

**WATER QUALITY ASSESSMENT REPORT  
FOR THE  
SAGINAW CHIPPEWA INDIAN TRIBE**

**Clean Water Act Section 106**

Grant #: I - 00E57602 October 1, 2004 - December 31, 2012



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**January 30, 2013**

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## **Acronyms and Abbreviations**

EPA	Environmental Protection Agency
QAPP	Quality Assurance Project Plan
SCIT	Saginaw Chippewa Indian Tribe
WQS	Water Quality Standards
CWA	Clean Water Act
CWA 106	Clean Water Act, Section 106 Program
CWA 319	Clean Water Act, Section 319 Program
<i>E. coli</i>	<i>Escherichia coli</i>
SOM	State of Michigan
DO	Dissolved Oxygen (mg/L)
%DO	Percent Oxygen Saturation
Temp	Temperature in Degrees Celsius
Turb	Turbidity (NTU)
S.C. or SpC	Specific Conductivity (mS/cm)
TDS	Total Dissolved Solids (mg/L)
TP	Total Phosphorus ( $\mu\text{g/L}$ )
TN	Total Nitrogen (mg/L)
BOD	Biological Oxygen Demand (mg/L)
TSS	Total Suspended Solids (mg/L)
NH <sub>3</sub>	Ammonia (mg/L)
MPN	Most Probable Number
CFS	Cubic Feet per Second

## SECTION 3 ATLAS OF TRIBAL WATER RESOURCES

### 3.1 OVERVIEW OF RESERVATION

The Saginaw Chippewa Indian Tribe (SCIT) is a federally recognized Indian Tribe. Current Tribal enrollment is 3,576 members. Of the approximate 3,500 members 1,650 live on tribally owned lands on the Isabella Reservation. The Isabella Reservation covers approximately 138,240 acres of land including fee land. The Isabella District encompasses major portions of six townships in Isabella County. The Saganing District is located in a rural setting 70 miles east on the shores of Lake Huron in Arenac County. Allotted land is scattered throughout both reservations. The majority of the land is fee land, meaning not tribally owned.



**Figure 1.** SCIT Locator Map

The assessment report focuses on the Main Branch of the Chippewa River and North Branch of the Chippewa River. The Assessment Report also covers Grewes Lake bacteria samples. It is the intention of the SCIT to monitor and report on the Salt River in the 2013 sampling season.

The Chippewa River watershed drains 288,252 acres and 23.3 percent of that watershed lies within the SCIT tribal boundaries. The Coldwater River drains to the Chippewa River watershed and 7,777 acres of that watershed lie within the Isabella Reservation. The Salt River extends 57.5 miles and drains 64,584 acres of the Isabella Reservation.

**Table 2. Drainage Basins**

Name	Drainage Acres inside of Reservation
Chippewa River	67,163
Coldwater River	7,777
North Branch of Chippewa River	27,008
Saganing River	19,200

**Table 1. Tribal Water Atlas**

Total miles of Rivers and Drains	571
Total number of lake acres (total does not include Lake Huron)	403
Total number of wetland acres	6547

### 3.2 ENVIRONMENTAL ISSUES

The people of the SCIT have relied on the water resources of the Saginaw Bay Watershed for centuries. Traditions continue today that rely on healthy aquatic systems including hunting, fishing, and gathering. Significant resources that are water dependent include Black Ash, Wild Rice, Sweetgrass, many fish and wildlife species, etc. Water resources continue to be a focus for the Tribal Community. The community uses water resources for drinking, recreating, and ceremonial purposes.

The Tribe continues to experience growth and development, directly correlating with continued growth of the surrounding communities. The downside is the ever increasing pressure on the natural resources of the reservation. To continue planning and understanding the effects of development, the tribe is building long-term water quality database including physical, chemical, and biological parameters. These efforts help to determine the impact, current state, and maintain an awareness of any emergency situations, on the water resources of the Saginaw Chippewa Indian Tribe of Michigan (SCIT).

## SECTION 4 WATER QUALITY MONITORING PROGRAM AND ASSESSMENT METHODS

### 4.1 INTRODUCTION

The purpose of the Saginaw Chippewa Indian Tribal water quality monitoring and assessment program is to determine the current health and condition of the tribe’s waters. The monitoring program assesses whether the thresholds specified in Analytical Techniques and Reference Point (**Table 5**) are being met. A baseline study has been underway for tribal waters since 2004, resulting in the collection of nine seasons of data on a limited amount of tribal waters. The program is evolving to cover more waters by becoming a rotational basin approach. The river systems will be revisited every five years to determine any changes, and continue to monitor the health of the systems.

Annually fixed stations will be monitored at specific points along the main branch of the Chippewa River running through the Isabella Reservation. It is the intention of SCIT to start a CWA Section 319 Program to support the restoration activities necessary to make improvements to the systems. The fixed sites will also be used to evaluate the impact of those restoration activities.

**Table 3. Water Quality Objectives**

Base Program	<ul style="list-style-type: none"> <li>- Evaluate expansion of monitoring to lakes and wetlands in the future</li> <li>- Establish, update, and maintain necessary documentation for grant status of CWA 106 Program</li> <li>- Develop Clean Water Act 319 Program</li> </ul>
Water Quality Monitoring	<ul style="list-style-type: none"> <li>- Determine current status of tribal waters using a minimum of 5 years measuring a combination of the following parameters               <ul style="list-style-type: none"> <li>o Biological – <i>E. coli</i>, macroinvertebrate, Habitat Assessment</li> <li>o Physical – Velocity, Temperature, pH, Dissolved Oxygen, Total Suspended Solids, Specific Conductance</li> <li>o Chemical – Total Phosphorous, Total Nitrogen</li> </ul> </li> <li>- Maintain a database of monitoring locations and information collected concerning the water quality of tribal waters</li> <li>- Identify waters in need of restoration</li> <li>- Identify potential threats to human health due to water quality issues</li> <li>- To maintain and improve the Water Program established by the SCIT with support from the Environmental Protection Agency</li> <li>- Compare changes in trends in chemical water quality, biology and habitat</li> <li>- Monitor emergency situations as necessary (suspicious situations, spills, fish kills)</li> </ul>
Outreach &	<ul style="list-style-type: none"> <li>- Represent the tribe at technical meetings</li> </ul>

Education	<ul style="list-style-type: none"> <li>- Attend school events Collaborate with internal Tribal departments and external agencies and organizations to develop programs for improvement to degraded water, health risks for community members, potential contamination, etc.</li> <li>- Educate and build enthusiasm in community members concerning water quality, water issues, and water related activities</li> <li>- Make Tribal Community, including Tribal Council, aware of issues concerning water</li> </ul>
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#### 4.2 MONITORING PROGRAM OVERVIEW

All water quality monitoring is done by tribal water staff in the Planning Department of the SCIT. A QAPP has been approved by EPA through 2012. We follow the protocol outlined in the accepted QAPP to collect and analyze all data. The data for sampling seasons 2004 -2012 have been modified some each year according to QAPPs. There are some gaps in data collection due to program and staff transition. Data for Grewes Lake began to be collected in 2012. Starting in the 2012 sampling season the SCIT began on a rotation basin monitoring strategy to collect data from more water resources with limited time, staff, and resources. The 2012 sampling season concentrated on the North Branch of the Chippewa River. Fixed sites have been established to stay aware of any changes or issues over time. As other areas of interest develop – the fixed sites will be used for reference.

The following table reflects the designated uses with the parameters used to establish if references levels are being met for each designated use.

**Table 4. Designated Use and Determining Parameters**

Designated Use or Tribal Goal	Parameters to be Measure to Dertermin Support of Goal
Aquatic Life	Dissolved oxygen, pH, turbidity, temperature, macroinvertebrate, Total Nitrogen, Total Phosphorous
Wild Rice Reintroduction	Velocity, dissolved oxygen, specific conductance, pH, total nitrogen, total phosphorous
Recreation	<i>E. coli</i> , total dissolved solids, turbidity, total nitrogen, total phosphorous
Human Health	<i>E. coli</i> , total dissolved solids, turbidity, total nitrogen, total phosphorous

**Table 5. Analytical Techniques and Reference Points**

Parameter	Analytical Method	Action Level & Reference	Accuracy	Detection Range	Action Taken
Dissolved Oxygen	Hydrolab	≤4.99 mg/L SOM WQS - 53	± 0.1 mg/L @ ≤ 8 mg/L ± 0.2 mg/L @ > 8 mg/L ± 10% reading > 20 mg/	0-60 mg/L	Notify MDEQ and Tribal Council
Specific Conductivity	Hydrolab	>0.5 mS/cm USEPA Water Monitoring & Assessing Chapter 5; 5.9 Conductivity <a href="http://water.epa.gov/type/rs/monitoring/vms59.cfm">http://water.epa.gov/type/rs/monitoring/vms59.cfm</a>	±0.05% of reading ±0.001 mS/cm	0-100 mS/cm	Inform tribal Council for further direction
Temperature	Hydrolab	Warmwater fisheries – for a line between Bay City, Midland, Alma, north monthly maximum temps. ** see below SOM WQS	±0.10°C	-5-50°C	Inform Tribal Council and MDEQ staff
pH	Hydrolab	<6.5 and >9.0 SOM WQS	±0.2 units	0-14 units	Inform Tribal Council and MDEQ
Total P	Standard method 4500 P - E	>31.25 µg/L USEPA Nutrient Ecoregion Reference Conditions (Ecoregion 56)	N/A	10-250 µg/L	Inform Tribal Council and MDEQ
Turbidity	Hydrolab	Level IV Ecoregion 56: 14.5 NTU USEPA Nutrient Ecoregion Reference Conditions (Ecoregion VI, VII, and 56)	<i>Compared to StablCal</i> ± 1% up to 100 NTU ± 3% from 100 - 400 NTU ± 5% from 400 - 3,000 NTU	0-3000 NTU	Inform Tribal Council and MDEQ
Nitrate	Field Check – Test Strips	>1 mg/L Absence/presence	Gradation nitrate - N 0, 1, 2, 5, 10, 20, 50.	0-50 ppm	Send sample to lab for further analysis
Nitrite		➤ 0.15 mg/L ➤ Absence Presence	Gradation nitrite - N 0, 0.15, 0.3, 1, 1.5, 3	0-3.0 ppm	Send sample to lab for further analysis
TN	Persulfate Method Standard method 4500 –N C	>1.15. mg/L Based on the 25 <sup>th</sup> percentile for USEPA Ecoregion 56 EPA 822-B-00-018 AMBIENT WATER QUALITY CRITERIA RECOMMENDATIONS INFORMATION SUPPORTING THE DEVELOPMENT OF STATE AND TRIBAL NUTRIENT CRITERIA FOR RIVERS AND STREAMS IN NUTRIENT ECOREGION VII	±15%	3 -2500 µg/L	Inform Tribal Council and MDEQ
Macroinvertebrates	SOM P #51 – Manual Identification	0***	N/A	-4 to 4	Inform Tribal Council and MDEQ
Velocity	Standard AA Meter Wading Rod AquaCalc Pro see methods in section 4.1	TBD	±2% of reading + zero stability	-0.15 m/sec to +6 m/sec	Inform Tribal Council and MDEQ in the event of significant flooding or lack of water flowing in stream.
<i>E. coli</i>	Colilert – 24	Total body contact requires no more than 130 <i>E. coli</i> /100 mL as a	N/A	1-2496 CFU	Inform Tribal Council, Central



		30 day mL geometric mean and never over 300 <i>E. coli</i> /100 mL at any one time. Partial body contact is 1000 <i>E. coli</i> /100 SOM WQS			Michigan District Health Department, and MDEQ
TSS	Standard Method 2540 D	TBD	±2.8 mg/L	0 to 20,000 mg/L	Fluctuations from previous averages will be reviewed. Significant changes will be addressed with MDEQ and Tribal Council.
Ammonia	Standard Method NH <sub>3</sub> D	0.053 mg/l Rule 57 Water Quality Values Surface Water Assessment Section Michigan DEQ for Aquatic Life	±0.038, ±0.017, ±0.007, and ±0.003	0.03 to 1400 mg	Fluctuations from previous averages will be reviewed. Significant changes will be addressed with MDEQ and Tribal Council
BOD	Standard Method 5210	TBD	There is no measurement for establishing bias of the BOD procedure.	2m g/ L to = difference between the max initial DO) and min DO residual of 1 mg/L multiplied by the dilution factor.	Fluctuations from previous averages will be reviewed. Significant changes will be addressed with MDEQ and Tribal Council
Habitat	Procedure 51	***Poor			
TDS	Hydrolab	20 mg/L annual difference <a href="http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm#A2">http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm#A2</a>	0.2 ppt	0-70 ppt	Fluctuations from previous averages will be reviewed. Significant changes will be addressed with MDEQ and Tribal Council

**\*Table 6. Water Temperature Reference**

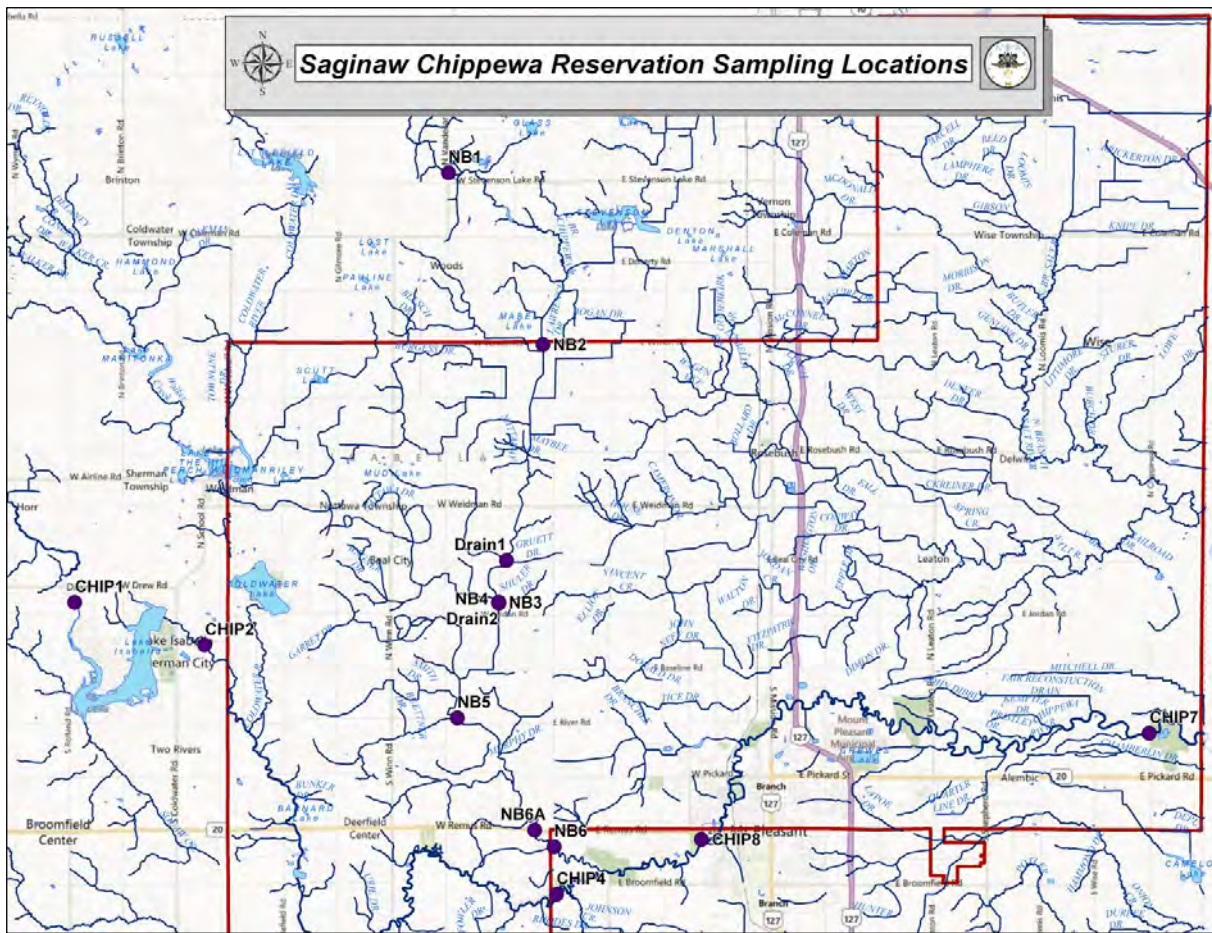
Water Temperature		Warmwater fisheries – for a line between Bay City, Midland, Alma, north monthly maximum temps.											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	°C	3.33	3.33	5	13.33	21.11	26.67	28.33	27.22	23.33	17.78	9.44	3.89
	°F	38	38	41	56	70	80	83	81	74	64	49	39

