

Real-Time Water Quality Annual Report

Northern Harvest Smolt Ltd.

January 1st to December 31st, 2025



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

Introduction

- The Real-Time Water Quality (RTWQ) Monitoring Network near Stephenville, NL consists of three groundwater well monitoring stations funded by Northern Harvest Smolt Ltd. The program is a partnership between Northern Harvest and the Newfoundland & Labrador Department of Environment, Conservation and Climate Change (ECC).
- Each of the three stations consists of groundwater water quality and quantity monitoring equipment (water level) which transmits data in near real-time every 2-3 hours.
- The well stations are known as: MW5/6; FMW10 and FMW12. They were installed in November 2019 by ECC staff and first deployed on November 6th, 2019. The instruments remain in the monitoring wells year-round unless removed temporarily for maintenance and calibration.
- These stations measure the following water parameters: temperature, pH, specific conductivity, total dissolved solids (TDS), oxidation-reduction potential (ORP) and water quantity (depth). Parameters are recorded on an hourly basis during the deployment period and are available in real-time online:

NLGWMW5/6: https://www.mae.gov.nl.ca/wrmd/ADRS/v6/Template_Station.asp?station=NLGWMW56

NLGWFMW10: https://www.mae.gov.nl.ca/wrmd/ADRS/v6/Template_Station.asp?station=NLGWFMW10

NLGWFMW12: https://www.mae.gov.nl.ca/wrmd/ADRS/v6/Template_Station.asp?station=NLGWFMW12

- MW5/6 – This 50mm well is one of the thirteen wells that make up the Northern Harvest near field monitoring well network within 500m of the water supply area. This is a relatively shallow well at 2.92m.
- FMW10 - This 50mm well is one of the five wells that make up the Northern Harvest far-field monitoring network set up outside the 500m radius of the hatchery. This well is relatively deep at 22.54m.
- FMW12 – This 152mm well is one of the thirteen wells that make up the Northern Harvest near-field monitoring network within 500m of the water supply area. This well is relatively deep at 29.25m.
- The purpose of this network is to monitor, process, and distribute water quality/quantity data to Northern Harvest Smolt Ltd. and ECC for assessment and management of water resources, as well as to provide an early warning for any potential or emerging water issues, allowing mitigative measures to be implemented in a timely manner.
- ECC will provide Northern Harvest Smolt Ltd. with deployment and annual reports. Data is also available in near real-time on ECC's website.



Figure 1: Map of Northern Harvest Smolt Ltd. Real Time Water Monitoring Network

- Gaps in the water quality data are the result of transmission loss by the stations or the removal of inaccurate data due to ongoing station maintenance during that period.
- The first deployment for 2025 began in December 2024. The instruments were next removed for full maintenance in April 2025, followed by August 2025 and December 2025.



(a) MW5/6

(b) FMW10



(c) FMW12

Figure 2: Northern Harvest Real Time Monitoring Network: (a) MW5/6, (b) FMW10, (c) FMW12

Maintenance and Calibration

- To ensure accurate data collection of the real time groundwater monitoring network, maintenance and calibration of the water quality instrumentation is performed approximately every four months.
- Maintenance includes thorough cleaning of each instrument and replacement of any small sensor parts that are damaged or unsuitable for reuse. Once the instrument is cleaned, ECC staff carefully calibrate each sensor attachment for pH, specific conductivity and ORP to ensure accurate data collection.
- Installation and removal dates for 2025 are summarized in Table 1 below.

Table 1: Water quality instrument deployment start and end dates for 2025

Station	Installation	Removal	Duration (days)
MW5/6	December 5, 2024	April 15, 2025	131
	April 16, 2025	August 7, 2025	113
	August 8, 2025	December 2, 2025	116
	December 3, 2025	April 30, 2026	148
FMW10	December 5, 2024	April 15, 2025	131
	April 16, 2025	August 7, 2025	113
	August 11, 2025	December 2, 2025	113
	December 3, 2025	April 30, 2026	148
FMW12	December 6, 2024	April 15, 2025	130
	April 16, 2025	August 7, 2025	113
	August 8, 2025	December 2, 2025	116
	December 3, 2025	April 30, 2026	148

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.
- During the maintenance phase, water levels are measured manually and a volume equivalent to three well casings is purged from each well prior to re-installation and the collection of grab samples. This process flushes stagnant water from the wells and ensures that the water being observed is aquifer water.
- After full purging of the well, the sonde is deployed and initial field readings are recorded. A grab sample is taken when possible, to compare the values of pH and specific conductance against the deployed sonde's initial values. Due to hold times for these parameters being exceeded, an QA sonde will be used going forward as an additional form of quality assurance.
- Deployment comparison rankings for the stations are summarized in Table 2.

