	99.8
KB-02	Y	8	76.7	96.0	86.7
KB-03	Y	7	95.0	115.0	103.7
KB-04	Y	8	71.8	90.0	83.2
KB-05	Y	8	84.7	99.0	93.5

Dissolved oxygen concentrations measured at Kennebunk River sites ranged from 6.6 mg/l to 10.7 mg/l. At Site KB-01, the lowest readings occurred in late August/early September. It dropped below the standard of 85% saturation slightly on one date. Site KB-02 followed a similar pattern with lowest readings occurring from early August to early September. Overall

percent saturation was lower at this site and dropped below the saturation standard on 3 dates (ranged from 76.6-83.4% for these three events). Site KB-03 never fell below standards for either dissolved oxygen concentration or percent saturation. Percent saturation was high in late June-early July and again in early August. The high values here may be an indication of high productivity. Site KB-04 had the lowest values occurring in late June-early July and early August. It dropped a bit below the concentration standard (6.6 and 6.8 mg/l) on 2 dates and below the percent saturation (71.8%) on one date. Site KB-05 overall looked good and never dropped the Class B standards. 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 always had the highest values, KB-04 the lowest, and KB-03 was in between.

The fact that dissolved oxygen concentrations and percent saturation values were overall good may have been partly due to the fact that measurements were generally collected sometime between mid-morning and noon—the time of day when plant photosynthesis is high. 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 7-8 times at each of the five 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.

Site	Approved Site	# of Samples	Minimum Value	Maximum Value	Average Value
KB-01	Y	8	16.1	19.9	17.3
KB-02	Y	8	15.7	23.3	20.6
KB-03	Y	7	12.6	23.1	20.3
KB-04	Y	8	11.6	21.1	18.7
KB-05	Y	8	11.6	20.2	18.1

Temperatures measured at Kennebunk River sites ranged from 11.6° to 23.3°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. From early June to early September, temperatures for site KB-02 ranged from 19.5-23.3°C. The

three freshwater sites followed the same trend with highest temperatures occurring generally in July and August. Site KB-03 had the highest temperatures overall being a couple of degrees warmer than sites KB-04 and KB-05, which were similar. Temperatures at site KB-03 were above 20°C for July-August (20.4-23.1°C). At site KB-04, temperatures were slightly above 20°C for July-early August (20.8-21.1°C). At site KB-05, temperatures were around 20°C for July-early August (19.2-20.2°C).

Specific Conductance

Specific conductance was measured 7-8 times at each of the three 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.

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	96	392	250
KB-04	Y	8	92	270	121
KB-05	Y	8	71	615	146

At site KB-03, values ranged from 96 to 392 µS/cm, which are considered moderate to high. The values were all mostly high pulling the mean here higher. At site KB-04, the values were also moderate to high ranging from 92 to 270 µS/cm. However, the values were all moderate, except for one high value in early June. Values at site KB-05 ranged from 71 to 615 µS/cm, which are low to high. All of the values at this site were low to moderate, except for the one very high value in early July. Overall, site KB-03 values were all moderate to high. Sites KB-04 and KB-05 were all low to moderate with one high value.

Bacteria

Enterococcus bacteria were sampled 7 times at sites KB-01 and KB-02 (Table 5-4-6). *Escherichia coli* bacteria were measured 7 times at sampling sites KB-03, KB-04 and KB-05 (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.

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.

Site	Bacteria Type	# of Samples	Minimum Value	Maximum Value	Geometric Mean
KB-01	Enterococcus	7	10	52	16
KB-02	Enterococcus	7	10	414	81
KB-03	E. Coli	7	96	261	161
KB-04	E. Coli	7	102	387	201
KB-05	E. Coli	7	32	365	122

Site KB-01 exceeded the geometric mean criterion, but did not exceed the instantaneous criterion. Site KB-02 exceeded the geometric mean criterion and the instantaneous criterion was exceeded 4 out of 7 sampling events. All of the freshwater sites exceeded the geometric mean criterion. The instantaneous criterion was exceeded one time at site KB-03, 3 times at site KB-04, and twice at site KB-05. Typically, observed high bacterial levels are often associated with stormwater runoff and/or combined sewer overflows. Rainfall totals at the nearby Sanford weather station (Figure 5-4-2) show seasonal variations along with sampling dates of monitoring stations on the Kennebunk River.

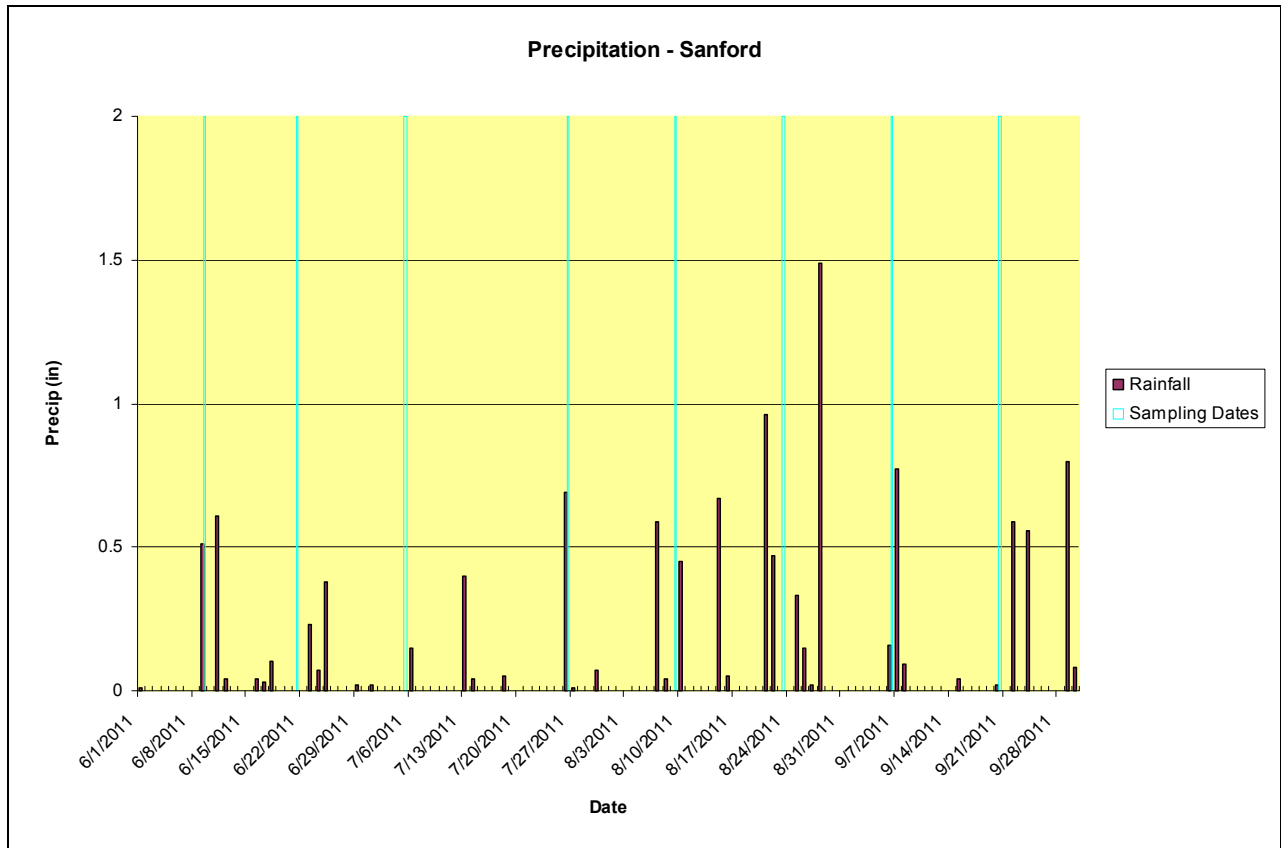


Figure 5-4-2: Seasonal precipitation measured at Sanford.

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. Because it looks like there is supersaturation of oxygen, it would also be useful to sample later in the day sometimes when dissolved oxygen is generally at its highest level.
- 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 will focus 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.