**Table 7. SCIT Sampling Stations with Data Collected**

River	Station ID	Monitoring Location Name	Years Sampled	Parameters Sampled*
Chippewa River	CHIP1	Rolland Rd at Chip	2004-2011	D.O., Temp, Turb., S.C., TDS, TP, TN, BOD, TSS, NH <sub>3</sub> , Discharge, and <i>E. coli</i>
	CHIP2	School Rd at Chip	2004-2012	D.O., Temp, Turb., S.C., TDS, TP, TN, BOD, TSS, NH <sub>3</sub> , Discharge and <i>E. coli</i>

River	Station ID	Monitoring Location Name	Years Sampled	Parameters Sampled*
	CHIP4	Meridian Rd at Chip	2010-2012	D.O., Temp, Turb., S.C., TDS, TP, TN, BOD, TSS, NH <sub>3</sub> , Discharge, and <i>E. coli</i>
	CHIP8	Chipp-A-Waters at Chip	2012	D.O., Temp, Turb., S.C., TDS, TP, TN, BOD, TSS, NH <sub>3</sub> , Discharge, and <i>E. coli</i>
	CHIP7	Chippewa Rd at Chip	2004-2012	D.O., Temp, Turb., S.C., TDS, TP, TN, BOD, TSS, NH <sub>3</sub> , Discharge, and <i>E. coli</i>
North Branch Chippewa River	NB1	Vandecar Rd at North Branch	2011-2012	D.O., Temp, Turb., S.C., TDS, TP, TN, BOD, TSS, NH <sub>3</sub> , Discharge, and <i>E. coli</i>
	NB2	Vernon Rd at North Branch	2011-2012	D.O., Temp, Turb., S.C., TDS, TP, TN, BOD, TSS, NH <sub>3</sub> , Discharge, and <i>E. coli</i>
	Drain1	Beal Rd	2012	D.O., Temp, Turb., S.C., TDS, TP, TN, BOD, TSS, NH <sub>3</sub> , and <i>E. coli</i>
	NB3	Nottawa Rd at North Branch	2012	D.O., Temp, Turb., S.C., TDS, TP, TN, BOD, TSS, NH <sub>3</sub> , Discharge, and <i>E. coli</i>
	Drain2	Nottawa Rd	2012	D.O., Temp, Turb., S.C., TDS, TP, TN, BOD, TSS, NH <sub>3</sub> , Discharge, and <i>E. coli</i>
	NB4	Nottawa Rd at North Branch	2012	D.O., Temp, Turb., S.C., TDS, TP, TN, BOD, TSS, NH <sub>3</sub> , Discharge, and <i>E. coli</i>
	NB5	River Rd	2012	D.O., Temp, Turb., S.C., TDS, TP, TN, BOD, TSS, NH <sub>3</sub> , Discharge, and <i>E. coli</i>
	NB Remus	Remus Rd	2008-2010	D.O., Temp, Turb., S.C., TDS, TP, TN, BOD, TSS, NH <sub>3</sub> , Discharge, and <i>E. coli</i>
	NB6	Meridian Rd at North Branch	2011-2012	D.O., Temp, Turb., S.C., TDS, TP, TN, BOD, TSS, NH <sub>3</sub> , Discharge, and <i>E. coli</i>
Grewes Lake	GL	Hideaway RV Park Beach	2012	D.O., Temp, Turb., S.C., TDS, and <i>E. coli</i>

#### 4.3 MAP OF MONITORING SITES



**Figure 2.** Map of SCIT Monitoring Sites

#### 4.4 TOTAL EXTENT OF WATERS ASSESSED

The SCIT monitored the Main Branch of the Chippewa River including sites anticipated to become fixed stations and the North Branch of the Chippewa River. This represents approximately 21% of the total streams within tribal boundary. We did not monitor any wetlands and were only able to monitor Grewes Lake due to funding constraints.

**Table 8. Extent of Tribal Waters Assessed**

Water Type	Area Monitored	Total within Reservation
Total miles of Rivers and Drains	120	571
Total number of lake acres (total does not include Lake Huron)	50	403
Total number of wetland acres	0	6547

#### 4.5 DATA ANALYSIS AND ASSESSMENT

The data has been analyzed using Excel. Data was reviewed at the time of collection for any indicators of significant impact or emergency situations. Data collected with tribal resources is the only information used for data analysis unless otherwise noted. Data gaps due to staffing limitations are unavoidable at times. In the event that was not collected, the data point was not included.

**Table 9. Water Body Tribal Goals and Designations**

Tribal Goal or Designated Use	Chippewa River	North Branch of the Chippewa River
Aquatic Life	X	X
Human Health	X	
Recreation	X	X
Wild Rice (Potential)	X	

*E. coli* data was shared with the District Health Department when it was found to exceed State of Michigan Water Quality Standards. The locations if accessed for recreational use were posted throughout the season

#### 4.5.1 DATA USED TO MAKE ASSESSMENT DECISIONS

Data were collected by the SCIT for Isabella Reservation waters on an annual basis from 2004 through 2011 in April through October. The SCIT measured the following parameters at its assessment sites, though not every parameter was analyzed in every sample taken (“Tribal Assessment Report”, 2011):

**Table 10. Measured Parameters at Site Locations**

Water Resource Type/ Monitoring Objective	Dissolved Oxygen	Temperature	pH	Turbidity	Nutrients (TP/TN*)	Habitat	Macro Invertebrates	Pathogens	Total Dissolved Solids (TDS)	Ammonia	Biological Oxygen Demand (BOD)	Total Suspended Solids (TSS)	Velocity
River Water Quality (Fixed Station)	X	X	X	X	X	X	X	X	X	X	X	X	X
River Water Quality (targeted)	X	X	X	X	X	X	X	X	X	X	X	X	X
Lake Water Quality								X					

## SECTION 5 DATA ANALYSIS RESULTS

### 5.1 SUMMARY OF DATA COLLECTED FROM CHIPPEWA RIVER

The following data is from all sampling seasons from 2004-2012. Note: data was unavailable for the following parameters and dates: Nitrogen from 2012; BOD from October 2011; Ammonia from August 2011; Total Suspended Solids from July, August, September, and October of 2011.

Below are tables representing all of the data collected from the locations listed. Please refer to the graphs below for comparisons to the reference points listed in **Table 5** above. All data showing the water quality is outside of referenced values are summarized.

#### 5.1.1 CHIP1 - ROLLAND RD

**Table 11. Summary of Field Data - Station ID: CHIP1**

Statistic	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	pH	Specific Conductivity (mS/cm)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Discharge (cfs)
Max Value	11.86	131.9	24.19	8.51	0.4322	8.1	276.6	163.42
Min Value	1.56	78.1	7.16	7.46	0.0001	0.0	0.1	62.06
Median	8.26	102.4	18.71	8.19	0.3858	1.0	246.9	78.35
Average	8.40	103.5	17.72	8.16	0.3791	1.4	242.6	95.36
# of Samples	143	42	42	42	41	41	41	10

**Table 12. Summary of Lab Data - Station ID: CHIP1**

Statistic	Nitrogen as NO <sub>3</sub> +NO <sub>2</sub> (mg/L)	Phos. Total (mg/L)	Biol. Oxygen Demand (mg/L)	NH <sub>3</sub> (mg/L)	Total Susp. Solids (mg/L)	Macro inverts (%EPT)	Total Coliform MPN/100ml	<i>E. coli</i> MPN/100ml
Max Value	0.00	34.02	2.14	0.043	40.00	61.03%	2005.00	433.67
Min Value	0.00	11.23	0.20	0.001	0.00	29.90%	2005.00	84.50
Median	0.00	23.66	0.95	0.023	5.00	45.47%	2005.00	180.92
Average	0.00	23.76	1.00	0.023	8.75	45.47%	2005.00	199.43
# of Samples	4	16	10	10	8	2	10	10

#### 5.1.2 CHIP2 - SCHOOL RD

**Table 13. Summary of Field Data - Station ID: CHIP2**

Statistic	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	pH	Specific Conductivity (mS/cm)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Discharge (cfs)
Max Value	11.86	113.6	29.00	8.64	0.3898	2.3	249.5	159.16
Min Value	1.41	73.9	8.94	7.84	0.3330	0.0	213.1	52.37
Median	8.15	98.7	21.99	8.29	0.3621	0.0	231.8	85.08
Average	8.12	97.8	20.71	8.28	0.3622	0.3	231.8	97.96
# of Samples	146	45	45	45	45	45	45	12

**Table 14. Summary of Lab Data - Station ID: CHIP2**

Statistic	Nitrogen as NO <sub>3</sub> +NO <sub>2</sub> (mg/L)	Phos. Total (mg/L)	Biol. Oxygen Demand (mg/L)	NH <sub>3</sub> (mg/L)	Total Susp. Solids (mg/L)	Macro inverts (%EPT)	Total Coliform MPN/100ml	<i>E. coli</i> MPN/100ml
Max Value	0.00	26.04	1.90	0.076	20.00	44.83%	2005.00	94.00

Min Value	0.00	11.35	0.00	0.001	0.00	34.89%	212.33	12.50
Median	0.00	18.24	1.00	0.026	5.00	42.43%	2005.00	28.50
Average	0.00	18.00	0.93	0.029	7.50	40.72%	1672.97	33.39
# of Samples	9	21	14	15	12	3	15	14

### 5.1.3 CHIP4 - MERIDIAN RD

**Table 15. Summary of Field Data - Station ID: CHIP4**

Statistic	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	pH	Specific Conductivity (mS/cm)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Discharge (cfs)
Max Value	11.38	127.1	26.59	8.48	0.4284	8.8	274.2	331.15
Min Value	6.61	74.2	9.47	7.32	0.3847	0.0	246.2	107.19
Median	8.39	98.5	21.62	8.18	0.4011	0.1	256.7	149.21
Average	8.69	98.4	20.36	8.13	0.4021	1.6	257.4	181.35
# of Samples	28	28	28	28	28	28	28	12

**Table 16. Summary of Lab Data - Station ID: CHIP4**

Statistic	Nitrogen as NO <sub>3</sub> +NO <sub>2</sub> (mg/L)	Phos. Total (mg/L)	Biol. Oxygen Demand (mg/L)	NH <sub>3</sub> (mg/L)	Total Susp. Solids (mg/L)	Macro inverts (%EPT)	Total Coliform MPN/100ml	<i>E. coli</i> MPN/100ml
Max Value	0.63	28.56	2.20	0.049	20.00	50.00%	2005.00	482.50
Min Value	0.00	8.13	0.10	0.007	0.00	31.58%	621.75	45.00
Median	0.00	18.64	1.00	0.029	0.00	40.96%	2005.00	95.00
Average	0.06	18.07	1.03	0.028	6.36	40.84%	1850.08	111.09
# of Samples	10	16	14	14	11	3	25	25

### 5.1.4 CHIP8 - CHIP-A-WATERS PARK

**Table 17. Summary of Field Data - Station ID: CHIP8**

Statistic	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	pH	Specific Conductivity (mS/cm)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Discharge (cfs)
Max Value	8.12	90.6	25.25	7.44	0.4570	2.1	292.5	159.92
Min Value	6.16	72.3	9.28	6.43	0.3508	0.0	224.5	123.74
Median	7.02	72.7	20.16	6.93	0.4342	0.0	277.9	125.63
Average	7.08	77.1	18.71	6.93	0.4191	0.5	268.2	136.43
# of Samples	4	4	4	4	4	4	4	3

**Table 18. Summary of Lab Data - Station ID: CHIP8**

Statistic	Nitrogen as NO <sub>3</sub> +NO <sub>2</sub> (mg/L)	Phos. Total (mg/L)	Biol. Oxygen Demand (mg/L)	NH <sub>3</sub> (mg/L)	Total Susp. Solids (mg/L)	Macro inverts (%EPT)	Total Coliform MPN/100ml	<i>E. coli</i> MPN/100ml
Max Value	0.00	31.28	1.80	0.040	20.00	26.67%	4793.33	2005.00
Min Value	0.00	13.53	0.80	0.018	0.00	26.67%	880.25	81.50
Median	0.00	27.78	1.08	0.023	15.00	26.67%	2005.00	224.63
Average	0.00	25.09	1.19	0.026	12.50	26.67%	2187.13	405.94
# of Samples	4	4	4	4	4	1	12	18

### 5.1.5 CHIP7 - CHIPPEWA RD

**Table 19. Summary of Field Data - Station ID: CHIP7**

Statistic	Dissolved Oxygen	Dissolved Oxygen	Temperature (°C)	pH	Specific Conductivity	Turbidity (NTU)	Total Dissolved	Discharge (cfs)
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	(mg/L)	Saturation (%)			(mS/cm)		Solids (mg/L)	
Max Value	17.40	170.9	27.90	8.66	1.7770	223.5	1137.0	300.27
Min Value	1.64	77.2	8.59	7.44	0.2970	0.0	190.1	176.18
Median	9.62	111.3	20.51	8.34	0.4831	4.5	309.0	226.98
Average	9.16	112.1	19.78	8.33	0.5073	13.9	324.7	232.60
# of Samples	132	39	39	39	39	39	39	4

