LaPlatte Watershed Partnership –
Thorp Watershed Group

Water Quality Supplement
LaPlatte Watershed

2012 Monitoring Season

Prepared for

Water Quality Section
Vermont Department of Environmental Conservation
and
The Town of Shelburne, Vermont
March, 2013

I. INTRODUCTION

During the 2012 monitoring season the LaPlatte Watershed Partnership – Thorpe Watershed Group focused their joint monitoring activities on McCabe's Brook and the Holmes Creek watershed. In addition to ongoing water quality objectives, a primary objective was to determine whether high flows could be targeted and monitored reliably.

II. RESULTS

A. McCabe's Brook

McCabe's Brook is of interest as a small, near-lake watershed impacted by farming in its upper reaches in the Town of Charlotte, and by collapse of stream banks, erosion, and urban storm water runoff in the Town of Shelburne before joining the LaPlatte River in the backwater from Shelburne Bay. Water quality in the stream has been monitored between May and November under the LaRosa Volunteer Monitoring Program since 2004, with the exception of 2008 when budgetary restrictions resulted in a temporary shut-down of the monitoring program.

Because the McCabe's Brook watershed is small, water quality is sensitive to land use and management practices. Since its start, the monitoring program has demonstrated the impacts of both. The monitoring effort has been augmented in several ways to enhance the value of the data it provides.

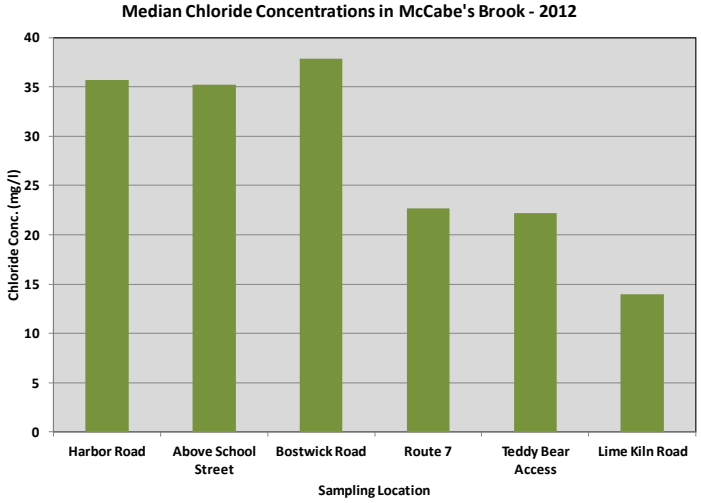
Of particular value have been installation of staff gages for measurement of flow at locations below the upstream agricultural portion of the watershed, and downstream from the Town of Shelburne. Flow measurement in conjunction with water quality sampling was initiated in 2010 to assess sources and relative importance of nutrient loadings from agricultural and urban runoff.

The monitoring program was further refined in 2012 in two ways: firstly by establishing a new sampling location just upstream from the School Street neighborhood in Shelburne (see map, Annex IB), closely bracketing all major sources of storm runoff from the town itself and providing a basis for improving the assessment of the impact of urban runoff on water quality and nutrient loadings on Shelburne Bay. Secondly, sampling dates were selected to target high flows based on weather predictions. Flow was also monitored on a regular basis in conjunction with daily rainfall data provided from the Shelburne Sewage Treatment Plant No. 2 located adjacent to McCabe's Brook just downstream from the Harbor Road monitoring site. This has provided insight into high flows apparently unrelated to rainfall and potentially adversely affecting water quality and nutrient loadings on Lake Champlain. Interpretation of monitoring

results was further informed by findings of a phase II fluvial geomorphic study carried out in 2011.

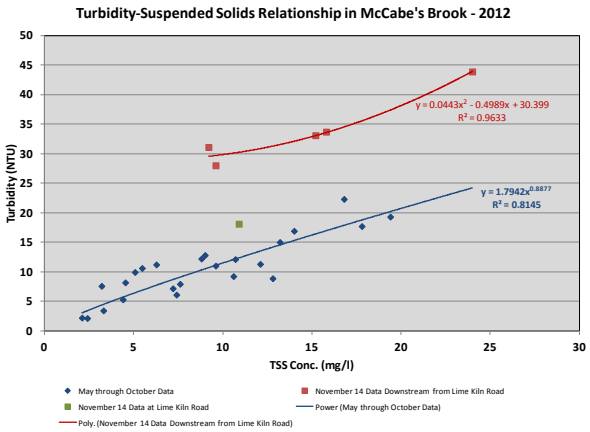
i. Water Quality

Chloride. Chloride levels were low and generally consistent with levels observed during previous years, but higher downstream from Route 7 than in 2011. No samples reached the highest concentrations observed during previous years, most likely because salt applications to roads were reduced relative to previous years.



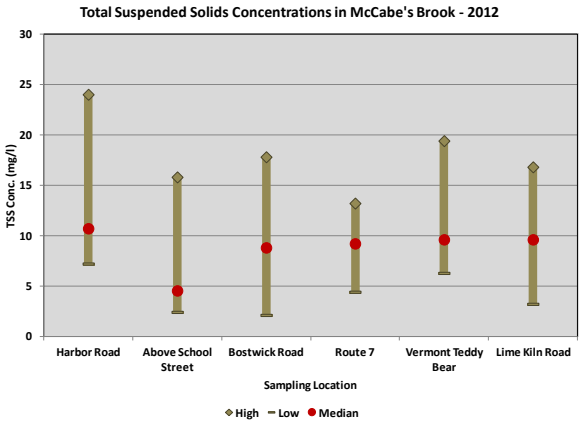
Concentrations increased substantially downstream from Route 7, suggesting that application of salt to that major route may be the major contributor to chloride in the stream. Levels were maintained as the stream passed through the Town of Shelburne, but did not increase reflecting reduced salt applications to local streets during the winter of 2011-2012.

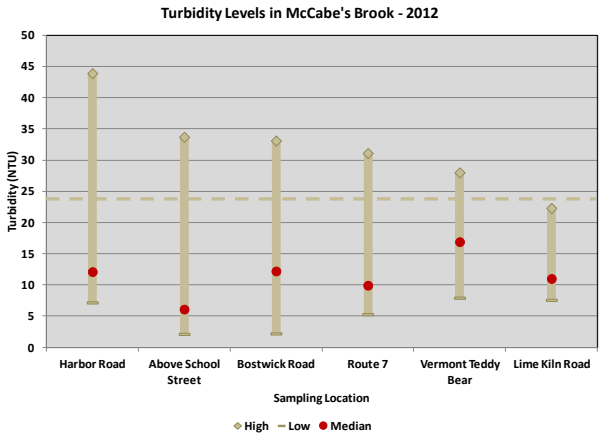
Suspended Sediment. Concentrations of total suspended solids (TSS) and turbidities related well to each other. Of interest, but of obscure meaning, were increased ratios of turbidity



to TSS concentration (specific turbidity) in the samples collected on November 14, 2012 downstream from Lime Kiln Road relative to those reported on earlier dates. It was noted that filtration rates were very slow on samples taken at these locations, suggesting high concentrations of fine particles or organic material in these samples. These observations would be consistent with the effect of runoff following rains on November 13 from agricultural fields to which manure had recently been applied (see also discussion of nutrient loadings below).

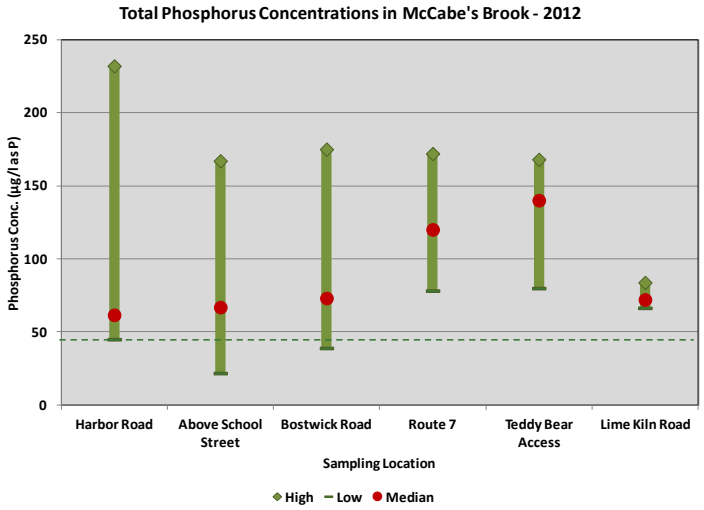
Concentrations of suspended sediment reflected in both TSS concentrations and turbidity were generally consistent with those observed in previous years. Median TSS concentrations





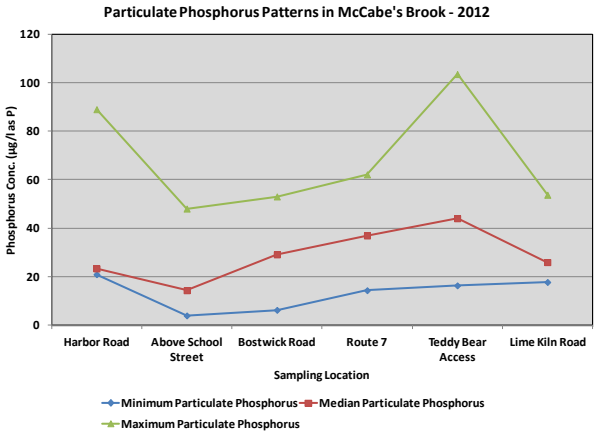
tended to decrease downstream to the School Street neighborhood in Shelburne, but increased through the town to Harbor Road. An increase in both minimum and maximum levels of solids through the town was also evident. The high maximum turbidity levels observed at locations downstream from Lime Kiln Road occurred on November 14 and were possibly related to recent application of manure to fields (see above and discussion of nutrient loadings below). The impact of stream bank failure observed on occasion in the past did not appear to influence results during the periods of increased rainfall and flow sampled during 2012.

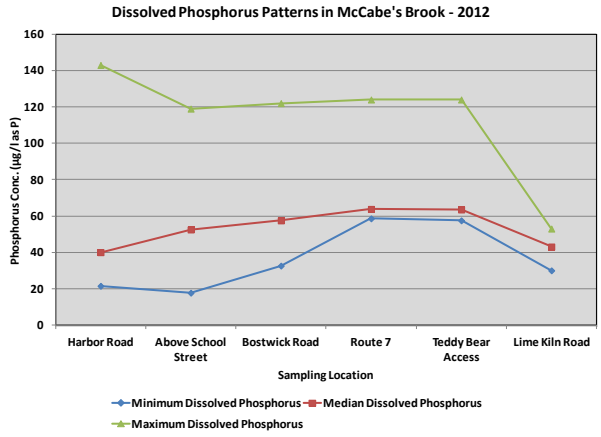
Phosphorus. Phosphorus concentrations observed in 2012 were consistent with previously reported values, increasing steadily from Lime Kiln Road to the Vermont Teddy Bear access road, and through the Town of Shelburne at higher flows. Concentrations of total phosphorus exceeded the proposed Vermont State criterion of 44 µg/l as P in all samples from all stations save for three samples from Bostwick Road and upstream from the School Street neighborhood. The increase between Lime Kiln Road and Vermont Teddy Bear was consistent



with previous observations reported during years when fields draining to this section of the stream were under cultivation. The highest total phosphorus concentrations occurred on November 14 and show the effect of runoff following manure application to fields between Lime Kiln Road and Vermont Teddy Bear and of storm water runoff in the Town of Shelburne.

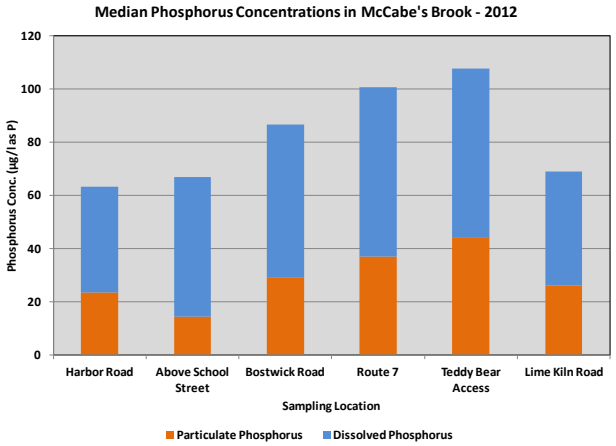
In general, concentrations of dissolved phosphorus exceeded those of particulate phosphorus, reflecting the primarily agricultural origin of phosphorus between Lime Kiln Road and Vermont Teddy Bear.

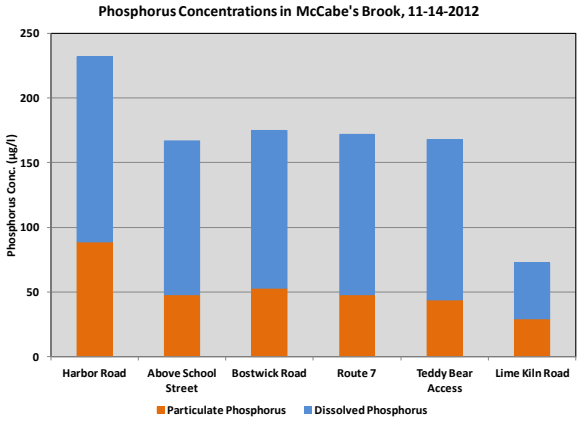




The distributions of median particulate and dissolved phosphorus concentrations and of maximum concentrations on November 14, 2012 demonstrate the continuous influence of agriculture on phosphorus in McCabe's Brook between Lime Kiln Road and Vermont Teddy Bear, and particularly the predominance of dissolved phosphorus, most clearly demonstrated on

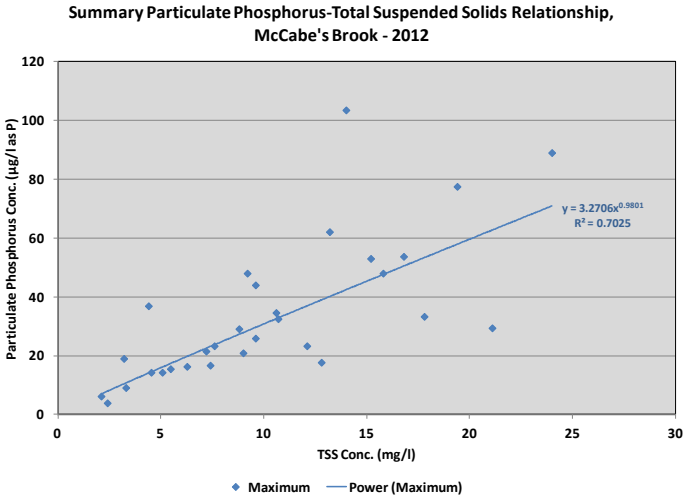
November 14 following application of manure to fields several days previously (see above and discussion of nutrient loadings below).





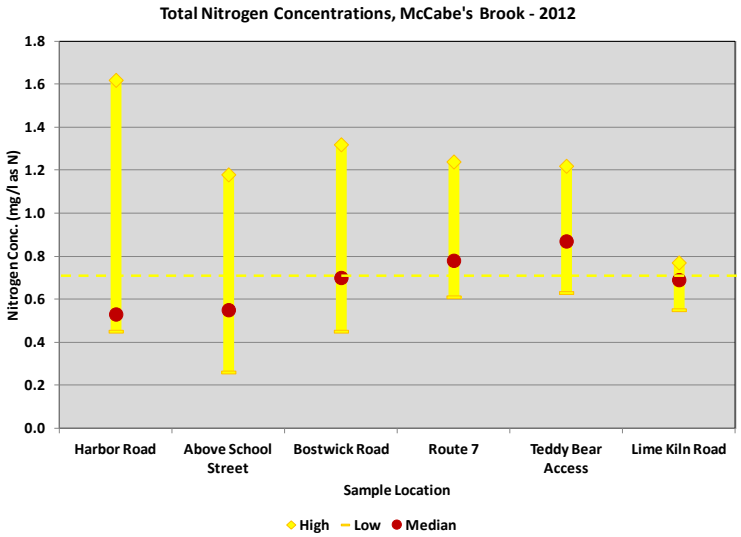
In contrast, the increase in total phosphorus as McCabe's Brook flowed through Shelburne Village receiving storm runoff from the School Street neighborhood and the town center was attributable to both particulate and dissolved phosphorus.

