

Real-Time Water Quality Annual Report

Iron Ore Company of Canada
Labrador West Network

July 16 to
October 29, 2020



Government of Newfoundland & Labrador
Department of Environment, Climate Change &
Municipalities
Water Resources Management Division

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Acknowledgements

The Real-Time Water Quality Monitoring Program (RTWQ) at Wabush Lake is fully funded by the Iron Ore Company of Canada (IOC). The program is made successful by a joint partnership between IOC, Environment and Climate Change Canada (ECCC), and the Newfoundland & Labrador Department of Environment, Climate Change & Municipalities (ECCM).

Various individuals from each sector have been diligently involved to ensure this program is a successful operation including: various WRMD staff (ECCM), Jody Wentzell (IOC) and various WSC staff (ECCC). In addition to these managers, there have been a team of individuals who work together to ensure the day to day operations of these stations are providing quality data. Maria Murphy (ECCM) was responsible for these water quality stations during 2020. Responsibilities included deployment and removal of instruments, maintenance and calibration of the instruments and preparation of monthly deployment reports. Brenda Congram (ECCM) is acknowledged for her assistance during deployment and removal procedures in 2020. Tara Clinton and Leona Hyde are acknowledged for their role in performing Performance Testing and Evaluation (PTE) and in-house servicing of the instruments during Winter 2020-2021.

ECCC staff are essential in the operation of the data logging/communication aspect of the network. Staff of the Meteorological Service of Canada Division – Water Survey of Canada, visit the stations regularly to ensure that the data logging and data transmission equipment is working properly. ECCC is also the lead on dealing with stage and flow issues.

Introduction

- The real-time water quality monitoring network on Wabush Lake was established during the summer of 2007 in a partnership between the Newfoundland & Labrador Department of Environment, Climate Change & Municipalities (ECCM) and the Iron Ore Company of Canada (IOC).
- This network consisted of two water quality/quantity stations, one located downstream of the IOC tailings disposal area and one located upstream of the same area.
- The official names of these two stations are *Wabush Lake at Dolomite Road* and *Wabush Lake at Lake Outlet*, hereafter referred to as the Dolomite Road station and the Julienne Narrows station.
- On June 8th, 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 12th, 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.
- These stations measure water quality parameters including water temperature, pH, specific conductivity, dissolved oxygen and turbidity, as well as water quantity parameters stage, and flow. Measurements are recorded on an hourly basis during the deployment period.



Figure 1: RTWQ Monitoring Stations in Labrador West

- Initial deployment in 2020 was on July 16th and instruments were removed for the winter season on October 28th at Dolomite Road and Julienne Narrows, and October 29th, 2020 at Dumbell Stream and Pumphouse Stream. The following report depicts and discusses water quality events throughout this time period.
- This was a shorter deployment season due to delays caused by the COVID-19 pandemic.
- The purpose of this network is to monitor, process, and distribute water quality/quantity data to IOC, ECCM and ECCC, for assessment and management of water resources, as well as to provide an early warning for any potential or emerging water issues. Any necessary mitigative measures can then be implemented in a timely manner.
- ECCM provides IOC with monthly and annual deployment reports.
- It is important to note that unless otherwise stated on the graphs, small gaps in data are due to the removal of the instrument for maintenance and calibration.

Maintenance and Calibration

- To ensure accurate data collection, maintenance and calibration of the water quality instrumentation are performed preferably on a monthly basis.
- Maintenance includes a thorough cleaning of the instrument and replacement of any small sensor parts that are damaged or unsuitable for reuse. Once the instrument is cleaned, MAE staff carefully calibrate each sensor attachment for pH, specific conductivity, dissolved oxygen and turbidity.
- Installation and removal dates for the 2020 season are summarized in the table below.

Table 1: Water quality instrument deployment start and end dates for 2020

Installation	Removal	Deployment duration (days)
July 16	September 2-3	48-49
September 2-3	October 28-29	56

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 the 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 adjacent to 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 2).

Table 2: 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. 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.
- Deployment and removal comparison rankings for the IOC water quality stations for the two deployment periods from July 16 to October 28-29, 2020 are summarized in Table 3.
- For additional information and explanations of ranking, please refer to the monthly deployment reports.

Table 3: Comparison rankings for IOC RTWQ stations July 16 to October 28-29, 2020

Station	Date		Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity
Dolomite Road	16-Jul-20	Deployment	Excellent	Good	Good	Excellent	Excellent
	02-Sep-20	Removal	Excellent	Fair	Excellent	Good	Excellent
	02-Sep-20	Deployment	Excellent	Good	Excellent	Excellent	Excellent
	28-Oct-20	Removal	Excellent	Excellent	Good	Excellent	Excellent
Julienne Narrows	16-Jul-20	Deployment	Excellent	Poor	Good	Excellent	Excellent
	02-Sep-20	Removal	Good	Excellent	Excellent	Good	Excellent
	02-Sep-20	Deployment	Good	Good	Excellent	Excellent	Excellent
	28-Oct-20	Removal	Marginal	Excellent	Good	Excellent	Good
Dumbell Stream	16-Jul-20	Deployment	Excellent	Good	Good	Excellent	Excellent
	02-Sep-20	Removal	Excellent	Excellent	Excellent	Fair	Excellent
	02-Sep-20	Deployment	Excellent	Fair	Excellent	Good	Excellent
	28-Oct-20	Removal	Excellent	Excellent	Excellent	Fair	Excellent
Pumphouse Stream	16-Jul-20	Deployment	Excellent	Good	Good	Excellent	Excellent
	03-Sep-20	Removal	Good	Excellent	Excellent	Excellent	Excellent
	03-Sep-20	Deployment	Good	Good	Excellent	Excellent	Excellent
	29-Oct-20	Removal	Excellent	Good	Excellent	Marginal	Good

Data Interpretation

- The following graphs and discussion illustrate water quality-related events from July 16th to October 29th, 2020 at the four IOC RTWQ stations.
- With the exception of water quantity data (stage), 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.
- Weather data is collected from a weather station near Moosehead Lake.

Wabush Lake Network

- Water temperature ranged from 0.90 to 20.30°C at Julienne Narrows during the 2020 deployment season. The median value was 10.70 °C (Figure 2).
- Water temperature ranged from 0.70 to 21.30°C at Dolomite Road during the 2020 deployment season. The median value was 11.70 °C (Figure 2).
- Water temperature steadily decreases after the middle of August and correlates to air temperature. Water temperature is typically higher at Dolomite Road than Julienne Narrows.

**Water and Air Temperature: Wabush Lake Network
July 16 to October 28, 2020**

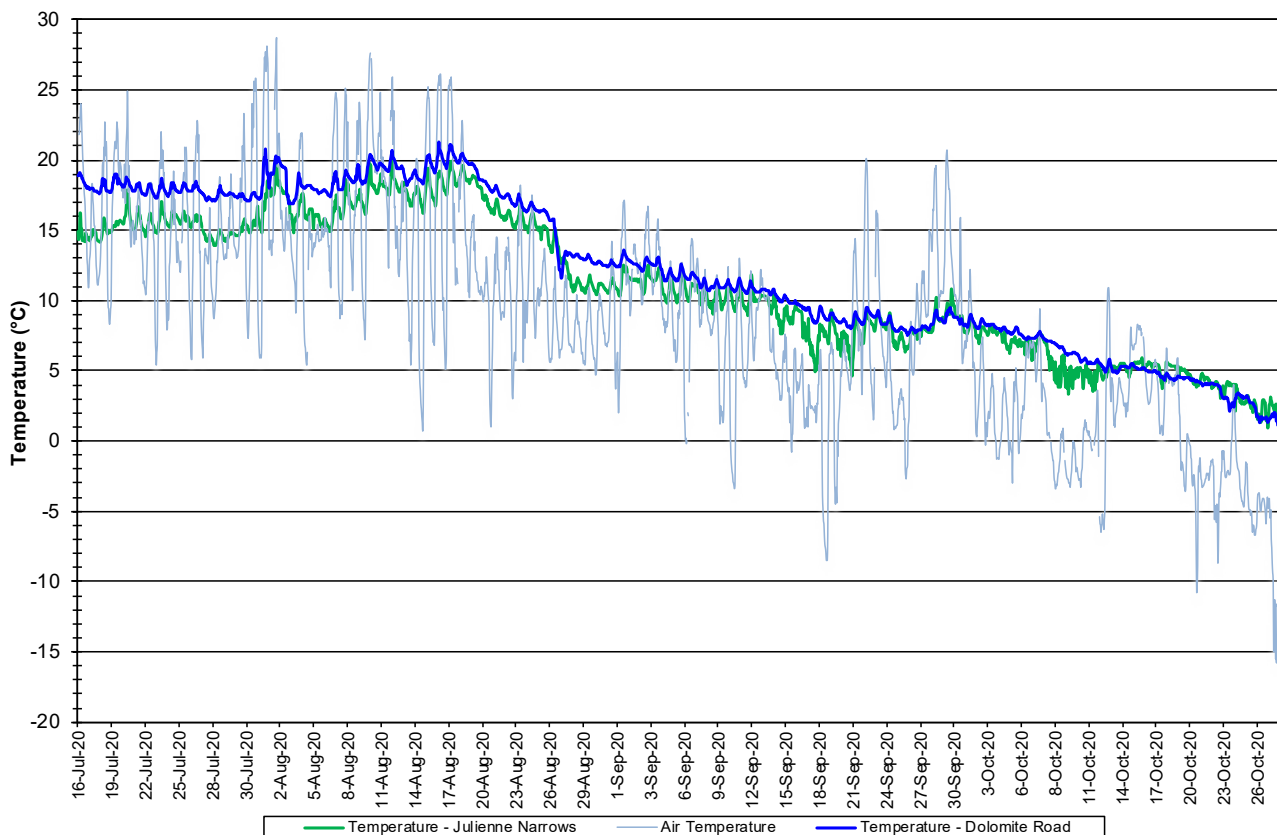


Figure 2: Water and Air Temperature – Wabush Lake Network

- pH ranged from 7.45 to 8.47 pH units at Julienne Narrows and from 6.64 to 7.87 pH units at Dolomite Road (Figure 3) during the 2020 deployment season. The median pH was 7.98 and 7.52 units respectively.
- pH fluctuates daily at both stations. Peaks are observed during late afternoon and early evening. Some decreases in pH are noted when there are increases in stage.
- All values during the deployment are within the CCME Water Quality Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units).
- At both stations there is a slight increase after the second deployment period. pH is then relatively stable for the remainder of the season.

**Water pH and Stage: Wabush Lake Network
July 16 to October 28, 2020**

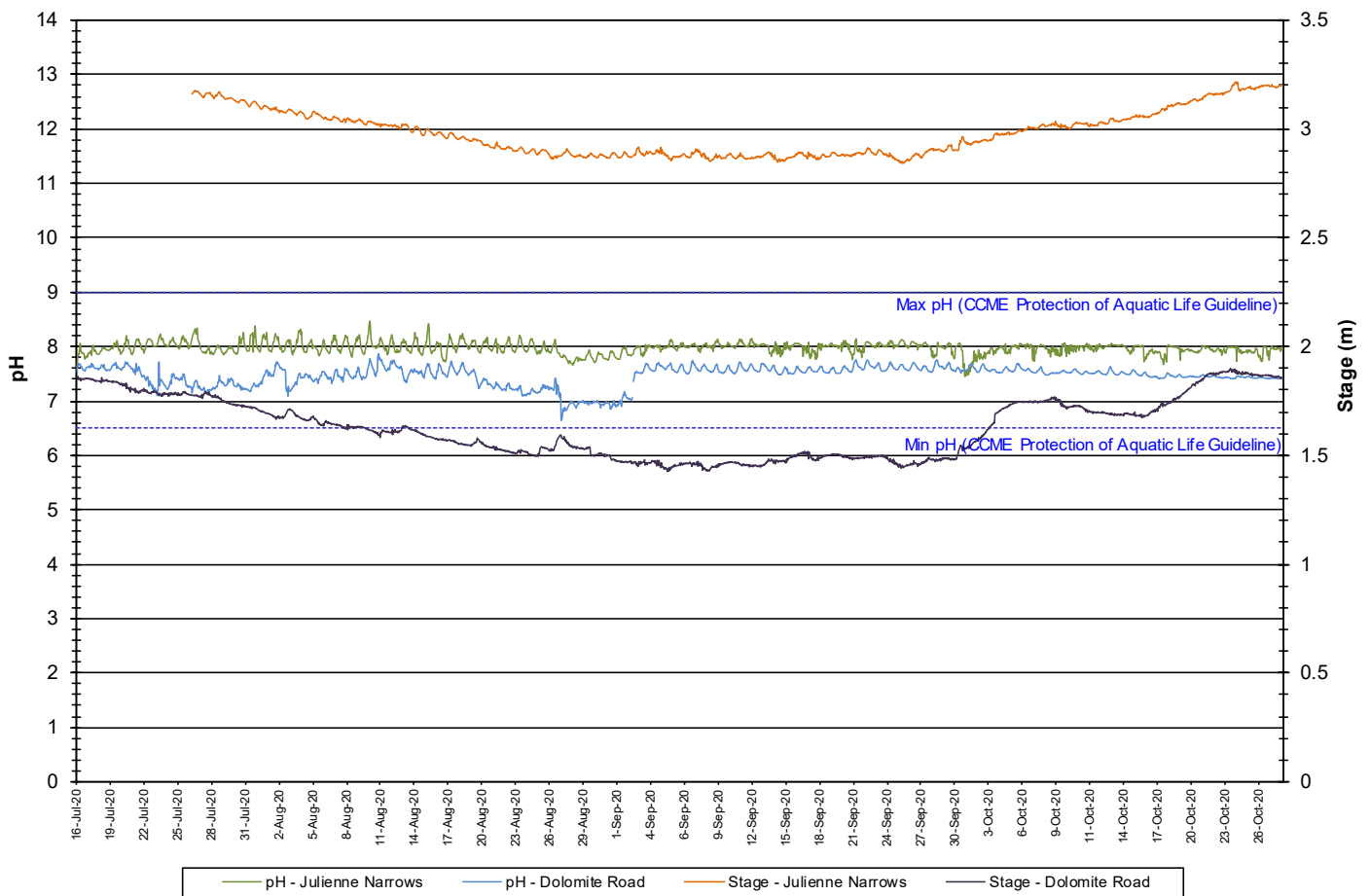


Figure 3: Water pH and Stage – Wabush Lake Network

- Throughout the 2020 deployment season, specific conductivity ranged from 47.5 to 113.4 $\mu\text{S}/\text{cm}$ at Julienne Narrows and from 47.4 to 91.2 $\mu\text{S}/\text{cm}$ at Dolomite Road (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.
- At Julienne Narrows, conductivity fluctuated greatly from the end of August onward.
- At Dolomite Road, conductivity increases gradually during the beginning of the deployment season and decreases gradually during the last month of the season. There is a large spike in August.
- Stage decreases at both stations into September before increasing for the remainder of the season.
- With the exception of water quantity data (stage), 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.

