Real-Time Water Quality Deployment Report

Voisey's Bay Network

August 25 to
September 26, 2013

Newfoundland Labrador

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

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Real Time Water Quality Monitoring

- Department of Environment and Conservation staff monitors the real-time web pages regularly.
- This deployment report discusses water quality related events occurring at four stations in the Voisey's Bay Network; Upper Reid Brook, Camp Pond Brook, Tributary to Lower Reid Brook, and Lower Reid Brook.
- On August 25, 2013, Vale Environment staff deployed real-time water quality monitoring instruments at the four real time stations in the Voisey's Bay network for a period of 32 days. Instruments were removed by Vale Environment staff on September 26.

Quality Assurance and Quality Control

- 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.
  - ► At deployment and removal, a QAQC Instrument is temporarily deployed along side the Field Instrument. 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 Instrument and QAQC Instrument at deployment and at removal, a qualitative statement is made on the data quality (Table 1).

Table 1: Ranking classifications for deployment and removal

	Rank				
Parameter	**Excellent**	**Good**	**Fair**	**Marginal**	**Poor**
Temperature (oC)	<=+/-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 instrument 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 instrument the entire instrument 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 Voisey's Bay Network stations deployed from August 25 to September 26, 2013 are summarized in Table 2.

Table 2: Comparison rankings for Voisey's Bay Network stations, August 25– September 26, 2013

Station Voisey's Bay	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Upper Reid Brook (62884)	Aug 25, 2013	Deployment	Excellent	Excellent	Excellent	n/a*	Excellent
	Sep 26, 2013	Removal	Marginal	Good	Excellent	n/a*	n/a**
Camp Pond Brook (62885)	Aug 25, 2013	Deployment	Excellent	Good	Good	n/a*	Excellent
	Sep 26, 2013	Removal	Excellent	Good	Good	n/a*	n/a**
Tributary to L. Reid B. (62886)	Aug 25, 2013	Deployment	Excellent	Fair	Excellent	n/a*	Excellent
	Sep 26, 2013	Removal	Excellent	Excellent	Good	n/a*	n/a**
Lower Reid Brook (62887)	Aug 25, 2013	Deployment	Good	Excellent	Good	n/a*	Excellent
	Sep 26, 2013	Removal	Good	Fair	Good	n/a*	n/a**

* The dissolved oxygen sensor on the QAQC instrument 62829 was not functioning correctly on August 25 or September 26.

** The turbidity sensor on the QAQC instrument 62829 was not functioning correctly on September 26.

- At the station at Upper Reid Brook, temperature, pH, specific conductivity and turbidity all rank 'excellent' at deployment. Dissolved oxygen is not ranked.
- At removal, pH and specific conductivity rank 'good' and 'excellent' respectively while temperature ranks 'marginal'. For temperature, the field instrument read a value of 8.25°C and the QAQC instrument read a value of 9.05°C. This difference is likely due to the positioning of the instruments in the stream at the time of the comparison readings. If the field instrument were slightly deeper in the water, the temperature may have actually been colder.
- At the station on Camp Pond Brook, temperature, pH and specific conductivity, and turbidity rank either 'good' or 'excellent' at deployment. Dissolved oxygen is not ranked.
- At removal, temperature, pH and specific conductivity all rank either 'good' or excellent'. Dissolved oxygen and turbidity are not ranked.
- At the station on the Tributary to Lower Reid Brook, temperature, specific conductivity, and turbidity all rank 'excellent' at deployment while pH rank 'fair'. For pH, the field instrument read a value of 6.35 and the QAQC instrument read a value of 7.00. This difference may be in part due to insufficient time for the field instrument to stabilize to the environment. At the time of the first transmission, the field instrument reads a value of 6.8 which when compared to the QAQC instrument value of 7.00, yields an 'excellent' rank. Dissolved oxygen is not ranked.
- At removal, temperature, pH, and specific conductivity rank either 'good' or 'excellent'. Dissolved oxygen and turbidity are not ranked.
- At the station on Lower Reid Brook, temperature, pH, specific conductivity, and turbidity all rank either 'good' or 'excellent' at deployment. Dissolved oxygen is not ranked.

- At removal, temperature and specific conductivity rank 'good' while pH ranks 'fair'. For pH, the field instrument read a value of 6.76 while the QAQC instrument read a value of 7.27. This discrepancy may in part be caused by insufficient time in allowing the QAQC instrument to stabilize. Dissolved oxygen and turbidity were not ranked.
- Grab samples were taken at each of the stations at the time of the deployment. The results are attached in Appendix 2.

Data Interpretation

- The following graphs and discussion illustrate significant water quality-related events from August 25 to September 26 in the Voisey's Bay Real Time Water Quality Monitoring Network.
- 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 QAQC protocol. Water Survey of Canada is responsible for QAQC of water quantity data. Corrected data can be obtained upon request.

Upper Reid Brook (Outlet from Reid Pond)

- Water temperature ranges from 6.42°C to 14.60°C during the deployment period (Figure 1).
- Water temperature is decreasing throughout the deployment period. This trend is expected given the cooling ambient air temperatures in late summer and fall seasons (Figure 2).
- Average water temperature is 10.43°C for the deployment period.

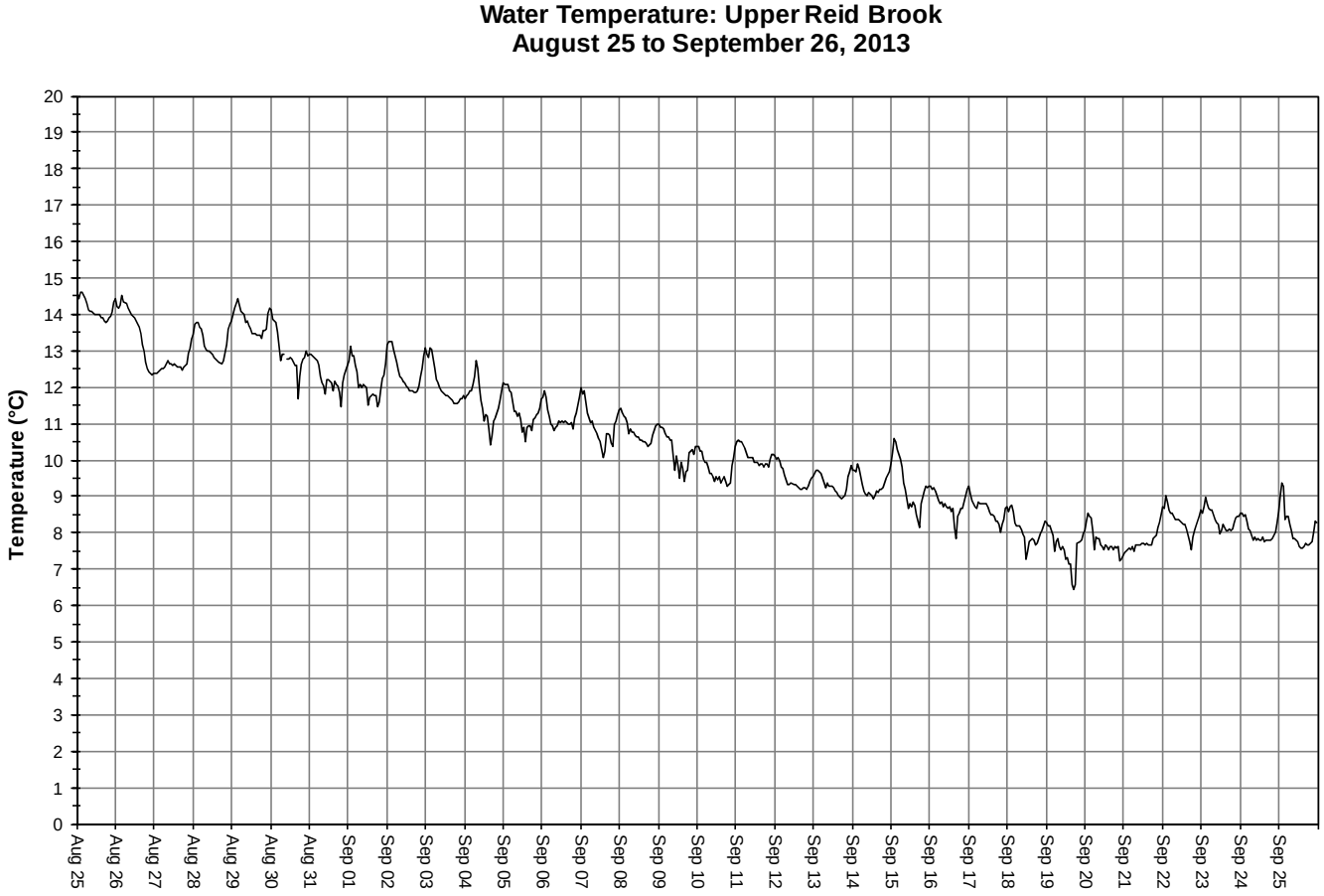


Figure 1: Water temperature at Upper Reid Brook

- Average daily air and water temperature are decreasing throughout the deployment period (Figure 2). Increases and decreases in air temperature are reflected in water temperatures. Air temperatures generally increase and decrease faster while water temperatures increase and decrease more slowly over time.

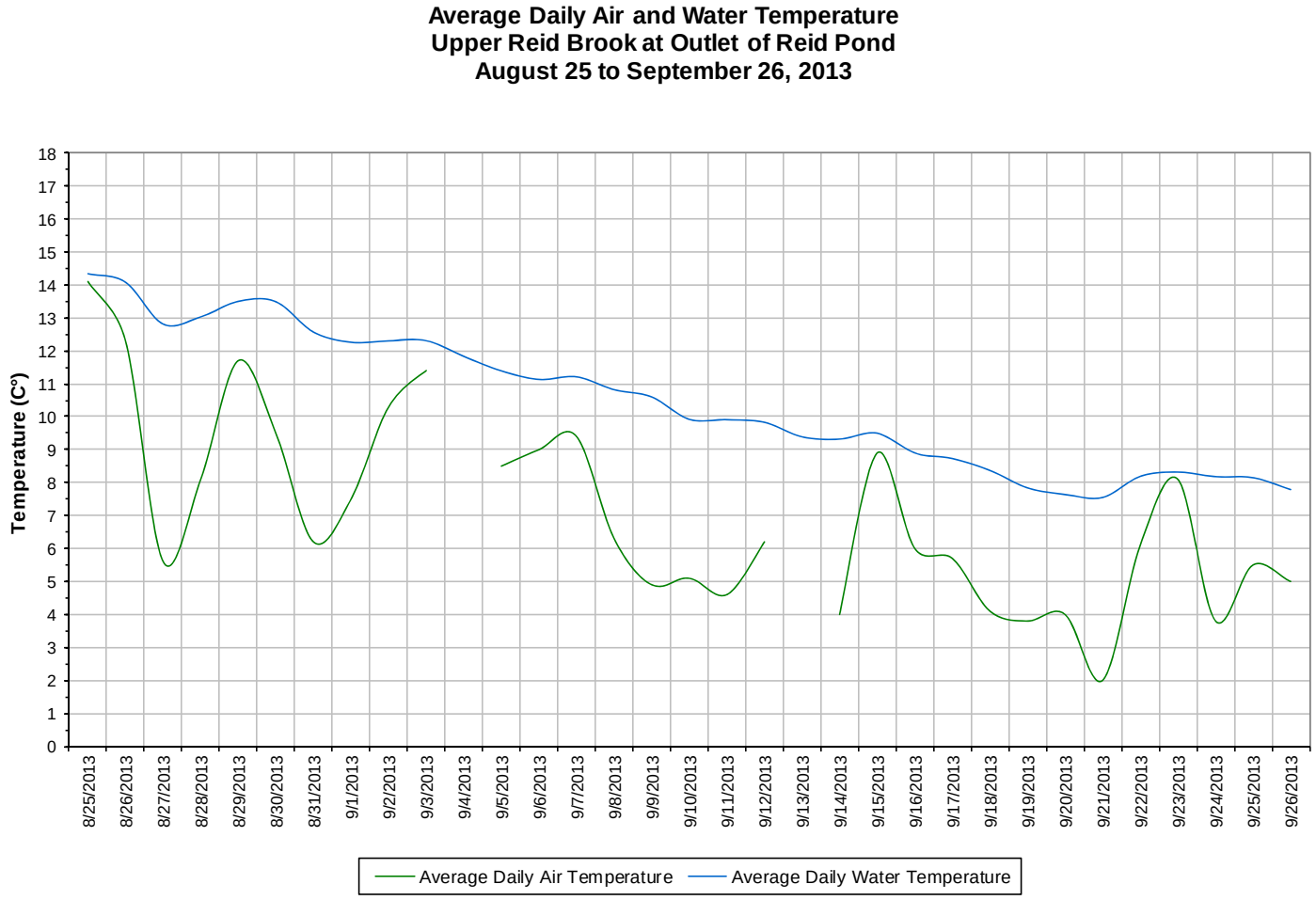


Figure 2: Average daily air and water temperatures at Upper Reid Brook

(weather data recorded at Nain)

- pH ranges between 6.35 and 7.02 pH units (Figure 3). pH is stable for the first three weeks of the deployment period and then decreases slightly in the final week.
- Until September 21, all values are within the recommended range as suggested by the CCME Guidelines for the Protection of Aquatic Life (> 6.5 and <9.5 pH units). On September 21 until the end of the deployment period, pH values fall to below the suggested guideline. This decrease follows a rainfall event recorded on September 21-22. Guidelines are indicated in blue on Figure 3.

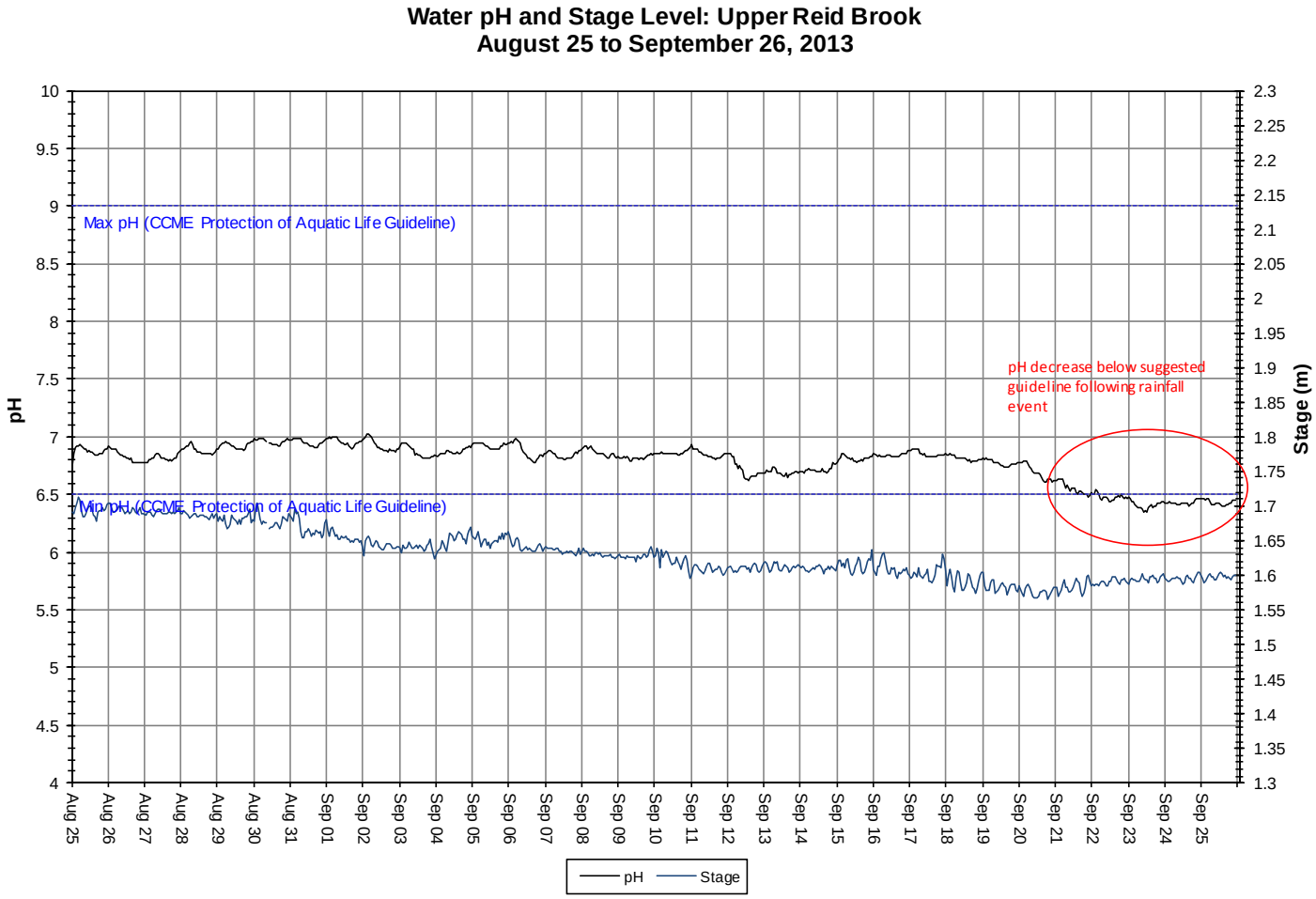


Figure 3: pH and stage level at Upper Reid Brook

- Specific conductivity values range from 11.7µS/cm to 12.6µS/cm during the deployment period (Figure 4).
- Specific conductivity remains very low and very stable throughout the deployment period. This trend is expected as the flow from this station is directly from a stable lake environment.

