

Water Quality in Thorp, Kimball, and Holmes Brooks

2013 Summary Report

Prepared for

VT DEC Watershed Management Division

Volunteer Water Quality Monitoring

LaRosa Analytical Services Partnerships

From South Chittenden River Watch, March 6, 2016

Water quality in Thorp and Kimball Brooks has been monitored since 2008. Following initial watershed level monitoring, sampling was limited to stations located at Greenbush Road upstream from the backwater of Lake Champlain.

Water quality in Holmes Brook and its southern tributary was initiated in 2010. Sampling has been spotty during dry periods as a result of lack of flow.

Chloride

Analysis for chlorides was initiated in 2013, but samples were taken on only two dates, limiting their value as indicators of factors influencing water quality in the streams and

Location	Date	Chloride Conc. (mg/l)
T 01 - Thorp Brook at Greenbush Road	5/27/2013	53 mg/L
T 01 - Thorp Brook at Greenbush Road	10/8/2013	28.2 mg/L
K 02 - Kimball Brook at Greenbush Road	5/27/2013	10.9 mg/L
K 02 - Kimball Brook at Greenbush Road	10/8/2013	27.8 mg/L

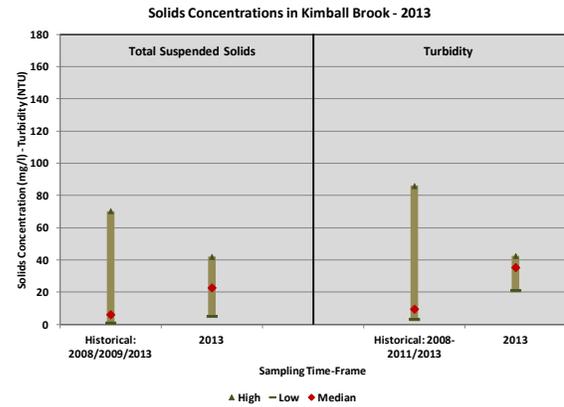
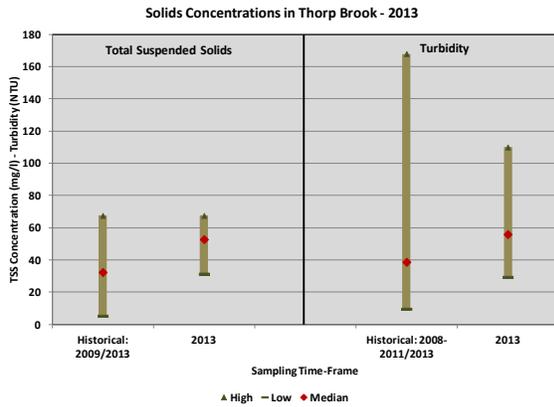
contributing to the wider interpretation of water quality results in the watersheds. The concentration of chloride in Thorp Brook detected on May 27 was consistent with concentrations commonly observed in streams impacted by runoff from roads during the spring., Similarly, the lower level observed on October 8 is consistent with reductions commonly observed in late summer and fall resulting from washout during summer rains.

The results observed in Kimball Brook were low, on May 27 in the range of background levels, and consistent with the location of the sampling point upstream from Greenbush Road, and as a result, unaffected by road runoff containing salt.

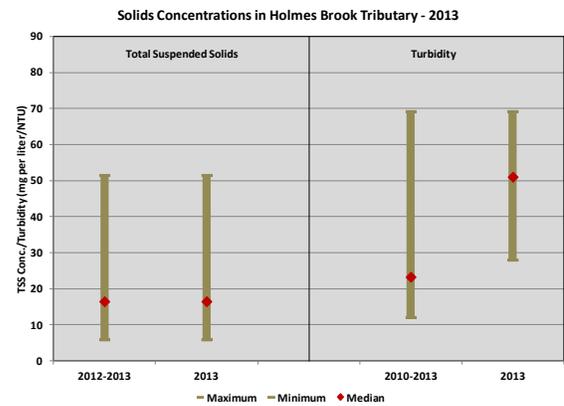
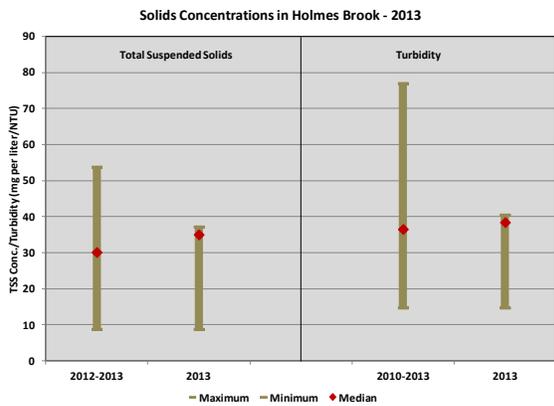
Suspended Solids

Concentrations of suspended solids observed in both Thorp and Kimball Brooks in 2013 were, on average, higher than those observed over the period of record, but fell well within the range of historical highs and lows. The increased levels of suspended sediment probably reflect higher flow rates sampled in 2013.

Concentrations in Thorp Brook were significantly higher than in Kimball Brook, reflecting the influence of road runoff transporting solids discharging to the stream. In contrast, samples from Kimball Brook are taken upstream from Greenbush Road, and were therefore not influenced by runoff from the road, and consistent with observations of chloride discussed above.



