Real-Time Water Quality Deployment Report

Paddy's Pond at Outlet

July 6, 2023 to August 24, 2023

Government of Newfoundland & Labrador
Department of Environment and Climate Change
Water Resources Management Division
St. John's, NL, A1B 4J6 Canada

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General

The Department of Environment and Climate Change, Water Resources Management Division staff monitor water quality in real-time at Paddy's Pond at outlet to Three Arm Pond (47.488129N, 52.893809W).

Due to the previous deployments logfile issues, an investigation into the instruments functional capacity was completed, thus delayed re-deployment from July 5, 2023, to July 6, 2023. A logfile did not record for this deployment period due to instrument malfunction.

Figure 1: Paddy's Pond at Outlet Real-Time Water Quality Station location

Maintenance and Calibration of Instrument

As part of the Quality Assurance and Quality Control protocol (QAQC), an assessment of the reliability of data recorded by an instrument is made at the beginning and end of the deployment period. The procedure is based on the approach used by the United States Geological Survey.

Upon deployment, a QA/QC Sonde is temporarily deployed *in situ*, adjacent to the Field Sonde. Depending on the degree of difference between each parameter from the Field and QA/QC sondes, a qualitative rank is assigned (See Table 1). The possible ranks, from most to least

desirable, are Excellent, Good, Fair, Marginal, and Poor. A grab sample is also taken for additional confirmation of conditions at deployment and to allow for future modelling studies.

Table 1: Ranking classifications for deployment and removal

	Rank				
Parameter	**Excellent**	**Good**	**Fair**	**Marginal**	**Poor**
Temperature (°C)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	<+/-1
pH (unit)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Sp. Conductance (µS/cm)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20
Sp. Conductance > 35 µS/cm (%)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20
Dissolved Oxygen (mg/L) (% Sat)	<=+/-0.3	>+/-0.3 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Turbidity <40 NTU (NTU)	<=+/-2	>+/-2 to 5	>+/-5 to 8	>+/-8 to 10	>+/-10
Turbidity > 40 NTU (%)	<=+/-5	>+/-5 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20

At the end of a deployment period, a freshly cleaned and calibrated QA/QC Sonde is placed *in situ*, adjacent to the Field Sonde. Deployment and removal comparison rankings for the station at Paddy's Pond deployed from July 6, 2023, to August 24, 2023 are summarized in Table 2.

Table 2: Qualitative QA/QC comparison rankings for Paddy's Pond at outlet station July 6, 2023, through August 24, 2023.

Station	**Date**	**Action**	**Comparison Ranking**				
			Temperature	**pH**	**Conductivity**	**Dissolved Oxygen**	**Turbidity**
Paddy's Pond at Outlet	2023-07-06	Deployment	Excellent	Good	Good	Good	Excellent
	2023-07-06	Grab Sample #2023-1707-00-SI-SP	N/A	Marginal	Excellent	N/A	Excellent
	2023-08-24	Removal	Excellent	Poor	Marginal	Excellent	Excellent

- On July 6, 2023, a real-time water quality monitoring instrument was deployed at the station Paddy's Pond at Outlet. The instrument was deployed for a period of 55 days and was removed on August 24, 2023.

- Upon deployment, sensors ranked 'Excellent' and 'Good' against the calibrated QA/QC sonde indicating consistent and acceptable measurements for all variables.

- The grab sample analysis comparison ranking (sample number #2023-1707-00-SI-SP), shows some discrepancies compared to the field instrument data rankings. While the grab sample

analysis rated pH as 'marginal', the field instrument data rated pH as 'good'. This suggests a potential difference in pH measurements between the two methods, with the grab sample analysis indicating a higher pH value than the field instrument. This is likely the result of inadequate time provided for the field sonde to acclimate to current water conditions. Conductivity and turbidity ranked as 'excellent', indicating agreement in the measurement of this parameter. Notably, temperature and dissolved oxygen are not analyzed in the grab sample, so no comparison can be made for these parameters.

- At the time of removal, the field instrument ranked 'excellent' for temperature, dissolved oxygen, and turbidity, indicating consistent measurements. However, there were notable differences in the parameters of conductivity, which ranked 'marginal' and pH with a ranking of 'poor'. This poor ranking may again be a result of limited acclimation time provided to the QAQC instrument to provide accurate representation of current water conditions.

DATA INTERPRETATION

The following graphs and discussion illustrate water quality data obtained hourly from July 6, 2023, through August 24, 2023 at Paddy's Pond at outlet to Three Arm Pond, St. John's, NL.

