

October 27, 2009

Summer 2009:

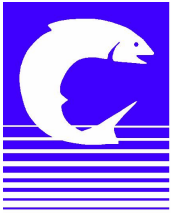
Low Ph Values Observed on the Merrimack River in Massachusetts

During the summer of 2009, Merrimack River Watershed Council (MRWC) staff, interns and volunteers measured baseline water quality parameters including temperature, specific conductivity, total dissolved solids, salinity, dissolved oxygen, and pH using a YSI 556 MPS in the Merrimack River in Massachusetts. Seven to ten sites were monitored in each of four sections: Section 1, the mouth at the Atlantic Ocean in Newburyport to Groveland Bridge in Haverhill; Section 2, Groveland Bridge in Haverhill to Essex Dam in Lawrence; Section 3, Essex Dam in Lawrence to Pawtucket Dam in Lowell; and Section 4, Pawtucket Dam in Lowell to the state line at Hudson, NH and Tyngsborough, MA (Figure 1, Table 1). On four separate occasions, May 20 in Section 1, May 30 in Section 3, August 1 in Section 3, and August 19 in Section 4, *pH values were found to be considerably lower than normal*, and well below the lower limit of 6.5 set by the state for conditions acceptable in Class B waters. It should be noted that at the first three of these monitoring trips the YSI 556 MPS that was used has a poor seal between the unit and the pH probe. This may allow water to interfere with the connection, thus causing low pH readings. Data have been reviewed for this potential issue and while it does not appear that the observed readings were caused by this malfunction, the possibility cannot be completely eliminated.

May 20th Section 1

On May 20, 2009, MRWC staff and volunteers monitored in Section 1 from Old North Canal in Haverhill to the Newburyport Wastewater Treatment Plant (Figure 1, Table 1). At the Old North Canal site (station 14.1), pH values were observed in the threes, and were thought to be erroneous; therefore, they were not recorded. Calibration of the pH was checked and found to be within tolerance. Values observed at Kimball Farm (station 11.8), two and three-tenths miles downstream, were also low and ranged from 3.29 at one meter depth to 3.50 at the surface, with intermediate values at lower depths (Figure 2). Low pH was also observed at Cobbler Brook (station 10.6); however, values there were higher than previous sites, with a range of 5.23 at three meters depth to 6.23 at the surface. The increasing pH trend continued from Indian River (station 9.4), with a low of 6.16, to a high of 6.96 at Newburyport Wastewater Treatment Plant (station 2.7).

During the return trip upstream, the team collected another pH reading as well as a sample of water at 12:42 PM (approximately 3 ½ hours after collecting the low readings at station 11.8, Kimball Farm) at a point between stations 11.8 and 10.6. The pH at this site was 5.84, and the water sample, evaluated with a volunteer's swimming pool test strips, confirmed the low pH readings.



May 30th Section 3

On May 30, 2009, MRWC staff and volunteers monitored in Section 3 from above the Essex Dam in Lawrence to Duck Island in Lowell (Figure 1, Table 1). At the Essex Dam site (station 29.6), pH was 4.65 at the surface and 4.95 at five meters depth (Figure 3). Upstream values were higher at the Methuen Water Intake (station 31.4; between 5.92 at five meters and 5.99 at three meters) and Bartlett Brook (station 32.2; between 6.10 at four meters and 6.15 at three meters). One and one-tenth mile upstream at Fish Brook (station 33.4), pH values decreased to between 4.11 at one meter depth and 4.25 at the surface, with intermediate values at lower depths. At the gravel pit (station 35.1) upstream, pH was slightly higher (between 4.48 at five meters and 4.76 at the surface). Trull Brook (station 36.3) pH values were lower at between 4.17 at three meters and 4.49 at the surface. Upstream at Duck Island (station 37.9), pH was closer to normal at 5.77 at the surface.

August 1st Section 3

On August 1, 2009, MRWC volunteers monitored in Section 3 from above Essex Dam to Trull Brook (Figure 1, Table 1). At the Essex Dam site (station 29.6), pH ranged from 3.99 at five meters depth and 5.62 at the surface (Figure 4). Upstream values were slightly lower at the Methuen Water Intake (station 31.4) with values between 3.28 at five meters depth and a high of 6.35 at the surface. Bartlett Brook (station 32.2) ranged from 4.45 at five meters and 4.67 at the surface. The pH increased through Fish Brook (station 33.4), which ranged from 5.30 at the surface and 5.52 at five meters, and the gravel pit (station 35.1) and Trull Brook (station 36.3) sites were both around six.