Table 2: QA/QC comparison rankings for Northern Harvest Stations

Station	Date	Action	Instrument #	pH	Specific Conductivity
MW5/6	December 5, 2024	Deployment	19D105282	Poor	Excellent
	April 16, 2025	Deployment	19E100387	Poor	Poor
	August 8, 2025	Deployment	23F102409	Poor	Good
	December 3, 2025	Deployment	19D105281	Poor	Fair
FMW10	December 5, 2024	Deployment	19D105281	Fair	Excellent
	April 16, 2025	Deployment	19D105282	Poor	Excellent
	August 11, 2025	Deployment	19D105281	Fair	Excellent
	December 3, 2025	Deployment	19D105281	Poor	Fair
FMW12	December 6, 2024	Deployment	19E100387	Marginal	Good
	April 16, 2025	Deployment	23F102409	Good	Excellent
	August 8, 2025	Deployment	19E100387	Poor	Excellent
	December 3, 2025	Deployment	19D105282	Poor	Excellent

Data Interpretation

- The following graphs and discussion illustrate water quality and level related events from January 1st to December 31st, 2025 at Northern Harvest Smolt facility.
- All data used in the preparation of the graphs and subsequent discussion below adhere to this stringent QA/QC protocol. Corrected data can be obtained upon request.

Water Temperature

- In 2025, water temperature ranged from 4.89°C to 14.31°C within the real-time well network (Table 3).
- MW5/6 had the largest range of water temperatures, reaching a low in late March and peaking in early September, with a range of 9.42°C over the course of 2025.
- At FMW10, water temperature gradually increased into April and began a decline in August (Figure 3).
- FMW12 was very stable throughout the year, varying within a small range with a median of 7.48 (Figure 3).