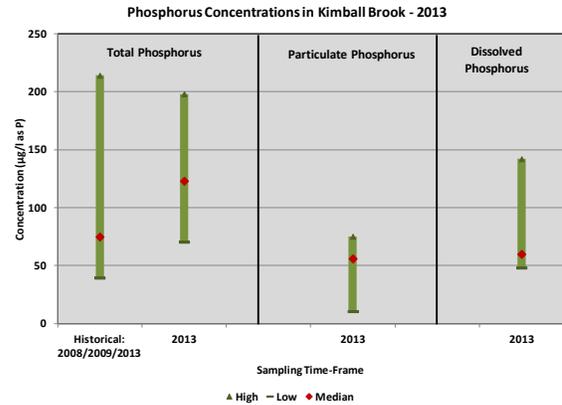
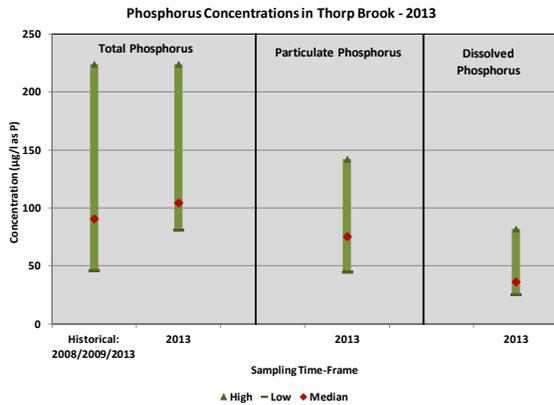
Holmes Brook and its tributary from the south drain mainly agricultural land. As in Thorp and Kimball Brooks, however, solids levels in Holmes Brook and its main tributary (measured as turbidity) were, on average, generally higher than observed over the period of



record. Although reported median turbidity levels in the southern tributary appeared to be significantly higher in 2013 than in previous years, no increase was observed from the 2012-2013 median of suspended solids concentrations. Furthermore, suspended solids in the tributary tended to be lower than in Holmes Brook itself. In general, solids concentrations appeared not to be greatly impacted by erosion or bottom scour.

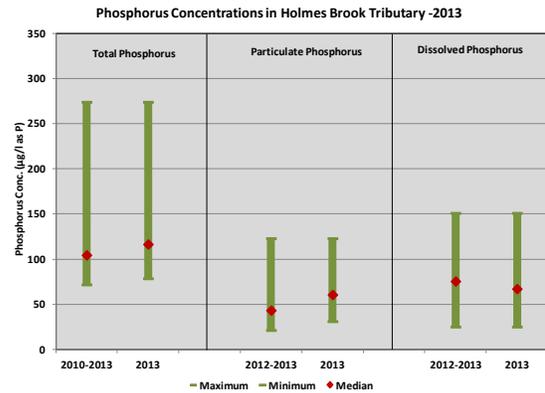
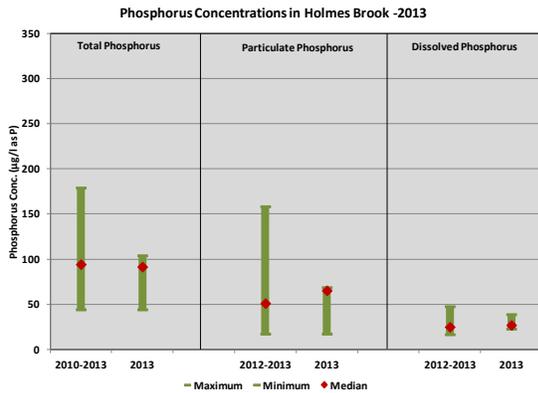
Phosphorus

Levels of total phosphorus tended to be slightly higher in Thorp Brook than in Kimball Brook. Concentrations increased somewhat in both streams in 2013, probably in response to higher rainfall than in earlier years. In Thorp Brook, particulate phosphorus was predominant, probably associated with solids discharged with road runoff.



In contrast, dissolved phosphorus predominated in Kimball Brook. The Kimball Brook watershed upstream from Greenbush Road is forested, and it is likely that the dissolved phosphorus leaches from decaying organic matter entering the stream with runoff.

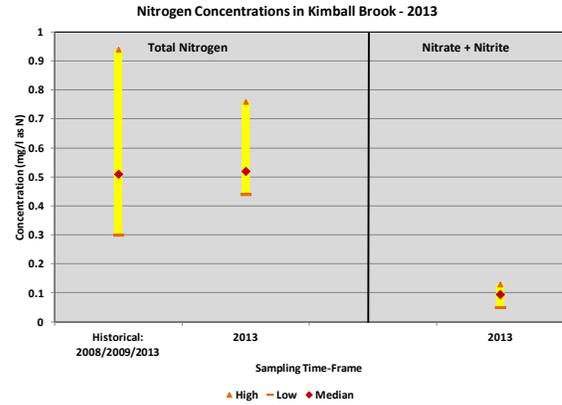
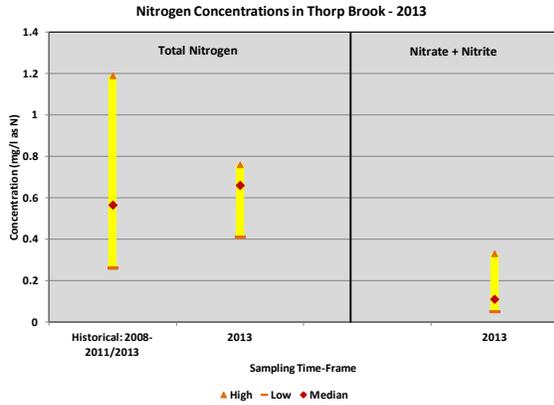
Total phosphorus levels in Holmes Brook and its southern tributary were in general not exceptional and differed little from previous years. In Holmes Brook itself, particulate



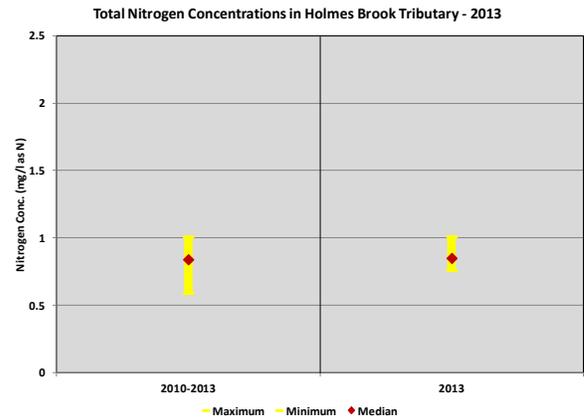
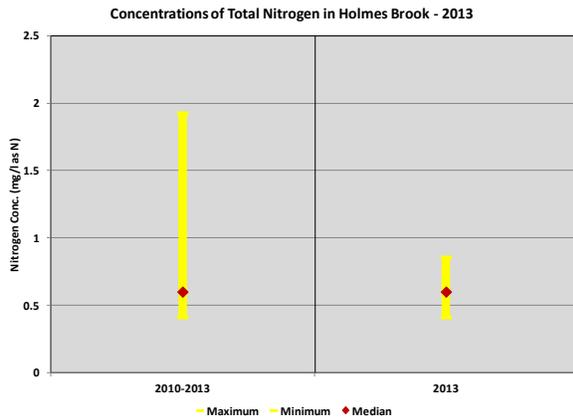
phosphorus predominated. In its southern tributary, levels of dissolved phosphorus were slightly higher than were those of particulate phosphorus, probably reflecting the history of farming in its watershed.