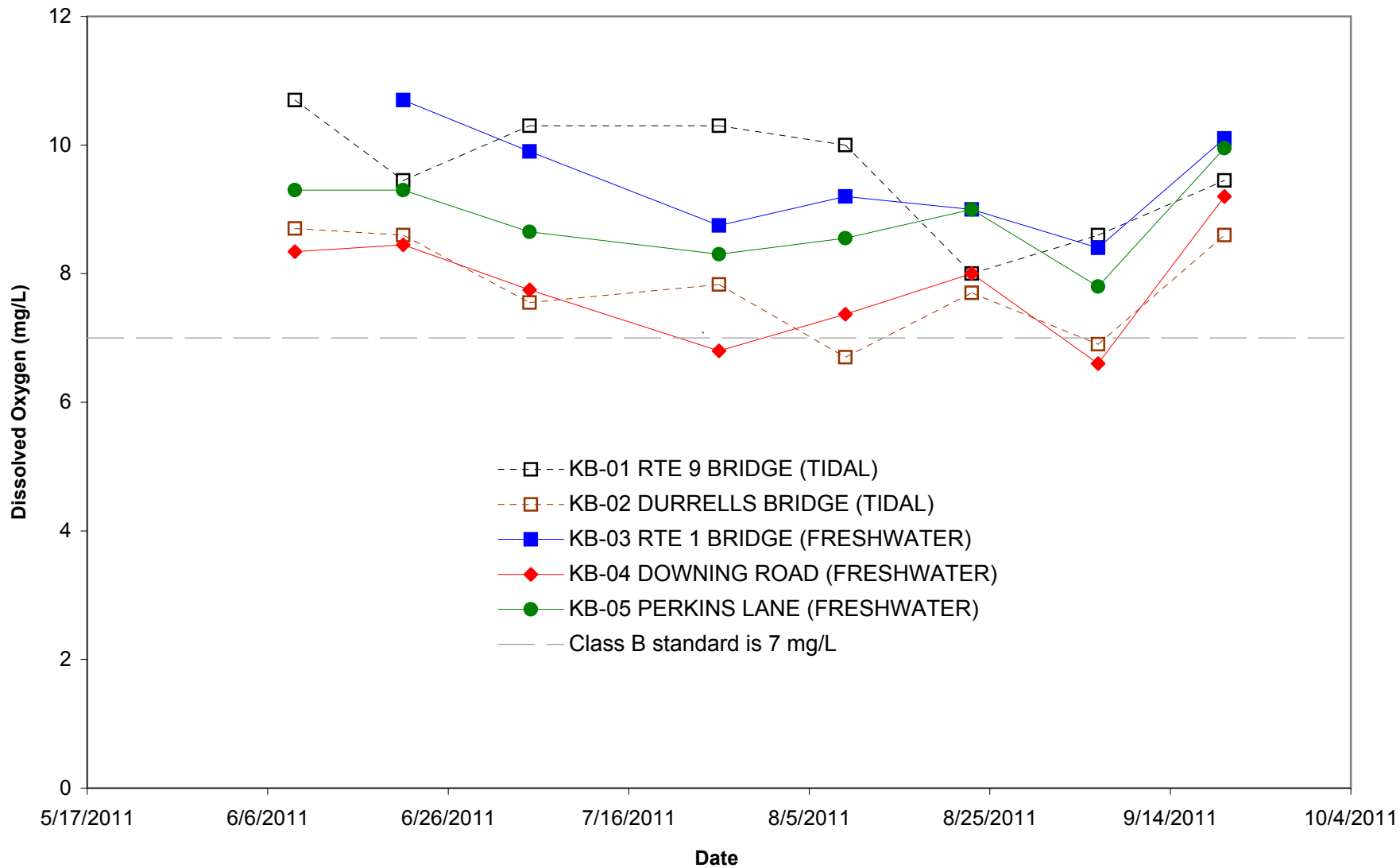


Figure 5-4-3. Dissolved oxygen concentrations at Mousam and Kennebunk Rivers Alliance approved monitoring sites on the Kennebunk River in 2011.

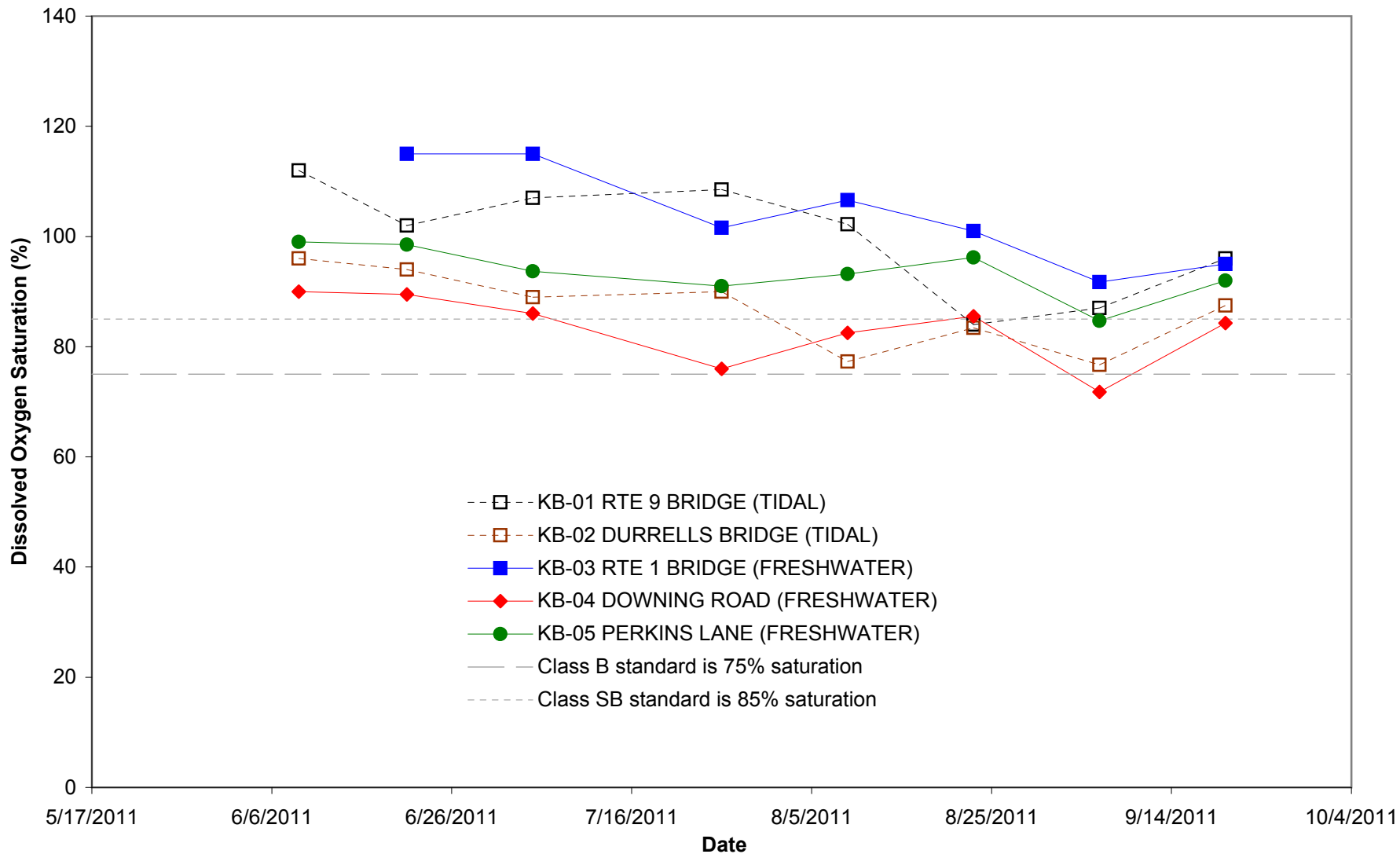


Figure 5-4-4. Dissolved oxygen saturation at Mousam and Kennebunk Rivers Alliance approved monitoring sites on the Kennebunk River in 2011.