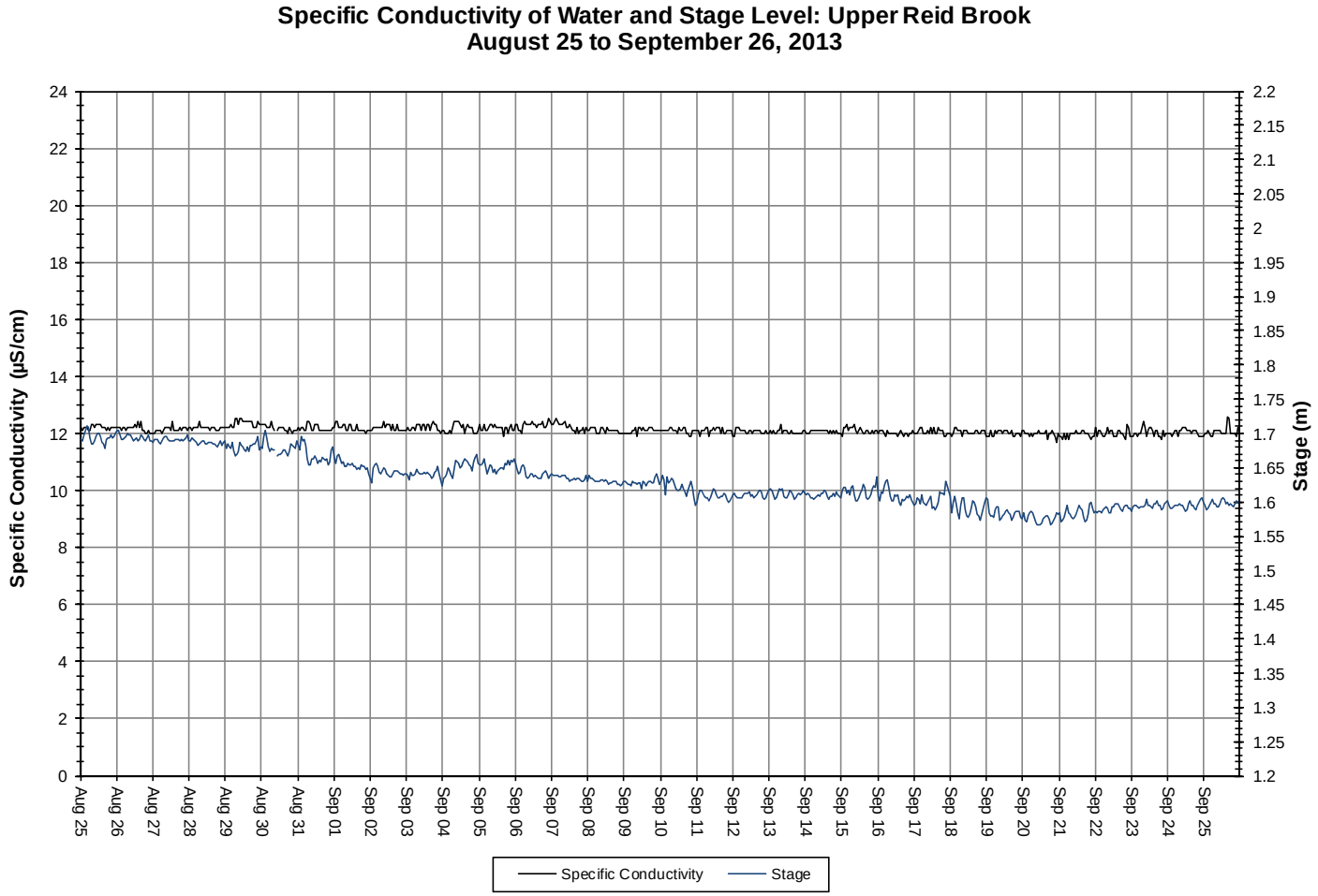


Figure 4: Specific conductivity and stage level at Upper Reid Brook

- Dissolved oxygen content ranges between 10.19mg/l and 11.67mg/l. The saturation of dissolved oxygen ranges from 92.9% to 102.9% (Figure 5).
- Dissolved oxygen content is increasing throughout the deployment period due to the decreasing air and water temperatures (Figure 2).
- All values are above both of the minimum CCME Guidelines for the Protection of Cold Water Biota at Other Life Stages (6.5mg/l) and Early Life Stages (9.5mg/l). The guidelines are indicated in blue on Figure 5. Average dissolved oxygen content is 10.80mg/l.

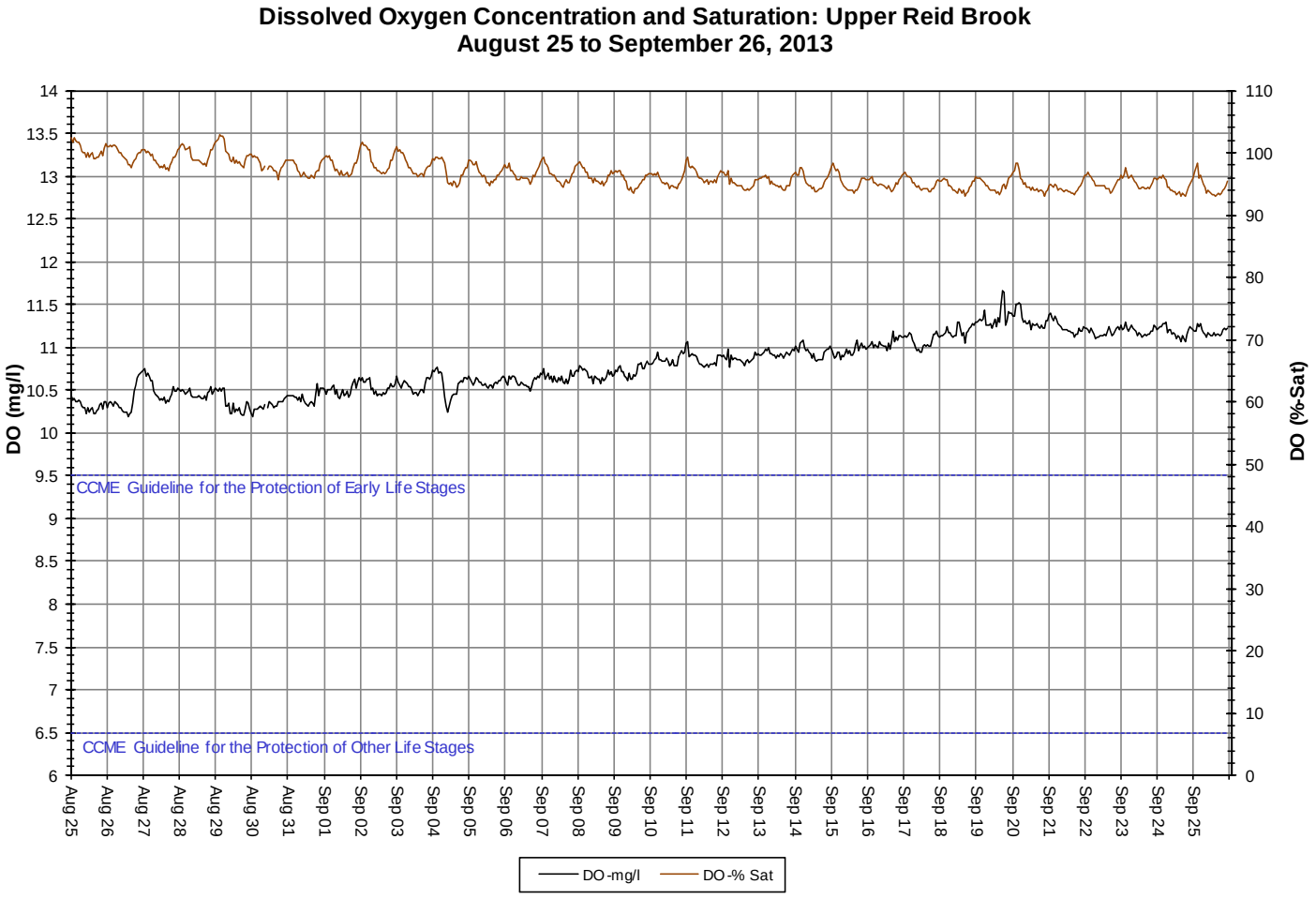


Figure 5: Dissolved oxygen and percent saturation at Upper Reid Brook

- Turbidity at this station remained at 0NTU for the entire deployment period. This trend is not unusual for this station as the water flowing from the lake is typically very clean, clear and cold.

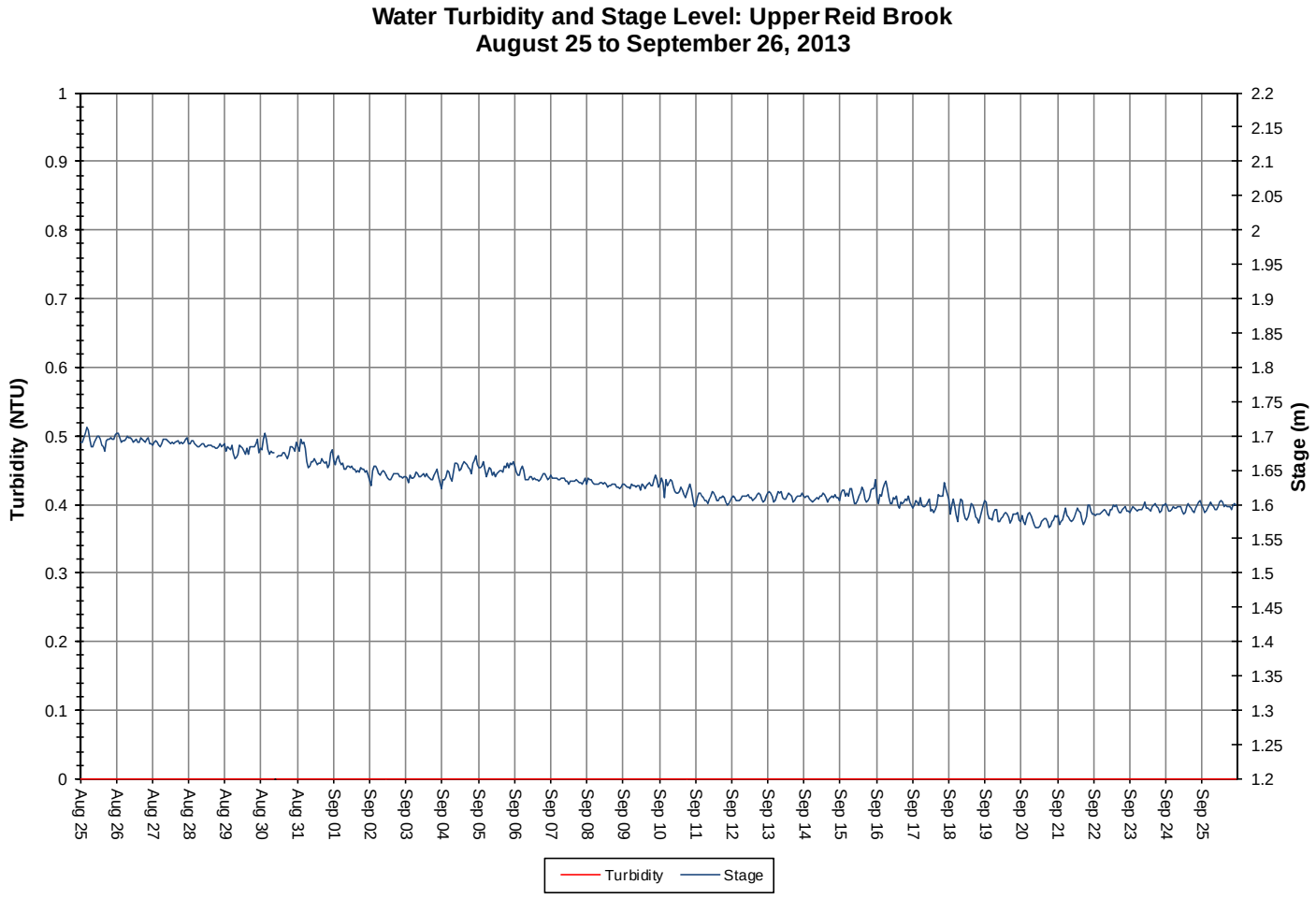


Figure 6: Turbidity and stage level at Upper Reid Brook

- Stage and precipitation are graphed below to show the relationship between rainfall and water level (Figure 7). Stage is decreasing slightly during the deployment period. Stage ranges from 1.57m to 1.71m, a difference of 0.14m.
- Precipitation events occur less than 50% of the time and are low in magnitude.

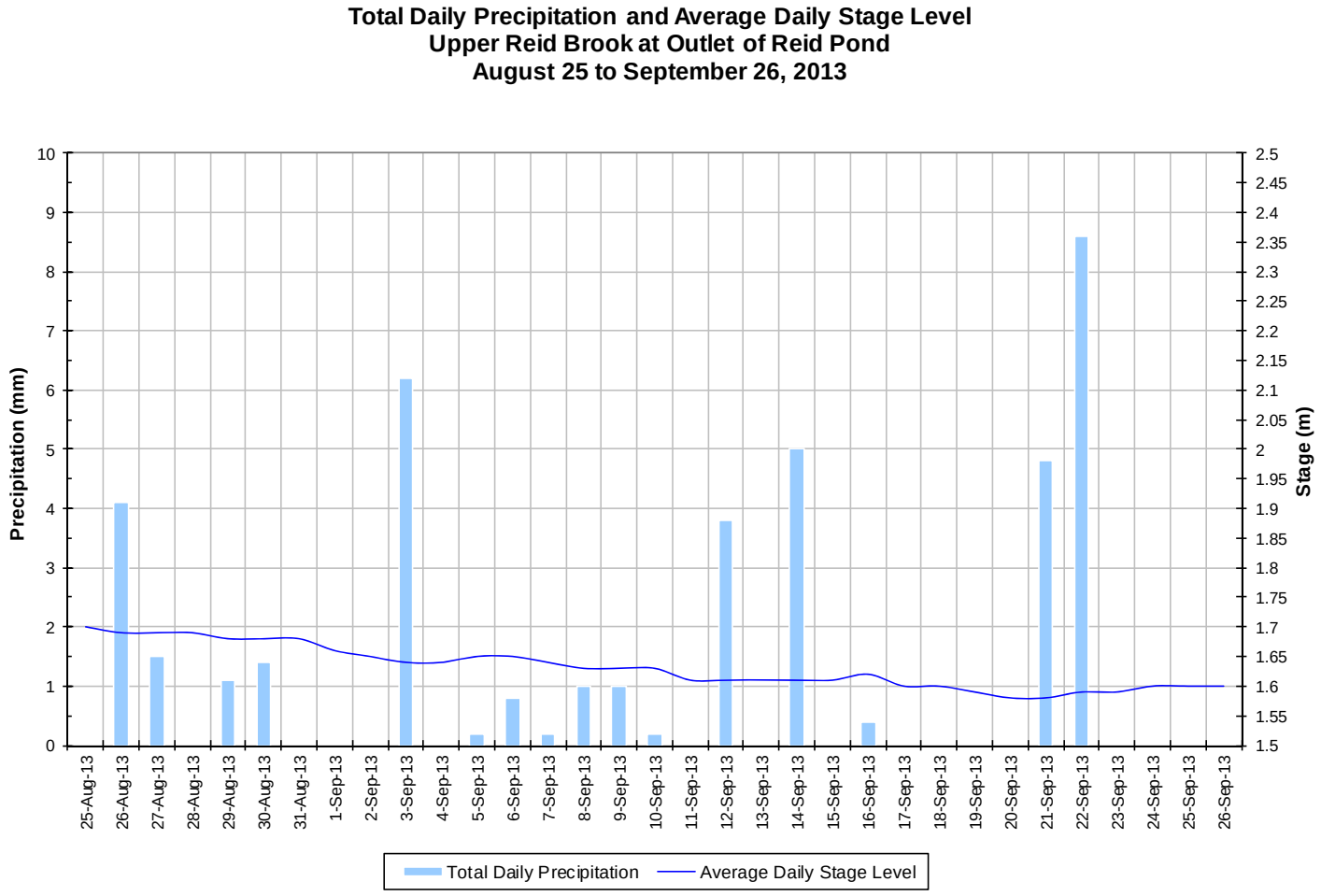


Figure 7: Daily precipitation and average daily stage level at Upper Reid Brook

(weather data recorded at Nain)

Camp Pond Brook

- Water temperature ranges from 3.03°C to 16.99°C during the deployment period (Figure 8).
- Water temperature is decreasing throughout the deployment period. The trend is expected given the cooling ambient air temperatures late summer and fall seasons (Figure 8). This stream is sensitive to changes in the ambient air temperature and fluctuates considerably depending on the weather and time of day.
- Average water temperature is 9.34°C for the deployment period.
- This station typically has the highest water temperatures and greatest fluctuations when compared to the other stations in the network.