Nitrogen

Nitrogen concentrations in both Thorp and Kimball Brooks in 2013 were low, consistent with, and within, the range observed during previous years, and slightly higher in Thorp than in Kimball Brook.



Similarly, concentrations in Holmes Brook and its southern tributary were low, but slightly higher in the tributary stream, probably reflecting its history of agriculture. Consistent with the generally higher total nitrogen concentrations in the tributary stream were detectable, but low, levels of nitrate plus nitrite with a median value of 0.25 mg/l. This is consistent with the slightly higher phosphorus levels, and in particular, the predominance of dissolved phosphorus, reflecting the agricultural history of its watershed.



Flow and Nutrient Loading Rates

Measurement of flow in Thorp and Kimball Brooks at Greenbush Road was initiated in 2011. Nutrient and suspended solids loading rates observed in 2013 are provided in the Attachments. Insufficient data are currently available to make reliable comparisons with similar watersheds. But based on the limited Thorp and Kimball Brook phosphorus data available for 2013, loadings calculated based on watershed area suggest that they are lower than in the more intensively agricultural upper McCabe's Brook watershed.

Conclusions

Kimball Brook

- Chlorides were determined only in a spring and a fall sample
- Chloride and solids concentrations were low consistent with immediate upstream forested area
- Total phosphorus concentrations not exceptional for unpolluted area streams
- Predominance of dissolved phosphorus possibly originating from decaying organic matter. Levels were generally low
- Nitrogen concentrations were low. Nitrate plus nitrite concentrations were slightly greater than in Thorp Brook.

Thorp Brook

- Chlorides were determined only in a spring and a fall sample
- Chlorides were higher than normal background levels, suggesting influence of runoff from Greenbush Road
- Solids levels influenced by runoff from Greenbush Road, at times reaching high levels
- Phosphorus levels in general relatively low, dominated by particulate phosphorus associated with sediment carried by runoff from Greenbush Road.
- Nitrogen levels, including nitrate plus nitrite, were low.

Nutrient Loadings

- Continue flow measurement and determination of loading rates

Recommendations

General

- Initiate high flow monitoring

Kimball Brook

- Continue with current sampling plan

Thorp Brook

- Continue with current sampling plan

Holmes Brook

- In view of the frequency of lack of flow, it is recommended that monitoring of water quality be suspended unless i) there is a change to agricultural use of the watershed, and ii) high flows are targeted.

ANNEX I

Sampling Stations

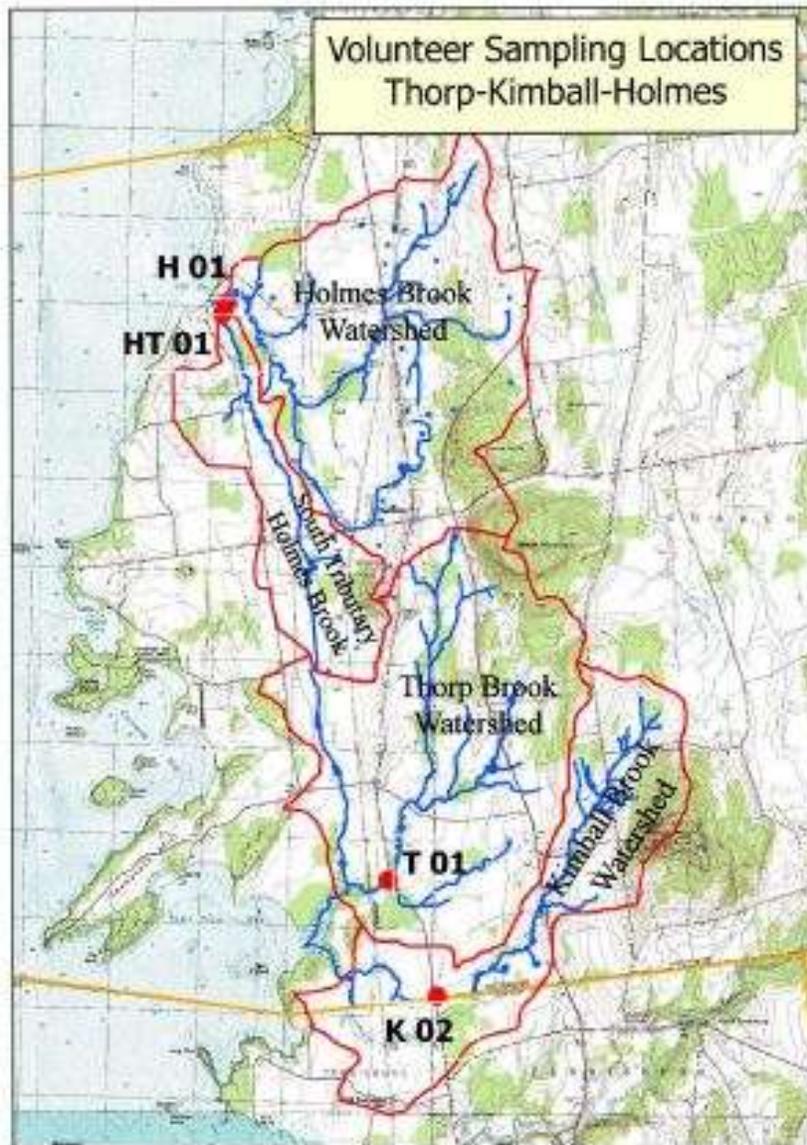
ANNEX IA

Station Descriptions

Site ID	Site Location	Site Latitude	Site Longitude	Upstream Area (mi2)	Staff Guage
T 01	T 01 - Thorp Brook at Greenbush Road	44.273073	-73.256597	2.93	Y
K 02	K 02 - Kimball Brook at Greenbush Road	44.25836	-73.249661	1.87	Y
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	N
HT 01	The first tributary feeding into Holmes Brook upstream from the mouth. Downstream from Mouth.	44.331389	-73.280556	1.71	N