The relation between particulate phosphorus and total suspended solids concentrations shown below suggests some variability, and highlights high phosphorus burdens transported by



suspended sediment, reaching 7.39 and 8.39 gm P/Kg solids at Vermont Teddy Bear and Route 7, respectively. The high values which tend to occur at lower flows, are associated with fine clay particles, particularly in reaches impacted by agriculture.

Nitrogen. The pattern of total nitrogen concentrations in McCabe's Brook mirrored those of total phosphorus. Total nitrogen concentrations exceeded the proposed Vermont State criterion of 0.75 mg/l as N in some samples at each sampling location, and in most samples from the Vermont Teddy Bear access road and Route 7, suggesting the continued influence of agriculture.



On the other hand, nitrate plus nitrite concentrations fell well below the Vermont State standard for nitrate. The highest total and nitrate nitrogen concentrations occurred at Harbor Road. Maximum nitrogen concentrations at locations downstream from Lime Kiln Road occurred on November 14, again suggesting the influence of recent application of manure to agricultural fields.

ii. *Stream Flow and Nutrient Loadings*

It is well established that the major contributions to nutrient loadings on Lake Champlain from its tributary streams occur when stream flows are high, reflecting a combined effect of high nutrient concentrations and high flow rates. In 2010, the LaPlatte Watershed Partnership and the Thorp Kimball Holmes Watershed Group installed staff gages for the measurement of flow at a number of "sentinel" sampling locations on the LaPlatte River, and McCabe's, Thorp, and Kimball Brooks. There were four main reasons for measuring flow:

- To assess nutrient loadings to Lake Champlain from small, low-gradient, direct-to-lake watersheds which are generally devoted largely to agricultural use
- To provide a basis for long term monitoring of trends and assessment of efforts to control and reduce nutrient loadings to Lake Champlain
- To assess the relative importance of nutrient sources, and

- To assess the impact of small direct-to-lake watersheds relative to larger inland watersheds

Staff gages were installed at two locations on McCabe's Brook, one just upstream from the Vermont Teddy Bear access road, and one downstream from Harbor Road. During calibration of the staff gages, flows as high as 46 cfs, or about 10 cfs per mi.^{2}, were recorded downstream from Harbor Road, and 38.6 cfs, or about 12.1 cfs/mi.^{2}, at Vermont Teddy Bear. During the first two years of monitoring flows in conjunction with water quality according to a pre-established schedule, few high flow data were recorded. It was decided, therefore, to target high flows. The objective was to sample when flows exceeded 5 cfs. To do so, weather predictions were monitored on a daily basis and samplers were alerted beginning several days in advance of high rainfalls falling on Mondays, Tuesdays, or Wednesdays. Final notification of samplers was provided on the day before anticipated high flows.

Flows were recorded on a regular basis. Daily rainfall data recorded at the Shelburne Waste Treatment Plant No. 2 located adjacent to McCabe's Brook just downstream from Harbor Road were provided by the Shelburne Sewer Department and are presented in Annex III.

While on the one hand, last minute mobilization of samplers worked well, the summer and fall of 2012 were exceptionally dry. Flows exceeding 5 cfs occurred on only 3 dates, two of which were sampled, and flows approaching or exceeding 5 cfs occurred only 5 times during the six months from June through November, four of which were caused by rain events (see discussion below). Of the four flows caused by rain events, three were sampled (see Annex III). Despite the limited number of flow events approaching the 5 cfs target, and the absence of high flow events sampled, the overall effort was informative. Daily flow and rainfall monitoring and targeted high flow sampling should be continued following procedures initiated in 2012.

Flow Monitoring Results. Flow monitoring data, together with rainfall records are illustrated in Annex III. Roughly 68% of the McCabe's Brook watershed (3.1 mi.^{2}) lies upstream from the Teddy Bear access road, and an additional 32% (1.48mi.^{2}) drains into the stream between Vermont Teddy Bear and the staff gage located below Harbor Road. Land use in the upstream drainage is largely agricultural. In contrast, the downstream portion of the watershed includes the School Street neighborhood and Shelburne town center. Flow during periods of daily rainfall in the spring and fall when soils was saturated and unable to absorb moisture, was roughly related to the area draining to the stream upstream from the respective staff gages. During the dry months of June, July, August, and ending with fall rains in September, discharges from the larger upstream rural portion of the watershed with little impervious surface remained very low and responded only very weakly to rain events. It is known from previous geomorphic studies and water quality monitoring, that at very low flows, little or no flow from the upper portion of the watershed contributes to flow downstream from Bostwick Road. In contrast, flows below Harbor Road which received runoff from the town of

Shelburne were generally about 5 times that at Vermont Teddy Bear, and were at times up to ten times those from the larger upstream portion of the watershed. Furthermore, flows at Harbor Road responded rapidly to even small rain events, reflecting the greater proportion of impervious surfaces in the town area connecting to the stream via the storm drainage system.

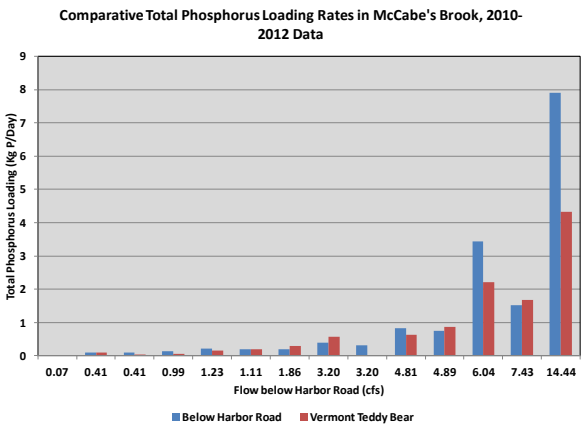
As the ground became increasingly saturated beginning with heavy rain on September 5, stream flows from the upper portion of the watershed increased relative to those below Harbor Road reflecting the larger upstream drainage area contributing to flow at Vermont Teddy Bear. A rough comparison of upstream and downstream flows during the dry month of July and the moderately wet month of October is shown in the following table:

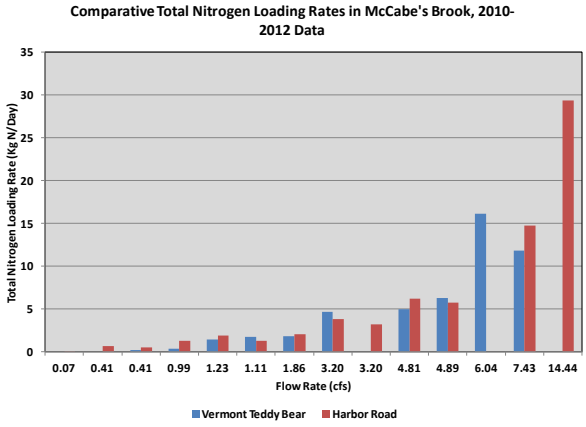
Location	Drainage Area ($mi.^2$)	Mean of Daily Flow Readings (cfs)	
		July	October
Vermont Teddy Bear	3.13	0.11	2.76
Harbor Road	4.57	0.561	3.718

Of note were increases in flow on October 30 which appeared to be out of proportion to low levels of rainfall over the previous 2 days which in turn followed 3 days without rain. This suggests the possibility of the release upstream of water from a farm pond (see discussion below).

The above patterns of rainfall and flow are important to understanding sources of nutrient loadings to the lake.

Nutrient Loadings. That nutrient loadings increase as flows and nutrient concentrations increase is self evident. This is illustrated in the following representations of total phosphorus and total nitrogen loadings measured between 2010 and 2012 below Harbor Road (not to scale):

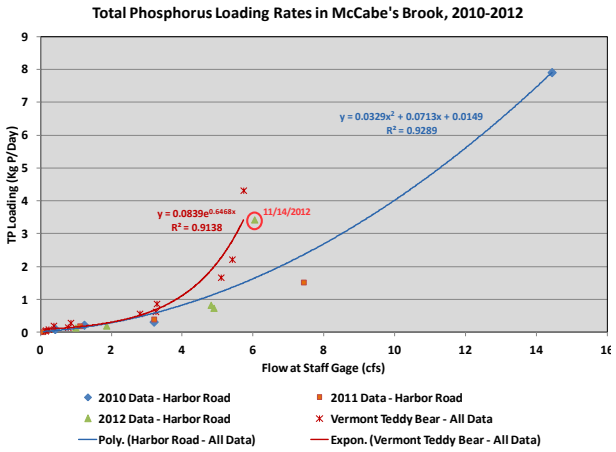


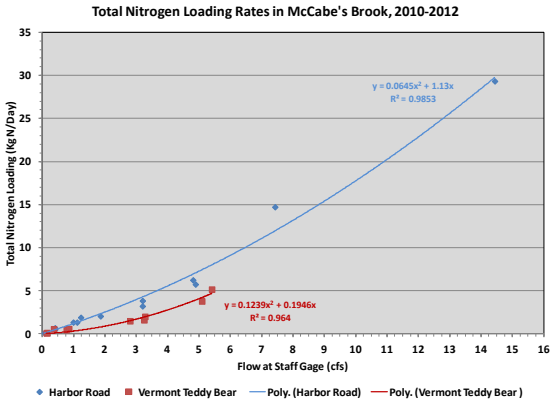


Rough comparisons of monthly nutrient loadings in McCabe's Brook during July, 2012 (a low flow month) and October, 2012 (a low-moderate flow month) based on daily flow readings/estimates and load vs. flow curves and calculated 1) as the mean of daily estimated loads, and 2) as the loading estimated from the mean of daily flows illustrates the importance of increased flows as a source of nutrients discharged to Lake Champlain relative to low flows.

Location	Estimated Monthly Loading (Kg)			
	Phosphorus		Nitrogen	
	July, 2012	October, 2012	July, 2012	October, 2012
Harbor Road				
Method 1	30.44	84.34	20.45	223
Method 2	30.35	51.13	25.96	167.7
Vermont Teddy Bear				
Method 1	27.95	-	0.72	137.4
Method 2	27.93	155.03	0.71	45.91

Loadings in relation to flow at both Vermont Teddy Bear and Harbor Road over the three year period of record are illustrated below:



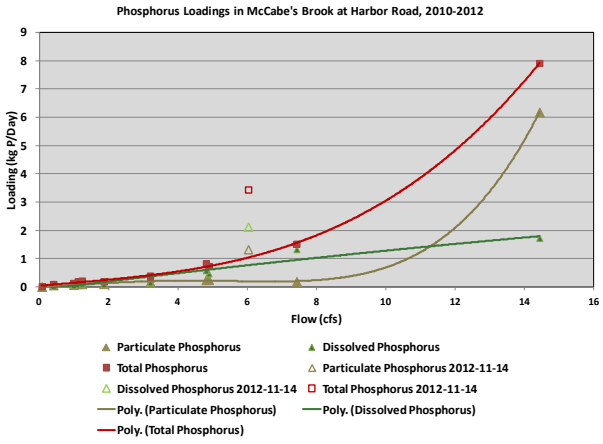


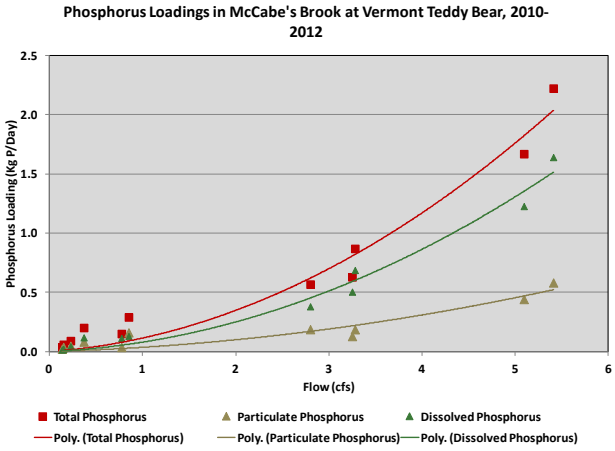
As illustrated in the loading-flow graphs, the increase in loadings is in general relatively steady as a function of flow. The deviation from a straight line indicates some increase in concentrations of nutrients as flow increases. Whereas more data, especially at high flow rates, are required to realize more fully the value of stream flows in McCabe's Brook to understanding more fully factors affecting sources of nutrients, the extreme upward trend in the total phosphorus loading curve for the Vermont Teddy Bear location emphasizes the need for more data points collected at high flows.

As suggested in the above discussion of water quality, the total phosphorus loading at Harbor Road calculated for November 14 and highlighted in the above graph is of particular

interest (unfortunately no total nitrogen results are available at Harbor Road for this date). The sample on this date was taken following two days of rain and flow at Harbor Road was slightly above 6 cfs. Furthermore, manure had been applied to agricultural fields several days prior to the start of the rains, suggesting confirming that loadings can provide a sensitive indicator, and more importantly, a sensitive measure of the effect of land management practices and decisions of nutrient discharged to Lake Champlain.

A closer examination of the particulate and dissolved fractions of the total phosphorus loadings at Harbor Road and Vermont Teddy Bear can also be helpful to understanding sources of this nutrient. Looking first at phosphorus loadings from above Vermont Teddy Bear, it can be seen that loadings of particulate and dissolved phosphorus each follow relatively smooth curves, contributing to a smooth increase in the total phosphorus loading in relation to flow. Of particular note is the major contribution of dissolved phosphorus to the total. In contrast, particulate phosphorus loadings increase in a near linear fashion as flow increases. This predominance of dissolved phosphorus in streams draining agricultural lands has been observed in rivers draining agricultural land in Addison County.





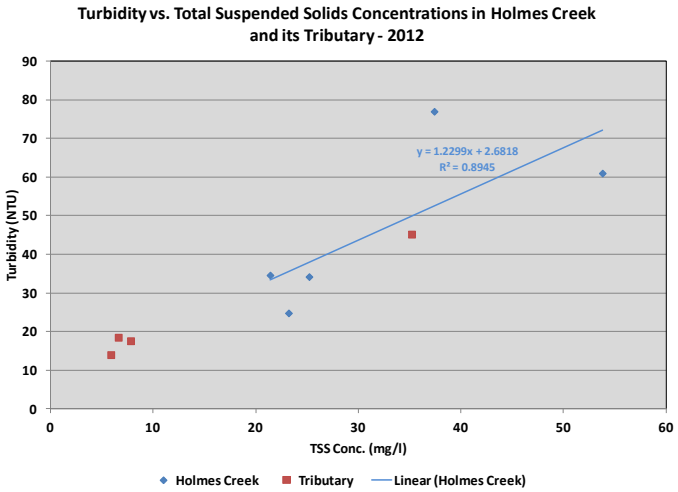
In contrast to the patterns of phosphorus loadings at Vermont Teddy Bear, total phosphorus loadings in McCabe's Brook at Harbor Road are driven normally by dissolved phosphorus at flows below about 8 cfs. Dissolved phosphorus loadings increase steadily in relation to flow rate at Harbor Road. However, at higher flows, particulate phosphorus rapidly becomes dominant as a result of contributions from urban drainage and erosion. This observation of a "critical" flow above which particulate phosphorus increases as a result of erosion and mobilization of bottom sediments observed in the LaPlatte River and the rivers of Addison County. An important exception was observed on November 14 after application of manure to fields upstream followed by two days of rain. Significantly, the contribution of dissolved phosphorus exceeded that of particulate phosphorus, again suggesting the agricultural origin of the high total phosphorus loading.

It is noted finally, that whereas the nutrient loading data collected from 2010 through 2012 have proven highly informative and useful in interpreting waters quality and understanding sources, few nutrient loading data have been collected on high flow days, and these are required to assess the importance of streams as a source of nutrient loadings on Lake Champlain, as well as to understanding the full significance of events causing very high loadings which have been observed in water quality data and subjective flow observations in the past.