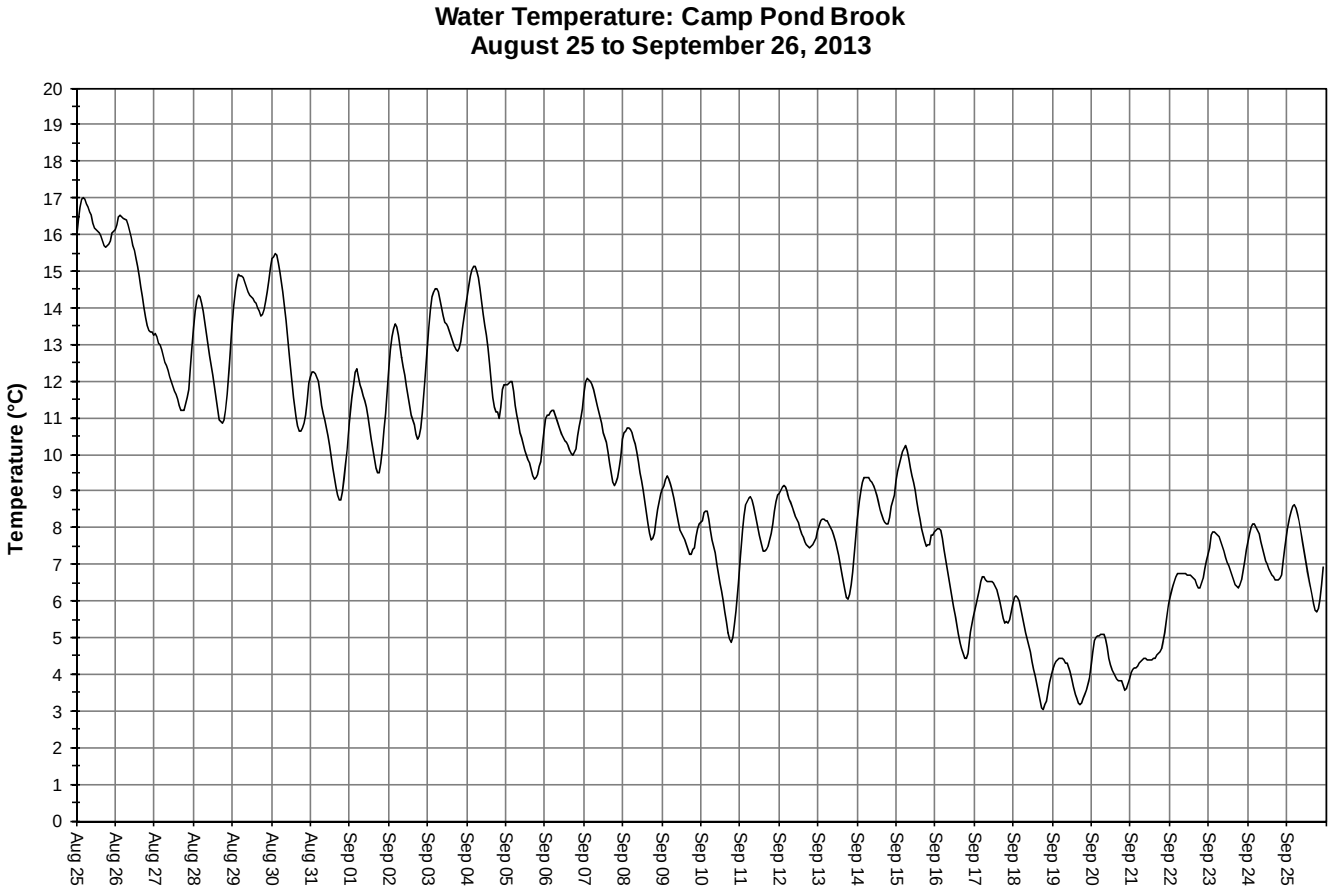


Figure 8: Water temperature at Camp Pond Brook

- Average daily air and water temperatures are decreasing throughout the deployment period (Figure 9). Fluctuations in average daily air temperatures are reflected by changes in water temperature. Air temperatures generally increase and decrease faster while water temperatures increase and decrease more slowly over time.

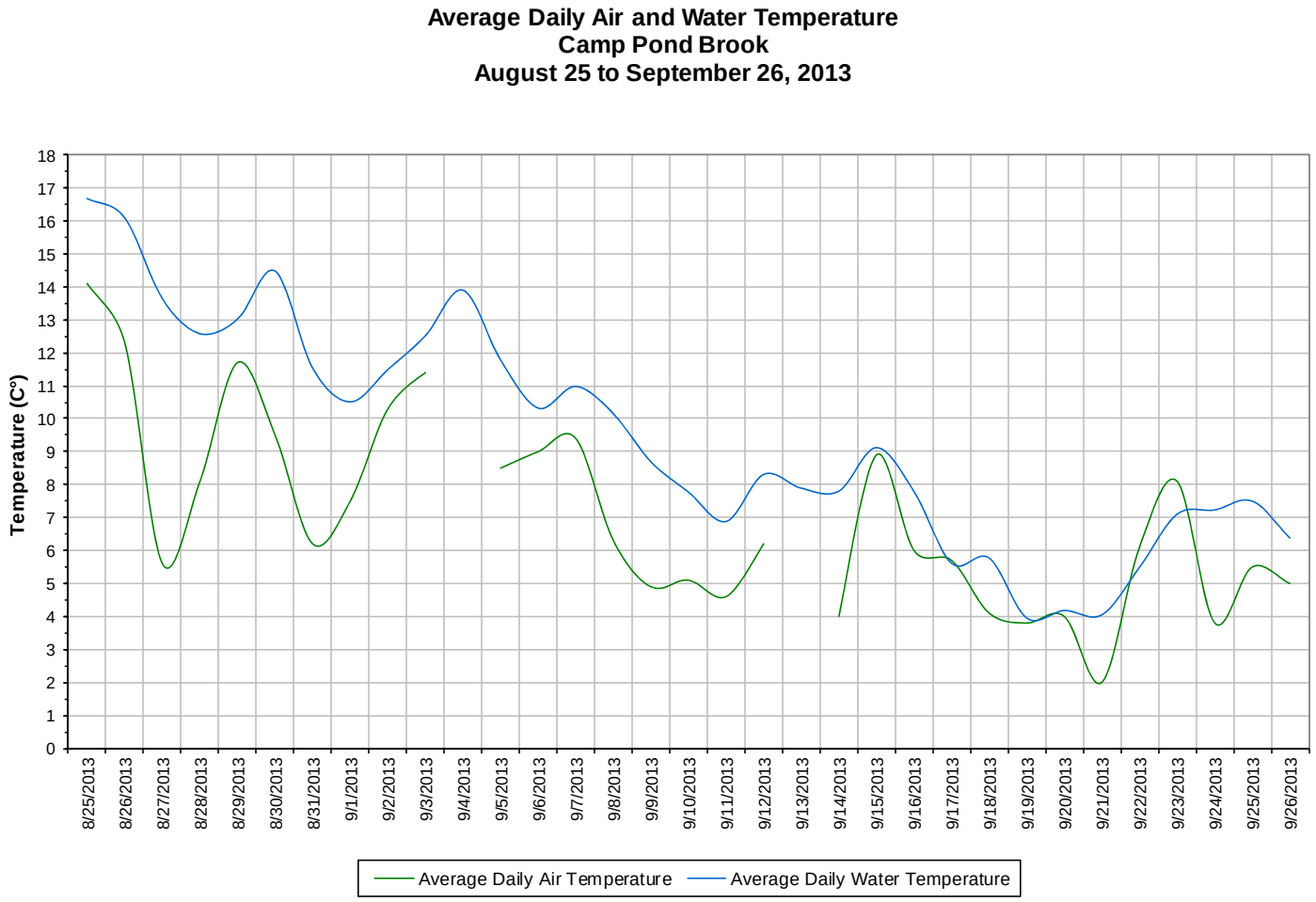


Figure 9: Average daily air and water temperatures at Camp Pond Brook

(weather data recorded at Nain)

- pH ranges between 6.86 and 7.15 pH units (Figure 10).
- pH values are very stable, fluctuating diurnally throughout the deployment period.
- All values are within the recommended guidelines for pH as suggested by the CCME Guidelines for the Protection of Aquatic Life (>6.5 and <9.0 pH units). Guidelines are indicated in blue on Figure 10.

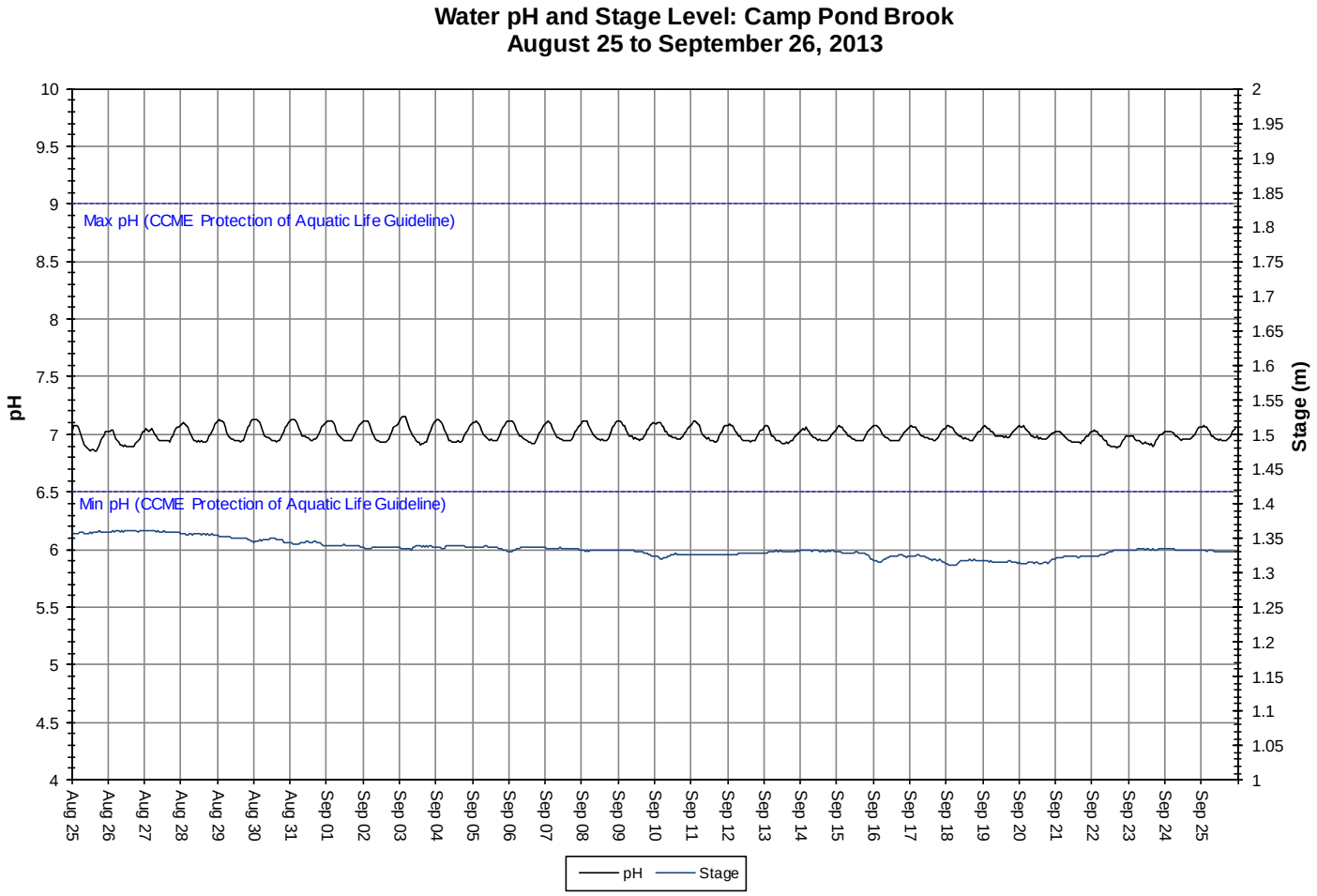


Figure 10: pH and stage level at Camp Pond Brook

- Specific conductivity ranges from 34.6µS/cm to 45.9µS/cm during the deployment period (Figure 11).
- Stage data is included in Figure 11 to illustrate the inverse relationship between conductivity and water level. Typically, as stage level decreases, the specific conductivity of the water increases because of the increase in concentration of dissolved solids present in the water column. Inversely, as stage levels increase, specific conductivity generally decreases as the dissolved solids become more diluted in the water column. This trend is not typically experienced at this station. Instead, there is a positive relationship between water level and specific conductance.
- While there is no visible change in stage level in the Environment Canada data, there are two increases in specific conductivity that correspond with rainfall events on September 3 and 21-22. These events are circled in red on Figure 11.

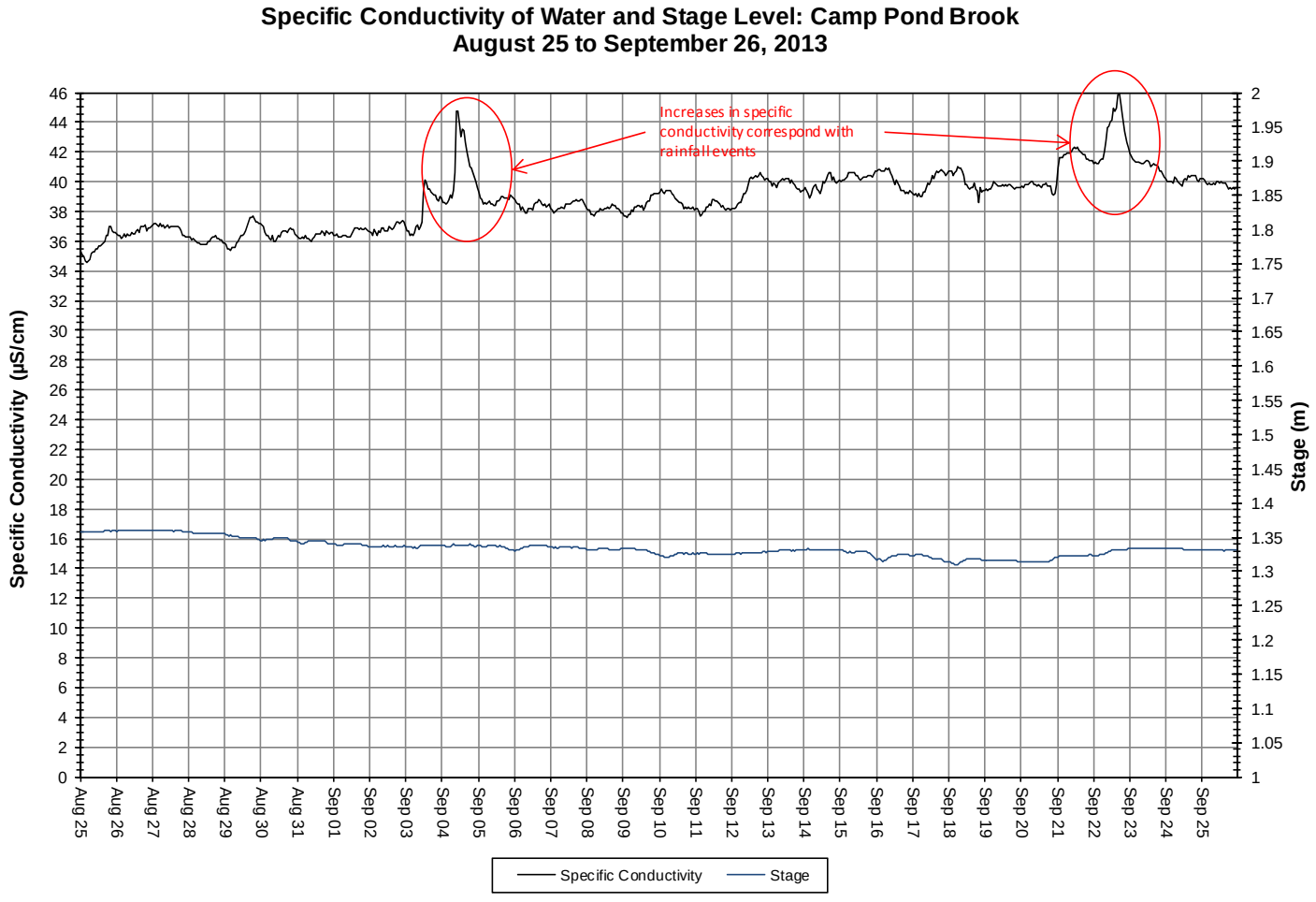


Figure 11: Specific conductivity and stage level at Camp Pond Brook

- Dissolved oxygen content ranges between 9.10mg/l and 12.80mg/l. The saturation of dissolved oxygen ranges from 88.3% to 100.9% (Figure 12).
- Dissolved oxygen content is increasing throughout the deployment period. This trend is expected given the decreasing air and water temperatures (Figure 9).
- Most values are above both the minimum CCME Guideline for the Protection of Cold Water Biota at Other Life Stages (6.5mg/l) and at Early Life Stages (9.5mg/l) throughout the deployment period. In the beginning of the deployment when water temperatures are warm, dissolved oxygen content is just below the guideline for a short period of time. Guidelines are indicated in blue on Figure 12. Average dissolved oxygen content is 10.83mg/l.

