

# Real-Time Water Quality Deployment Report

Iron Ore Company of Canada  
Labrador West Network

June 12 to  
July 17, 2019



Government of Newfoundland & Labrador  
Department of Municipal Affairs and  
Environment  
Water Resources Management Division

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## General

- The Water Resources Management Division, in partnership with the Iron Ore Company of Canada (IOC) and Environment and Climate Change Canada (ECCC), maintain two real-time water quality (RTWQ) and water quantity stations at Wabush Lake.
- The official name of each station is *Wabush Lake at Dolomite Road* and *Wabush Lake at Lake Outlet*, hereafter referred to as the Dolomite Road station and the Julienne Narrows station.
- These stations are situated upstream (Dolomite Road) and downstream (Julienne Narrows) of the IOC tailings disposal area in Wabush Lake.
- On June 8<sup>th</sup>, 2016, an additional station was commissioned under this agreement. This station is located at *Dumbell Stream above Dumbell Lake*, hereafter referred to as Dumbell Stream.
- On June 12<sup>th</sup>, 2017 a new station was commissioned under this agreement. This station is located at *Pumphouse Stream above Drum Lake*, hereafter referred to as Pumphouse Stream.
- Water Resources Management Division staff monitor the real-time graphs regularly. They will inform IOC of any significant water quality events by email notification and by monthly deployment reports.
- On June 12<sup>th</sup>, real-time water quality monitoring instruments were deployed at the four IOC stations. The instruments were deployed for a period of 34 days at Julienne Narrows and 35 days at Dolomite Road, Dumbell Stream and Pumphouse Stream. The instruments were removed between July 16<sup>th</sup> and 17<sup>th</sup>. This was the first deployment period for this season.



Figure 1: RTWQ Monitoring Stations in Labrador West

## Quality Assurance and Quality Control

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

At deployment and removal, a QA/QC Sonde is temporarily deployed along side the Field Sonde. Values for temperature, pH, conductivity, dissolved oxygen and turbidity are compared between the two instruments. Based on the degree of difference between parameters recorded by the Field Sonde and QA/QC Sonde at deployment and at removal, a qualitative statement is made on the data quality (Table 1).

**Table 1: Ranking classifications for deployment and removal**

Parameter	Rank				
	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

- 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 dependant, temperature compensated and temperature independent. Because 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.
- Deployment and removal comparison rankings for the IOC water quality stations deployed between June 12 and July 16-17, 2019 are summarized in Table 2.

Table 2: QA/QC comparison rankings for IOC stations between June 12 and July 16-17, 2019.

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Dolomite Road	June 12, 2019	Deployment	Excellent	Fair	Excellent	Good	Excellent
	July 17, 2019	Removal	Excellent	Good	Good	N/A	N/A
Julienne Narrows	June 12, 2019	Deployment	Good	Good	Excellent	Marginal	Fair
	July 16, 2019	Removal	Excellent	Excellent	Fair	Excellent	Good
Dumbell Stream	June 12, 2019	Deployment	Good	Fair	Excellent	Fair	Excellent
	July 17, 2019	Removal	Good	Good	Excellent	Excellent	Excellent
Pumphouse Stream	June 12, 2019	Deployment	Excellent	Good	Excellent	Good	Excellent
	July 17, 2019	Removal	Excellent	Good	Excellent	Excellent	Excellent

▪ **Dolomite Road**

At deployment, all parameters with the exception of pH ranked either ‘excellent’ or ‘good’. pH ranked ‘fair’. The field instrument read a value of 6.71, while the QA/QC instrument read a value of 7.34. It is worth noting that the QA/QC sample that was collected at this time had a value of 7.32.

At removal, temperature, pH and conductivity ranked either ‘excellent’ or ‘good’. Dissolved oxygen and turbidity could not be ranked due to a power issue with the sonde.

▪ **Julienne Narrows**

At deployment, temperature, pH and conductivity ranked either ‘excellent’ or ‘good’. Dissolved oxygen ranked ‘marginal’. The field instrument read a value of 11.48 mg/l, while the QA/QC sonde read a value of 10.56 mg/l. Turbidity ranked ‘fair’. The field instrument read a value of 9.6 NTU, while the QA/QC read a value of 15.8 NTU; however, when compared to the QA/QC grab sample of 5.4 NTU, turbidity ranked ‘good’.

At removal, all parameters with the exception of conductivity ranked either ‘excellent’ or ‘good’. Conductivity ranked ‘fair’. The field instrument read a value of 85.0 µS/cm, while the QA/QC sonde read a value of 94.0 µS/cm.

▪ **Dumbell Stream**

At deployment, temperature, conductivity and turbidity ranked either ‘excellent’ or ‘good’. pH ranked ‘fair’. The field instrument read a value of 7.45, while the QA/QC read a value of 8.00; however, when compared to the QA/QC grab sample value of 7.57, pH ranked ‘excellent’. Dissolved oxygen ranked ‘fair’. The field instrument read a value of 12.42 mg/l, while the QA/QC instrument read a value of 11.69 mg/l.

At removal, all parameters ranked either ‘excellent’ or ‘good’.

▪ **Pumphouse Stream**

At deployment and removal, all parameters ranked either ‘excellent’ or ‘good’.

- There are a few circumstances which may cause less than ideal QA/QC rankings to be obtained. These include: the placement of the QA/QC sonde in relation to the field sonde; the amount of time each sonde was given to stabilize before readings were recorded; and deteriorating performance of one or more of the sensors.

## **Data Interpretation**

- The following graphs and discussion illustrate water quality-related events from June 12 to July 16-17, 2019 at the IOC RTWQ monitoring stations in Labrador West.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion below adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

### Wabush Lake Network

- Water temperature ranged from 8.0 to 20.03°C at Dolomite Road and 3.77 to 17.22°C at Julienne Narrows during this deployment period (Figure 2).
- Water temperature increased during this deployment period, which corresponds with increasing ambient air temperature into summer (Figure 2).

Water and Air Temperature : Wabush Lake Network  
June 12 to July 17, 2019

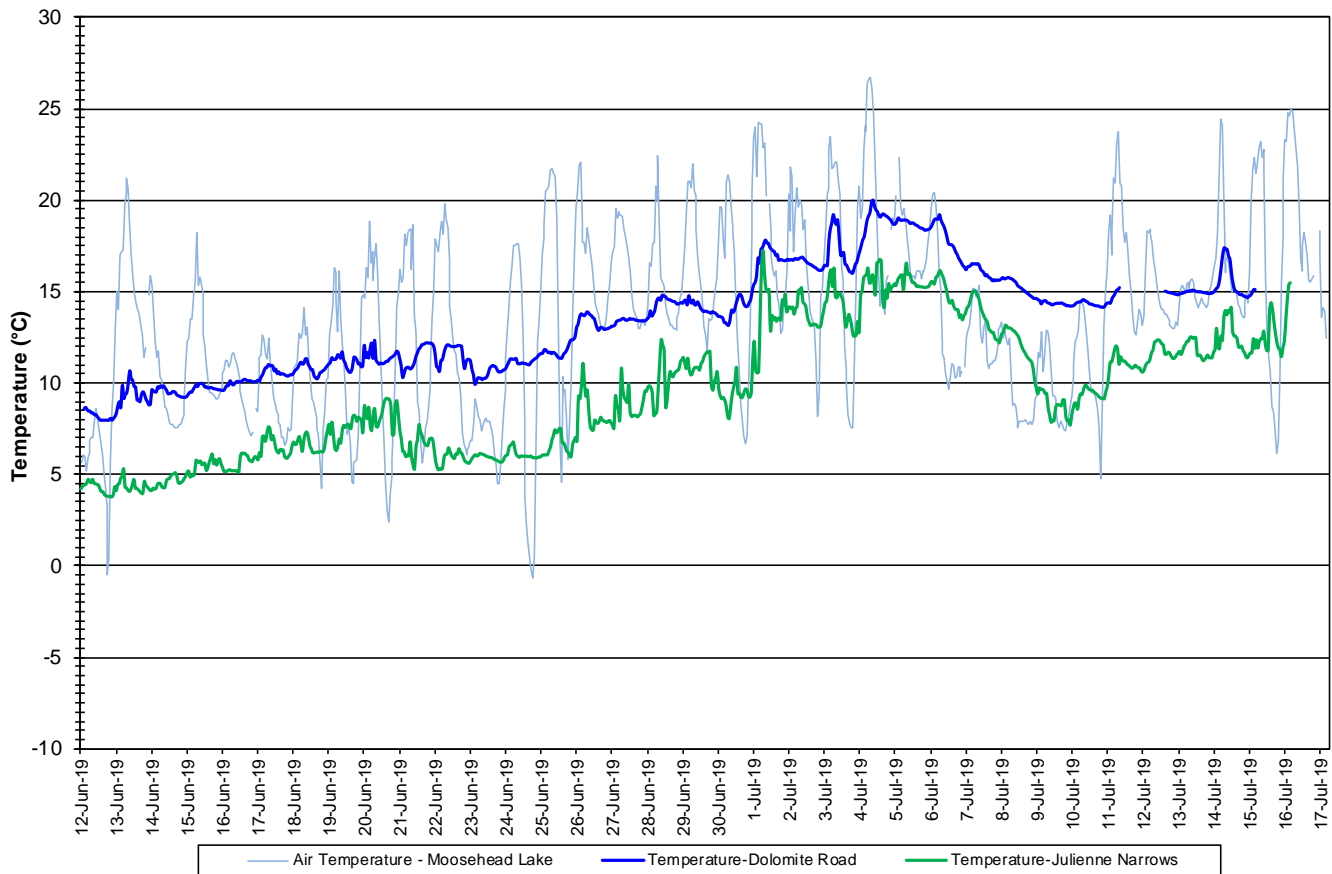
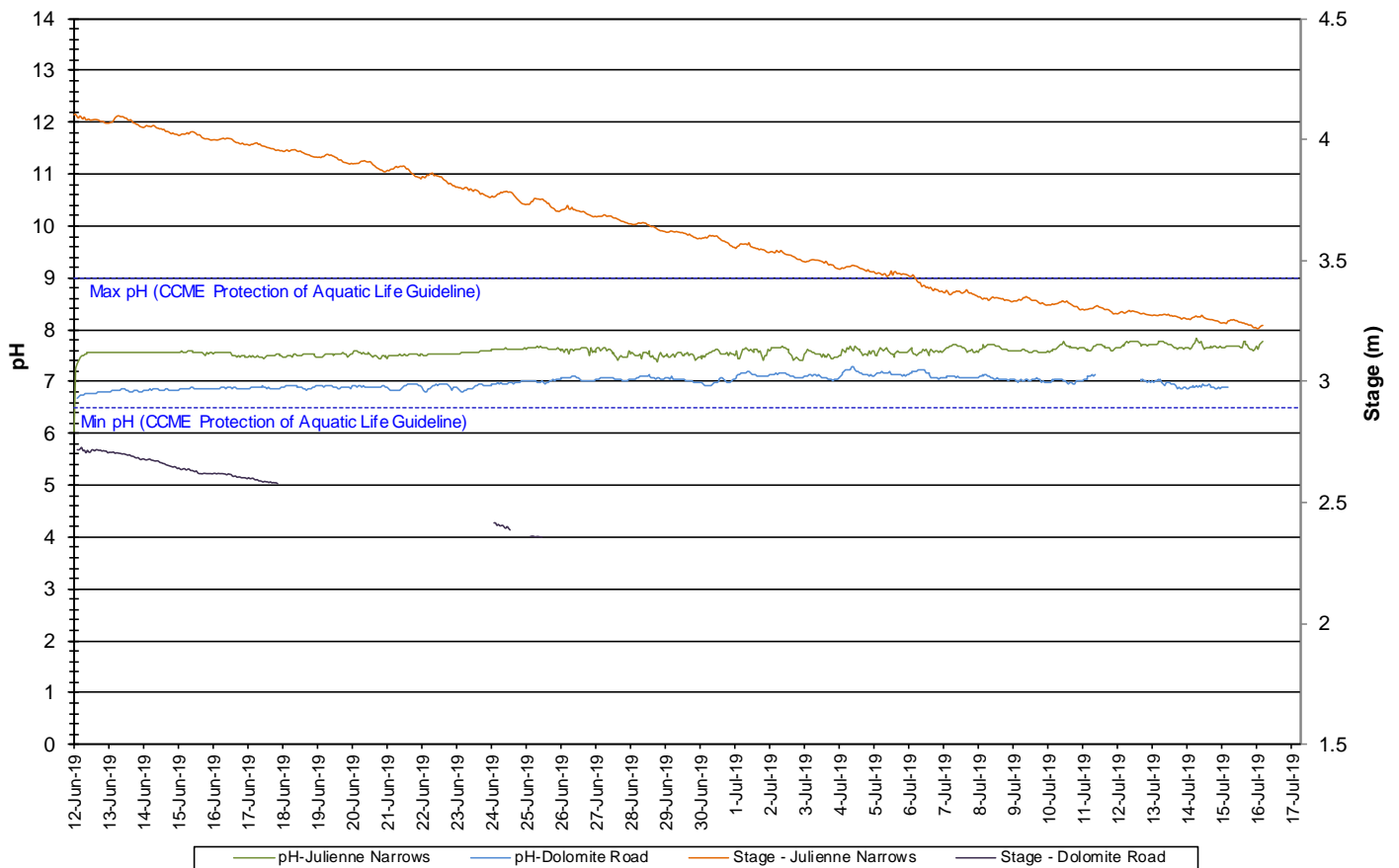