ANNEX IB

Map



ANNEX II-A

Raw Data: Final – 2013

Thorp Brook Data
T 01 – Thorp Brook at Greenbush Road

Solids Concentrations in Thorp Brook - 2013

	5/27/2013	7/9/2013	9/3/2013	9/13/2013	10/8/2013	Median	Low	High
TSS	60.2	33.3	31.4	52.8	67.5	52.8	31.4	67.5
Turbidity	66.8	33.3	29.4	55.9	110	55.9	29.4	110
Sp Turbidity	1.11	1.00	0.94	1.06	1.63	1.06	0.94	1.63

Phosphorus Concentrations in Thorp Brook - 2013

	5/27/2013	7/9/2013	9/3/2013	9/13/2013	10/8/2013	Median	Low	High
TP	104		81	105	224	104.5	81	224
PP	78.6		44.7	72.1	142.1	75.35	44.7	142.1
DP	25.4	50.3	36.3	32.9	81.9	36.3	25.4	81.9
TSS	60.2	33.3	31.4	52.8	67.5	52.8	31.4	67.5
PP/TSS	1.31		1.42	1.37	2.11	1.39	1.31	2.11
%DP	24.42		44.81	31.33	36.56	33.95	24.42	44.81

Nitrogen Concentrations in Thorp Brook - 2013

	5/27/2013	7/9/2013	9/3/2013	9/13/2013	10/8/2013	Median	Low	High
TN	0.69	0.66	0.41	0.51	0.76	0.66	0.41	0.76
NOx	0.33	0.21	0.05	0.07	0.11	0.11	0.05	0.33

Kimball Brook Data
K 02 – Kimball Brook at Greenbush Road

Solids Concentrations in Kimball Brook - 2013

	5/27/2013	7/9/2013	9/3/2013	9/13/2013	10/8/2013	Median	Low	High
TSS	36.2	5.11	22.8	42	10.2	22.8	5.11	42
Turbidity	42.5		30.2	40.6	21.1	35.4	21.1	42.5
Specific Turbidity	1.17		1.32	0.97	2.07	1.25	0.97	2.07

Phosphorus Concentrations in Kimball Brook - 2013

	5/27/2013	7/9/2013	9/3/2013	9/13/2013	10/8/2013	Median	Low	High
TP	123	70.4	96.3	153	198	123	70.4	198
PP	74.9	10.5	46.2	75.1	56	56	10.5	75.1
DP	48.1	59.9	50.1	77.9	142	59.9	48.1	142
TSS	36.2	5.11	22.8	42	10.2	22.8	5.11	42
PP/TSS	2.07	2.05	2.03	1.79	5.49	2.05	1.79	5.49
%DP	39.11	85.09	52.02	50.92	71.72	52.02	39.11	85.09

Nitrogen Concentrations in Kimball Brook - 2013

	5/27/2013	7/9/2013	9/3/2013	9/13/2013	10/8/2013	Median	Low	High
TN	0.44	0.46	0.52	0.76	0.74	0.52	0.44	0.76
NOx	0.13	<0.05	0.06	<0.05	<0.05	0.095	<0.05	0.13

Thorp and Kimball Brooks Nutrient and Solids Loadings

Nutrient and Total Suspended Solids Loadings in Thorp Brook at Greenbush Road based on Drainage Area, 2013

Date	Flow (cfs)	Flow Per mi ²	Total Phosphorus (kg/day/mi ²)	Particulate Phosphorus (kg/day/mi ²)	Dissolved Phosphorus (kg/day/mi ²)	Total Suspended Solids (kg/day/mi ²)
5/27/2013	9.30	3.17	0.81	0.61	0.20	467.41
7/9/2013	5.52	1.88			0.23	153.40
9/13/2013	3.62	1.24	0.32	0.22	0.10	159.74
10/8/2013	1.56	0.53	0.29	0.19	0.11	88.03
9/3/2013	0.76	0.26	0.05	0.03	0.02	19.99

Nutrient and Total Suspended Solids Loadings in Kimball Brook at Greenbush Road based on Drainage Area, 2013

Date	Flow (cfs)	Flow Per mi ²	Total Phosphorus (kg/day/mi ²)	Particulate Phosphorus (kg/day/mi ²)	Dissolved Phosphorus (kg/day/mi ²)	Total Suspended Solids (kg/day/mi ²)
5/27/2013	4.39	2.35	0.71	0.43	0.28	207.75
7/9/2013	1.11	0.60	0.10	0.02	0.09	7.44
9/13/2013	0.41	0.22	0.08	0.04	0.04	22.78
10/8/2013	0.41	0.22	0.11	0.03	0.08	5.53
9/3/2013	0.10	0.05	0.01	0.01	0.01	2.98

Holmes Creek Watershed Data

Solids Concentrations in the Holmes Creek Watershed - 2013

		5/27/2013	7/9/2013	9/3/2013	9/13/2013	10/8/2013	Median	Minimum	Maximum
H 01	TSS	8.78	35	No Flow	37.2		35	8.78	37.2
	Turbidity	14.7	40.5		38.4	38.4	14.7	40.5	
	Turbidity/TSS	1.67	1.16		1.03	1.16	1.03	1.67	
H 02	TSS					64.3			
	Turbidity					68			
	Turbidity/TSS					1.06			
HT 01	TSS	17.6	15.3	No Flow	37.2	51.5	27.4	15.3	51.5
	Turbidity	28			51	69.2	51	28	69.2
	Turbidity/TSS	1.59			1.37	1.34	1.37	1.34	1.59