Table 3: Water Temperature (°C) Summary Statistics from the Well Network

	MW5/6	FMW10	FMW12
MIN.	4.89	6.06	7.0
MAX.	14.31	7.46	7.25
MEDIAN	8.48	6.85	7.48

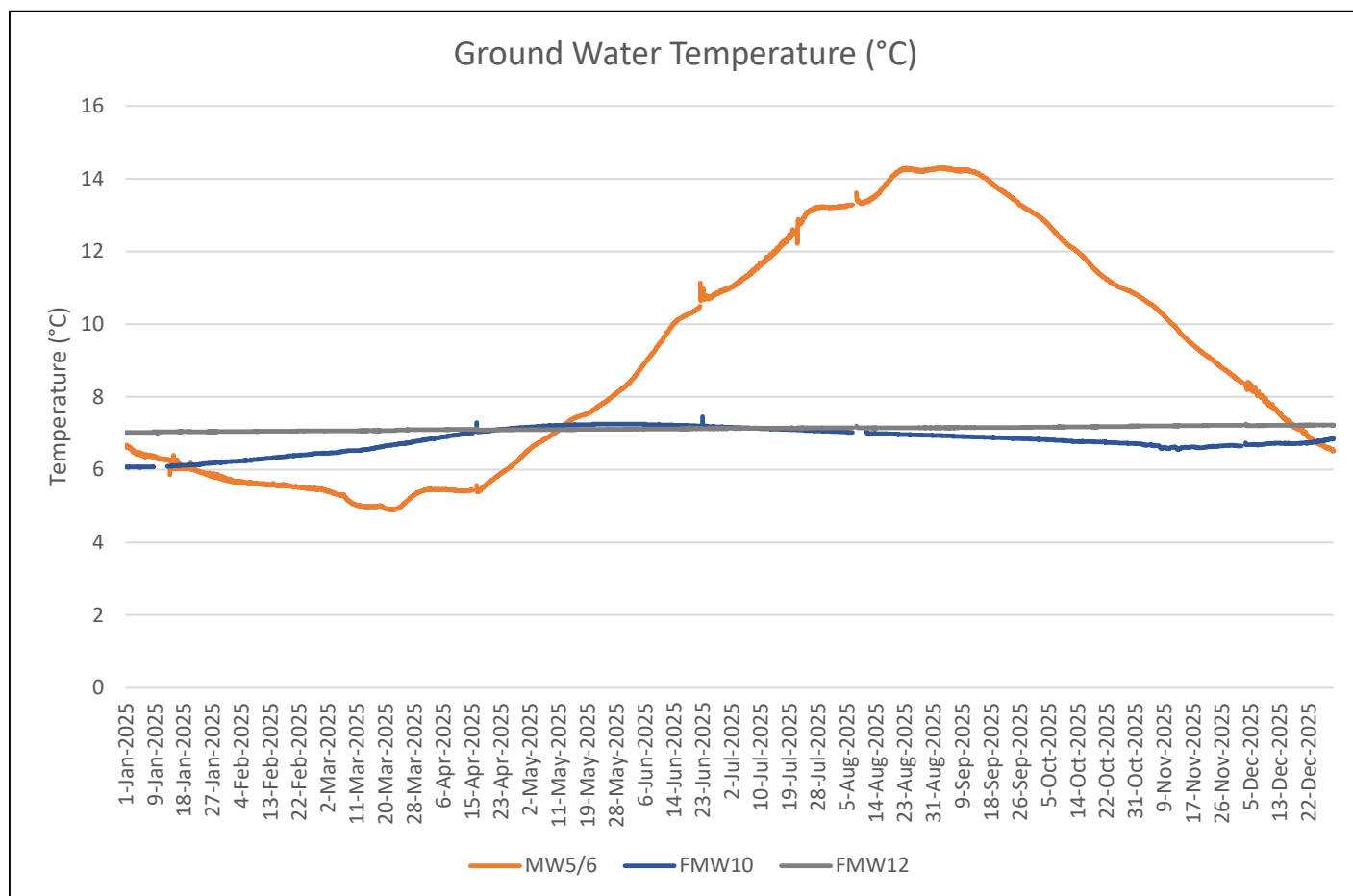


Figure 3: Water Temperature (°C) – Northern Harvest Smolt Ltd. Network

Water Depth

- During the deployment, MW5/6 and FMW12 fluctuated within a small range, but exhibited general decreasing trends (Figure 4).
- FMW10 showed a greater range of fluctuation over the deployment, increasing significantly between late March and early May before declining again into September (Figure 4).