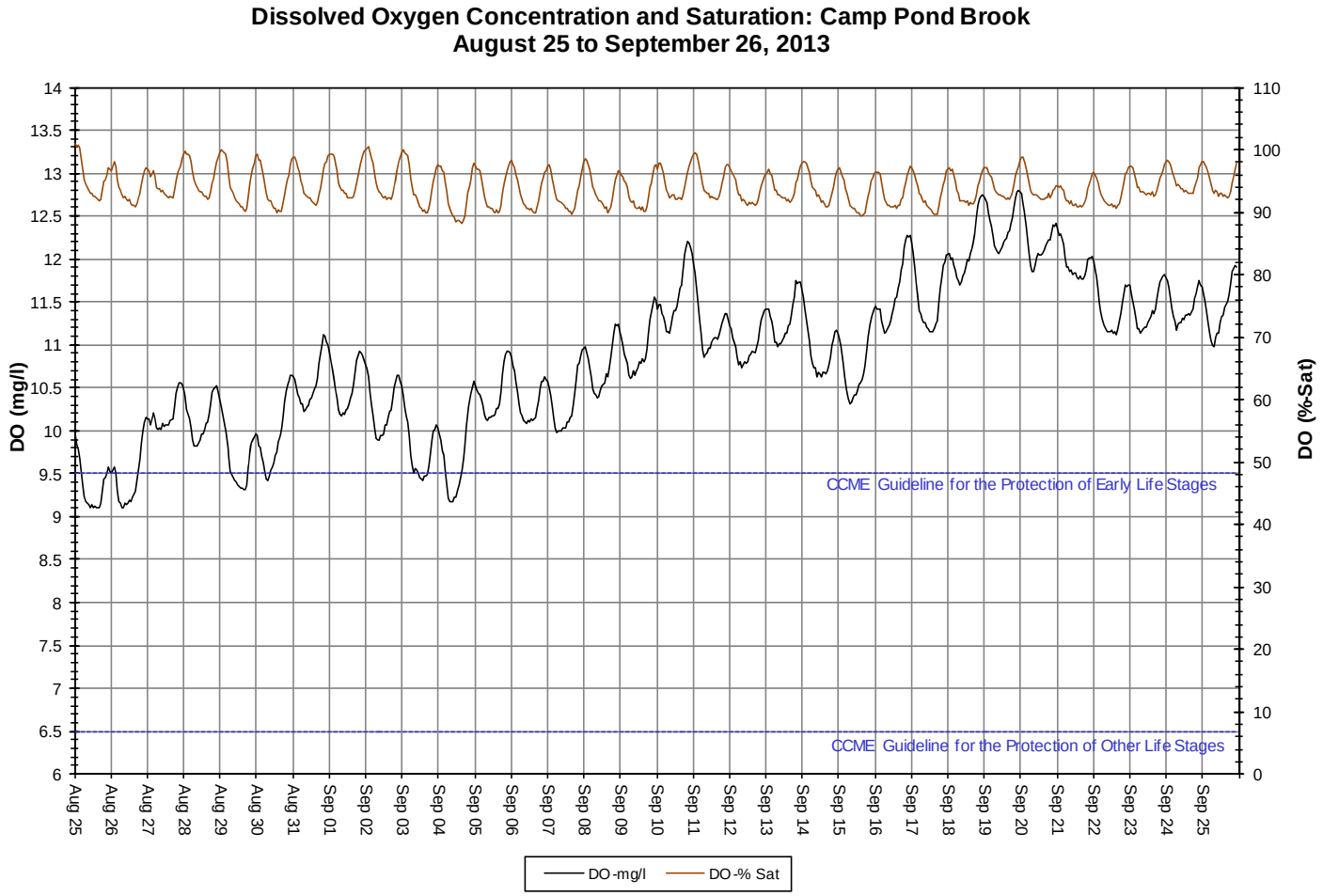


Figure 12: Dissolved oxygen and percent saturation at Camp Pond Brook

- Turbidity values range between 0.0NTU and 6.7NTU (Figure 13). A median value of 0.0NTU indictes there is no natural background turbidity at this station for this deployment period.
- There are a number of low magnitude turbidity events at this station lasting from between 1 and 36 hours. This trend is typical for this station. Some of these events (indicated in red on Figure 13) correspond with rainfall events.

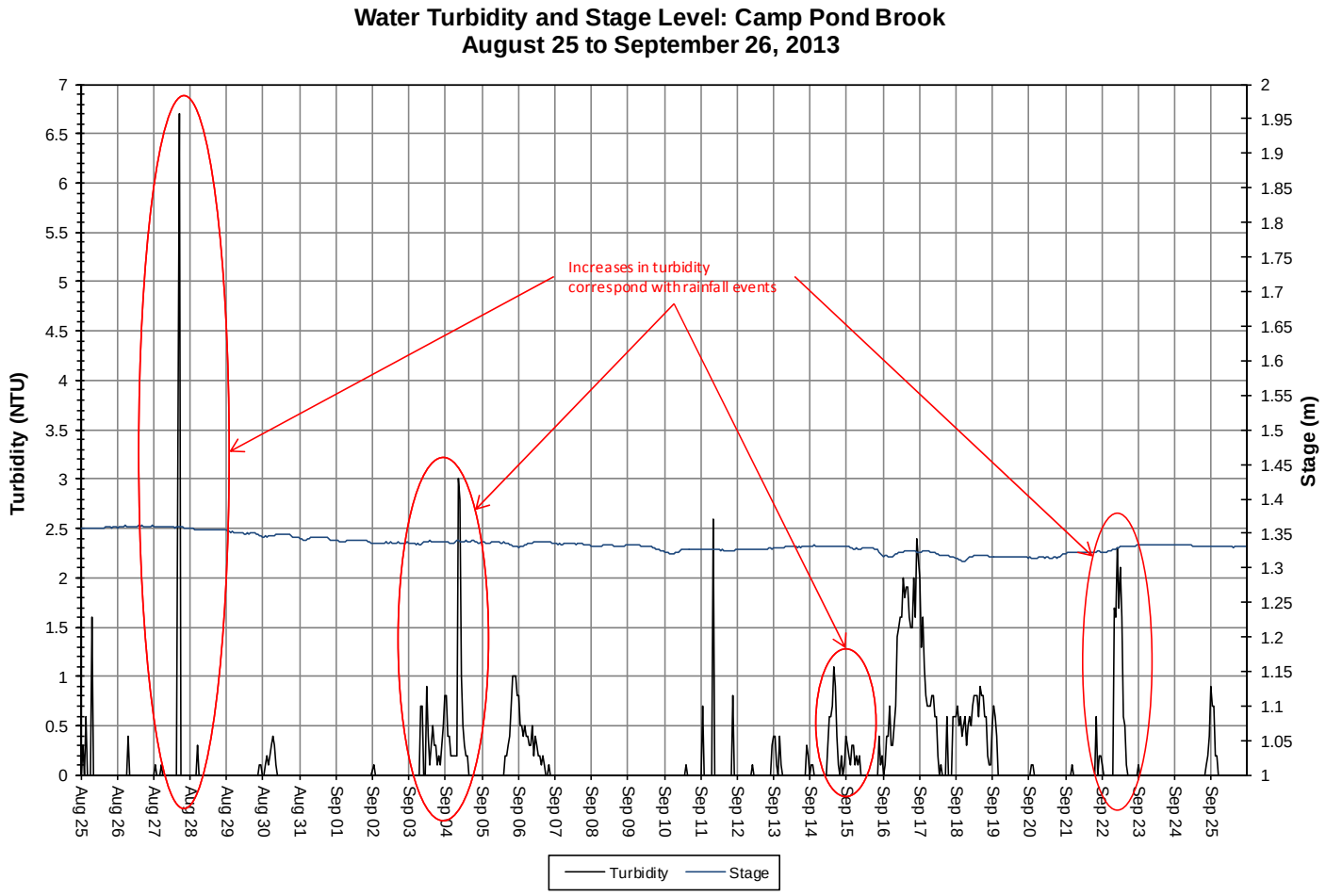


Figure 13: Turbidity and stage level at Camp Pond Brook

- Stage and precipitation are graphed below to show the relationship between rainfall and water level (Figure 14). Stage is very stable and consistent throughout the deployment period. Stage level values range from 1.31 to 1.36m, a difference of 0.06m.
- Precipitation events occur less than 50% of the time and are low in magnitude.

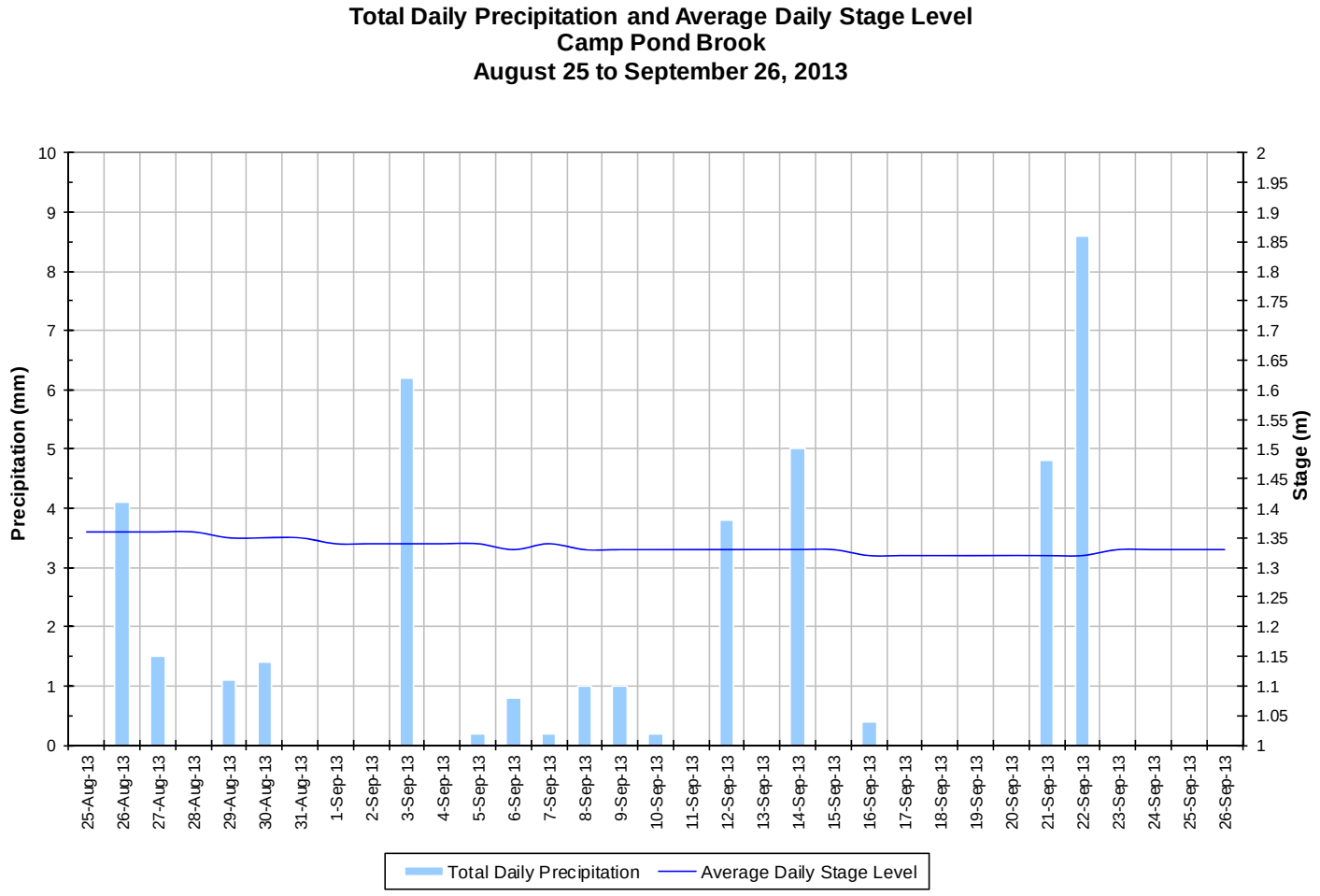


Figure 14: Daily precipitation and average daily stage level at Camp Pond Brook

(weather data recorded at Nain)

Tributary to Lower Reid Brook

- Water temperature ranges from 2.40°C to 12.70°C during the deployment period (Figure 15).
- Water temperature is decreasing throughout the deployment period. This trend is expected given the cooling ambient air temperatures in the late summer and fall seasons (Figure 16). This stream is sensitive to changes in the ambient air temperature and fluctuates considerably depending on the weather and time of day.
- Average water temperature is 7.08°C for the deployment period.

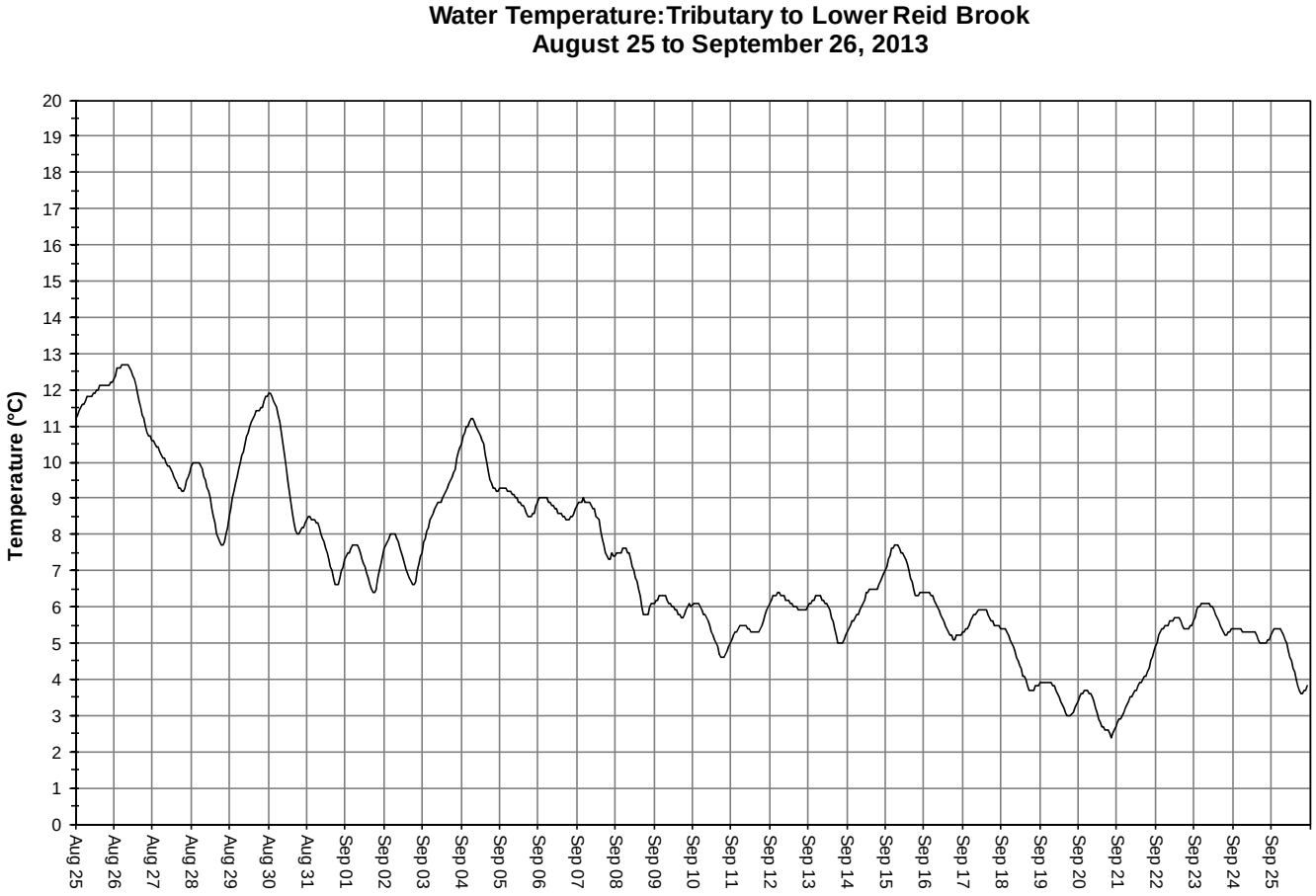


Figure 15: Water temperature at Tributary to Lower Reid Brook

- Average daily air and water temperatures are decreasing throughout the deployment period (Figure 16). Increases and decreases in air temperature are reflected in water temperatures. Air temperatures generally increase and decrease faster while water temperatures increase and decrease more slowly over time.

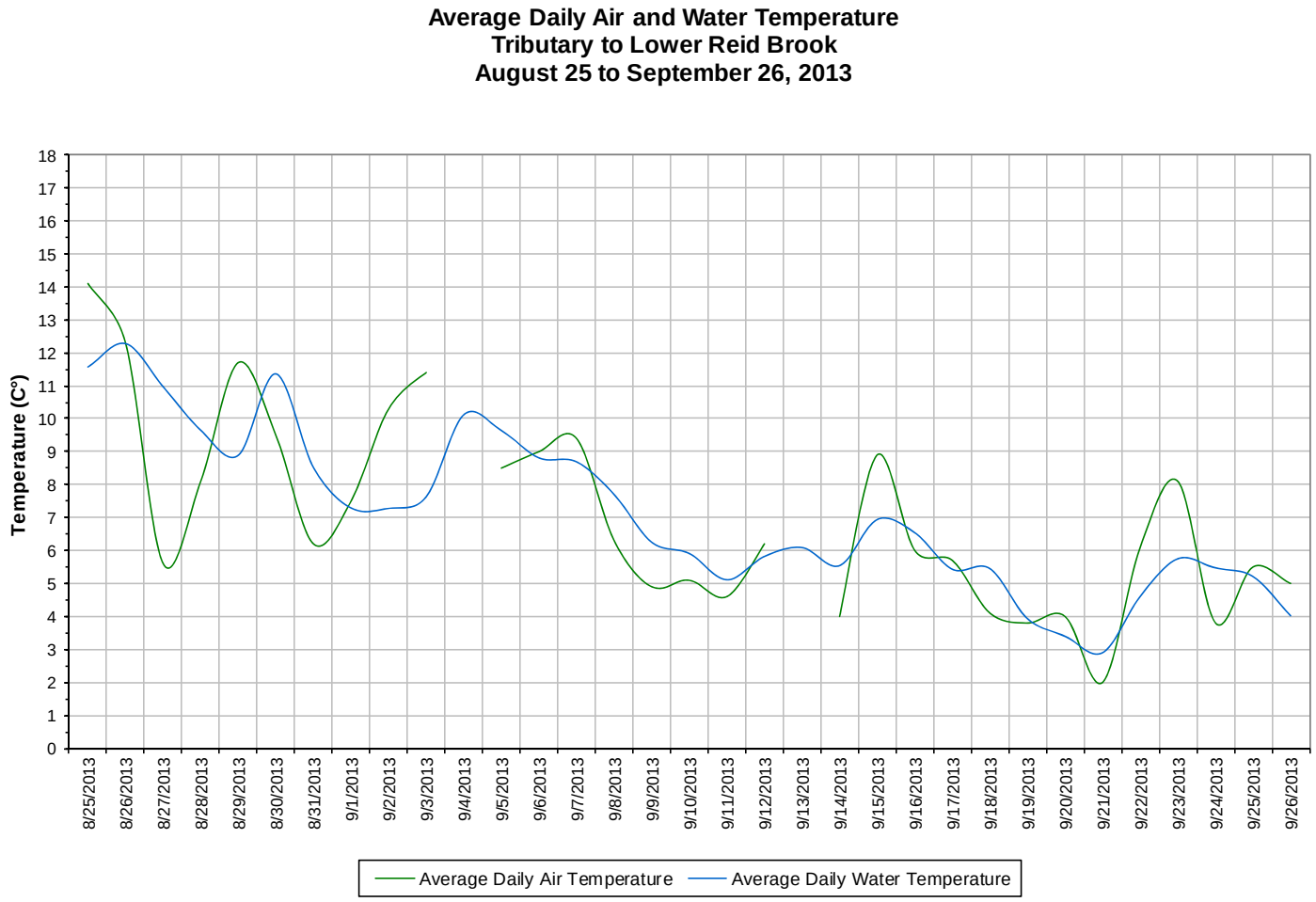


Figure 16: Average daily air and water temperatures at Tributary to Lower Reid Brook (weather data recorded at Nain)

- pH ranges between 6.80 and 7.21 pH units (Figure 17).
- pH is very stable and consistently fluctuating diurnally. Near the end of the deployment period, pH drops slightly following a rainfall event on September 21-22. There is an increase in stage at this time as well. These events are highlight in red on Figure 17.
- All values are within the recommended range for pH as suggested by the CCME Guidelines for the Protection of Aquatic Life (>6.5 and <9.0 pH units). Guidelines are indicated in blue on Figure 17.