Figure 2: Water and Air Temperature - Wabush Lake network  
(Weather data collected from climate station near Moosehead Lake)



- pH ranges from 6.68 to 7.29 pH units at Dolomite Road, and from 7.25 to 7.83 pH units at Julienne Narrows throughout the deployment period (Figure 3). The median pH is 6.99 and 7.57 units respectively.
- All values during the deployment are within the CCME Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units). pH fluctuates slightly throughout the day and night.
- There is a large portion of stage data missing from Dolomite Road due to a power issue.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

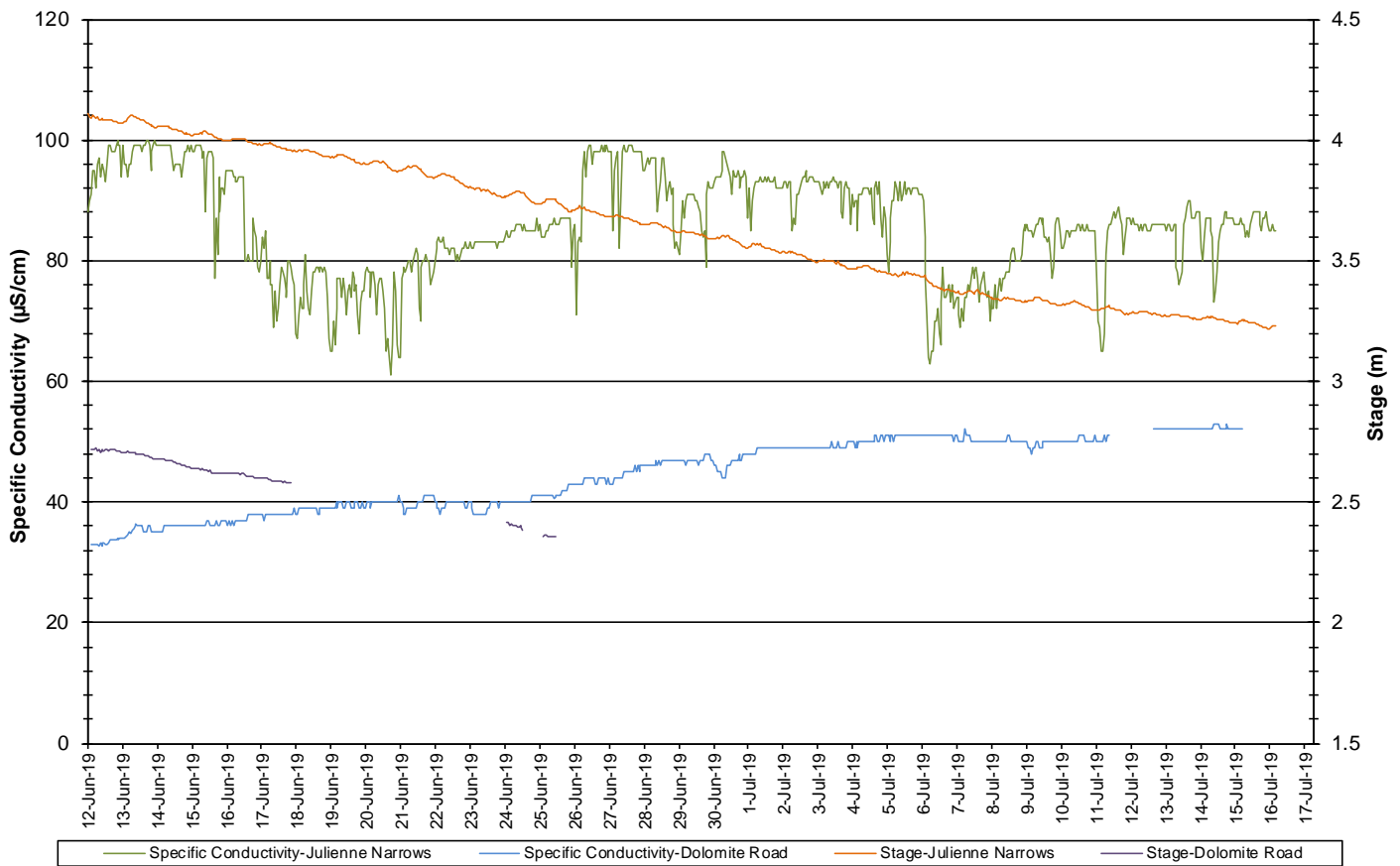
**Water pH and Stage: Wabush Lake Network  
June 12 to July 17, 2019**



**Figure 3: Water pH and Stage– Wabush Lake network**

- Specific conductivity ranged from 32.8 to 52.0  $\mu\text{S}/\text{cm}$  at Dolomite Road and from 61.0 to 100.0  $\mu\text{S}/\text{cm}$  at Julienne Narrows throughout the deployment period (Figure 4).
- Daily fluctuations are evident at the Julienne Narrows station. This can be attributed to varying contributions of iron ore tailings deposited into Wabush Lake upstream of Julienne Narrows and downstream of Dolomite Road. This can also explain the difference in specific conductivity levels between the two stations as conductance values are generally higher at Julienne Narrows.
- Specific conductance increases slightly at Dolomite Road during this deployment period.
- There is a large portion of stage data missing from Dolomite Road due to a power issue.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

**Specific Conductivity and Stage: Wabush Lake Network  
June 12 to July 17, 2019**



**Figure 4: Specific Conductivity and Stage – Wabush Lake network**

- At the Dolomite Road station, the saturation of dissolved oxygen ranged from 80.9 to 96.2% while the dissolved oxygen content ranged from 9.27 to 12.02 mg/l with a median value of 10.11 mg/l (Figure 5).
- At the Julienne Narrows station, the saturation of dissolved oxygen ranged from 90.5 to 103.4% while the dissolved oxygen content ranged from 9.84 to 13.05 mg/l with a median value of 11.44 mg/l (Figure 5).
- All values recorded at Julienne Narrows and Dolomite Road were above the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota of Other Life Stages of 6.5 mg/l.
- The majority of the values recorded at Julienne Narrows were above the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota of Early Life Stages of 9.5 mg/l, while half of the values recorded at Dolomite Road were above the guideline. The guidelines are indicated in blue on Figure 5.
- Dissolved oxygen decreased at both stations towards the end of this deployment period, as water temperature increased. Dissolved oxygen fluctuated daily with decreases observed at night.

Dissolved Oxygen and Percent Saturation : Wabush Lake Network  
June 12 to July 17, 2019

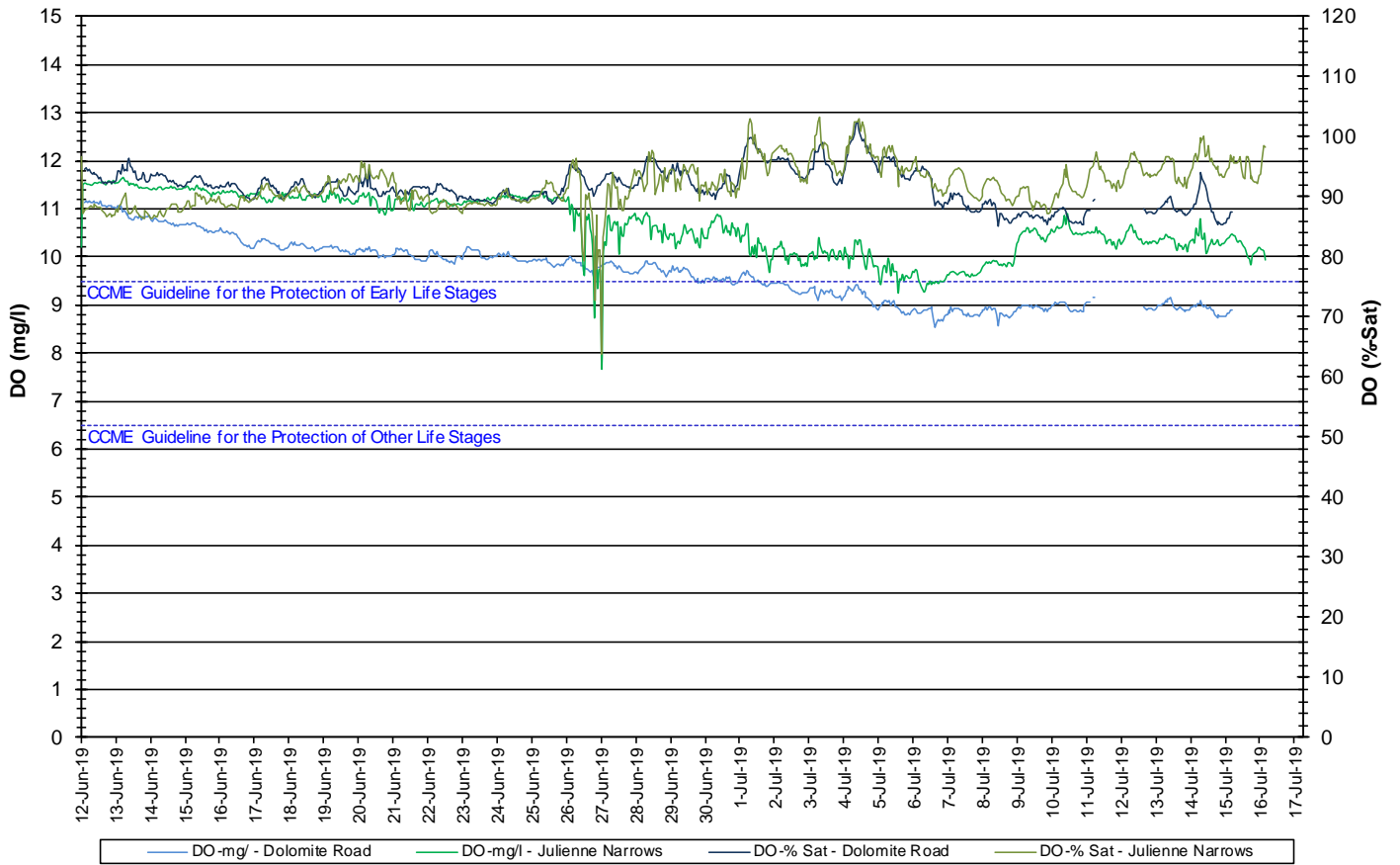
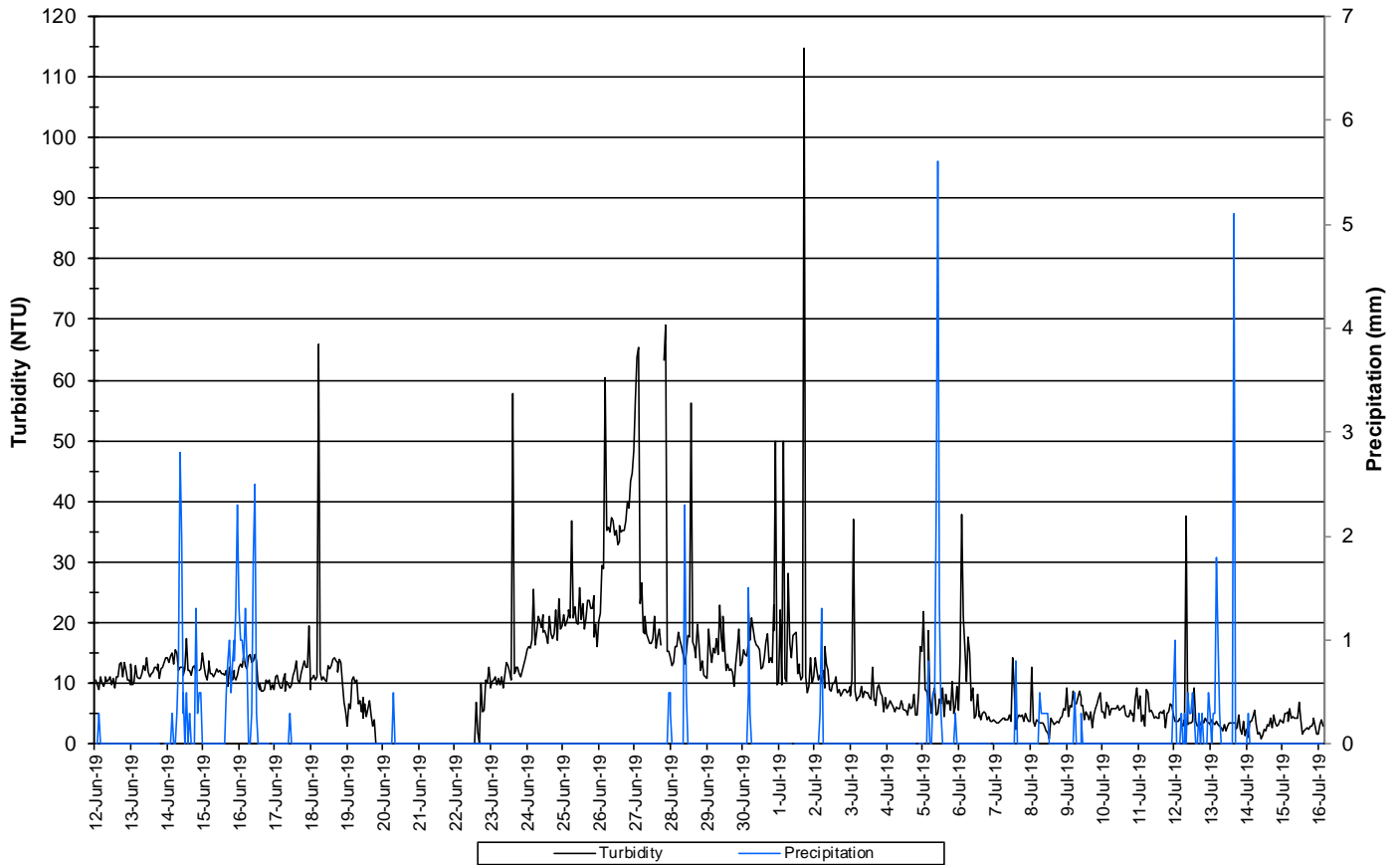


Figure 5: Dissolved Oxygen and Percent Saturation – Wabush Lake Network

- At the Julienne Narrows station, turbidity values range from 0.0 to 114.7 NTU throughout the deployment period (Figure 6). The median value was 9.4 NTU.
- In some instances, turbidity spikes can be attributed to precipitation events.