Table 4: Water Elevation (m) Summary Statistics from the Well Network

	MW5/6	FMW10	FMW12
MIN.	1.18	5.56	5.52
MAX.	2.40	8.61	6.82
RANGE	1.22	3.05	1.30
MEDIAN	1.95	6.57	6.23

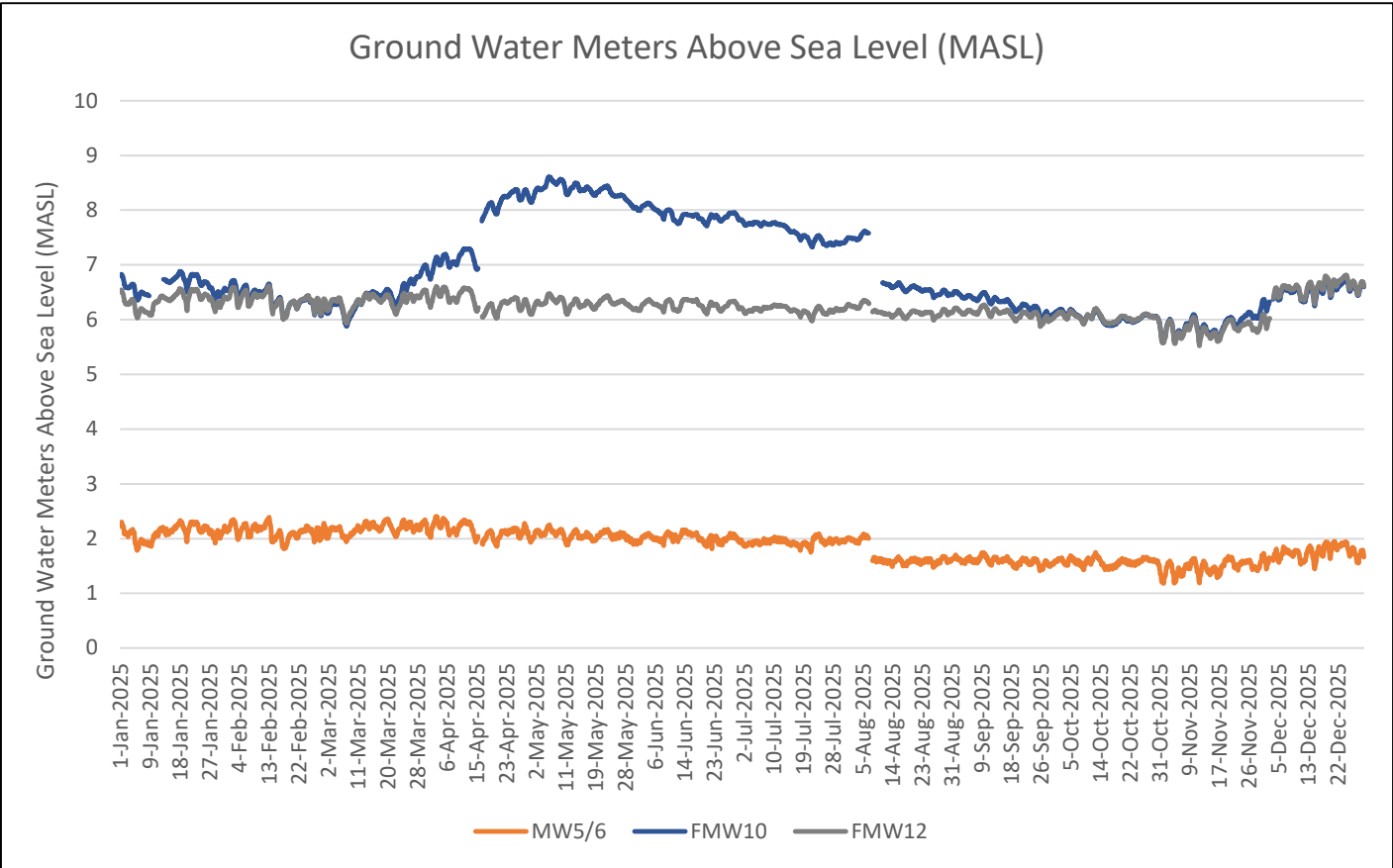


Figure 4: Water Elevation (masl) – Northern Harvest Smolt Ltd. Network

pH

- In 2025, pH ranged from 5.67 (at MW5/6) to 8.05 (at FMW12) pH units within the real-time well network (Table 5). MW5/6 remained acidic while FMW10 and FMW12 remained basic throughout the deployment.
- All wells in the network displayed similar variability throughout 2025 with several exceptions at each well at different times (Figure 5). This may be related to sampling or pumping occurring at the wells.