**Specific Conductivity and Stage: Wabush Lake Network
July 16 to October 28, 2020**

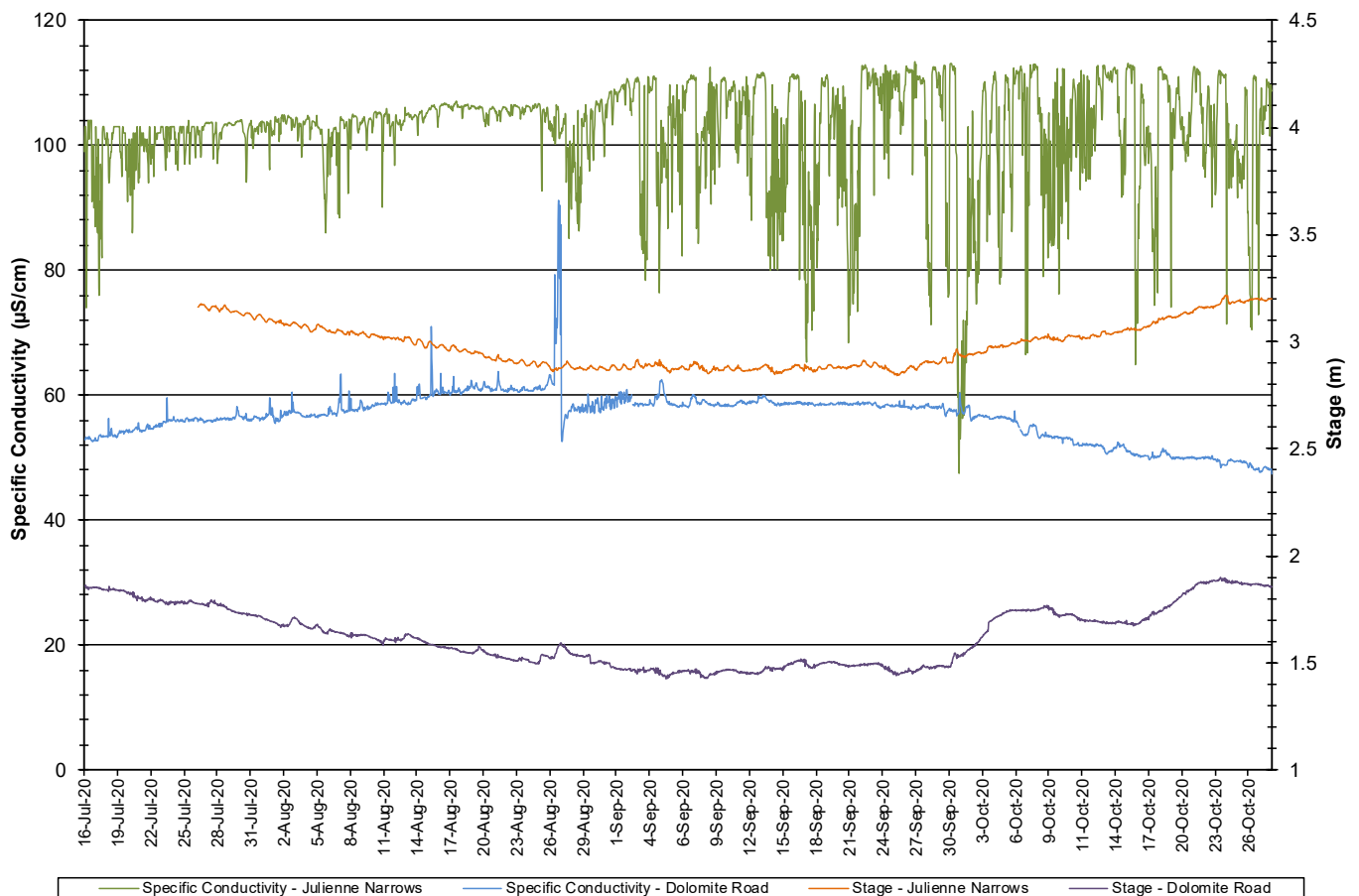


Figure 4: Specific Conductivity and Stage – Wabush Lake Network

- Dissolved oxygen ranged from 81.2 to 112.9% saturation and 8.42 to 13.03 mg/l with a median value of 10.22 mg/L at Julienne Narrows (Figure 5).
- Dissolved oxygen ranged from 73.8 to 102.0% saturation and 8.02 to 12.88 mg/l with a median value of 9.93 mg/L at Dolomite Road (Figure 5).
- Dissolved oxygen fluctuated daily at both stations with decreases observed at night.
- Dissolved oxygen increases during the later portion of the deployment season, as water temperature decreases into fall.
- All values were above the CCME Water Quality Guideline for the Protection of Aquatic Life for Cold Water Biota at Other Life Stages of 6.5 mg/l. The majority of values recorded were above the minimum CCME Water Quality Guideline for the Protection of Aquatic Life for Cold Water Biota at Early Life Stages of 9.5 mg/l. The guidelines are indicated in blue on Figure 5.

**Dissolved Oxygen and Percent Saturation: Wabush Lake Network
July 16 to October 28, 2020**

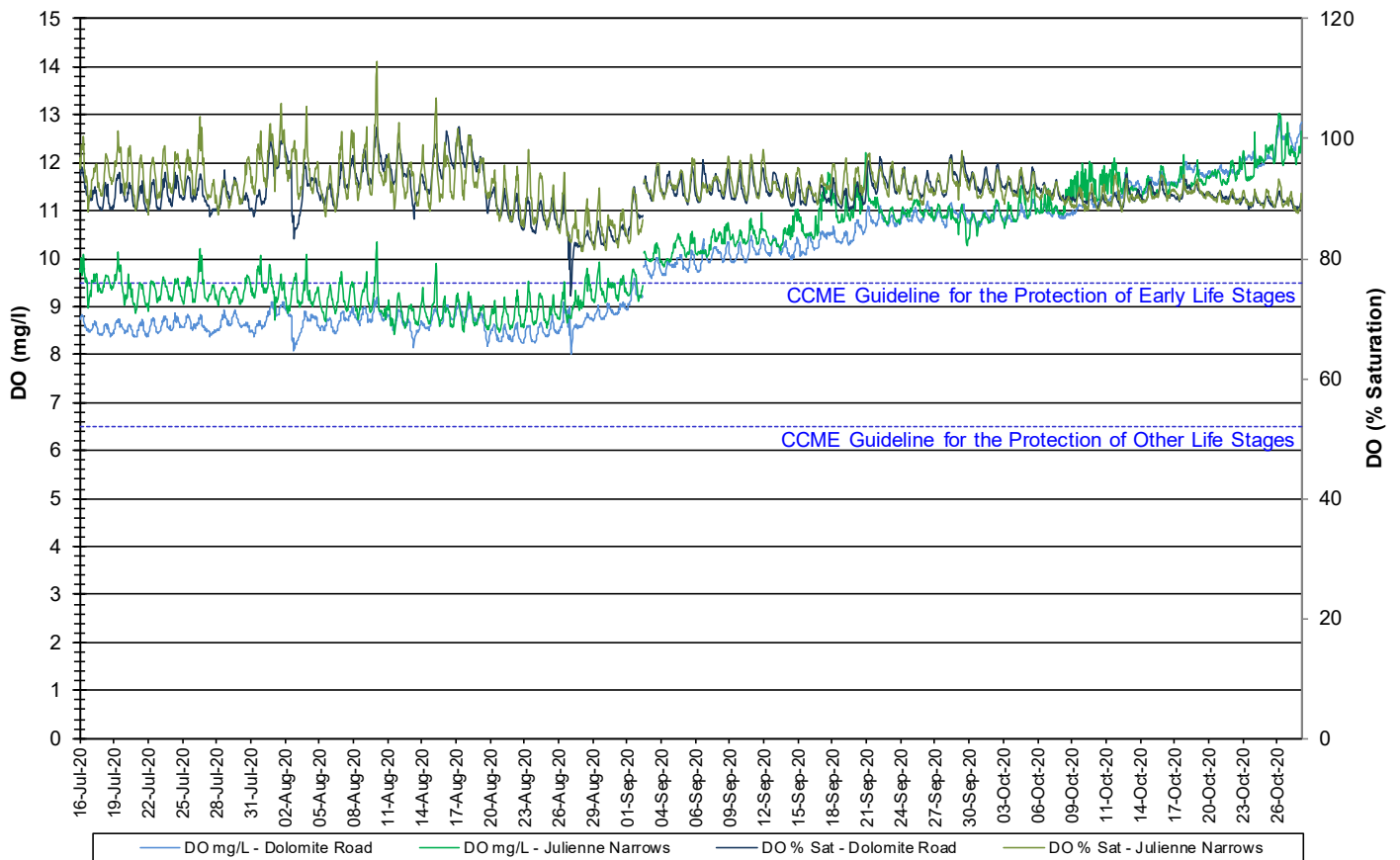


Figure 5: Dissolved Oxygen and Percent Saturation – Wabush Lake Network

- At the Julienne Narrows station, turbidity values ranged from 0.0 to 240.9 NTU with a median value of 0.0 NTU (Figure 6a) indicating low background turbidity.
- Turbidity readings are higher in the first deployment period and then decrease for the remainder of the season with occasional spikes. The period of high turbidity may be due to turbulence during spring freshet.

**Water Turbidity and Precipitation: Julienne Narrows
July 16 to October 28, 2020**

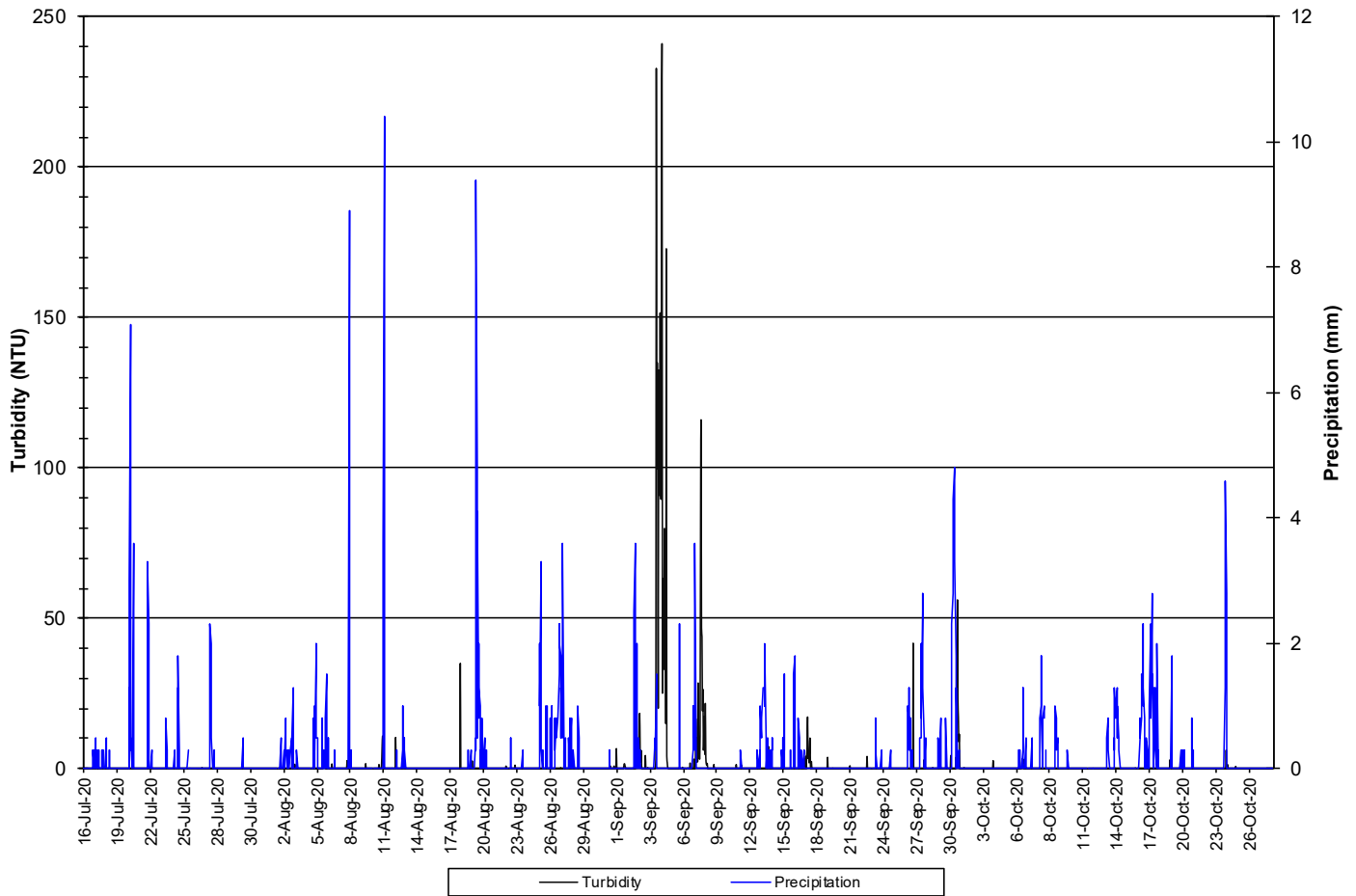


Figure 6a: Water Turbidity and Precipitation: Julienne Narrows

- At the Dolomite Road station, turbidity values ranged from 0.0 to 139.8 NTU, with a median value of 0.0 NTU (Figure 6b).
- Turbidity readings higher than 0 NTU occur occasionally and are of short duration.

**Turbidity and Precipitation : Dolomite Road
July 16 to October 28, 2020**

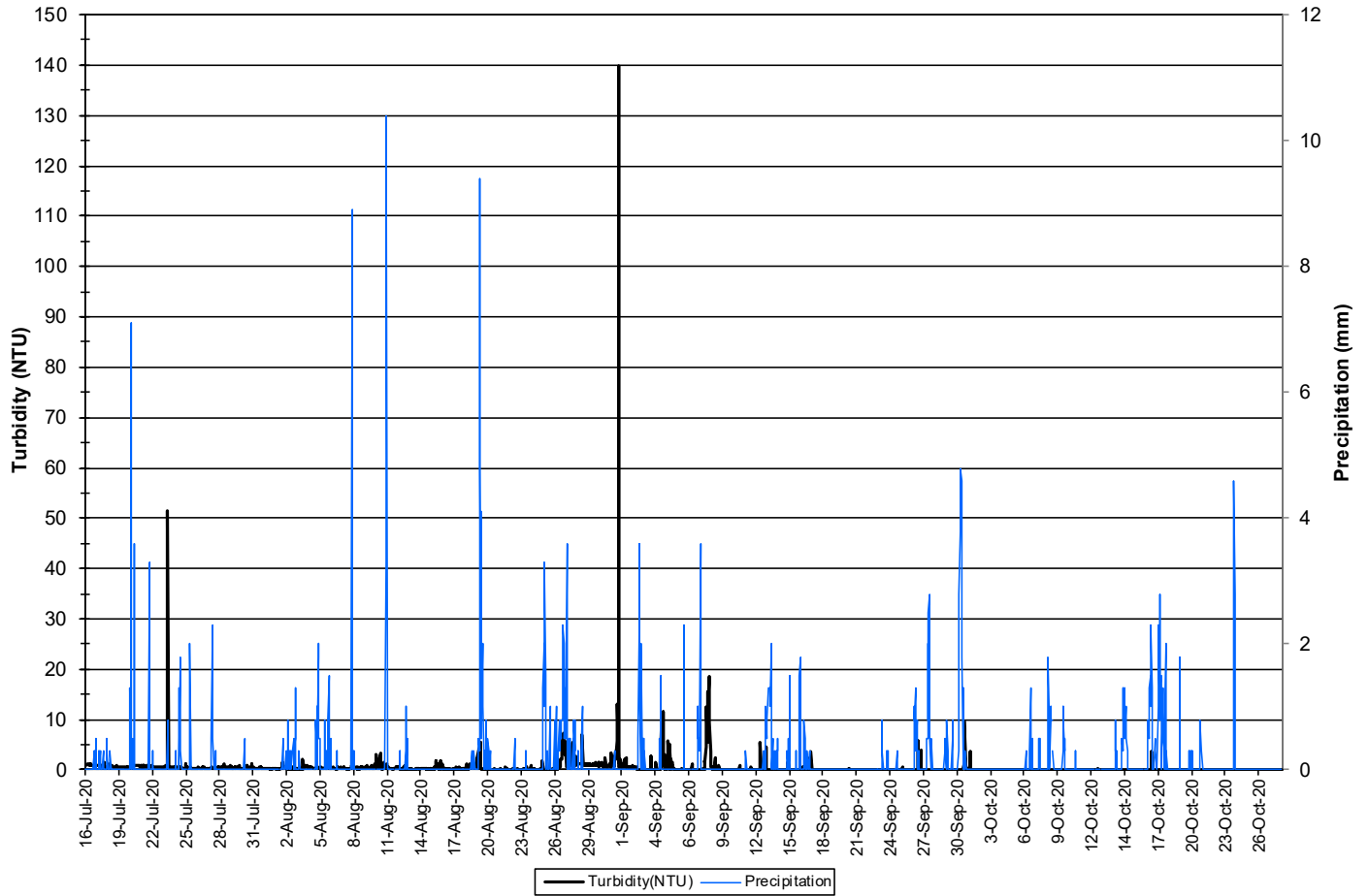


Figure 6b: Turbidity and Precipitation: Dolomite Road

- Stage and precipitation are graphed below to show the relationship between rainfall and water level at Julienne Narrows and Dolomite Road (Figure 7).
- Stage decreases after the first deployment period of the season at both stations before increasing into October, showing an identical trend.
- With the exception of water quantity data (stage), 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.