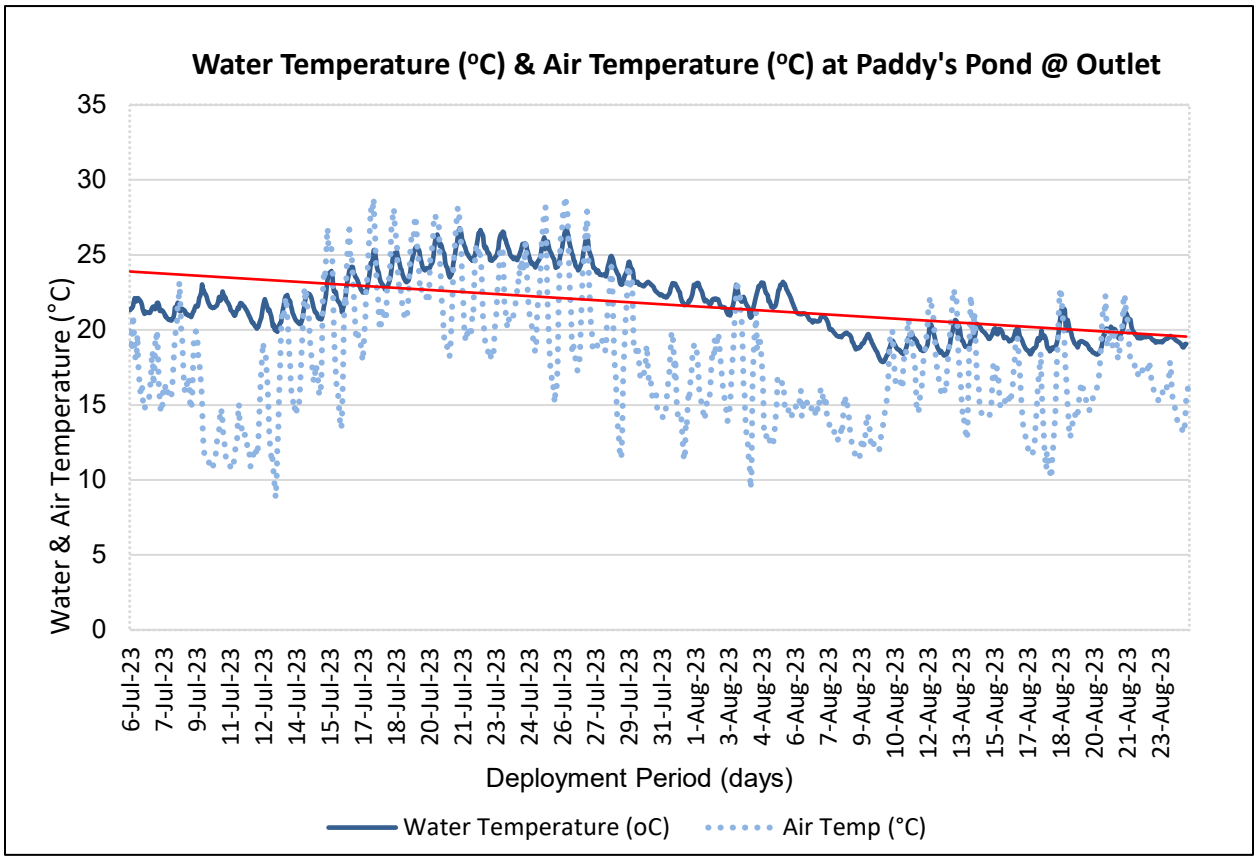
Stage is not monitored at this station to date and as such cannot be discussed with respect to other monitored water quality parameters. All data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol.

Mean daily temperature and total precipitation data was obtained from the Department of Environment and Climate Change Canada (ECCC) historical weather data at https://climate.weather.gc.ca/historical_data/search_historic_data_e.html and can be found illustrated in Appendix A. Gaps in available daily data were removed for graphing purposes.

Water Temperature

- Water Temperature is a major factor used to describe water quality. Temperature has major implications on both the ecology and chemistry of a water body, governing processes such as the metabolic rate of aquatic plants and animals and the degree of dissolved oxygen saturation.

- It should be noted that the temperature sensor on any sonde is the most important. All other parameters can be broken down into three groups: temperature dependent, temperature compensated and temperature independent. As the temperature sensor is not isolated from the rest of the sonde, the entire sonde must be at the same temperature before the sensor will stabilize. The values may take some time to climb to the appropriate reading; if a reading is taken too soon it may not accurately portray the water body.



Mean	Median	Min	Max
21.72	21.52	17.86	26.78

Figure 2: Water temperature (°C) values at Paddy's Pond at Outlet.

- Over the 55-day deployment period, water temperature fluctuated naturally in correlation to air temperature. The mean temperature was 21.72°C with a median of 21.52°C suggests that the majority of temperature readings cluster around this value and were generally consistent.

- Minimum water temperature of 17.86°C was observed on August 10, 2023, and a maximum water temperature of 26.78 °C was observed on July 21, 2023 (Figure 2).