August 19th Section 4 and Pawtucket Canal

On August 19, 2009, MRWC interns and volunteers monitored at the Lowell Motor Boat Club (just above the Pawtucket Dam in Lowell), and in the Pawtucket Canal, from upstream to downstream, at Pawtucket Street Bridge, the co-generation plant, and at Swamp Locks (Figure 1, Table 1). The first site to be monitored was at the Lowell Motor Boat Club (station 44.1) within the upstream portion of the mooring field. At this site, pH levels ranged from 3.23 at two meters depth and 3.37 at four meters (Figure 5). Following these measurements, monitoring equipment was checked with pH 4.00 buffer solution and found to be properly calibrated. Within Pawtucket Canal at the Pawtucket Street Bridge (station PC40.9), pH ranged from 4.70 to 4.83 at a depth of one meter. At the co-generation plant (station PC40.2), pH ranged from 6.36 at the surface and 6.31 at one meter depth. At Swamp Locks (station 39.7), pH ranged from 6.54 at the surface and 5.56 at a depth of two meters.

MRWC interns returned to Lowell Motor Boat Club to check pH values within three hours after the initial measurements. They positioned themselves on the southern shoreline, just upstream from the boat club and used a seven meter extension pole to measure pH. At the surface, pH was at 6.5, 3.57 at one meter depth, and 4.75 at two meters. They also took grab samples and confirmed the general range of pH readings using pH test strips. Eight days later, EPA sampled in the same area and found that pH had returned to normal levels.

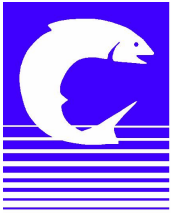


Table 1. Merrimack River Watershed Council water quality monitoring sites in Massachusetts. Geographic coordinates are in WGS1984. Station numbers correspond to distance from Atlantic Ocean in miles.

Section	Station	Description	Town	Latitude	Longitude
1	2.7	Newburyport Wastewater Treatment Plant	Newburyport	42.81073	-70.85984
	4.4	Yankee Marina	Newburyport	42.82495	-70.88801
	6.8	Powow River	Amesbury	42.84122	-70.92167
	8.3	Artichoke River	Newburyport	42.82293	-70.93748
	9.4	Indian River	West Newbury	42.81835	-70.95872
	10.6	Cobbler Brook	Merrimac	42.82493	-70.98138
	11.8	Kimball Farm	Merrimac	42.81800	-71.00100
	14.1	Old North Canal	Haverhill	42.79260	-71.01966
2	16.8	Johnson Creek	Groveland	42.75688	-71.04058
	17.8	Haverhill Wastewater Treatment Plant	Haverhill	42.76168	-71.05393
	19.1	Little River	Haverhill	42.77367	-71.07700
	22.3	Creek Brook	Haverhill	42.77392	-71.12713
	25.6	Lucent Technologies	North Andover	42.73359	-71.12155
	26.9	Greater Lawrence Wastewater Treatment Plant	North Andover	42.71783	-71.13422
	27.8	Shawsheen River	Lawrence	42.70700	-71.13700
	28.2	Spickett River	Lawrence	42.76168	-71.14439
3	29.6	Above Essex Dam	Lawrence	42.69667	-71.17265
	31.4	Methuen Water Intake	Methuen	42.69893	-71.20259
	32.2	Bartlett Brook	Methuen	42.70139	-71.21619
	33.4	Fish Brook	Andover	42.68791	-71.22498
	35.1	Gravel Pit	Dracut	42.66665	-71.24048
	36.3	Trull Brook	Tewksbury	42.65661	-71.25751
	37.9	Duck Island	Lowell	42.65084	-71.28442
	38.9	Concord River	Lowell	42.64692	-71.30195
PC	40.0	Beaver Brook	Lowell	42.65700	-71.31900
	PC39.7*	Swamp Locks	Lowell	42.64223	-71.31545
	PC40.2*	Co-generation plant	Lowell	42.63981	-71.32329
4	PC40.9*	Pawtucket St. Bridge	Lowell	42.64672	-71.33144
	41.1	Pawtucket Dam	Lowell	42.64721	-71.33453
	42.4	Rourke Bridge	Lowell	42.63858	-71.35682
	43.4	Stony Brook	Chelmsford	42.63852	-71.37270
	44.1	Lowell Motor Boat Club	Lowell	42.64660	-71.33380
	44.6	Vesper Country Club	Lowell	42.64972	-71.38817
	46.4	Lawrence Brook	Tyngsborough	42.66766	-71.40976
	47.3	Tyngsborough (Rte. 113) Bridge	Tyngsborough	42.67538	-71.42106
	48.9	Limit Brook	Tyngsborough	42.69329	-71.42046
49.6	Mass./New Hampshire Border	Tyngsborough	42.69439	-71.42400	

*Stations within Pawtucket Canal, Lowell, MA.