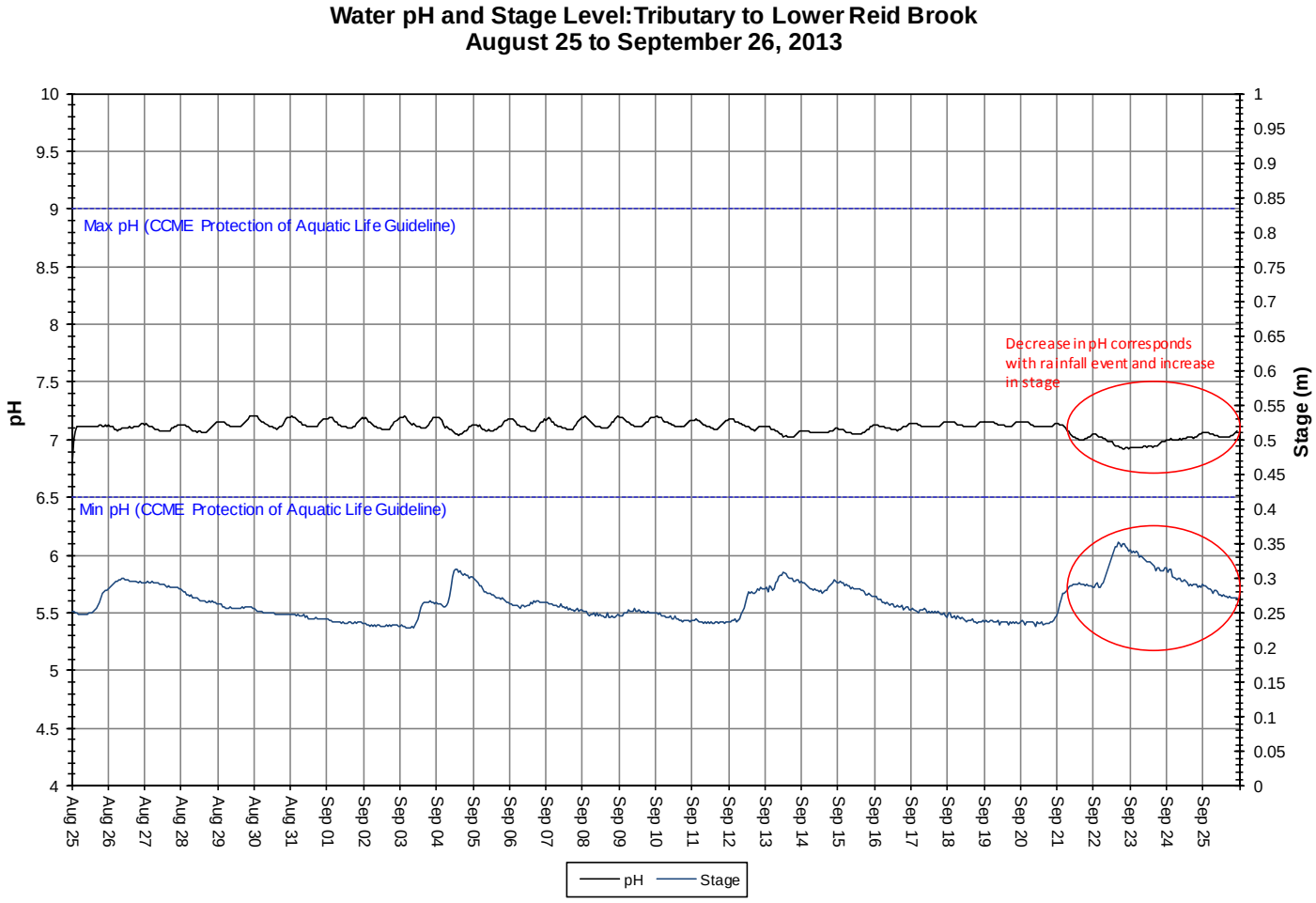


Figure 17: pH and stage level at Tributary to Lower Reid Brook

- Specific conductivity ranges between 36.1µS/cm and 46.5µS/cm during the deployment period (Figure 18).
- Stage is included in Figure 18 to illustrate the inverse relationship between conductivity and water level. Specific conductivity changes with the varying water level. As stage decreases, specific conductivity generally increases due to the increase in concentration of dissolved solids in the water column. Inversely, as stage increases, specific conductivity decreases as the concentration of dissolved solids is diluted.
- This trend is clear with the values collected from this station during the deployment period. This pattern is also clearly apparent at the station nearby on Lower Reid Brook. This trend is highlighted in red on Figure 18.

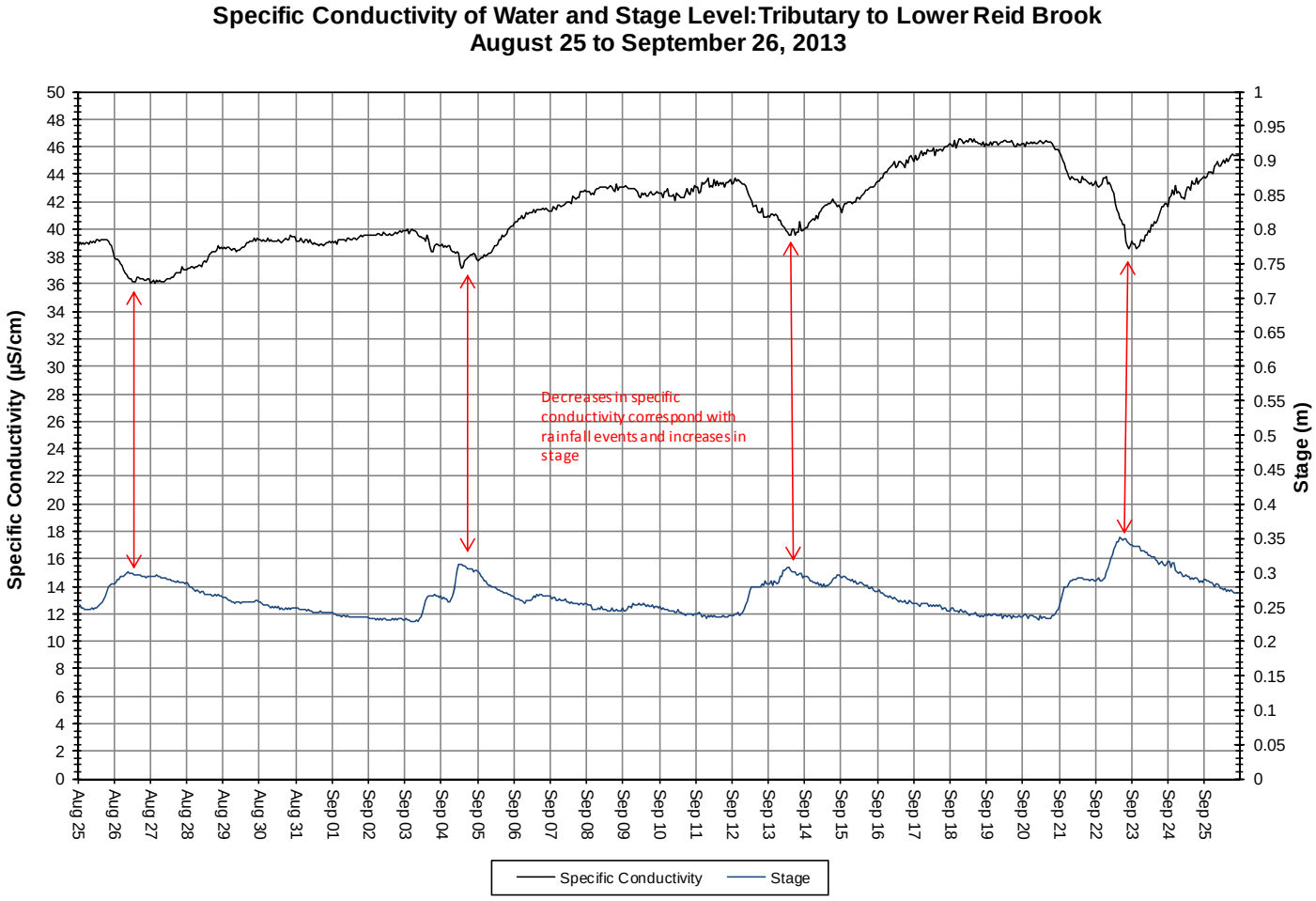


Figure 18: Specific conductivity and stage level at Tributary to Lower Reid Brook

- Dissolved oxygen content ranges between 10.04mg/l and 13.05mg/l. The saturation of dissolved oxygen ranges from 92.6% to 99.5% (Figure 19).
- Dissolved oxygen content is increasing throughout the deployment period. This trend is expected given the cooling air and water temperatures (Figure 16).
- All values are above both the minimum CCME Guideline for the Protection of Cold Water Biota at Other Life Stages (6.5mg/l) and Early Life Stages (9.5mg/l). The guidelines are indicated in blue on Figure 19. Average dissolved oxygen value is 11.59mg/l.

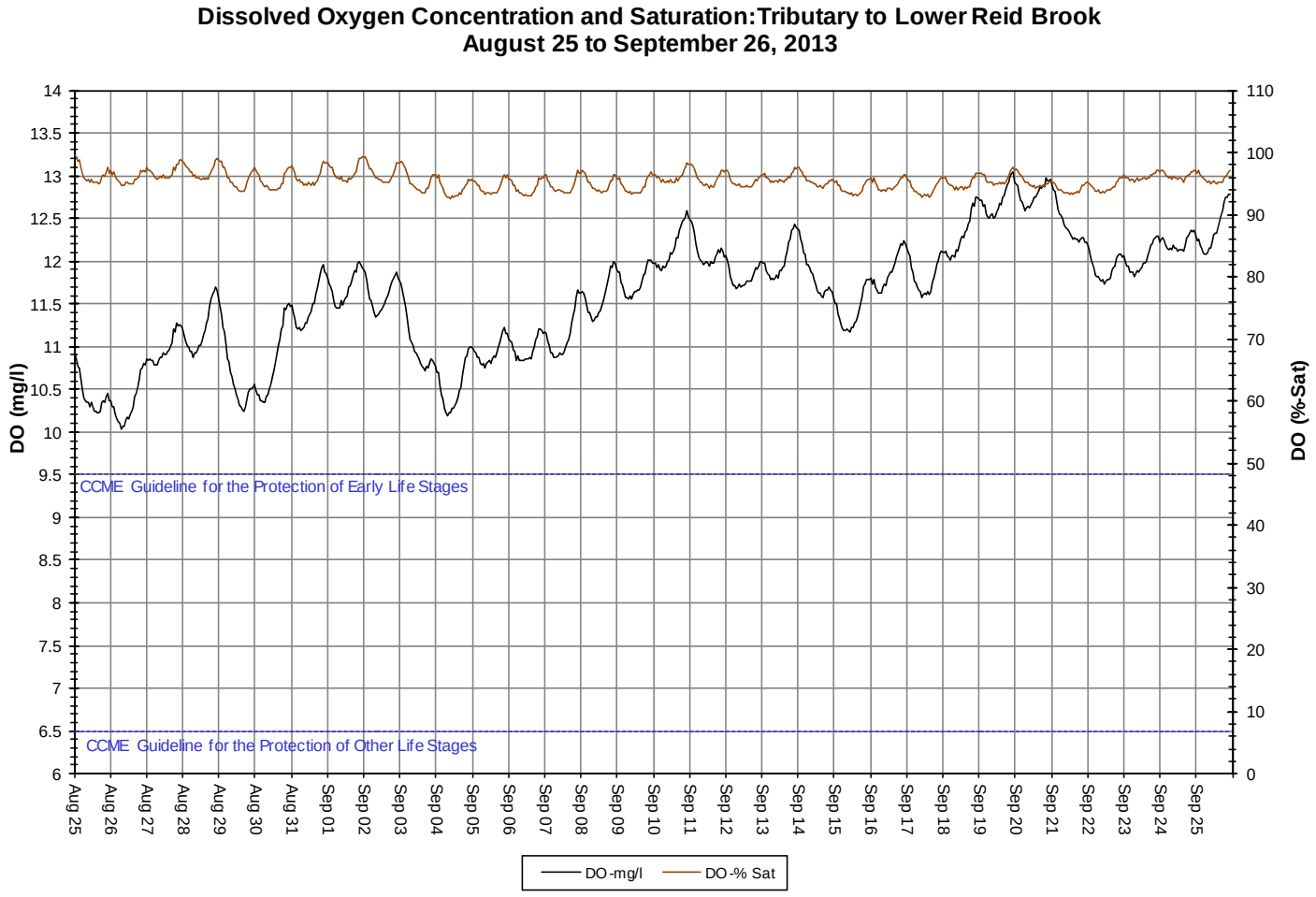


Figure 19: Dissolved oxygen and percent saturation at Tributary to Lower Reid Brook

- Turbidity ranges between 0NTU and 17.3NTU throughout the deployment period (Figure 20). A median value of 0NTU indicates there is no natural background turbidity value for this deployment period.
- Turbidity events at low magnitudes are normal for this station. Turbidity events occurring on September 4, 14 and 21-23 each correspond with low magnitude rainfalls and increases in stage level. These events are indicated in red on Figure 20.

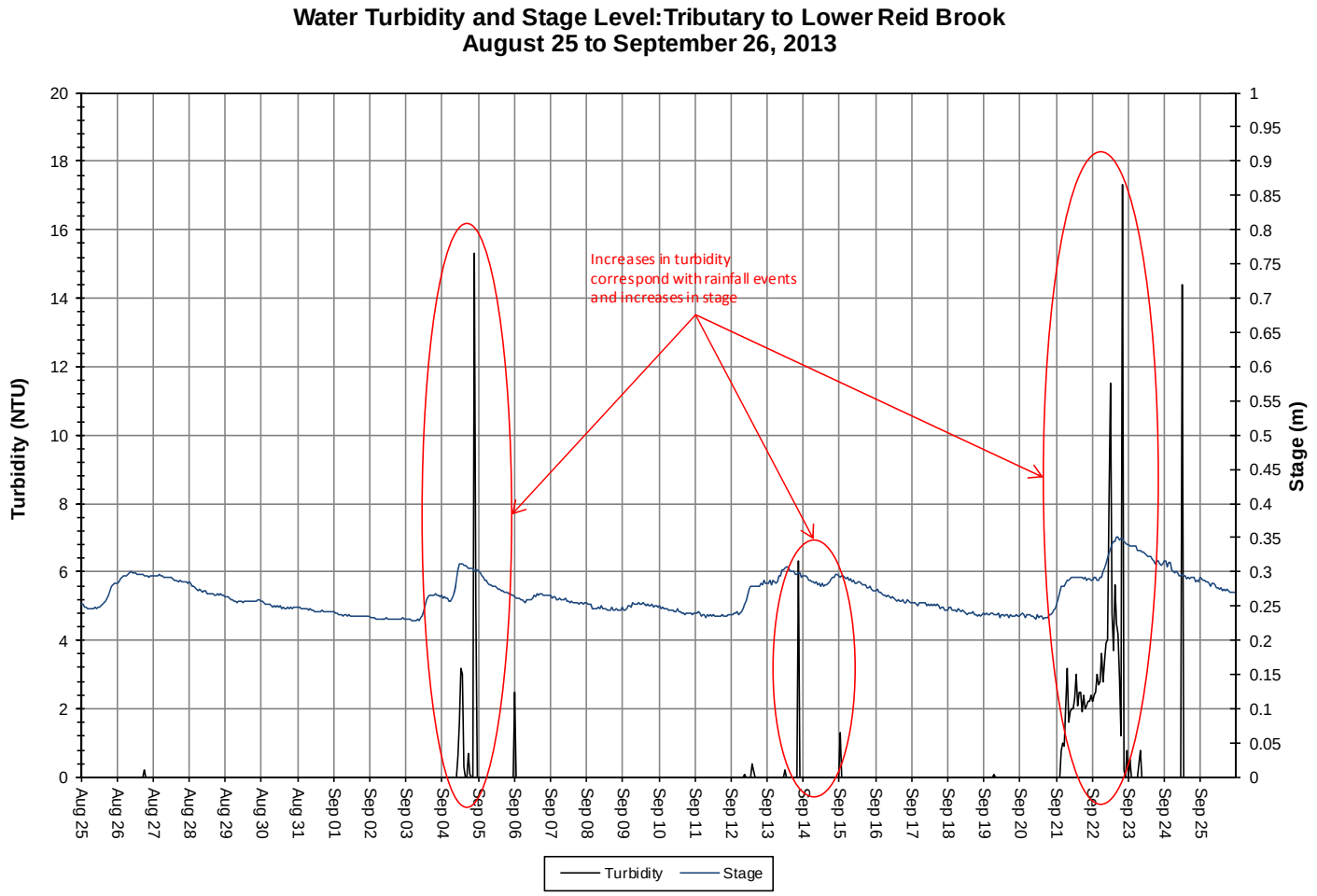


Figure 20: Turbidity and stage level at Tributary to Lower Reid Brook

- Stage and precipitation are graphed below to show the relationship between rainfall and water level (Figure 21). Stage is increasing and decreasing throughout the deployment period. Stage ranges from 0.23m to 0.35m, a difference of 0.12m.
- Precipitation events occur less than 50% of the time and are low in magnitude.