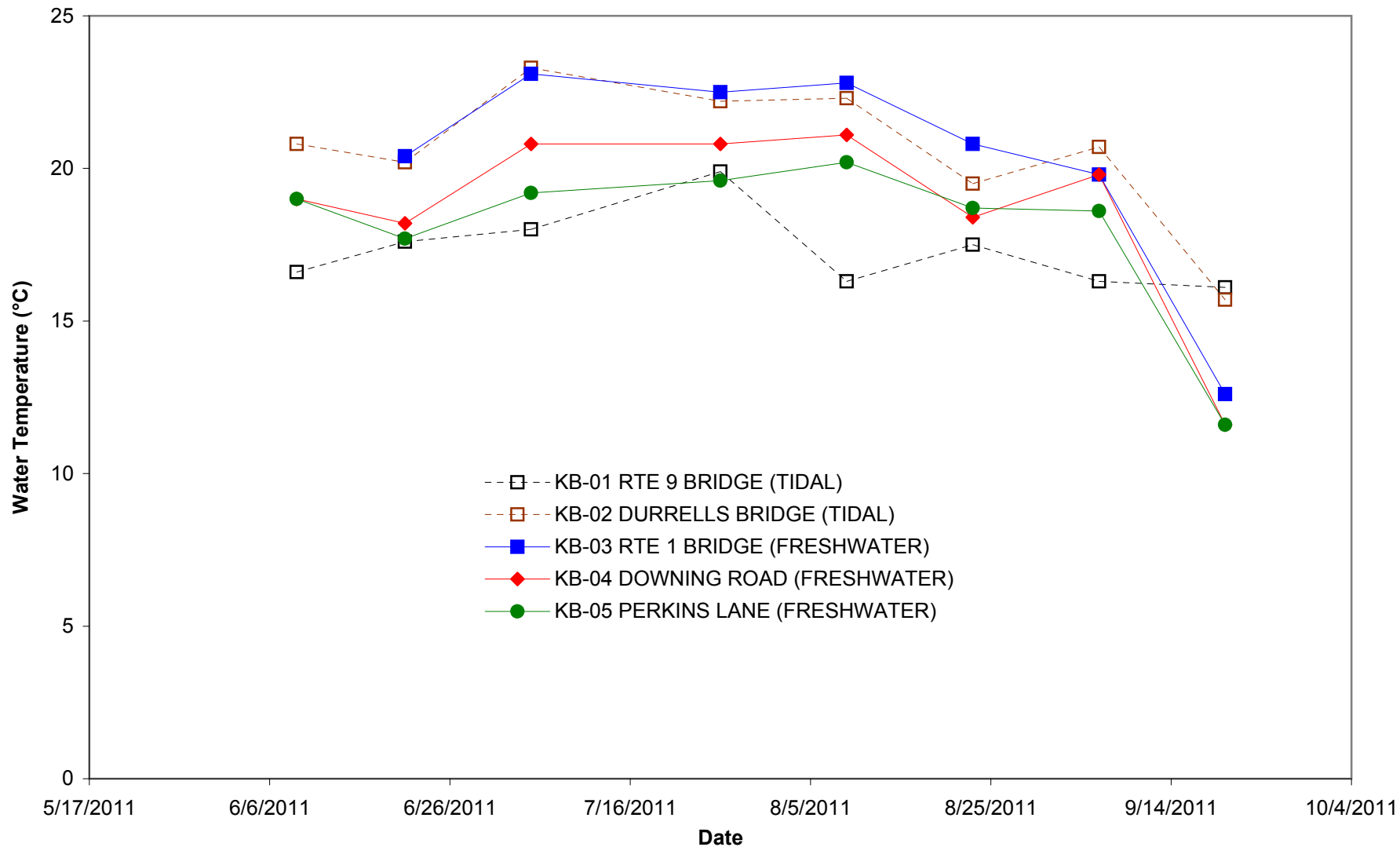


Figure 5-4-5. Water temperature at Mousam and Kennebunk Rivers Alliance approved monitoring sites on the Kennebunk River in 2011.

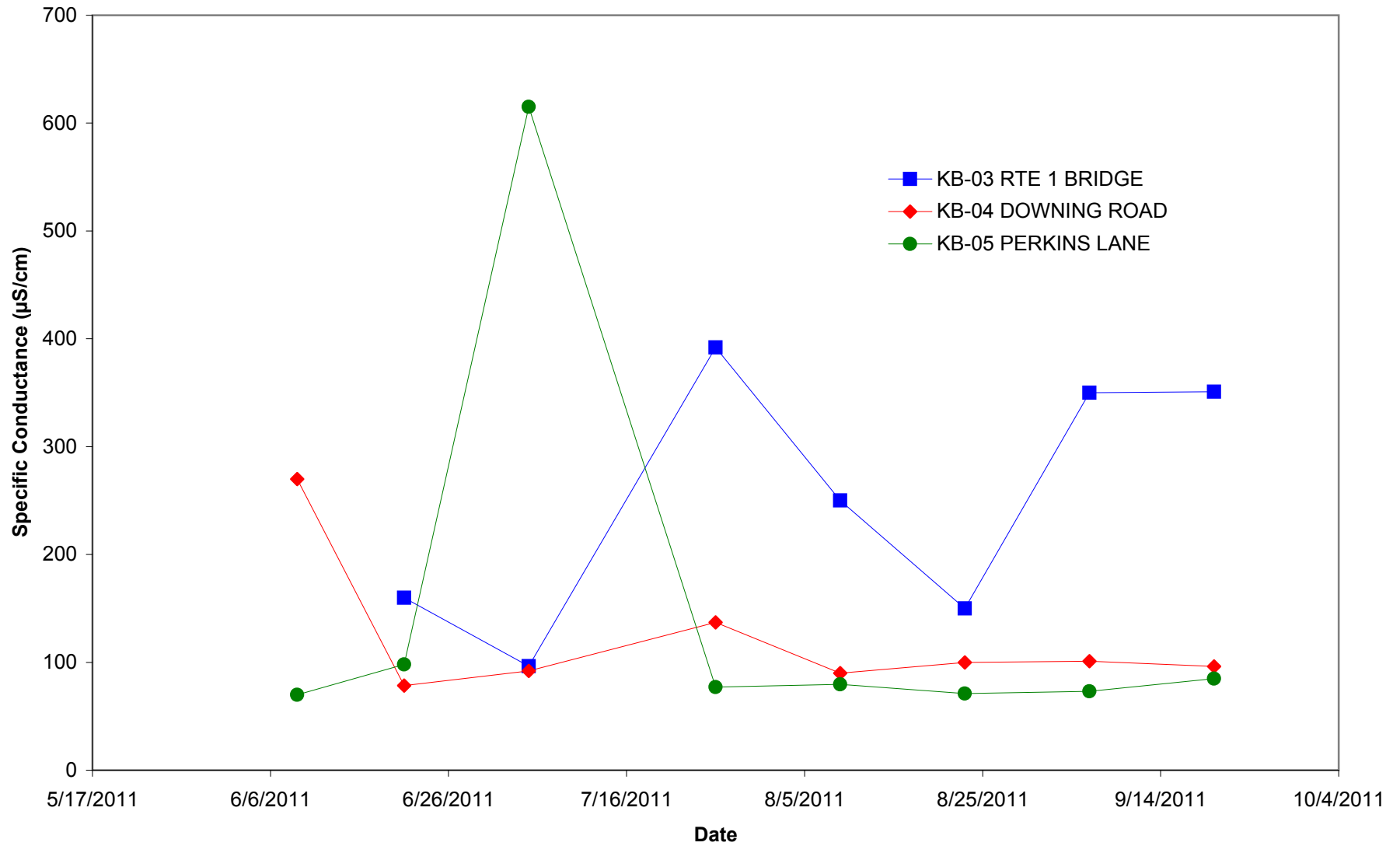


Figure 5-4-6. Specific conductance at Mousam and Kennebunk Rivers Alliance approved freshwater monitoring sites on the Kennebunk River in 2011.

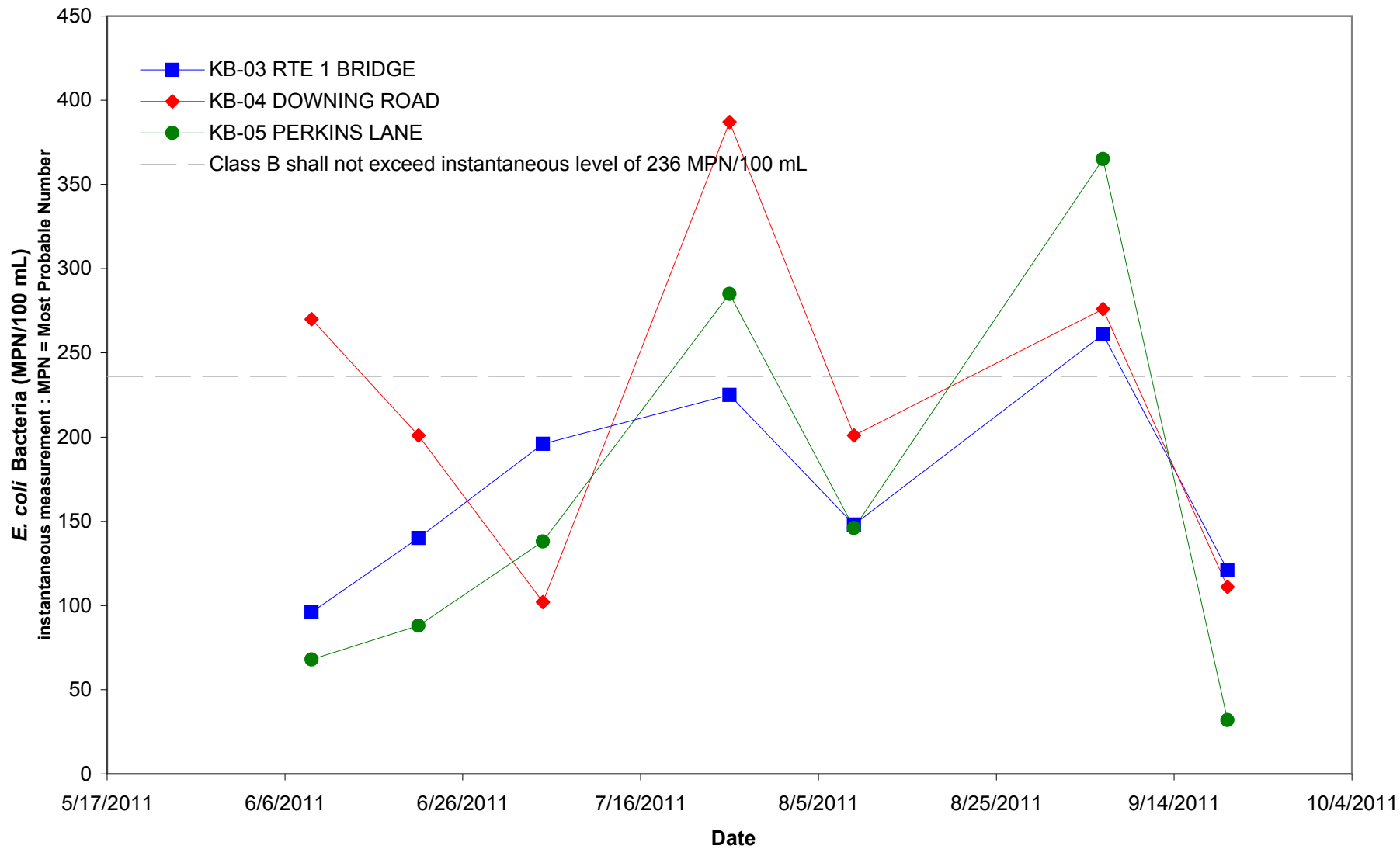


Figure 5-4-7. *E. coli* bacteria at Mousam and Kennebunk Rivers Alliance approved freshwater monitoring sites on the Kennebunk River in 2011.