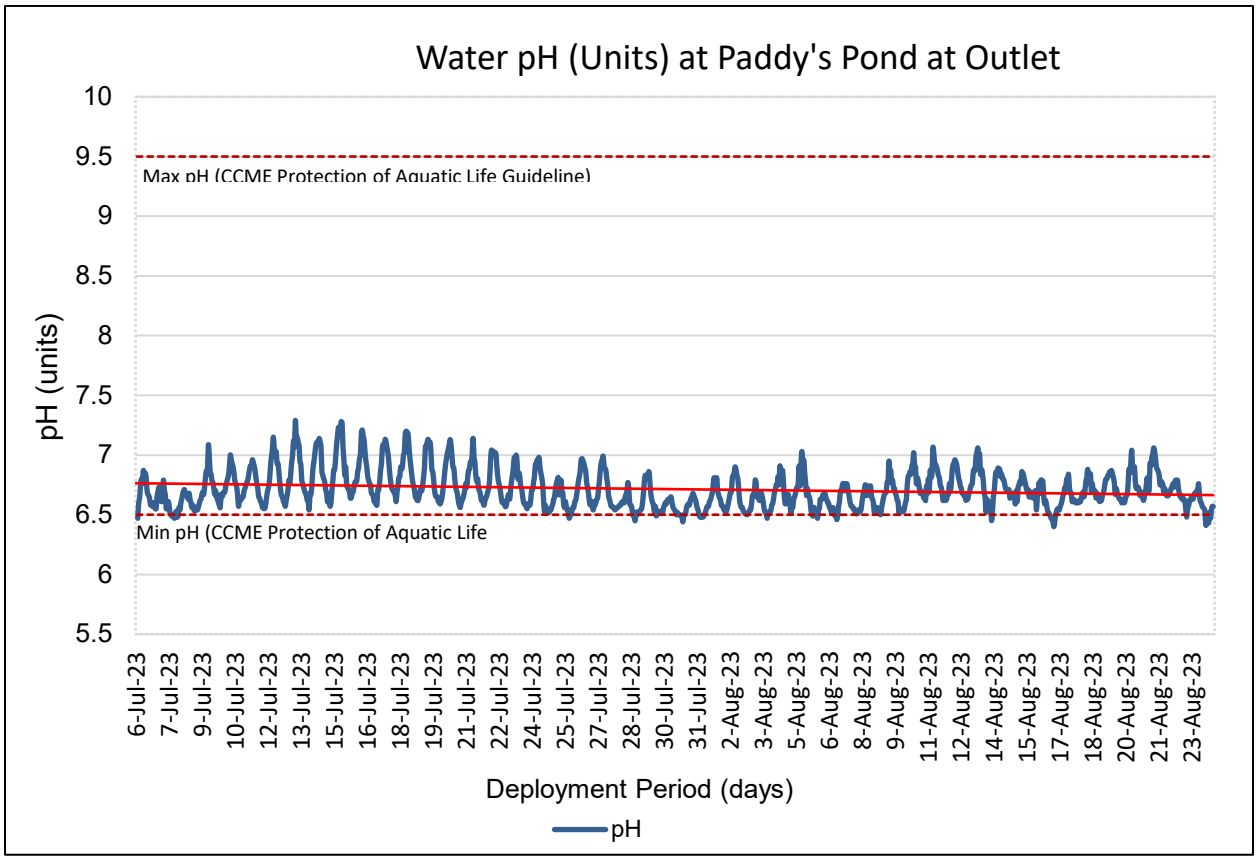
- Water temperature remained relatively constant during the initial week of deployment, followed by a notable increase from July 12 to July 23, 2023. Over the remaining deployment period, there was a gradual decline in temperature, consistent with the expected seasonal cooling trend typical for this time of year, particularly as the fall months approach. (Figure 7 in Appendix A).

- A distinctive natural diurnal variation pattern in water temperature was observed. This pattern was characterized by significant fluctuations between daytime and nighttime temperatures, as expected during the summer season. Daytime temperatures typically rose

due to solar radiation and warm air temperatures, while nighttime temperatures tended to decrease as heat dissipated into the atmosphere. These diurnal variations reflect the dynamic interplay between solar heating, atmospheric conditions, and water body characteristics, contributing to the overall thermal dynamics of the aquatic environment.

pH

- pH is used to give an indication of the acidity or basicity of a solution. A pH of seven (7) denotes a neutral solution while lower values are acidic and higher values are basic. Technically, the pH of a solution indicates the availability of protons to react with molecules dissolved in water. Such reactions can affect how molecules function chemically and metabolically.
- pH values are temperature dependant as well as influenced by photosynthesis and respiration by aquatic organisms. The concentration of dissolved carbon dioxide in the water throughout the day, especially overnight when oxygen production is reduced relative to carbon dioxide levels. Carbon dioxide dissolved in water yields a slightly acidic solution.



Mean	Median	Min	Max
6.71	6.68	6.40	7.29

Figure 3: pH (pH units) at Paddy's Pond at outlet from July 6, 2023, through August 24, 2023.