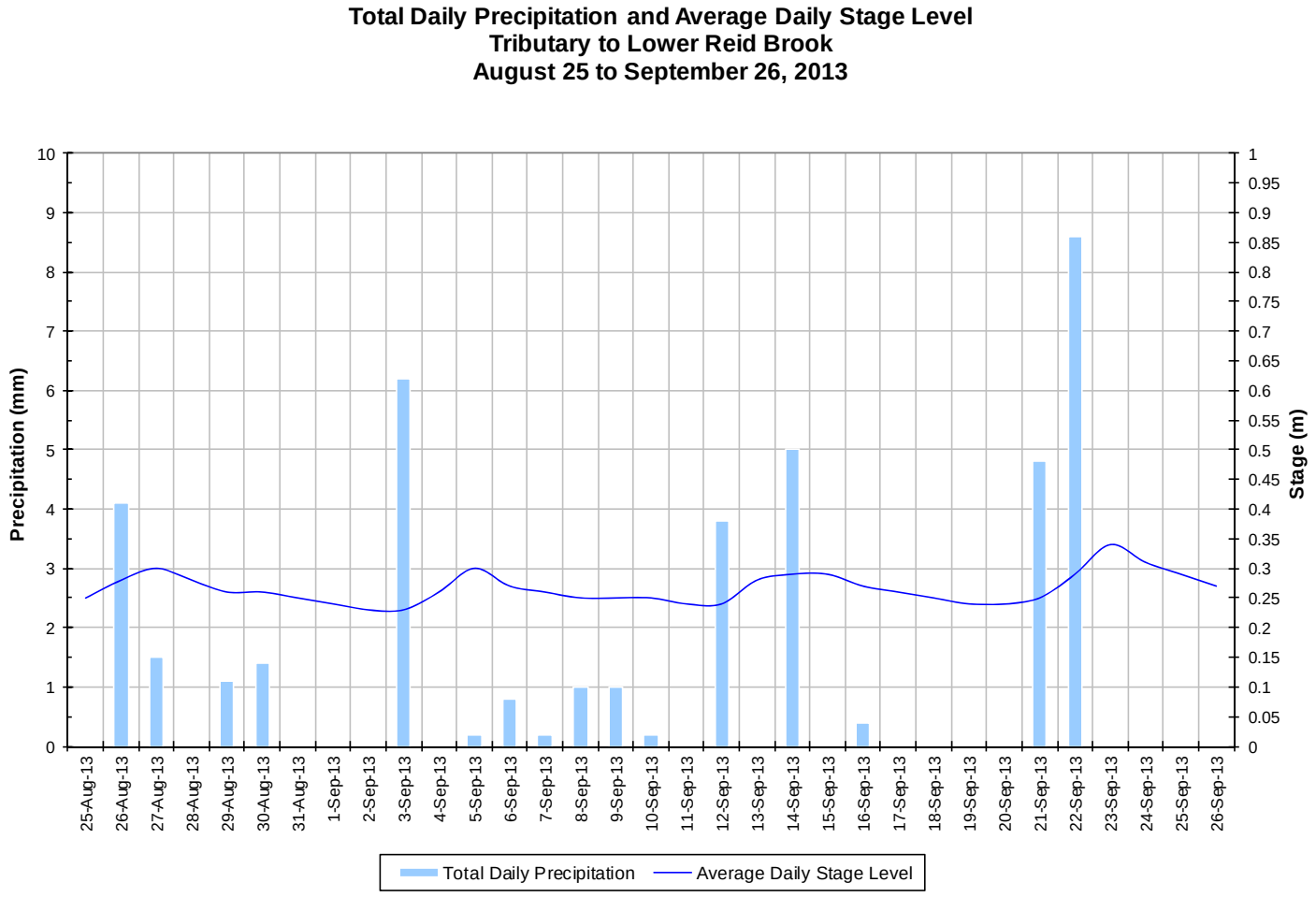


Figure 21: Daily precipitation and average daily stage at Tributary to Lower Reid Brook

(weather data recorded at Nain)

Lower Reid Brook

- Water temperature ranges from 2.30°C to 14.19°C during the deployment period (Figure 22).
- Water temperature is decreasing throughout the deployment period. This trend is expected given the cooling ambient air temperatures in the late summer and fall seasons (Figure 23). This stream is sensitive to changes in the ambient air temperature and fluctuates considerably depending on the weather and time of day.
- Average water temperature is 7.50°C for the deployment period.

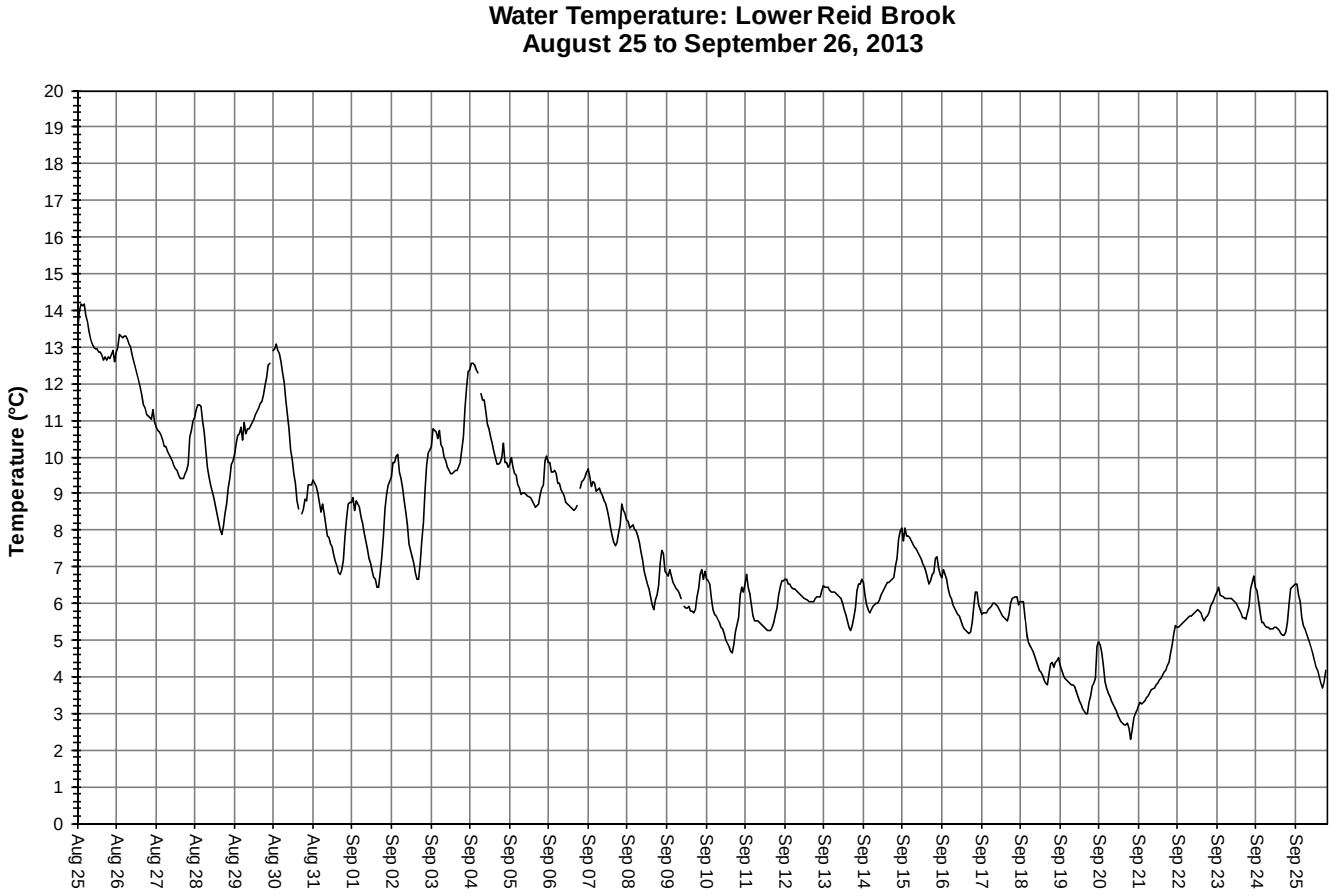


Figure 22: Water temperature at Lower Reid Brook

- Average daily air and water temperatures are decreasing throughout the deployment period (Figure 23). Increases and decreases in air temperature are reflected in water temperatures. Air temperatures generally increase and decrease faster while water temperatures increase and decrease more slowly over time.

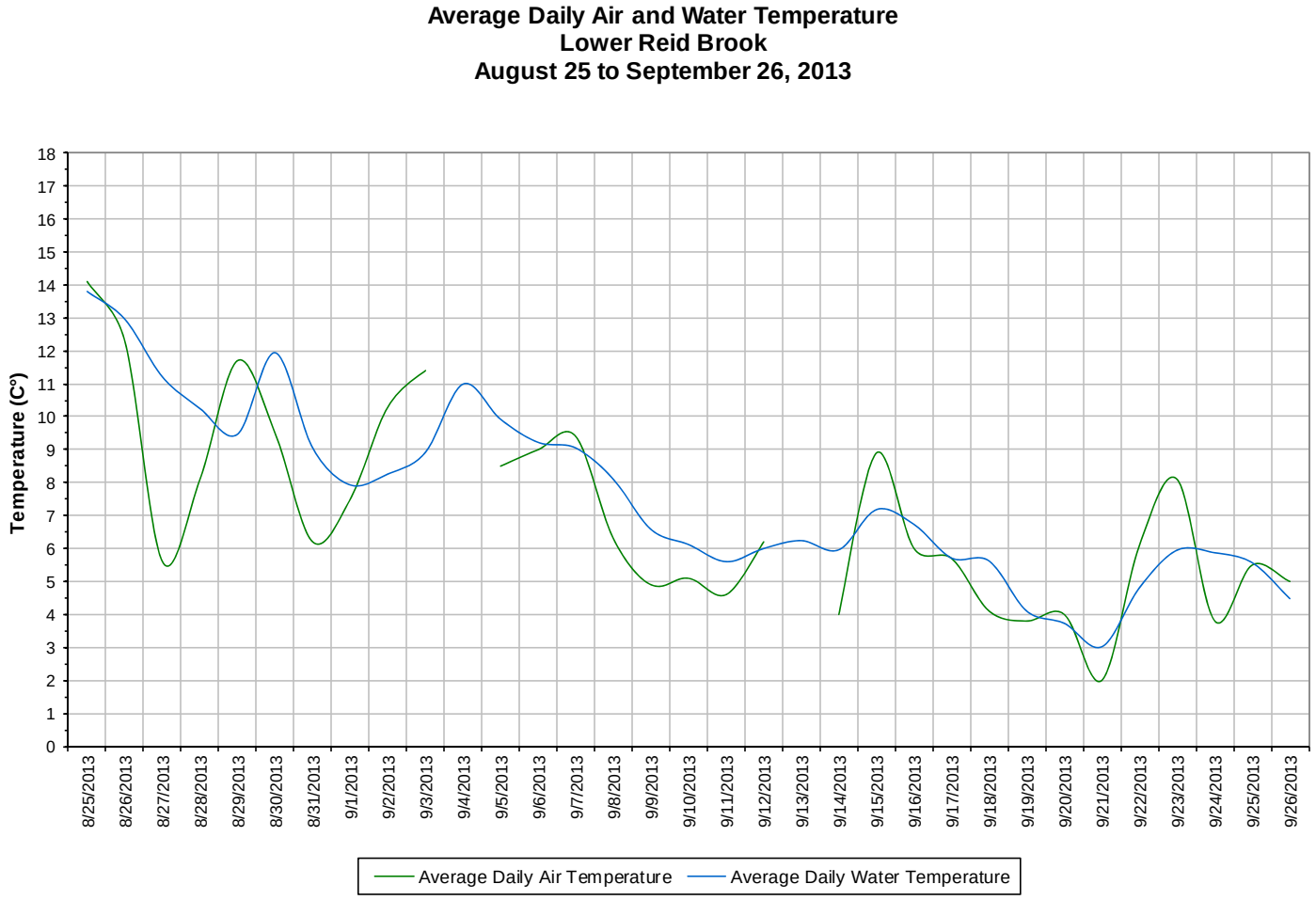


Figure 23: Average daily air and water temperatures at Lower Reid Brook

(weather data recorded at Nain)

- pH ranges between 6.57 and 7.11 pH units (Figure 24).
- pH is very stable and consistently fluctuating diurnally. Near the end of the deployment period, pH drops slightly following a rainfall event on September 21-22. There is an increase in stage at this time as well. These events are highlight in red on Figure 17.
- All values are within the recommended range for pH as suggested by the CCME Guidelines for the Protection of Aquatic Life (>6.5 and <9.0 pH units). Guidelines are indicated in blue on Figure 24.

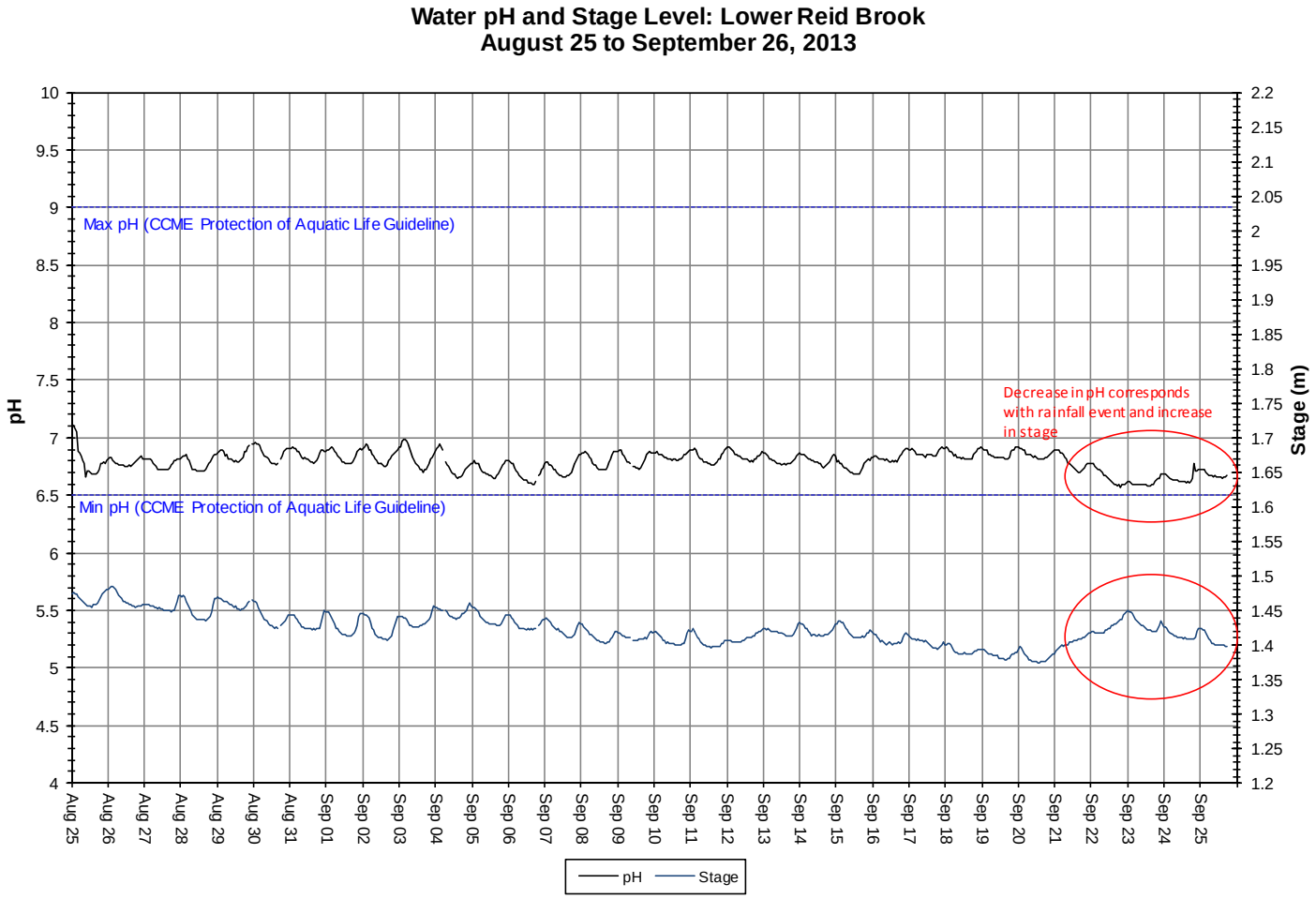


Figure 24: pH and stage level at Lower Reid Brook

- Specific conductivity ranges between 30.1µS/cm and 40.7µS/cm (Figure 25).
- Stage is included in Figure 25 to illustrate the inverse relationship between conductivity and water level. As stage decreases, specific conductivity increases because of the increased concentration of dissolved solids. Inversely, as stage increases, specific conductivity decreases due to the dilution of dissolved solids in the water column.
- This trend is not evidently clear with the values collected from this station during the deployment period. There is a decrease in specific conductivity near the end of the deployment period which does correspond with a rainfall event and a slight increase in stage. Other increases in specific conductivity do correspond with rainfall events however there is no noticeable increase in stage. These events are highlighted in red on Figure 25.