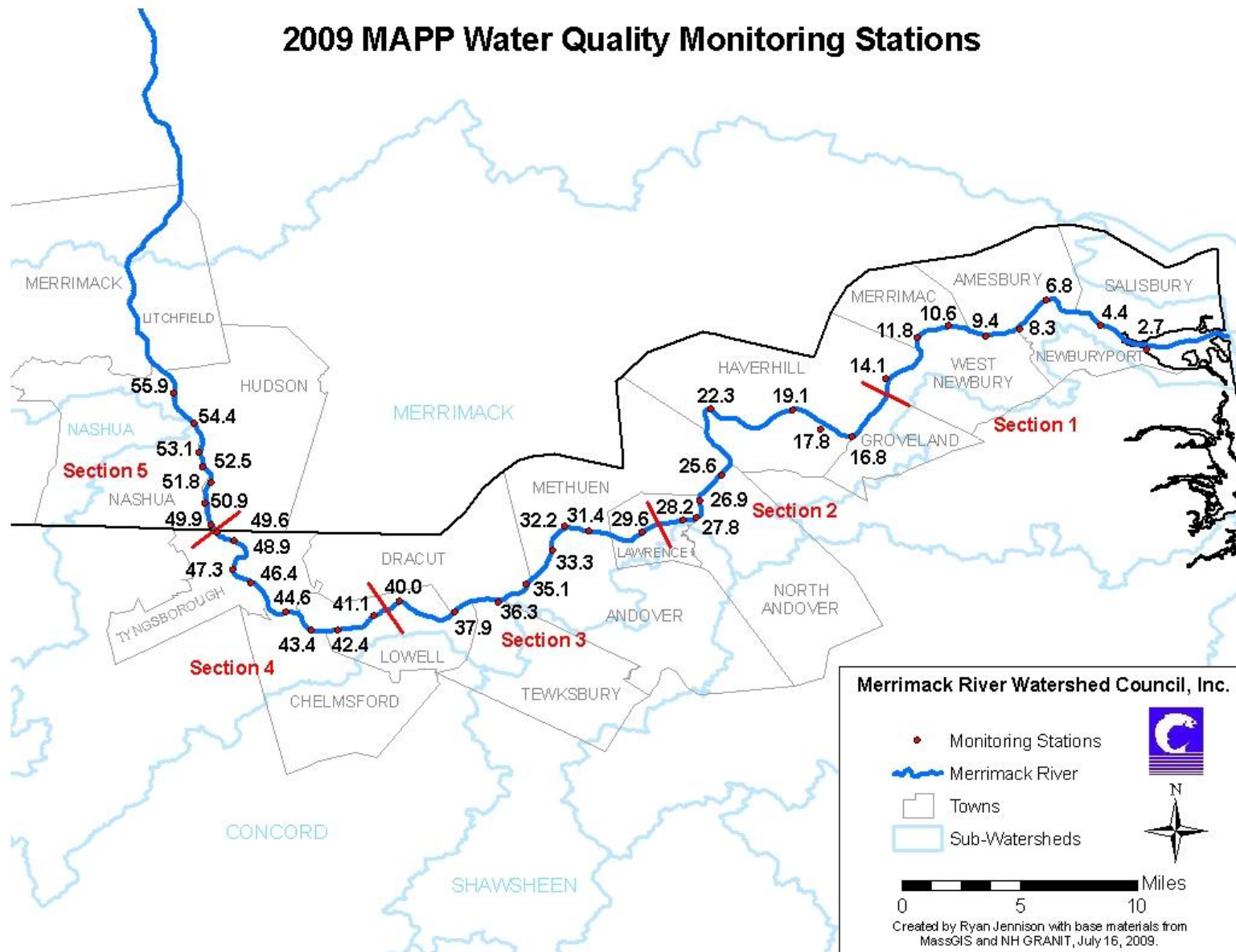


Figure 1. Merrimack River Watershed Council water quality monitoring sites in Massachusetts. Station numbers correspond to distance from Atlantic Ocean in miles, and site names and geographic coordinates in Table 1.