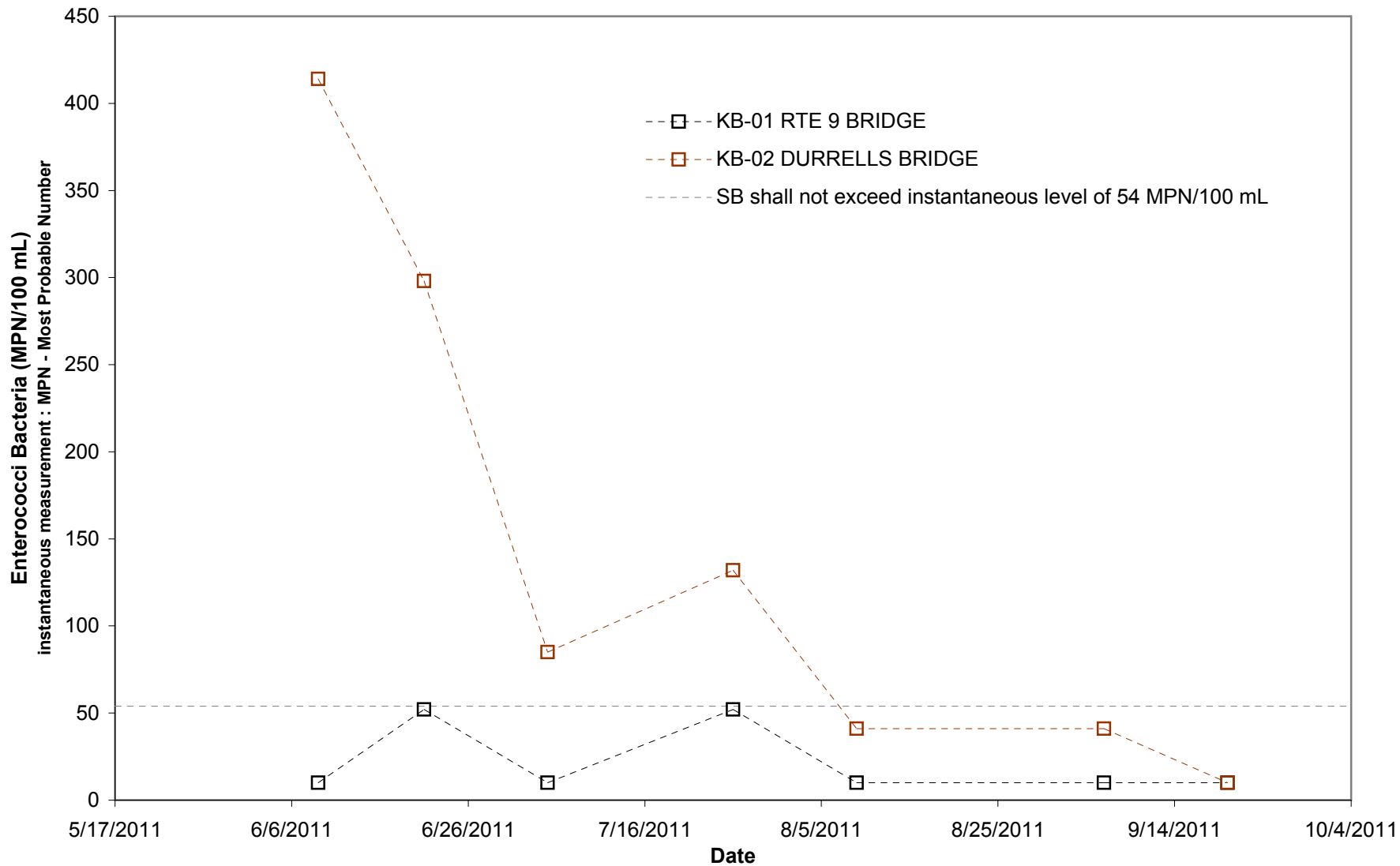


Figure 5-4-8. Enterococci values at Mousam and Kennebunk Rivers Alliance approved tidal monitoring sites on the Kennebunk River in 2011.

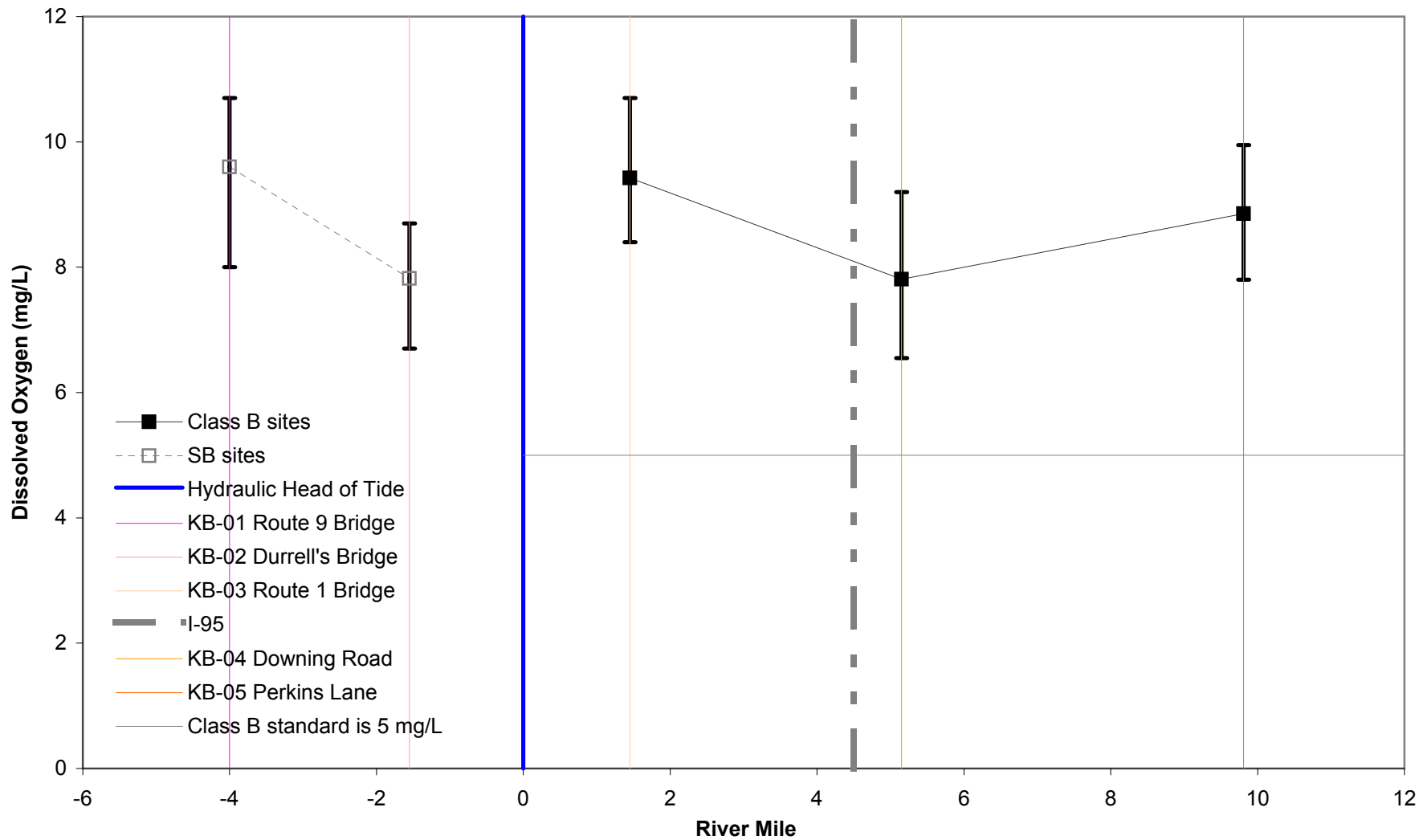


Figure 5-4-9. Dissolved oxygen concentration changes per river mile at Mousam and Kennebunk Rivers Alliance monitoring sites on the Kennebunk River in 2011.
Points represent mean values. Error bars represent range of values.