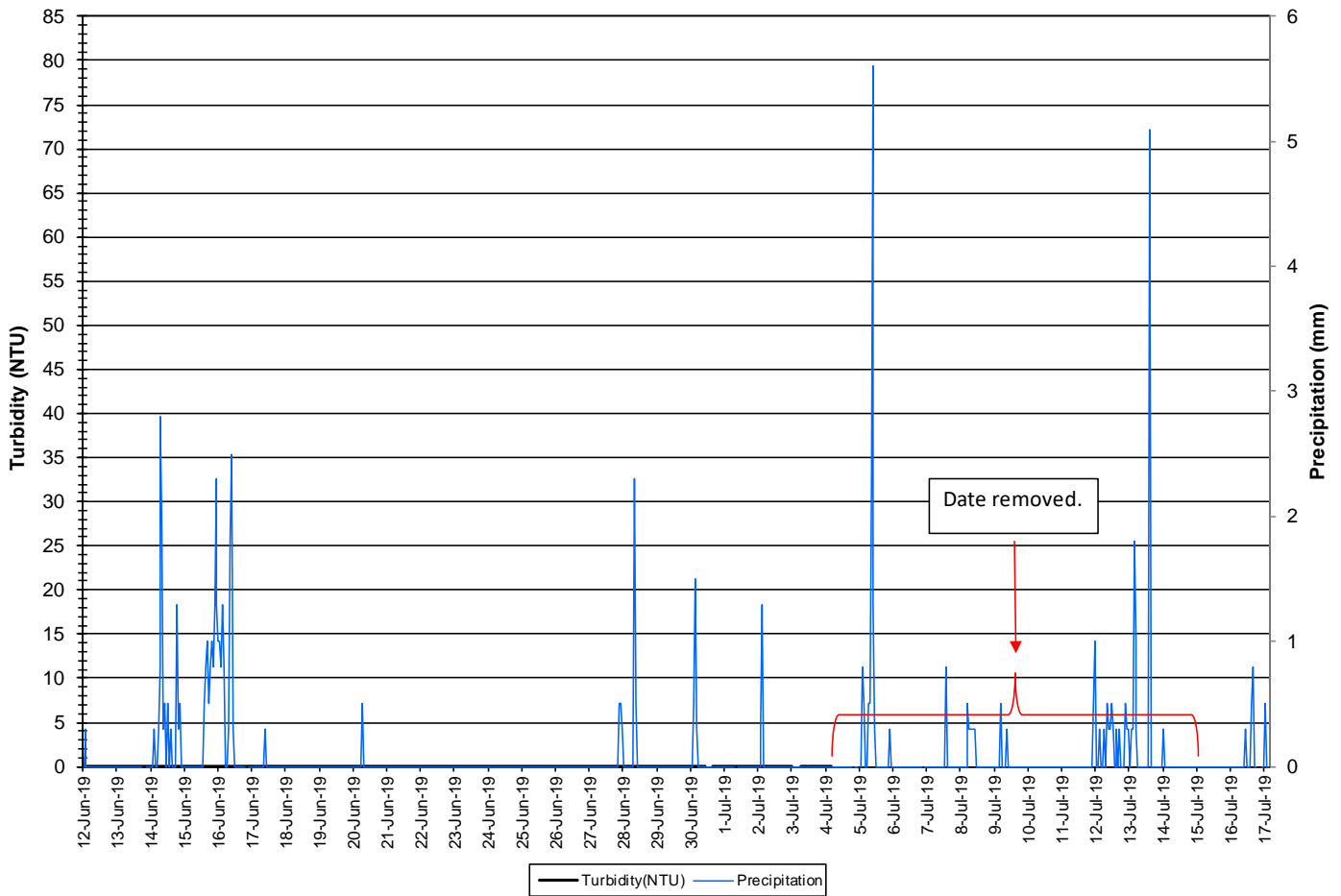
**Water Turbidity and Precipitation: Julienne Narrows  
June 12 to July 16, 2019**



**Figure 6: Turbidity and Precipitation – Julienne Narrows  
(Weather data collected from climate station near Moosehead Lake)**

- At the Dolomite Road station, turbidity values remained 0.0 NTU, throughout the deployment period (Figure 7). The median value was 0.0 NTU.
- There was a large portion of turbidity data removed from this dataset due to a power issue at this station.

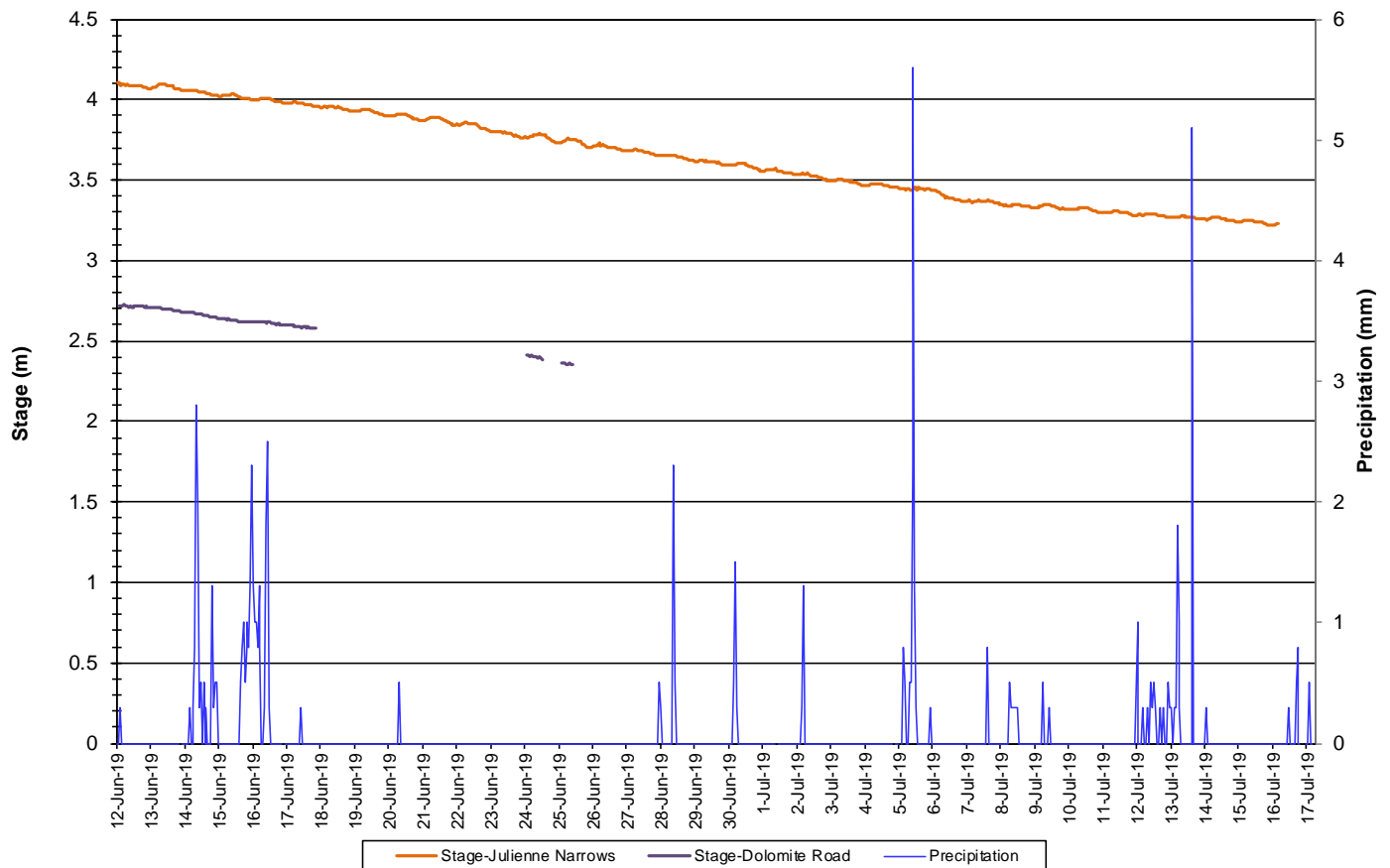
**Turbidity and Precipitation : Dolomite Road  
June 12 to July 17, 2019**



**Figure 7: Turbidity and Precipitation – Dolomite Road  
(Weather data collected from climate station near Moosehead Lake)**

- Stage and precipitation are graphed below to show the relationship between rainfall and water level at Dolomite Road and Julienne Narrows (Figure 8).
- Overall, stage decreased throughout the deployment period at both stations. There is a large portion of data missing from Dolomite Road due to a power issue at this station.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

**Stage and Precipitation: Wabush Lake Network  
June 12 to July 17, 2019**

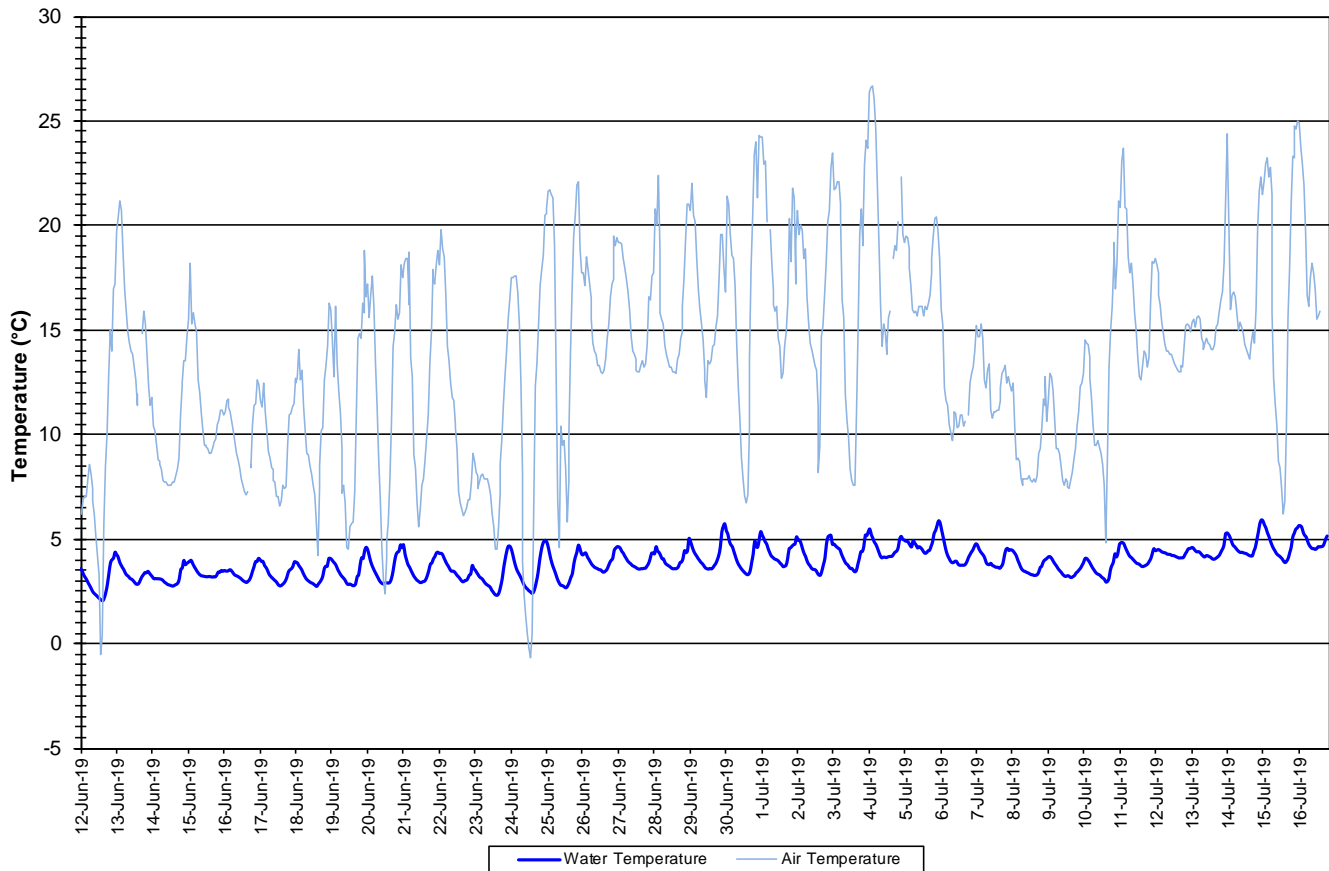


**Figure 8: Stage and Precipitation – Wabush Lake Network**  
**(Weather data collected at climate station located near Moosehead Lake)**

### Dumbell Stream

- Water temperature ranged from 2.02 to 5.94°C during this deployment period (Figure 9).
- Water temperature generally fluctuated within this range for the deployment period. This area is very shaded and minimally influenced by the increasing air temperature (Figure 9).