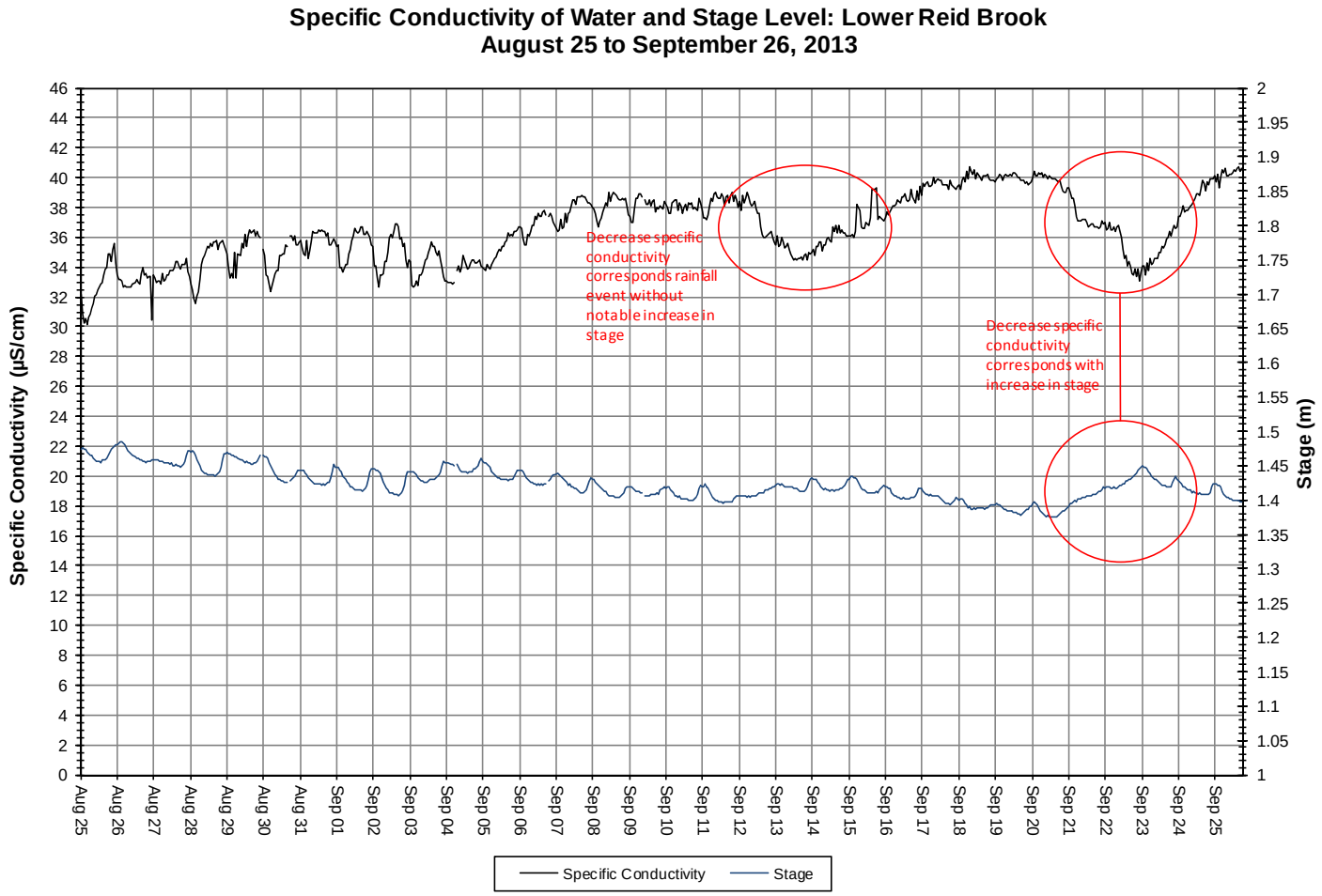


Figure 25: Specific conductivity and stage level at Lower Reid Brook

- Dissolved oxygen content ranges between 9.97mg/l and 13.04mg/l. The saturation of dissolved oxygen ranges from 92.7% to 105.1% (Figure 26).
- Dissolved oxygen content is increasing throughout the deployment period. This trend is expected given the decreasing air and water temperatures (Figure 23).
- All values are above both the minimum CCME Guideline for the Protection of Cold Water Biota at Other Life Stages (6.5mg/l) and Early Life Stages (9.5 mg/l). The guidelines are indicated in blue on Figure 26. Average dissolved oxygen content is 11.61mg/l.

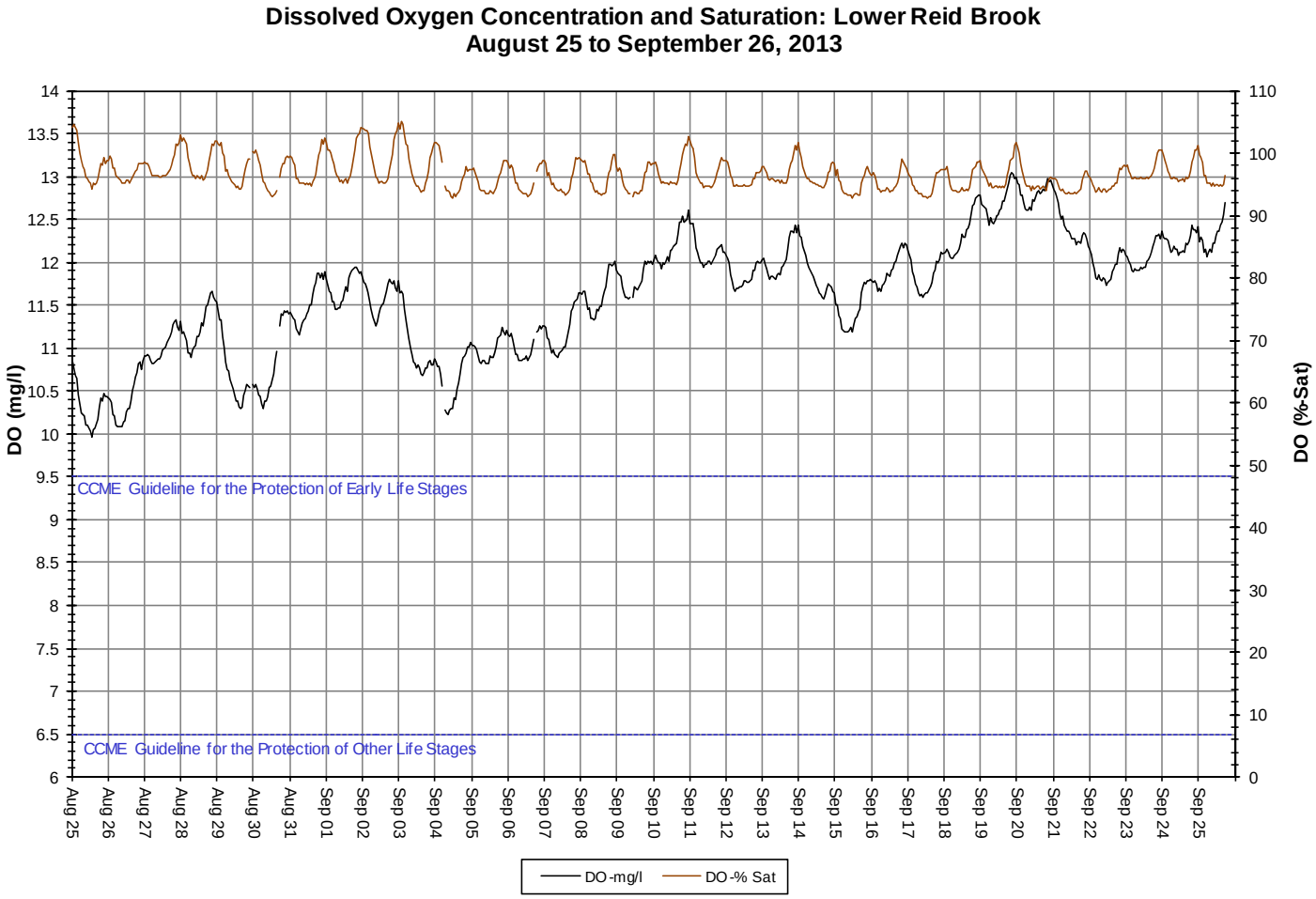


Figure 26: Dissolved oxygen and percent saturation at Lower Reid Brook

- Turbidity ranges between 0NTU and 76.3NTU throughout the deployment period (Figure 27). A median value of 0.0NTU indicates there is no natural background turbidity data for this deployment period.
- Turbidity events at low magnitudes are normal for this station. There are very few turbidity increases captured during the deployment period, all of which only last 1-2 hours.

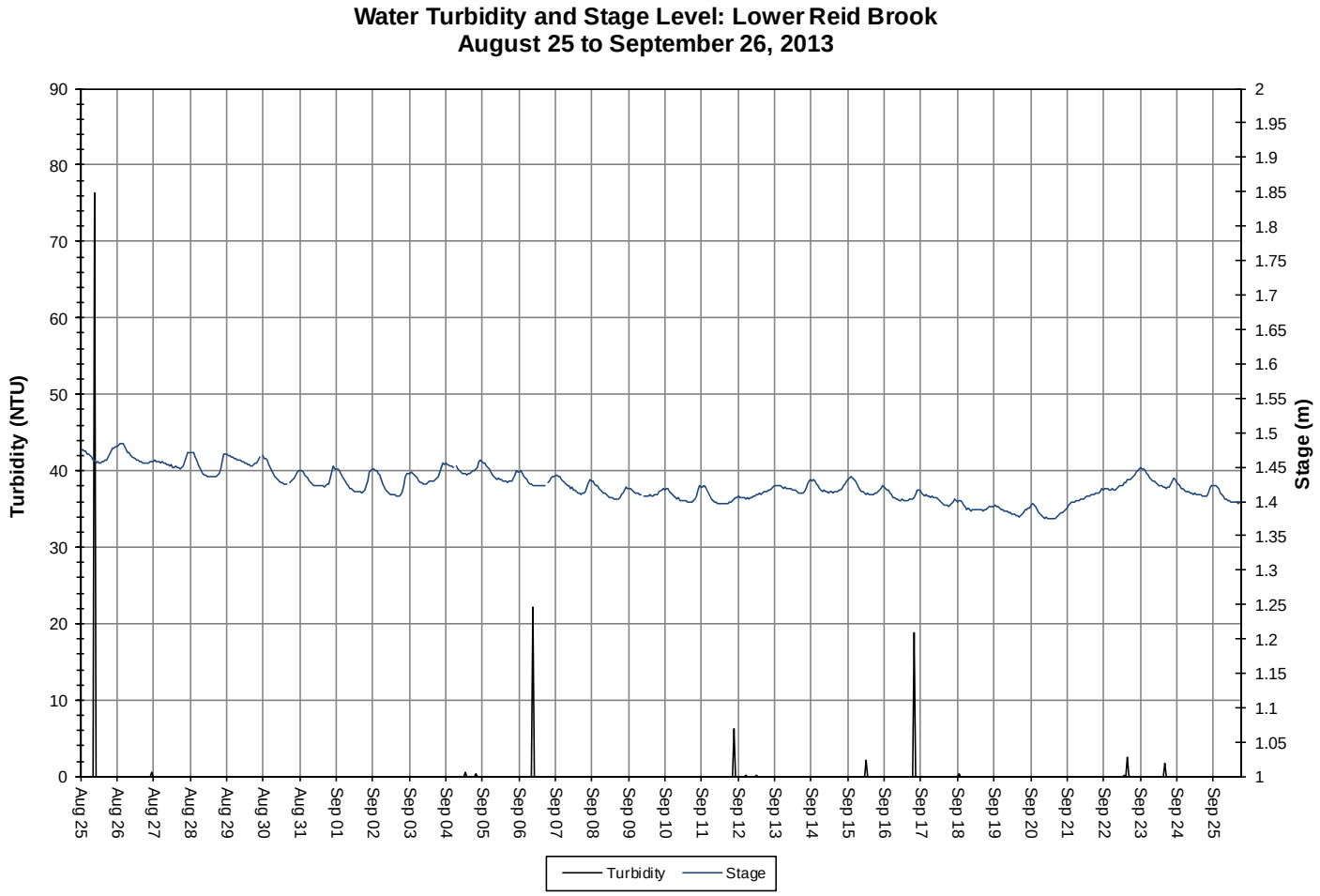


Figure 27: Turbidity and stage level at Lower Reid Brook

- Stage and precipitation are graphed below to show the relationship between rainfall and stage level (Figure 28). Stage is very stable at this station throughout the deployment period. Stage ranges from 1.38 to 1.48m, a difference of 0.10m.
- Precipitation events occur less than 50% of the time and are low in magnitude.

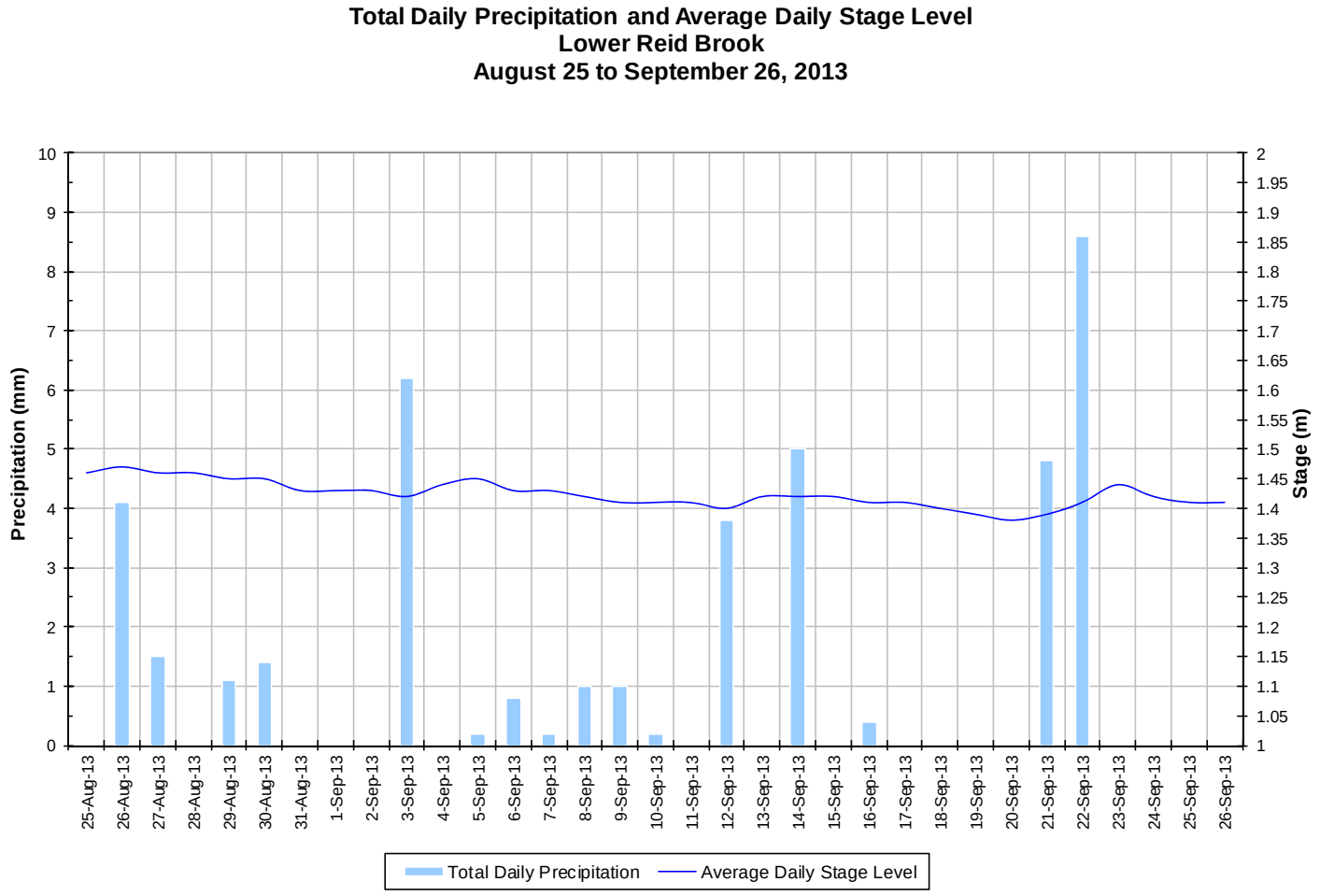


Figure 28: Daily precipitation and average daily stage level at Lower Reid Brook

(weather data recorded at Nain)

Conclusions

- Instruments at water quality monitoring stations in the Voisey's Bay Network were deployed from August 25 to September 26, 2013.

Summary by Station

- At Upper Reid Brook, water temperature decreased while dissolved oxygen increased throughout the deployment period. Specific conductivity was low and very stable which is normal for this station. pH values were neutral and consistent for the majority of the deployment period before decreasing slightly in the final week. Turbidity remained at 0NTU. Stage levels decreased consistently throughout the deployment period.
- At Camp Pond Brook, water temperature decreased and dissolved oxygen increased throughout the deployment period. pH was neutral and consistently fluctuated on a daily basis. Specific conductivity increased following rainfall events regardless of there not being an increase in stage. Turbidity events were frequent but low in magnitude.
- At Tributary to Lower Reid Brook, water temperature decreased while and dissolved oxygen increased. pH values were neutral and stable throughout deployment period. Specific conductivity fluctuated with changes in stage level and remained inversely proportional to water level. Turbidity events were minimal and corresponded with precipitation events. Events at this station closely resemble the events captured at the station nearby on Lower Reid Brook.
- At Lower Reid Brook, water temperature decreased and dissolved oxygen increased. pH values were neutral and consistently throughout the deployment period. Specific conductivity decreased following rainfall events. Turbidity events were minimal and short lived. Events at this station closely resemble the events captured at the station nearby on Tributary to Lower Reid Brook.