Table 5: pH (pH units) Summary Statistics from the Well Network

	MW5/6	FMW10	FMW12
MIN.	5.67	7.05	7.48
MAX.	6.27	7.63	8.05
MEDIAN	6.03	7.48	7.90

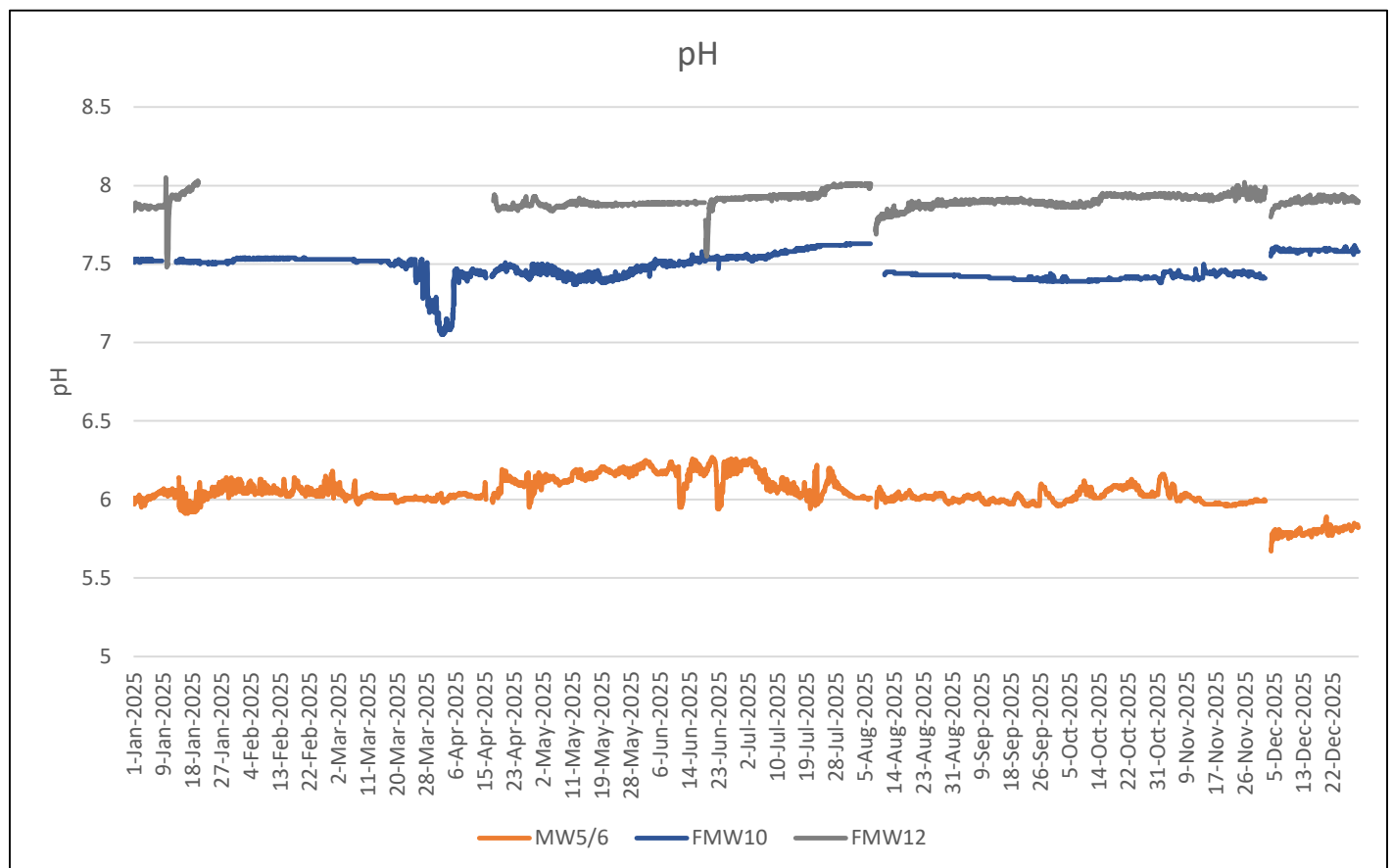


Figure 5: pH – Northern Harvest Smolt Ltd. Network

Specific Conductance and TDS

- In 2025, specific conductance ranged from 65.34 $\mu\text{S}/\text{cm}$ to 1078.27 $\mu\text{S}/\text{cm}$ within the real-time well network (Table 6).
- Specific conductance at FMW12 shows little variation while MW5/6 and FMW10 fluctuate frequently during the 2025 deployments (Figure 6). The excessive fluctuations at FMW10 January to April were related to a broken sensor and are inaccurate.

Table 6: Specific Conductance ($\mu\text{S}/\text{cm}$) & TDS (g/L) Summary Statistics from the Well Network

	MW5/6	FMW10	FMW12		MW5/6	FMW10	FMW12
	SPECIFIC CONDUCTANCE				TOTAL DISSOLVED SOLIDS		
MIN.	65.34	365.24	333.14	MIN.	0.04	0.24	0.22
MAX.	160.24	1078.27	353.08	MAX.	0.1	0.7	0.23
MEDIAN	111.76	466.80	340.49	MEDIAN	0.07	0.3	0.22