**Water and Air Temperature : Dumbell Stream above Dumbell Lake  
June 12 to July 17, 2019**



**Figure 9: Water and Air Temperature – Dumbell Stream  
(Weather data collected from climate station near Moosehead Lake)**



- pH ranged from 7.39 to 7.61 pH units (Figure 10). The median pH was 7.49.
- All values during the deployment are within the CCME Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units). pH fluctuates slightly throughout the day and night.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

Water pH and Stage : Dumbell Stream above Dumbell Lake  
June 12 to July 17, 2019

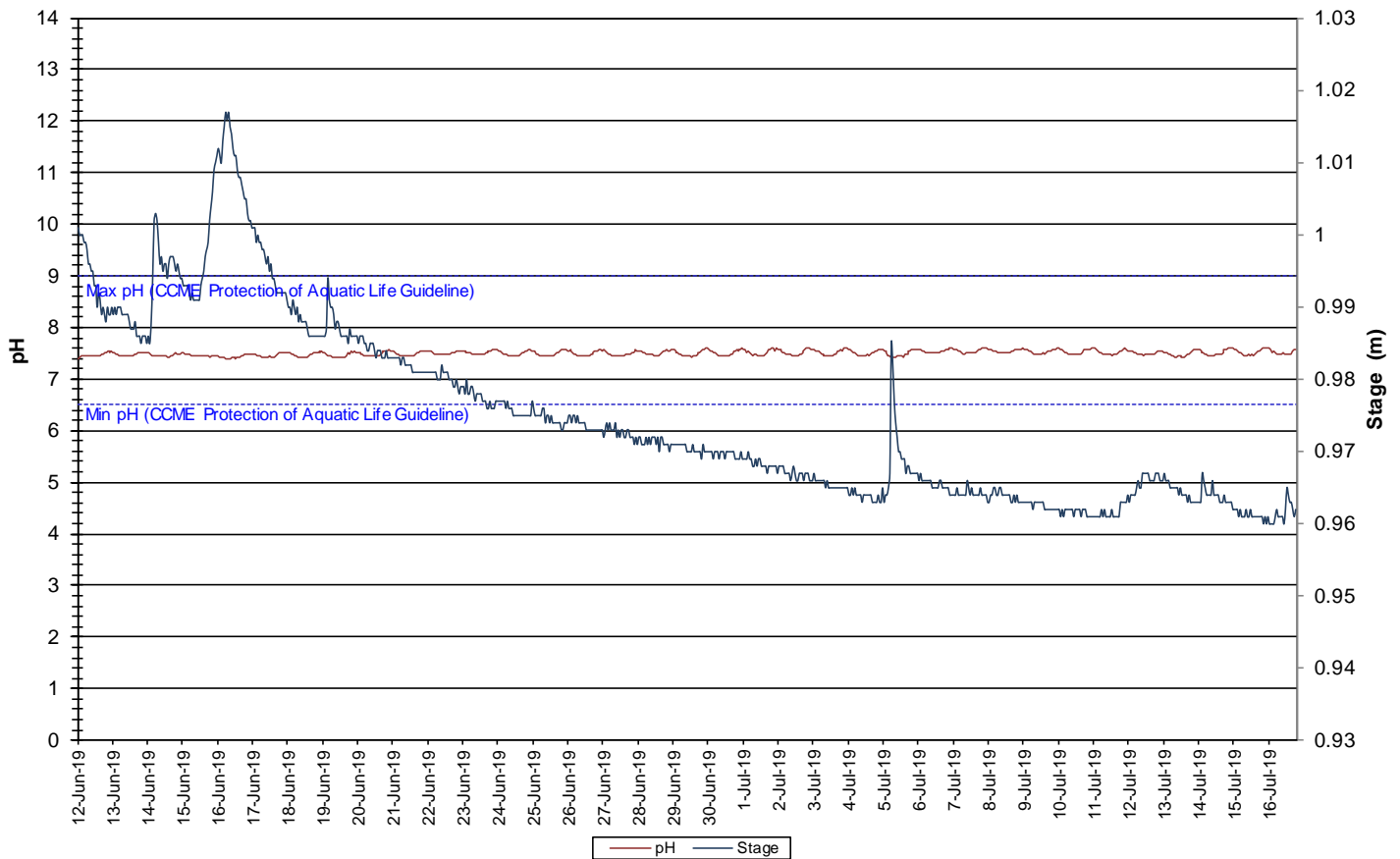


Figure 10: Water pH and Stage – Dumbell Stream

- Specific conductivity ranged from 63.0 to 73.1  $\mu\text{S}/\text{cm}$ , throughout the deployment period (Figure 11).
- Decreases in specific conductivity correspond to increases in stage. As more water is added to the system from precipitation, the solids in the water are diluted, decreasing conductivity. These decreases are indicated in red on Figure 11.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

Specific Conductivity of Water and Stage: Dumbell Stream above Dumbell Lake  
June 12 to July 17, 2019

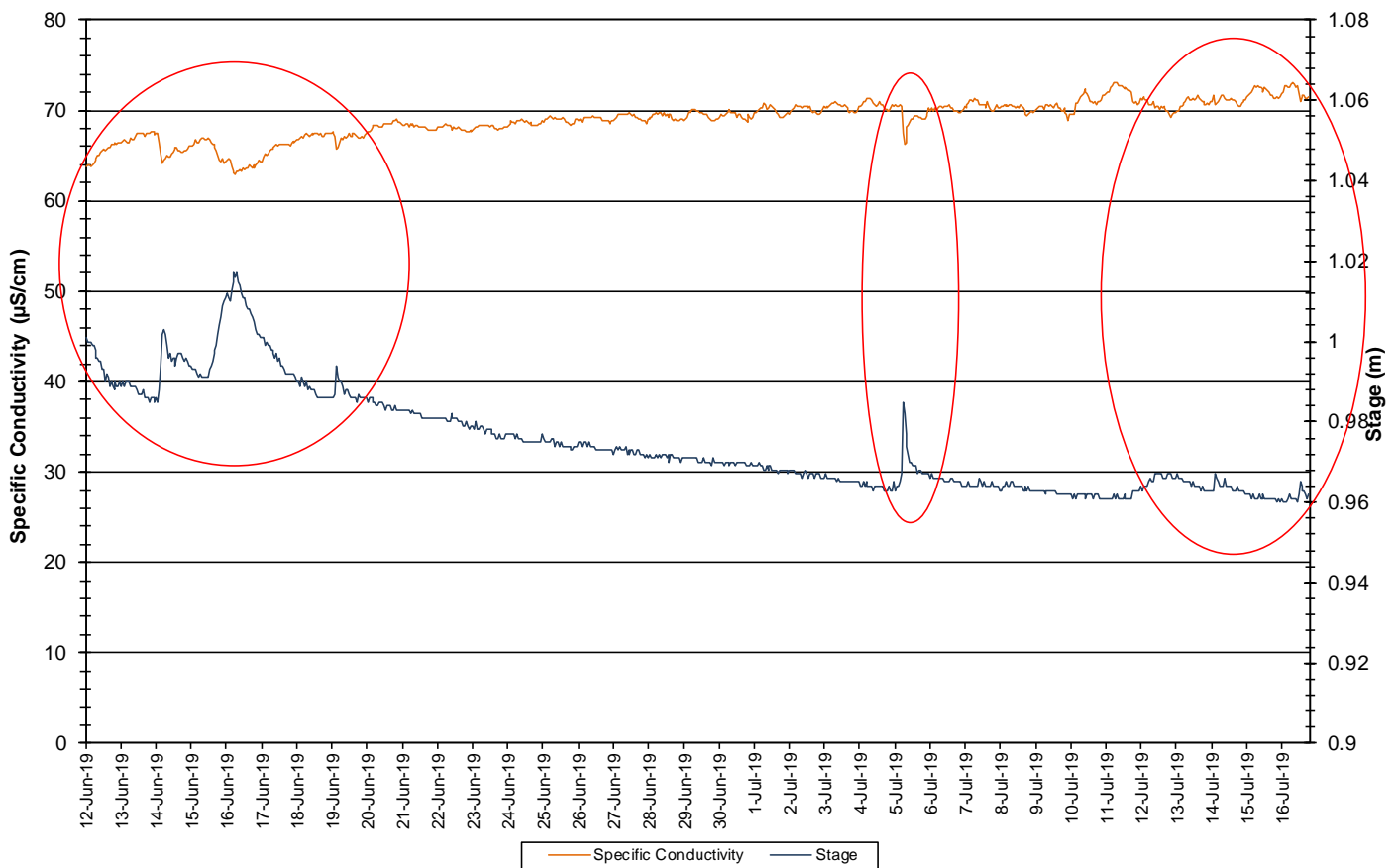


Figure 11: Specific conductivity and stage – Dumbell Stream

- The saturation of dissolved oxygen ranged from 90.3 to 94.2% while the dissolved oxygen content ranged from 11.54 to 13.05 mg/l with a median value of 12.27 mg/l (Figure 12).
- All values recorded at Dumbell Stream were above the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota of Other Life Stages of 6.5 mg/l and the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota of Early Life Stages of 9.5 mg/l. The guidelines are indicated in blue on Figure 12.
- Dissolved oxygen decreased slightly during this deployment period as water temperature increased.
- Dissolved oxygen fluctuated daily with decreases observed at night.

Dissolved Oxygen Concentration and Saturation : Dumbell Stream at Dumbell Lake  
June 12 to July 17, 2019