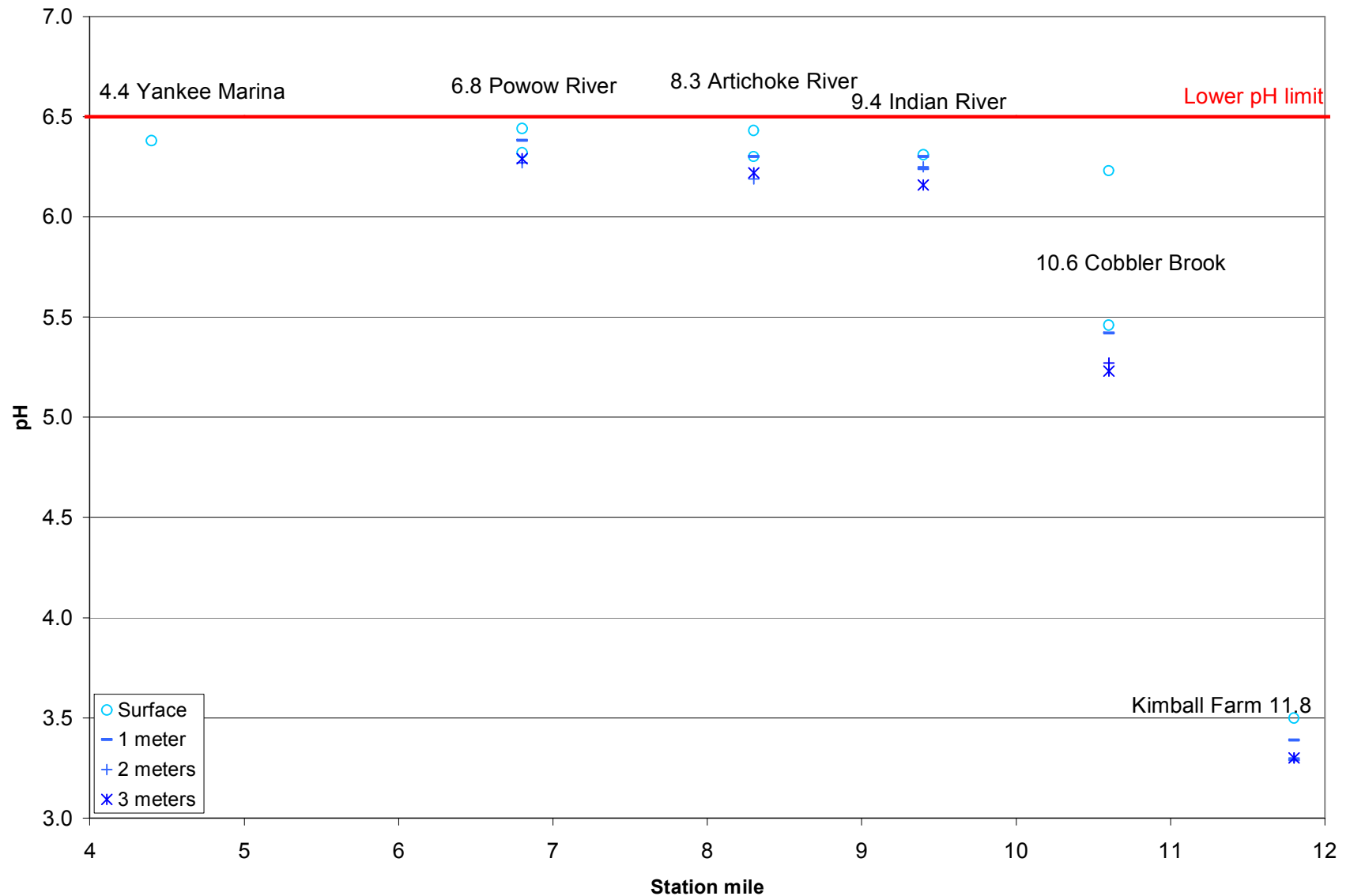


Figure 2. Water quality monitoring pH data collected on May 20, 2009 at sites from Old North Canal in Haverhill, MA to the Newburyport Wastewater Treatment Plant in Newburyport, MA (Section 1). Station numbers correspond to distance from Atlantic Ocean in miles, and site names and geographic coordinates in Table 1. The red line indicates the lower pH limit for conditions acceptable in Class B waters.