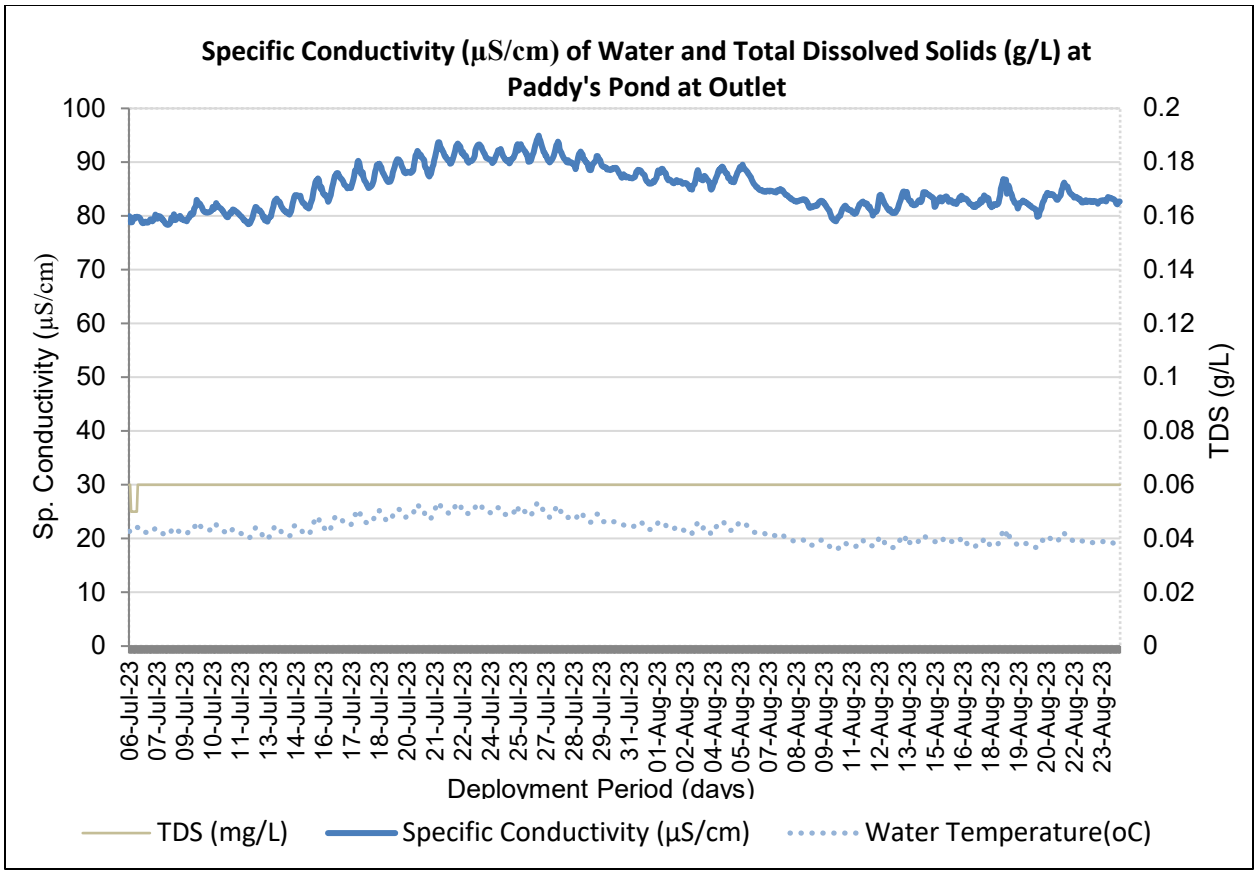
- Throughout the deployment period, the pH value trend (shown in red) was uniform, however slight variability within 6.40 to 7.29 pH units was observed during peak day-time pH levels. A mean unit value of 6.71 and median of 6.68 units (Figure 3) was determined through statistical analysis.

- Most pH values were near or just above the CCME Protection of Aquatic Life minimum pH guideline of 6.5 units and below the maximum pH CCME Protection of Aquatic Life guideline (horizontal dashed lines). It must be noted that these are national guidelines and do not reflect the peculiarities of Newfoundland geology. This guideline provides a basis for the overall health of the waterbody. Paddy's Pond at Outlet pH values were slightly below the minimum guideline for a total of 38 readings of which is likely the result of lower water temperature and the addition of more acidic rainwater and/or snowmelt runoff during precipitation events. (See Figure 7 – Appendix A).

- Diurnal variation pattern was visible throughout the deployment period. The magnitude of variation correlates to daily water temperature range, length of days and fluctuations in photosynthesis and respiration rates. As such, the observed increase in the diurnal pattern is expected due to the increase in aquatic biotic activity and higher daily temperature ranges during late spring-summer season. The greatest diurnal peaks are observed from July 12 to July 23, 2023, when air temperatures were at its highest.

Specific Conductivity

- Conductivity relates to the ease of passing an electric charge – or resistance – through a solution. Conductivity is highly influenced by the concentration of dissolved ions in solution: distilled water has zero conductivity (infinite resistance) while salty solutions have high conductivity (low resistance). Specific Conductivity is corrected to 25^{o}C to allow comparison across variable temperatures.



Mean	Median	Min	Max
85.1	84.1	78.4	94.9

Figure 4: Specific Conductivity (µS/cm) values at Paddy's Pond at Outlet.

- Conductivity remained relatively constant during the initial week of deployment, followed by a notable increase from July 12 to July 23, 2023, in correspondence with an increase in water temperature. Subsequently, there was a gradual decline in conductivity until August 9, 2023, at which point conductivity plateaued for the remainder of the deployment period (Figure 7 in Appendix A).