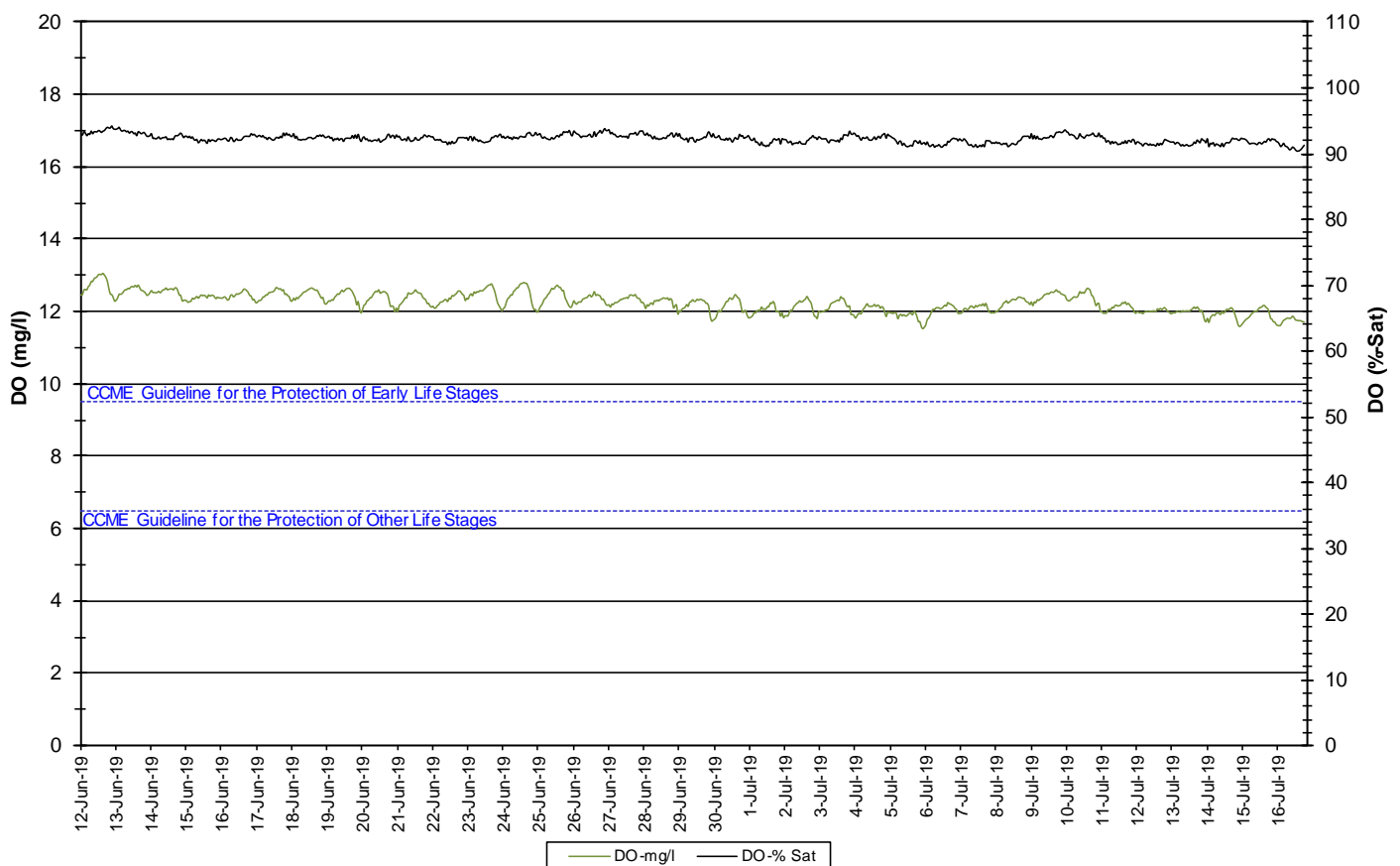
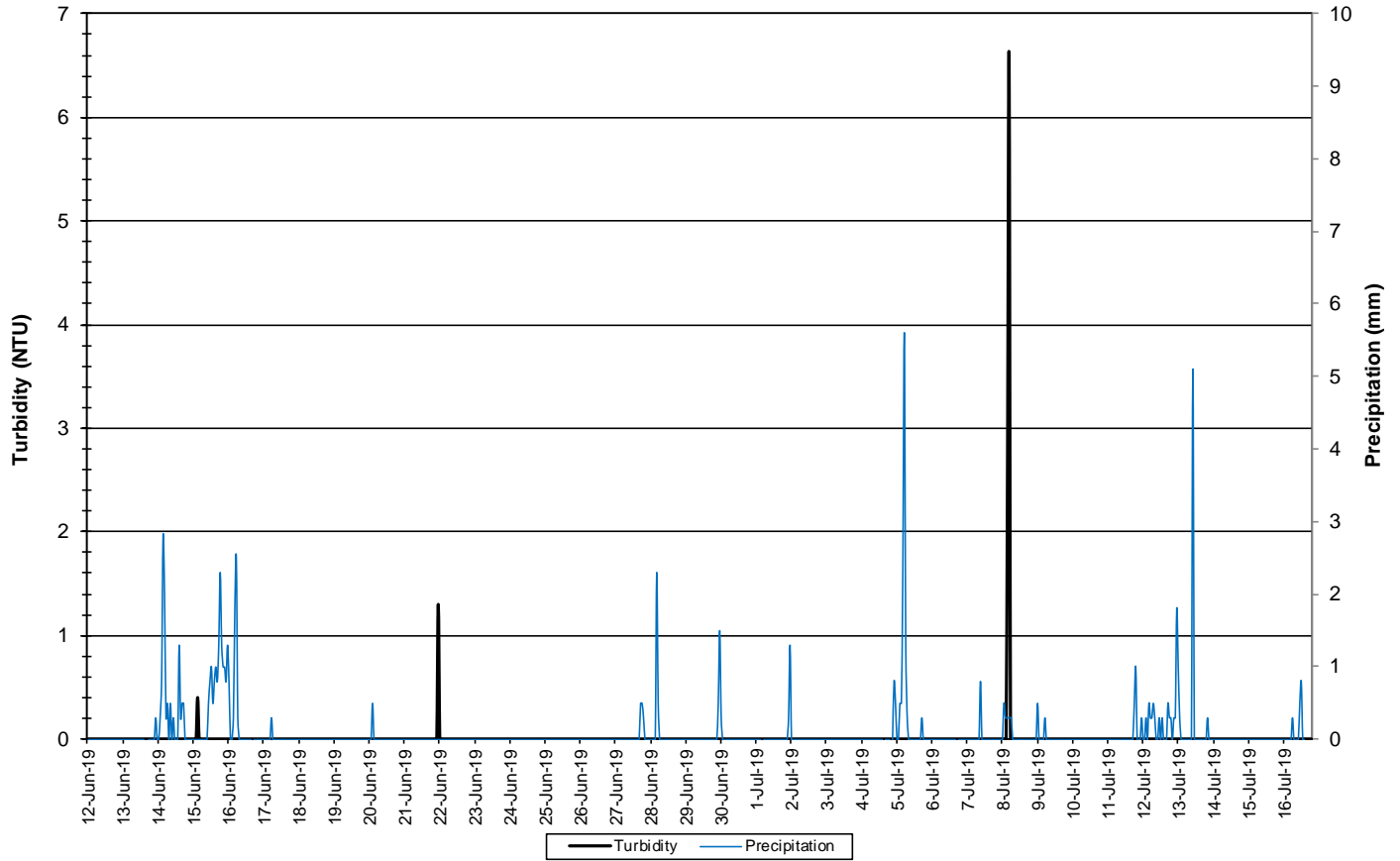


Figure 12: Dissolved oxygen – Dumbell Stream

- Turbidity values ranged from 0.0 NTU to 6.6 NTU, throughout the deployment period (Figure 13). The median value was 0.0 NTU.

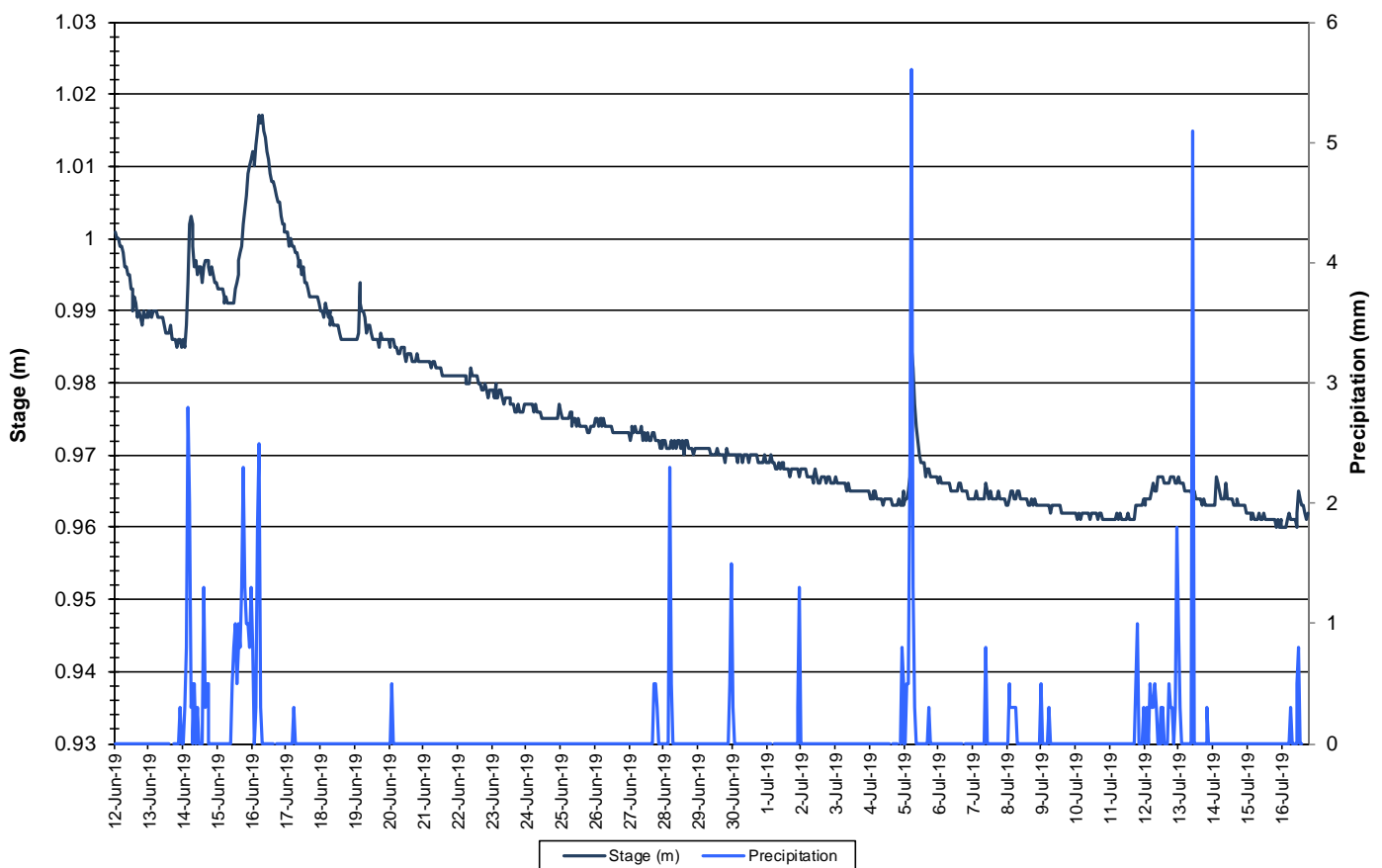
**Water Turbidity and Precipitation : Dumbell Stream above Dumbell Lake  
June 12 to July 17, 2019**



**Figure 13: Turbidity and Precipitation – Dumbell Stream  
(Weather data collected from climate station near Moosehead Lake)**

- Stage and precipitation are graphed below to show the relationship between rainfall and water level at Dumbell Stream (Figure 14).
- Overall, stage decreased throughout the deployment period, with precipitation events causing periodic spikes.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

**Stage and Precipitation: Dumbell Stream  
June 12 to July 17, 2019**

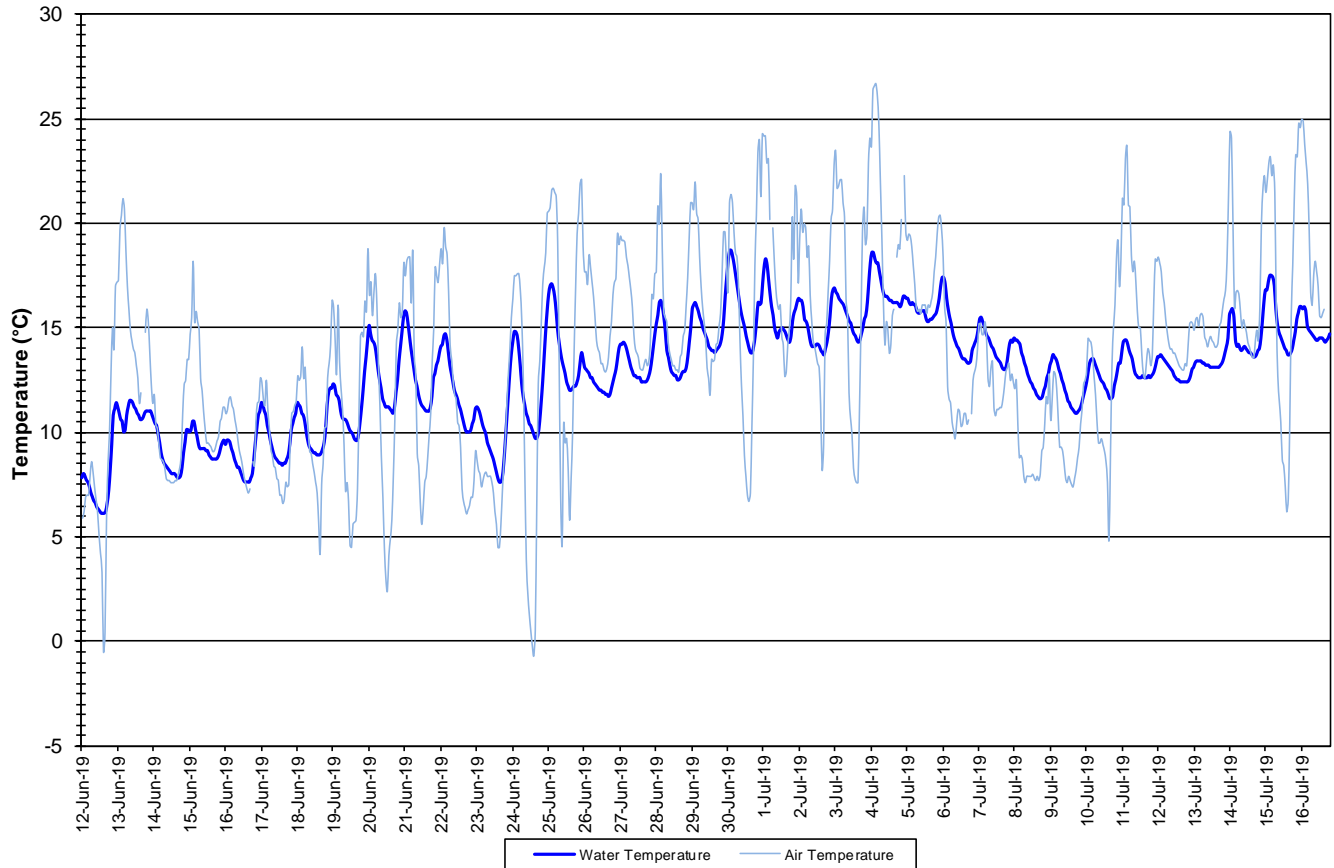


**Figure 14: Stage and Precipitation – Dumbell Stream  
(Weather data collected from climate station near Moosehead Lake)**

### Pumphouse Stream

- Water temperature ranged from 6.10 to 18.70°C during this deployment period (Figure 15).
- Water temperature increased over the course of this deployment period, corresponding to increasing ambient air temperatures (Figure 15).