B. Holmes Creek Watershed

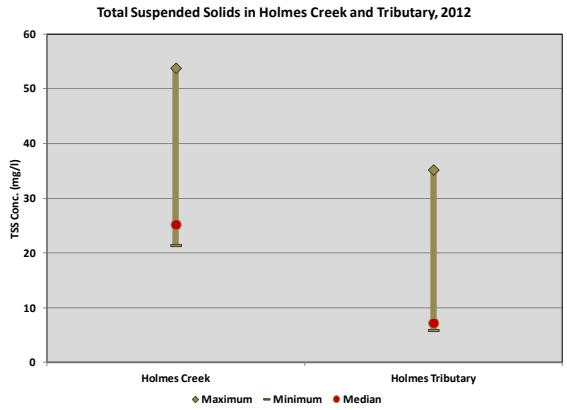
The Holmes Creek watershed has been sampled since 2010 at two locations a short distance upstream from the point of discharge into Lake Champlain (see Annex IB). The first sampling site is located on an un-named tributary from the south draining 1.71 mi.^{2} of agricultural land and joining the main stem of Holmes Creek just upstream from its mouth. The second sampling site is located on Holmes Creek just upstream from its confluence with the tributary from the south. Holmes Creek drains 3.84 mi.^{2} of mixed forest and agricultural land upstream from this sampling site. Samples were taken from Holmes Creek on five dates, but there was no flow in the tributary stream when flows were very low in Holmes Creek and McCabe's Brook on June 28, 2012.

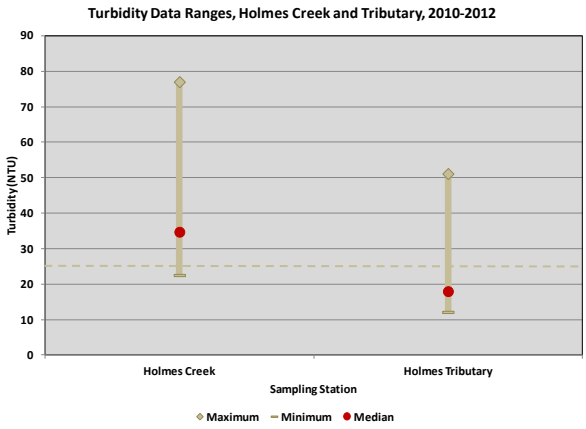
Suspended Sediment. Turbidity reflected total suspended solids (TSS) concentrations in a consistent and predictable way. The ratio of turbidity to TSS concentration (specific turbidity) was consistently lower in Holmes Creek (median = 1.36) than in its southern tributary (median = 2.32).



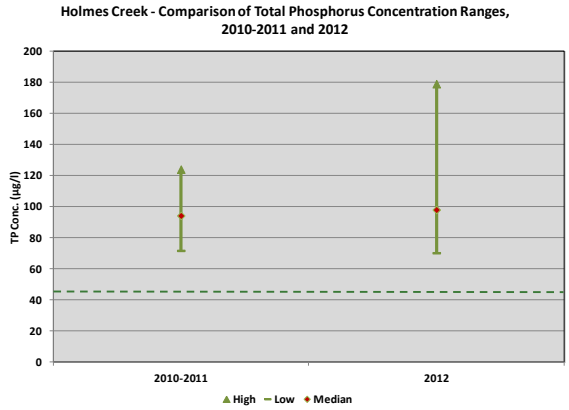
Both turbidities and TSS concentrations tend to be higher in Holmes Creek than in its tributary, and turbidities equaled or exceeded the Vermont State standard in all Holmes Creek and one of four samples from its tributary in 2012. Turbidities observed in Holmes Creek were

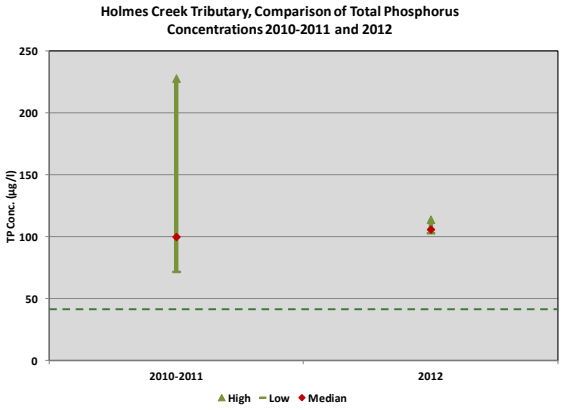
consistent with turbidities observed in 2010 and 2011 (TSS concentrations were not determined prior to 2012).





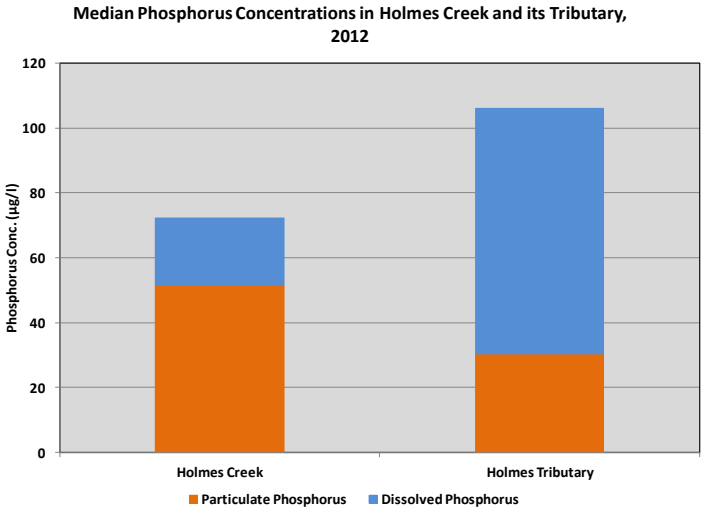
Phosphorus. Phosphorus concentrations in both Holmes Creek and its southern tributary were consistently well above the Vermont State proposed criterion of 44 µg/l as P. The median concentration in Holmes Creek was close to 100 µg/l as P in 2012, and the maximum value reached 180 µg/l as P. While the median total phosphorus concentrations in both Holmes Creek



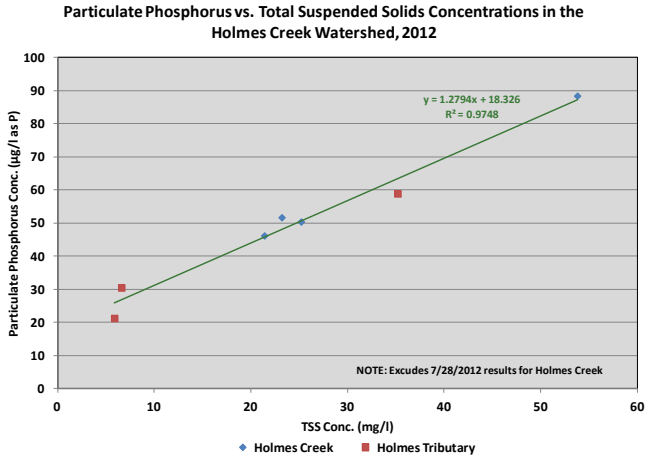


and its tributary were approximately 100 µg/l as P, the range of concentrations observed in the southern tributary was very narrow during 2012, in contrast to earlier years when concentrations reached 230 µg/l as P.

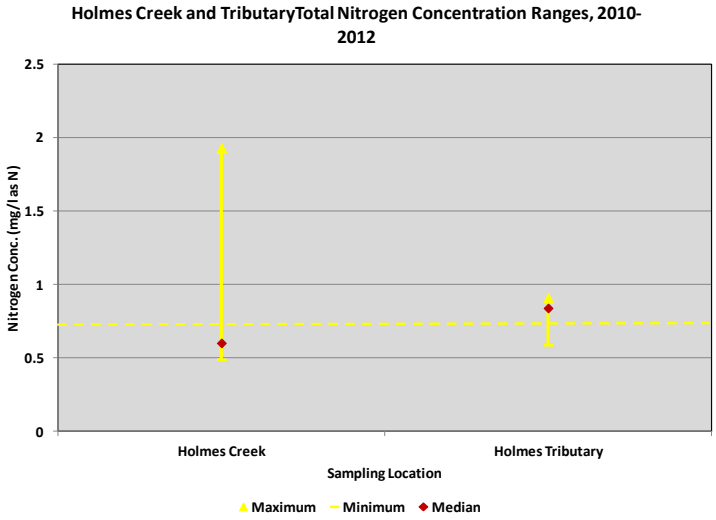
Analysis of dissolved and particulate phosphorus was initiated in the Holmes Creek watershed in 2012. Results suggest that particulate phosphorus predominates in Holmes Creek, making up about 2/3 of the total phosphorus, and is related to TSS concentrations. In contrast,



dissolved phosphorus predominates in the southern tributary to Holmes Creek, making up close to 75% of the total phosphorus, and apparently reflecting the predominance of agricultural land use in the watershed. Particulate phosphorus concentrations mirrored TSS concentrations very closely at both sampling locations.



Nitrogen. The patterns of total nitrogen in Holmes Creek and its southern tributary resemble those of total phosphorus in the streams. Total nitrogen concentrations in Holmes Creek tended to fall below the proposed Vermont State criterion of 0.75 mg/l as N during 2012, although it was exceeded in 2 of 5 samples, reaching a maximum of 1.93 mg/l. The range of total nitrogen concentrations in the southern tributary was, as in the case of total phosphorus,



narrow, and all samples exceeded the proposed Vermont State criterion, consistent with observations in 2010 and 2011.

III. CONCLUSIONS AND RECOMMENDATIONS

Whereas in the past, the monitoring programs carried out by the LaPlatte Watershed Partnership and the Thorp Kimball Holmes Watershed Group have been based on a fixed pre-established sampling schedule, monitoring of water quality in McCabe's Brook and the Holmes Creek watershed were modified during 2012 to target high flows. This was done because nutrient loadings from tributary streams during periods of high runoff and flow exceed those contributed during periods of low flow.

Although targeting of high flows had been attempted previously by the LaPlatte Watershed Partnership during monitoring of water quality in the Munroe Brook watershed and found to be difficult, it was considered to be especially important where monitoring of stream flow was being carried out in conjunction with the water quality monitoring program and where monitoring of nutrient loading rates at "sentinel" sites had become a priority. It was decided to pilot the targeting of high flows in excess of 5 cfs in McCabe's Brook where both agricultural and urban storm runoff were known to impact on water quality and where past monitoring of water quality had highlighted sensitive areas, as well as Holmes Creek and one of its tributaries monitored by the Thorp Kimball Holmes Watershed Group.

The summer of 2012 was exceptionally dry, and flows reaching or exceeding 5 cfs were rare. However, samples were taken on 5 dates, 3 of which marginally met the 5 cfs target. The effort contributed in an important way to the record of nutrient loading data accumulated beginning in 2010, and further demonstrated the value of loading data to understanding sources of nutrients, the influence of land use on nutrient loadings, and extent of nutrient loadings from

small near-lake watersheds discharging to Lake Champlain. It also demonstrated the feasibility of monitoring flow and targeting high flow events by volunteer sampling programs. On the other hand, such efforts require a substantial increase in level of effort on the part of program coordinators and individuals assigned specific tasks such as reading staff gages on a regular basis and monitoring weather reports, as well as enhancing sampling teams so that back-up is available when individual samplers or coordinators are unavailable.

Continuation of the monitoring of flow at sentinel sites will also require yearly validation of the setting of staff gages and their replacement if they become dislodged by winter ice, as well as periodic recalibration of staff gages. Maintenance of staff gages and their periodic calibration will require financial resources and technical assistance.

In view of the immediate and longer term value of nutrient loading data, and of the feasibility of targeting high flows, it is recommended that monitoring of flows and water quality at sentinel sites on the LaPlatte River, and McCabe's, Thorp, and Kimball Brooks be resumed in 2013, and that the possibility of establishing a sentinel site on Holmes Creek be determined. A long term sampling schedule is attached in Annex VIIA. A protocol for all sampling locations is attached in Annex VIIB.