**Table 20. Summary of Lab Data - Station ID: CHIP7**

Statistic	Nitrogen as NO <sub>3</sub> +NO <sub>2</sub> (mg/L)	Phos. Total (mg/L)	Biol. Oxygen Demand (mg/L)	NH <sub>3</sub> (mg/L)	Total Susp. Solids (mg/L)	Macro inverts (%EPT)	Total Coliform MPN/100ml	<i>E. coli</i> MPN/100ml
Max Value	1.59	88.31	2.00	0.093	10.00	39.73%	2005.00	522.00
Min Value	1.04	10.92	0.30	0.007	0.00	31.43%	2005.00	91.50
Median	1.33	41.22	0.96	0.035	0.00	35.58%	2005.00	147.25
Average	1.33	40.35	1.03	0.041	3.33	35.58%	2005.00	230.31
# of Samples	14	16	10	9	6	2	10	9

## 5.2 SUMMARY OF DATA COLLECTED FROM NORTH BRANCH CHIPPEWA RIVER

### 5.2.1 NB1 - VANDECAR RD

**Table 21. Summary of Field Data - Station ID: NB1**

Statistic	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	pH	Specific Conductivity (mS/cm)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Discharge (cfs)
Max Value	9.08	86.4	23.40	8.15	0.3940	234.5	252.2	7.96
Min Value	6.67	69.8	7.30	6.80	0.3075	0.0	196.8	1.28
Median	7.66	80.5	16.33	7.85	0.3821	0.0	244.6	3.02
Average	7.65	79.1	16.21	7.82	0.3706	23.5	237.2	4.12
# of Samples	10	10	10	10	10	10	10	7

**Table 22. Summary of Lab Data - Station ID: NB1**

Statistic	Nitrogen as NO <sub>3</sub> +NO <sub>2</sub> (mg/L)	Phos. Total (mg/L)	Biol. Oxygen Demand (mg/L)	NH <sub>3</sub> (mg/L)	Total Susp. Solids (mg/L)	Macro inverts (%EPT)	Total Coliform MPN/100ml	<i>E. coli</i> MPN/100ml
Max Value	0.19	51.60	3.47	0.091	20.00	34.48%	20050.00	2005.00
Min Value	0.00	9.64	0.23	0.034	0.00	28.85%	1129.50	114.50
Median	0.00	21.30	1.03	0.047	10.00	31.66%	2005.00	380.33
Average	0.05	22.86	1.28	0.051	10.00	31.66%	4073.75	470.53
# of Samples	8	8	8	8	5	2	25	25

### 5.2.2 NB2 - VERNON RD

**Table 23. Summary of Field Data - Station ID: NB2**

Statistic	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	pH	Specific Conductivity (mS/cm)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Discharge (cfs)
Max Value	11.81	137.2	26.01	8.46	0.4960	5.6	317.4	9.05
Min Value	5.79	67.1	8.37	7.74	0.3654	0.0	233.9	2.87
Median	9.45	101.0	18.76	7.97	0.4640	1.4	297.0	6.26
Average	9.26	100.5	18.09	8.04	0.4560	2.1	291.9	6.30
# of Samples	9	9	9	9	9	9	9	6

**Table 24. Summary of Lab Data - Station ID: NB2**

Statistic	Nitrogen as NO <sub>3</sub> +NO <sub>2</sub> (mg/L)	Phos. Total (mg/L)	Biol. Oxygen Demand (mg/L)	NH <sub>3</sub> (mg/L)	Total Susp. Solids (mg/L)	Macro inverts (%EPT)	Total Coliform MPN/100ml	<i>E. coli</i> MPN/100ml
Max Value	1.38	78.67	2.62	0.057	10.00	41.56%	20050.00	2005.00
Min Value	0.00	23.73	0.29	0.031	0.00	0.00%	2005.00	253.33
Median	0.43	46.72	1.14	0.040	0.00	20.78%	2005.00	573.33
Average	0.51	47.45	1.25	0.042	2.00	20.78%	4536.07	744.49
# of Samples	8	8	8	8	5	2	25	25

## 5.2.3 DRAIN1 - FOREST DRAIN - BEAL CITY RD

**Table 25. Summary of Field Data - Station ID: DRAIN1**

Statistic	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	pH	Specific Conductivity (mS/cm)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Discharge (cfs)
Max Value	8.15	79.2	19.67	8.05	0.8389	8.9	536.9	x
Min Value	6.38	70.1	7.72	7.63	0.0001	0.0	0.1	x
Median	7.18	71.9	17.04	7.86	0.3889	0.8	248.9	x
Average	7.22	73.3	15.37	7.85	0.4042	2.6	258.7	x
# of Samples	4	4	4	4	4	4	4	x

**Table 26. Summary of Lab Data - Station ID: DRAIN1**

Statistic	Nitrogen as NO <sub>3</sub> +NO <sub>2</sub> (mg/L)	Phos. Total (mg/L)	Biol. Oxygen Demand (mg/L)	NH <sub>3</sub> (mg/L)	Total Susp. Solids (mg/L)	Macro inverts (%EPT)	Total Coliform MPN/100ml	<i>E. coli</i> MPN/100ml
Max Value	1.00	210.87	1.80	0.049	20.00	0.00%	20500.00	20050.00
Min Value	0.00	167.70	1.00	0.032	0.00	0.00%	2005.00	173.33
Median	0.00	190.32	1.20	0.045	10.00	0.00%	13473.33	2005.00
Average	0.25	189.80	1.30	0.043	10.00	0.00%	12820.44	5277.65
# of Samples	4	4	4	4	4	1	15	15

## 5.2.4 NB3 - NOTTAWA RD

**Table 27. Summary of Field Data - Station ID: NB3**

Statistic	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	pH	Specific Conductivity (mS/cm)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Discharge (cfs)
Max Value	7.74	75.1	19.14	8.02	0.5440	6.0	348.2	10.81
Min Value	6.31	67.4	8.19	7.83	0.4309	0.3	275.8	6.18
Median	7.08	69.9	17.31	7.85	0.5033	5.0	322.1	6.93
Average	7.04	70.8	14.88	7.90	0.4927	3.8	315.4	7.97
# of Samples	3	3	3	3	3	3	3	3

**Table 28. Summary of Lab Data - Station ID: NB3**

Statistic	Nitrogen as NO <sub>3</sub> +NO <sub>2</sub> (mg/L)	Phos. Total (mg/L)	Biol. Oxygen Demand (mg/L)	NH <sub>3</sub> (mg/L)	Total Susp. Solids (mg/L)	Macro inverts (%EPT)	Total Coliform MPN/100ml	<i>E. coli</i> MPN/100ml
Max Value	0.00	123.03	2.00	0.054	20.00	11.54%	2005.00	2005.00
Min Value	0.00	42.13	1.10	0.023	0.00	11.54%	1260.00	132.67
Median	0.00	72.45	1.20	0.041	5.00	11.54%	2005.00	501.50
Average	0.00	77.52	1.38	0.040	7.50	11.54%	1913.19	795.36



# of Samples	4	4	4	4	4	1	14	14
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### 5.2.5 DRAIN2 - WAGNER & BRANCHES DRAIN - NOTTAWA RD

**Table 29. Summary of Field Data - Station ID: DRAIN2**

Statistic	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	pH	Specific Conductivity (mS/cm)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Discharge (cfs)
Max Value	x	x	x	x	x	x	x	2.10
Min Value	x	x	x	x	x	x	x	1.38
Median	x	x	x	x	x	x	x	1.58
Average	x	x	x	x	x	x	x	1.69
# of Samples	x	x	x	x	x	x	x	3

**Table 30. Summary of Lab Data - Station ID: DRAIN2**

Statistic	Nitrogen as NO <sub>3</sub> +NO <sub>2</sub> (mg/L)	Phos. Total (mg/L)	Biol. Oxygen Demand (mg/L)	NH <sub>3</sub> (mg/L)	Total Susp. Solids (mg/L)	Macro inverts (%EPT)	Total Coliform MPN/100ml	<i>E. coli</i> MPN/100ml
Max Value	0.00	32.39	0.90	0.039	10.00	6.67%	2005.00	2005.00
Min Value	0.00	27.28	0.40	0.020	0.00	6.67%	1127.00	45.67
Median	0.00	30.71	0.60	0.036	5.00	6.67%	1902.04	199.50
Average	0.00	30.13	0.63	0.032	5.00	6.67%	1738.43	335.10
# of Samples	3	3	3	3	4	1	14	14

### 5.2.6 NB4 - NOTTAWA RD

**Table 31. Summary of Field Data - Station ID: NB4**

Statistic	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	pH	Specific Conductivity (mS/cm)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Discharge (cfs)
Max Value	8.22	78.7	18.36	7.91	0.5969	12.7	382.0	13.37
Min Value	6.11	66.7	8.25	7.85	0.4345	0.0	278.1	6.50
Median	7.37	71.6	17.65	7.87	0.5196	4.1	332.5	9.93
Average	7.23	72.3	14.75	7.88	0.5170	5.6	330.9	9.93
# of Samples	3	3	3	3	3	3	3	3

**Table 32. Summary of Lab Data - Station ID: NB4**

Statistic	Nitrogen as NO <sub>3</sub> +NO <sub>2</sub> (mg/L)	Phos. Total (mg/L)	Biol. Oxygen Demand (mg/L)	NH <sub>3</sub> (mg/L)	Total Susp. Solids (mg/L)	Macro inverts (%EPT)	Total Coliform MPN/100ml	<i>E. coli</i> MPN/100ml
Max Value	0.00	121.18	2.00	0.040	30.00	5.88%	2005.00	2005.00
Min Value	0.00	37.72	1.00	0.020	0.00	5.88%	1416.00	137.33
Median	0.00	76.88	1.20	0.034	10.00	5.88%	2005.00	426.21
Average	0.00	78.16	1.35	0.032	12.50	5.88%	1962.93	666.51
# of Samples	4	4	4	4	4	1	14	14

### 5.2.7 NB5 - RIVER RD

**Table 33. Summary of Field Data - Station ID: NB5**

Statistic	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	pH	Specific Conductivity (mS/cm)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Discharge (cfs)
Max Value	7.16	72.1	21.25	7.98	0.6497	32.4	415.8	13.38

Min Value	5.40	59.3	8.04	7.53	0.4956	1.7	317.2	13.19
Median	6.35	64.1	17.23	7.79	0.5965	7.4	381.7	13.31
Average	6.32	64.9	15.94	7.77	0.5846	12.2	374.1	13.29
# of Samples	4	4	4	4	4	4	4	3

**Table 34. Summary of Lab Data - Station ID: NB5**

Statistic	Nitrogen as NO <sub>3</sub> +NO <sub>2</sub> (mg/L)	Phos. Total (mg/L)	Biol. Oxygen Demand (mg/L)	NH <sub>3</sub> (mg/L)	Total Susp. Solids (mg/L)	Macro inverts (%EPT)	Total Coliform MPN/100ml	<i>E. coli</i> MPN/100ml
Max Value	0.00	118.63	1.80	0.035	20.00	12.50%	2005.00	2005.00
Min Value	0.00	43.61	1.08	0.022	0.00	12.50%	1887.33	244.00
Median	0.00	96.57	1.40	0.025	5.00	12.50%	2005.00	958.83
Average	0.00	88.85	1.42	0.027	7.50	12.50%	1996.60	1123.27
# of Samples	4	4	4	4	4	1	14	14

5.2.8 NB REMUS - REMUS RD

**Table 35. Summary of Field Data - Station ID: NB Remus**

Statistic	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	pH	Specific Conductivity (mS/cm)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Discharge (cfs)
Max Value	12.66	113.1	21.59	8.24	0.6601	115.0	422.5	105.16
Min Value	7.18	82.8	6.69	7.72	0.4850	0.0	310.4	19.76
Median	8.93	92.2	16.09	8.09	0.6041	12.5	386.6	25.09
Average	8.93	93.8	15.66	8.07	0.5928	20.6	379.4	41.12
# of Samples	47	35	35	35	35	35	35	5

**Table 36. Summary of Lab Data - Station ID: NB Remus**

Statistic	Nitrogen as NO <sub>3</sub> +NO <sub>2</sub> (mg/L)	Phos. Total (mg/L)	Biol. Oxygen Demand (mg/L)	NH <sub>3</sub> (mg/L)	Total Susp. Solids (mg/L)	Macro inverts (%EPT)	Total Coliform MPN/100ml	<i>E. coli</i> MPN/100ml
Max Value	5.35	208.12	2.90	0.413	30.00	18.75%	x	x
Min Value	0.89	32.89	0.50	0.001	0.00	18.75%	x	x
Median	2.03	63.89	1.15	0.030	10.00	18.75%	x	x
Average	2.34	88.17	1.47	0.081	11.43	18.75%	x	x
# of Samples	14	12	6	7	7	1	x	x

5.2.9 NB6 - MERIDIAN RD

**Table 37. Summary of Field Data - Station ID: NB6**

Statistic	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	pH	Specific Conductivity (mS/cm)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Discharge (cfs)
Max Value	7.99	84.9	21.34	8.15	0.6498	17.2	415.8	30.46
Min Value	6.46	68.1	8.28	7.39	0.5256	1.1	336.4	13.78
Median	7.35	74.7	17.75	7.85	0.6275	2.2	401.6	22.39
Average	7.28	76.6	16.76	7.83	0.6104	5.3	390.6	20.74
# of Samples	8	8	8	8	8	8	8	7

**Table 38. Summary of Lab Data - Station ID: NB6**

Statistic	Nitrogen as NO <sub>3</sub> +NO <sub>2</sub> (mg/L)	Phos. Total (mg/L)	Biol. Oxygen Demand	NH <sub>3</sub> (mg/L)	Total Susp. Solids (mg/L)	Macro inverts (%EPT)	Total Coliform MPN/100ml	<i>E. coli</i> MPN/100ml
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			(mg/L)					
Max Value	2.28	164.67	1.80	0.077	10.00	28.33%	20050.00	2310.00
Min Value	0.00	33.19	0.40	0.019	0.00	21.74%	1887.33	88.33
Median	1.06	57.42	0.98	0.032	0.00	25.04%	2005.00	577.33
Average	1.00	71.23	1.07	0.039	2.00	25.04%	5295.79	807.66
# of Samples	8	8	8	8	5	2	25	25

### 5.3 SUMMARY OF DATA COLLECTED FROM GREWES LAKE

**Table 39. Summary of Field Data - Station ID: GL**

Statistic	Dissolved Oxygen (mg/L)	Dissolved Oxygen Saturation (%)	Temperature (°C)	pH	Specific Conductivity (mS/cm)	Turbidity (NTU)	Total Dissolved Solids (mg/L)	Discharge (cfs)
Max Value	11.51	135.5	30.12	9.05	0.9344	274.2	598.0	x
Min Value	7.22	87.6	20.84	7.03	0.8360	0.0	535.0	x
Median	8.96	107.0	23.43	8.22	0.8924	3.8	571.2	x
Average	9.15	111.1	24.13	8.23	0.8855	52.4	566.7	x
# of Samples	6	6	6	6	6	6	6	x