**Stage & Precipitation: Wabush Lake Network
July 16 to October 28, 2020**

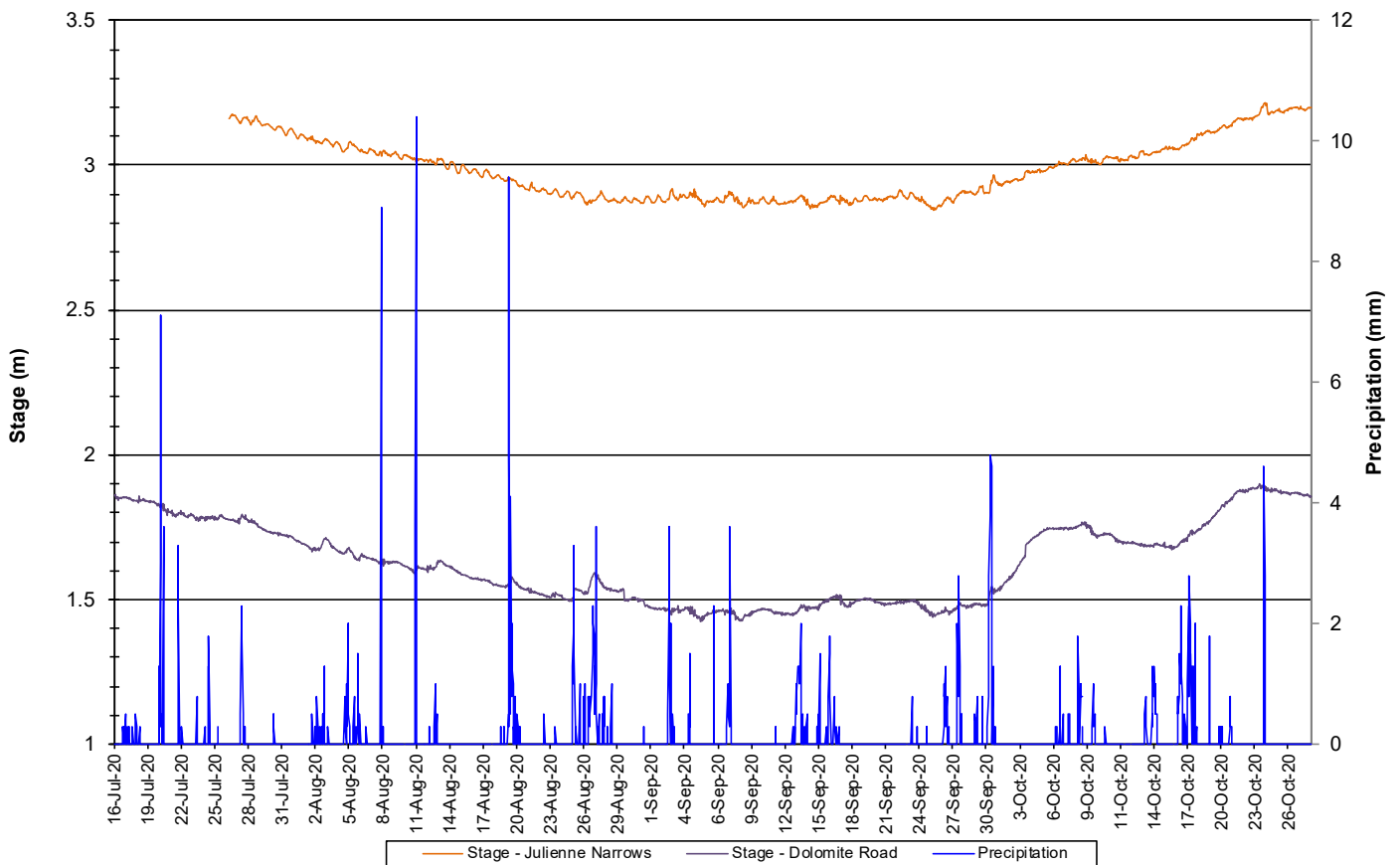


Figure 7: Stage and Precipitation: Wabush Lake Network

Dumbell Stream

- Water temperature ranged from 0.00 to 8.00°C at Dumbell Stream during the 2020 deployment season. The median value was 4.45 °C (Figure 8).
- Water temperature starts to decrease around the end of August as air temperatures cool into the fall. Water temperature at this station remains within a small range throughout the season and is impacted less than the other stations by air temperature values.

**Water and Air Temperature : Dumbell Stream above Dumbell Lake
July 16 to October 28, 2020**

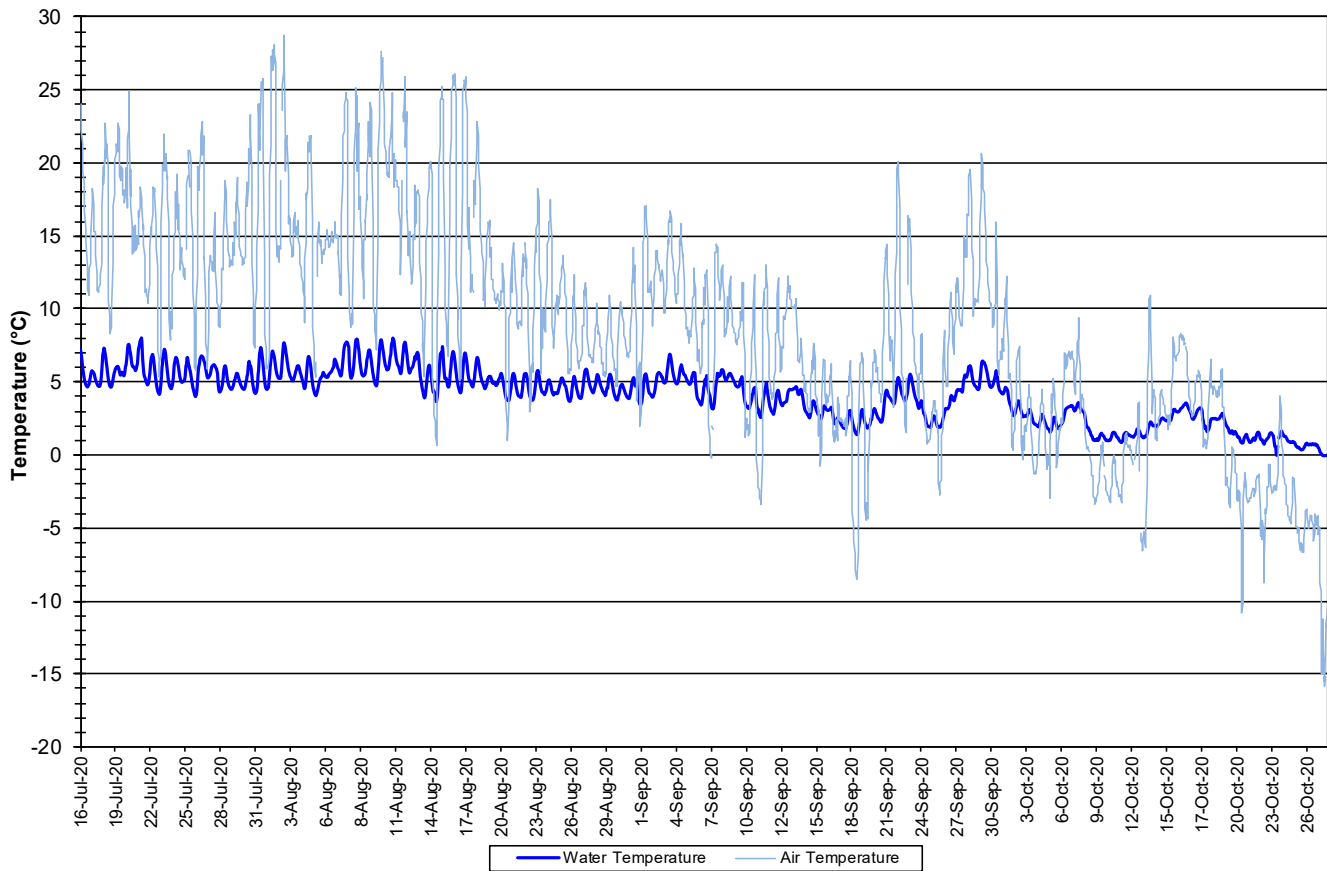


Figure 8: Water and Air Temperature – Dumbell Stream above Dumbell Lake

- pH ranges from 5.99 to 7.94 pH units at Dumbell Stream (Figure 9). The median pH is 7.71 units.
- pH fluctuates daily. Peaks are observed during late afternoon and into early evening.
- All values during the deployment are within the CCME Water Quality Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units) for the first half of the deployment.
- pH is relatively stable during the deployment season until the sensor begins to show signs of failure and experiences sensor drift September 15th onwards.

**Water pH and Stage : Dumbell Stream above Dumbell Lake
July 16 to October 28, 2020**

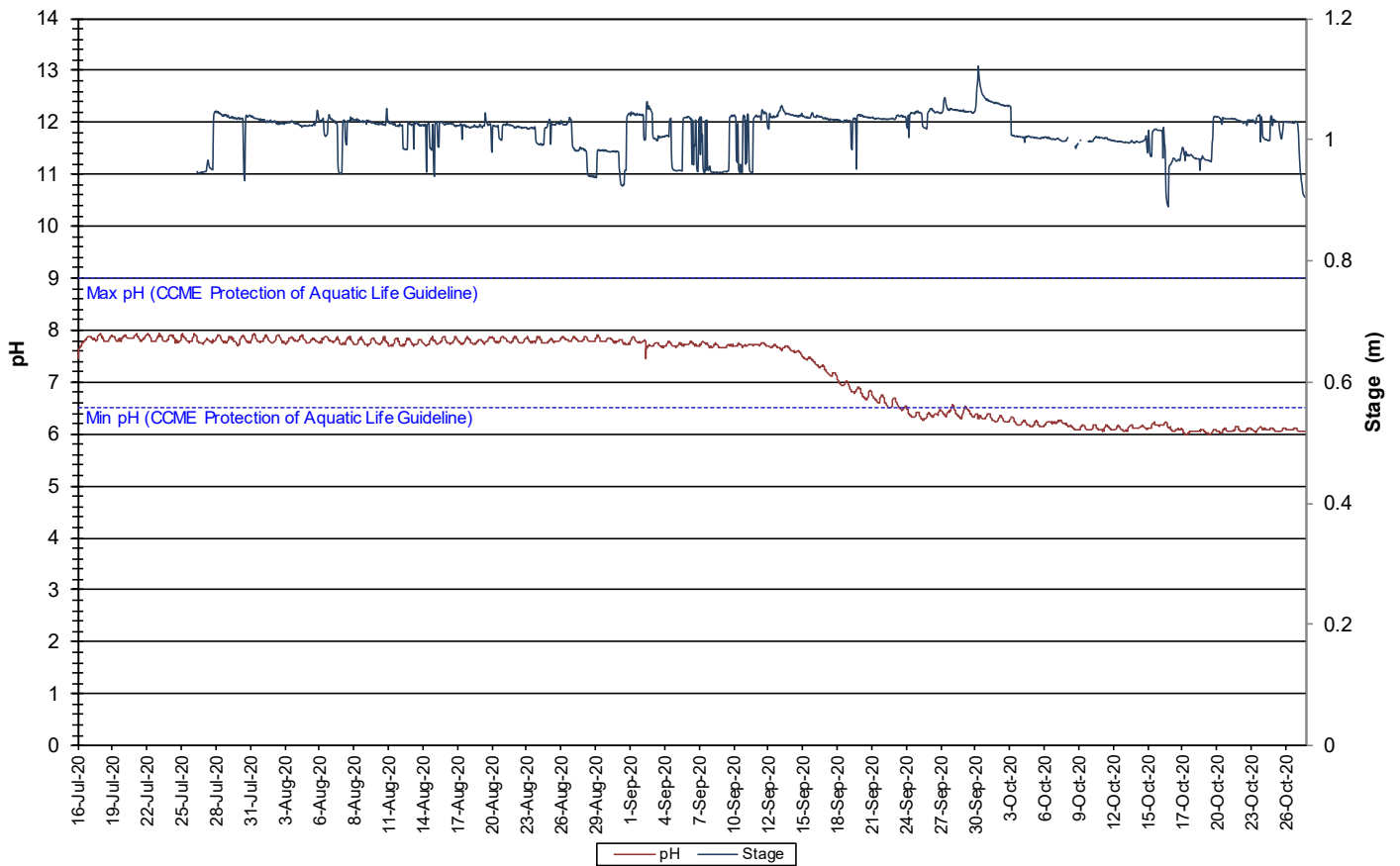


Figure 9: Water pH and Stage – Dumbell Stream above Dumbell Lake

- Throughout the 2020 deployment season, specific conductivity ranged from 63.5 to 111.6 $\mu\text{S}/\text{cm}$ at Dumbell Stream (Figure 10).
- Decreases in specific conductivity frequently correspond to increases in stage. As more water is added to the system from precipitation, the solids in the water are diluted, decreasing conductivity. Stage data was unreliable, therefore precipitation data was used for comparison.
- Overall, specific conductivity increased very gradually throughout the deployment season, with periodic fluctuations related to stage.
- With the exception of water quantity data (stage), 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.