ANNEX I

Sampling Stations

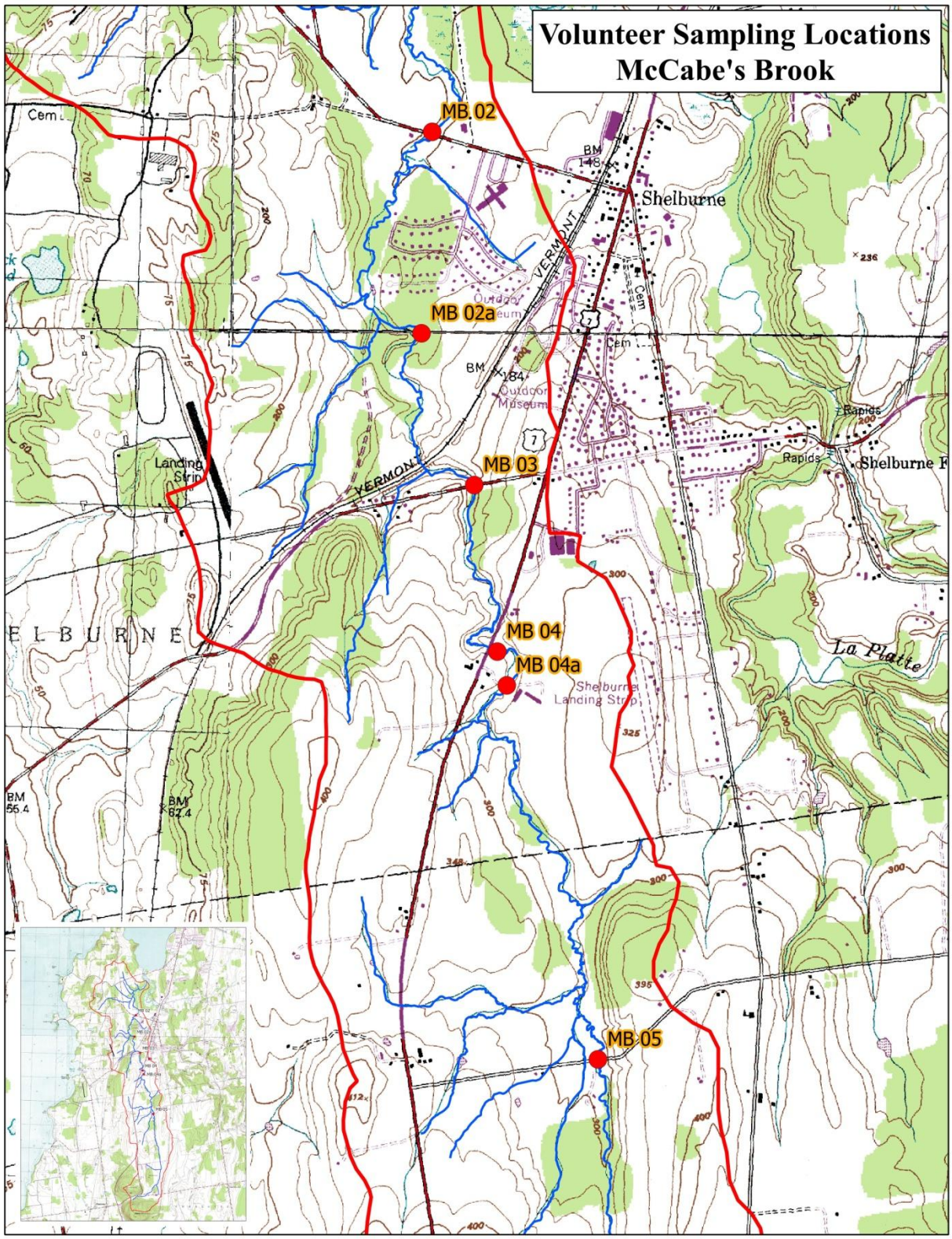
ANNEX IA

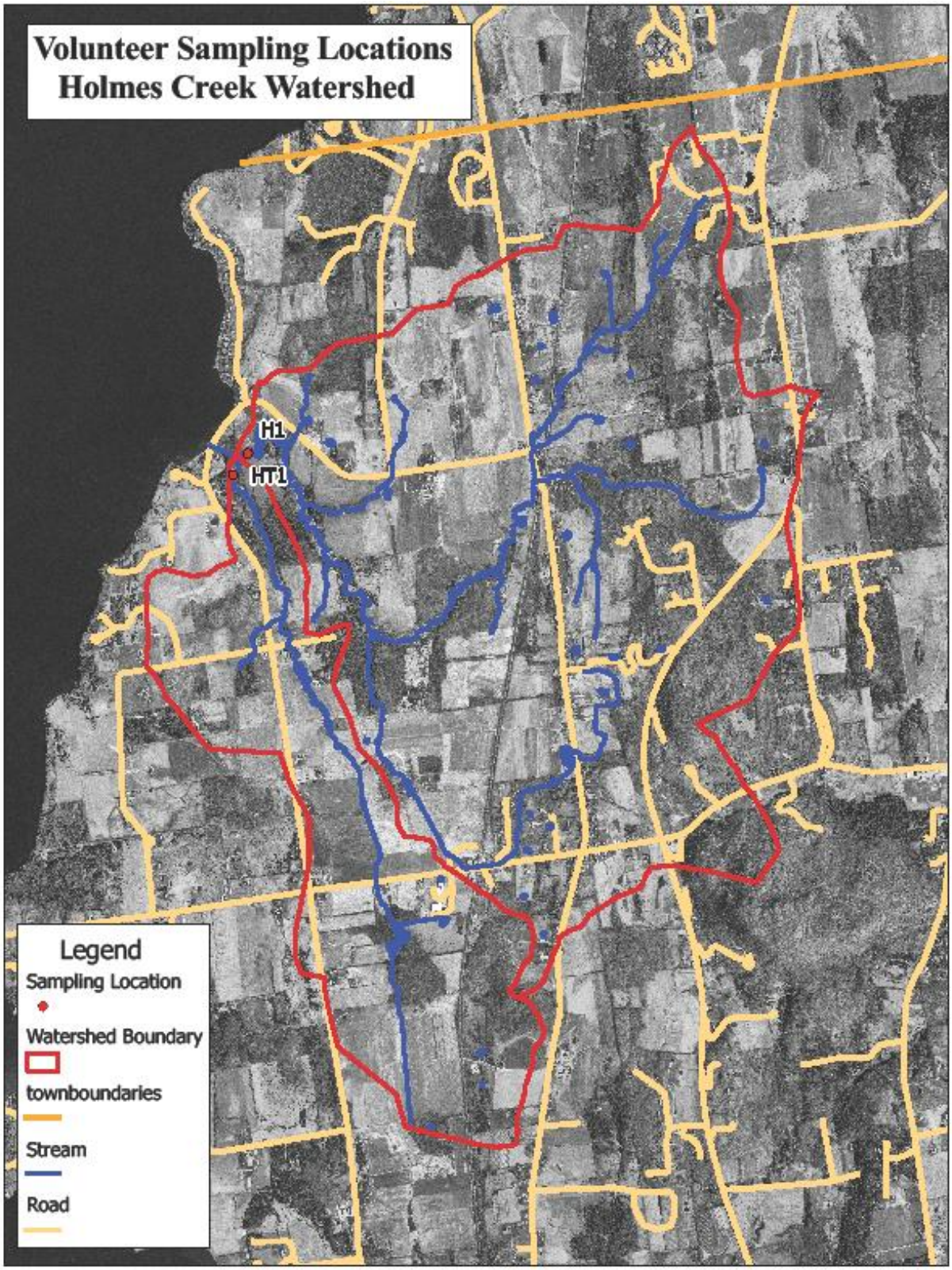
Station Descriptions

Site ID	Site Location	Site Latitude	Site Longitude	Upstream Area (mi2)	Staff Guage
MB 02	MB02 - McCabes Brook at Harbor Road	44.38305	-73.23853	4.57	Y
MB 02a	MB 02a - McCabe's Brook upstream from School Street neighborhood	44.37502	-73.23881		
MB 03	MB03 - McCabes Brook at Bostwick Road	44.36892	-73.23586		
MB 04	MB04 - McCabes Brook at Route 7	44.36230	-73.23461		
MB 04a	MB04a - McCabes Brook at Teddy Bear Access Road	44.36086	-73.23405	3.31	Y
MB 05	MB05 - McCabes Brook at Lime Kiln Road	44.34582	-73.22868		
H 01	Behind the tennis court of Charlotte Town Beach, downstream from impoundment pond on the main branch of Holmes Brook. Upstream from HT.	44.332689	-73.279539	3.84	P
HT 01	The first tributary feeding into Holmes Brook upstream from the mouth. Downstream from Mouth.	44.331389	-73.280556	1.71	

ANNEX IB

Maps


Volunteer Sampling Locations
McCabe's Brook
MB 02
MB 02a
MB 03
MB 04
MB 04a
MB 05
Shelburne
VERMONT
Landing Strip
Rapids
La Platte
BM 148
BM 184
BM 56.4
BM 67.4


Volunteer Sampling Locations
Holmes Creek Watershed
H1
HT1
Legend
Sampling Location
Watershed Boundary
townboundaries
Stream
Road

ANNEX II

Raw Data – Edited for Submission and Analysis

ANNEX IIA

McCabe's Brook Data

Chloride Concentrations in McCabe's Brook - 2012

Station No.	5/30/2012	6/28/2012	10/8/2012	10/22/2012	11/14/2012	Median	Minimum	Maximum
MB 02	37.6	49.1	35.7	22.5	28.7	35.7	22.5	49.1
MB 02a	35.2	43	46.7	22.9	26.1	35.2	22.9	46.7
MB 03	37.9	51.5	47	20.7	24.2	37.9	20.7	51.5
MB 04	18.3	75.6	46	19.1	22.7	22.7	18.3	75.6
MB 04a	14.1	39.6	38	17.2	22.2	22.2	14.1	39.6
MB 05	8.87	7.06	22.2	14	20.4	14	7.06	22.2

Solids Concentrations in McCabe's Brook - 2012

	Station No.	5/30/2012	6/28/2012	10/8/2012	10/22/2012	11/14/2012	Median	Minimum	Maximum
TSS	MB 02	12.1	10.7	7.2	9	24	10.70	7.20	24.00
	MB 02a	3.3	2.4	7.4	4.53	15.8	4.53	2.40	15.80
	MB 03	8.8	2.1	17.8	5.47	15.2	8.80	2.10	17.80
	MB 04	13.2	4.4	10.6	5.07	9.2	9.20	4.40	13.20
	MB 04a	19.4	14	7.6	6.27	9.6	9.60	6.27	19.40
	MB 05	9.6	16.8	3.2	6.13	10.9	9.60	3.20	16.80
Turbidity	MB 02	11.3	12.1	7.16	12.8	43.9	12.10	7.16	43.90
	MB 02a	3.41	2.12	6.09	8.16	33.7	6.09	2.12	33.70
	MB 03	12.2	2.19	17.7	10.6	33.1	12.20	2.19	33.10
	MB 04	15	5.28	9.22	9.92	31.1	9.92	5.28	31.10
	MB 04a	19.3	16.9	7.92	11.2	28	16.90	7.92	28.00
	MB 05	11	22.3	7.57	8.86	18.1	11.00	7.57	22.30
Specific	MB 02	0.93	1.13	0.99	1.42	1.83	1.13	0.93	1.83
Turbidity	MB 02a	1.03	0.88	0.82	1.80	2.13	1.03	0.82	2.13
	MB 03	1.39	1.04	0.99	1.94	2.18	1.39	0.99	2.18
	MB 04	1.14	1.20	0.87	1.96	3.38	1.20	0.87	3.38
	MB 04a	0.99	1.21	1.04	1.79	2.92	1.21	0.99	2.92
	MB 05	1.15	1.33	2.37	1.45	1.66	1.45	1.15	2.37
PP	MB 02	23.3	32.5	21.5	20.9	89	23.30	20.90	89.00
	MB 02a	9.1	3.9	16.7	14.3	48	14.30	3.90	48.00
	MB 03	29.1	6.2	33.3	15.5	53	29.10	6.20	53.00
	MB 04	62.1	36.9	34.6	14.3	48	36.90	14.30	62.10
	MB 04a	77.5	103.5	23.3	16.3	44	44.00	16.30	103.50
	MB 05	25.9	53.7	19	17.7	41.9	25.90	17.70	53.70
PP/TSS	MB 02	1.93	3.04	2.99	2.32	3.71	2.99	1.93	3.71
	MB 02a	2.76	1.63	2.26	3.16	3.04	2.76	1.63	3.16
	MB 03	3.31	2.95	1.87	2.83	3.49	2.95	1.87	3.49
	MB 04	4.70	8.39	3.26	2.82	5.22	4.70	2.82	8.39
	MB 04a	3.99	7.39	3.07	2.60	4.58	3.99	2.60	7.39
	MB 05	2.70	3.20	5.94	2.89	3.84	3.20	2.70	5.94

Phosphorus Concentrations in McCabe's Brook - 2012

	Station No.	5/30/2012	6/28/2012	10/8/2012	10/22/2012	11/14/2012	Median	Minimum	Maximum
TP	MB 02	44.8	57.3	61.5	70.5	232	61.5	44.8	232
	MB 02a	33.9	21.6	79.8	66.8	167	66.8	21.6	167
	MB 03	71.5	38.8	113	73	175	73	38.8	175
	MB 04	125	95.5	120	78.1	172	120	78.1	172
	MB 04a	140	161	109	79.8	168	140	79.8	168
	MB 05	66.3	83.7	72	67.3	72.5	72	66.3	83.7
PP	MB 02	23.3	32.5	21.5	20.9	89	23.3	20.9	89
	MB 02a	9.1	3.9	16.7	14.3	48	14.3	3.9	48
	MB 03	29.1	6.2	33.3	15.5	53	29.1	6.2	53
	MB 04	62.1	36.9	34.6	14.3	48	36.9	14.3	62.1
	MB 04a	77.5	103.5	23.3	16.3	44	44	16.3	103.5
	MB 05	25.9	53.7	19	17.7	29.4	25.9	17.7	53.7
DP	MB 02	21.5	24.8	40	49.6	143	40	21.5	143
	MB 02a	24.8	17.7	63.1	52.5	119	52.5	17.7	119
	MB 03	42.4	32.6	79.7	57.5	122	57.5	32.6	122
	MB 04	62.9	58.6	85.4	63.8	124	63.8	58.6	124
	MB 04a	62.5	57.5	85.7	63.5	124	63.5	57.5	124
	MB 05	40.4	30	53	49.6	43.1	43.1	30	53
% DP	MB 02	47.99	43.28	65.04	70.35	61.64	61.6	43.28	70.35
	MB 02a	73.16	81.94	79.07	78.59	71.26	78.6	71.26	81.94
	MB 03	59.30	84.02	70.53	78.77	69.71	70.5	59.30	84.02
	MB 04	50.32	61.36	71.17	81.69	72.09	71.2	50.32	81.69
	MB 04a	44.64	35.71	78.62	79.57	73.81	73.8	35.71	79.57
	MB 05	60.94	35.84	73.61	73.70	59.45	60.9	35.84	73.70
TSS	MB 02	12.1	10.7	7.2	9	24	10.7	7.20	24.00
	MB 02a	3.3	2.4	7.4	4.53	15.8	4.5	2.40	15.80
	MB 03	8.8	2.1	17.8	5.47	15.2	8.8	2.10	17.80
	MB 04	13.2	4.4	10.6	5.07	9.2	9.2	4.40	13.20
	MB 04a	19.4	14	7.6	6.27	9.6	9.6	6.27	19.40
	MB 05	9.6	16.8	3.2	12.8	21.1	12.8	3.20	21.10
PP/TSS	MB 02	1.93	3.04	2.99	2.32	3.71	3.0	1.93	3.71
	MB 02a	2.76	1.63	2.26	3.16	3.04	2.8	1.63	3.16
	MB 03	3.31	2.95	1.87	2.83	3.49	3.0	1.87	3.49
	MB 04	4.70	8.39	3.26	2.82	5.22	4.7	2.82	8.39
	MB 04a	3.99	7.39	3.07	2.60	4.58	4.0	2.60	7.39
	MB 05	2.70	3.20	5.94	1.38	1.39	2.7	1.38	5.94

Nitrogen Concentrations in McCabe's Brook - 2012

	Station No.	5/30/2012	6/28/2012	10/8/2012	10/22/2012	11/14/2012	Median	Minimum	Maximum
TN	MB 02	0.45	0.55	0.48	0.53	1.62	0.53	0.45	1.62
	MB 02a	0.47	0.26	0.6	0.55	1.18	0.55	0.26	1.18
	MB 03	0.7	0.45	0.73	0.62	1.32	0.70	0.45	1.32
	MB 04	1.09	0.68	0.78	0.61	1.24	0.78	0.61	1.24
	MB 04a	0.87	1.04	0.78	0.63	1.22	0.87	0.63	1.22
	MB 05	0.69	0.72	0.77	0.55	0.64	0.69	0.55	0.77
Nox	MB 02	0.09	0.08	<0.05	0.08	0.58	0.085	0.08	0.58
	MB 02a	0.08	<0.05	<0.05	0.07	0.38	0.08	<0.05	0.38
	MB 03	0.14	0.2		0.06	0.37	0.17	0.06	0.37
	MB 04	0.05	0.09	0.06	<0.05	0.32	0.075	0.05	0.32
	MB 04a	<0.05	0.07	0.05	<0.05	0.3	0.07	<0.05	0.3
	MB 05	<0.05	0.09	0.06	<0.05	<0.05	0.075	<0.05	0.09

ANNEX IIB

Holmes Creek Watershed

Solids Concentrations in the Holmes Creek Watershed - 2012

Station No.	Parameter	5/30/2012	6/28/2012	10/8/2012	10/22/2012	11/14/2012	Median	Minimum	Maximum
H 01	TSS	23.2	37.4	53.8	21.4	25.2	25.2	21.4	53.8
	Turbidity	24.8	77	61	34.6	34.2	34.6	24.8	77
	Turbidity/TSS	1.07	1.43	1.13	1.62	1.36	1.36	1.07	1.62
HT 01	TSS	35.2		7.8	5.87	6.6	7.2	5.87	35.2
	Turbidity	45.2	14	17.6	14	18.5	17.6	14	45.2
	Turbidity/TSS	1.28		2.26	2.39	2.80	2.32	1.28	2.80

Phosphorus Concentrations in the Holmes Creek Watershed - 2012

Station No.	Parameter	5/30/2012	6/28/2012	10/8/2012	10/22/2012	11/14/2012	Median	Minimum	Maximum
H 01	TP	70.2	179	105	93.1	98	98	70.2	179
	PP	51.7	158.3	88.4	46.2	50.4	51.7	46.2	158.3
	DP	18.5	20.7	16.6	46.9	47.6	20.7	16.6	47.6
HT 01	TP	114			103	106	106	103	114
	PP	58.9			21.3	30.5	30.5	21.3	58.9
	DP	55.1			81.7	75.5	75.5	55.1	81.7

Nitrate-Nitrite Concentrations in the Holmes Creek Watershed - 2012

Station No.	5/30/2012	6/28/2012	10/8/2012	10/22/2012	11/14/2012	Median	Minimum	Maximum
H 01	<0.05	0.09	0.05	<0.05	<0.05	<0.05	<0.05	0.09
HT 01				0.14	0.09			

ANNEX III

QUALITY ASSURANCE

Annex IIIA

QA Summary

Completeness of Sampling and Field Duplicates

	No. of Stations	Date	No. of Stations Sampled	Chloride	Turbidity	TSS	Total P	Diss. P	Total N	NOx
No. Scheduled	48		48	36	48	48	48	48	48	48
	8	5/30/2012	8	6	8	8	8	8	8	8
	8	6/28/2012	7	6	7	6	7	7	7	7
	8	10/8/2012	7	6	8	8	7	7	7	6
	8	10/22/2012	8	6	8	8	8	8	8	8
	8	11/14/2012	8	6	8	8	8	8	8	8
Total No. of Stations	40		39	30	39	39	38	38	38	37
Percent	83.33		79.17	83.33	79.17	79.17	79.17	79.17	79.17	77.08
Target Percent				≥80%	≥80%	≥80%	≥80%	≥80%	≥80%	≥80%

Blanks

	Chloride	TSS	Turbidity	TP	DP	TN	NOx
5/30/2012	<2	<1	<0.2	<5	<5	<0.1	<0.05
6/28/2012	<2	<1	<0.2	<5	<5	<0.1	<0.05
10/8/2012	<2	<1	0.37	<5	<5	<0.1	<0.05
10/22/2012	<2	<1	<0.2	<5	<5	<0.1	<0.05
11/14/2012	<2	<1	<0.2	<5	<5	<0.1	<0.05

	Chloride	Turbidity	TSS	TP	DP	TN	NOx
Number of Duplicates	6	10	10	10	10	10	10
Percent of Total	20.0	25.6	25.6	26.3	26.3	26.3	27.0
Target Percent	10%	10%	10%	10%	10%	10%	10%

Summary of Percent Differences

Parameter	Target Precision	Mean RPD
Chloride	10%	1.66
Turbidity	15%	8.13
TSS	15%	23.40
Total P	15%	4.53
Diss. P	15%	1.10
Total N	15%	2.85
NOx	10%	1.82

NOTES on QUALITY CONTROL/QUALITY ASSURANCE

Blanks

All blanks met requirements save that for turbidity on 10/8/2012 which measured 0.37 NTU, exceeding the expected value of <0.2 NTU.