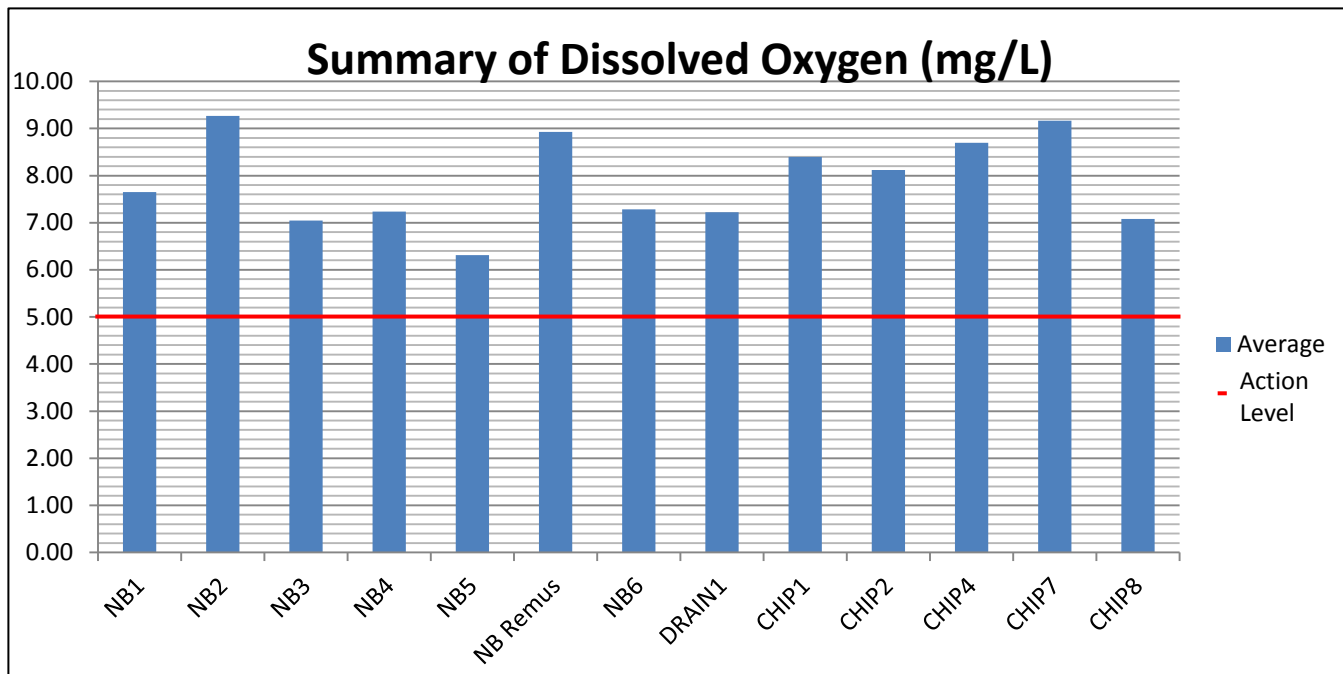
**Table 40. Summary of Lab Data - Station ID: GL**

Statistic	Nitrogen as NO <sub>3</sub> +NO <sub>2</sub> (mg/L)	Phos. Total (mg/L)	Biol. Oxygen Demand (mg/L)	NH <sub>3</sub> (mg/L)	Total Susp. Solids (mg/L)	Macro inverts (%EPT)	Total Coliform MPN/100ml	<i>E. coli</i> MPN/100ml
Max Value	x	x	x	x	x	x	2005.00	73.50
Min Value	x	x	x	x	x	x	209.75	10.00
Median	x	x	x	x	x	x	2005.00	12.50
Average	x	x	x	x	x	x	1853.39	20.69
# of Samples	x	x	x	x	x	x	19	19

### 5.4 COMPARISON OF DATA TO BENCHMARKS/CRITERIA

The following are graphical representations of water quality data collected from 2004-2012 sampling seasons. Action levels correspond to information presented in **Table 5**.

#### 5.4.1 DISSOLVED OXYGEN

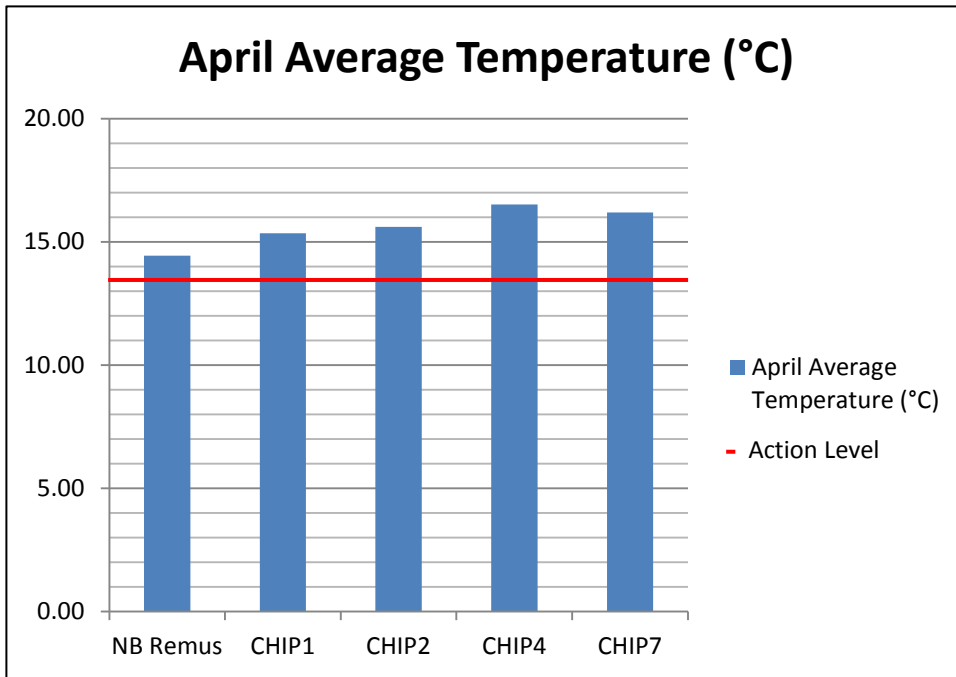


**Figure 3.** All dissolved oxygen (mg/L) data for each monitoring site was averaged and displayed with corresponding action level (see **Table 5**).

All sample sites are meeting SOM Water Quality Standards of 5 mg/L or above, the lower limit of dissolved oxygen for warmwater streams.

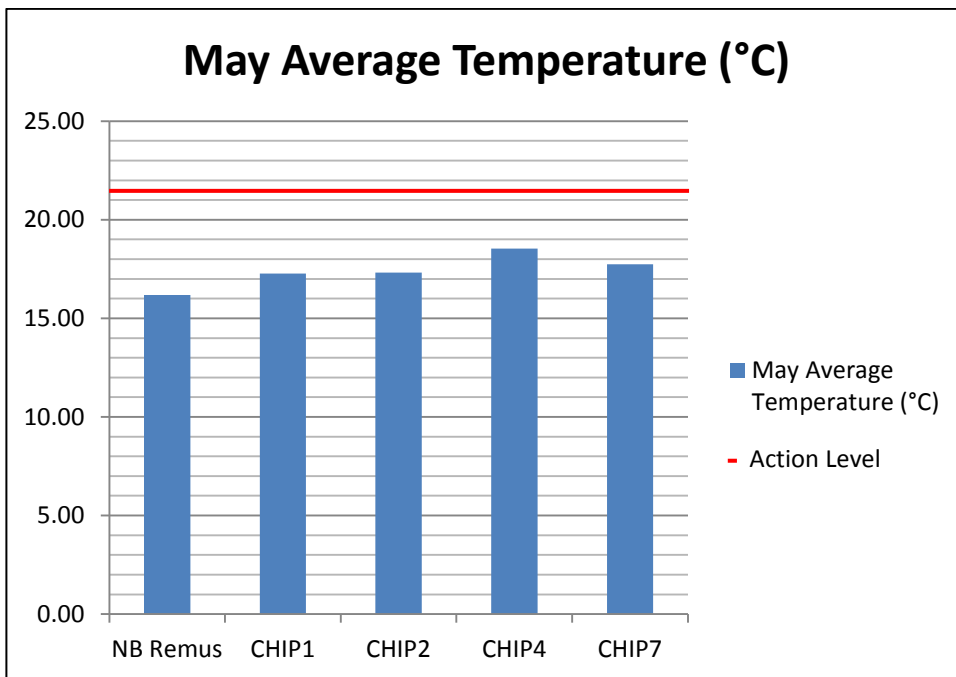
#### 5.4.2 TEMPERATURE

The following data is presented as a monthly average of temperature data from 2004-2012 sampling seasons. The action levels for each month correspond to the information contained in **Table 5**.



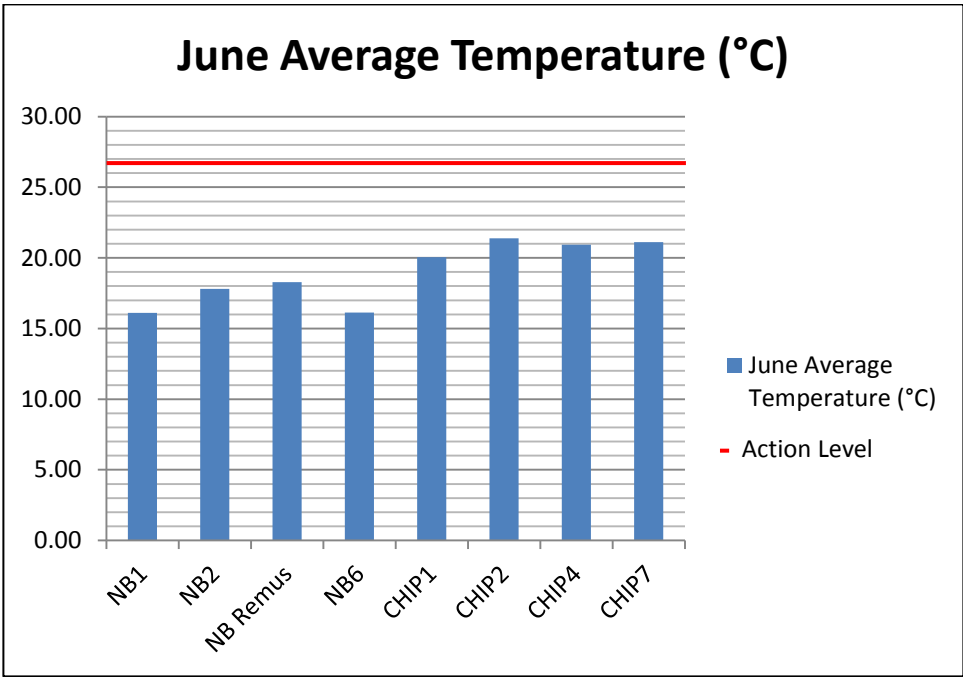
**Figure 4.** Average monthly temperature (°C) data for each monitoring site is displayed with corresponding action level (see **Table 5**).

The North Branch and Main Branch of the Chippewa Rivers are not meeting the SOM Water Quality Standard for the EcoRegion of 13.33 °C.



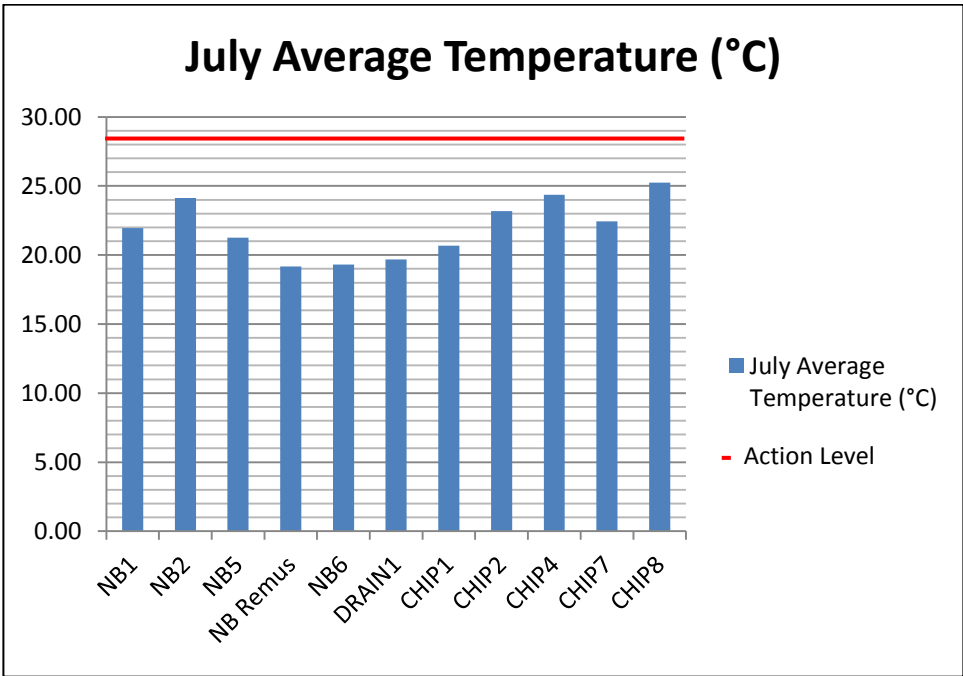
**Figure 5.** Average monthly temperature (°C) data for each monitoring site is displayed with corresponding action level (see **Table 5**).

The North Branch and Main Branch of the Chippewa Rivers are meeting the SOM Water Quality Standard of the EcoRegion of 21.11 °C for the month of June.



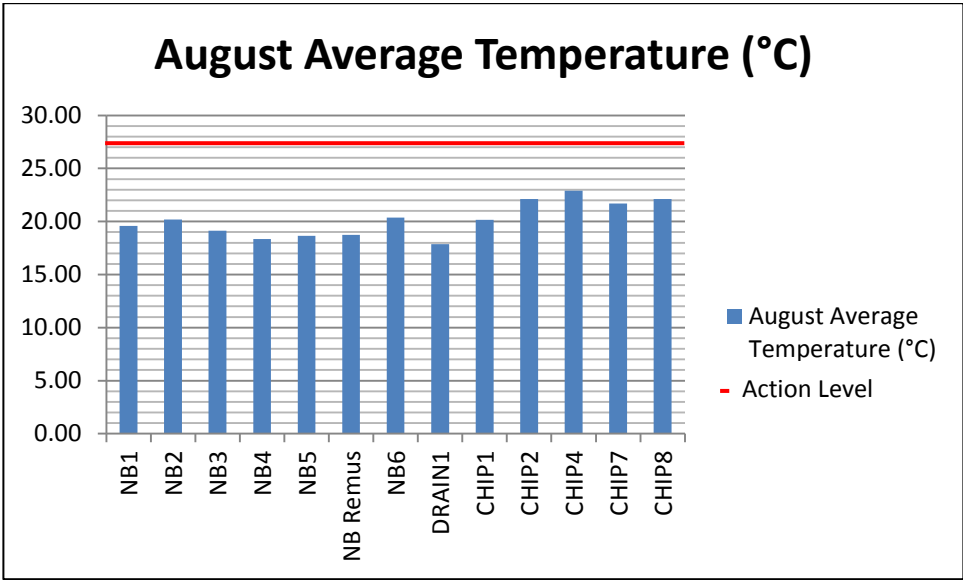
**Figure 6.** Average monthly temperature (°C) data for each monitoring site is displayed with corresponding action level (see **Table 5**).