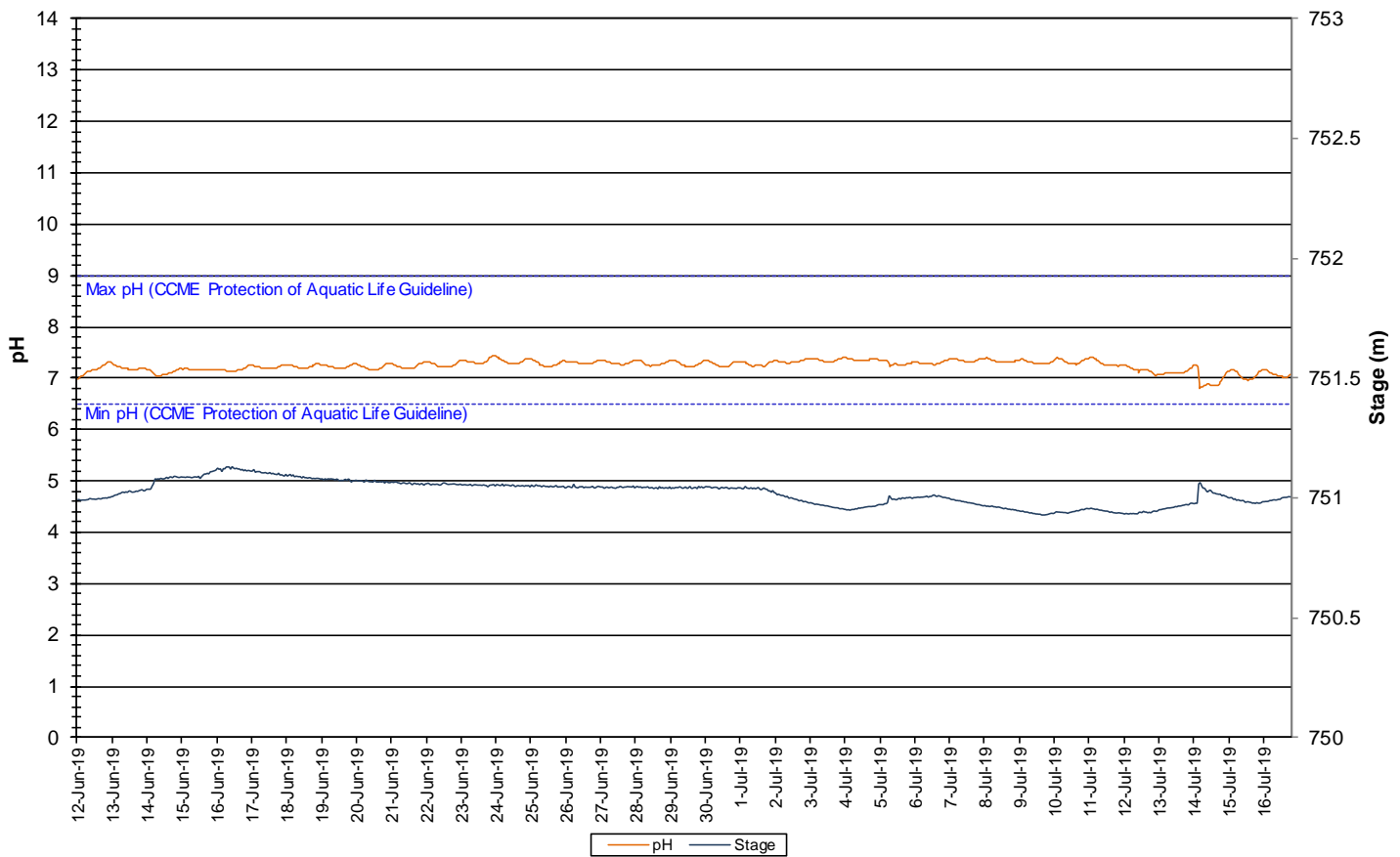
**Water and Air Temperature : Pumphouse Stream above Drum Lake  
June 12 to July 17, 2019**



**Figure 15: Water and Air Temperature – Pumphouse Stream  
(Weather data collected from climate station near Moosehead Lake)**

- pH ranged from 6.81 to 7.44 pH units (Figure 16). The median pH was 7.27.
- All values during the deployment are within the CCME Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units). pH fluctuates slightly throughout the day and night.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

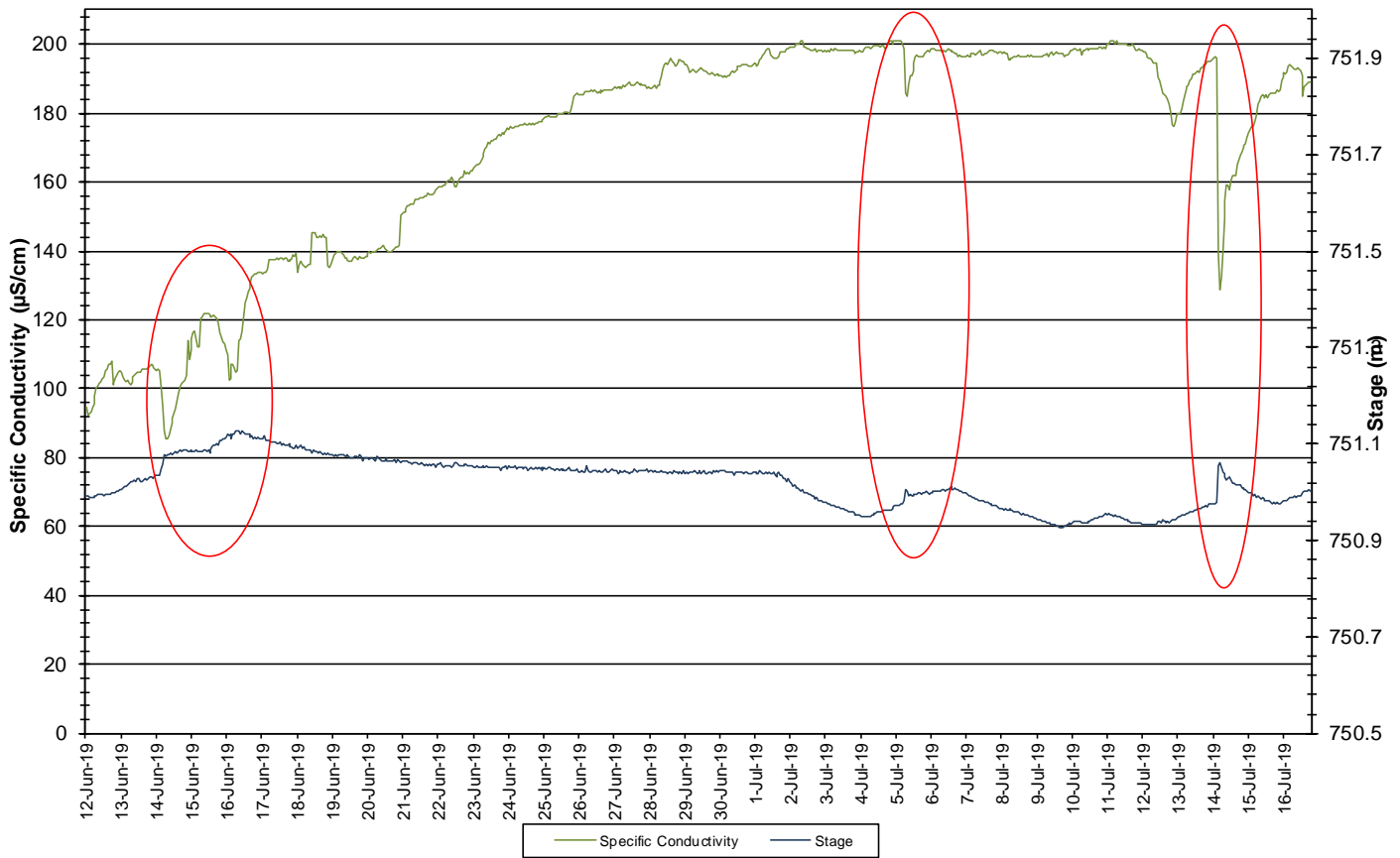
**Water pH and Stage : Pumphouse Stream above Drum Lake  
June 12 to July 17, 2019**



**Figure 16: Water pH and Stage – Pumphouse Stream**

- Specific conductivity ranged from 85.4 to 201.0  $\mu\text{S}/\text{cm}$ , throughout the deployment period (Figure 17).
- Some decreases in specific conductivity correspond to increases in stage. As more water is added to the system from precipitation, the solids in the water are diluted, decreasing conductivity. They are identified on the graph in red.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

**Specific Conductivity of Water and Stage Level : Pumphouse Stream above Drum Lake  
June 12 to July 17, 2019**

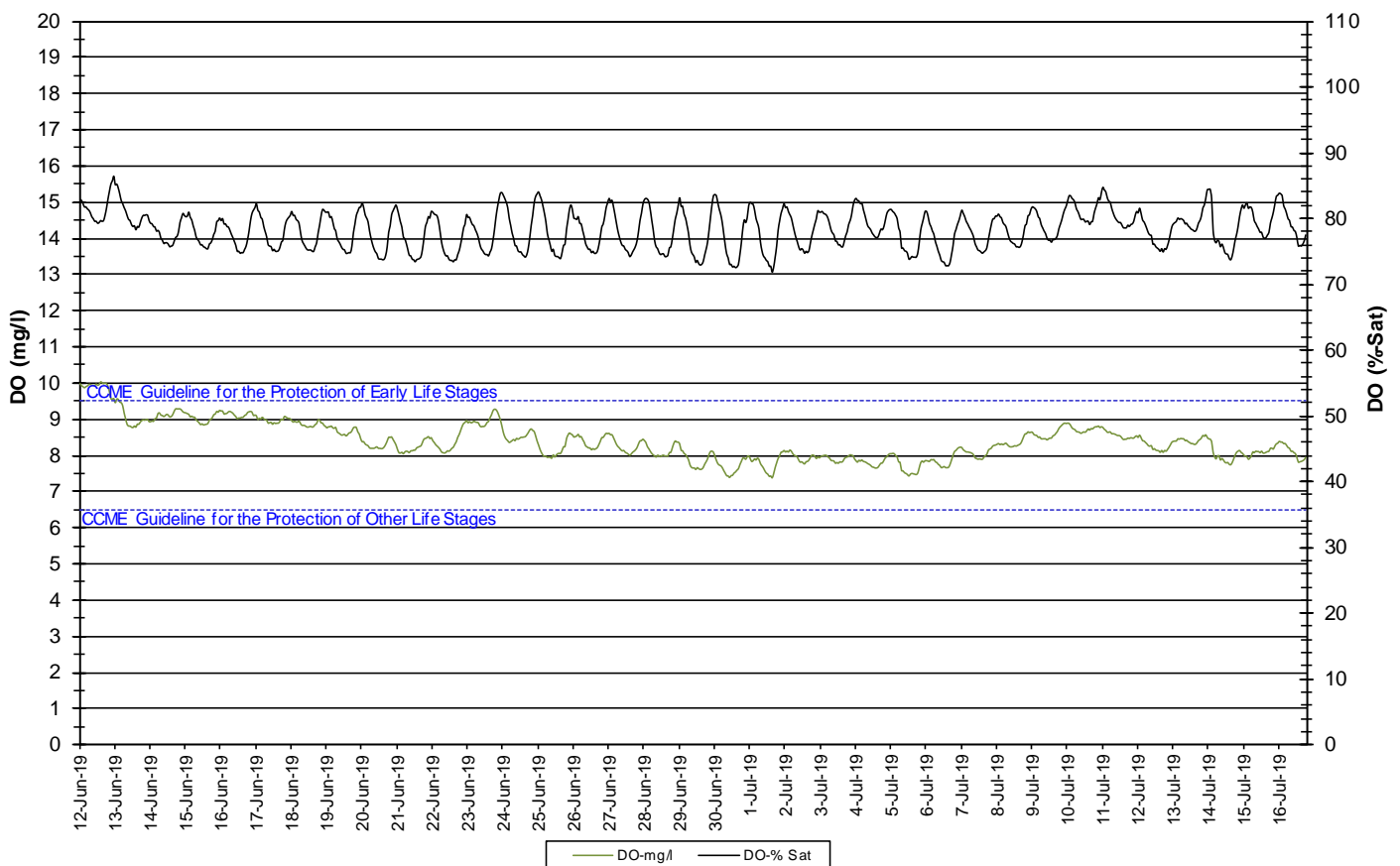


**Figure 17: Specific Conductivity and Stage – Pumphouse Stream**



- The saturation of dissolved oxygen ranged from 71.8 to 86.5% while the dissolved oxygen ranged from 7.38 to 10.01 mg/l with a median value of 8.32 mg/l (Figure 18).
- All values recorded at Pumphouse Stream were above the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota of Other Life Stages of 6.5 mg/l. The majority of values were below the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota of Early Life Stages of 9.5 mg/l. The guidelines are indicated in blue on Figure 18.
- Dissolved oxygen decreased during this deployment period as water temperature increased.
- Dissolved oxygen fluctuated daily with decreases observed at night.