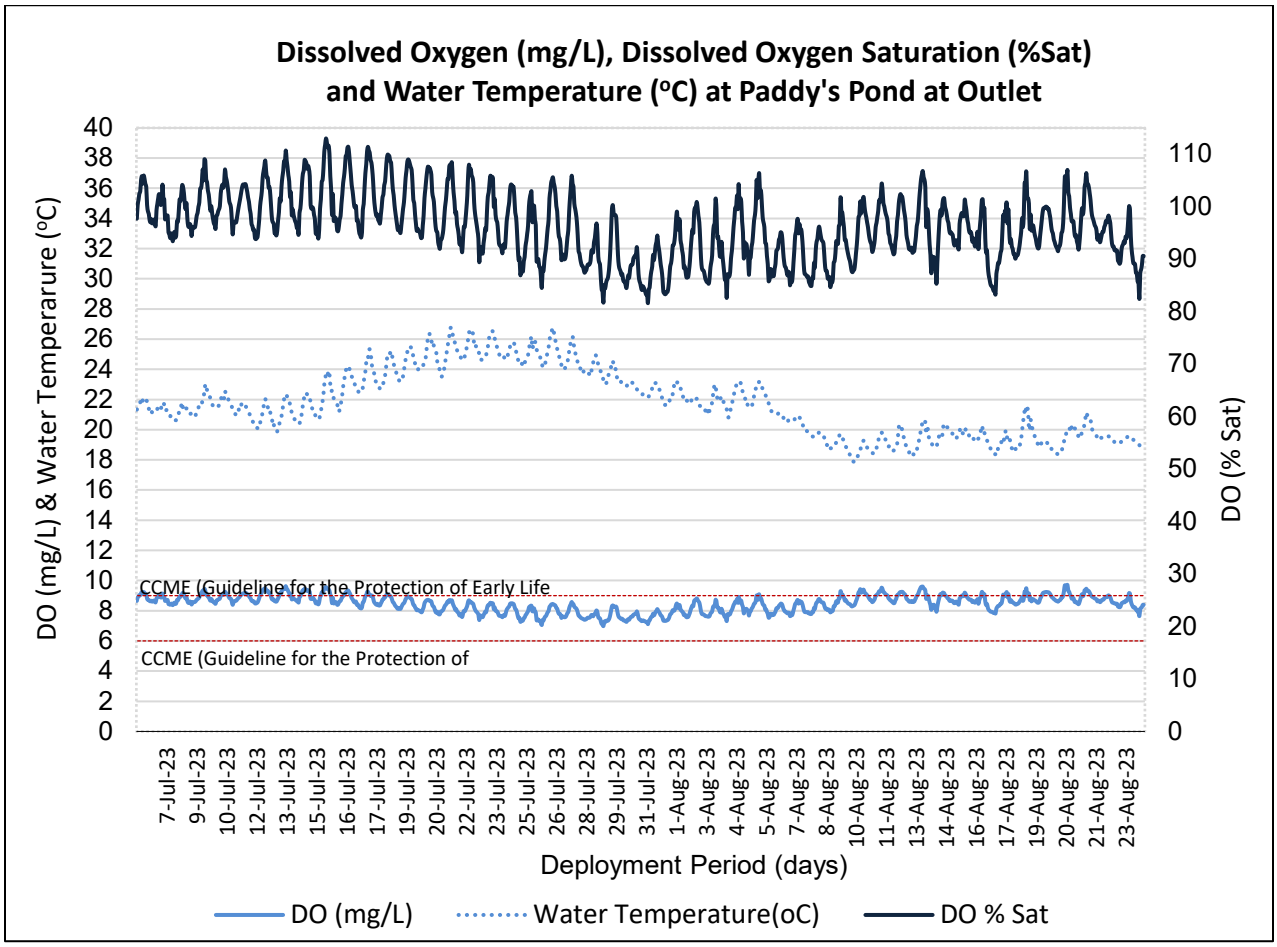
- Inconsistencies to the diurnal variation pattern, as seen on July 28-30, 2023, and August 6-10, 2023 are likely the result of an increase in precipitation events as seen in Appendix A - Figure 7. The addition of cool precipitation can decrease water temperature, lowering the concentration of dissolved ions and specific conductivity.

- Given the isolated station location, sources of disturbances that may affect conductivity are considered minimal.

- The calculated Total Dissolved Solids (TDS) value range from 0.0500 to 0.0600 g/L throughout the deployment period.

Dissolved Oxygen

- Dissolved oxygen is a metabolic requirement of aquatic plants and animals. The concentration of oxygen in water depends on many factors, especially temperature – the saturation of oxygen in water is inversely proportional to water temperature. Oxygen concentrations also tend to be higher in flowing water compared to still, lake environments. Low oxygen concentrations can give an indication of excessive decomposition of organic matter or the presence of oxidizing materials.



Parameter	Mean	Median	Min	Max
DO (mg/L)	8.46	8.55	6.98	9.71
DO (% Sat)	96.2	96.1	81.6	113.0

Figure 5: Dissolved Oxygen (mg/L & Percent (%) Saturation) values at Paddy's Pond at Outlet.

- In correlation with increasing water temperatures, dissolved oxygen (DO) concentrations (mg/L) had a uniform and stable trend throughout the deployment period, with exception to a decrease in concentration between July 18 to August 8, 2023. This reduction is most likely