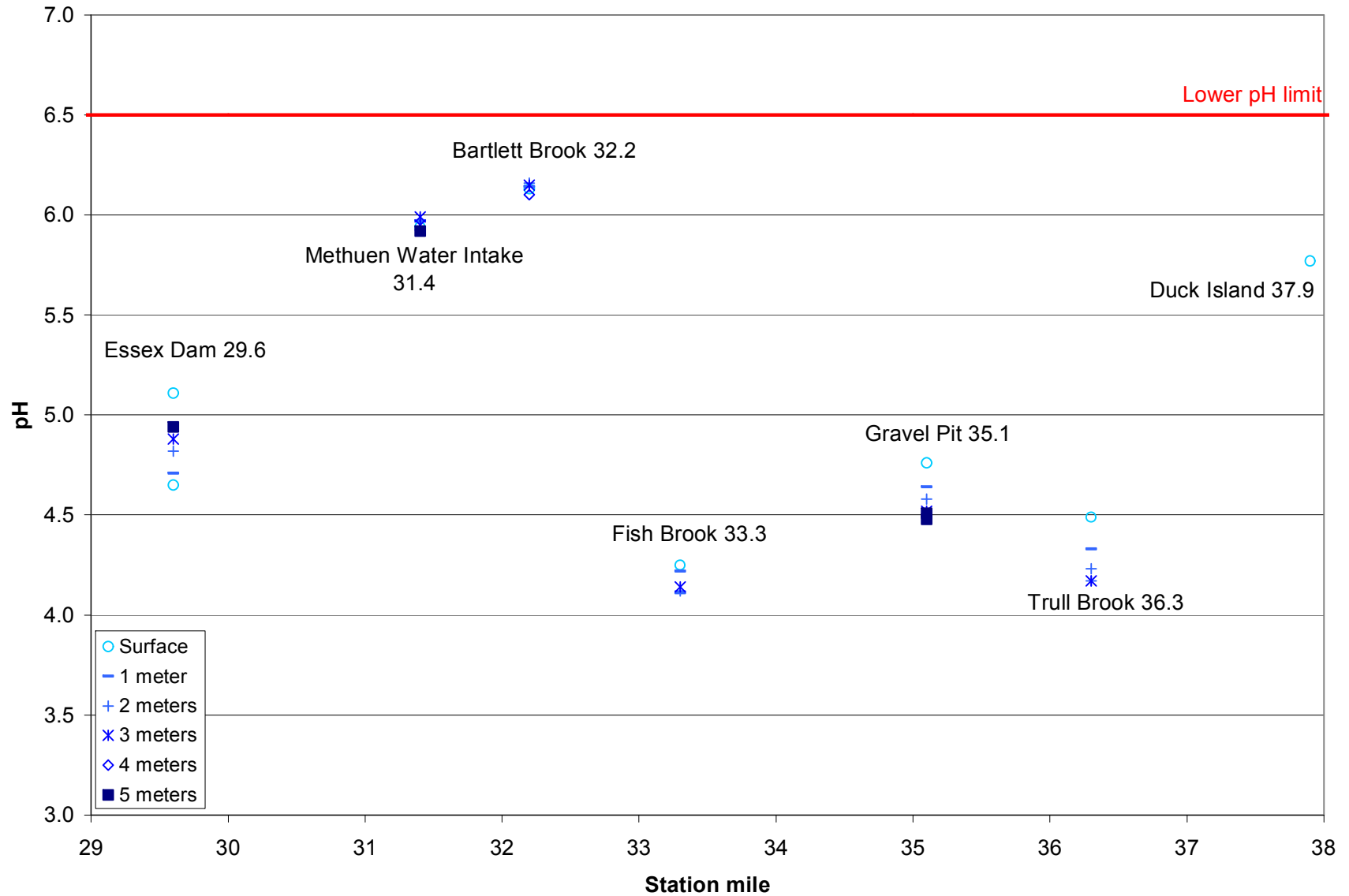


Figure 3. Water quality monitoring pH data collected on May 30, 2009 at sites from above Essex Dam in Lawrence, MA to Duck Island in Lowell, MA (Section 3). Station numbers correspond to distance from Atlantic Ocean in miles, and site names and geographic coordinates in Table 1. The red line indicates the lower pH limit for conditions acceptable in Class B waters.