Completeness

Objective: The 2012 monitoring program aimed to sample all McCabe's Brook and Holmes Creek watershed stations on a total of six sampling dates when flows exceeded five cfs in McCabe's Brook downstream from Harbor Road in Shelburne.

Constraints: Sampling was limited to Mondays-Wednesdays in order to assure that turbidity analyses could be completed within 48 hours. The fulfillment of the objectives was limited by several constraints:

- Monitoring was initiated on May 30, 2012 and was continued through the end of November, 2012. The end of May starting date resulted in the loss of important spring high flow opportunities.
- The summer of 2012 was an exceptionally dry one. Flows exceeded 5 cfs below Harbor Road on only 3 occasions (See Annex III). Samples were taken on only one of these occasions. It was not possible to mobilize samplers on one occasion, and the third was unpredictable from weather predictions (suggesting release from a farm pond). The limited number of rain events and relatively long periods of very low flow severely limited the opportunities to meet objectives fully.
- In spite of limitations, sampling was carried out on three occasions when flows were close to, or in excess of 5 cfs. An additional two dates were sampled in May and June when flows were relatively low. No high flows falling in the range of 5-45 cfs occurred during the monitoring period.
- In spite of the lack of flows fully meeting QA/QC targets, samples collected in McCabe's Brook met the 80% target. Overall, completeness fell marginally below the 80% target for TP, DP, TN, and NOx, primarily because there was no flow at HT 01 on 6/28/2012 and no data were reported for station HT 01 on October 8, 2012.

Relative Percent Difference (RPD) Analysis

The RPD analyses were well below target values for all parameters save for TSS. Comparison of sample and duplicate results indicates significant differences at station MB 05 located at Lime Kiln Road on McCabe's Brook on 5/30/2012, 10/8/2012, 10/22/2012, and 11/14/2012, and at station H 01 on Holmes Creek on 6/28/2012. These differences appear to be attributable to sampling where the water was too shallow, resulting in suspension of sediment. These differences were reflected in differences between the sample and duplicate TP analysis results at MB 05 on 10/8/2012, 10/22/2012, and 11/14/2012. As a result, the higher of the two results have been deleted from the data analyses and data submission for the following TSS samples:

H 01 6/28/2012
MB 05 10/22/2012
MB 05 11/14/2012

And the TP sample at MB 05 on 11/14/2012. Solids and TP results for these locations and dates were high and the magnitudes of the differences were judged to be great.

As a result of these deletions, the number of duplicates will continue to meet the QA requirements and all RPDs will fall within the target as follows:

Parameter	Chloride	TSS	Turbidity	TP	DP	TN	Nox
Number of Samples	30	39	39	38	38	38	37
Number of Duplicates	6	7	10	9	10	10	10
Percent of Total	20.0	17.9	25.6	23.7	26.3	26.3	27.0
Target Percent	10%	10%	10%	10%	10%	10%	10%

Summary of Percent Differences

Parameter	**Target Precision**	**Mean RPD**
Chloride	10%	1.66
Turbidity	15%	8.13
TSS	15%	9.12
Total P	15%	3.27
Diss. P	15%	1.10
Total N	15%	2.85
NOx	10%	1.82

ANNEX IIIB

RPD Raw Data and Calculations

RPD Raw Data and Calculations

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
Chlorides	H 01 - Holmes Creek Behind Tennis Court Below Pond	5/30/2012	22.8	mg/L	0.1000	0.1000	22.7500	0.4396
	H 01 DUP - Homes Crk Behind Tenis Crt. Below Pond	5/30/2012	22.7	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Rd.	5/30/2012	8.87	mg/L	0.2800	0.2800	8.7300	3.2073
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	5/30/2012	8.59	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Rd.	6/28/2012	7.06	mg/L	0.0500	0.0500	7.0350	0.7107
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	6/28/2012	7.01	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/8/2012	22.2	mg/L	-0.4000	0.4000	22.4000	1.7857
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/8/2012	22.6	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/22/2012	14	mg/L	-0.4000	0.4000	14.2000	2.8169
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/22/2012	14.4	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	11/14/2012	20.4	mg/L	0.2000	0.2000	20.3000	0.9852
	MB 05 DUP - McCabes Brook at Lime Kiln Road	11/14/2012	20.2	mg/L				
							Mean	1.66
							Target	10%

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
Turbidity	H 01 - Holmes Creek Behind Tennis Court Below Pond	5/30/2012	24.8	NTU	0.8000	0.8000	24.4000	3.2787
	H 01 DUP - Homes Crk Behind Tenis Crt. Below Pond	5/30/2012	24	NTU				
	MB 05 - McCabes Brook at Lime Kiln Rd.	5/30/2012	11	NTU	-0.2000	0.2000	11.1000	1.8018
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	5/30/2012	11.2	NTU				
	H 01 - Holmes Creek behind Tennis Court Below Pond	6/28/2012	77	NTU	18.3000	18.3000	67.8500	26.9713
	H 01 DUP - Holmes Crk behind Tennis Court Below Po	6/28/2012	58.7	NTU				
	MB 05 - McCabes Brook at Lime Kiln Rd.	6/28/2012	22.3	NTU	0.3000	0.3000	22.1500	1.3544
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	6/28/2012	22	NTU				
	H 01 - Holmes Creek behind Tennis Court Below Pond	10/8/2012	61	NTU	-1.1000	1.1000	61.5500	1.7872
	H 01 DUP - Holmes Crk behind Tennis Crt below Pond	10/8/2012	62.1	NTU				
	MB 05 - McCabes Brook at Lime Kiln Road	10/8/2012	7.57	NTU	0.2300	0.2300	7.4550	3.0852
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/8/2012	7.34	NTU				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	10/22/2012	34.6	NTU	1.0000	1.0000	34.1000	2.9326
	H 01 DUP - Holmes Crk Behind Tennis Crt Below Pond	10/22/2012	33.6	NTU				
	MB 05 - McCabes Brook at Lime Kiln Road	10/22/2012	8.86	NTU	2.3300	2.3300	7.6950	30.2794
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/22/2012	6.53	NTU				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	11/14/2012	34.2	NTU	0.4000	0.4000	34.0000	1.1765
	H 01 DUP - Holmes Creek Behind Tennis Court Below	11/14/2012	33.8	NTU				
	MB 05 - McCabes Brook at Lime Kiln Road	11/14/2012	18.1	NTU	1.5000	1.5000	17.3500	8.6455
	MB 05 DUP - McCabes Brook at Lime Kiln Road	11/14/2012	16.6	NTU				

Mean	8.13
Target	15%

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
TSS	H 01 DUP - Homes Crk Behind Tenis Crt. Below Pond	5/30/2012	22	mg/l	-1.2000	1.2000	22.6000	5.3097
	H 01 - Holmes Creek Behind Tennis Court Below Pond	5/30/2012	23.2	mg/l				
	MB 05 - McCabes Brook at Lime Kiln Rd.	5/30/2012	9.6	mg/l	-1.5000	1.5000	10.3500	14.4928
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	5/30/2012	11.1	mg/l				
	H 01 - Holmes Creek behind Tennis Court Below Pond	6/28/2012	53.8	mg/L	16.4000	16.4000	45.6000	35.9649
	H 01 DUP - Holmes Crk behind Tennis Court Below Po	6/28/2012	37.4	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Rd.	6/28/2012	16.8	mg/L	-0.4000	0.4000	17.0000	2.3529
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	6/28/2012	17.2	mg/L				
	H 01 - Holmes Creek behind Tennis Court Below Pond	10/8/2012	53.8	mg/L	-0.8000	0.8000	54.2000	1.4760
	H 01 DUP - Holmes Crk behind Tennis Crt below Pond	10/8/2012	54.6	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/8/2012	3.2	mg/L	-0.8000	0.8000	3.6000	22.2222
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/8/2012	4	mg/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	10/22/2012	21.4	mg/L	-3.0000	3.0000	22.9000	13.1004
	H 01 DUP - Holmes Crk Behind Tennis Crt Below Pond	10/22/2012	24.4	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/22/2012	12.8	mg/L	6.6700	6.6700	9.4650	70.4702
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/22/2012	6.13	mg/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	11/14/2012	25.2	mg/l	1.2000	1.2000	24.6000	4.8780
	H 01 DUP - Holmes Creek Behind Tennis Court Below	11/14/2012	24	mg/l				
	MB 05 - McCabes Brook at Lime Kiln Road	11/14/2012	21.1	mg/l	10.2000	10.2000	16.0000	63.7500
	MB 05 DUP - McCabes Brook at Lime Kiln Road	11/14/2012	10.9	mg/l				

Mean	18.92
Target	15%

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
Total P	H 01 DUP - Homes Crk Behind Tenis Crt. Below Pond	5/30/2012	71.8	ug P/L	1.6000	1.6000	71.0000	2.2535
	H 01 - Holmes Creek Behind Tennis Court Below Pond	5/30/2012	70.2	ug P/L				
	MB 05 - McCabes Brook at Lime Kiln Rd.	5/30/2012	66.3	ug P/L	0.4000	0.4000	66.1000	0.6051
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	5/30/2012	65.9	ug P/L				
	H 01 - Holmes Creek behind Tennis Court Below Pond	6/28/2012	179	ug P/L	2.0000	2.0000	178.0000	1.1236
	H 01 DUP - Holmes Crk behind Tennis Court Below Po	6/28/2012	177	ug P/L				
	MB 05 - McCabes Brook at Lime Kiln Rd.	6/28/2012	83.7	ug P/L	-2.5000	2.5000	84.9500	2.9429
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	6/28/2012	86.2	ug P/L				
	H 01 - Holmes Creek behind Tennis Court Below Pond	10/8/2012	105	ug P/L	1.0000	1.0000	104.5000	0.9569
	H 01 DUP - Holmes Crk behind Tennis Crt below Pond	10/8/2012	104	ug P/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/8/2012	72	ug P/L	6.8000	6.8000	68.6000	9.9125
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/8/2012	65.2	ug P/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	10/22/2012	93.1	ug P/L	0.6000	0.6000	92.8000	0.6466
	H 01 DUP - Holmes Crk Behind Tennis Crt Below Pond	10/22/2012	92.5	ug P/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/22/2012	67.3	ug P/L	-7.7000	7.7000	71.1500	10.8222
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/22/2012	75	ug P/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	11/14/2012	98	ug P/L	-0.2000	0.2000	98.1000	0.2039
	H 01 DUP - Holmes Creek Behind Tennis Court Below	11/14/2012	98.2	ug P/L				
	MB 05 - McCabes Brook at Lime Kiln Road	11/14/2012	85	ug P/L	12.5000	12.5000	78.7500	15.8730
	MB 05 DUP - McCabes Brook at Lime Kiln Road	11/14/2012	72.5	ug P/L				

Mean	4.53
Target	15%

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
Dissolved P	H 01 - Holmes Creek Behind Tennis Court Below Pond	5/30/2012	18.5	ug P/L	-0.2000	0.2000	18.6000	1.0753
	H 01 DUP - Homes Crk Behind Tenis Crt. Below Pond	5/30/2012	18.7	ug P/L				
	MB 05 - McCabes Brook at Lime Kiln Rd.	5/30/2012	40.4	ug P/L	0.7000	0.7000	40.0500	1.7478
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	5/30/2012	39.7	ug P/L				
	H 01 - Holmes Creek behind Tennis Court Below Pond	6/28/2012	20.7	ug P/L	-0.3000	0.3000	20.8500	1.4388
	H 01 DUP - Holmes Crk behind Tennis Court Below Po	6/28/2012	21	ug P/L				
	MB 05 - McCabes Brook at Lime Kiln Rd.	6/28/2012	30	ug P/L	0.7000	0.7000	29.6500	2.3609
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	6/28/2012	29.3	ug P/L				
	H 01 - Holmes Creek behind Tennis Court Below Pond	10/8/2012	16.6	ug P/L	0.2000	0.2000	16.5000	1.2121
	H 01 DUP - Holmes Crk behind Tennis Crt below Pond	10/8/2012	16.4	ug P/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/8/2012	53	ug P/L	0.2000	0.2000	52.9000	0.3781
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/8/2012	52.8	ug P/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	10/22/2012	46.9	ug P/L	1.0000	1.0000	46.4000	2.1552
	H 01 DUP - Holmes Crk Behind Tennis Crt Below Pond	10/22/2012	45.9	ug P/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/22/2012	49.6	ug P/L	0.1000	0.1000	49.5500	0.2018
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/22/2012	49.5	ug P/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	11/14/2012	47.6	ug P/L	0.0000	0.0000	47.6000	0.0000
	H 01 DUP - Holmes Creek Behind Tennis Court Below	11/14/2012	47.6	ug P/L				
	MB 05 - McCabes Brook at Lime Kiln Road	11/14/2012	43.1	ug P/L	0.2000	0.2000	43.0000	0.4651
	MB 05 DUP - McCabes Brook at Lime Kiln Road	11/14/2012	42.9	ug P/L				

Mean	1.10
Target	15%

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
Total N	H 01 - Holmes Creek Behind Tennis Court Below Pond	5/30/2012	0.58	mg/L	0.0100	0.0100	0.5750	1.7391
	H 01 DUP - Homes Crk Behind Tenis Crt. Below Pond	5/30/2012	0.57	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Rd.	5/30/2012	0.69	mg/L	0.0200	0.0200	0.6800	2.9412
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	5/30/2012	0.67	mg/L				
	H 01 - Holmes Creek behind Tennis Court Below Pond	6/28/2012	1.93	mg/L	0.0800	0.0800	1.8900	4.2328
	H 01 DUP - Holmes Crk behind Tennis Court Below Po	6/28/2012	1.85	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Rd.	6/28/2012	0.72	mg/L	-0.0200	0.0200	0.7300	2.7397
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	6/28/2012	0.74	mg/L				
	H 01 - Holmes Creek behind Tennis Court Below Pond	10/8/2012	0.88	mg/L	0.0100	0.0100	0.8750	1.1429
	H 01 DUP - Holmes Crk behind Tennis Crt below Pond	10/8/2012	0.87	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/8/2012	0.77	mg/L	-0.0200	0.0200	0.7800	2.5641
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/8/2012	0.79	mg/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	10/22/2012	0.62	mg/L	0.0000	0.0000	0.6200	0.0000
	H 01 DUP - Holmes Crk Behind Tennis Crt Below Pond	10/22/2012	0.62	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/22/2012	0.55	mg/L	-0.0300	0.0300	0.5650	5.3097
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/22/2012	0.58	mg/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	11/14/2012	0.57	mg/L	-0.0100	0.0100	0.5750	1.7391
	H 01 DUP - Holmes Creek Behind Tennis Court Below	11/14/2012	0.58	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	11/14/2012	0.64	mg/L	-0.0400	0.0400	0.6600	6.0606
	MB 05 DUP - McCabes Brook at Lime Kiln Road	11/14/2012	0.68	mg/L				

Mean	2.85
Target	15%

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
Nox	H 01 DUP - Homes Crk Behind Tenis Crt. Below Pond	5/30/2012	0.05	mg/L	0.0000	0.0000	0.0500	0.0000
	H 01 - Holmes Creek Behind Tennis Court Below Pond	5/30/2012	0.05	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Rd.	5/30/2012	0.05	mg/L	0.0000	0.0000	0.0500	0.0000
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	5/30/2012	0.05	mg/L				
	H 01 - Holmes Creek behind Tennis Court Below Pond	6/28/2012	0.09	mg/L	0.0000	0.0000	0.0900	0.0000
	H 01 DUP - Holmes Crk behind Tennis Court Below Po	6/28/2012	0.09	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Rd.	6/28/2012	0.09	mg/L	0.0000	0.0000	0.0900	0.0000
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	6/28/2012	0.09	mg/L				
	H 01 - Holmes Creek behind Tennis Court Below Pond	10/8/2012	0.05	mg/L	0.0000	0.0000	0.0500	0.0000
	H 01 DUP - Holmes Crk behind Tennis Crt below Pond	10/8/2012	0.05	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/8/2012	0.06	mg/L	0.0100	0.0100	0.0550	18.1818
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/8/2012	0.05	mg/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	10/22/2012	0.05	mg/L	0.0000	0.0000	0.0500	0.0000
	H 01 DUP - Holmes Crk Behind Tennis Crt Below Pond	10/22/2012	0.05	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/22/2012	0.05	mg/L	0.0000	0.0000	0.0500	0.0000
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/22/2012	0.05	mg/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	11/14/2012	0.05	mg/L	0.0000	0.0000	0.0500	0.0000
	H 01 DUP - Holmes Creek Behind Tennis Court Below	11/14/2012	0.05	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	11/14/2012	0.05	mg/L	0.0000	0.0000	0.0500	0.0000
	MB 05 DUP - McCabes Brook at Lime Kiln Road	11/14/2012	0.05	mg/L				