Phosphorus Concentrations in the Holmes Creek Watershed - 2013

		5/27/2013	7/9/2013	9/3/2013	9/13/2013	10/8/2013	Median	Minimum	Maximum
H 01	TP	44.2	104	No Flow	91.5		91.5	44.2	104
	PP	17.3	65.2		68.7	65.2	17.3	68.7	
	DP	26.9	38.8		22.8	26.9	22.8	38.8	
	TSS	8.78	35		37.2	35	8.78	37.2	
	PP/TSS	1.97	1.86		1.85	1.86	1.85	1.97	
H 02	TP					154			
	PP					131.2			
	DP					22.8			
	TSS					64.3			
	PP/TSS					2.04			
HT 01	TP	78.6	130	No Flow	103	274	116.5	78.6	274
	PP	31.1	43.3		77.9	123	60.6	31.1	123
	DP	47.5	86.7		25.1	151	67.1	25.1	151
	TSS	17.6	15.3		37.2	51.5	27.4	15.3	51.5
	PP/TSS	1.77	2.83		2.09	2.39	2.24	1.77	2.83

Nitrogen Concentrations in the Holmes Creek Watershed - 2013

	Station No.	5/27/2013	7/9/2013	9/3/2013	9/13/2013	10/8/2013	Median	Minimum	Maximum
TN	H 01	0.41	0.6	No Flow	0.86		0.6	0.41	0.86
	H 02						0.81		
	HT 01	0.76	0.83		0.87	1.01	0.85	0.76	1.01
NOx	H 01	0.07	<0.05	No Flow	<0.05		<0.05	<0.05	0.07
	H 02						<0.05		
	HT 01	0.25	0.07		<0.05	<0.05	0.16	<0.05	0.25

ANNEX III-A

Quality Control Analysis - 2013

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
Chlorides	MB 05 - McCabes Brook at Lime Kiln Road	5/27/2013	9.25	mg/L	0.0200	0.0200	9.2400	0.2165
	MB 05 DUP - McCabes Brook at Lime Kiln Road	5/27/2013	9.23	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	5/27/2013	10	mg/L	0.0400	0.0400	9.9800	0.4008
	LP 05 DUP - LaPlatte River at Carpenter Road	5/27/2013	9.96	mg/L				
	MB05 - McCabes Brook at Lime Kiln Road	7/9/2013	11.4	mg/L	0.2000	0.2000	11.3000	1.7699
	MB05 DUP - McCabes Brook at Lime Kiln Road	7/9/2013	11.2	mg/L				
	LP03 - LaPlatte River at Falls Road	7/9/2013	14.2	mg/L	0.0000	0.0000	14.2000	0.0000
	LP03 DUP - LaPlatte River at Falls Road	7/9/2013	14.2	mg/L				
	LP05 - LaPlatte River at Carpenter Road	7/9/2013	13.6	mg/L	-0.1000	0.1000	13.6500	0.7326
	LP05 DUP - LaPlatte River at Carpenter Rd	7/9/2013	13.7	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	9/13/2013	14.5	mg/L	0.2000	0.2000	14.4000	1.3889
	MB 05 DUP - McCabes Brook at Lime Kiln Road	9/13/2013	14.3	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	9/13/2013	24.5	mg/L	0.2000	0.2000	24.4000	0.8197
	LP 05 DUP - LaPlatte River at Carpenter Road	9/13/2013	24.3	mg/L				
	H 01 - Holmes Creek behind Tennis Court below pond	9/13/2013	19.7	mg/L	0.3000	0.3000	19.5500	1.5345
	H 01 DUP - Holmes Creek behind Tennis Court below	9/13/2013	19.4	mg/L				

MB 05 - McCabes Brook at Lime Kiln Road	9/3/2013	14.7	mg/L	-0.3000	0.3000	14.8500	2.0202
MB 05 DUP - McCabes Brook at Lime Kiln Road	9/3/2013	15	mg/L				
LP 05 - LaPlatte River at Carpenter Road	9/3/2013	31.2	mg/L	-0.4000	0.4000	31.4000	1.2739
LP 05 DUP - LaPlatte River at Carpenter Road	9/3/2013	31.6	mg/L				
MB 04a - McCabes Brook at Teddy Bear Access Road	10/8/2013	25	mg/L	0.7000	0.7000	24.6500	2.8398
MB 04a - DUP McCabes Brook at Teddy Bear Access Rd	10/8/2013	24.3	mg/L				
LP 05 - LaPlatte River at Carpenter Road	10/8/2013	30.1	mg/L	0.7000	0.7000	29.7500	2.3529
LP 05 DUP - LaPlatte River at Carpenter Road	10/8/2013	29.4	mg/L				

Mean 1.28

Target 10%

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
Turbidity	MB 05 - McCabes Brook at Lime Kiln Road	5/27/2013	9.25	NTU	-1.3500	1.3500	9.9250	13.6020
	MB 05 DUP - McCabes Brook at Lime Kiln Road	5/27/2013	10.6	NTU				
	LP 05 - LaPlatte River at Carpenter Road	5/27/2013	12.5	NTU	-1.1000	1.1000	13.0500	8.4291
	LP 05 DUP - LaPlatte River at Carpenter Road	5/27/2013	13.6	NTU				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	5/27/2013	14.7	NTU	-0.9000	0.9000	15.1500	5.9406
	H 01 DUP - Holmes Crk bnd Tennis Crt Blw Pond	5/27/2013	15.6	NTU				
	MB05 - McCabes Brook at Lime Kiln Road	7/9/2013	7.99	NTU	0.5200	0.5200	7.7300	6.7270
	MB05 DUP - McCabes Brook at Lime Kiln Road	7/9/2013	7.47	NTU				
	LP03 - LaPlatte River at Falls Road	7/9/2013	13.4	NTU	-2.0000	2.0000	14.4000	13.8889
	LP03 DUP - LaPlatte River at Falls Road	7/9/2013	15.4	NTU				
	MB 05 - McCabes Brook at Lime Kiln Road	9/3/2013	41.8	NTU	3.4000	3.4000	40.1000	8.4788
	MB 05 DUP - McCabes Brook at Lime Kiln Road	9/3/2013	38.4	NTU				
	LP 05 - LaPlatte River at Carpenter Road	9/3/2013	12.7	NTU	0.7000	0.7000	12.3500	5.6680