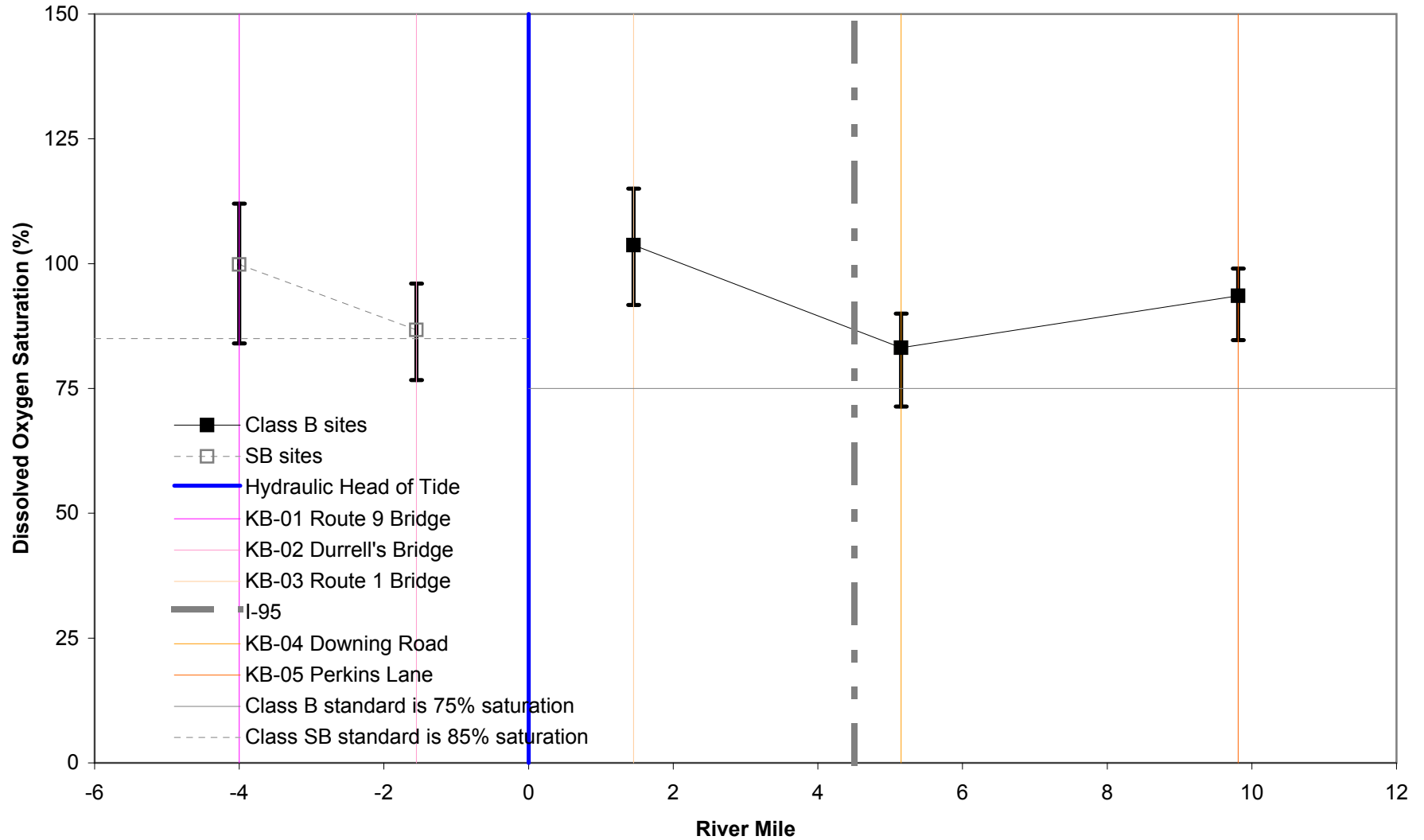


Figure 5-4-10. Dissolved oxygen saturation changes per river mile at Mousam and Kennebunk Rivers Alliance monitoring sites on the Kennebunk River in 2011.

Points represent mean values. Error bars represent range of values.

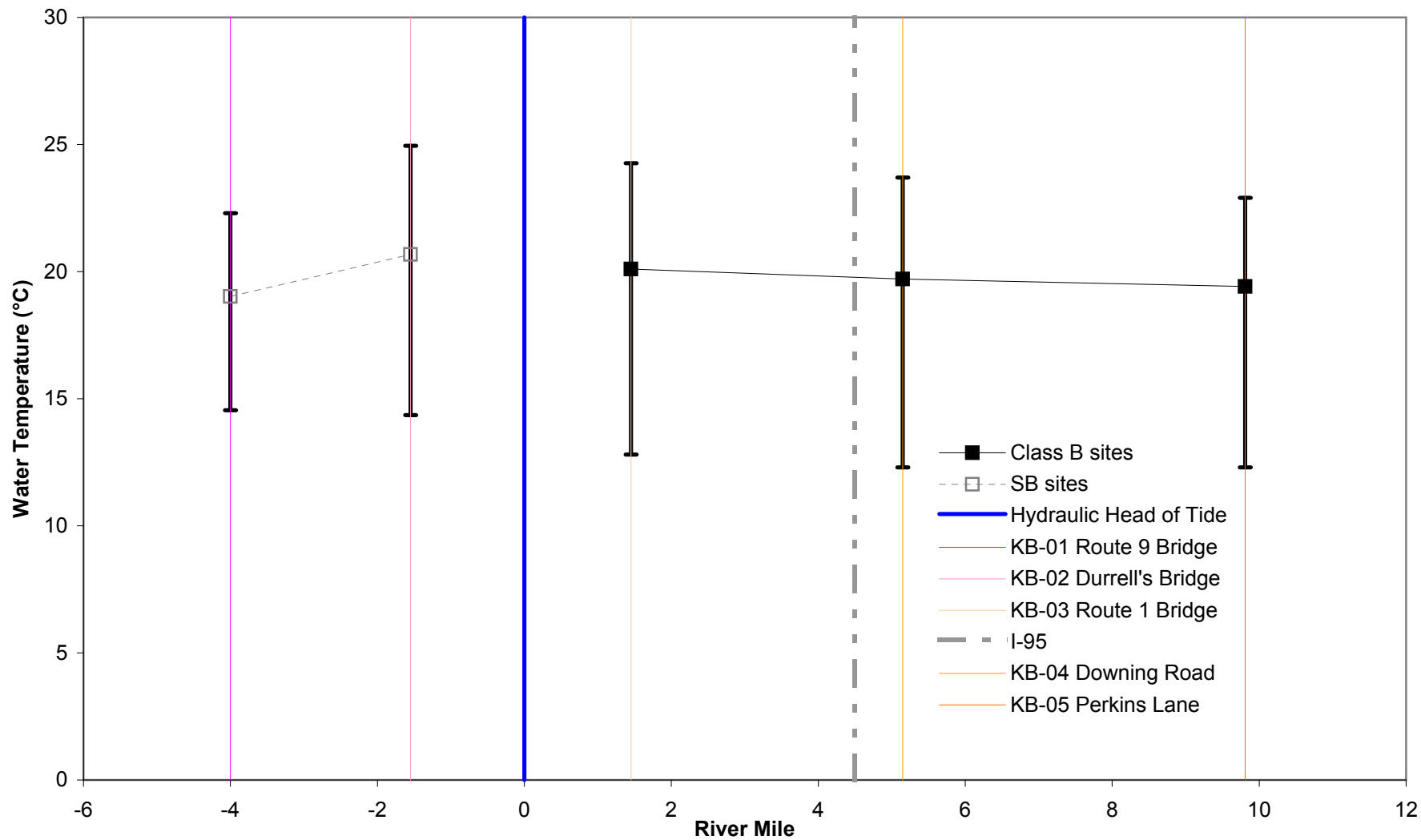


Figure 5-4-11. Water temperature changes per river mile at Mousam and Kennebunk Rivers Alliance monitoring sites on the Kennebunk River in 2011.
Points represent mean values. Error bars represent range of values.