The North Branch and Main Branch of the Chippewa Rivers are meeting the SOM Water Quality Standard of the EcoRegion of 26.67°C.



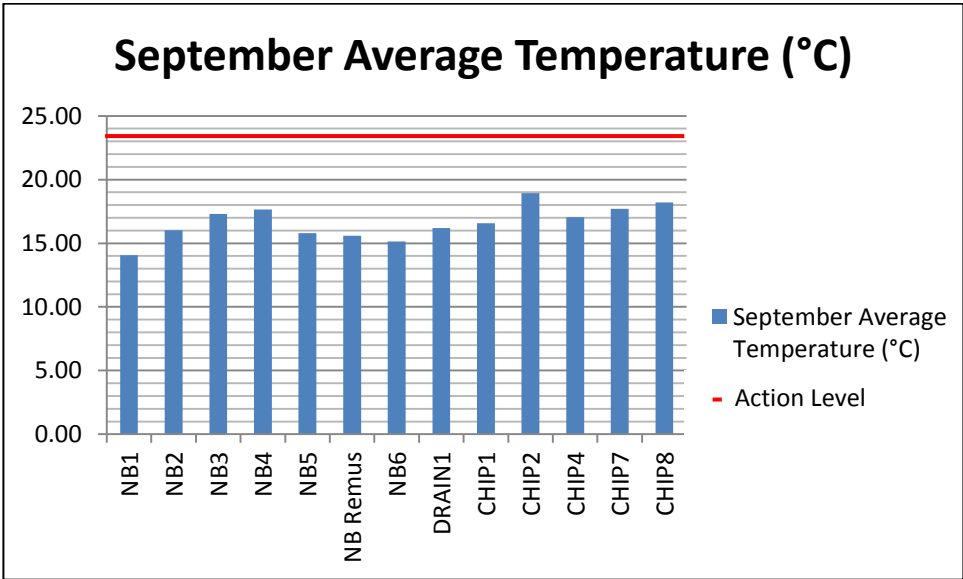
**Figure 7.** Average monthly temperature (°C) data for each monitoring site is displayed with corresponding action level (see **Table 5**).

The North Branch and Main Branch of the Chippewa Rivers are meeting the SOM Water Quality Standard of the EcoRegion of 28.33°C.



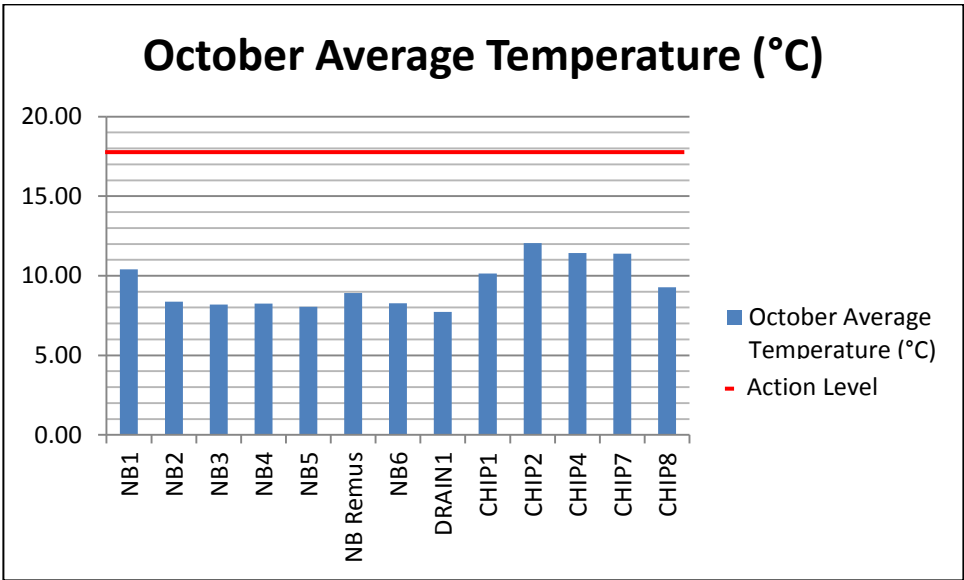
**Figure 8.** Average monthly temperature (°C) data for each monitoring site is displayed with corresponding action level (see **Table 5**).

The North Branch and Main Branch of the Chippewa Rivers are meeting the SOM Water Quality Standard for the EcoRegion of 27.22°C.



**Figure 9.** Average monthly temperature (°C) data for each monitoring site is displayed with corresponding action level (see **Table 5**).

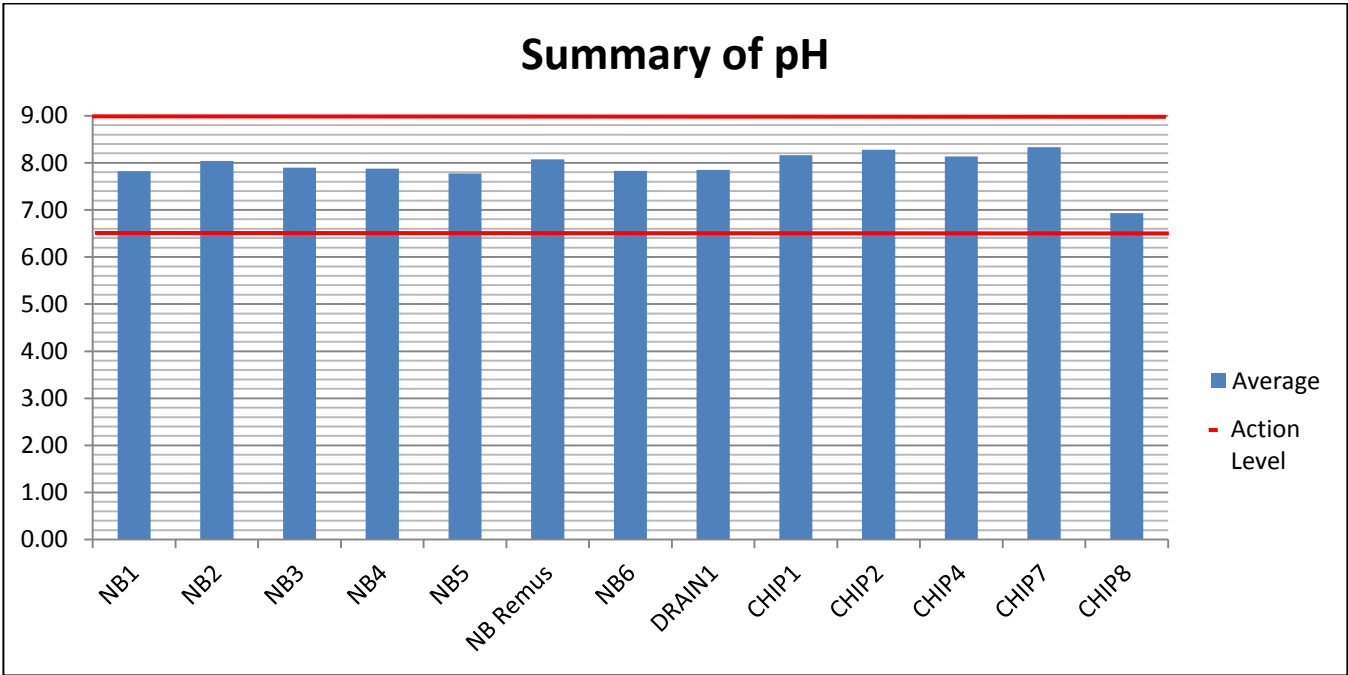
The North Branch and Main Branch of the Chippewa Rivers are meeting the SOM Water Quality Standard for the EcoRegion of 23.33°C.



**Figure 10.** Average monthly temperature (°C) data for each monitoring site is displayed with corresponding action level (see **Table 5**).

The North Branch and Main Branch of the Chippewa Rivers are meeting the SOM Water Quality Standard for the EcoRegion of 17.78°C.

5.4.3 PH

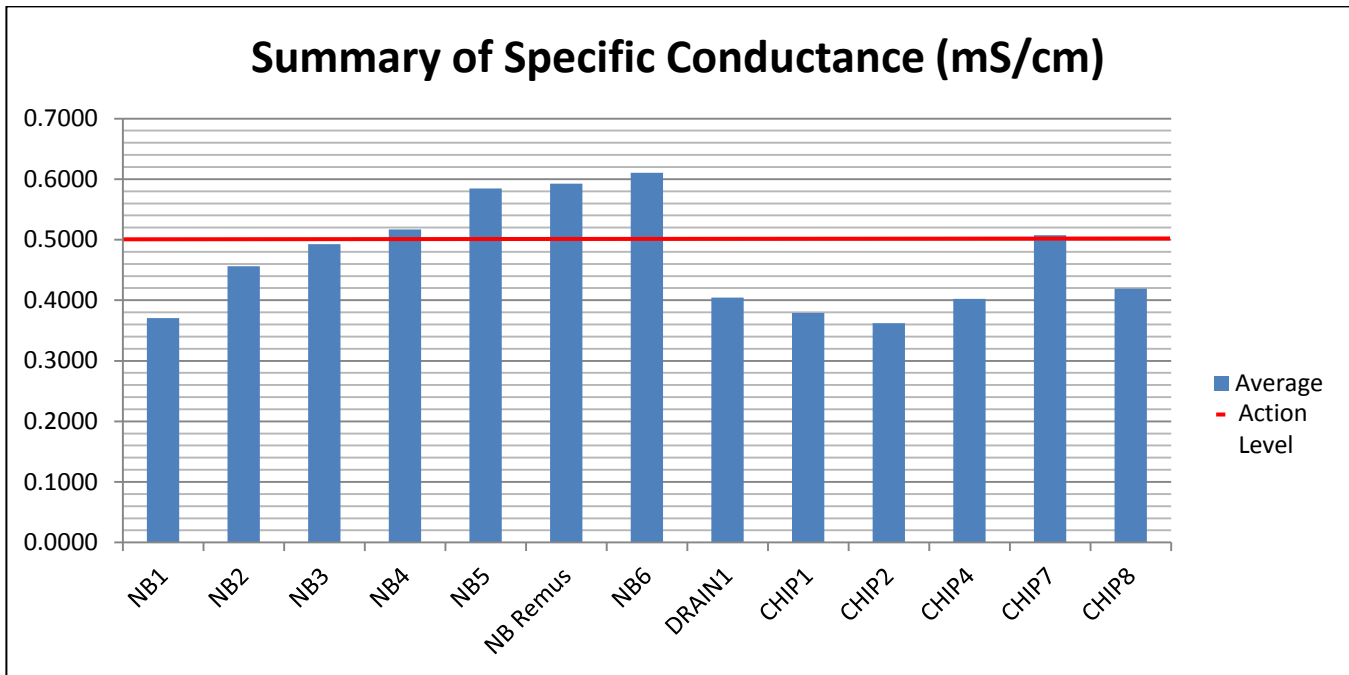


**Figure 11.** Average pH data for each monitoring site is displayed with corresponding action levels (see **Table 5**).

All sample sites are meeting SOM Water Quality Standards for pH, 6.5 to 9.0.

5.4.4 SPECIFIC CONDUCTIVITY



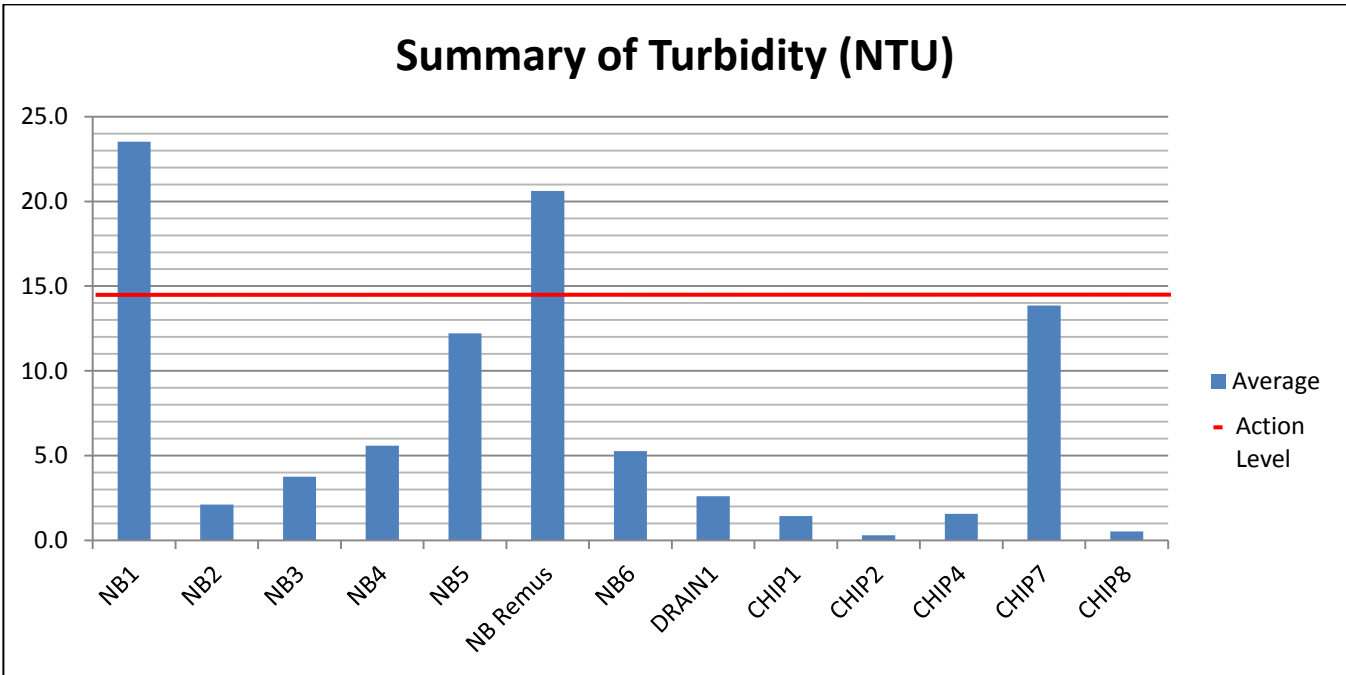


**Figure 12.** Average Specific Conductivity (mS/cm) data for each monitoring site is displayed with corresponding action levels (see **Table 5**).