LP 05 DUP - LaPlatte River at Carpenter Road	9/3/2013	12	NTU				
MB 05 - McCabes Brook at Lime Kiln Road	9/13/2013	28.2	NTU	-0.3000	0.3000	28.3500	1.0582
MB 05 DUP - McCabes Brook at Lime Kiln Road	9/13/2013	28.5	NTU				
LP 05 - LaPlatte River at Carpenter Road	9/13/2013	66.8	NTU	-8.5000	8.5000	71.0500	11.9634
LP 05 DUP - LaPlatte River at Carpenter Road	9/13/2013	75.3	NTU				
H 01 - Holmes Creek behind Tennis Court below pond	9/13/2013	38.4	NTU	2.4000	2.4000	37.2000	6.4516
H 01 DUP - Holmes Creek behind Tennis Court below	9/13/2013	36	NTU				
MB 04a - McCabes Brook at Teddy Bear Access Road	10/8/2013	24.5	NTU	-1.4000	1.4000	25.2000	5.5556
MB 04a - DUP McCabes Brook at Teddy Bear Access Rd	10/8/2013	25.9	NTU				
LP 05 - LaPlatte River at Carpenter Road	10/8/2013	39.1	NTU	-0.2000	0.2000	39.2000	0.5102
LP 05 DUP - LaPlatte River at Carpenter Road	10/8/2013	39.3	NTU				
H 02 - Holmes Creek behind Tennis Court below pond	10/8/2013	68	NTU	-1.5000	1.5000	68.7500	2.1818
H 02 DUP - Holmes Creek behind Tennis Court below	10/8/2013	69.5	NTU				

Mean 10.20
Target 15%

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
TSS	MB 05 - McCabes Brook at Lime Kiln Road	5/27/2013	10.7	mg/l	-0.1000	0.1000	10.7500	0.9302
	MB 05 DUP - McCabes Brook at Lime Kiln Road	5/27/2013	10.8	mg/l				
	LP 05 - LaPlatte River at Carpenter Road	5/27/2013	12.3	mg/l	-2.9000	2.9000	13.7500	21.0909
	LP 05 DUP - LaPlatte River at Carpenter Road	5/27/2013	15.2	mg/l				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	5/27/2013	8.78	mg/L	-0.4400	0.4400	9.0000	4.8889
	H 01 DUP - Holmes Crk bnd Tennis Crt Blw Pond	5/27/2013	9.22	mg/L				
	MB05 - McCabes Brook at Lime Kiln Road	7/9/2013	5.57	mg/L	-0.9000	0.9000	6.0200	14.9502
	MB05 DUP - McCabes Brook at Lime Kiln Road	7/9/2013	6.47	mg/L				

LP05 - LaPlatte River at Carpenter Road	7/9/2013	18.8	mg/L	0.8000	0.8000	18.4000	4.3478
LP05 DUP - LaPlatte River at Carpenter Rd	7/9/2013	18	mg/L				
H01-Holmes Creek	7/9/2013	35	mg/L	4.2000	4.2000	32.9000	12.7660
H01 DUP - Holmes Crk behind Tennis Court below Pond	7/9/2013	30.8	mg/L				
MB 05 - McCabes Brook at Lime Kiln Road	9/3/2013	32.2	mg/L	0.0000	0.0000	32.2000	0.0000
MB 05 DUP - McCabes Brook at Lime Kiln Road	9/3/2013	32.2	mg/L				
LP 05 - LaPlatte River at Carpenter Road	9/3/2013	15.2	mg/l	0.6000	0.6000	14.9000	4.0268
LP 05 DUP - LaPlatte River at Carpenter Road	9/3/2013	14.6	mg/l				
MB 05 - McCabes Brook at Lime Kiln Road	9/13/2013	18.2	mg/L	-1.2000	1.2000	18.8000	6.3830
MB 05 DUP - McCabes Brook at Lime Kiln Road	9/13/2013	19.4	mg/L				
LP 05 - LaPlatte River at Carpenter Road	9/13/2013	79.2	mg/L	7.6000	7.6000	75.4000	10.0796
LP 05 DUP - LaPlatte River at Carpenter Road	9/13/2013	71.6	mg/L				
H 01 - Holmes Creek behind Tennis Court below pond	9/13/2013	37.2	mg/L	1.6000	1.6000	36.4000	4.3956
H 01 DUP - Holmes Creek behind Tennis Court below	9/13/2013	35.6	mg/L				
MB 04a - McCabes Brook at Teddy Bear Access Road	10/8/2013	22.6	mg/L	0.6000	0.6000	22.3000	2.6906
MB 04a - DUP McCabes Brook at Teddy Bear Access Rd	10/8/2013	22	mg/L				
LP 05 - LaPlatte River at Carpenter Road	10/8/2013	27.8	mg/L	-2.2000	2.2000	28.9000	7.6125
LP 05 DUP - LaPlatte River at Carpenter Road	10/8/2013	30	mg/L				
H 02 - Holmes Creek behind Tennis Court below pond	10/8/2013	64.3	mg/L	3.3000	3.3000	62.6500	5.2674
H 02 DUP - Holmes Creek behind Tennis Court below	10/8/2013	61	mg/L				
						Mean	9.95
						Target	15%

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
Total P	LP 05 - LaPlatte River at Carpenter Road	5/27/2013	49.9	µg P/L	-0.9000	0.9000	50.3500	1.7875
	LP 05 DUP - LaPlatte River at Carpenter Road	5/27/2013	50.8	µg P/L				