**Specific Conductivity of Water and Precipitation: Dumbell Stream above Dumbell Lake
July 16 to October 28, 2020**

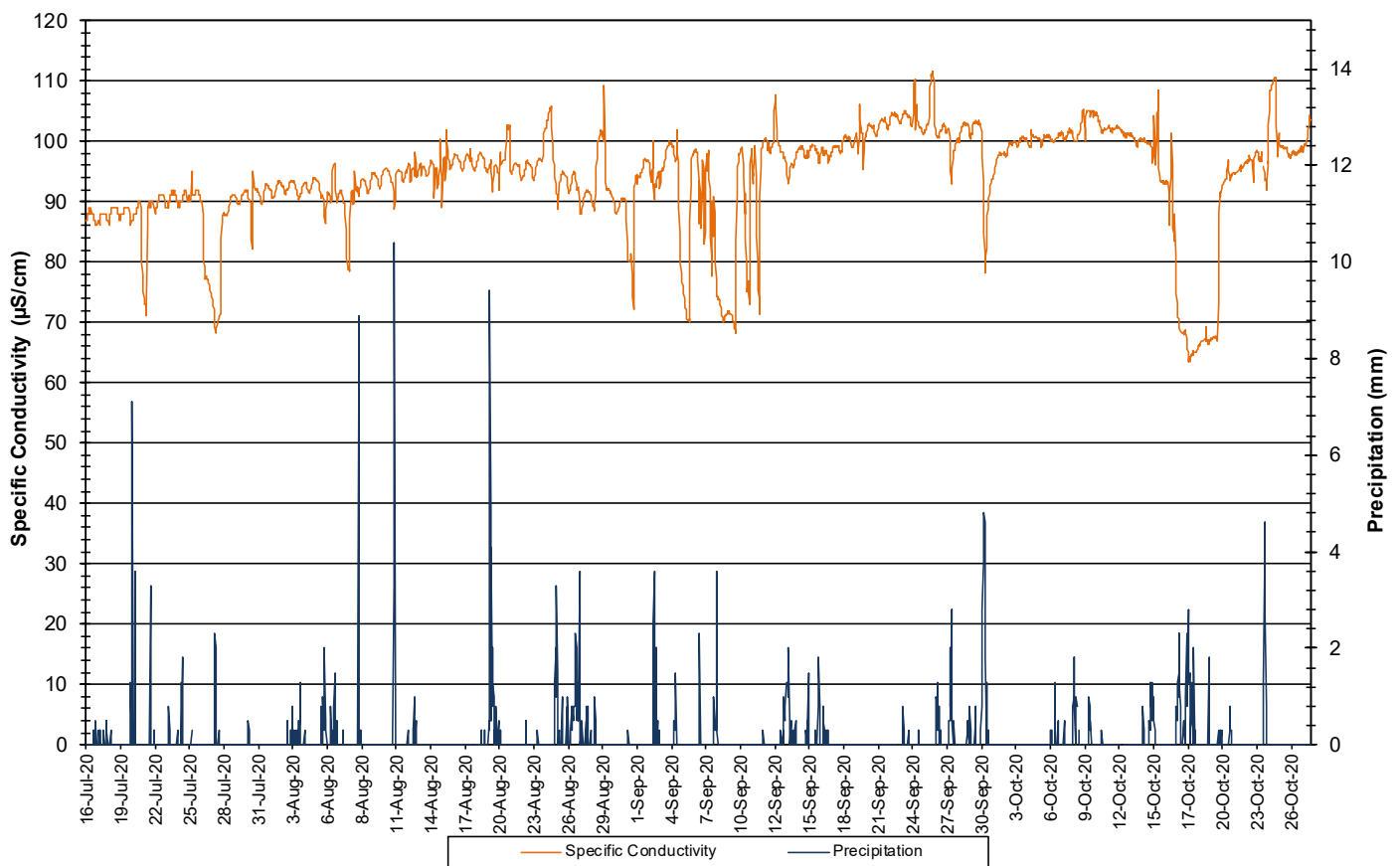


Figure 10: Specific Conductivity and Stage – Dumbell Stream above Dumbell Lake

- Dissolved oxygen ranged from 85.1 to 91.3% saturation and from 10.38 to 12.91 mg/l, with a median value of 11.42 mg/l (Figure 11).
- Dissolved oxygen fluctuated daily with decreases observed at night.
- Dissolved oxygen increased during the later portion of the deployment season when water temperature was decreasing in the fall.
- All values were above the CCME Water Quality Guidelines for the Protection of Aquatic Life for Cold Water Biota at Other Life Stages (6.5 mg/l) and Early Life Stages (9.5 mg/l). The guidelines are indicated in blue on Figure 11.

**Dissolved Oxygen Concentration and Saturation : Dumbell Stream at Dumbell Lake
July 16 to October 28, 2020**

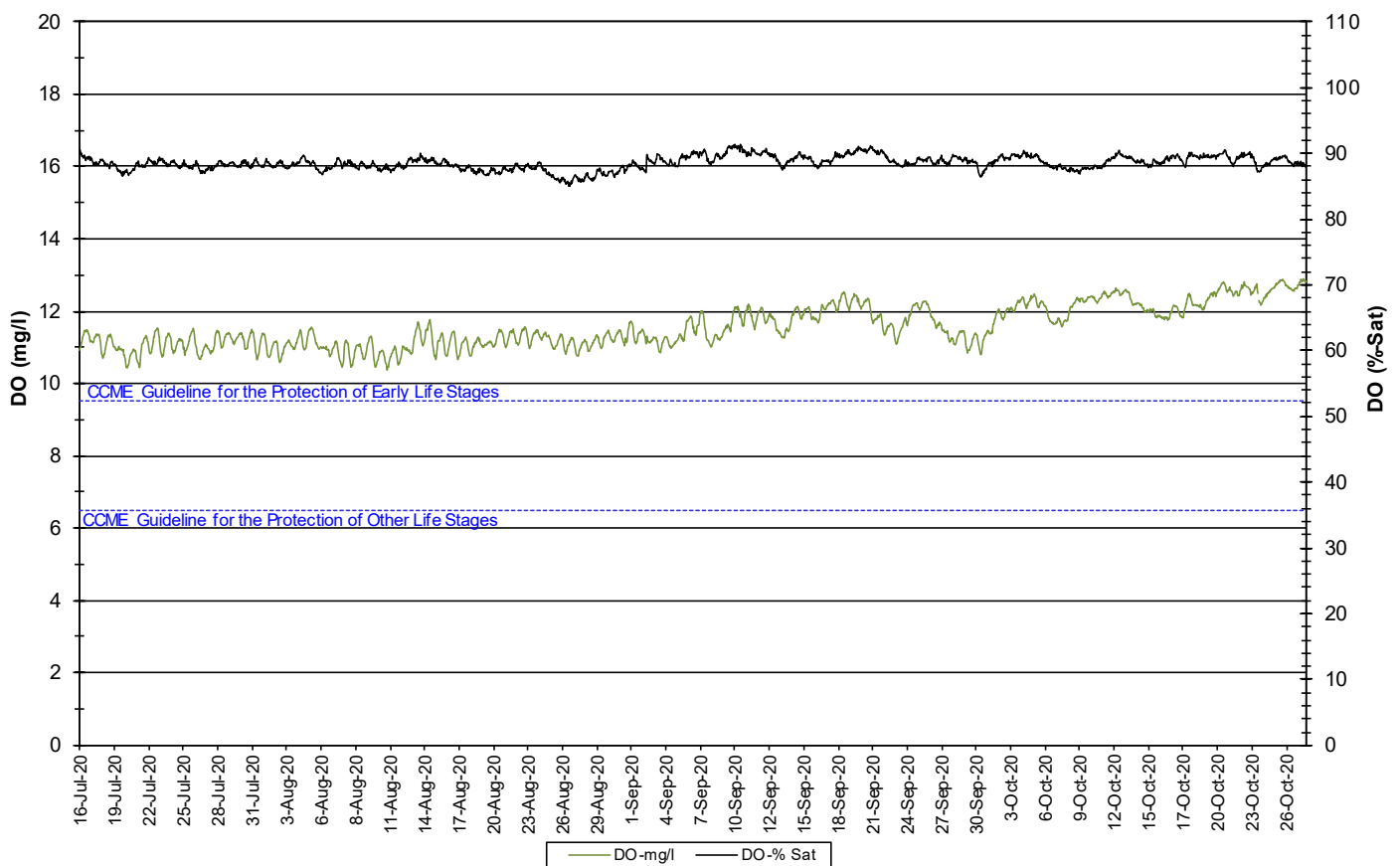


Figure 11: Dissolved Oxygen and Percent Saturation – Dumbell Stream above Dumbell Lake

- Turbidity values range from 0.0 to 322.2 NTU, with a median value of 0.0 NTU (Figure 12a & 12b) indicating very low background turbidity.
- Turbidity readings greater than 0 NTU occur occasionally and are of short duration.

**Water Turbidity and Precipitation : Dumbell Stream above Dumbell Lake
July 16 to October 28, 2020**

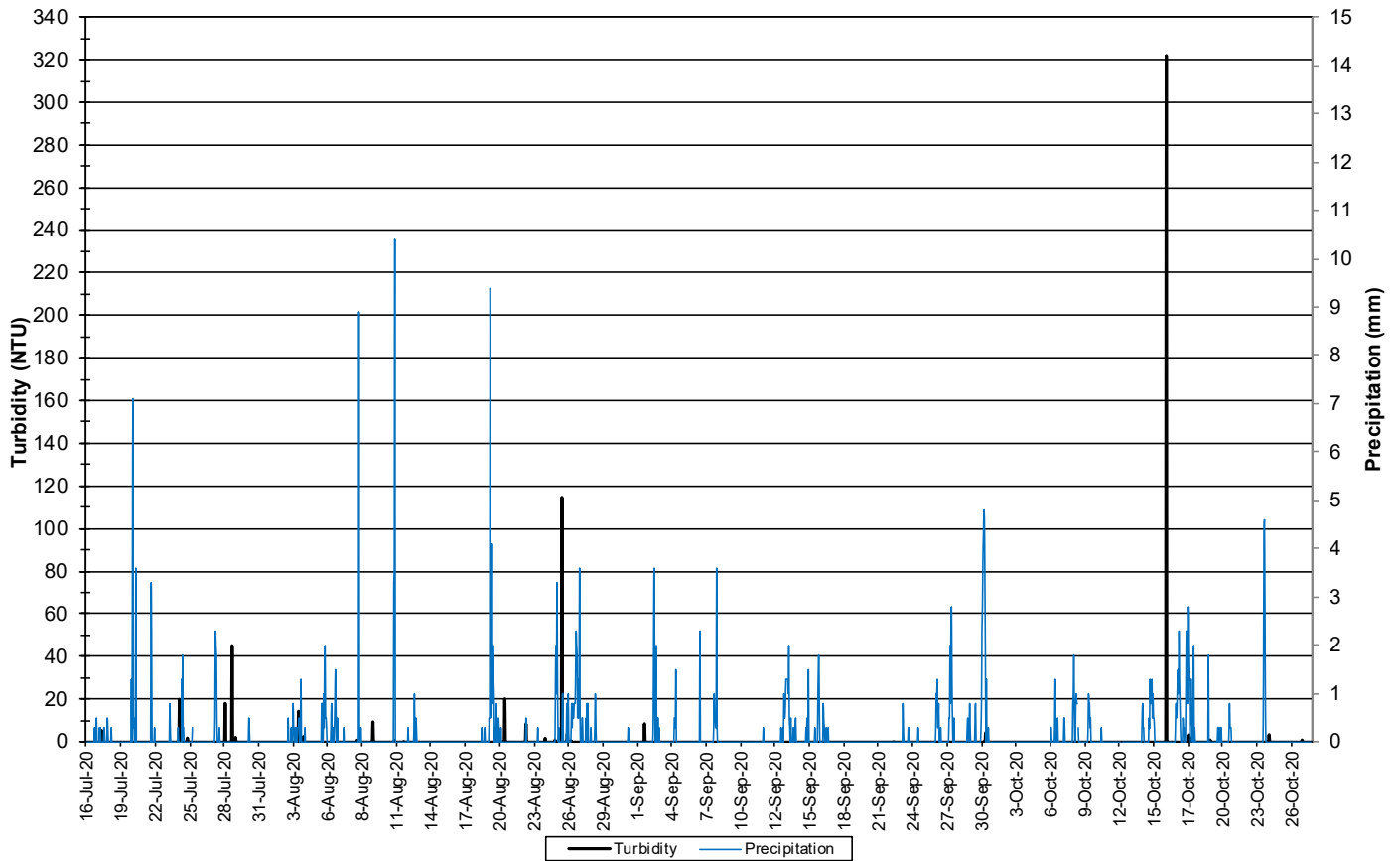


Figure 12a: Turbidity and Precipitation – Dumbell Stream above Dumbell Lake

**Water Turbidity <50 NTU and Precipitation : Dumbell Stream above Dumbell Lake
July 16 to October 28, 2020**

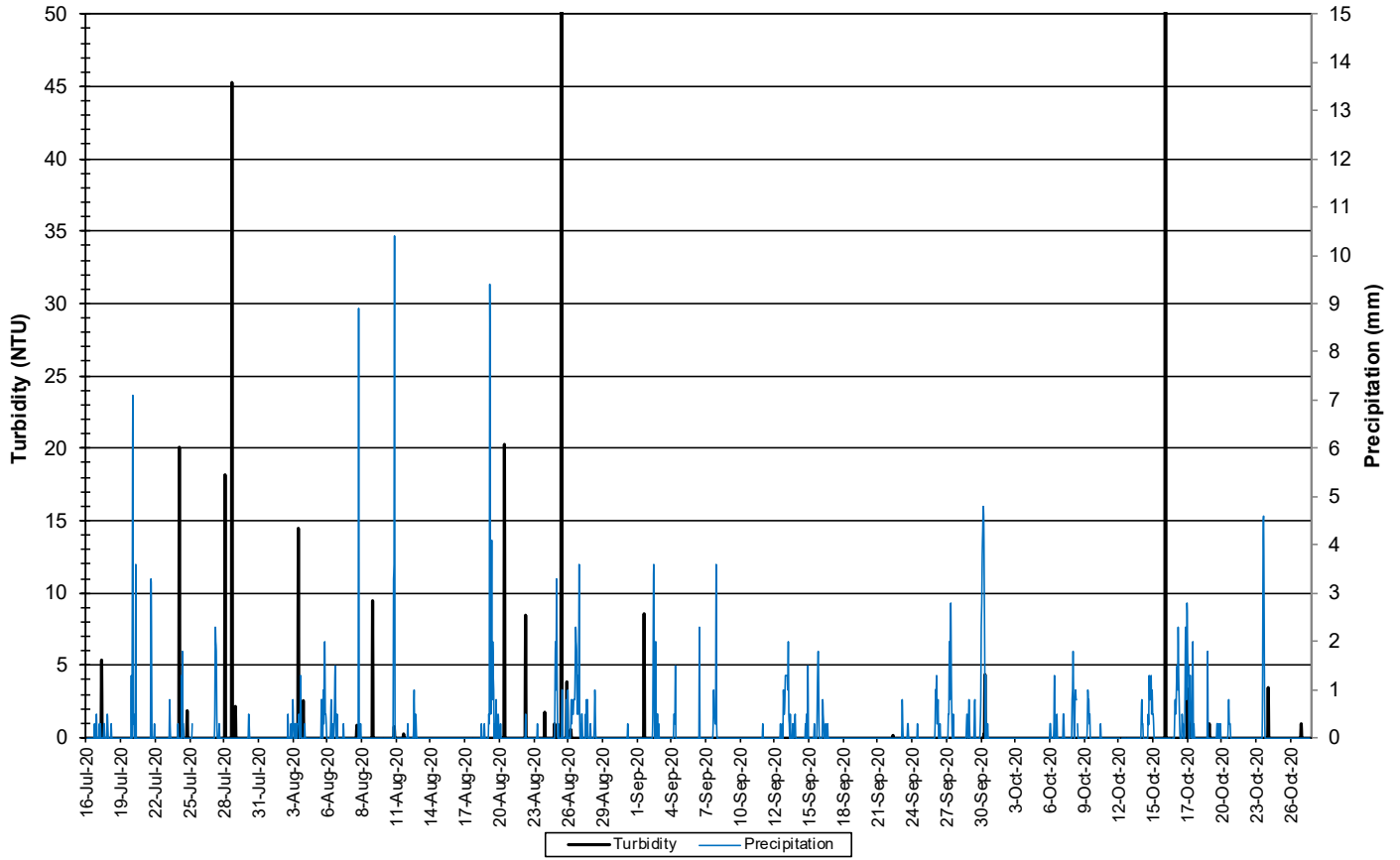


Figure 12b: Turbidity <50 NTU and Precipitation – Dumbell Stream above Dumbell Lake

- Stage and precipitation are graphed below to show the relationship between rainfall and water level at Dumbell Stream (Figure 13). Precipitation has a direct effect on stage at this location.
- With the exception of water quantity data (stage), 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.