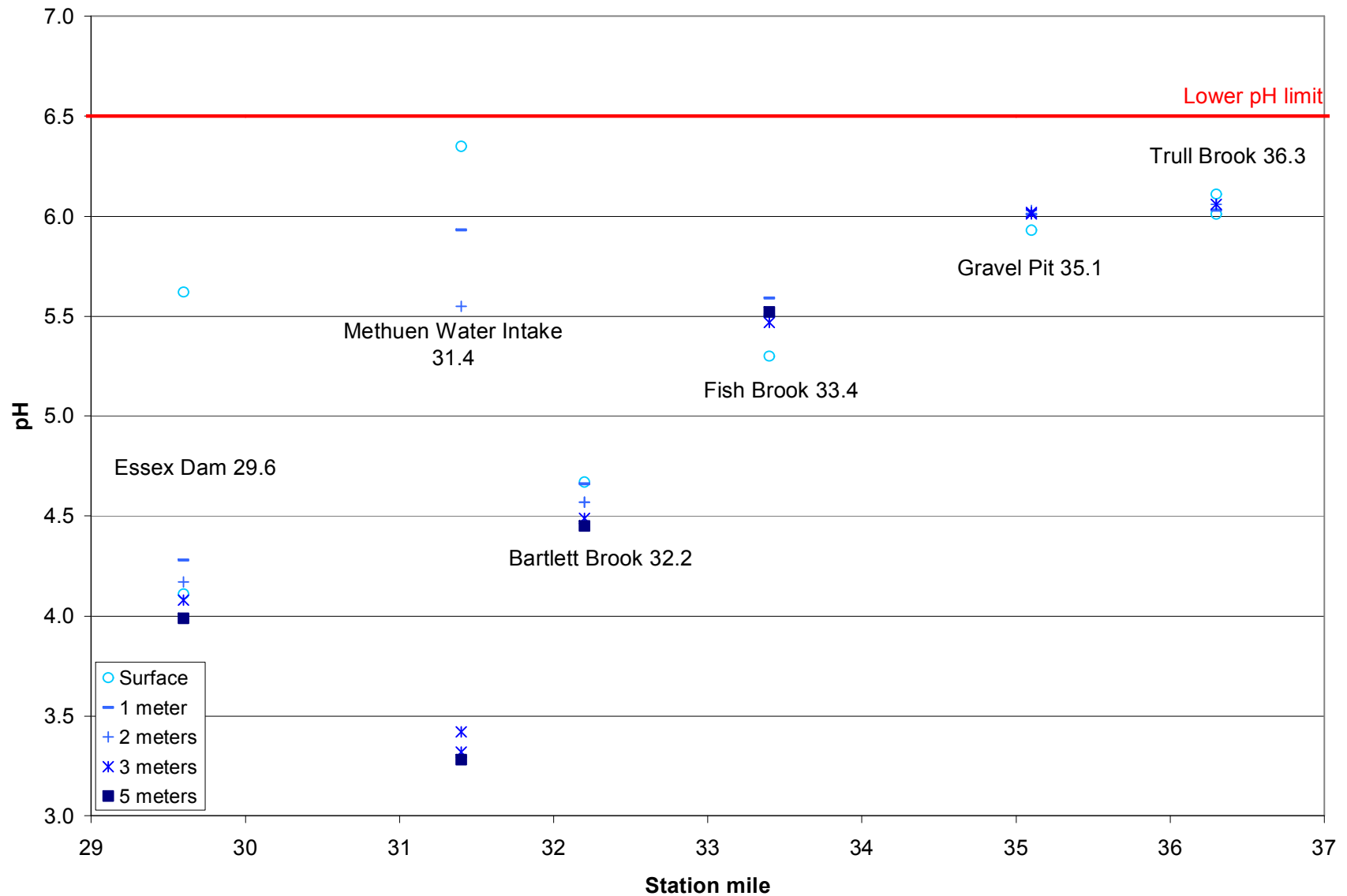


Figure 4. Water quality monitoring pH data collected on August 1, 2009 at sites from above Essex Dam in Lawrence, MA to Trull Brook in Tewksbury, MA (Section 3). Station numbers correspond to distance from Atlantic Ocean in miles, and site names and geographic coordinates in Table 1. The red line indicates the lower pH limit for conditions acceptable in Class B waters.