H 01 - Holmes Creek Behind Tennis Court Below Pond	5/27/2013	44.2	µg P/L	-2.8000	2.8000	45.6000	6.1404
H 01 DUP - Holmes Crk bnd Tennis Crt Blw Pond	5/27/2013	47	µg P/L				
MB05 - McCabes Brook at Lime Kiln Road	7/9/2013	66.8	µg P/L	-0.7000	0.7000	67.1500	1.0424
MB05 DUP - McCabes Brook at Lime Kiln Road	7/9/2013	67.5	µg P/L				
LP03 - LaPlatte River at Falls Road	7/9/2013	66.7	µg P/L	-0.2000	0.2000	66.8000	0.2994
LP03 DUP - LaPlatte River at Falls Road	7/9/2013	66.9	µg P/L				
LP05 - LaPlatte River at Carpenter Road	7/9/2013	65.9	µg P/L	-3.9000	3.9000	67.8500	5.7480
LP05 DUP - LaPlatte River at Carpenter Rd	7/9/2013	69.8	µg P/L				
H01-Holmes Creek	7/9/2013	104	µg P/L	2.0000	2.0000	103.0000	1.9417
H01 DUP - Holmes Crk behind Tennis Court below Pond	7/9/2013	102	µg P/L				
MB 05 - McCabes Brook at Lime Kiln Road	9/3/2013	108	µg P/L	4.0000	4.0000	106.0000	3.7736
MB 05 DUP - McCabes Brook at Lime Kiln Road	9/3/2013	104	µg P/L				
LP 05 - LaPlatte River at Carpenter Road	9/3/2013	57.7	µg P/L	-0.4000	0.4000	57.9000	0.6908
LP 05 DUP - LaPlatte River at Carpenter Road	9/3/2013	58.1	µg P/L				
MB 05 - McCabes Brook at Lime Kiln Road	9/13/2013	135	µg P/L	-2.0000	2.0000	136.0000	1.4706
MB 05 DUP - McCabes Brook at Lime Kiln Road	9/13/2013	137	µg P/L				
LP 05 - LaPlatte River at Carpenter Road	9/13/2013	184	µg P/L	2.0000	2.0000	183.0000	1.0929
LP 05 DUP - LaPlatte River at Carpenter Road	9/13/2013	182	µg P/L				
H 01 - Holmes Creek behind Tennis Court below pond	9/13/2013	91.5	µg P/L	-2.6000	2.6000	92.8000	2.8017
H 01 DUP - Holmes Creek behind Tennis Court below	9/13/2013	94.1	µg P/L				
MB 04a - McCabes Brook at Teddy Bear Access Road	10/8/2013	158	µg P/L	1.0000	1.0000	157.5000	0.6349
MB 04a - DUP McCabes Brook at Teddy Bear Access Rd	10/8/2013	157	µg P/L				
LP 05 - LaPlatte River at Carpenter Road	10/8/2013	148	µg P/L	4.0000	4.0000	146.0000	2.7397
LP 05 DUP - LaPlatte River at Carpenter Road	10/8/2013	144	µg P/L				
H 02 - Holmes Creek behind Tennis Court below pond	10/8/2013	154	µg P/L	-2.0000	2.0000	155.0000	1.2903
H 02 DUP - Holmes Creek behind Tennis Court below	10/8/2013	156	µg P/L				

Mean 2.25
Target 15%

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
Dissolved P	LP 05 - LaPlatte River at Carpenter Road	5/27/2013	25.8	µg P/L	0.8000	0.8000	25.4000	3.1496
	LP 05 DUP - LaPlatte River at Carpenter Road	5/27/2013	25	µg P/L				
	MB 05 - McCabes Brook at Lime Kiln Road	5/27/2013	23.9	µg P/L	-0.2000	0.2000	24.0000	0.8333
	MB 05 DUP - McCabes Brook at Lime Kiln Road	5/27/2013	24.1	µg P/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	5/27/2013	26.9	µg P/L	0.4000	0.4000	26.7000	1.4981
	H 01 DUP - Holmes Crk bnd Tennis Crt Blw Pond	5/27/2013	26.5	µg P/L				
	MB05 - McCabes Brook at Lime Kiln Road	7/9/2013	48.9	µg P/L	0.1000	0.1000	48.8500	0.2047
	MB05 DUP - McCabes Brook at Lime Kiln Road	7/9/2013	48.8	µg P/L				
	LP03 - LaPlatte River at Falls Road	7/9/2013	35.8	µg P/L	0.3000	0.3000	35.6500	0.8415
	LP03 DUP - LaPlatte River at Falls Road	7/9/2013	35.5	µg P/L				
	LP05 - LaPlatte River at Carpenter Road	7/9/2013	34	µg P/L	0.7000	0.7000	33.6500	2.0802
	LP05 DUP - LaPlatte River at Carpenter Rd	7/9/2013	33.3	µg P/L				
	H01-Holmes Creek	7/9/2013	38.8	µg P/L	1.0000	1.0000	38.3000	2.6110
	H01 DUP - Holmes Crk behind Tennis Court below Pond	7/9/2013	37.8	µg P/L				
	LP 05 - LaPlatte River at Carpenter Road	9/3/2013	31.9	µg P/L	-1.4000	1.4000	32.6000	4.2945
	LP 05 DUP - LaPlatte River at Carpenter Road	9/3/2013	33.3	µg P/L				
	MB 05 - McCabes Brook at Lime Kiln Road	9/13/2013	82.9	µg P/L	0.4000	0.4000	82.7000	0.4837
	MB 05 DUP - McCabes Brook at Lime Kiln Road	9/13/2013	82.5	µg P/L				
	LP 05 - LaPlatte River at Carpenter Road	9/13/2013	72.1	µg P/L	-0.6000	0.6000	72.4000	0.8287
	LP 05 DUP - LaPlatte River at Carpenter Road	9/13/2013	72.7	µg P/L				
	H 01 - Holmes Creek behind Tennis Court below pond	9/13/2013	22.8	µg P/L	0.3000	0.3000	22.6500	1.3245
	H 01 DUP - Holmes Creek behind Tennis Court below	9/13/2013	22.5	µg P/L				
	MB 04a - McCabes Brook at Teddy Bear Access Road	10/8/2013	64.5	µg P/L	-0.4000	0.4000	64.7000	0.6182
	MB 04a - DUP McCabes Brook at Teddy Bear Access Rd	10/8/2013	64.9	µg P/L				
	LP 05 - LaPlatte River at Carpenter Road	10/8/2013	67.5	µg P/L	-1.5000	1.5000	68.2500	2.1978
	LP 05 DUP - LaPlatte River at Carpenter Road	10/8/2013	69	µg P/L				
H 02 - Holmes Creek behind Tennis Court below pond	10/8/2013	22.8	µg P/L	-1.4000	1.4000	23.5000	5.9574	
H 02 DUP - Holmes Creek behind Tennis Court below	10/8/2013	24.2	µg P/L					