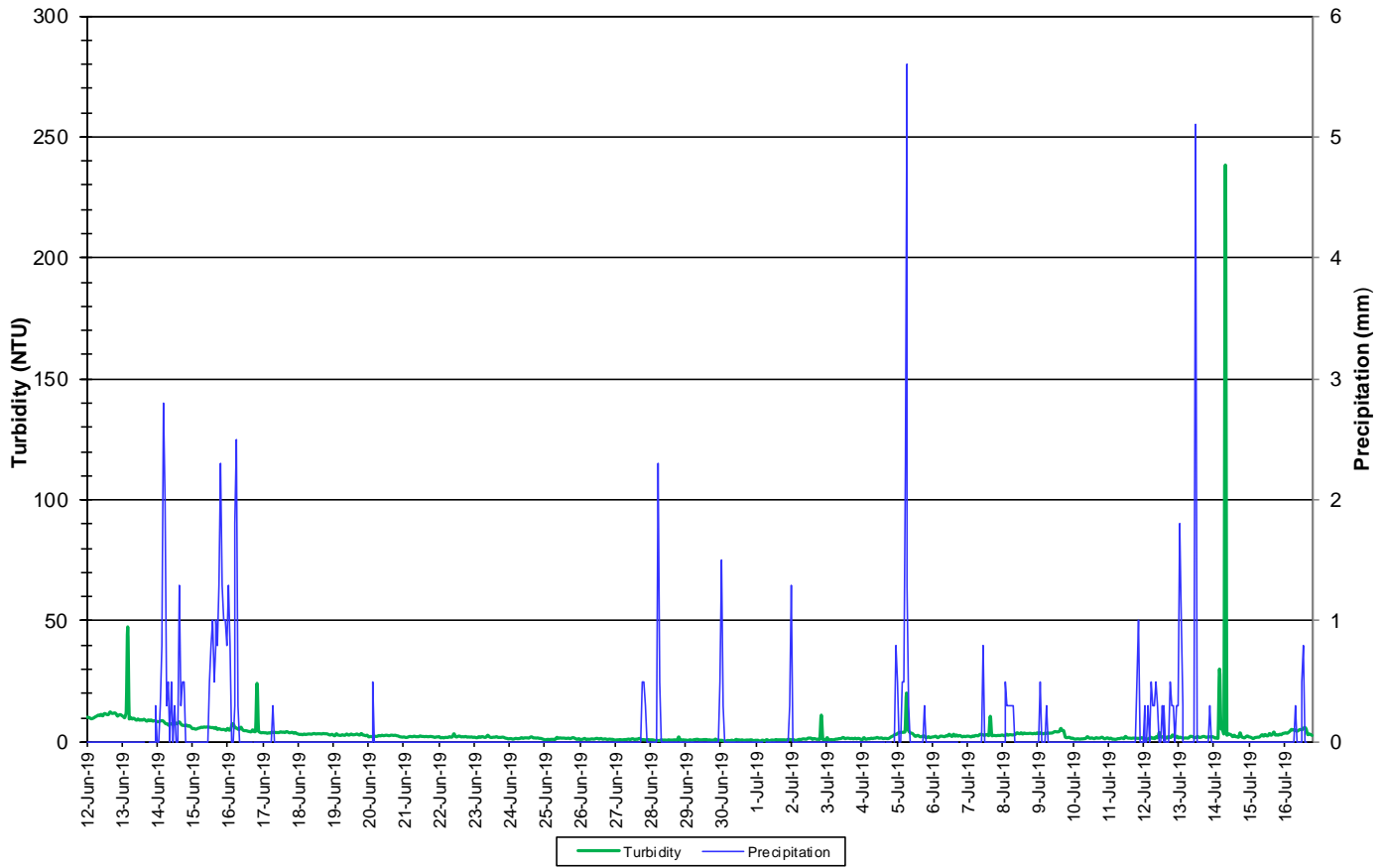
**Dissolved Oxygen Concentration and Saturation : Pumphouse Stream above Drum Lake  
June 12 to July 17, 2019**



**Figure 18: Dissolved Oxygen – Pumphouse Stream**

- Turbidity values range from 0.5 to 238.3 NTU throughout the deployment period (Figure 19). The median value was 2.4 NTU.
- In some instances, turbidity spikes can be attributed to precipitation events.

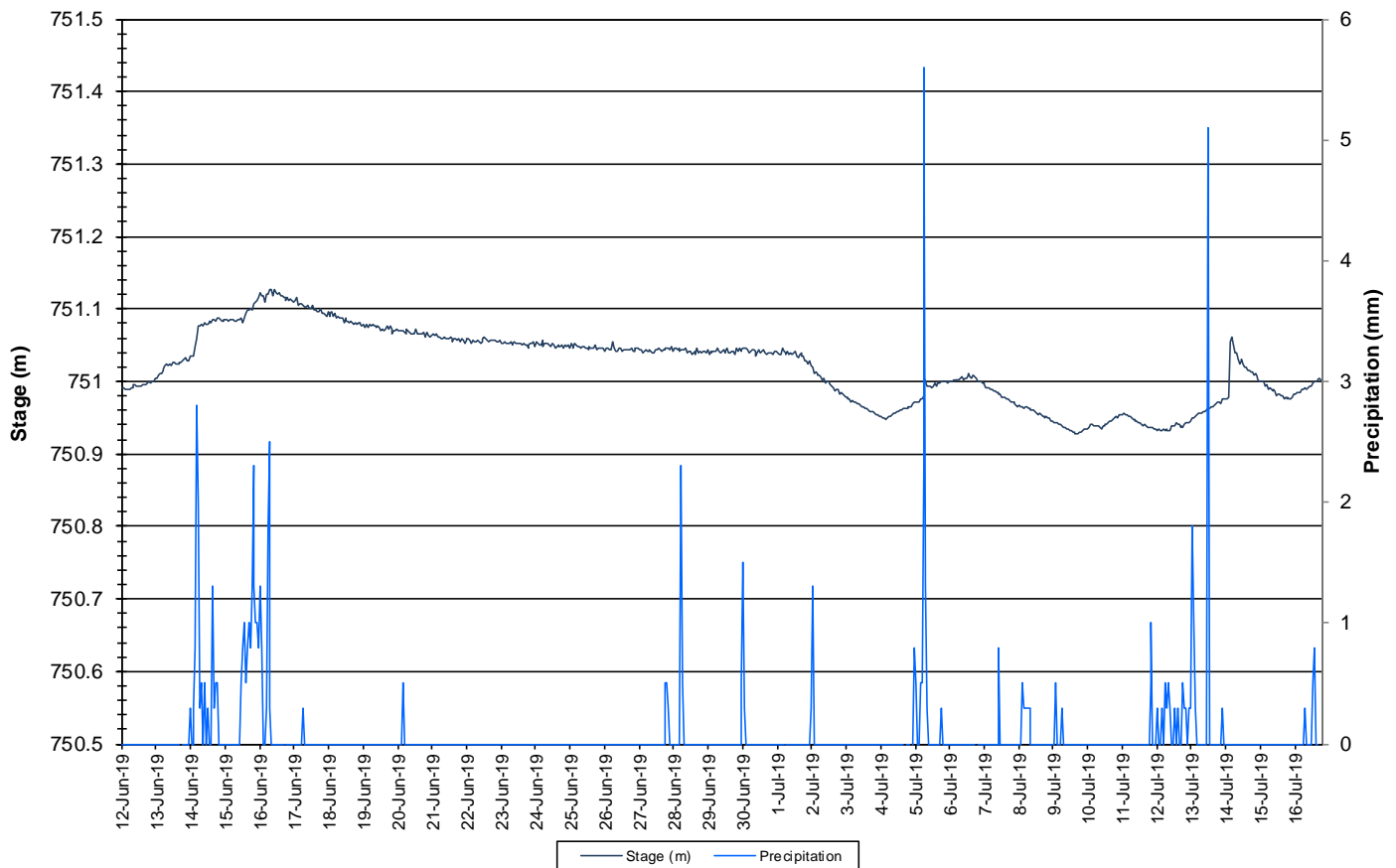
**Water Turbidity and Precipitation : Pumphouse Stream above Drum Lake  
June 12 to July 17, 2019**



**Figure 19: Turbidity and Precipitation – Pumphouse Stream  
(Weather data collected from climate station near Moosehead Lake)**

- Stage and precipitation are graphed below to show the relationship between rainfall and water level at Pumphouse Stream (Figure 20).
- Overall, stage decreased throughout the deployment period, with precipitation events causing periodic spikes.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

**Stage & Precipitation: Pumphouse Stream  
June 12 to July 17, 2019**



**Figure 20: Stage and Precipitation – Pumphouse Stream  
(Weather data collected from climate station near Moosehead Lake)**

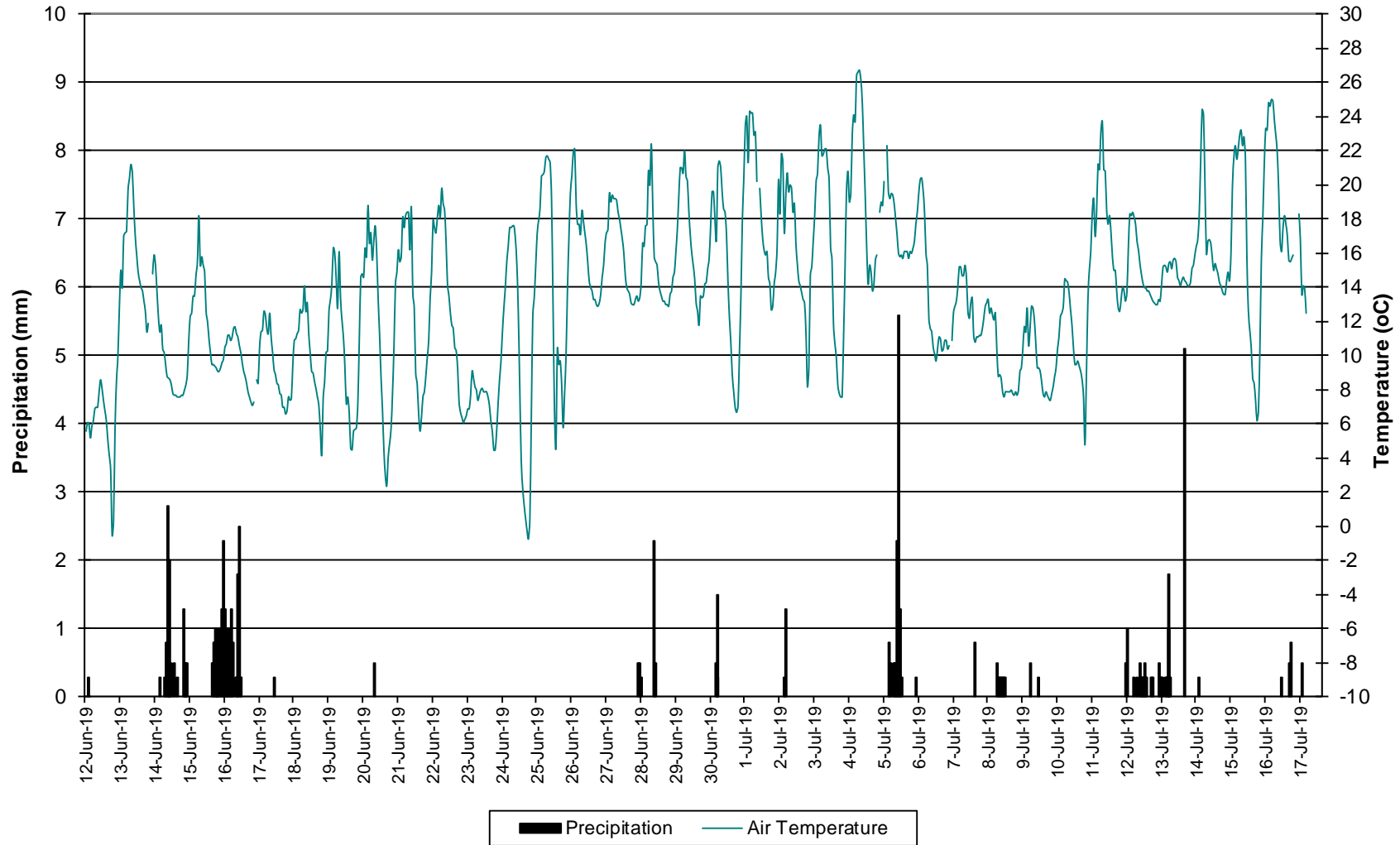
## Conclusions

- Instruments were deployed on June 12<sup>th</sup> and removed by July 17<sup>th</sup>, 2019. This was the first deployment period for this season.
- In most cases, precipitation events or increase/decreases in water level could be used to explain the data fluctuations. Most values recorded were within ranges as suggested by the CCME Guidelines for the Protection of Aquatic Life for pH and dissolved oxygen.
- Water temperature corresponded with air temperature at all stations. Temperature typically ranged between 2.02 and 20.03°C at these stations.
- All of the pH values were within the recommended CCME Guidelines for the Protection of Aquatic Life. pH ranged between 6.68 and 7.83. Fluctuations were noted between day and night.
- Specific conductivity differed between the two Wabush Lake stations. This can be attributed to varying concentrations of iron ore tailings deposited between the stations. Specific conductivity ranged from 32.8 µs/cm to 100.0 µs/cm at the Wabush Lake stations, 63.0 to 73.1 µs/cm at Dumbell Stream and 85.4 to 201.0 µs/cm at Pumphouse Stream.
- At all four stations, all dissolved oxygen values were above the minimum CCME Guideline for the Protection of Aquatic Life for Cold Water Biota at Other Life Stages of 6.5 mg/L. When dissolved oxygen values are compared to the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota at Early Life Stages of 9.5 mg/L, half the values were below this guideline.
- Turbidity at Dolomite Road remained at 0 NTU during this deployment period. The median value was 0.0 NTU. Turbidity spikes at Julienne Narrows occurred frequently. The median value was 9.4 NTU.
- Turbidity at Dumbell Stream remained at 0.0 NTU for the majority of the deployment period with few spikes.
- Turbidity at Pumphouse Stream fluctuated throughout the deployment period with one high spike attributed to precipitation. The median value was 2.4 NTU.
- Stage steadily decreased at Dolomite Road and Julienne Narrows throughout the deployment period.
- At Dumbell Stream and Pumphouse Stream, stage decreased overall, with spikes noted after precipitation events.
- With the exception of of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request