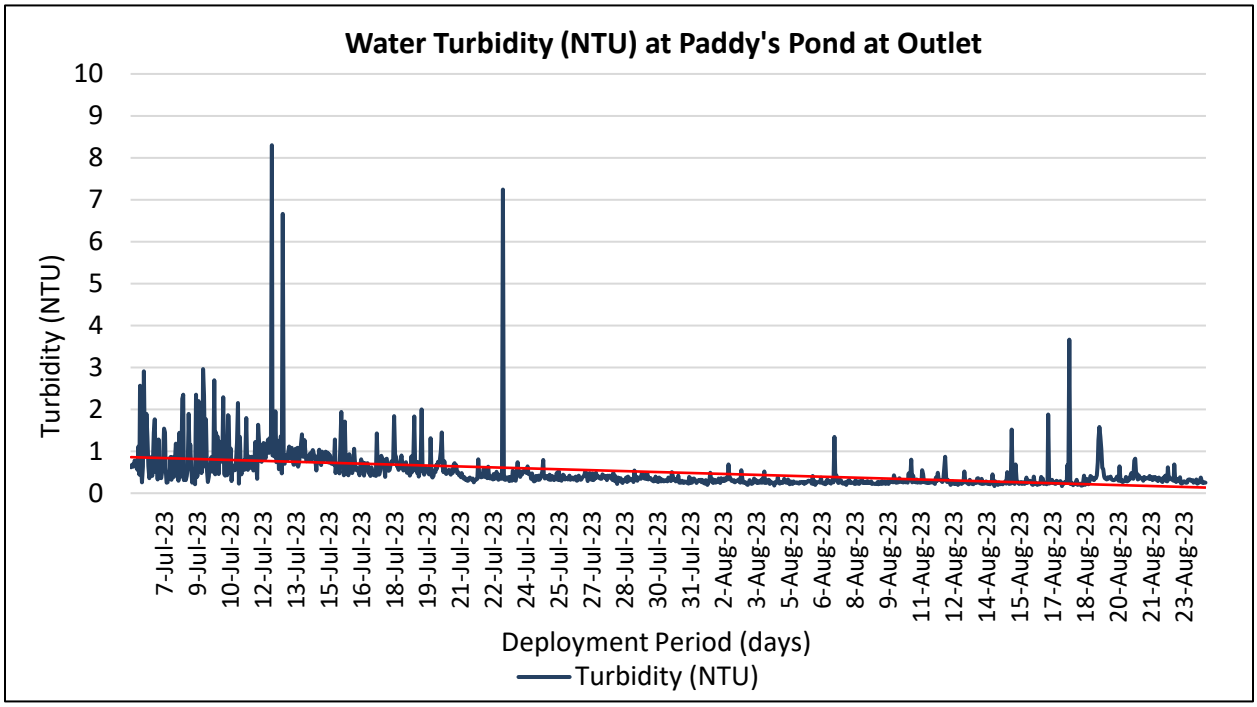
the result of the increase in water temperature during this time. A maximum DO of 9.71 mg/L (113.0 % Sat) to a minimum DO of 6.98 mg/L (81.6 % Sat) were observed. The lower dissolved oxygen concentration was also due to precipitation events on July 28, 2023, and July 30, 2023, where a total of 24.4 mm of rain was received. Dissolved oxygen (% Saturation) readings of greater than 100% air saturation can occur in ambient water because of the production of pure oxygen by photosynthetically-active organisms and/or because of non-ideal equilibration of dissolved oxygen between the water and the air above it.

- A consistent diurnal variation pattern was observed throughout the deployment period due to temperature ranges from day to night. Variations can be influenced by water depth during deployment as shallow water temperatures will change more rapidly, especially in a lake environment such as Paddy's Pond. As well as linked to the daily range of water temperature, duration of daylight, and fluctuations in rates of photosynthesis and respiration.

- The dissolved oxygen values were above and below the CCME Guideline for the Protection of Early Life Stages (9.5 mg/L) and remained above the CCME Guideline for the Protection of Other Life Stages (6.5mg/L) for the entire deployment period.

Turbidity

- Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover spawning areas.



Mean	Median	Min	Max
0.5	0.4	0.2	8.3

Figure 6: Water turbidity (NTU) values at Paddy's Pond at Outlet during deployment period through July 6, 2023 to August 24, 2023.

- Turbidity values range from 0.2 to 8.3 NTU, with a mean of 0.5 NTU and a median value of 0.4 NTU (Figure 6).

- Turbidity measurements throughout the deployment period indicated very low turbidity. This is consistent with historical data for this location. An increase in turbidity was observed in the first week of the deployment period and may be a result of sediment build-up around the sensor because of sediment disturbance during the recent deployment.

- Turbidity spikes above the baseline as seen on July 12 and July 22, 2023, are likely the result of suspended algae or siltation due to wave action.