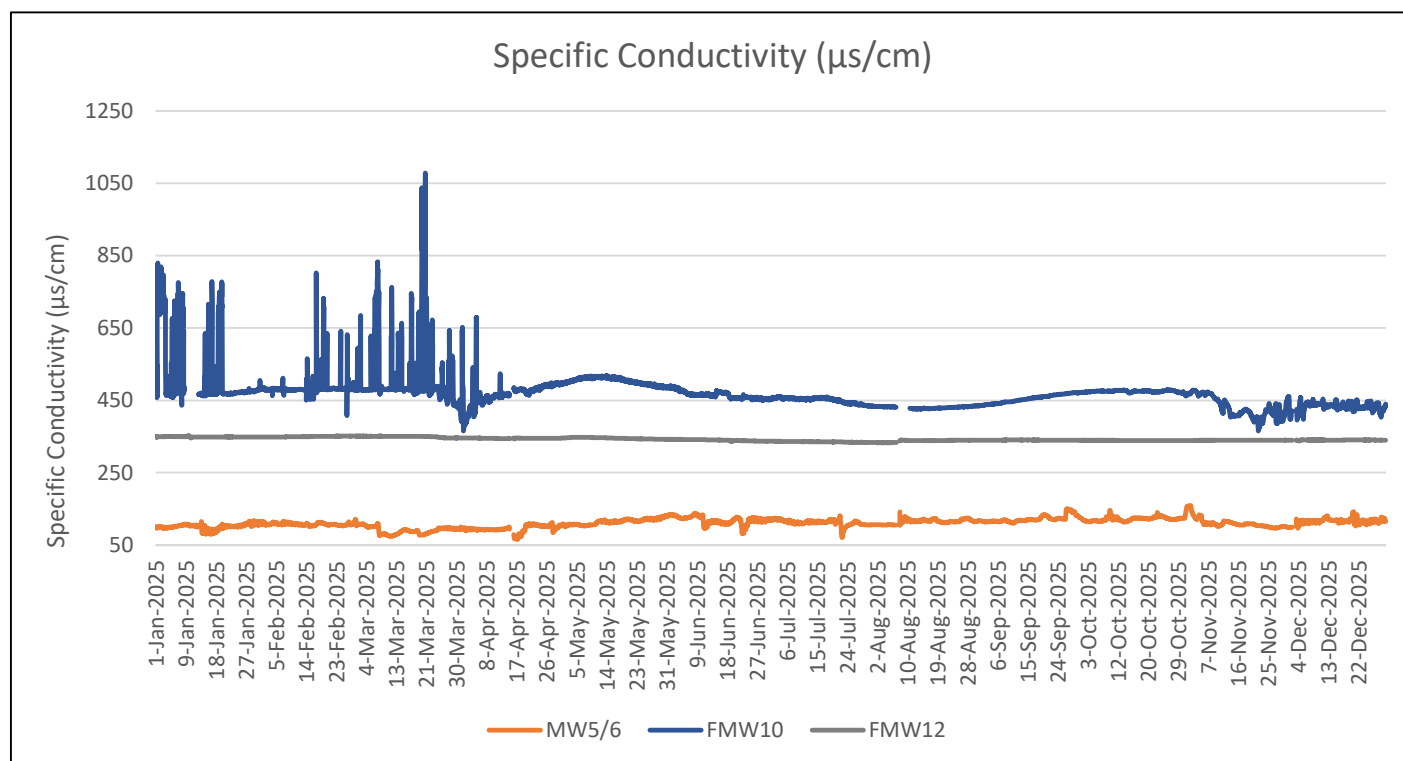


Figure 6: Specific Conductance – Northern Harvest Smolt Ltd. Network

- During 2025, total dissolved solids (TDS) ranged from 0.04 mg/L to 0.70 mg/L within the real time well network (Table 6).
- TDS varied minimally at FMW12 in 2025. At FMW10 and MW5/6, TDS varied more frequently and to a larger degree during the 2025 deployments. (Figure 7). The excessive fluctuations at FMW10 January to April were related to a broken sensor and are inaccurate.