**Stage and Precipitation: Dumbell Stream
July 16 to October 28, 2020**

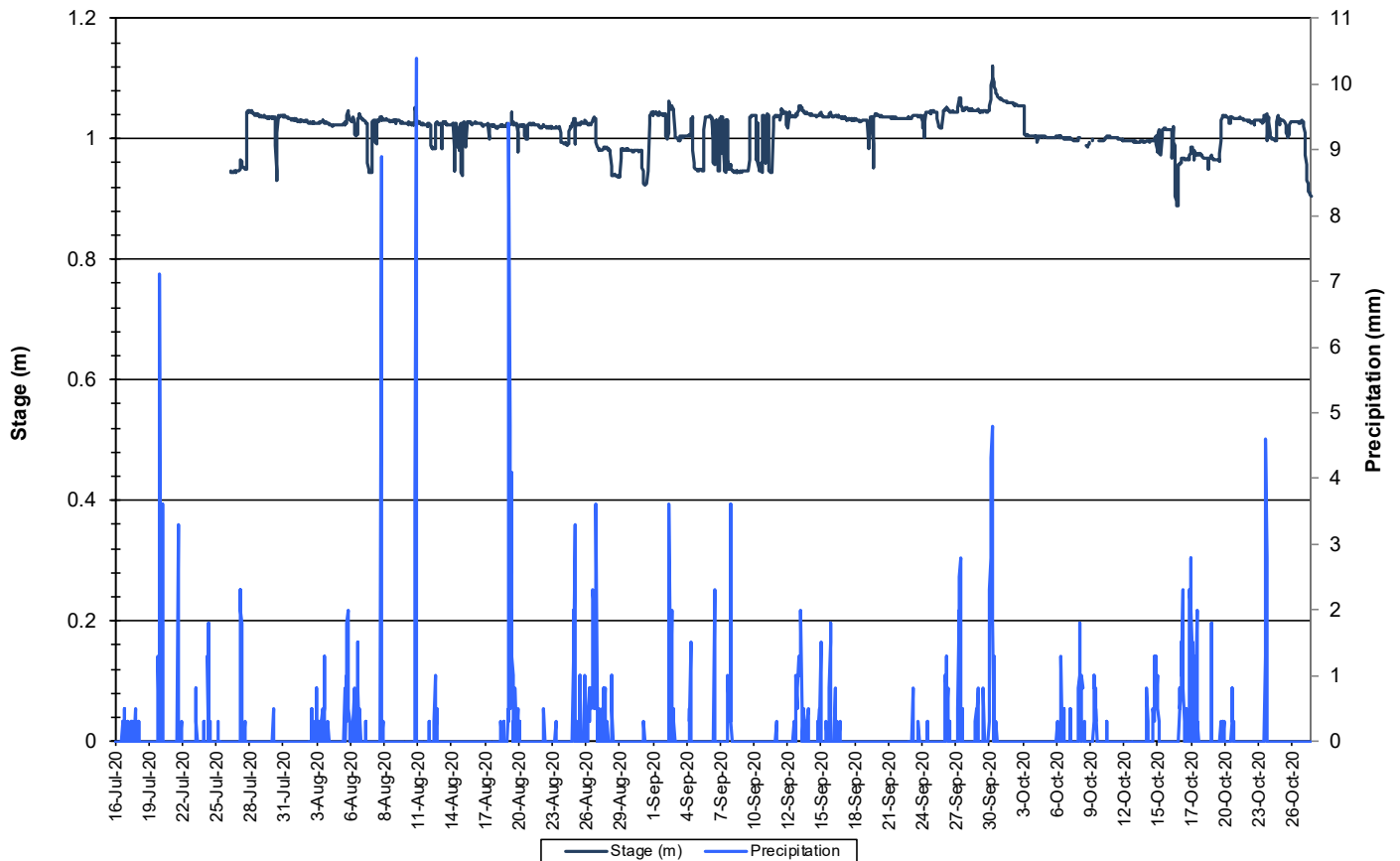


Figure 13: Stage and Precipitation – Dumbell Stream above Dumbell Lake

Pumphouse Stream

- Water temperature ranged from -0.20 to 19.40°C at Pumphouse Stream during the 2020 deployment season. The median value was 8.40°C (Figure 14).
- Water temperature corresponded closely with air temperature fluctuations, decreasing steadily after August as air temperature cooled in to the fall.

**Water and Air Temperature : Pumphouse Stream above Drum Lake
July 16 to October 29, 2020**

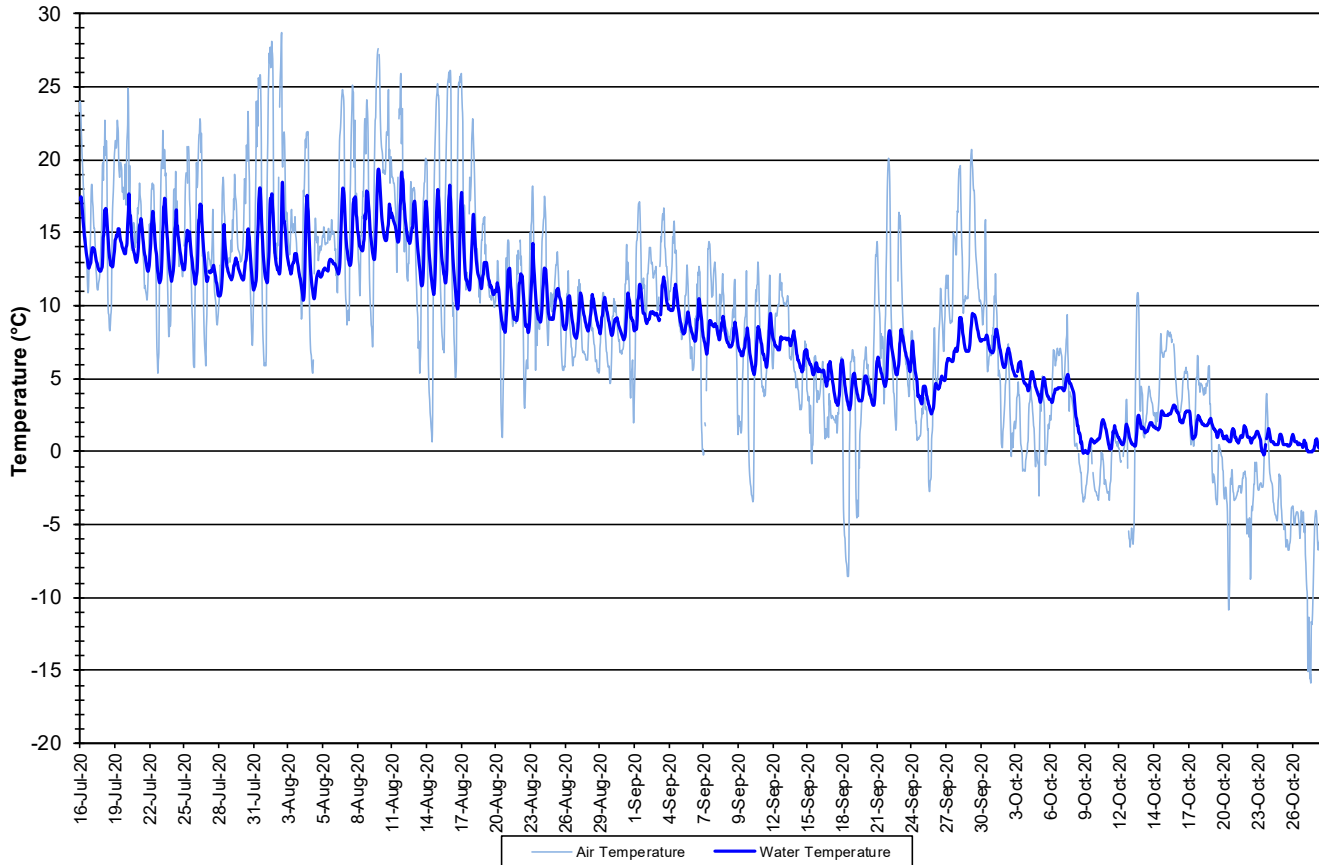


Figure 14: Water and Air Temperature – Pumphouse Stream above Drum Lake

- pH ranged from 6.92 to 7.82 pH units at Dumbell Stream (Figure 15). The median pH was 7.65 units.
- pH fluctuated daily. Peaks were observed during late afternoon into the early evening. pH increases slightly over the course of this deployment season.
- All values during the deployment are within the CCME Water Quality Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units).

**Water pH and Precipitation: Pumphouse Stream above Drum Lake
July 16 to October 29, 2020**

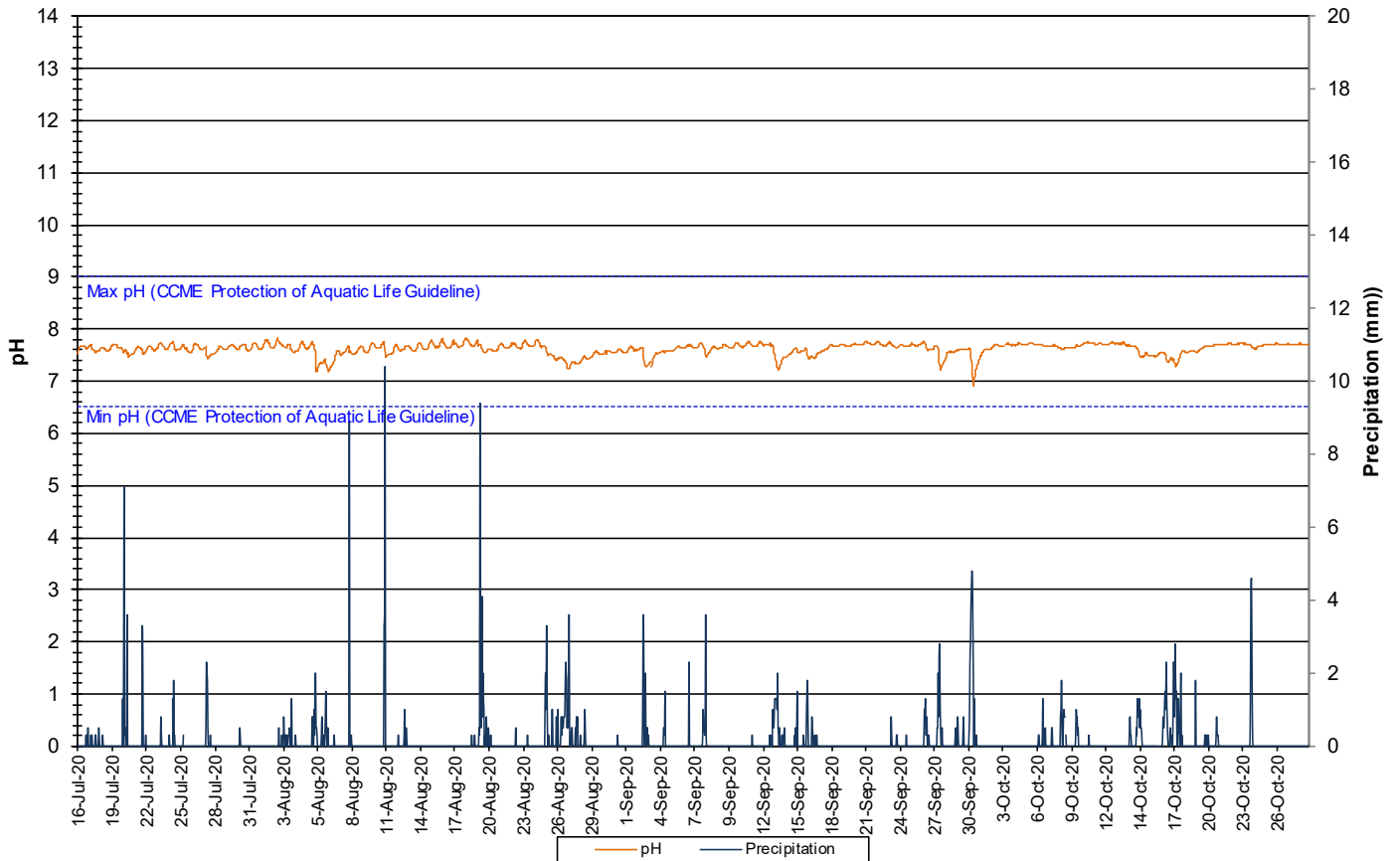


Figure 15: Water pH and Precipitation – Pumphouse Stream above Drum Lake

- Throughout the 2020 deployment season, specific conductivity ranged from 76.3 to 228.0 $\mu\text{S}/\text{cm}$ at Pumphouse Stream (Figure 16).
- Drops in specific conductivity frequently correspond to increases in stage. As more water is added to the system from precipitation, the solids in the water are diluted, decreasing conductivity. Stage data was not available for a large portion of the deployment season, thus specific conductivity is graphed with precipitation.
- Overall, specific conductivity gradually decreases throughout the deployment season.
- With the exception of water quantity data (stage), 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.