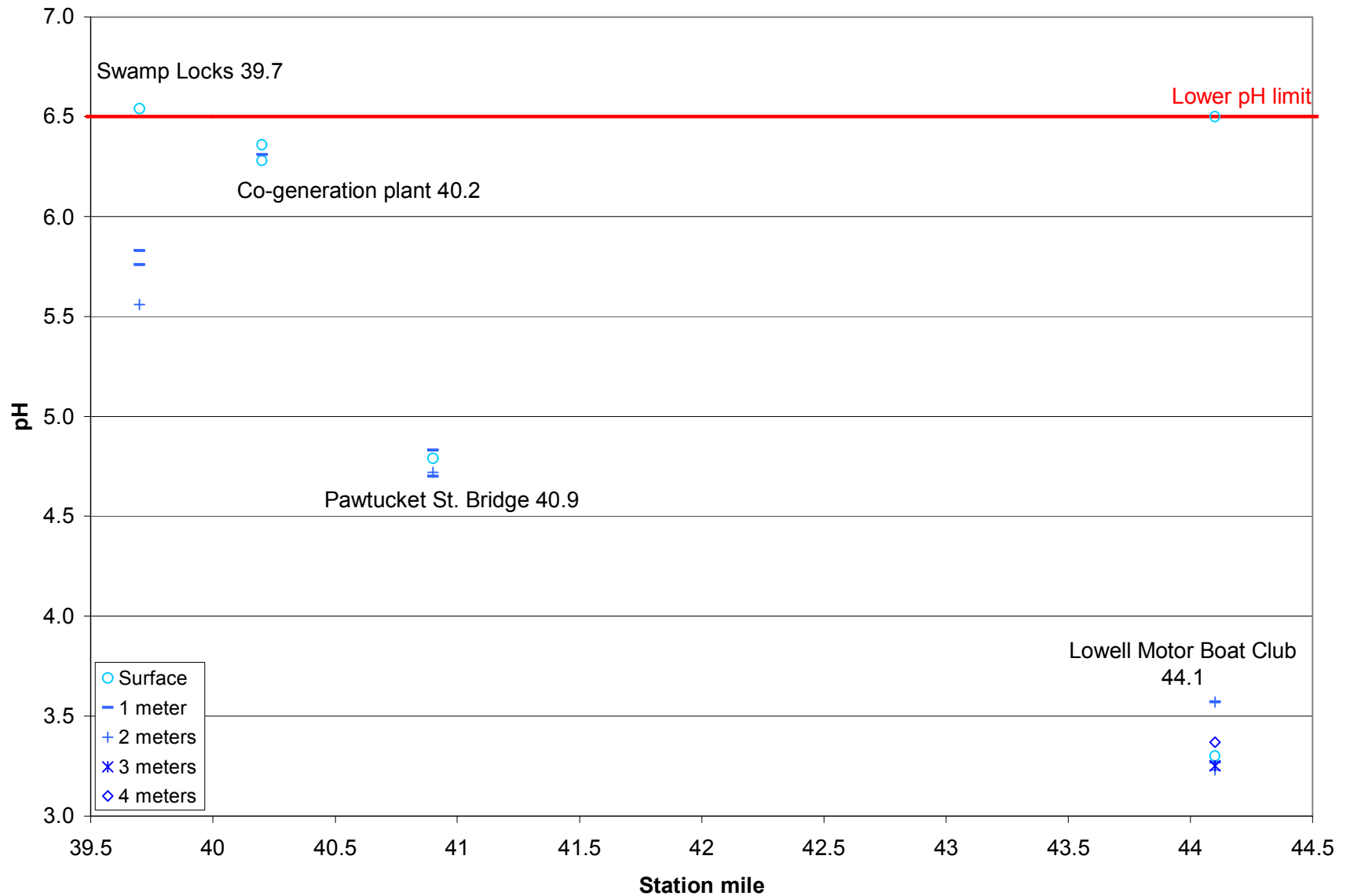


Figure 5. Water quality monitoring pH data collected on August 19, 2009 at sites in Lowell, MA, including the Lowell Motor Boat Club (just above the Pawtucket Dam), and in the Pawtucket Canal, from upstream to downstream, at Pawtucket Street Bridge, the co-generation plant, and Swamp Locks (Section 4). Station numbers correspond to distance from Atlantic Ocean in miles, and site names and geographic coordinates in Table 1. The red line indicates the lower pH limit for conditions acceptable in Class B waters.



Appendix A. Provisional water quality data collected on May 20, 2009 on the Merrimack River in Massachusetts in summer 2009. Station numbers correspond to distance from Atlantic Ocean in miles and geographic coordinates in Table 1. Note that these data have undergone internal Quality Control and Quality Assurance, but have not been reviewed by the MAPP Project QA/QC officer.

Description	Station	Depth (m)	pH	Duplicate
Newburyport WWTP	2.7	0	6.96	N
Newburyport WWTP	2.7	0	7.01	Y
Yankee Marina	4.4	0	6.38	N
Powow River	6.8	0	6.44	N
Powow River	6.8	0	6.32	Y
Powow River	6.8	1	6.38	N
Powow River	6.8	2	6.27	N
Powow River	6.8	3	6.29	N
Artichoke River	8.3	0	6.43	N
Artichoke River	8.3	0	6.30	Y
Artichoke River	8.3	1	6.30	N
Artichoke River	8.3	2	6.19	N
Artichoke River	8.3	3	6.22	N
Indian River	9.4	0	6.31	N
Indian River	9.4	1	6.30	N
Indian River	9.4	1	6.24	Y
Indian River	9.4	2	6.25	N
Indian River	9.4	3	6.16	N
Cobbler Brook	10.6	0	6.23	N
Cobbler Brook	10.6	0	5.46	Y
Cobbler Brook	10.6	1	5.42	N
Cobbler Brook	10.6	2	5.27	N
Cobbler Brook	10.6	3	5.23	N
Kimball Farm	11.8	0	3.50	N
Kimball Farm	11.8	1	3.29	N
Kimball Farm	11.8	1	3.39	Y
Kimball Farm	11.8	2	3.30	N
Kimball Farm	11.8	3	3.30	N
Old North Canal	14.1	0		N
Old North Canal	14.1	0		Y
Old North Canal	14.1	1		N
Old North Canal	14.1	2		N
Old North Canal	14.1	3		N



Appendix B. Provisional water quality data collected May 30, 2009 on the Merrimack River in Massachusetts in summer 2009. Station numbers correspond to distance from Atlantic Ocean in miles and geographic coordinates in Table 1. Note that these data have undergone internal Quality Control and Quality Assurance, but have not been reviewed by the MAPP Project QA/QC officer.

Description	Station	Depth (m)	pH	Duplicate
Above Essex Dam	29.6	0	4.65	N
Above Essex Dam	29.6	0	5.11	Y
Above Essex Dam	29.6	1	4.71	N
Above Essex Dam	29.6	2	4.82	N
Above Essex Dam	29.6	3	4.88	N
Above Essex Dam	29.6	5	4.94	N
Methuen Water Intake	31.4	0	5.94	N
Methuen Water Intake	31.4	1	5.97	N
Methuen Water Intake	31.4	2	5.97	N
Methuen Water Intake	31.4	3	5.95	N
Methuen Water Intake	31.4	3	5.99	Y
Methuen Water Intake	31.4	5	5.92	N
Bartlett Brook	32.2	0	6.13	N
Bartlett Brook	32.2	1	6.14	N
Bartlett Brook	32.2	2	6.14	N
Bartlett Brook	32.2	2	6.16	Y
Bartlett Brook	32.2	3	6.15	N
Bartlett Brook	32.2	4	6.10	N
Fish Brook	33.3	0	4.25	N
Fish Brook	33.3	1	4.11	N
Fish Brook	33.3	1	4.22	Y
Fish Brook	33.3	2	4.12	N
Fish Brook	33.3	3	4.14	N
Gravel Pit	35.1	0	4.76	N
Gravel Pit	35.1	1	4.64	N
Gravel Pit	35.1	2	4.58	N
Gravel Pit	35.1	3	4.52	N
Gravel Pit	35.1	5	4.48	N
Gravel Pit	35.1	5	4.51	Y
Trull Brook	36.3	0	4.49	N
Trull Brook	36.3	1	4.33	N
Trull Brook	36.3	2	4.23	N
Trull Brook	36.3	2	4.17	Y
Trull Brook	36.3	3	4.17	N
Duck Island	37.9	0	5.77	N