The North Branch of the Chippewa River shows increased levels of Conductivity throughout the downstream areas, above the suggested Action Level in **Table 5**.

The Main Branch of the Chippewa River shows a conductivity level above the Action Level outlined in **Table 5** at the Chip 7 location only. All other locations along the Chippewa River are below the referenced action level.

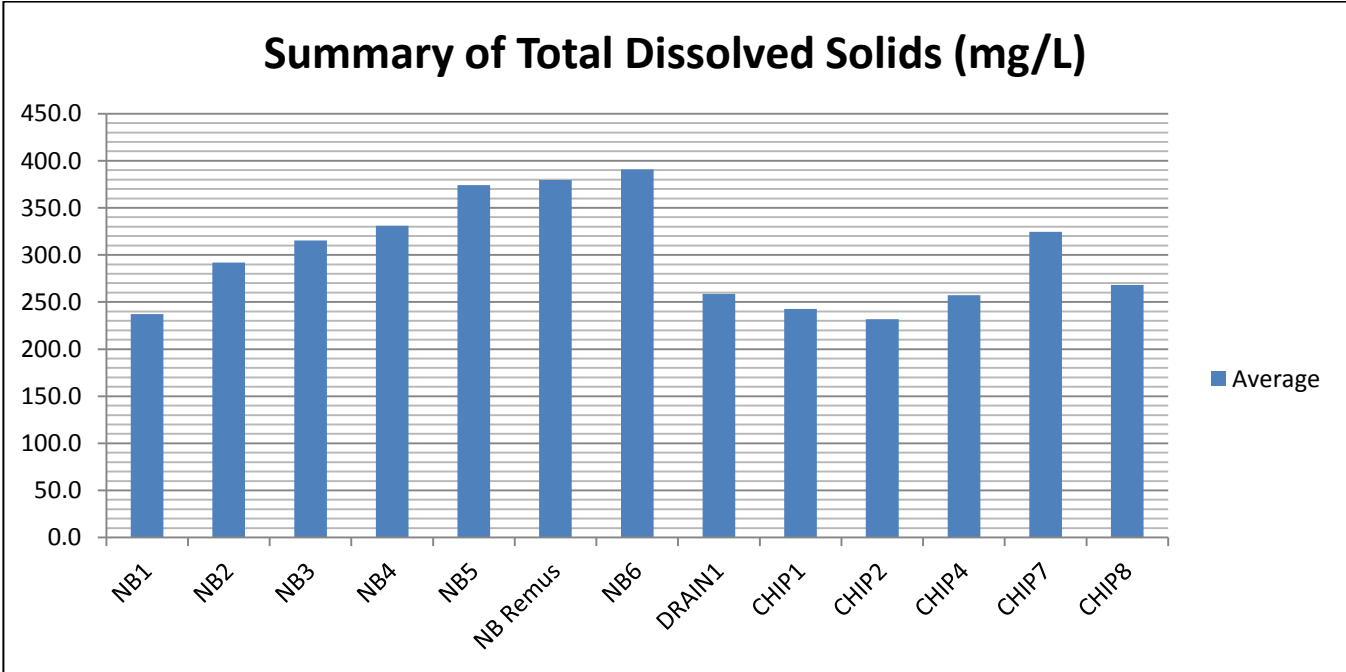
#### 5.4.5 TURBIDITY



**Figure 13.** Average Turbidity (NTU) data for each monitoring site is displayed with corresponding action levels (see **Table 5**).

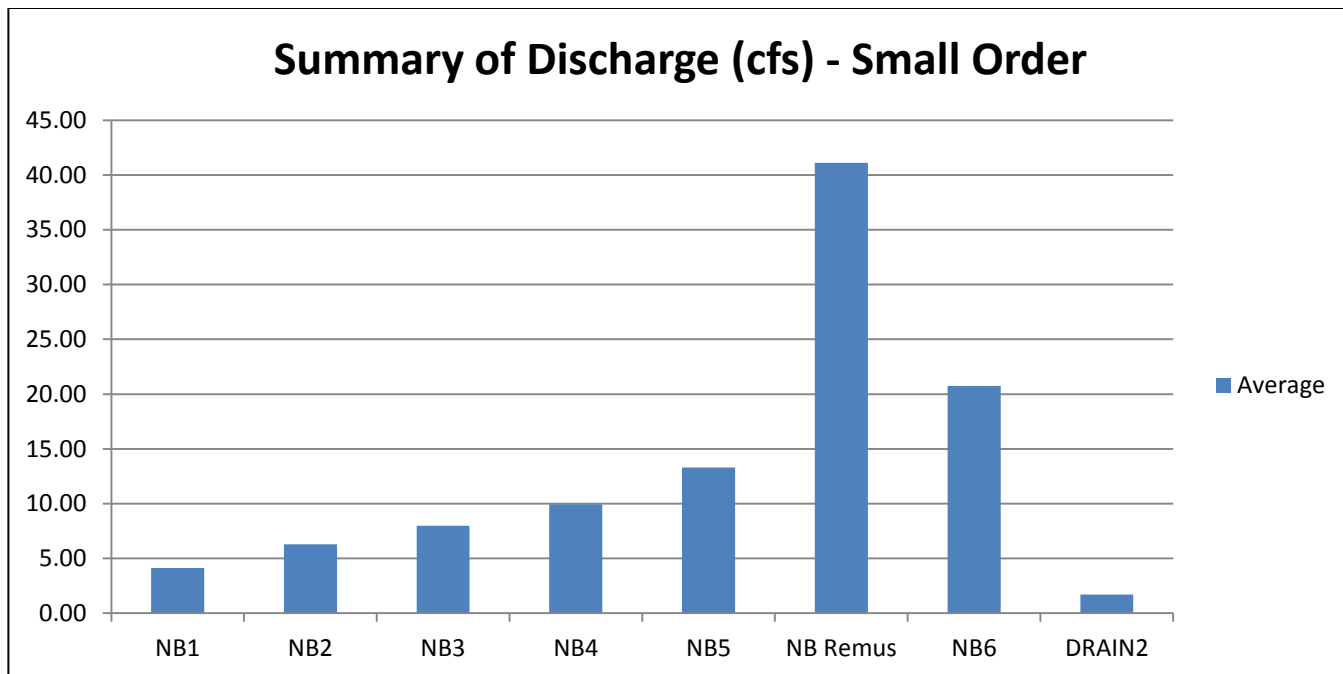
Turbidity is above the Action Level of 14 NTU in different location along the North Branch of the Chippewa River. The Chippewa River stays below the action level throughout the Main Branch of the river.

5.4.6 TOTAL DISSOLVED SOLIDS



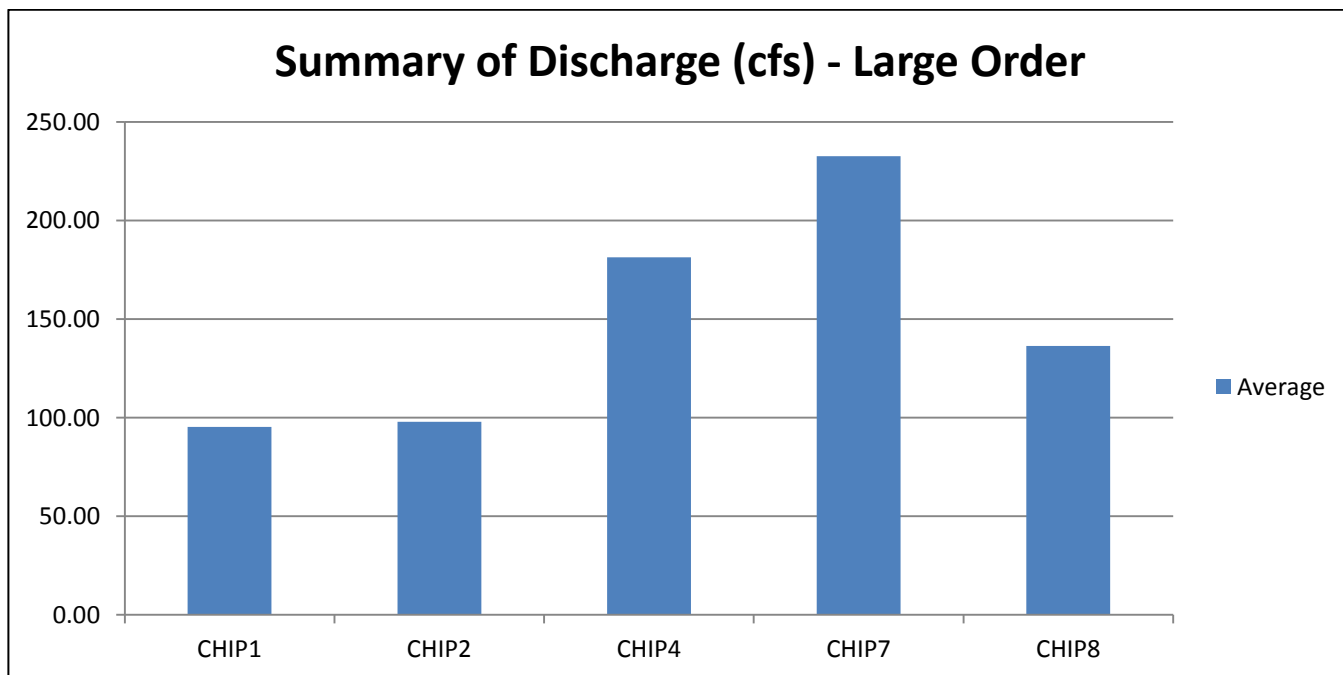
**Figure 14.** Average Total Dissolved Solids (mg/L) data for each monitoring site is displayed. Action levels for this particular parameter are based on yearly changes from average (see **Table 5**).

### 5.4.7 DISCHARGE



**Figure 15.** Average discharge (cfs) data for each of the smaller order drain and stream monitoring sites. Action levels are not available at this time for this particular parameter (see **Table 5**).

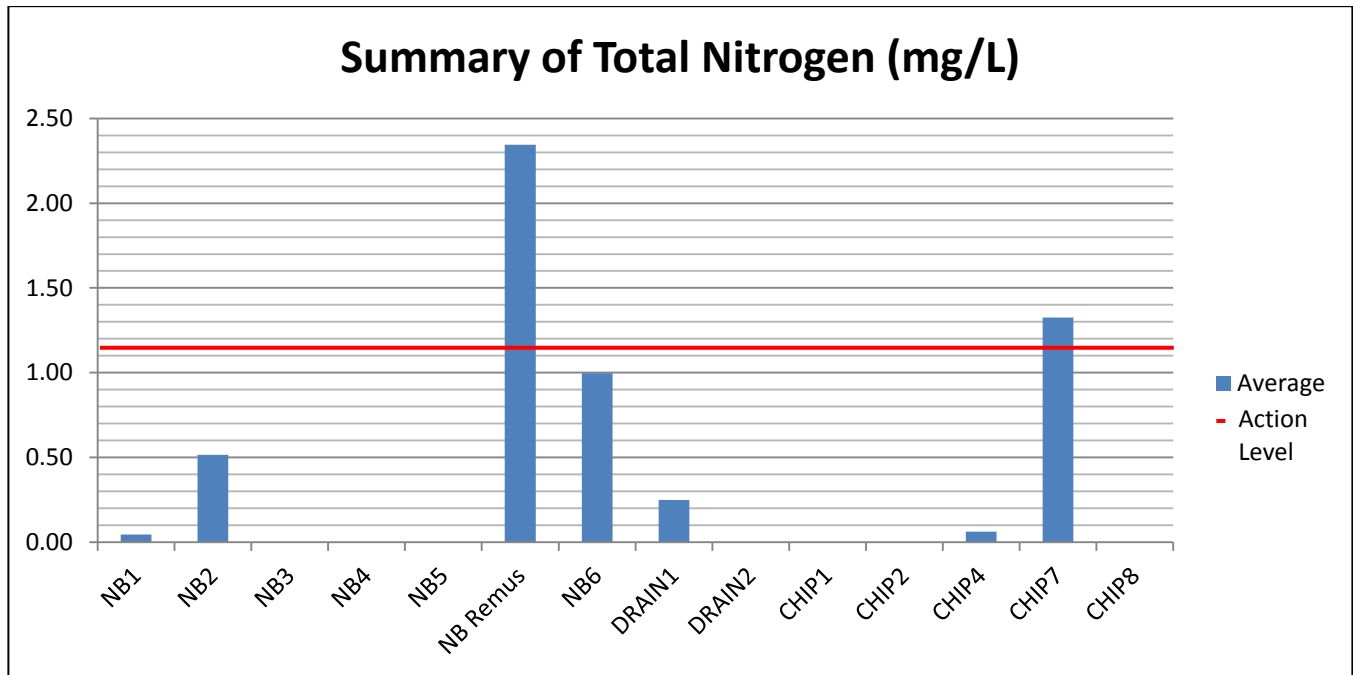
The North Branch of the Chippewa River increases in discharge as we go down stream, a normal drainage pattern.



**Figure 16.** Average discharge (cfs) data for each of the larger order stream monitoring sites. Action levels are not available at this time for this particular parameter (see **Table 5**).

### 5.4.8 TOTAL NITROGEN

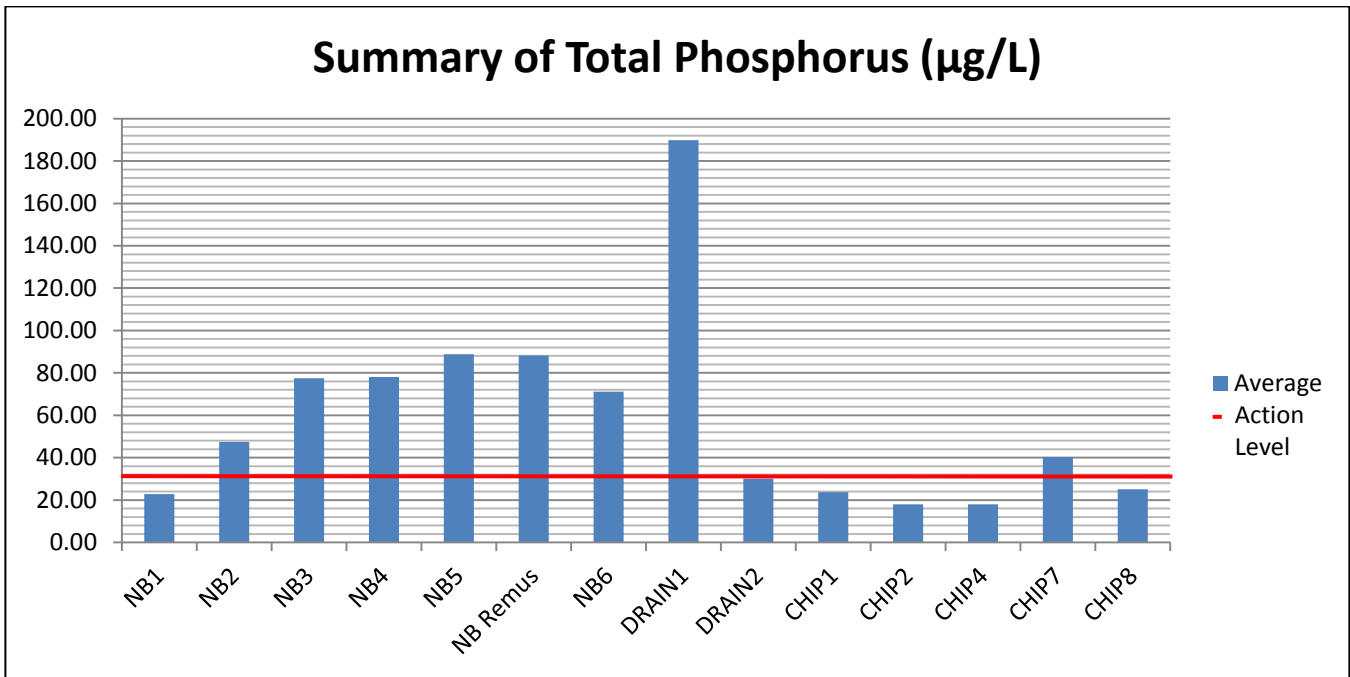
Total Nitrogen data is displayed in the following figure. Partial data from 2012 is missing, but a best estimate based on the results of the field test strips has been done to complete the data set. Test strips were used as presence absence of nitrite and nitrate. When either is deemed present a grab sample is taken and processed at a local lab.