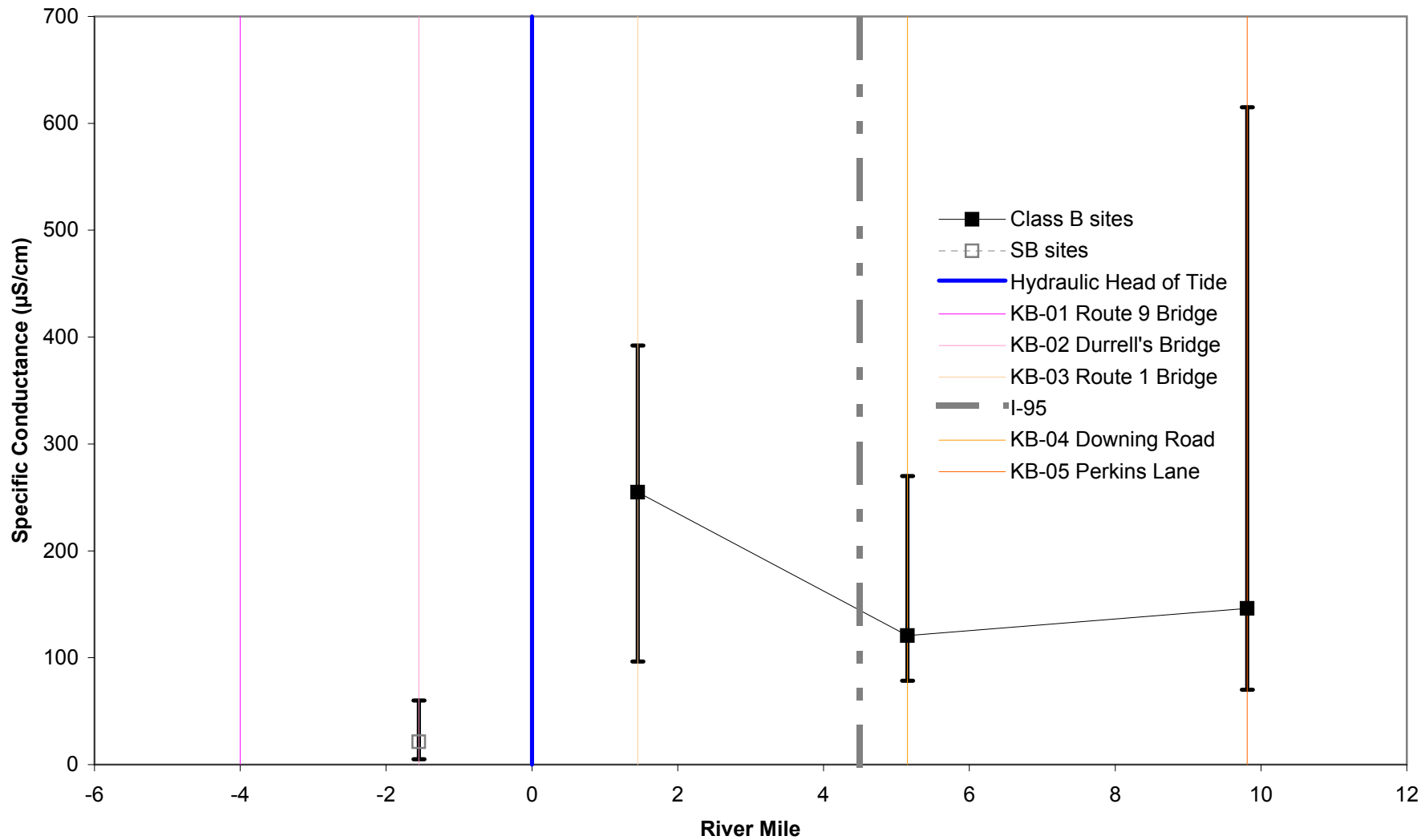


Figure 5-4-12. Specific conductance changes per river mile at Mousam and Kennebunk Rivers Alliance monitoring sites on the Kennebunk River in 2011.
Points represent mean values. Error bars represent range of values.

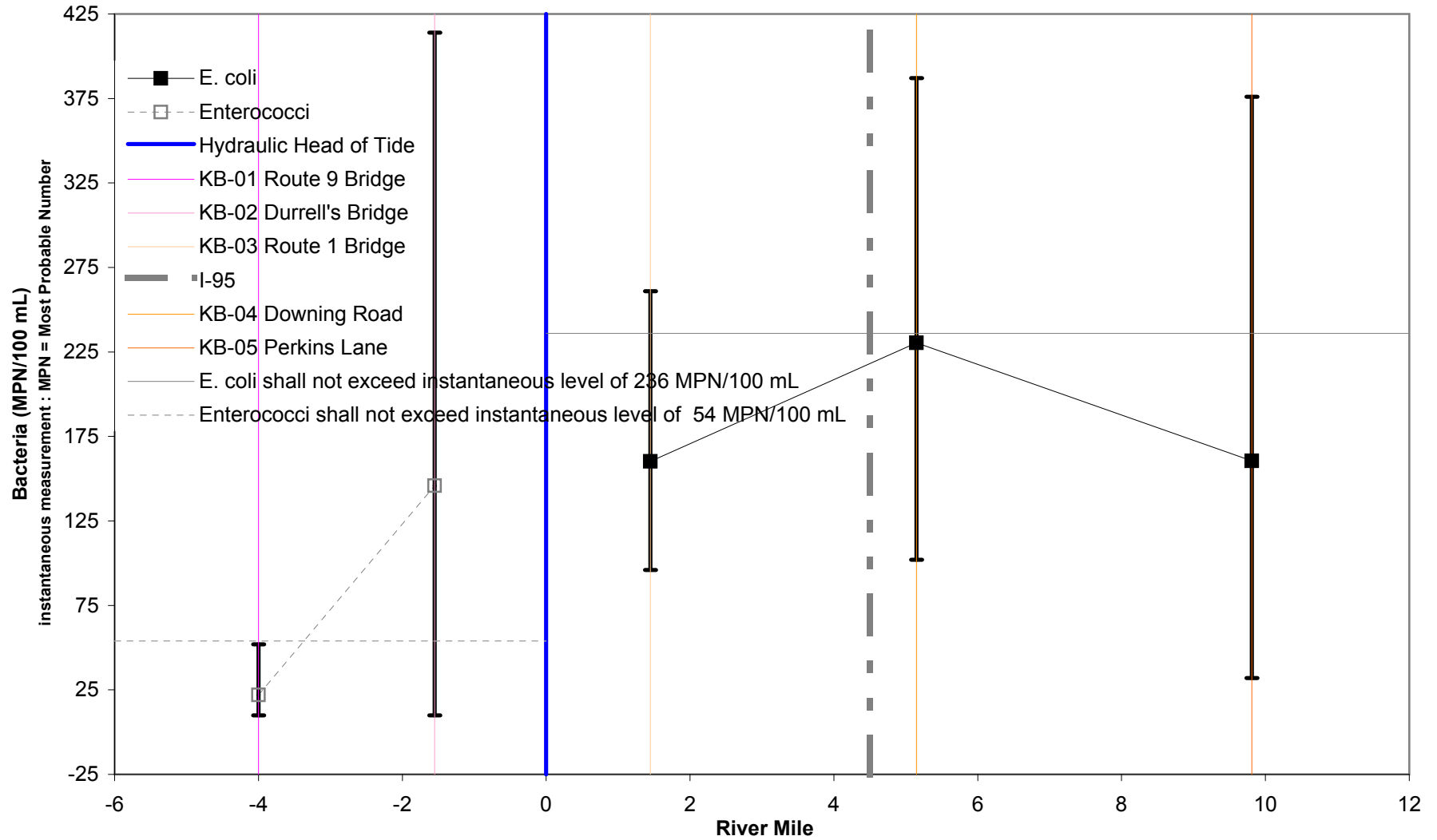


Figure 5-4-13. Bacteria changes per river mile at Mousam and Kennebunk Rivers Alliance monitoring sites on the Kennebunk River in 2011.
Points represent mean values. Error bars represent range of values.

Appendix A-1. 2011 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
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)	E Coli Bacteria (MPN/ 100ML)	Enterococci (MPN/ 100ML)
Kennebunk River - Kennebunk-Mousam Alliance (Approved Sites)													
KB-01 - RTE 9 BRIDGE	KENNEBUNK RIVER - SKE11 - VRMP	6/9/2011	8:32 AM	N			16.6	112	10.7		28		10
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	6/21/2011	9:20 AM	N			17.6	102	9.45		22		52
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	7/5/2011	11:45 AM	N			18	107	10.3				10
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	7/26/2011	9:15 AM	N			19.9	108.5	10.3		32		52
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	8/9/2011	9:30 AM	N			16.3	102.2	10		32		10
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	8/23/2011	9:40 AM	N			17.5	84	8		27		
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	9/6/2011	7:15 AM	N			16.3	87	8.6		33		10
KB-01	KENNEBUNK RIVER - SKE11 - VRMP	9/20/2011	6:55 AM	N			16.1	96	9.45				10
KB-02 - DURRELLS BRIDGE	KENNEBUNK RIVER - SKE35 - VRMP	6/9/2011	9:15 AM	N			20.8	96	8.7	15	5		414
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	6/21/2011	9:50 AM	N			20.2	94	8.6	60	4		298
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	7/5/2011	11:20 AM	N			23.3	89	7.55	7			85
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	7/26/2011	9:45 AM	N			22.2	90	7.83		19		132
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	8/9/2011	10:00 AM	N			22.3	77.3	6.7		15		41
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	8/23/2011	10:00 AM	N			19.5	83.4	7.7	5	2		
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	9/6/2011	7:40 AM	N			20.7	76.7	6.9		17		41
KB-02	KENNEBUNK RIVER - SKE35 - VRMP	9/20/2011	7:20 AM	N			15.7	87.5	8.6	19.5			10
KB-03 - RTE 1 BRIDGE	KENNEBUNK RIVER - SKE66 - VRMP	6/9/2011	9:45 AM	N								96	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	6/21/2011	10:15 AM	N			20.4	115	10.7	160		140	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	6/21/2011	10:15 AM	D			20.4	115	10.7	160			
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	6/21/2011	10:25 AM	D								100	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	7/5/2011	11:00 AM	N			23.1	115	9.9	96.5		196	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	7/5/2011	11:00 AM	D			23.1	114.8	9.85	96.5		228	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	7/26/2011	10:05 AM	N			22.5	101.6	8.75	392		225	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	8/9/2011	10:25 AM	N			22.8	106.6	9.2	250		148	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	8/9/2011	10:25 AM	D			23	106.7	9.1	320		105	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	8/23/2011	10:30 AM	N			20.8	101	9	150			
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	9/6/2011	8:05 AM	N			19.8	91.7	8.4	350		261	
KB-03	KENNEBUNK RIVER - SKE66 - VRMP	9/20/2011	7:40 AM	N			12.6	95	10.1	351		121	