APPENDIX A : MEAN DAILY TEMPERATURE AND TOTAL PRECIPITATION

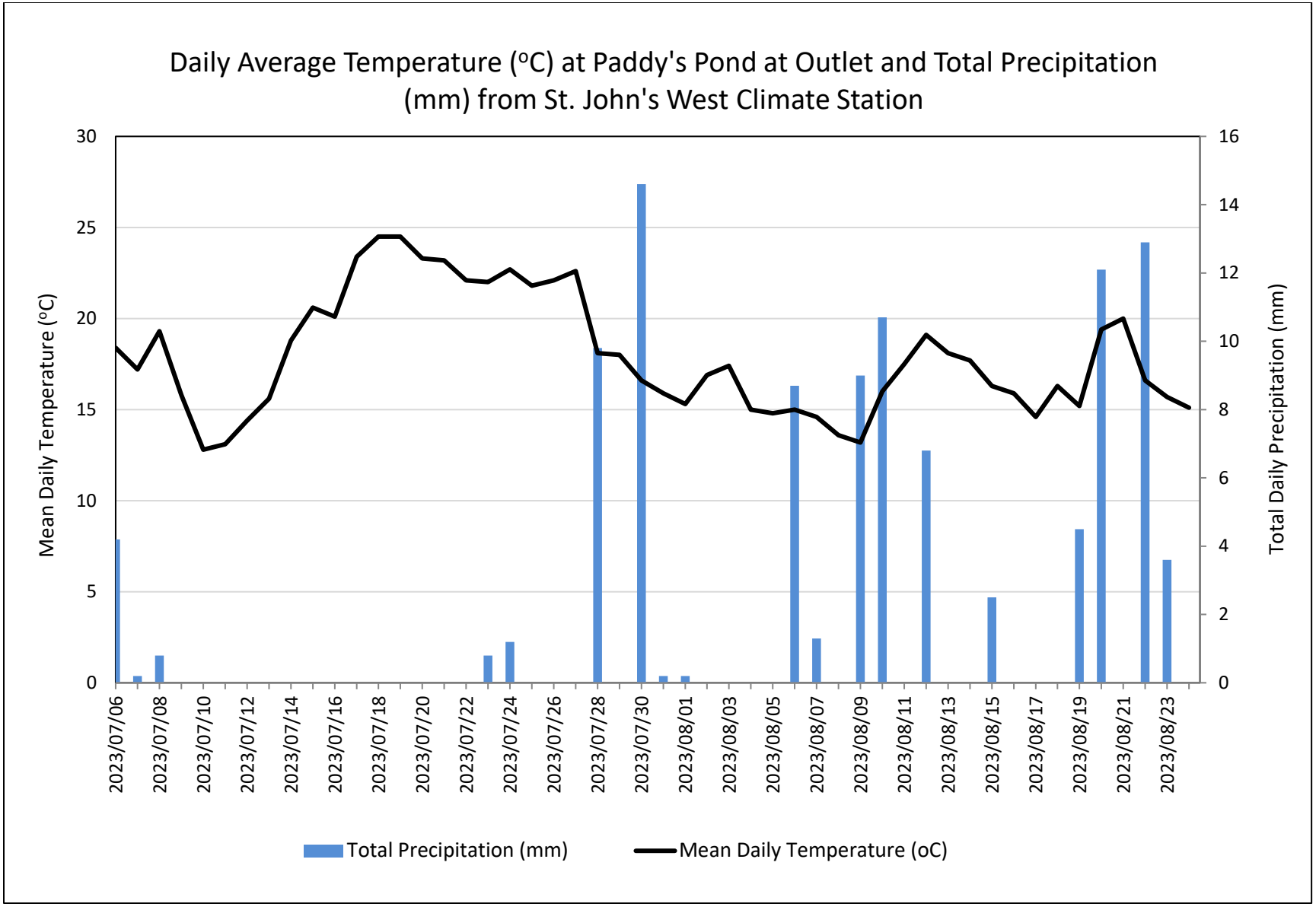


Figure 7: Mean daily air temperature and total precipitation at St. John's West near Paddy's Pond July 6, 2023 to August 24, 2023.

APPENDIX B : QA/QC GRAB SAMPLE FIELD RESULTS

Your P.O. #: 220028978-9
Your C.O.C. #: N/a, 2023-1707-SI-SP

Attention: Robert Richard Harvey

NL Department of Environment, Climate Change and Municipalities
Water Resources
PO Box 8700
St. John's, NL
CANADA A1B 4J6

Report Date: 2023/07/28
Report #: R7739413
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3K1991
Received: 2023/07/07, 10:21

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	1	N/A	2023/07/27	ATL SOP 00142	SM 24 2320 B
Anions (1)	1	N/A	2023/07/14	CAM SOP-00435	SM 23 4110 B m
Colour	1	N/A	2023/07/27	ATL SOP 00020	SM 24 2120C m
Organic carbon - Diss (DOC) (2)	1	N/A	2023/07/27	ATL SOP 00203	SM 24 5310B m
Conductance - water	1	N/A	2023/07/27	ATL SOP 00004	SM 24 2510B m
Fluoride	1	N/A	2023/07/27	ATL SOP 00043	SM 24 4500-F- C m
Hardness (calculated as CaCO3)	1	N/A	2023/07/27	ATL SOP 00048	Auto Calc
Mercury - Total (CVAA,LL)	1	2023/07/20	2023/07/21	ATL SOP 00026	EPA 245.1 R3 m
Metals Water Total MS	1	2023/07/26	2023/07/27	ATL SOP 00058	EPA 6020B R2 m
Nitrogen Ammonia - water	1	N/A	2023/07/20	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	1	N/A	2023/07/27	ATL SOP 00016	USGS I-2547-11m
Nitrogen - Nitrite	1	N/A	2023/07/27	ATL SOP 00017	SM 24 4500-NO2- B m
Nitrogen - Nitrate (as N)	1	N/A	2023/07/28	ATL SOP 00018	ASTM D3867-16
pH (3)	1	N/A	2023/07/27	ATL SOP 00003	SM 24 4500-H+ B m
Calculated TDS (DW Pkg)	1	N/A	2023/07/28	N/A	Auto Calc
Total Kjeldahl Nitrogen in Water (1)	1	2023/07/14	2023/07/17	CAM SOP-00938	OMOE E3516 m
Organic carbon - Total (TOC) (2)	1	N/A	2023/07/21	ATL SOP 00203	SM 24 5310B m
Total Phosphorus (Colourimetric) (1)	1	2023/07/14	2023/07/16	CAM SOP-00407	SM 23 4500-P I
Total Suspended Solids	1	2023/07/13	2023/07/14	ATL SOP 00007	SM 24 2540D m
Turbidity	1	N/A	2023/07/26	ATL SOP 00011	EPA 180.1 R2 m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

(1) This test was performed by Bureau Veritas Mississauga, 6740 Campobello Rd , Mississauga, ON, L5N 2L8
(2) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.
(3) The APHA Standard Method requires pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.