Appendix C. Provisional water quality data collected on August 1, 2009 on the Merrimack River in Massachusetts in summer 2009. Station numbers correspond to distance from Atlantic Ocean in miles and geographic coordinates in Table 1. Note that these data have undergone internal Quality Control and Quality Assurance, but have not been reviewed by the MAPP Project QA/QC officer.

Description	Station	Depth (m)	pH	Duplicate
Above Essex Dam	29.6	0	5.62	N
Above Essex Dam	29.6	0	4.11	Y
Above Essex Dam	29.6	1	4.28	N
Above Essex Dam	29.6	2	4.17	N
Above Essex Dam	29.6	3	4.08	N
Above Essex Dam	29.6	5	3.99	N
Methuen Water Intake	31.4	0	6.35	N
Methuen Water Intake	31.4	1	5.93	N
Methuen Water Intake	31.4	2	5.55	N
Methuen Water Intake	31.4	3	3.42	N
Methuen Water Intake	31.4	3	3.32	Y
Methuen Water Intake	31.4	5	3.28	N
Bartlett Brook	32.2	0	4.67	N
Bartlett Brook	32.2	1	4.66	N
Bartlett Brook	32.2	2	4.57	N
Bartlett Brook	32.2	2	4.57	Y
Bartlett Brook	32.2	3	4.49	N
Bartlett Brook	32.2	5	4.45	N
Fish Brook	33.4	0	5.30	N
Fish Brook	33.4	1	5.50	N
Fish Brook	33.4	1	5.59	Y
Fish Brook	33.4	2	5.51	N
Fish Brook	33.4	3	5.47	N
Fish Brook	33.4	5	5.52	N
Gravel Pit	35.1	0	5.93	N
Gravel Pit	35.1	1	6.01	N
Gravel Pit	35.1	2	6.03	N
Gravel Pit	35.1	3	6.02	N
Gravel Pit	35.1	3	6.01	Y
Trull Brook	36.3	0	6.01	N
Trull Brook	36.3	0	6.11	Y
Trull Brook	36.3	1	6.03	N
Trull Brook	36.3	2	6.06	N
Trull Brook	36.3	3	6.06	N



Appendix D. Provisional water quality data collected on August 19, 2009 on the Merrimack River in Massachusetts in summer 2009. Station numbers correspond to distance from Atlantic Ocean in miles and geographic coordinates in Table 1. Note that these data have undergone internal Quality Control and Quality Assurance, but have not been reviewed by the MAPP Project QA/QC officer.

Description	Station	Depth (m)	pH	Duplicate
Lowell Motor Boat Club	44.1	0	3.30	N
Lowell Motor Boat Club	44.1	1	3.27	N
Lowell Motor Boat Club	44.1	2	3.23	N
Lowell Motor Boat Club	44.1	2	3.57	Y
Lowell Motor Boat Club	44.1	3	3.25	N
Lowell Motor Boat Club	44.1	4	3.37	N
Swamp Locks	39.7*	0	6.54	N
Swamp Locks	39.7*	1	5.76	N
Swamp Locks	39.7*	1	5.83	Y
Swamp Locks	39.7*	2	5.56	N
Co-generation plant	40.2*	0	6.36	N
Co-generation plant	40.2*	0	6.28	Y
Co-generation plant	40.2*	1	6.31	N
Pawtucket St. Bridge	40.9*	0	4.79	N
Pawtucket St. Bridge	40.9*	1	4.70	N
Pawtucket St. Bridge	40.9*	1	4.83	Y
Pawtucket St. Bridge	40.9*	2	4.72	N
Lowell Motor Boat Club	44.1**	0	6.50	
Lowell Motor Boat Club	44.1**	1	3.57	
Lowell Motor Boat Club	44.1**	1 [†]	4.09	
Lowell Motor Boat Club	44.1**	2 [†]	4.75	

* These stations are within Pawtucket Canal. Station numbers are relative to Station 44.1, not necessarily distance to the Atlantic Ocean as other stations are numbered.

** Measurements at this site were taken from shore, rather than the middle of the channel.

† These are approximate depths of grab samples. Containers could not be closed while submerged as samples were taken with an extension pole.

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October 2009