Mean	1.82
Target	10%

ANNEX IIIC

Revised TSS, Turbidity, and TP RPD Analysis

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
TSS	H 01 DUP - Homes Crk Behind Tenis Crt. Below Pond	5/30/2012	22	mg/l	-1.2000	1.2000	22.6000	5.3097
	H 01 - Holmes Creek Behind Tennis Court Below Pond	5/30/2012	23.2	mg/l				
	MB 05 - McCabes Brook at Lime Kiln Rd.	5/30/2012	9.6	mg/l	-1.5000	1.5000	10.3500	14.4928
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	5/30/2012	11.1	mg/l				
	MB 05 - McCabes Brook at Lime Kiln Rd.	6/28/2012	16.8	mg/L	-0.4000	0.4000	17.0000	2.3529
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	6/28/2012	17.2	mg/L				
	H 01 - Holmes Creek behind Tennis Court Below Pond	10/8/2012	53.8	mg/L	-0.8000	0.8000	54.2000	1.4760
	H 01 DUP - Holmes Crk behind Tennis Crt below Pond	10/8/2012	54.6	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/8/2012	3.2	mg/L	-0.8000	0.8000	3.6000	22.2222
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/8/2012	4	mg/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	10/22/2012	21.4	mg/L	-3.0000	3.0000	22.9000	13.1004
	H 01 DUP - Holmes Crk Behind Tennis Crt Below Pond	10/22/2012	24.4	mg/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	11/14/2012	25.2	mg/l	1.2000	1.2000	24.6000	4.8780
	H 01 DUP - Holmes Creek Behind Tennis Court Below	11/14/2012	24	mg/l				

Mean	9.12
Target	15%

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
Total P	H 01 DUP - Homes Crk Behind Tenis Crt. Below Pond	5/30/2012	71.8	ug P/L	1.6000	1.6000	71.0000	2.2535
	H 01 - Holmes Creek Behind Tennis Court Below Pond	5/30/2012	70.2	ug P/L				
	MB 05 - McCabes Brook at Lime Kiln Rd.	5/30/2012	66.3	ug P/L	0.4000	0.4000	66.1000	0.6051
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	5/30/2012	65.9	ug P/L				
	H 01 - Holmes Creek behind Tennis Court Below Pond	6/28/2012	179	ug P/L	2.0000	2.0000	178.0000	1.1236
	H 01 DUP - Holmes Crk behind Tennis Court Below Po	6/28/2012	177	ug P/L				
	MB 05 - McCabes Brook at Lime Kiln Rd.	6/28/2012	83.7	ug P/L	-2.5000	2.5000	84.9500	2.9429
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	6/28/2012	86.2	ug P/L				
	H 01 - Holmes Creek behind Tennis Court Below Pond	10/8/2012	105	ug P/L	1.0000	1.0000	104.5000	0.9569
	H 01 DUP - Holmes Crk behind Tennis Crt below Pond	10/8/2012	104	ug P/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/8/2012	72	ug P/L	6.8000	6.8000	68.6000	9.9125
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/8/2012	65.2	ug P/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	10/22/2012	93.1	ug P/L	0.6000	0.6000	92.8000	0.6466
	H 01 DUP - Holmes Crk Behind Tennis Crt Below Pond	10/22/2012	92.5	ug P/L				
	MB 05 - McCabes Brook at Lime Kiln Road	10/22/2012	67.3	ug P/L	-7.7000	7.7000	71.1500	10.8222
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/22/2012	75	ug P/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	11/14/2012	98	ug P/L	-0.2000	0.2000	98.1000	0.2039
	H 01 DUP - Holmes Creek Behind Tennis Court Below	11/14/2012	98.2	ug P/L				

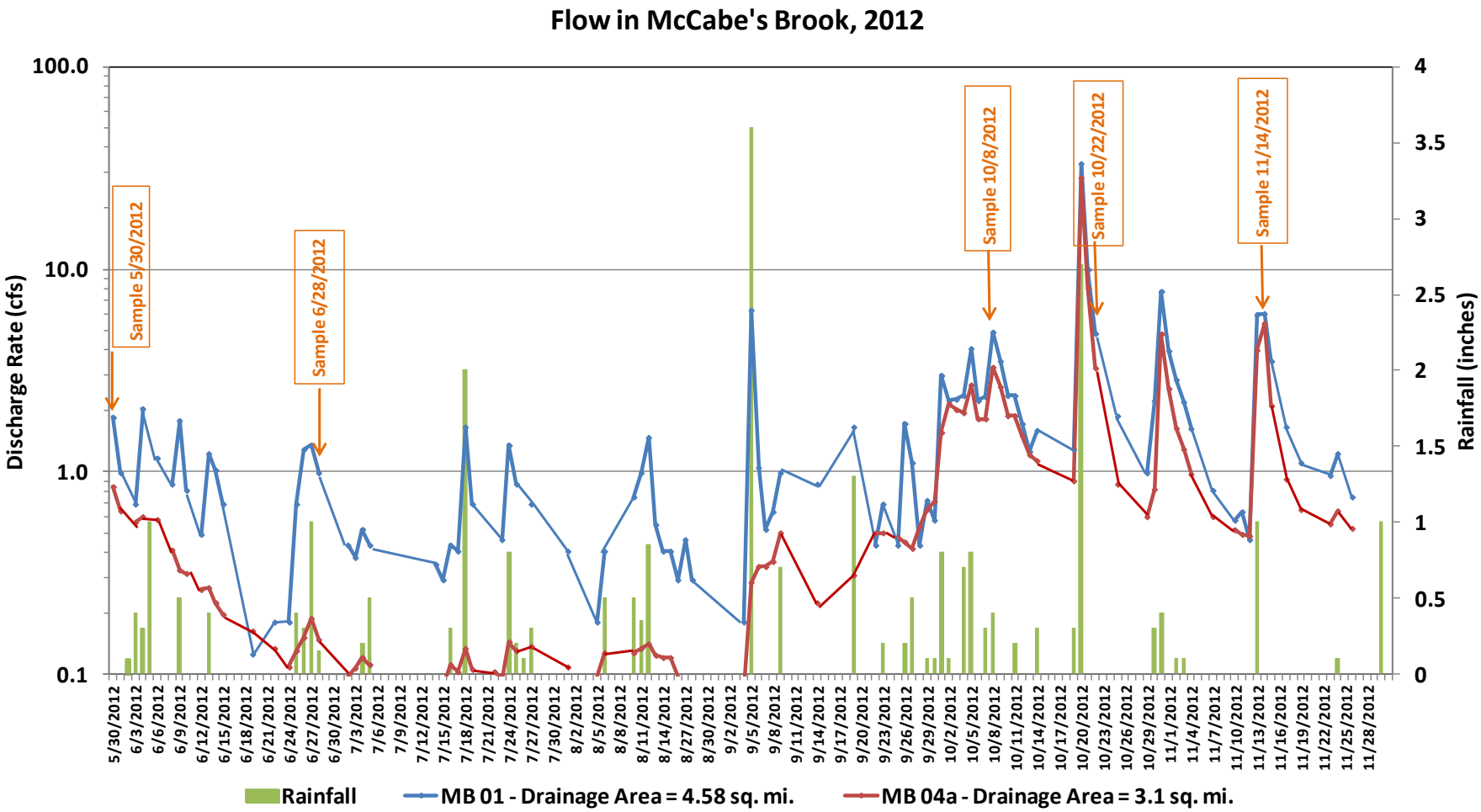
Mean	3.27
Target	15%

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
Turbidity	H 01 - Holmes Creek Behind Tennis Court Below Pond	5/30/2012	24.8	NTU	0.8000	0.8000	24.4000	3.2787
	H 01 DUP - Homes Crk Behind Tenis Crt. Below Pond	5/30/2012	24	NTU				
	MB 05 - McCabes Brook at Lime Kiln Rd.	5/30/2012	11	NTU	-0.2000	0.2000	11.1000	1.8018
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	5/30/2012	11.2	NTU				
	MB 05 - McCabes Brook at Lime Kiln Rd.	6/28/2012	22.3	NTU	0.3000	0.3000	22.1500	1.3544
	MB 05 DUP - McCabes Brook at Lime Kiln Rd.	6/28/2012	22	NTU				
	H 01 - Holmes Creek behind Tennis Court Below Pond	10/8/2012	61	NTU	-1.1000	1.1000	61.5500	1.7872
	H 01 DUP - Holmes Crk behind Tennis Crt below Pond	10/8/2012	62.1	NTU				
	MB 05 - McCabes Brook at Lime Kiln Road	10/8/2012	7.57	NTU	0.2300	0.2300	7.4550	3.0852
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/8/2012	7.34	NTU				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	10/22/2012	34.6	NTU	1.0000	1.0000	34.1000	2.9326
	H 01 DUP - Holmes Crk Behind Tennis Crt Below Pond	10/22/2012	33.6	NTU				
	MB 05 - McCabes Brook at Lime Kiln Road	10/22/2012	8.86	NTU	2.3300	2.3300	7.6950	30.2794
	MB 05 DUP - McCabes Brook at Lime Kiln Road	10/22/2012	6.53	NTU				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	11/14/2012	34.2	NTU	0.4000	0.4000	34.0000	1.1765
	H 01 DUP - Holmes Creek Behind Tennis Court Below	11/14/2012	33.8	NTU				
	MB 05 - McCabes Brook at Lime Kiln Road	11/14/2012	18.1	NTU	1.5000	1.5000	17.3500	8.6455
	MB 05 DUP - McCabes Brook at Lime Kiln Road	11/14/2012	16.6	NTU				

Mean	6.04
Target	15%

ANNEX IV

Rainfall and Flow Records in McCabe's Brook


Flow in McCabe's Brook, 2012
Discharge Rate (cfs)
Rainfall (inches)
100.0
10.0
1.0
0.1
4
3.5
3
2.5
2
1.5
1
0.5
0
Sample 5/30/2012
Sample 6/28/2012
Sample 10/8/2012
Sample 10/22/2012
Sample 11/14/2012
5/30/2012
6/3/2012
6/6/2012
6/9/2012
6/12/2012
6/15/2012
6/18/2012
6/21/2012
6/24/2012
6/27/2012
6/30/2012
7/3/2012
7/6/2012
7/9/2012
7/12/2012
7/15/2012
7/18/2012
7/21/2012
7/24/2012
7/27/2012
7/30/2012
8/2/2012
8/5/2012
8/8/2012
8/11/2012
8/14/2012
8/27/2012
8/30/2012
9/2/2012
9/5/2012
9/8/2012
9/11/2012
9/14/2012
9/17/2012
9/20/2012
9/23/2012
9/26/2012
9/29/2012
10/2/2012
10/5/2012
10/8/2012
10/11/2012
10/14/2012
10/17/2012
10/20/2012
10/23/2012
10/26/2012
10/29/2012
11/1/2012
11/4/2012
11/7/2012
11/10/2012
11/13/2012
11/16/2012
11/19/2012
11/22/2012
11/25/2012
11/28/2012
Rainfall
MB 01 - Drainage Area = 4.58 sq. mi.
MB 04a - Drainage Area = 3.1 sq. mi.

ANNEX V

Nutrient Loading in McCabe's Brook
2010-2012

Total Phosphorus Loadings in McCabe's Brook, 2010-2012

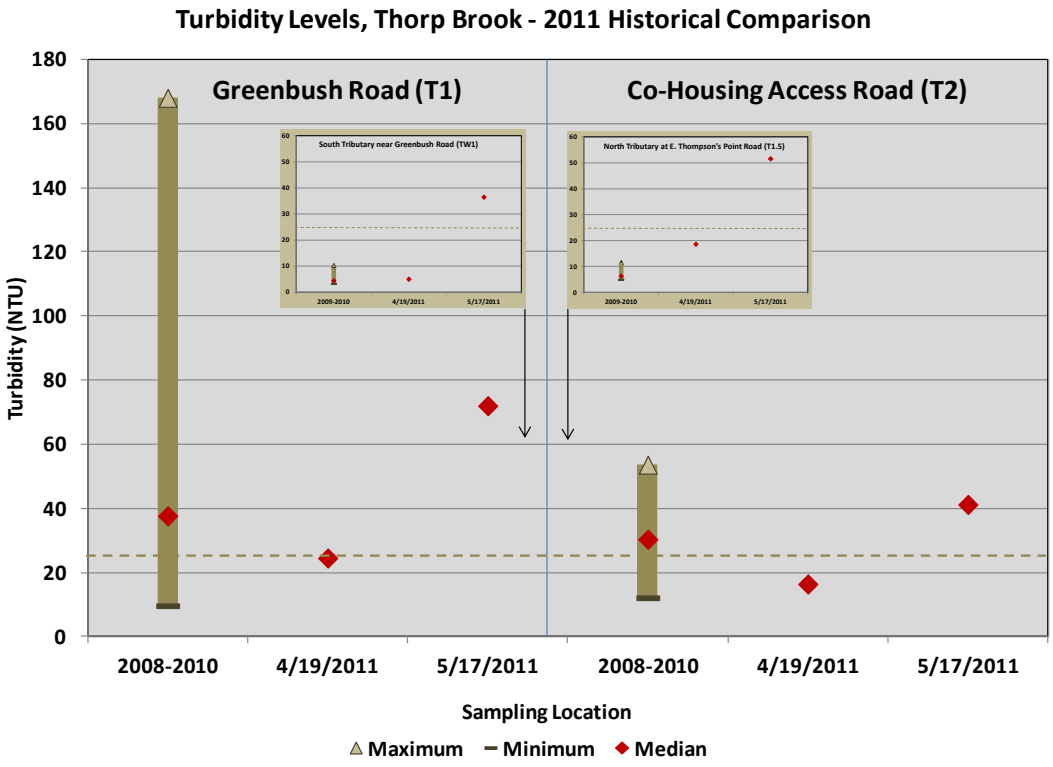
	Harbor Road			Vermont Teddy Bear		
Date	Flow (cfs)	TP Load (Kg/Day)	TP Load/ mi^2	Flow (cfs)	TP Load (Kg/Day)	TP Load/ mi^2
8/3/2011	0.07	0.01	0.00			
7/7/2010	0.41	0.10	0.02	0.23	0.09	0.03
9/1/2010	0.41	0.10	0.02	0.13	0.04	0.01
6/28/2012	0.99	0.14	0.03	0.15	0.06	0.02
10/6/2010	1.23	0.22	0.05	0.77	0.15	0.05
7/13/2011	1.11	0.19	0.04	0.37	0.20	0.06
5/30/2012	1.86	0.20	0.04	0.85	0.29	0.09
10/26/2011	3.20	0.40	0.09	2.80	0.57	0.18
11/4/2010	3.20	0.32	0.07			
10/22/2012	4.81	0.83	0.18	3.25	0.63	0.20
10/8/2012	4.89	0.74	0.16	3.28	0.87	0.28
11/14/2012	6.04	3.43	0.75	5.41	2.22	0.71
6/1/2011	7.43	1.52	0.33	5.09	1.67	0.53
8/4/2010	14.44	7.91	1.73	5.73	4.32	1.38