**Figure 17.** Average Total Nitrogen (mg/L) data for each monitoring site is displayed with corresponding action levels (see **Table 5**).

Total Nitrogen remains below the action level listed in **Table 5**, 1.15 mg/L for the EcoRegion in most locations concerning tribal waters. The North Branch of the Chippewa River at Remus Road and the Main Branch of the Chippewa River site 7 exceeds the action level listed in **Table 5**. Both locations are downstream sites.

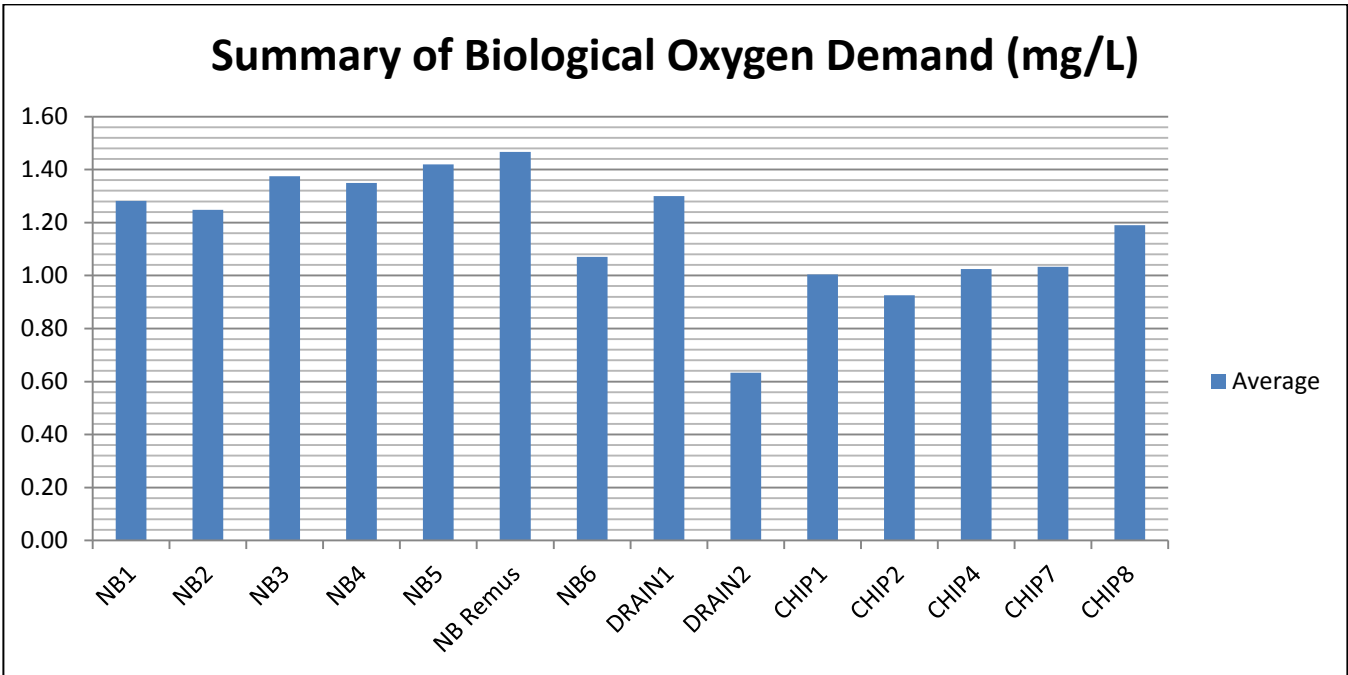
#### 5.4.9 TOTAL PHOSPHORUS



**Figure 18.** Average Total Phosphorus ( $\mu\text{g/L}$ ) data for each monitoring site is displayed with corresponding action levels (see **Table 5**).

The Reference condition for EcoRegion 56 for Total Phosphorous,  $31.25 \mu\text{g/L}$  is exceeded in most of the North Branch of the Chippewa River, while the Main Branch of the Chippewa River exceeds the action level at the furthest location sampled downstream.

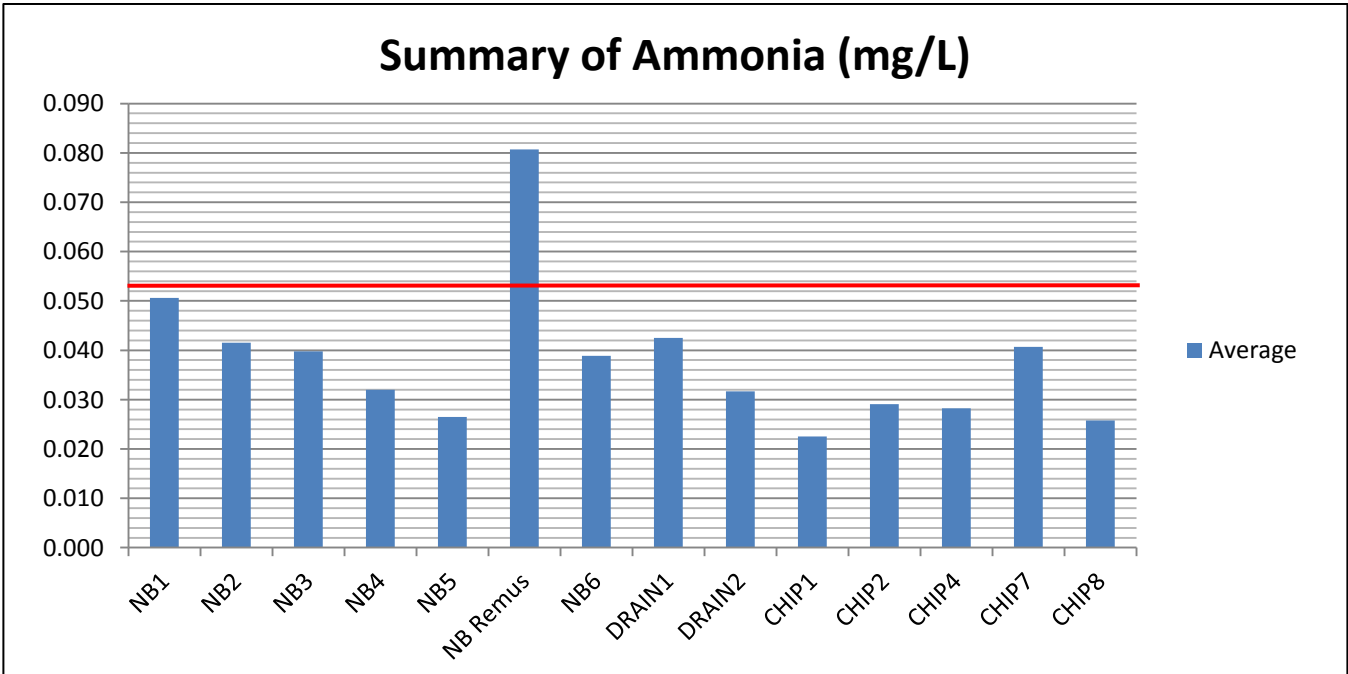
#### 5.4.10 BIOLOGICAL OXYGEN DEMAND



**Figure 19.** Average Biological Oxygen Demand (mg/L) data for each monitoring site is displayed. Action levels are not available at this time for this particular parameter (see **Table 5**).

BOD does not have a standard or action level referenced currently.

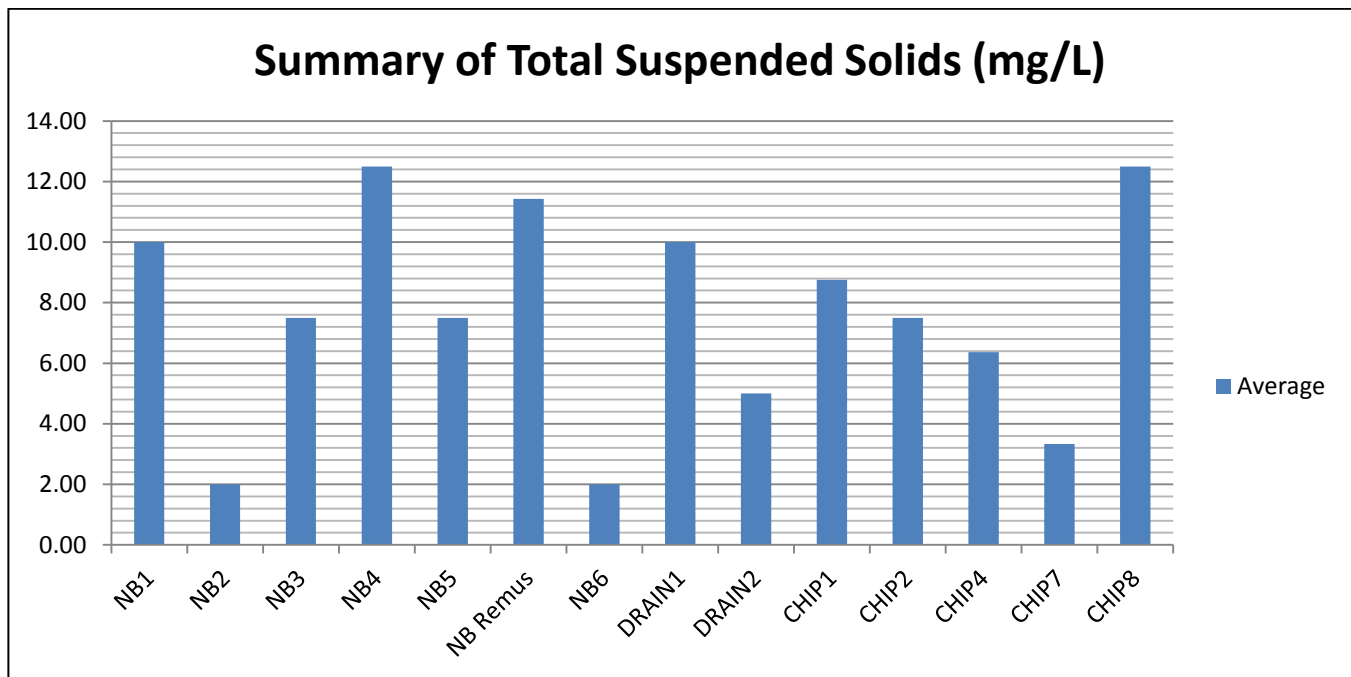
5.4.11 AMMONIA



**Figure 20.** Average Ammonia (mg/L) data for each monitoring site is displayed. Action levels are not available at this time for this particular parameter (see **Table 5**).

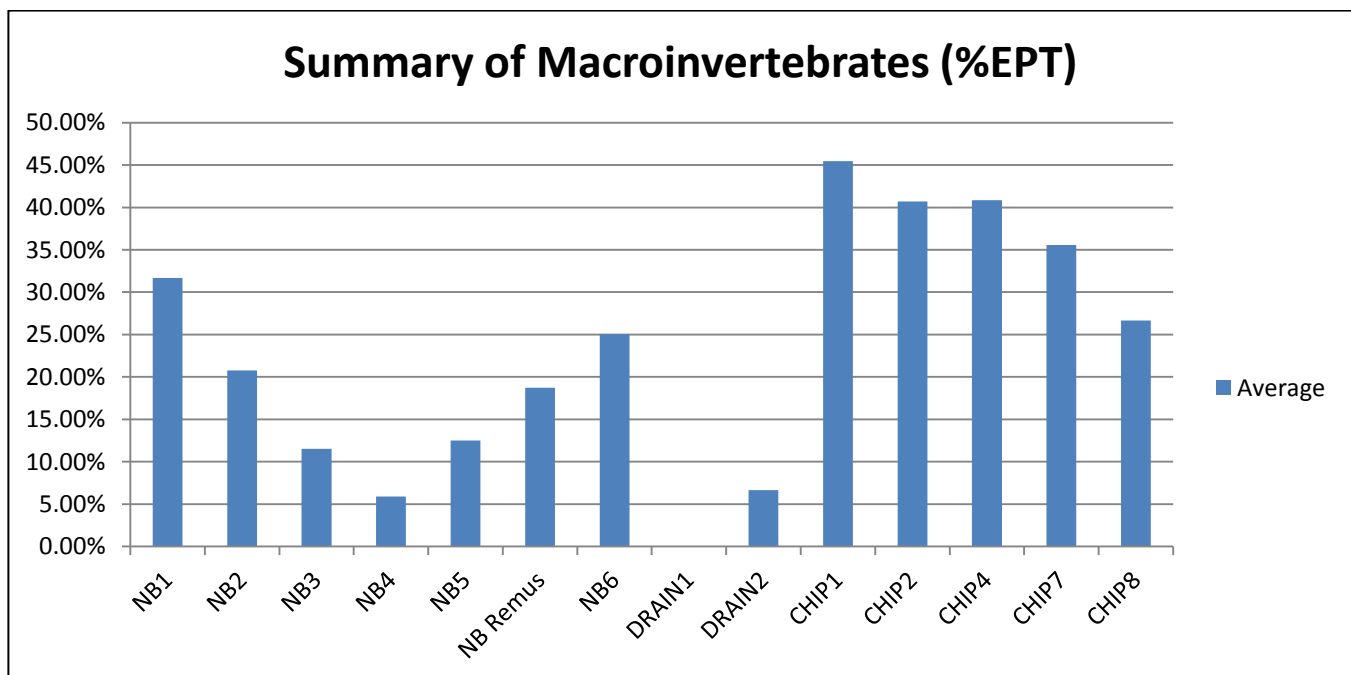
All sites meet the SOM Water Quality Standards for Ammonia, 0.053 mg/L, with the exception of the North Branch of the Chippewa River at Remus Road.