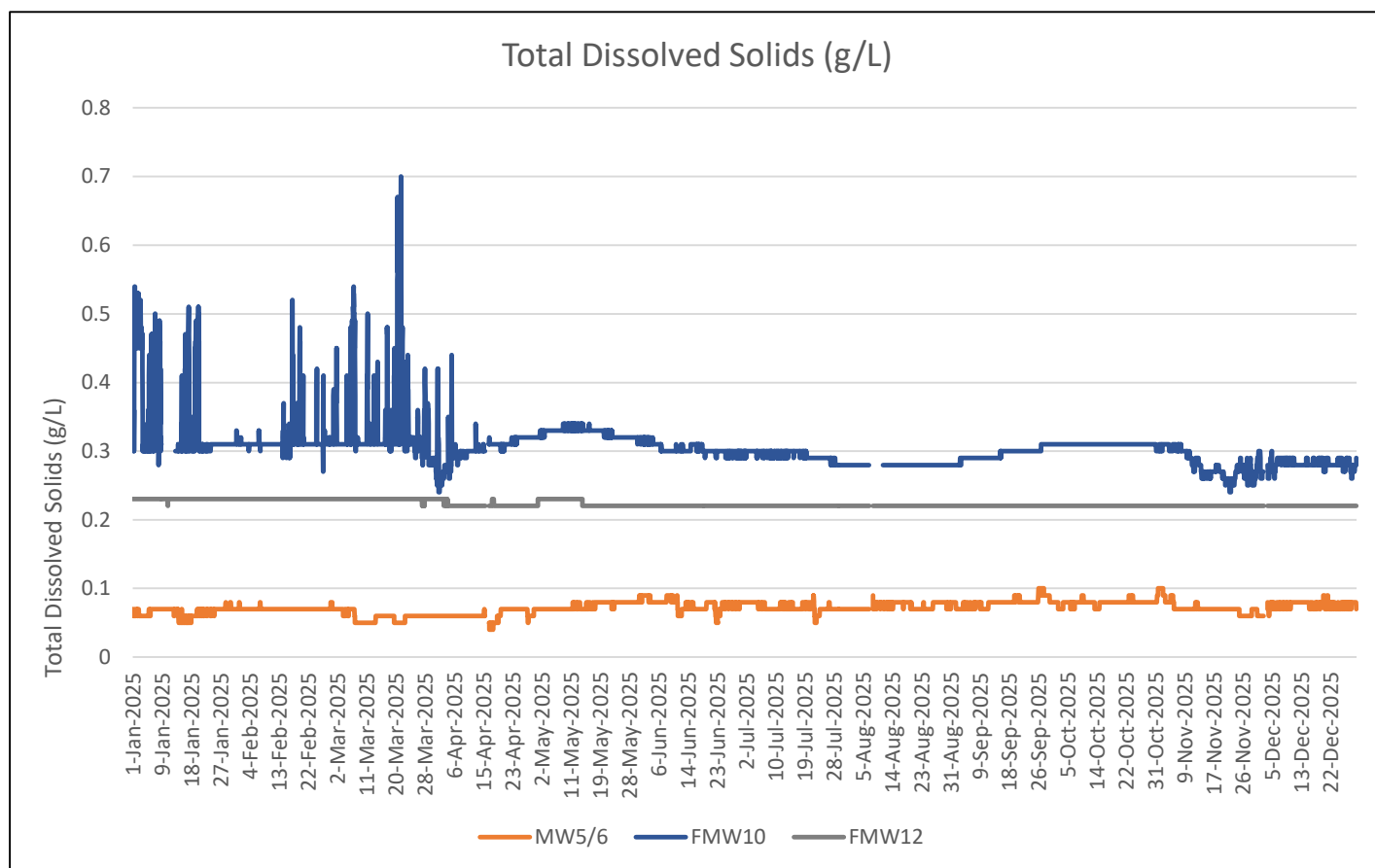


Figure 7: Total Dissolved Solids – Northern Harvest Smolt Ltd. Network

Oxidation – Reduction Potential (ORP)

- During 2025, oxidation-reduction potential (ORP) ranged from -75.74 mV to 506.35 mV within the real time well network (Table 7). Both these values were from MW5/6.
- During the 2025 deployment year, FMW12 appeared to be oxidative in nature except for a few occasions, while FMW10 remained oxidative throughout the year. MW5/6 exhibited large fluctuations and was generally oxidative but dropped before zero for several weeks.

Table 7: Oxidation-Reduction Potential (ORP) Summary Statistics from the Well Network