**Specific Conductivity of Water and Stage Level : Pumphouse Stream above Drum Lake
July 16 to October 29, 2020**

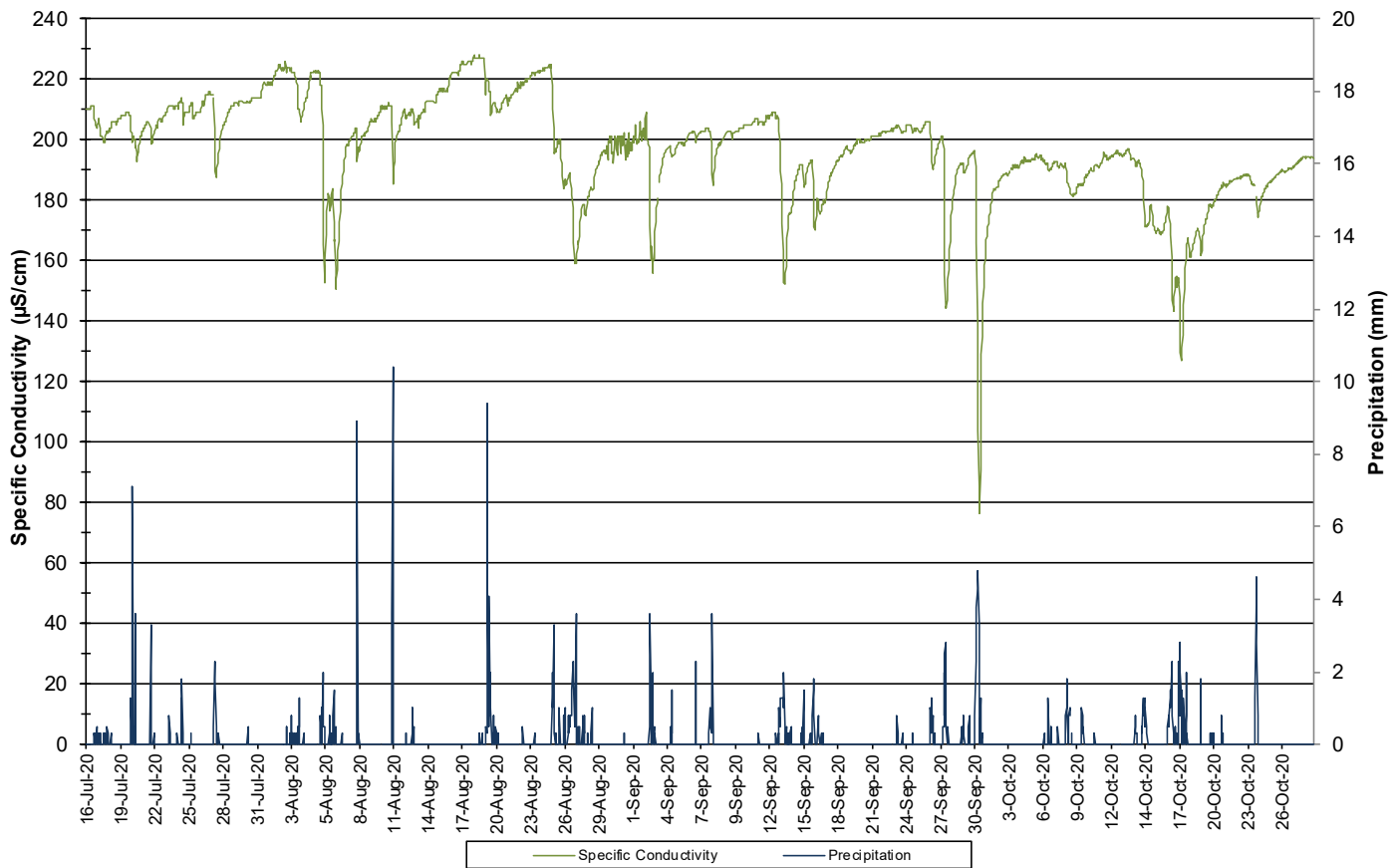


Figure 16: Specific Conductivity and Precipitation – Pumphouse Stream above Drum Lake

- Dissolved oxygen ranged from 73.3 to 89.7% saturation and 7.83 to 11.55 mg/l with a median value of 9.47 mg/l (Figure 17).
- Dissolved oxygen fluctuated daily with decreases observed at night.
- Dissolved oxygen increased during the later portion of the deployment season when water temperature was decreasing in the fall. This is a normal seasonal trend.
- All values were above the CCME Water Quality Guideline for the Protection of Aquatic Life for Cold Water Biota at Other Life Stages of 6.5 mg/l. Most values recorded were below the minimum guideline for early life stages of 9.5 mg/l until water temperatures dropped and oxygen levels began to rise in September. The guidelines are indicated in blue on Figure 11.

**Dissolved Oxygen Concentration and Saturation : Pumphouse Stream above Drum Lake
July 16 to October 29, 2020**

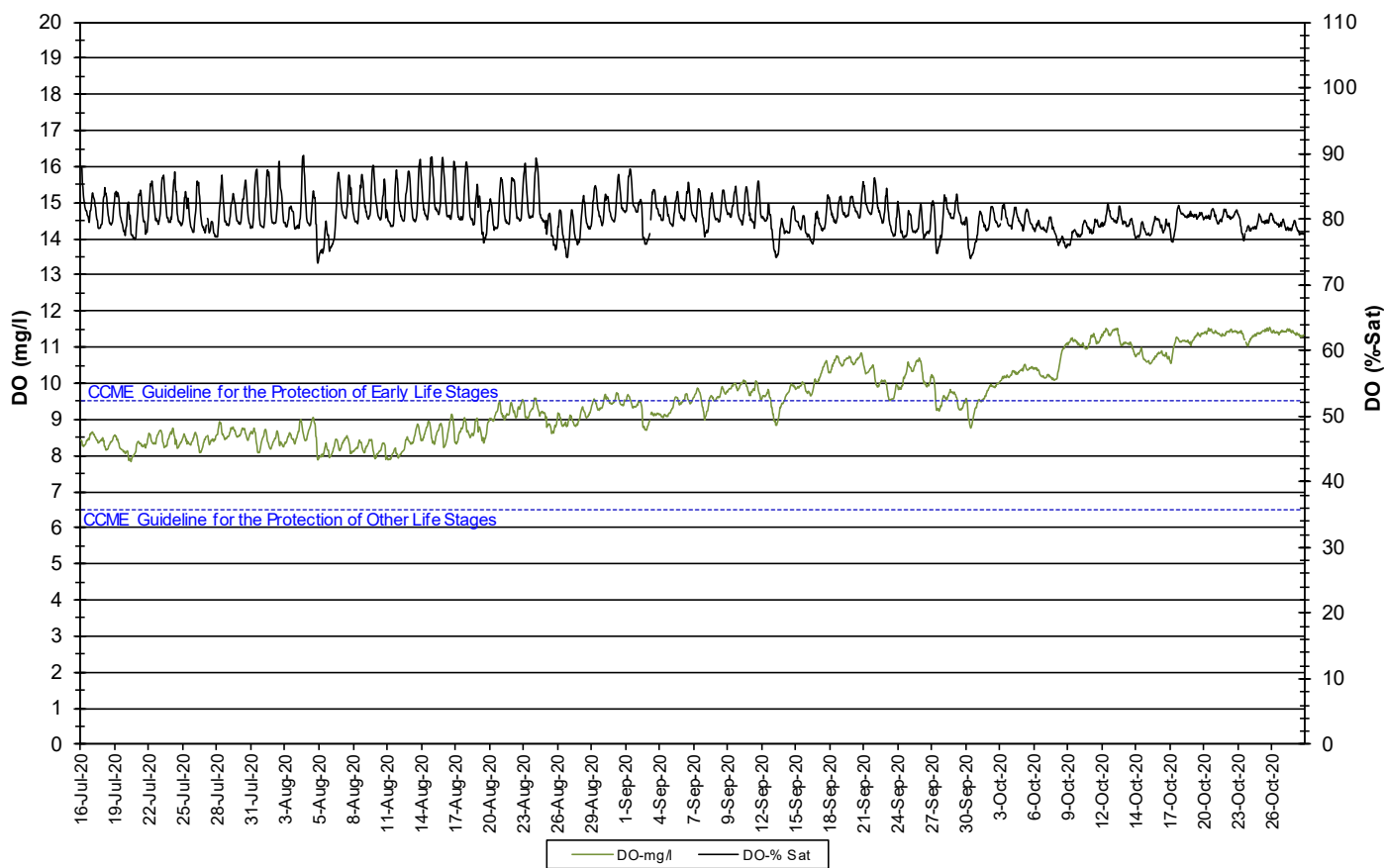


Figure 17: Dissolved Oxygen and Percent Saturation – Pumphouse Stream above Drum Lake

- Turbidity values range from 0.0 to 197.8 NTU, with a median value of 2.7 NTU (Figure 18a & 18b).
- The baseline of the turbidity data in the second deployment is higher than the first deployment period. This is likely due to calibration or sensor error. The data is still included as it shows the fluctuations in turbidity during this time period.

**Water Turbidity and Precipitation : Pumphouse Stream above Drum Lake
July 16 to October 29, 2020**

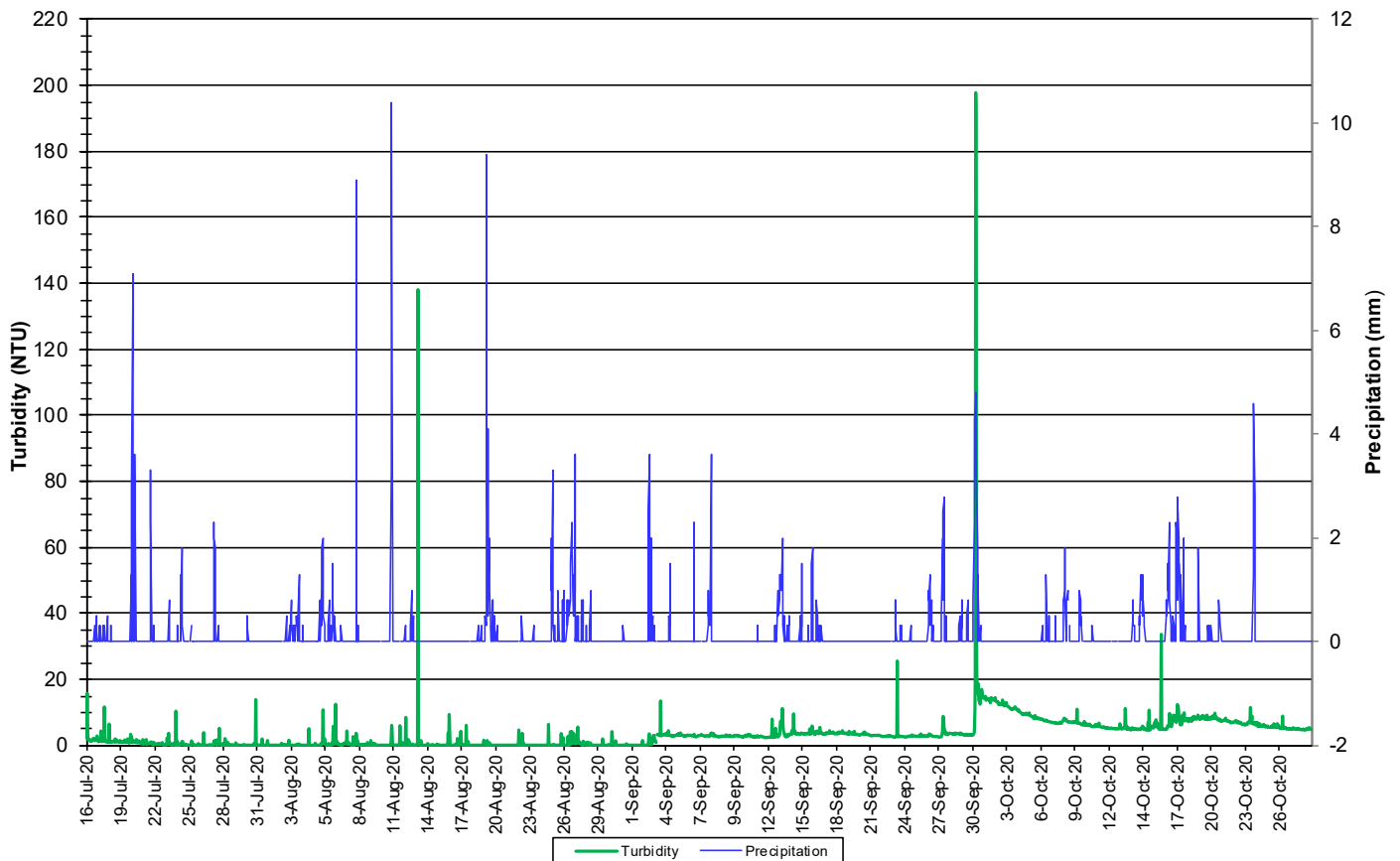


Figure 18a: Turbidity and Precipitation – Pumphouse Stream above Drum Lake

**Water Turbidity <40 NTU and Precipitation : Pumphouse Stream above Drum Lake
July 16 to October 29, 2020**

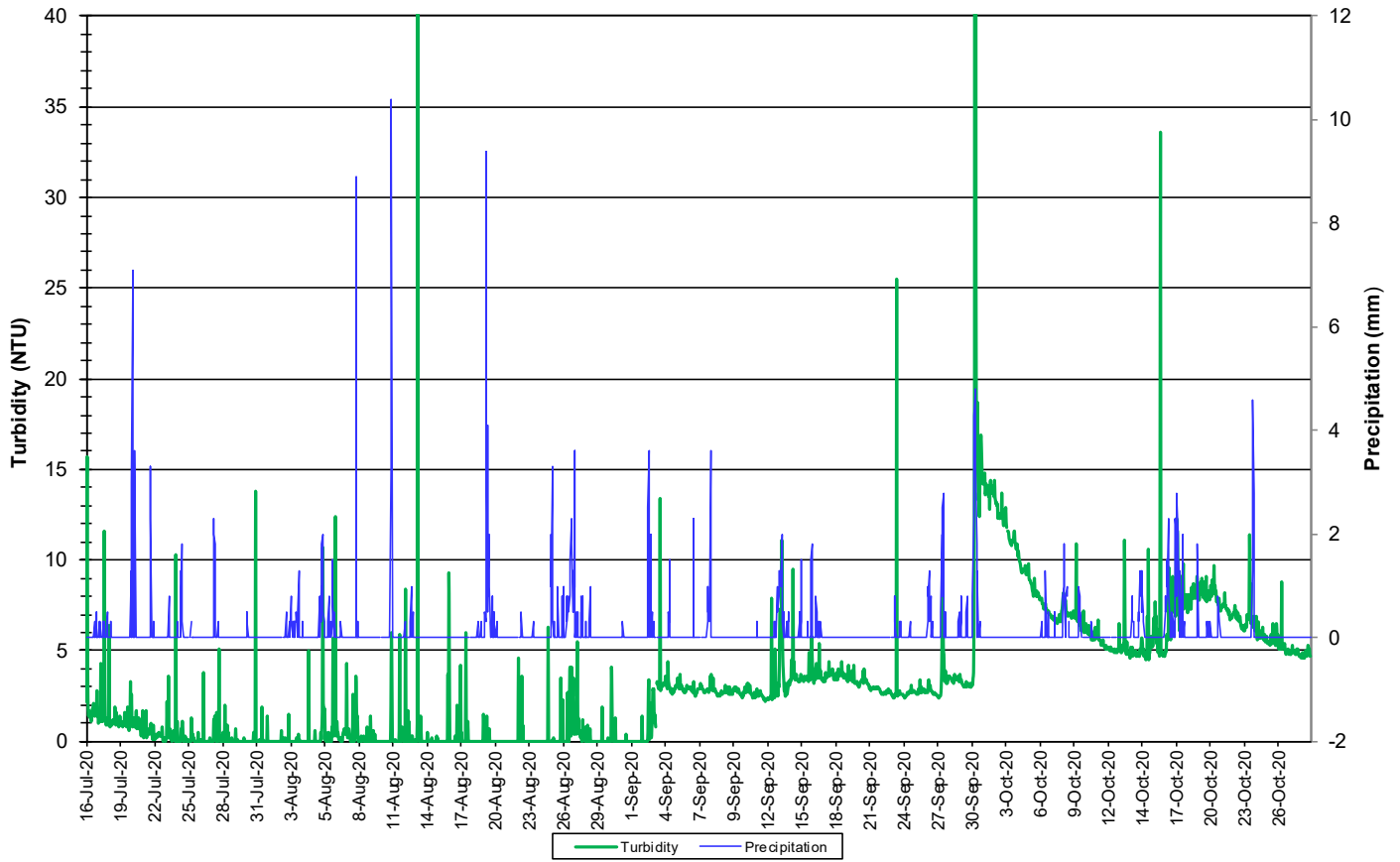


Figure 18b: Turbidity <40 NTU and Precipitation – Pumphouse Stream above Drum lake

- Stage and precipitation are graphed below to show the relationship between rainfall and water level at Dumbell Stream (Figure 19).
- A large portion of stage data is missing from this deployment season. During the last month of the deployment, stage increases during and after precipitation events.
- With the exception of water quantity data (stage), 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.