Mean 1.92
Target 15%

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
Total N	MB 05 - McCabes Brook at Lime Kiln Road	5/27/2013	0.36	mg/L	-0.0100	0.0100	0.3650	2.7397
	MB 05 DUP - McCabes Brook at Lime Kiln Road	5/27/2013	0.37	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	5/27/2013	0.41	mg/L	0.0400	0.0400	0.3900	10.2564
	LP 05 DUP - LaPlatte River at Carpenter Road	5/27/2013	0.37	mg/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	5/27/2013	0.41	mg/L	0.0000	0.0000	0.4100	0.0000
	H 01 DUP - Holmes Crk bnd Tennis Crt Blw Pond	5/27/2013	0.41	mg/L				
	MB05 - McCabes Brook at Lime Kiln Road	7/9/2013	0.57	mg/L	0.0100	0.0100	0.5650	1.7699
	MB05 DUP - McCabes Brook at Lime Kiln Road	7/9/2013	0.56	mg/L				
	LP03 - LaPlatte River at Falls Road	7/9/2013	0.5	mg/L	0.0100	0.0100	0.4950	2.0202
	LP03 DUP - LaPlatte River at Falls Road	7/9/2013	0.49	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	9/3/2013	0.65	mg/L	0.0100	0.0100	0.6450	1.5504
	MB 05 DUP - McCabes Brook at Lime Kiln Road	9/3/2013	0.64	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	9/3/2013	0.56	mg/L	0.0000	0.0000	0.5600	0.0000
	LP 05 DUP - LaPlatte River at Carpenter Road	9/3/2013	0.56	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	9/13/2013	1.03	mg/L	0.0000	0.0000	1.0300	0.0000
	MB 05 DUP - McCabes Brook at Lime Kiln Road	9/13/2013	1.03	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	9/13/2013	1.03	mg/L	-0.0500	0.0500	1.0550	4.7393
	LP 05 DUP - LaPlatte River at Carpenter Road	9/13/2013	1.08	mg/L				
	H 01 - Holmes Creek behind Tennis Court below pond	9/13/2013	0.86	mg/L	-0.2700	0.2700	0.9950	27.1357
	H 01 DUP - Holmes Creek behind Tennis Court below	9/13/2013	1.13	mg/L				
MB 04a - McCabes Brook at Teddy Bear Access Road	10/8/2013	0.85	mg/L	0.0100	0.0100	0.8450	1.1834	
MB 04a - DUP McCabes Brook at Teddy Bear Access Rd	10/8/2013	0.84	mg/L					

LP 05 - LaPlatte River at Carpenter Road	10/8/2013	0.69	mg/L	0.0100	0.0100	0.6850	1.4599
LP 05 DUP - LaPlatte River at Carpenter Road	10/8/2013	0.68	mg/L				
H 02 - Holmes Creek behind Tennis Court below pond	10/8/2013	0.81	mg/L	0.0100	0.0100	0.8050	1.2422
H 02 DUP - Holmes Creek behind Tennis Court below	10/8/2013	0.8	mg/L				
						Mean	4.16
						Target	15%

Parameter	Station	Date	Results		(S-D)	Absolute Value (S-D)	(S + D)/2	RPD
			Value	Units				
NOx	MB 05 - McCabes Brook at Lime Kiln Road	5/27/2013	0.05	mg/L	0.0000	0.0000	0.0500	0.0000
	MB 05 DUP - McCabes Brook at Lime Kiln Road	5/27/2013	0.05	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	5/27/2013	0.06	mg/L	0.0000	0.0000	0.0600	0.0000
	LP 05 DUP - LaPlatte River at Carpenter Road	5/27/2013	0.06	mg/L				
	H 01 - Holmes Creek Behind Tennis Court Below Pond	5/27/2013	0.07	mg/L	0.0000	0.0000	0.0700	0.0000
	H 01 DUP - Holmes Crk bnd Tennis Crk Blw Pond	5/27/2013	0.07	mg/L				
	MB05 - McCabes Brook at Lime Kiln Road	7/9/2013	0.05	mg/L	0.0000	0.0000	0.0500	0.0000
	MB05 DUP - McCabes Brook at Lime Kiln Road	7/9/2013	0.05	mg/L				
	LP03 - LaPlatte River at Falls Road	7/9/2013	0.12	mg/L	0.0000	0.0000	0.1200	0.0000
	LP03 DUP - LaPlatte River at Falls Road	7/9/2013	0.12	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	9/3/2013	0.06	mg/L	0.0000	0.0000	0.0600	0.0000
	MB 05 DUP - McCabes Brook at Lime Kiln Road	9/3/2013	0.06	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	9/3/2013	0.2	mg/L	-0.0100	0.0100	0.2050	4.8780
	LP 05 DUP - LaPlatte River at Carpenter Road	9/3/2013	0.21	mg/L				
	MB 05 - McCabes Brook at Lime Kiln Road	9/13/2013	0.21	mg/L	0.0200	0.0200	0.2000	10.0000
	MB 05 DUP - McCabes Brook at Lime Kiln Road	9/13/2013	0.19	mg/L				
	LP 05 - LaPlatte River at Carpenter Road	9/13/2013	0.13	mg/L	0.0100	0.0100	0.1250	8.0000
	LP 05 DUP - LaPlatte River at Carpenter Road	9/13/2013	0.12	mg/L				
	H 01 - Holmes Creek behind Tennis Court below pond	9/13/2013	0.05	mg/L	0.0000	0.0000	0.0500	0.0000
	H 01 DUP - Holmes Creek behind Tennis Court below	9/13/2013	0.05	mg/L				
MB 04a - McCabes Brook at Teddy Bear Access Road	10/8/2013	0.06	mg/L	0.0000	0.0000	0.0600	0.0000	
MB 04a - DUP McCabes Brook at Teddy Bear Access Rd	10/8/2013	0.06	mg/L					

Blanks

	Chloride	TSS	Turbidity	TP	DP	TN	NOx
5/27/2013	<2	<1	0.13	<5	<5	<0.1	<0.05
7/9/2013	<2	<1	<0.2	<5	<5	<0.1	<0.05
9/3/2013	-	-	-	-	-	-	-
9/13/2013	-	-	-	-	-	-	-
10/8/2013	<2	<1	<0.2	<5	<5	<0.1	<0.05

Summary of Percent Differences

Parameter	Target Precision	Mean RPD
Chloride	10%	1.28
Turbidity	15%	10.20
TSS	15%	9.95
Total P	15%	2.25
Diss. P	15%	1.92
Total N	15%	4.07
NOx	10%	1.76