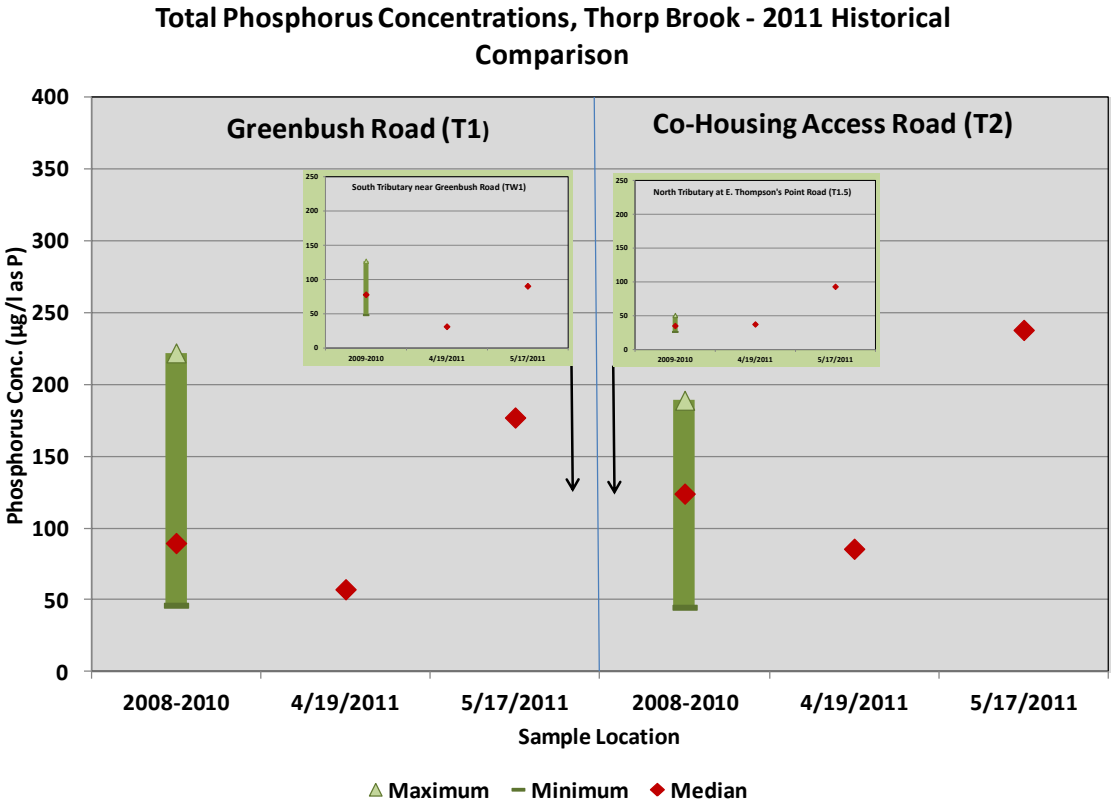
Total Nitrogen Loadings in McCabe's Brook, 2010-2012

	Harbor Road			Vermont Teddy Bear		
Date	Flow (cfs)	TN Load (Kg/Day)	TN Load/ mi^2	Flow (cfs)	TN Load (Kg/Day)	TN Load/ mi^2
8/3/2011	0.07	0.09	0.02	-	-	-
7/7/2010	0.41	0.67	0.15	0.23	-	-
9/1/2010	0.41	0.50	0.11	0.13	0.25	0.08
6/28/2012	0.99	1.33	0.29	0.15	0.38	0.12
10/6/2010	1.23	1.90	0.41	0.77	1.44	0.46
7/13/2011	1.11	1.33	0.29	0.37	1.75	0.56
5/30/2012	1.86	2.05	0.45	0.85	1.81	0.58
10/26/2011	3.20	3.84	0.84	2.80	4.66	1.49
11/4/2010	3.20	3.21	0.70	-	-	-
10/22/2012	4.81	6.24	1.36	3.25	5.01	1.60
10/8/2012	4.89	5.74	1.26	3.28	6.26	2.00
11/14/2012	6.04	-	-	5.41	16.15	5.16
6/1/2011	7.43	14.72	3.22	5.09	11.84	3.78
8/4/2010	14.44	29.33	6.42	5.73	1.14	0.36

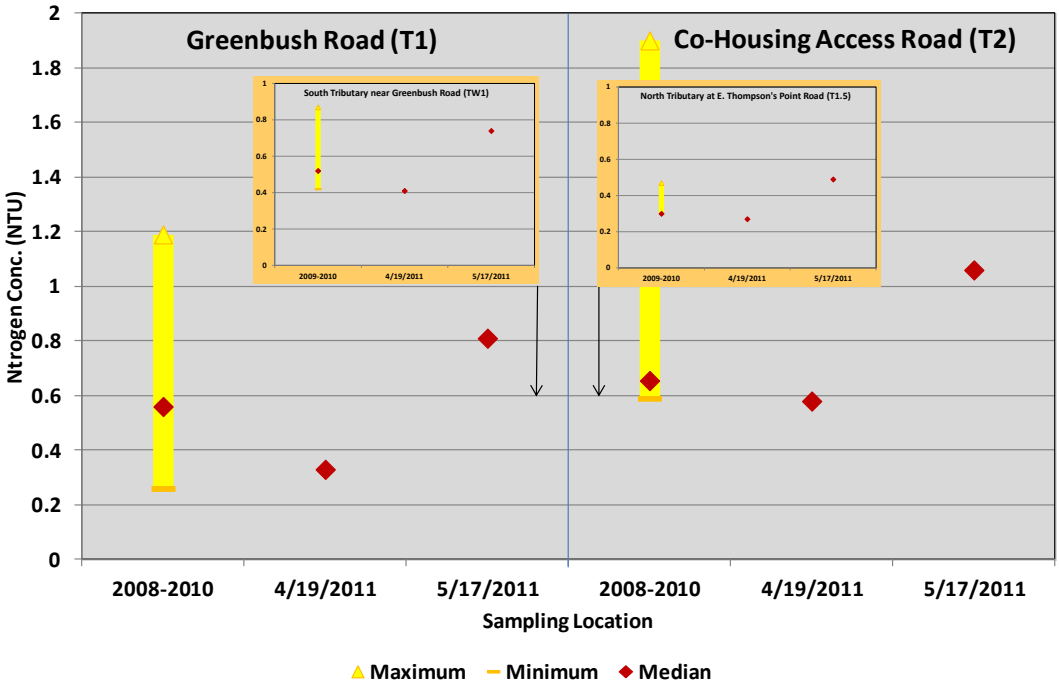
ANNEX VI

Thorpe-Kimball Data Summary 2008-2011

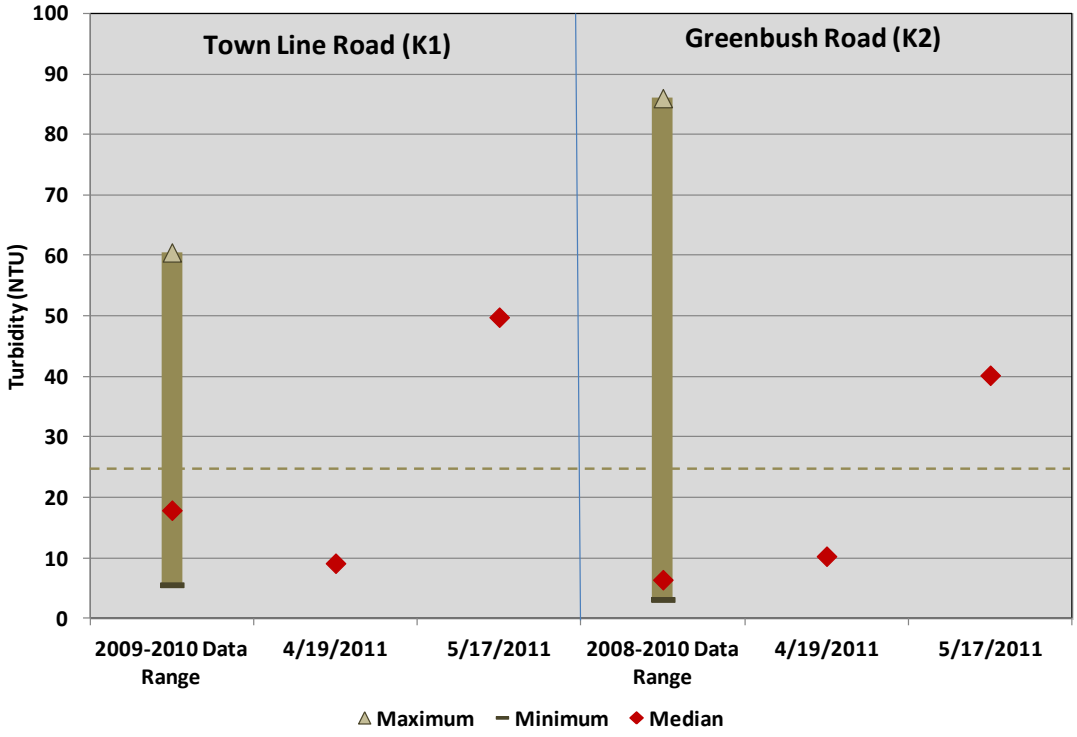

Turbidity Levels, Thorp Brook - 2011 Historical Comparison
Greenbush Road (T1)
Co-Housing Access Road (T2)
South Tributary near Greenbush Road (TW1)
North Tributary at E. Thompson's Point Road (T1.5)
Turbidity (NTU)
0
20
40
60
80
100
120
140
160
180
2008-2010
4/19/2011
5/17/2011
2008-2010
4/19/2011
5/17/2011
Sampling Location
Maximum
Minimum
Median

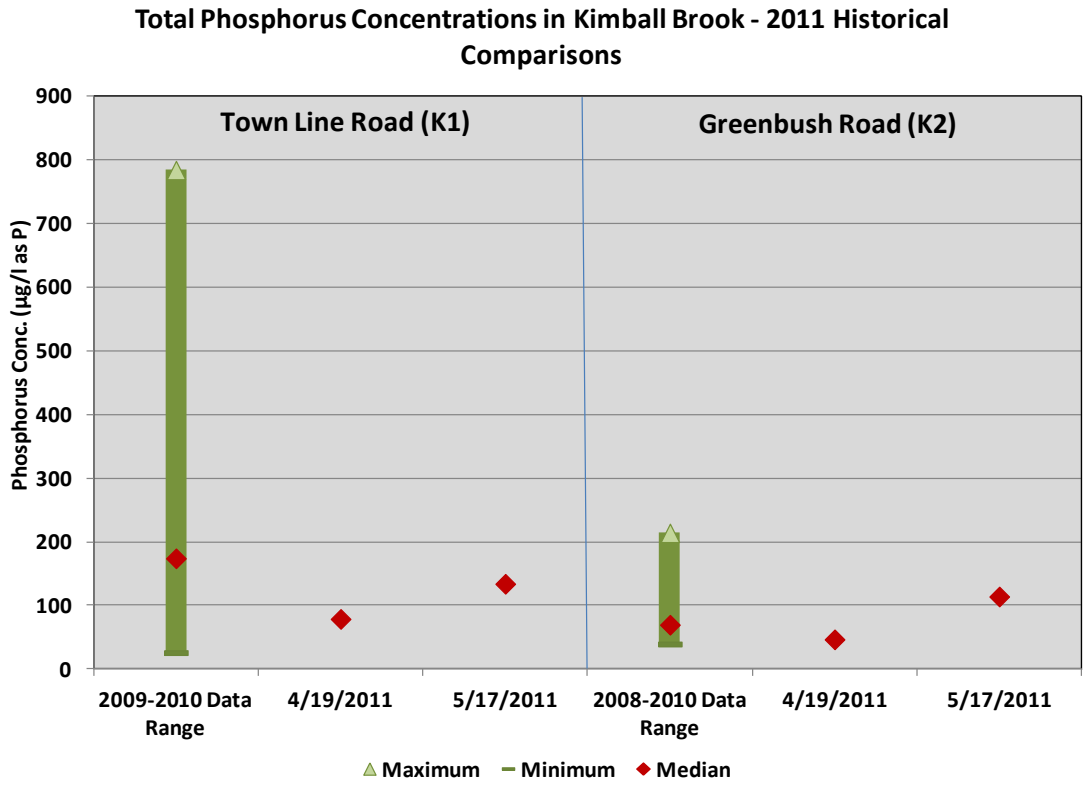

Total Phosphorus Concentrations, Thorp Brook - 2011 Historical Comparison
Greenbush Road (T1)
Co-Housing Access Road (T2)
South Tributary near Greenbush Road (TW1)
North Tributary at E. Thompson's Point Road (T1.5)
Phosphorus Conc. (µg/l as P)
0
50
100
150
200
250
300
350
400
2008-2010
4/19/2011
5/17/2011
2008-2010
4/19/2011
5/17/2011
Sample Location
Maximum
Minimum
Median

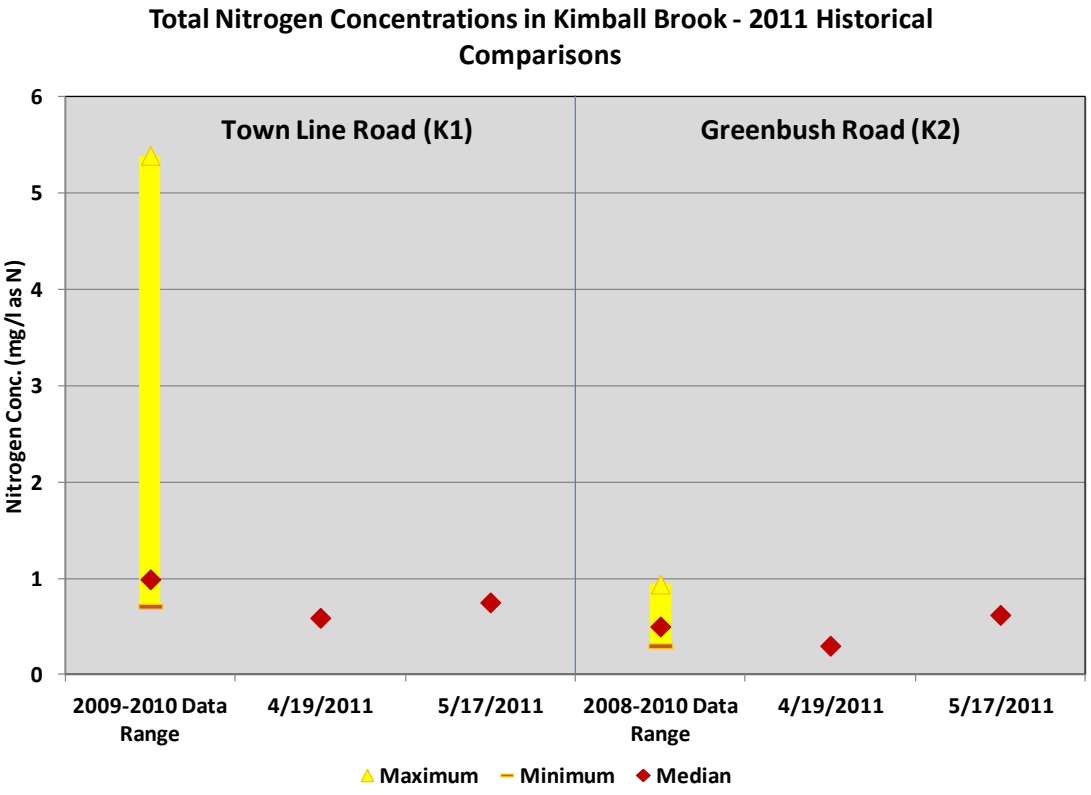
Total Nitrogen Concentrations, Thorp Brook - 2011 Historical Comparison