**Stage & Precipitation: Pumphouse Stream above Drum Lake
July 16 to October 29, 2020**

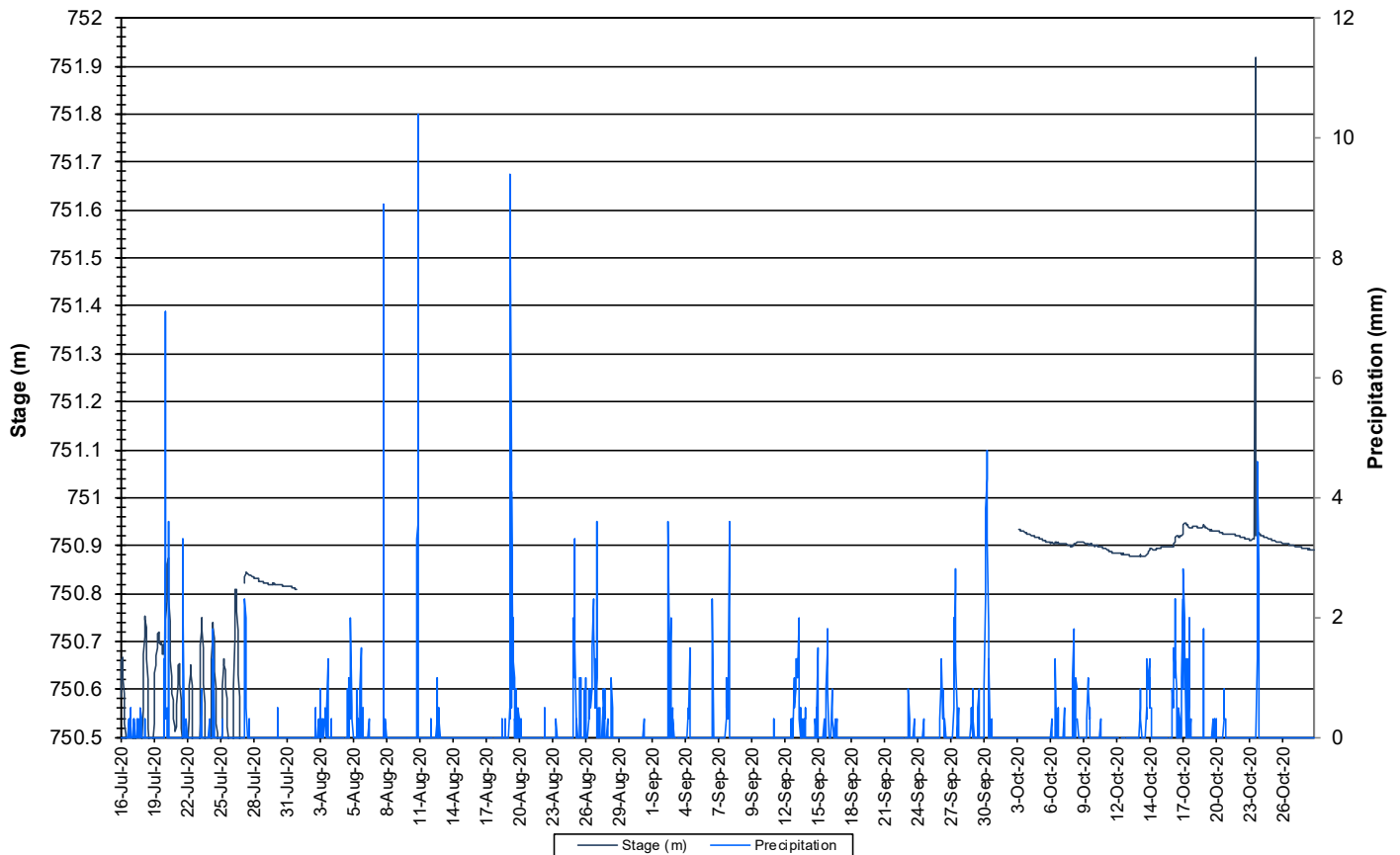


Figure 19: Stage and Precipitation – Pumphouse Stream above Drum Lake

Conclusions

- Instruments at the water quality monitoring stations in Labrador West were deployed on July 16th and removed on October 28-29th, 2020. They were then removed for the winter season.
- Instruments were deployed for periods of 48 to 56 days before maintenance and calibration.
- In most cases, weather related events or increases/decreases in water level could be used to explain the fluctuations.
- Most values recorded were within ranges as suggested by the CCME Water Quality Guidelines for the Protection of Aquatic Life.
- The instruments performed well in 2020 except for a few minor issues. These instruments will undergo PTE's during the winter.
- Water temperature followed the seasonal trend of increasing during the summer and decreasing into the fall. Water temperature corresponded closely with air temperature at all stations except Dumbell.
- All pH values were within the acceptable range of the CCME Water Quality Guidelines for Protection of Aquatic Life except at Dumbell where sensor drift is suspected.
- Specific conductivity differed between the two Wabush Lake stations. This can be attributed to varying concentrations of iron ore tailings, which are deposited into Wabush Lake downstream of Dolomite Road and upstream of Julienne Narrows. Dumbell Stream and Pumphouse Stream are small streams in which conductivity values responded to increases in stage with corresponding decreases in values.
- For the minimum CCME Water Quality Guideline for the Protection of Aquatic Life for Cold Water Biota at Early Life Stages of 9.5 mg/l, the majority of values at the two Wabush Lake stations were above the guideline. At Dumbell Stream, all values were above this guideline. At Pumphouse Stream, the majority of values were below this guideline.
- All values were above the CCME Water Quality Guideline for the Protection of Aquatic Life for Cold water Biota at Other Life Stages of 6.5 mg/l at all stations.
- Turbidity values varied greatly between the two Wabush Lake stations with values remaining lower at Dolomite road. Turbidity fluctuations at Dumbell Stream and Pumphouse Stream can mostly be attributed to precipitation events.

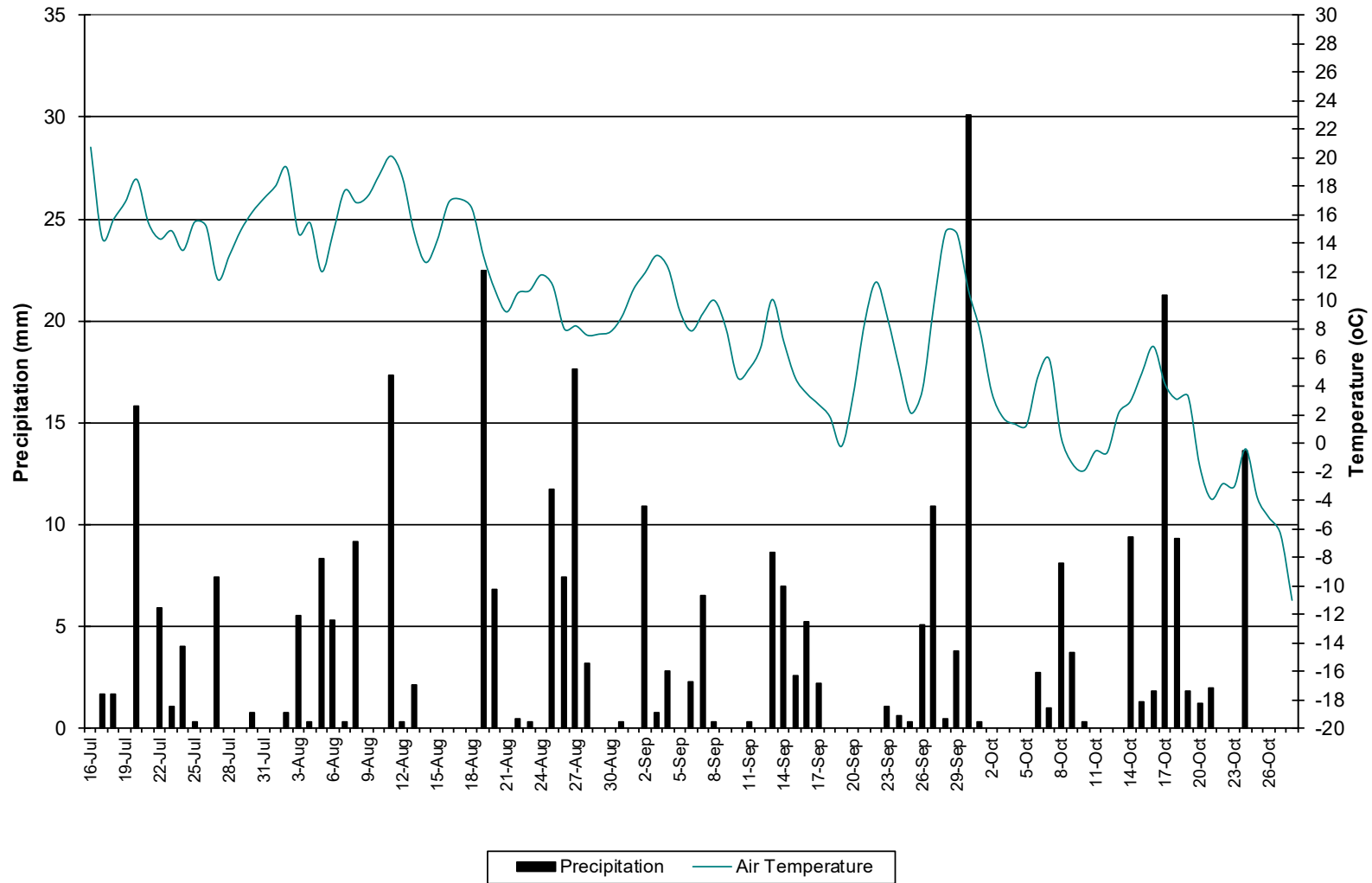
Path Forward

- All field instruments will undergo Proficiency, Testing, and Evaluation (PTE) during the winter of 2020-2021. ECCM will inform IOC of any instrument performance issues.
- ECCM staff will deploy real time water quality instruments in spring 2021 when ice conditions allow and perform regular site visits throughout the 2021 deployment season for calibration and maintenance of the instruments.
- If necessary, deployment techniques will be evaluated and adapted to each site, ensuring secure and suitable conditions for RTWQ monitoring.
- ECCM will update IOC staff on any changes to procedures with handling, maintenance and calibration of the real-time instruments.
- ECCM will continue to work on its Automatic Data Retrieval System, to incorporate new capabilities in data management and data display.
- Open communication will continue to be maintained between ECCM, ECCC and IOC employees involved with the agreement, in order to respond to emerging issues on a proactive basis.
- IOC will continue to be informed of data trends and any significant water quality events in the form of email and/or monthly deployment reports, when the deployment season begins. IOC will also receive an annual report, summarizing the events of the deployment season.

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Appendix 1

**Air Temperature and Precipitation: Moosehead Lake, NL
July 16 to October 28, 2020**



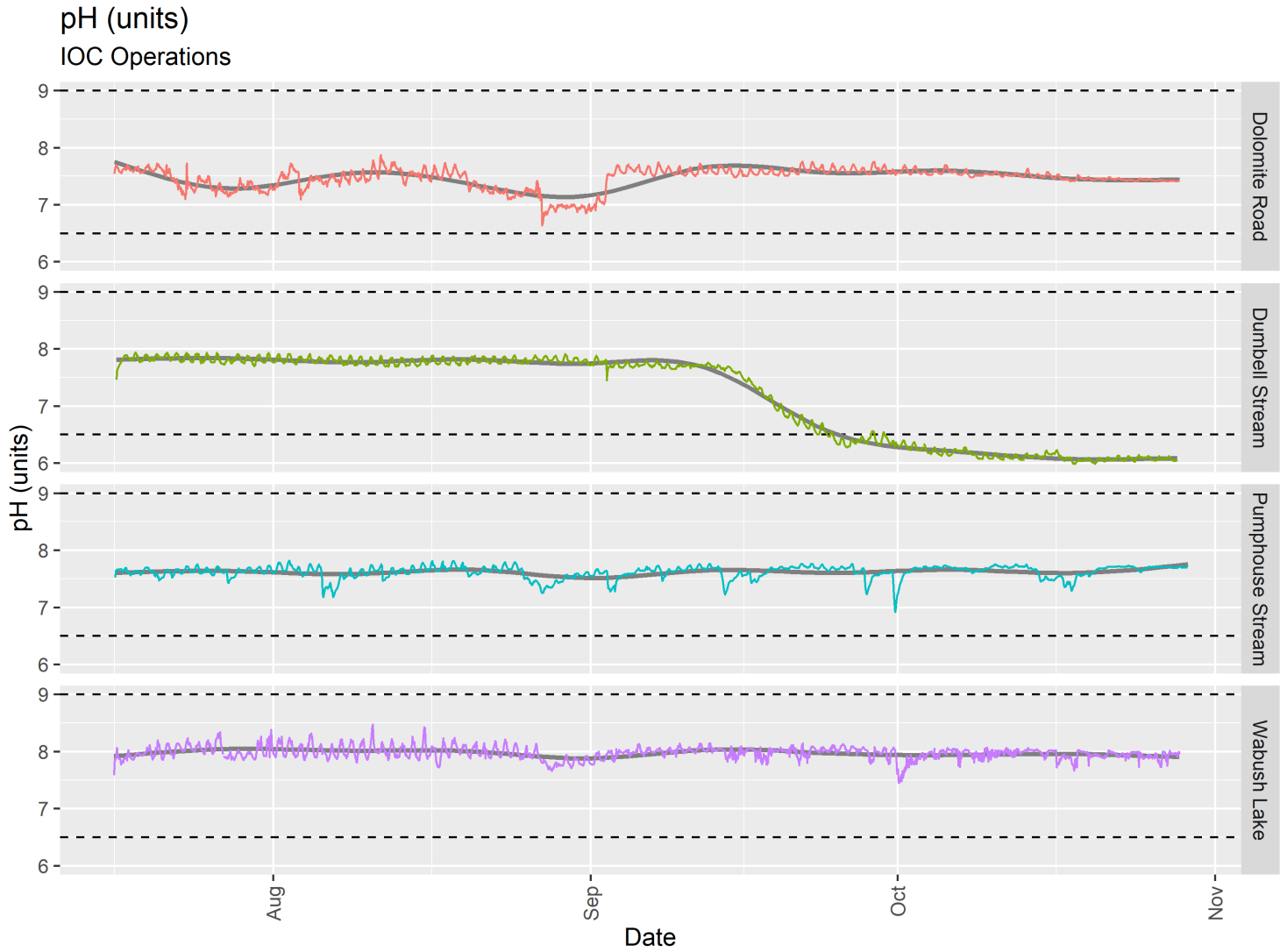
Appendix 2
Station to Station Quick View

Water Temperature (C)