Bureau Veritas 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.bvna.com

Your P.O. #: 220028978-9
Your C.O.C. #: N/a, 2023-1707-SI-SP

Attention: Robert Richard Harvey

NL Department of Environment, Climate Change and Municipalities
Water Resources
PO Box 8700
St. John's, NL
CANADA A1B 4J6

Report Date: 2023/07/28
Report #: R7739413
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3K1991
Received: 2023/07/07, 10:21

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Gemarie Balatico, Project Manager
Email: Gemarie.Balatico@bureauveritas.com
Phone# (905)817-5787

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Bureau Veritas Job #: C3K1991
Report Date: 2023/07/28

NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 220028978-9
Sampler Initials: LB

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
WII029 PADDY'S POND								
Sampling Date 2023/07/06 10:30								
Matrix W								
Sample # 2023-1707-SI-SP								
Registration # SA-0000								
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	7.6	1.0	mg/L	N/A	2023/07/27		8778146
Nitrate (N)	-	0.051	0.050	mg/L	N/A	2023/07/28		8778819
Total dissolved solids (calc., EC)	-	48	1.0	mg/L	N/A	2023/07/28		8778351
Inorganics								
Conductivity	-	86	1.0	uS/cm	N/A	2023/07/27	LJV	8815354
Dup.Conductivity	-	86	1.0	uS/cm	N/A	2023/07/27	LJV	8815354
Chloride (Cl-)	-	19	1.0	mg/L	N/A	2023/07/14	SUR	8788421
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2023/07/14	SUR	8788421
Sulphate (SO4)	-	ND	1.0	mg/L	N/A	2023/07/14	SUR	8788421
Total Alkalinity (Total as CaCO3)	-	3.0	2.0	mg/L	N/A	2023/07/27	LJV	8815356
Dup.Total Alkalinity (Total as CaCO3)	-	3.1	2.0	mg/L	N/A	2023/07/27	LJV	8815356
Colour	-	26	5.0	TCU	N/A	2023/07/27	TGO	8815401
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2023/07/27	LJV	8815359
Dup.Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2023/07/27	LJV	8815359
Total Kjeldahl Nitrogen (TKN)	-	0.13	0.10	mg/L	2023/07/14	2023/07/17	KJP	8790069
Dup.Total Kjeldahl Nitrogen (TKN)	-	0.13	0.10	mg/L	2023/07/14	2023/07/17	KJP	8790069
Nitrate + Nitrite (N)	-	0.051	0.050	mg/L	N/A	2023/07/27	TGO	8815398
Nitrite (N)	-	ND	0.010	mg/L	N/A	2023/07/27	TGO	8813896
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2023/07/20	TGO	8799065
Dissolved Organic Carbon (C)	-	4.4	0.50	mg/L	N/A	2023/07/27	CPP	8813955
Dup.Dissolved Organic Carbon (C)	-	4.2	0.50	mg/L	N/A	2023/07/27	CPP	8813955
Total Organic Carbon (C)	-	5.1	0.50	mg/L	N/A	2023/07/21	CPP	8804117
pH	-	6.58		pH	N/A	2023/07/27	LJV	8815352
Dup.pH	-	6.59		pH	N/A	2023/07/27	LJV	8815352
Total Phosphorus	-	0.007	0.004	mg/L	2023/07/14	2023/07/16	MUM	8789527
Total Suspended Solids	-	3.6	1.0	mg/L	2023/07/13	2023/07/14	RDM	8787106
Turbidity	-	2.0	0.10	NTU	N/A	2023/07/26	LJV	8813326
Dup.Turbidity	-	2.1	0.10	NTU	N/A	2023/07/26	LJV	8813326
MERCURY BY COLD VAPOUR AA (WATER)								
Metals								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2023/07/20	2023/07/21	SGK	8800983
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	-	0.071	0.0050	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Antimony (Sb)	-	ND	0.0010	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Arsenic (As)	-	ND	0.0010	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Barium (Ba)	-	0.0035	0.0010	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Boron (B)	-	ND	0.050	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2023/07/26	2023/07/27	JHY	8813076

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Bureau Veritas Job #: C3K1991
Report Date: 2023/07/28

NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 220028978-9
Sampler Initials: LB

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
WII029 PADDY'S POND								
Sampling Date 2023/07/06 10:30								
Matrix W								
Sample # 2023-1707-SI-SP								
Registration # SA-0000								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Calcium (Ca)	-	2.0	0.10	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Chromium (Cr)	-	ND	0.0010	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Copper (Cu)	-	ND	0.00050	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Iron (Fe)	-	0.12	0.050	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Lead (Pb)	-	ND	0.00050	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Magnesium (Mg)	-	0.60	0.10	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Manganese (Mn)	-	0.032	0.0020	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Nickel (Ni)	-	ND	0.0020	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Phosphorus (P)	-	ND	0.10	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Potassium (K)	-	0.37	0.10	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Selenium (Se)	-	ND	0.00050	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Sodium (Na)	-	12	0.10	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Strontium (Sr)	-	0.0068	0.0020	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Uranium (U)	-	ND	0.00010	mg/L	2023/07/26	2023/07/27	JHY	8813076
Total Zinc (Zn)	-	ND	0.0050	mg/L	2023/07/26	2023/07/27	JHY	8813076

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NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 220028978-9
Sampler Initials: LB

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	17.0°C

Results relate only to the items tested.

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Bureau Veritas Job #: C3K1991
Report Date: 2023/07/28

NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 220028978-9
Sampler Initials: LB

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Cristina Carriere, Senior Scientific Specialist

Janah Rhyno, Scientific Specialist

Mike MacGillivray, Scientific Specialist (Inorganics)

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