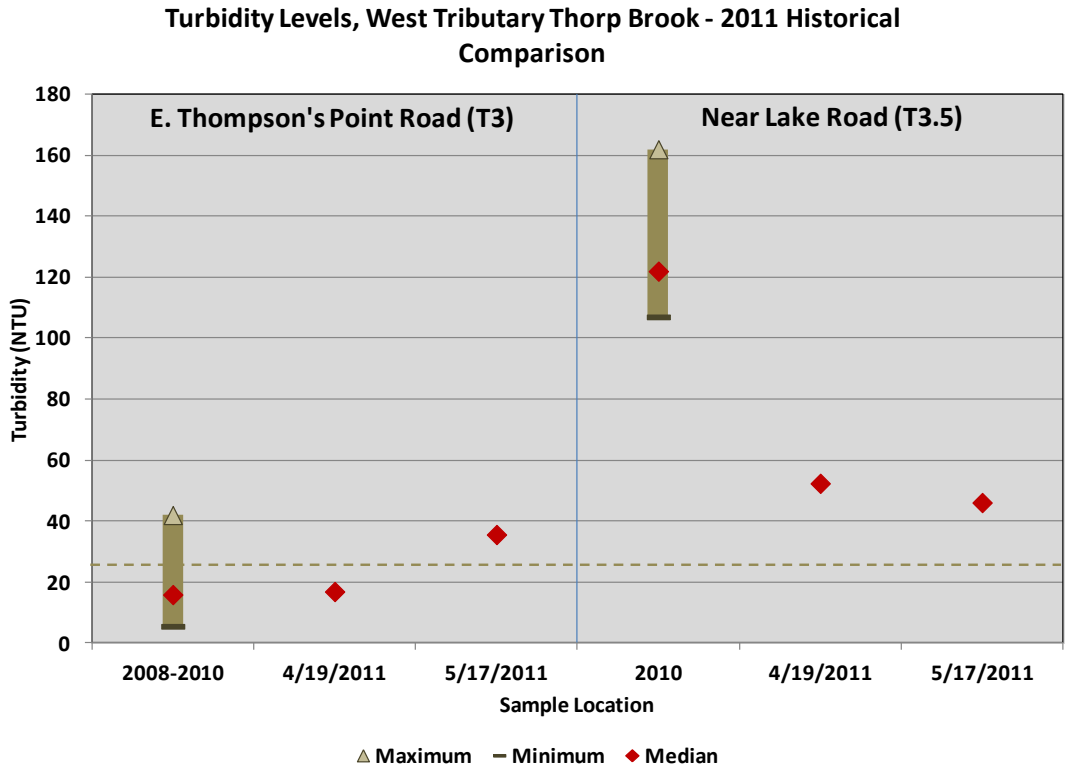


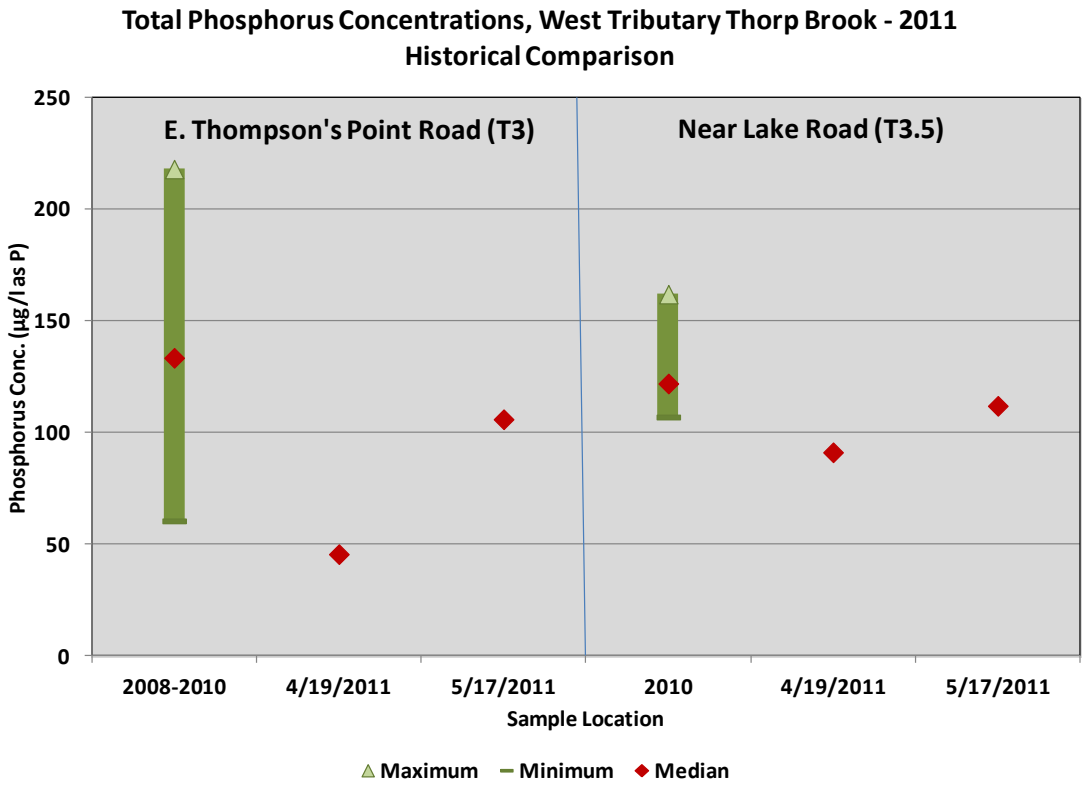
Turbidity in Kimball Brook - 2011 Historical Comparison

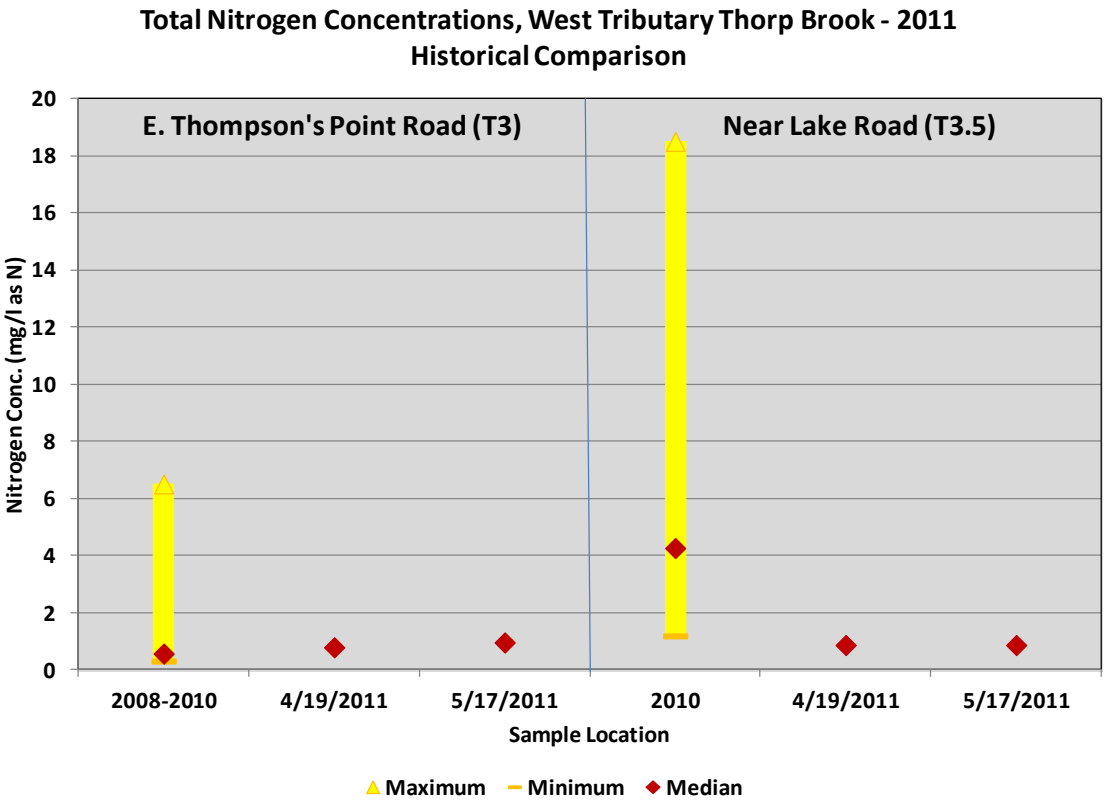



Total Phosphorus Concentrations in Kimball Brook - 2011 Historical Comparisons
Town Line Road (K1)
Greenbush Road (K2)
Phosphorus Conc. (µg/l as P)
900
800
700
600
500
400
300
200
100
0
2009-2010 Data Range
4/19/2011
5/17/2011
2008-2010 Data Range
4/19/2011
5/17/2011
Maximum
Minimum
Median


Total Nitrogen Concentrations in Kimball Brook - 2011 Historical Comparisons
Town Line Road (K1)
Greenbush Road (K2)
Nitrogen Conc. (mg/l as N)
6
5
4
3
2
1
0
2009-2010 Data Range
4/19/2011
5/17/2011
2008-2010 Data Range
4/19/2011
5/17/2011
Maximum
Minimum
Median


Turbidity Levels, West Tributary Thorp Brook - 2011 Historical Comparison
E. Thompson's Point Road (T3)
Near Lake Road (T3.5)
Turbidity (NTU)
180
160
140
120
100
80
60
40
20
0
2008-2010
4/19/2011
5/17/2011
2010
4/19/2011
5/17/2011
Sample Location
Maximum
Minimum
Median


Total Phosphorus Concentrations, West Tributary Thorp Brook - 2011 Historical Comparison
E. Thompson's Point Road (T3)
Near Lake Road (T3.5)
Phosphorus Conc. (µg/l as P)
250
200
150
100
50
0
2008-2010
4/19/2011
5/17/2011
2010
4/19/2011
5/17/2011
Sample Location
Maximum
Minimum
Median


Total Nitrogen Concentrations, West Tributary Thorp Brook - 2011
Historical Comparison
E. Thompson's Point Road (T3)
Near Lake Road (T3.5)
Nitrogen Conc. (mg/l as N)
20
18
16
14
12
10
8
6
4
2
0
2008-2010
4/19/2011
5/17/2011
2010
4/19/2011
5/17/2011
Sample Location
Maximum
Minimum
Median

ANNEX VII

Sampling Plans

ANNEX VIIA

Long Term Sampling Plan

Long Term Sampling Plan**LaPlatte-McCabe's-Thorp-Kimball-Holmes RiverWatch Collaborative Meeting 2-11-13, Shelburne Town Hall, 2nd floor, Rm 2**

We are a volunteer based river watch group and depend upon annual reliable volunteer help. We will need volunteers to monitor approximately 12 stations in 2013. We are also planning for a new paid coordinator to shadow Bill and learn his coordinator role.

Currently **Bill** does grant applications, QC plan & oversight, data entry/interpretation/ reporting to DEC.
Other tasks to hand off to a **paid coordinator**: ordering bottles, getting bottles and labels, bottles labeling & preparation, deliver and pick up bottles to volunteers, manage flow tasks and determine hi flow sampling dates, Bottle delivery and sample processing QC training.

We partner with VT DEC, LCA and the watershed towns of Shelburne, Charlotte, Hinesburg. **DEC** provides samples analysis and QC oversight. **LCA** provides admin, grant writing, equipment and outreach. **Towns** provide financial support.

Our goal is to inform water quality policies, goals and strategies using our science based information.

Our sampling plan monitors both in stream conditions and impacts to river uses such as swimming, and long-term trends to inform watershed and lake WQ plans. 2013 est. labor costs: $1700-$2200 new coordinator, Vol hrs @ 1100 hrs, *Bill 110 hrs IK*, *LCA hrs 50 hrs IK.,* MMI@??

- *Focus* monitoring is more detailed sampling to characterize <u>in stream</u> water quality conditions/issues. Ecoli, Nutrients, Solids, Flow.
We sample annually to get a range of flows (multiple high med and low flow events). Repeat as needed (5-6 yrs) or when land use changes.
- *Sentinel* monitoring helps to understand long term trends/issues at a larger <u>subwatershed scale</u>. Ecoli TMDL, Nutrients, Solids, Flow
We sample each year at high flow times to understand nutrient yields/sq mile and loadings from smaller subsheds to the lake.

STREAM NAME S=Sentinel Stations	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
LaPlatte River-12 S: Hinesb.WWSTP S: Carpenter Rd S: Falls Rd	Focus/S	S	S	S	S	S	S	Focus/S	Focus/S	Focus/S

McCabe's Brook-6 S: Harbor Rd	Focus/S	Focus/S	Focus/S	Focus/S	Focus/S	S	S	S	S	S
Thorp Brook-1 S: Greenbush Rd	S	S	S	S	S	S	S	S	S	S
Kimball Brook-1 S: Greenbush or Bay View Rd.?	S	S	S	S	S	S	S	S	S	S
Holmes Creek-2 S: H1, rec field	S	S	S	S	S	S	S	S	S	S

ANNEX VIIB

SAMPLING PROTOCOLS

Site ID	Site Location	Site Latitude	Site Longitude	Upstream Area (mi2)	Staff Gage	Sentinel/ Focus	Focus Years	*E. coli*	Chloride	TSS	Turbidity	Total Phosphorus	Dissolved Phosphorus	Total Nitrogen
MB 02	MB02 – McCabe's Brook at Harbor Road	44.38305	-73.23853	4.57	Y	S/F	2010-2015		X	X	X	X	X	X
MB 02a	MB 02a - McCabe's Brook upstream from School Street neighborhood	44.37502	-73.23881			F	2010-2015		X	X	X	X	X	X
MB 03	MB03 - McCabes Brook at Bostwick Road	44.36892	-73.23586			F	2010-2015		X	X	X	X	X	X
MB 04	MB04 - McCabes Brook at Route 7	44.36230	-73.23461			F	2010-2015		X	X	X	X	X	X
MB 04a	MB04a - McCabes Brook at Teddy Bear Access Road	44.36086	-73.23405	3.31	Y	S/F	2010-2015		X	X	X	X	X	X
MB 05	MB05 - McCabes Brook at Lime Kiln Road	44.34582	-73.22868			F	2010-2015		X	X	X	X	X	X
LP 01	LaPlatte River, trail from end of Yacht Haven Drive	44.3945	-73.22879			F	2018-2020		X	X	X	X	X	X
LP 02	LaPlatte River, Route 7 bridge north of Shelburne Village. Right bank under bridge.	44.38707	-73.22515			F	2018-2020		X	X	X	X	X	X
LP 03	LP03 - LaPlatte River at Falls Road	44.37022	-73.21577	44.8		S/F	2018-2020		X	X	X	X	X	X
LP 04	LaPlatte River, Spear St. bridge (at Gecewicz). Left bank, 3 meters downstream of bridge.	44.355	-73.19382			F	2018-2020		X	X	X	X	X	X
LP 05	LP05 - LaPlatte River at Carpenter Road	44.34176	-73.18383	31.2		S/F	2018-2020		X	X	X	X	X	X
LP 06	LaPlatte River, Dorset St. bridge. Right bank, upstream end of bridge.	44.33839	-73.17097			F	2018-2020		X	X	X	X	X	X
LP 07	LaPlatte River, Leavenworth Rd. North bridge. Left bank at downstream end of bridge.	44.33887	-73.14931			F	2018-2020		X	X	X	X	X	X
LP 08	LP08 - LaPlatte River below Hinesburg STP Outfall	44.33319	-73.12618			F	2018-2020		X	X	X	X	X	X
LP 09	LP09 - LaPlatte River above Hinesburg STP Outfall	44.33395	-73.12598	17.7		S/F	2018-2020		X	X	X	X	X	X
LP 10	LP10 - LaPlatte River at Silver St	44.32524	-73.11015	8.94		S/F	2018-2020			X	X	X	X	X

Site ID	Site Location	Site Latitude	Site Longitude	Upstream Area (mi2)	Staff Gage	Sentinel/ Focus	Focus Years	*E. coli*	Chloride	TSS	Turbidity	Total Phosphorus	Dissolved Phosphorus	Total Nitrogen
T 01	Thorpe Brook, West of Greenbush Rd	44.273073	-73.256597	2.93	Y	S/F				X	X	X	X	X
T 02	Thorpe Brook, East Branch: South of Champlain Co-Housing Road	44.290703	-73.249991			F				X	X	X	X	X
T 1.5	Tributary toThorpe Brook at East Thompson's Point Rd	44.281086	-73.251489											
TW 01	Tributary to Thorpe Brook south and East of T 01	44.273119	-73.251489											
T 03	West Tributary Thorp Brook: South side of E. Thompson's Point Rd	44.282732	-73.262495											
T 3.5	West Tributary South Branch Thorpe Brook, near source. North of T 03 and upstream from public mound system	44.288539	-73.265942											
K 01	Kimball Brook, Town Line Rd	44.257767	-73.259469											
K 02	Kimball Brook, East of Greenbush Rd	44.25836	-73.249661	1.87	Y	S/F				X	X	X	X	X
H 01	Behind the tennis court of Charlotte Town Beach, downstream from impoundment pond on the main branch of Holmes Brook. Upstream from HT.	44.332689	-73.279539	3.84	P	S/F	2010-2015	X		X	X	X	X	X
HT 01	The first tributary feeding into Holmes Brook upstream from the mouth. Downstream from Mouth.	44.331389	-73.280556	1.71		F		X		X	X	X	X	X

NOTES: All McCabe and Holmes monitoring to target high flows May through November