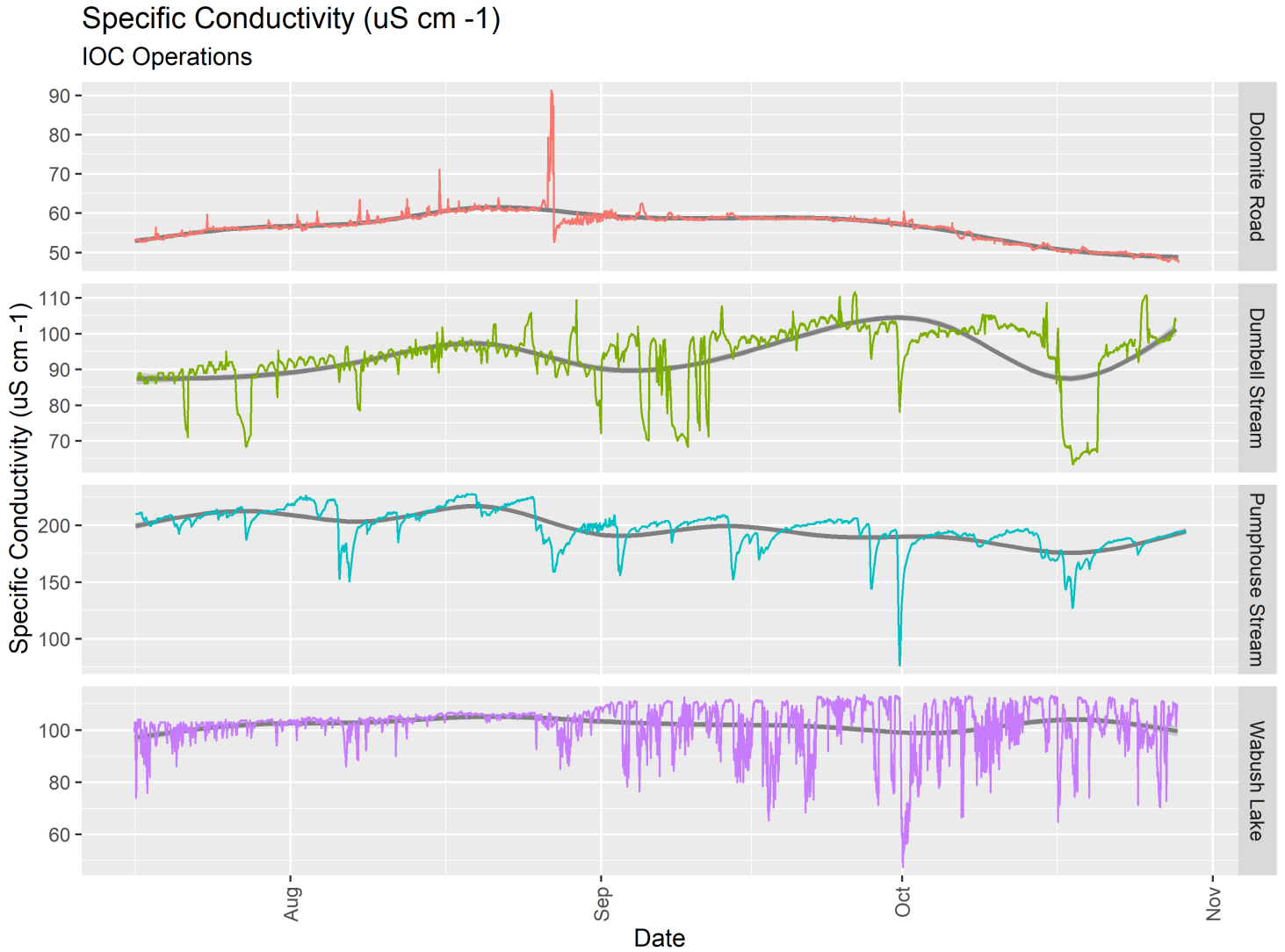
IOC Operations



Temperature (°C)				
	Dolomite Road	Dumbell Stream	Pumphouse Stream	Julienne Narrows (Wabush Lake)
Min	0.7	0	-0.2	0.9
Max	21.3	8	19.4	20.3
Median	11.7	4.45	8.4	10.7



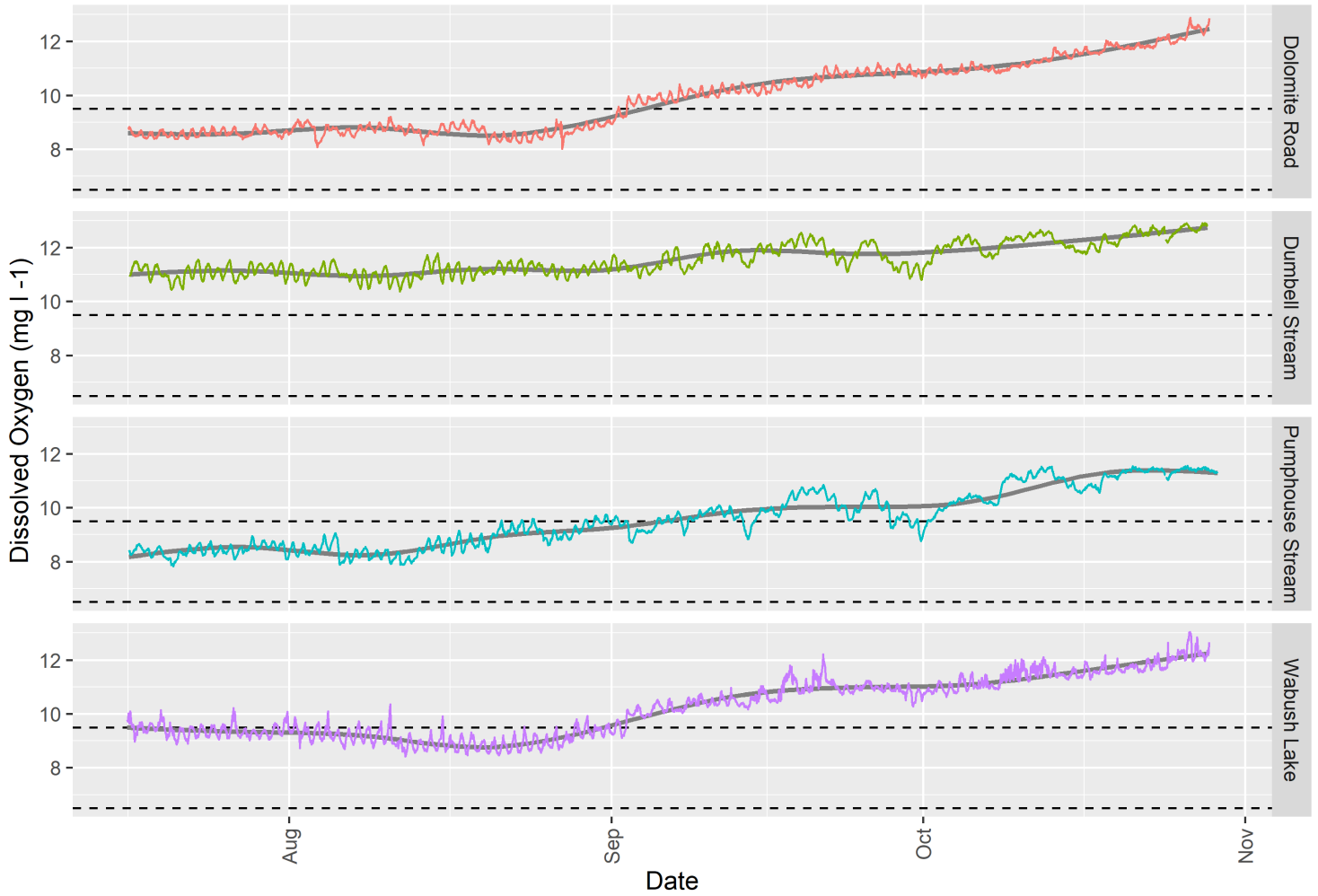
pH				
	Dolomite Road	Dumbell Stream	Pumphouse Stream	Julienne Narrows (Wabush Lake)
Min	6.64	5.99	6.92	7.45
Max	7.87	7.94	7.82	8.47
Median	7.52	7.71	7.65	7.98



Specific Conductivity (µs/cm)				
	Dolomite Road	Dumbell Stream	Pumphouse Stream	Julienne Narrows (Wabush Lake)
Min	47.4	63.5	76.3	47.5
Max	91.2	111.6	228.0	113.4
Median	57.6	95.4	199.1	103.9

Dissolved Oxygen (mg l⁻¹)

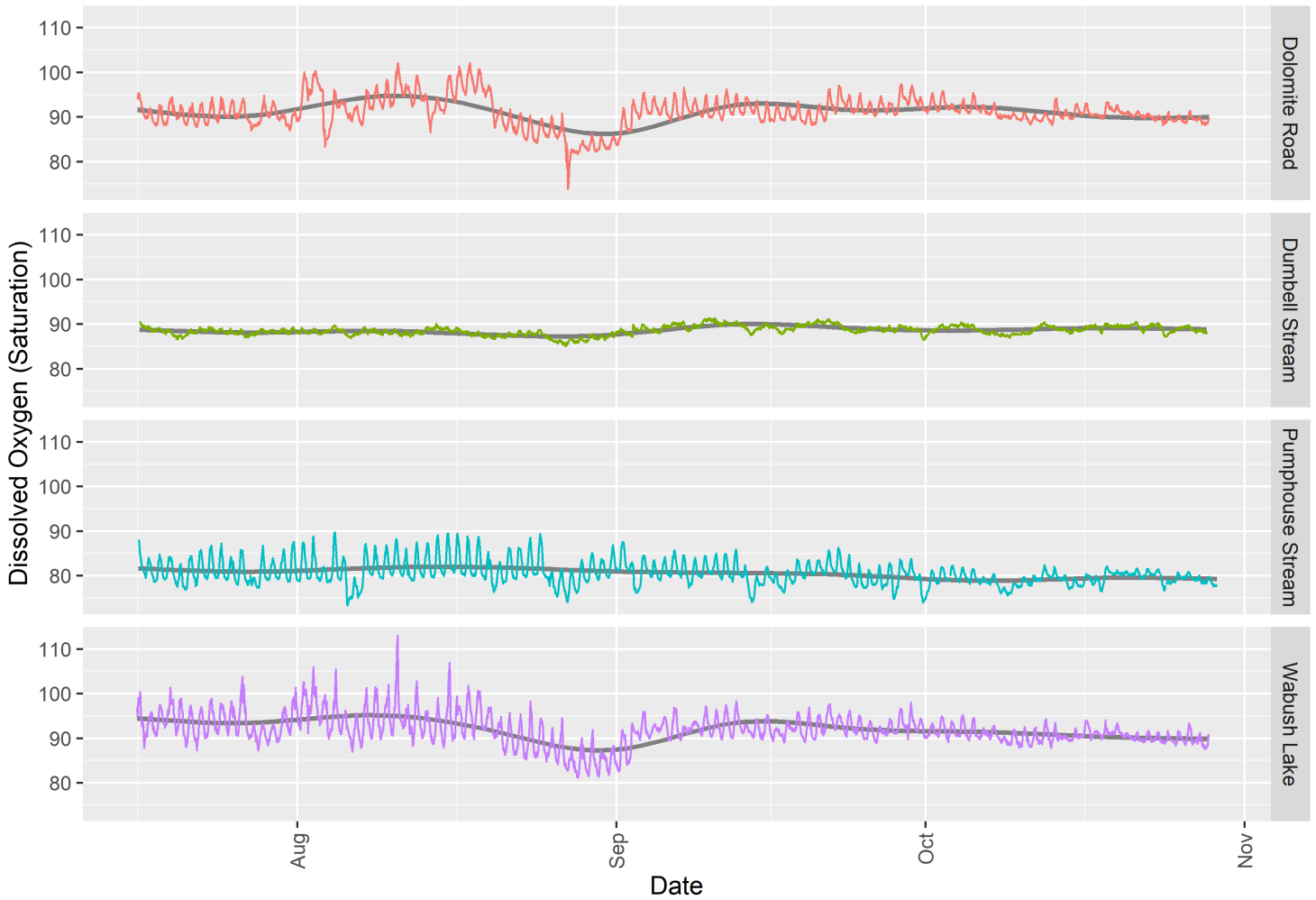
IOC Operations



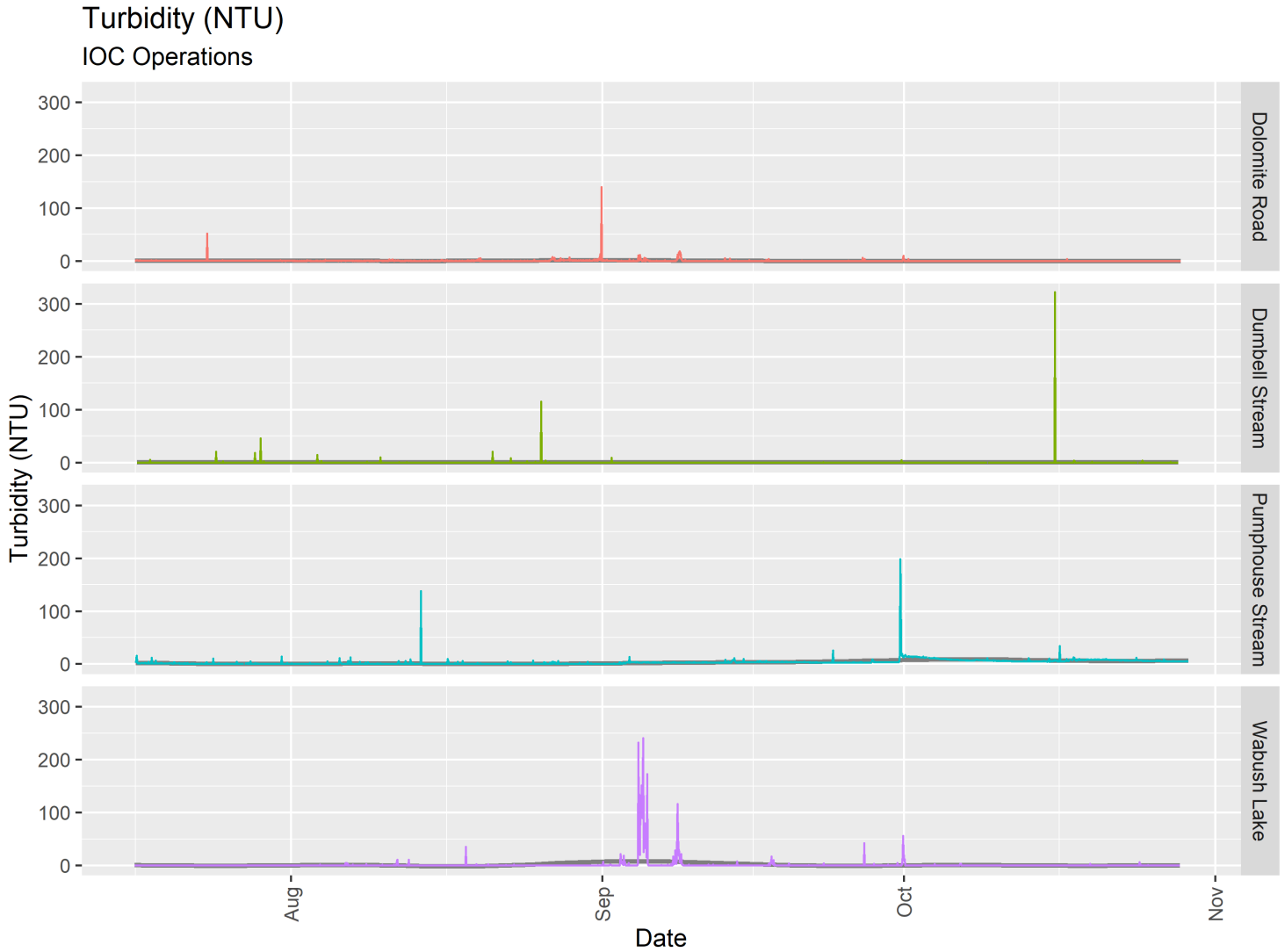
Dissolved Oxygen (mg/l)				
	Dolomite Road	Dumbell Stream	Pumphouse Stream	Julienne Narrows (Wabush Lake)
Min	8.02	10.38	7.83	8.42
Max	12.88	12.91	11.55	13.03
Median	9.93	11.42	9.47	10.22

Dissolved Oxygen (Saturation)

IOC Operations



Dissolved Oxygen (% Sat)				
	Dolomite Road	Dumbell Stream	Pumphouse Stream	Julienne Narrows (Wabush Lake)
Min	73.8	85.1	73.3	81.2
Max	102.0	91.3	89.7	112.9
Median	90.9	88.6	80.2	91.5



Turbidity (NTU)				
	Dolomite Road	Dumbell Stream	Pumphouse Stream	Julienne Narrows (Wabush Lake)
Min	0.0	0.0	0.0	0.0
Max	139.8	322.2	197.8	240.9
Median	0.0	0.0	2.7	0.0