### 5.4.12 TOTAL SUSPENDED SOLIDS

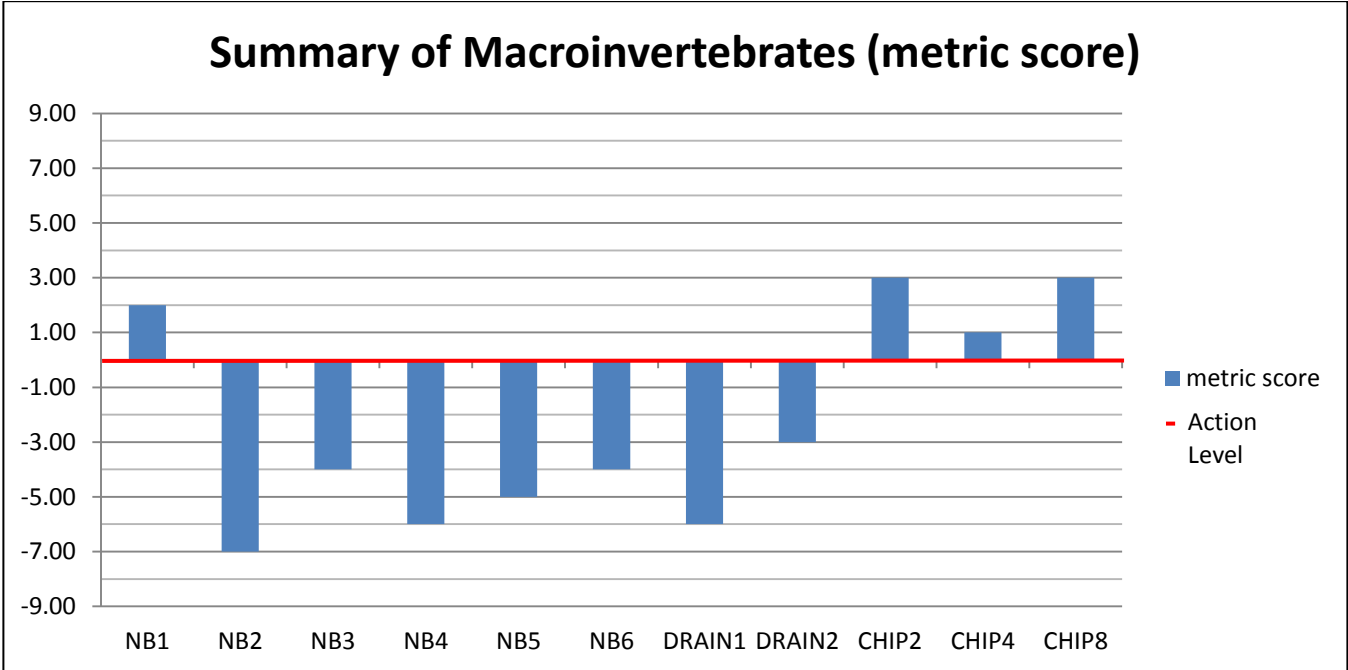


**Figure 21.** Average Total Suspended Solids (mg/L) data for each monitoring site is displayed. Action levels are not available at this time for this particular parameter (see **Table 5**). TSS currently does not have an action level referenced for comparison.

### 5.4.13 MACROINVERTEBRATES



**Figure 22.** Average Macroinvertebrates (%EPT) data for each monitoring site is displayed. Action levels are not available at this time for this particular parameter (see **Table 5**).



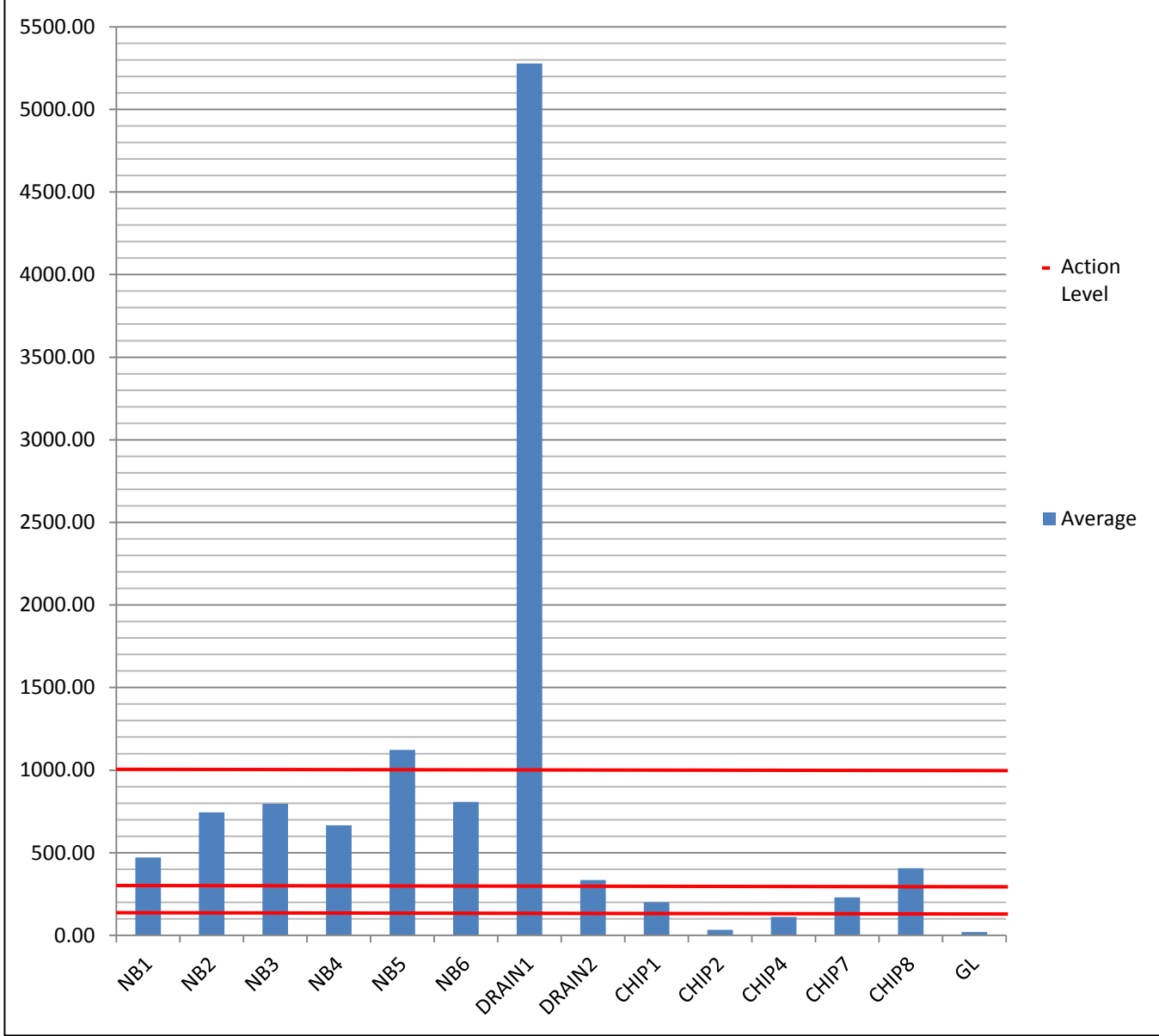
**Figure 23.** Average Macroinvertebrates (metric score) data for each monitoring site of the 2012 sampling season is displayed with corresponding action levels (see **Table 5**).

Using the SOM Macroinvertebrate method Part 51 shows impairments in many locations along the North Branch of the Chippewa River, with most sites falling below the action level. The Main Branch of the Chippewa River and the furthest upstream location of the North Branch of the Chippewa River all score above the referenced Action Level in **Table 5**.

5.4.14 E. COLI



## Summary of *E.coli* Daily Geometric Mean (MPN/100ml)



**Figure 24.** Average *E. coli* Daily Geometric Mean (MPN/100ml) data for each monitoring site is displayed with corresponding action levels (see **Table 5**).

For full body contact SOM Water Quality Standards for *E. coli*, daily geometric mean of 300 *E. coli* / 100ml is currently being exceeded in most locations along the North Branch of the Chippewa River. The Main Branch of the Chippewa River is also exceeding the monthly geometric mean of 130 *E. coli* / 100 ml in most locations sampled. For partial body contact SOM Water Quality Standards for *E. coli*, daily geometric mean of 1,000 *E. coli* / 100ml is currently being exceeded at one location along the North Branch of the Chippewa River as well as at Drain 1 which flows into the North Branch.

### 5.5 SUMMARY OF THE EXTENT TO WATERS MEETING DESIGNATED USES

**Table 41. Summary of the Extent to Waters Meeting Designated Uses**

Designated Use	Chippewa River	North Branch of Chippewa River
Aquatic Life	Not Full Support	Not Full Support
Human Health	Not Full Support	Not Full Support
Recreation	Not Full Support	Not Full Support
Wild Rice	Not Full Support	N/A

5.6 DESCRIPTION OF WHY WATERS ARE NOT MEETING USES OR GOALS

**Table 42. North Branch of Chippewa River – Parameters Exceeding Action Levels**

Location / Parameter	NB 1	NB 2	NB 3	NB 4	NB 5	NB 6	NB Remus	Drain 1	Drain 2
DO									
Temp*	X	X	X	X	X	X	X	X	X
SpC				X	X	X	X		
pH									
TP		X	X	X	X	X	X	X	
TN							X		
Turb	X						X		
Macro		X	X	X	X	X		X	X
<i>E.coli</i>	X	X	X	X	X	X	X	X	X
Ammonia							X		

\*Temperature exceeds referenced SOM water quality standard in the month of April only. All other months sampled meet SOM water quality standards.

The Tribal Goals or Designated Uses assigned to the North Branch of the Chippewa River are Aquatic Life and Recreation. The North Branch is not meeting these designated uses based on the information in **Table 42**. Recreation is not being met by *E. coli*, turbidity, total nitrogen, and total phosphorous levels exceeding the action levels referenced in **Table 5**. Aquatic Life is not being met by turbidity, temperature, macroinvertebrate, total nitrogen, and total phosphorous levels exceeding the action levels reference in **Table 5**.

**Table 43. Main Branch of Chippewa River – Parameters Exceeding Action Levels**

Location / Parameter	Chip 1	Chip 2	Chip 4	Chip 7	Chip 8
DO					
Temp*	X	X	X	X	X
SpC				X	
pH					
TP				X	
TN				X	
Turb					
Macro					
<i>E.coli</i>	X	X	X	X	X
Ammonia					

\*Temperature exceeds referenced SOM water quality standard in the month of April only. All other months sampled meet SOM water quality standards.

The Tribal Goals or Designated Uses assigned to the Main Branch of the Chippewa River are Aquatic Life, Human Health, Recreation, and Wild Rice (Potential). The Chippewa River is not meeting these designated uses based on the information in **Table 43** in comparison to references in **Table 6**. Aquatic Life is not being met by turbidity, total nitrogen, and total phosphorous. Human Health is not being met by *E. coli*, total nitrogen, total phosphorous. Recreation is not being met by *E. coli*, total nitrogen, and total phosphorous. Wild Rice is not being met by specific conductance, total nitrogen, and total phosphorous.

### **Temperature**

The SCIT is experiencing temperatures above the SOM water quality standards for the month of April in both the North Branch of the Chippewa River and the Main Branch of the Chippewa River. The water temperature issue is also present at each location in both systems. There is a canopy reduction in most of the watershed due to timber harvesting and high agricultural production. Loss of shade could result in increased temperature, but would likely have throughout the year, more monitoring needs to be continued to measure winter water temperatures. The WQS and WRT have begun to do winter temperature monitoring to rule out consistent winter temps that may be resulting from groundwater feeds.

### **Turbidity**

The North Branch experiences higher turbidity due to sedimentation. The watershed is highly agricultural. The channel has been dredged in many areas and converted to county drain. The riparian corridors are disturbed in many locations resulting in extensive erosion of high banks.

### ***E. coli***

*E. coli* is elevated in the North Branch of the Chippewa River and throughout the Main Branch of the Chippewa River as well. Through tribal funding the Isabella Conservation District is currently working on a Watershed Management Plan of the North Branch of the Chippewa River to identify and address the potential sources of *E. coli*. There are several dairy farms along the North Branch of the Chippewa River that are suspect along with manure applications to fields. Both water bodies have antiquated septic systems at many homes. Several small municipalities are operating on antiquated septic systems versus sewer treatment facilities. Areas of pooling, stagnant water can be found throughout several drains in the area, allowing bacterial growth until rain events occur to wash pools downstream. The most significant issues with *E. coli* are found in the North Branch of the Chippewa River. The Main Branch of the Chippewa River has higher *E. coli* at areas downstream of the confluence of the North Branch.

### **Total Nitrogen and Total Phosphorous**

TN and TP are result of highly agricultural watersheds. TP is elevated throughout the North Branch of the Chippewa River, while TN is an issue at the Remus road location, a downstream location. The TN and TP issues with the Main Branch occur only at the furthest downstream location. These are believed to be a result of urban fertilizer and agricultural fertilizer use.

### **Macroinvertebrates**

Macroinvertebrate populations are significantly impacted in the North Branch of the Chippewa River. The sedimentation, chemical use, and lack of canopy have an impact on the populations of macroinvertebrates. One site on the North Branch remains at an acceptable point for macroinvertebrates – the furthest upstream location. The Chippewa River shows acceptable macroinvertebrate representation.

### **Specific Conductance**

Specific conductance is an issue in several locations along the North Branch of the Chippewa River and the furthest downstream location on the Chippewa River. Elevated levels of SpC are higher in these locations due to agricultural production, use of fertilizers and other chemicals along with sedimentation.

### SECTION 6 DISCUSSION OF ISSUES OF TRIBAL CONCERN

SCIT has concerns regarding the Chippewa River and tributaries associated. The agriculture production in the areas and deforestation in the last century have altered the watershed severely. The result is rivers with high sediment loads, lack of habitat, *E. coli* issues, high nutrient input, with many parameters not meeting water quality standards for the State of Michigan. SCIT intends to continue to monitor fixed stations along the Main Branch of the Chippewa River, while establishing a rotational basin approach throughout the reservation to become more familiar with the issues of all waters within the reservation. The tribe is focused on restoring tribal waters. Water is the blood of Mother Earth, the rivers are her arteries. Respect, restoration, and stewardship of Mother Earth are the backbone of the SCIT heritage.

It is the intention of SCIT to continue to utilize CWA 106 for monitoring, program administration, and community outreach. The anticipated addition of the CWA 319 program will allow SCIT and several partners to begin to address the issues of concern listed above.

### SECTION 7 REFERENCES

Fishbeck, Thompson, Hubert & Carr, (2011). *Tribal Assessment Report for the Saginaw Chippewa Indian Tribe of Michigan*.