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)	E Coli Bacteria (MPN/ 100ML)	Entero- cocci (MPN/ 100ML)
KB-04 - DOWNING ROAD	KENNEBUNK RIVER - SKE103 - VRMP	6/9/2011	10:00 AM	N			19	90	8.34	270		270	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	6/9/2011	10:00 AM	D			19	90	8.34	270		299	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	6/21/2011	10:40 AM	N			18.2	89.5	8.45	78.5		201	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	7/5/2011	10:35 AM	N			20.8	86	7.75	92		102	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	7/26/2011	10:30 AM	N			20.8	76	6.8	137		387	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	8/9/2011	10:55 AM	N			21.1	82.5	7.37	90		201	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	8/23/2011	10:50 AM	N			18.4	85.5	8	100			
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	9/6/2011	8:25 AM	N			19.8	71.8	6.6	101		276	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	9/6/2011	8:25 AM	D			19.7	71	6.5	103		387	
KB-04	KENNEBUNK RIVER - SKE103 - VRMP	9/20/2011	8:00 AM	N			11.6	84.3	9.2	96.2		111	
KB-05 - PERKINS LANE	KENNEBUNK RIVER - SKE148 - VRMP	6/9/2011	10:30 AM	N			19	99	9.3	70		68	
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	6/21/2011	11:00 AM	N			17.7	98.5	9.3	98		88	
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	7/5/2011	10:10 AM	N			19.2	93.7	8.65	615		138	
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	7/26/2011	10:50 AM	N			19.6	91	8.3	77		285	
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	8/9/2011	11:20 AM	N			20.2	93.2	8.55	79.5		146	
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	8/9/2011	11:20 AM	L								127	
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	8/23/2011	11:20 AM	N			18.7	96.2	9	71			
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	9/6/2011	8:50 AM	N			18.6	84.7	7.8	73.2		365	
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	9/6/2011	8:50 AM	L								387	
KB-05	KENNEBUNK RIVER - SKE148 - VRMP	9/20/2011	8:15 AM	N			11.6	92	9.95	85		32	