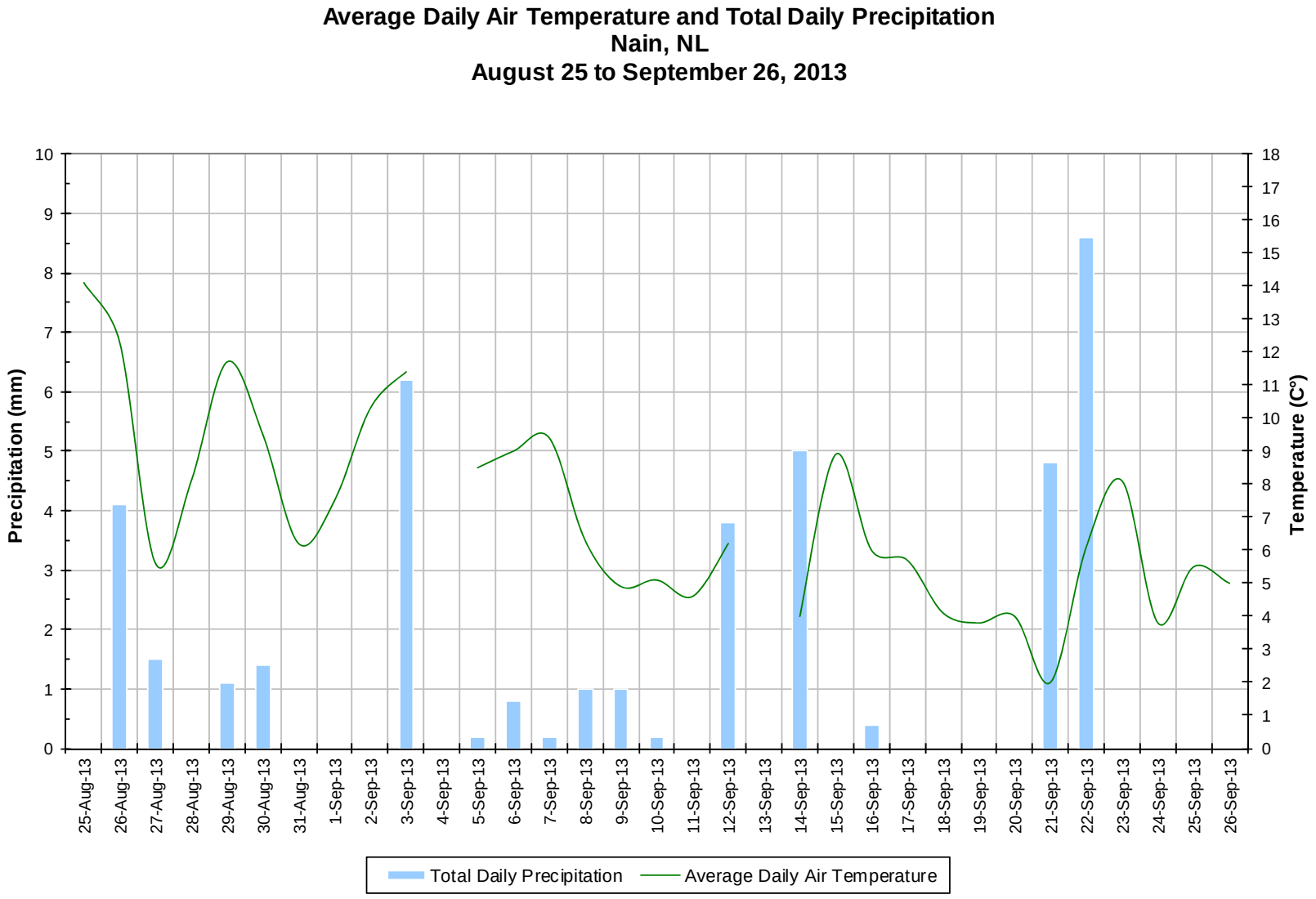
Summary by Parameter

- Temperature averaged between 7.08°C (Tributary to Lower Reid) and 10.43°C (Upper Reid Brook) at the 4 stations in the Voisey's Bay Network. Water temperature was decreasing at all stations and fluctuated throughout the deployment period depending on the weather conditions. The stations on Camp Pond Brook, Tributary to Lower Reid Brook and Lower Reid Brook are more sensitive to changes in the ambient air temperatures. Camp Pond Brook was on average 2°C warmer than the two lower streams.
- pH values averaged between 6.78 (Upper Reid Brook) and 7.10 (Tributary to Lower Reid) pH units across the network. At Upper Reid Brook, Tributary to Lower Reid Brook and Lower Reid Brook, pH values decreased following a rainfall event on September 21-22. pH values recorded at Lower Reid Brook are subject to drifting as values appear to decrease consistently throughout the deployment period. Most values recorded at all stations were within the recommended range as suggested by the CCME Guideline for the Protection of Aquatic Life.
- At Tributary to Lower Reid Brook, Lower Reid Brook and Camp Pond Brook stations, specific conductivity averaged between 36.6µS/cm (Lower Reid Brook) and 41.4µS/cm (Tributary to Lower Reid). Values at Upper Reid Brook were considerably lower averaging 12.1µS/cm. These lower values are expected from this pristine station at the outflow from Reid Pond. At Tributary to Lower Reid and Lower Reid Brook

stations, specific conductivity displayed a clear inverse relationship with stage level, with values decreasing when stage level increased. At Camp Pond Brook, specific conductivity displayed a positive relationship to stage level however this is typical for this station.

- Dissolved oxygen levels averaged between 10.80mg/l (Upper Reid Brook) and 11.61mg/l (Lower Reid Brook). All values recorded at all stations were above the minimum CCME Guideline for the Protection of Aquatic Life at Other Life Stages (6.5mg/l). Most values were above minimum CCME Guideline for the Protection of Aquatic Life at Early Life Stages (9.5mg/l). Dissolved oxygen content was increasing at all stations which is expected given the seasonably cooling air and water temperatures. Dissolved oxygen content at Upper Reid Brook is more stable due to the lake from which the water flows.
- Median turbidity values are 0NTU at all stations indicating there is generally no background turbidity in these streams. There were no turbidity events at Upper Reid Brook. Turbidity events at the stations on Tributary to Lower Reid Brook and Lower Reid Brook were infrequent and short lived and most often correspond with rainfall events. At Camp Pond Brook, turbidity events were slightly more frequent but remained low in magnitude and also corresponded with rainfall events.

Appendix 1: Weather Data – Environment Canada Historical Climate Database



Appendix 2: Grab Sample Results: Report of Analysis – Exova Accutest

2013-6335-00-SI-SP, Upper Reid Brook

2013-6336-00-SI-SP, Tributary to Lower Reid Brook

2013-6337-00-SI-SP, Lower Reid Brook

2013-6338-00-SI-SP, Camp Pond Brook

REPORT OF ANALYSIS

Lab Report Number: **1318904**

Cient:	Department of Environment	**COC Number:**	1463
Attention:	Ms. Annette Tobin	**Date Reported:**	2013-09-10
Client Project:	Happy Valley-Goose Bay	**Date Submitted:**	2013-08-29
Purchase Order:	213002094	**Sample Matrix:**	Water

LAB ID	Supply / Description	Client Sample ID	Sample Date
1054496	WS-S-0000 Upper Reid Brook	2013-6335-00-SI-SP	2013-08-25

Comment:

Holding time for turbidity analysis was exceeded. Holding time for DOC analysis was exceeded for the entire report.

ANALYTE	UNIT	MRL	RESULT
Alkalinity as CaCO3	mg/L	5	10
Bromide	mg/L	0.25	<0.25
Chloride	mg/L	1	<1
Colour	TCU	2	8
Conductivity	uS/cm	5	18
Dissolved Organic Carbon	mg/L	0.5	2.0
Fluoride	mg/L	0.10	<0.10
Hardness as CaCO3	mg/L	1	2
N-NH3 (Ammonia)	mg/L	0.02	<0.02
N-NO2 (Nitrite)	mg/L	0.10	<0.10
N-NO3 (Nitrate)	mg/L	0.10	<0.10
pH		1.00	6.65
Sulphate	mg/L	3	<3
Total Dissolved Solids (COND - CALC)	mg/L	1	12
Total Kjeldahl Nitrogen	mg/L	0.10	<0.10
Total Organic Carbon	mg/L	0.5	1.9
Total Phosphorus	mg/L	0.01	<0.01
Turbidity	NTU	0.1	0.2
Aluminum	mg/L	0.01	0.04
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	1
Cadmium	mg/L	0.0001	<0.0001
Chromium	mg/L	0.001	<0.001

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

APPROVAL:

Lorna Wilson
Laboratory Supervisor, Inorganics

REPORT OF ANALYSIS

Lab Report Number: **1318904**

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Client Project:	Happy Valley-Goose Bay	**Date Submitted:**	2013-08-29
Purchase Order:	213002094	**Sample Matrix:**	Water

LAB ID	Supply / Description	Client Sample ID	Sample Date	ANALYTE	UNIT	MRL	RESULT
1054496	WS-S-0000 Upper Reid Brook	2013-6335-00-SI-SP	2013-08-25	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	<1
				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	0.005
				Uranium	mg/L	0.001	<0.001
				Zinc	mg/L	0.01	<0.01
				Total Suspended Solids	mg/L	2	<2

Comment:

Holding time for turbidity analysis was exceeded. Holding time for DOC analysis was exceeded for the entire report.

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

APPROVAL:

Lorna Wilson
Laboratory Supervisor, Inorganics

REPORT OF ANALYSIS

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Attention:	Ms. Annette Tobin	**Date Reported:**	2013-09-10
Client Project:	Happy Valley-Goose Bay	**Date Submitted:**	2013-08-29
Purchase Order:	213002094	**Sample Matrix:**	Water

LAB ID	Supply / Description	Client Sample ID	Sample Date	ANALYTE	UNIT	MRL	RESULT
1054497	WS-S-0000 Tributary to CRB	2013-6336-00-SI-SP	2013-08-25	Alkalinity as CaCO3	mg/L	5	14
				Bromide	mg/L	0.25	<0.25
				Chloride	mg/L	1	3
				Colour	TCU	2	30
				Conductivity	uS/cm	5	41
				Dissolved Organic Carbon	mg/L	0.5	4.1
				Fluoride	mg/L	0.10	0.12
				Hardness as CaCO3	mg/L	1	12
				N-NH3 (Ammonia)	mg/L	0.02	<0.02
				N-NO2 (Nitrite)	mg/L	0.10	<0.10
				N-NO3 (Nitrate)	mg/L	0.10	<0.10
				pH		1.00	6.80
				Sulphate	mg/L	3	4
				Total Dissolved Solids (COND - CALC)	mg/L	1	27
				Total Kjeldahl Nitrogen	mg/L	0.10	0.19
				Total Organic Carbon	mg/L	0.5	4.0
				Total Phosphorus	mg/L	0.01	<0.01
				Turbidity	NTU	0.1	1.0
				Aluminum	mg/L	0.01	0.05
				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	3
				Cadmium	mg/L	0.0001	<0.0001
				Chromium	mg/L	0.001	<0.001

Comment:

Holding time for turbidity analysis was exceeded.

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

APPROVAL:

Lorna Wilson
Laboratory Supervisor, Inorganics

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Client Project:	Happy Valley-Goose Bay	**Date Submitted:**	2013-08-29
Purchase Order:	213002094	**Sample Matrix:**	Water

LAB ID	Supply / Description	Client Sample ID	Sample Date	ANALYTE	UNIT	MRL	RESULT
1054497	WS-S-0000 Tributary to CRB	2013-6336-00-SI-SP	2013-08-25	Copper	mg/L	0.001	<0.001
				Iron	mg/L	0.03	0.42
				Lead	mg/L	0.001	<0.001
				Magnesium	mg/L	1	1
				Manganese	mg/L	0.01	<0.01
				Mercury	mg/L	0.0001	<0.0001
				Nickel	mg/L	0.005	0.006
				Potassium	mg/L	1	<1
				Selenium	mg/L	0.001	<0.001
				Sodium	mg/L	2	2
				Strontium	mg/L	0.001	0.021
				Uranium	mg/L	0.001	<0.001
				Zinc	mg/L	0.01	<0.01
				Total Suspended Solids	mg/L	2	<2

Comment:

Holding time for turbidity analysis was exceeded.

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

APPROVAL:

Lorna Wilson
Laboratory Supervisor, Inorganics

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Client Project:	Happy Valley-Goose Bay	**Date Submitted:**	2013-08-29
Purchase Order:	213002094	**Sample Matrix:**	Water

LAB ID	Supply / Description	Client Sample ID	Sample Date	ANALYTE	UNIT	MRL	RESULT
1054498	WS-S-0000 Lower Reid Brook	2013-6337-00-SI-SP	2013-08-25	Alkalinity as CaCO3	mg/L	5	14
				Bromide	mg/L	0.25	<0.25
				Chloride	mg/L	1	2
				Colour	TCU	2	21
				Conductivity	uS/cm	5	36
				Dissolved Organic Carbon	mg/L	0.5	3.2
				Fluoride	mg/L	0.10	0.11
				Hardness as CaCO3	mg/L	1	7
				N-NH3 (Ammonia)	mg/L	0.02	<0.02
				N-NO2 (Nitrite)	mg/L	0.10	<0.10
				N-NO3 (Nitrate)	mg/L	0.10	<0.10
				pH		1.00	6.78
				Sulphate	mg/L	3	4
				Total Dissolved Solids (COND - CALC)	mg/L	1	23
				Total Kjeldahl Nitrogen	mg/L	0.10	0.16
				Total Organic Carbon	mg/L	0.5	3.0
				Total Phosphorus	mg/L	0.01	<0.01
				Turbidity	NTU	0.1	1.0
				Aluminum	mg/L	0.01	0.05
				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	3
				Cadmium	mg/L	0.0001	<0.0001
				Chromium	mg/L	0.001	<0.001

Comment:

Holding time for turbidity analysis was exceeded.

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Methods references and/or additional QA/QC information available on request.

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Client Project:	Happy Valley-Goose Bay	**Date Submitted:**	2013-08-29
Purchase Order:	213002094	**Sample Matrix:**	Water

LAB ID	Supply / Description	Client Sample ID	Sample Date	ANALYTE	UNIT	MRL	RESULT
1054498	WS-S-0000 Lower Reid Brook	2013-6337-00-SI-SP	2013-08-25	Copper	mg/L	0.001	<0.001
				Iron	mg/L	0.03	0.34
				Lead	mg/L	0.001	<0.001
				Magnesium	mg/L	1	<1
				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	0.016
				Uranium	mg/L	0.001	<0.001
				Zinc	mg/L	0.01	<0.01
				Total Suspended Solids	mg/L	2	<2

Comment:

Holding time for turbidity analysis was exceeded.

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Methods references and/or additional QA/QC information available on request.

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Client Project:	Happy Valley-Goose Bay	**Date Submitted:**	2013-08-29
Purchase Order:	213002094	**Sample Matrix:**	Water

LAB ID	Supply / Description	Client Sample ID	Sample Date	ANALYTE	UNIT	MRL	RESULT
1054499	WS-S-0000 Camp Pond Brook	2013-6338-00-SI-SP	2013-08-25	Alkalinity as CaCO3	mg/L	5	13
				Bromide	mg/L	0.25	<0.25
				Chloride	mg/L	1	2
				Colour	TCU	2	19
				Conductivity	uS/cm	5	39
				Dissolved Organic Carbon	mg/L	0.5	3.5
				Fluoride	mg/L	0.10	<0.10
				Hardness as CaCO3	mg/L	1	12
				N-NH3 (Ammonia)	mg/L	0.02	<0.02
				N-NO2 (Nitrite)	mg/L	0.10	<0.10
				N-NO3 (Nitrate)	mg/L	0.10	<0.10
				pH		1.00	6.73
				Sulphate	mg/L	3	5
				Total Dissolved Solids (COND - CALC)	mg/L	1	25
				Total Kjeldahl Nitrogen	mg/L	0.10	<0.10
				Total Organic Carbon	mg/L	0.5	3.7
				Total Phosphorus	mg/L	0.01	<0.01
				Turbidity	NTU	0.1	0.6
				Aluminum	mg/L	0.01	0.03
				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	5
				Cadmium	mg/L	0.0001	<0.0001
				Chromium	mg/L	0.001	<0.001

Comment:

Holding time for turbidity analysis was exceeded.

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

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Client Project:	Happy Valley-Goose Bay	**Date Submitted:**	2013-08-29
Purchase Order:	213002094	**Sample Matrix:**	Water

LAB ID	Supply / Description	Client Sample ID	Sample Date	ANALYTE	UNIT	MRL	RESULT
1054499	WS-S-0000 Camp Pond Brook	2013-6338-00-SI-SP	2013-08-25	Copper	mg/L	0.001	0.002
				Iron	mg/L	0.03	0.11
				Lead	mg/L	0.001	<0.001
				Magnesium	mg/L	1	<1
				Manganese	mg/L	0.01	<0.01
				Mercury	mg/L	0.0001	<0.0001
				Nickel	mg/L	0.005	0.015
				Potassium	mg/L	1	<1
				Selenium	mg/L	0.001	<0.001
				Sodium	mg/L	2	2
				Strontium	mg/L	0.001	0.018
				Uranium	mg/L	0.001	<0.001
				Zinc	mg/L	0.01	<0.01
				Total Suspended Solids	mg/L	2	3

Comment:

Holding time for turbidity analysis was exceeded.

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

APPROVAL:

Lorna Wilson
Laboratory Supervisor, Inorganics