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Water Resources Management Division  
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### Appendix 1

#### Air Temperature and Precipitation: Moosehead Lake, NL June 12 to July 17, 2019



Appendix 2  
QA/QC Grab Sample Results

**Client:** Department of Environment  
**Attention:** Ms. Leona Hyde  
**Client Project:**  
**Purchase Order:** 2180014303

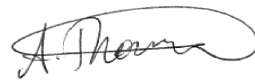
**COC Number:** 844849  
**Date Reported:** 2019-06-28  
**Date Submitted:** 2019-06-17  
**Sample Matrix:** Water

<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1433464	WS-S-0000 Julienne Narrows	2019-6302-00-SI-SP	2019-06-12	Alkalinity as CaCO3	mg/L	5	40
				Bromide	mg/L	0.25	<0.25
				Chloride	mg/L	1	2
				Colour	TCU	2	29
				Conductivity	uS/cm	5	95
				Dissolved Organic Carbon	mg/L	0.5	4.4
				Fluoride	mg/L	0.10	<0.10
				Hardness as CaCO3	mg/L	1	41
				N-NH3 (Ammonia)	mg/L	0.010	<0.010
				N-NO2 (Nitrite)	mg/L	0.10	<0.10
				N-NO3 (Nitrate)	mg/L	0.10	0.49
				pH		1.00	7.70
				Sulphate	mg/L	1	3
				Total Dissolved Solids (COND - CALC)	mg/L	1	62
				Total Kjeldahl Nitrogen	mg/L	0.15	<0.15
				Total Organic Carbon	mg/L	0.5	3.7
				Turbidity	NTU	0.1	5.4
				Aluminum	mg/L	0.01	0.03

Sample comment:

Report comment:

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APPROVAL:   
 Addrine Thomas

**Client:** Department of Environment  
**Attention:** Ms. Leona Hyde  
**Client Project:**  
**Purchase Order:** 2180014303

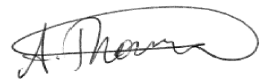
**COC Number:** 844849  
**Date Reported:** 2019-06-28  
**Date Submitted:** 2019-06-17  
**Sample Matrix:** Water

<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1433464	WS-S-0000 Julienne Narrows	2019-6302-00-SI-SP	2019-06-12	Antimony	mg/L	0.0005	<0.0005
				Arsenic	mg/L	0.001	<0.001
				Barium	mg/L	0.01	<0.01
				Boron	mg/L	0.01	<0.01
				Calcium	mg/L	1	10
				Cadmium	mg/L	0.0001	<0.0001
				Chromium	mg/L	0.001	<0.001
				Copper	mg/L	0.001	<0.001
				Iron	mg/L	0.03	0.18
				Lead	mg/L	0.001	<0.001
				Magnesium	mg/L	1	4
				Manganese	mg/L	0.01	0.07
				Mercury	mg/L	0.0001	<0.0001
				Nickel	mg/L	0.005	<0.005
				Potassium	mg/L	1	<1
				Selenium	mg/L	0.001	<0.001
				Sodium	mg/L	2	<2
				Strontium	mg/L	0.001	0.015

Sample comment:

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**COC Number:** 844849

**Date Reported:** 2019-06-28

**Date Submitted:** 2019-06-17

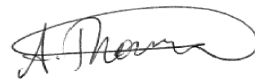
**Sample Matrix:** Water

<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1433464	WS-S-0000 Julienne Narrows	2019-6302-00-SI-SP	2019-06-12	Uranium	mg/L	0.001	<0.001
				Zinc	mg/L	0.01	<0.01
				Phosphorus	mg/L	0.002	0.005
				Total Suspended Solids	mg/L	2	<2

Sample comment:

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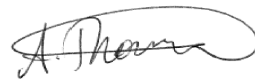
**COC Number:** 844849  
**Date Reported:** 2019-06-28  
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**Sample Matrix:** Water

<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1433465	WS-S-0000 Dolomite Road	2019-6304-00-SI-SP	2019-06-12	Alkalinity as CaCO3	mg/L	5	15
				Bromide	mg/L	0.25	<0.25
				Chloride	mg/L	1	<1
				Colour	TCU	2	45
				Conductivity	uS/cm	5	38
				Dissolved Organic Carbon	mg/L	0.5	5.7
				Fluoride	mg/L	0.10	<0.10
				Hardness as CaCO3	mg/L	1	18
				N-NH3 (Ammonia)	mg/L	0.010	<0.010
				N-NO2 (Nitrite)	mg/L	0.10	<0.10
				N-NO3 (Nitrate)	mg/L	0.10	<0.10
				pH		1.00	7.32
				Sulphate	mg/L	1	1
				Total Dissolved Solids (COND - CALC)	mg/L	1	25
				Total Kjeldahl Nitrogen	mg/L	0.15	<0.15
				Total Organic Carbon	mg/L	0.5	5.4
				Turbidity	NTU	0.1	1.4
				Aluminum	mg/L	0.01	0.06

Sample comment:

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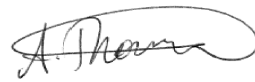
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**Date Reported:** 2019-06-28  
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**Sample Matrix:** Water

<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1433465	WS-S-0000 Dolomite Road	2019-6304-00-SI-SP	2019-06-12	Antimony	mg/L	0.0005	<0.0005
				Arsenic	mg/L	0.001	<0.001
				Barium	mg/L	0.01	<0.01
				Boron	mg/L	0.01	<0.01
				Calcium	mg/L	1	4
				Cadmium	mg/L	0.0001	<0.0001
				Chromium	mg/L	0.001	<0.001
				Copper	mg/L	0.001	<0.001
				Iron	mg/L	0.03	0.12
				Lead	mg/L	0.001	<0.001
				Magnesium	mg/L	1	2
				Manganese	mg/L	0.01	0.02
				Mercury	mg/L	0.0001	<0.0001
				Nickel	mg/L	0.005	<0.005
				Potassium	mg/L	1	<1
				Selenium	mg/L	0.001	<0.001
				Sodium	mg/L	2	<2
				Strontium	mg/L	0.001	0.009

Sample comment:

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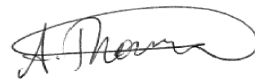
**Sample Matrix:** Water

<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1433465	WS-S-0000 Dolomite Road	2019-6304-00-SI-SP	2019-06-12	Uranium	mg/L	0.001	<0.001
				Zinc	mg/L	0.01	<0.01
				Phosphorus	mg/L	0.002	0.004
				Total Suspended Solids	mg/L	2	<2

Sample comment:

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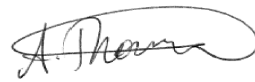
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**Date Reported:** 2019-06-28  
**Date Submitted:** 2019-06-17  
**Sample Matrix:** Water

<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1433468	WS-S-0000 Dumbell Stream	2019-6307-00-SI-SP	2019-06-12	Alkalinity as CaCO3	mg/L	5	29
				Bromide	mg/L	0.25	<0.25
				Chloride	mg/L	1	<1
				Colour	TCU	2	10
				Conductivity	uS/cm	5	70
				Dissolved Organic Carbon	mg/L	0.5	1.5
				Fluoride	mg/L	0.10	<0.10
				Hardness as CaCO3	mg/L	1	30
				N-NH3 (Ammonia)	mg/L	0.010	<0.010
				N-NO2 (Nitrite)	mg/L	0.10	<0.10
				N-NO3 (Nitrate)	mg/L	0.10	1.05
				pH		1.00	7.57
				Sulphate	mg/L	1	2
				Total Dissolved Solids (COND - CALC)	mg/L	1	46
				Total Kjeldahl Nitrogen	mg/L	0.15	<0.15
				Total Organic Carbon	mg/L	0.5	1.8
				Turbidity	NTU	0.1	1.0
				Aluminum	mg/L	0.01	0.01

Sample comment:

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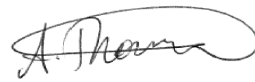
**COC Number:** 844849  
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**Sample Matrix:** Water

<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1433468	WS-S-0000 Dumbell Stream	2019-6307-00-SI-SP	2019-06-12	Antimony	mg/L	0.0005	<0.0005
				Arsenic	mg/L	0.001	<0.001
				Barium	mg/L	0.01	<0.01
				Boron	mg/L	0.01	<0.01
				Calcium	mg/L	1	7
				Cadmium	mg/L	0.0001	<0.0001
				Chromium	mg/L	0.001	<0.001
				Copper	mg/L	0.001	<0.001
				Iron	mg/L	0.03	<0.03
				Lead	mg/L	0.001	<0.001
				Magnesium	mg/L	1	3
				Manganese	mg/L	0.01	<0.01
				Mercury	mg/L	0.0001	<0.0001
				Nickel	mg/L	0.005	<0.005
				Potassium	mg/L	1	<1
				Selenium	mg/L	0.001	<0.001
				Sodium	mg/L	2	<2
				Strontium	mg/L	0.001	0.010

Sample comment:

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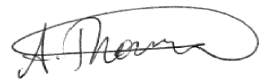
**Sample Matrix:** Water

<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1433468	WS-S-0000 Dumbell Stream	2019-6307-00-SI-SP	2019-06-12	Uranium	mg/L	0.001	<0.001
				Zinc	mg/L	0.01	<0.01
				Phosphorus	mg/L	0.002	0.003
				Total Suspended Solids	mg/L	2	<2

Sample comment:

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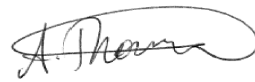
**COC Number:** 844849  
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**Date Submitted:** 2019-06-17  
**Sample Matrix:** Water

<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1433467	WS-S-0000 Pumphouse Stream	2019-6306-00-SI-SP	2019-06-12	Alkalinity as CaCO3	mg/L	5	36
				Bromide	mg/L	0.25	<0.25
				Chloride	mg/L	1	4
				Colour	TCU	2	37
				Conductivity	uS/cm	5	101
				Dissolved Organic Carbon	mg/L	0.5	4.2
				Fluoride	mg/L	0.10	<0.10
				Hardness as CaCO3	mg/L	1	46
				N-NH3 (Ammonia)	mg/L	0.010	0.201
				N-NO2 (Nitrite)	mg/L	0.10	<0.10
				N-NO3 (Nitrate)	mg/L	0.10	2.25
				pH		1.00	7.54
				Sulphate	mg/L	1	3
				Total Dissolved Solids (COND - CALC)	mg/L	1	66
				Total Kjeldahl Nitrogen	mg/L	0.15	0.41
				Total Organic Carbon	mg/L	0.5	3.9
				Turbidity	NTU	0.1	5.6
				Aluminum	mg/L	0.01	0.23

Sample comment:

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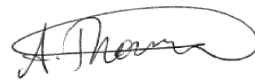
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**Sample Matrix:** Water

<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1433467	WS-S-0000 Pumphouse Stream	2019-6306-00-SI-SP	2019-06-12	Antimony	mg/L	0.0005	<0.0005
				Arsenic	mg/L	0.001	<0.001
				Barium	mg/L	0.01	0.01
				Boron	mg/L	0.01	<0.01
				Calcium	mg/L	1	12
				Cadmium	mg/L	0.0001	<0.0001
				Chromium	mg/L	0.001	<0.001
				Copper	mg/L	0.001	<0.001
				Iron	mg/L	0.03	0.31
				Lead	mg/L	0.001	<0.001
				Magnesium	mg/L	1	4
				Manganese	mg/L	0.01	0.14
				Mercury	mg/L	0.0001	<0.0001
				Nickel	mg/L	0.005	<0.005
				Potassium	mg/L	1	<1
				Selenium	mg/L	0.001	<0.001
				Sodium	mg/L	2	<2
				Strontium	mg/L	0.001	0.015

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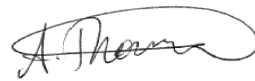
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<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1433467	WS-S-0000 Pumphouse Stream	2019-6306-00-SI-SP	2019-06-12	Uranium	mg/L	0.001	<0.001
				Zinc	mg/L	0.01	<0.01
				Phosphorus	mg/L	0.002	0.007
				Total Suspended Solids	mg/L	2	<2

Sample comment:

Report comment:

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