Appendix A-2. 2011 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 - Kennebunk-Mousam Alliance (Approved Sites)															
KB-01 RTE 9 BRIDGE	KENNEBUNK RIVER	6/9/2011	8:32 AM	N	BASE FLOW	LOW	24.0	BRIDGE	PARTLY CLOUDY		CLEAR, CLOUDY, SHOWERS	RUN	LOW EBB	CLEAR	DUPLICATE SAMPLES TAKEN AT EACH SITE FOR OPTICAL BRIGHTENER TESTING BY MHB NON-WADEABLE/3 FT BELOW SURFACE
KB-01	KENNEBUNK RIVER	6/21/2011	9:20 AM	N	BASE FLOW	LOW	25.0	BRIDGE	CLEAR	CALM	CLEAR, PARTLY CLOUDY	RIFFLE	LOW EBB	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-01	KENNEBUNK RIVER	7/5/2011	11:45 AM	N	BASE FLOW	LOW	26.6	BRIDGE	CLEAR	CALM	CLEAR, FOGGY, PARTLY CLOUDY, SHOWERS	RIFFLE	LOW FLOOD	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE DO CALIBRATION READING APPEARED HIGH (103.1%)
KB-01	KENNEBUNK RIVER	7/26/2011	9:15 AM	N	BASE FLOW	HIGH	19.1	BRIDGE	MOSTLY CLOUDY, SHOWER		CLEAR, LIGHT RAIN, MOSTLY CLOUDY, SHOWERS	RIFFLE	HIGH EBB	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-01	KENNEBUNK RIVER	8/9/2011	9:30 AM	N	BASE FLOW	HIGH	23.0	BRIDGE	PARTLY CLOUDY	BREEZE	CLEAR, LIGHT RAIN, PARTLY CLOUDY	RIFFLE	HIGH EBB	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-01	KENNEBUNK RIVER	8/23/2011	9:40 AM	N	BASE FLOW	MEDIUM	19.4	BRIDGE	CLEAR, PARTLY CLOUDY	CALM	CLEAR, PARTLY CLOUDY	RUN	EBB	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-01	KENNEBUNK RIVER	9/6/2011	7:15 AM	N	BASE FLOW	MEDIUM	16.0	BRIDGE	CLOUDY, SHOWER	CALM	CLEAR, FOGGY, PARTLY CLOUDY, SHOWERS	RUN	HIGH EBB	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-01	KENNEBUNK RIVER	9/20/2011	6:55 AM	N	BASE FLOW	MEDIUM	13.0	BRIDGE	CLOUDY, LIGHT RAIN	CALM	CLEAR, PARTLY CLOUDY	RIFFLE	HIGH EBB	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-02 DURRELLS BRIDGE	KENNEBUNK RIVER	6/9/2011	9:15 AM	N	BASE FLOW	MEDIUM	24.0	BRIDGE	PARTLY CLOUDY		CLEAR, CLOUDY, SHOWERS	RUN	LOW EBB	CLEAR	DUPLICATE SAMPLES TAKEN AT EACH SITE FOR OPTICAL BRIGHTENER TESTING BY MHB NON-WADEABLE/3 FT BELOW SURFACE
KB-02	KENNEBUNK RIVER	6/21/2011	9:50 AM	N	BASE FLOW	LOW	25.0	WADING	CLEAR	CALM	CLEAR, PARTLY CLOUDY	RIFFLE	LOW EBB	CLEAR	WADEABLE/1.5 FT BELOW SURFACE
KB-02	KENNEBUNK RIVER	7/5/2011	11:20 AM	N	BASE FLOW	LOW	26.6	WADING	CLEAR	CALM	CLEAR, FOGGY, PARTLY CLOUDY, SHOWERS	CASCADE	LOW	CLEAR	WADEABLE/1.5 FT BELOW SURFACE DO CALIBRATION READING APPEARED HIGH (103.1%)
KB-02	KENNEBUNK RIVER	7/26/2011	9:45 AM	N	BASE FLOW	HIGH	19.1	BRIDGE	MOSTLY CLOUDY, SHOWER		CLEAR, LIGHT RAIN, MOSTLY CLOUDY, SHOWERS	RIFFLE	HIGH EBB	CLEAR	NON-WADEABLE/MID-DEPTH
KB-02	KENNEBUNK RIVER	8/9/2011	10:00 AM	N	BASE FLOW	HIGH	23.0	BRIDGE	PARTLY CLOUDY	BREEZE	CLEAR, LIGHT RAIN, PARTLY CLOUDY	RIFFLE	HIGH EBB	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-02	KENNEBUNK RIVER	8/23/2011	10:00 AM	N	BASE FLOW	MEDIUM	19.4	BRIDGE	CLEAR, PARTLY CLOUDY	CALM	CLEAR, PARTLY CLOUDY	RIFFLE	EBB	MEDIUM STAINED	NON-WADEABLE/3 FT BELOW SURFACE
KB-02	KENNEBUNK RIVER	9/6/2011	7:40 AM	N	BASE FLOW	HIGH	16.0	BRIDGE	CLOUDY, SHOWER	CALM	CLEAR, FOGGY, PARTLY CLOUDY, SHOWERS	RIFFLE	HIGH EBB	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-02	KENNEBUNK RIVER	9/20/2011	7:20 AM	N	BASE FLOW	MEDIUM	13.0	BRIDGE	CLOUDY, LIGHT RAIN	CALM	CLEAR, PARTLY CLOUDY	RIFFLE	HIGH EBB	CLEAR	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-03 RTE 1 BRIDGE	KENNEBUNK RIVER	6/9/2011	9:45 AM	N											
KB-03	KENNEBUNK RIVER	6/21/2011	10:15 AM	N	BASE FLOW	LOW	25.0	WADING	CLEAR	CALM	CLEAR, PARTLY CLOUDY	CASCADE	LOW EBB	CLEAR	WADEABLE/1.5 FT BELOW SURFACE
KB-03	KENNEBUNK RIVER	6/21/2011	10:15 AM	D				WADING							WADEABLE/1.5 FT BELOW SURFACE
KB-03	KENNEBUNK RIVER	6/21/2011	10:25 AM	D											
KB-03	KENNEBUNK RIVER	7/5/2011	11:00 AM	N	BASE FLOW	MEDIUM	26.6	WADING	CLEAR	CALM	CLEAR, FOGGY, PARTLY CLOUDY, SHOWERS	CASCADE		CLEAR	WADEABLE/MID-DEPTH DO CALIBRATION READING APPEARED HIGH (103.1%)
KB-03	KENNEBUNK RIVER	7/5/2011	11:00 AM	D				WADING							WADEABLE/MID-DEPTH DO CALIBRATION READING APPEARED HIGH (103.1%)
KB-03	KENNEBUNK RIVER	7/26/2011	10:05 AM	N	BASE FLOW	LOW	19.1	WADING	MOSTLY CLOUDY, SHOWER		CLEAR, LIGHT RAIN, MOSTLY CLOUDY, SHOWERS	RIFFLE		CLEAR	WADEABLE/1.5 FT BELOW SURFACE
KB-03	KENNEBUNK RIVER	8/9/2011	10:25 AM	N	BASE FLOW	MEDIUM	23.0	WADING	PARTLY CLOUDY	BREEZE	CLEAR, LIGHT RAIN, PARTLY CLOUDY	CASCADE	HIGH EBB	CLEAR	WADEABLE/MID-DEPTH
KB-03	KENNEBUNK RIVER	8/9/2011	10:25 AM	D				WADING							WADEABLE/MID-DEPTH
KB-03	KENNEBUNK RIVER	8/23/2011	10:30 AM	N		MEDIUM	19.4	WADING	CLEAR, PARTLY CLOUDY	CALM	CLEAR, PARTLY CLOUDY	CASCADE			UNUSUAL AMOUNT OF SEDIMENT WADEABLE/1.5 FT BELOW SURFACE PARTIALLY COMPLETED OBSERVATIONAL DATA
KB-03	KENNEBUNK RIVER	9/6/2011	8:05 AM	N	BASE FLOW	HIGH	16.0	WADING	CLOUDY, SHOWER	CALM	CLEAR, FOGGY, PARTLY CLOUDY, SHOWERS	CASCADE	HIGH EBB	CLEAR	WADEABLE/1.5 FT BELOW SURFACE
KB-03	KENNEBUNK RIVER	9/20/2011	7:40 AM	N	BASE FLOW	MEDIUM	13.0	WADING	CLOUDY, LIGHT RAIN	CALM	CLEAR, PARTLY CLOUDY	CASCADE		CLEAR	WADEABLE/MID-DEPTH
KB-04 DOWNING ROAD	KENNEBUNK RIVER	6/9/2011	10:00 AM	N	BASE FLOW	MEDIUM	24.0	CULVERT	PARTLY CLOUDY		CLEAR, CLOUDY, SHOWERS	RIFFLE		CLEAR	DUPLICATE SAMPLES TAKEN AT EACH SITE FOR OPTICAL BRIGHTENER TESTING BY MHB NON-WADEABLE/3 FT BELOW SURFACE
KB-04	KENNEBUNK RIVER	6/9/2011	10:00 AM	D				CULVERT							DUPLICATE SAMPLES TAKEN AT EACH SITE FOR OPTICAL BRIGHTENER TESTING BY MHB NON-WADEABLE/3 FT BELOW SURFACE
KB-04	KENNEBUNK RIVER	6/21/2011	10:40 AM	N	BASE FLOW	LOW	25.0	CULVERT	CLEAR	CALM	CLEAR, PARTLY CLOUDY	RIFFLE	LOW EBB	CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-04	KENNEBUNK RIVER	7/5/2011	10:35 AM	N	BASE FLOW	MEDIUM	26.6	CULVERT	CLEAR	CALM	CLEAR, FOGGY, PARTLY CLOUDY, SHOWERS	RIFFLE		CLEAR	NON-WADEABLE/3 FT BELOW SURFACE DO CALIBRATION READING APPEARED HIGH (103.1%)
KB-04	KENNEBUNK RIVER	7/26/2011	10:30 AM	N	BASE FLOW	LOW	19.1	CULVERT	MOSTLY CLOUDY, SHOWER		CLEAR, LIGHT RAIN, MOSTLY CLOUDY, SHOWERS	RIFFLE		CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-04	KENNEBUNK RIVER	8/9/2011	10:55 AM	N	BASE FLOW	MEDIUM	23.0	CULVERT	PARTLY CLOUDY	BREEZE	CLEAR, LIGHT RAIN, PARTLY CLOUDY	RIFFLE		CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-04	KENNEBUNK RIVER	8/23/2011	10:50 AM	N	BASE FLOW	HIGH	19.4	CULVERT	CLEAR, PARTLY CLOUDY	CALM	CLEAR, PARTLY CLOUDY	RIFFLE		TURBID	NON-WADEABLE/3 FT BELOW SURFACE
KB-04	KENNEBUNK RIVER	9/6/2011	8:25 AM	N	BASE FLOW	HIGH	16.0	CULVERT	CLOUDY, SHOWER	CALM	CLEAR, FOGGY, PARTLY CLOUDY, SHOWERS	RIFFLE		CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-04	KENNEBUNK RIVER	9/6/2011	8:25 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 -	9/20/2011	8:00 AM	N	BASE FLOW	MEDIU M	13.0	CULVERT	CLOUDY, LIGHT RAIN	CALM	CLEAR, PARTLY CLOUDY	RIFFLE		CLEAR	NON-WADEABLE/3 FT BELOW SURFACE
KB-05 PERKINS LANE	KENNEBUNK RIVER -	6/9/2011	10:30 AM	N	BASE FLOW	LOW	24.0	BANK	PARTLY CLOUDY		CLEAR, CLOUDY, SHOWERS	RIFFLE		CLEAR	DUPLICATE SAMPLES TAKEN AT EACH SITE FOR OPTICAL BRIGHTENER TESTING BY MHB WADEABLE/1.5 FT BELOW SURFACE
KB-05	KENNEBUNK RIVER -	6/21/2011	11:00 AM	N	BASE FLOW	LOW	25.0	WADING	CLEAR	CALM	CLEAR, PARTLY CLOUDY	RIFFLE	LOW EBB	CLEAR	WADEABLE/1.5 FT BELOW SURFACE
KB-05	KENNEBUNK RIVER -	7/5/2011	10:10 AM	N	BASE FLOW	LOW	26.6	WADING	CLEAR	CALM	CLEAR, FOGGY, PARTLY CLOUDY, SHOWERS	RIFFLE		CLEAR	WADEABLE/1.5 FT BELOW SURFACE DO CALIBRATION READING APPEARED HIGH (103.1%)
KB-05	KENNEBUNK RIVER -	7/26/2011	10:50 AM	N	BASE FLOW	LOW	19.1	WADING	MOSTLY CLOUDY, SHOWER		CLEAR, LIGHT RAIN, MOSTLY CLOUDY, SHOWERS	RIFFLE		CLEAR	WADEABLE/1.5 FT BELOW SURFACE
KB-05	KENNEBUNK RIVER -	8/9/2011	11:20 AM	N	BASE FLOW	LOW	23.0	WADING	PARTLY CLOUDY	BREEZE	CLEAR, LIGHT RAIN, PARTLY CLOUDY	RIFFLE	HIGH EBB	CLEAR	WADEABLE/MID-DEPTH
KB-05	KENNEBUNK RIVER -	8/9/2011	11:20 AM	L											
KB-05	KENNEBUNK RIVER -	8/23/2011	11:20 AM	N	BASE FLOW	MEDIU M	19.4	WADING	CLEAR, PARTLY CLOUDY	CALM	CLEAR, PARTLY CLOUDY	RIFFLE		TURBID	UNUSUAL AMOUNT OF SEDIMENT WADEABLE/1.5 FT BELOW SURFACE
KB-05	KENNEBUNK RIVER -	9/6/2011	8:50 AM	N	BASE FLOW	MEDIU M	16.0	WADING	CLOUDY, SHOWER	CALM	CLEAR, FOGGY, PARTLY CLOUDY, SHOWERS	RIFFLE		CLEAR	WADEABLE/1.5 FT BELOW SURFACE
KB-05	KENNEBUNK RIVER -	9/6/2011	8:50 AM	L											
KB-05	KENNEBUNK RIVER -	9/20/2011	8:15 AM	N	BASE FLOW	MEDIU M	13.0	WADING	CLOUDY, LIGHT RAIN	CALM	CLEAR, PARTLY CLOUDY	RIFFLE		CLEAR	WADEABLE/1.5 FT BELOW SURFACE