	MW5/6	FMW10	FMW12
MIN.	-75.74	321.14	-4.84
MAX.	506.35	446.72	411.76
MEDIAN	216.97	388.78	376.38

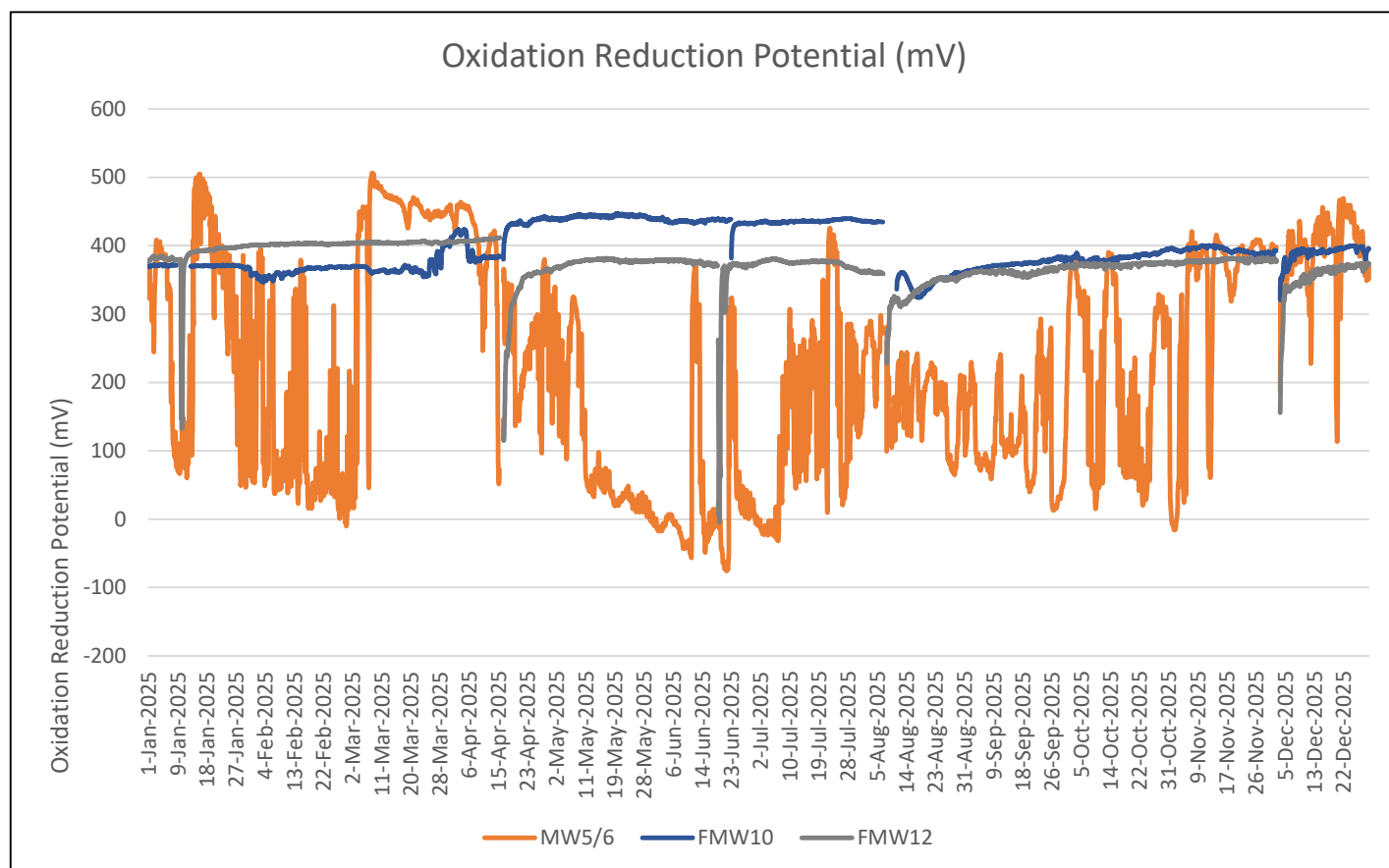


Figure 8: Oxidation-Reduction Potential (ORP) – Northern Harvest Smolt Ltd. Network

Conclusions

- The real-time water quality and quantity monitoring network at Northern Harvest Smolt Ltd was established on November 6, 2019, when instruments were initially deployed at each of the three wells in the network: MW5/6, FMW10, and FMW12.
- Since initial deployment, data has been monitored closely to determine if the instruments are accurately placed in the well casings and if there are other issues such as sensor errors.
- QA/QC rankings were obtained when grab samples could be collected. Going forward a QA sonde will be used as an additional method of quality assurance.
- Water temperature at MW5/6 displayed the most variability in the network due to seasonal temperature changes, while temperatures at FMW10 displayed an increase followed by a decrease and FMW12 varied little throughout 2025.
- Over the course of the year, water depth was relatively stable with a slight decreasing trend at both MW5/6 and FMW12. At FMW10, a greater range of variation occurred with a notable increase from March to May followed by a decrease into September.
- pH at MW5/6 was slightly acidic and showed moderate variability. pH values at FMW10 and FMW12 were slightly basic with similar variability.
- Specific conductivity was generally lowest at MW5/6 with some variability. Levels at FMW10 showed moderate variability while FMW12 was relatively stable with minimal fluctuations throughout the year.
- During the 2025 deployment year, FMW12 appeared to be oxidative in nature except for a few occasions, while FMW10 remained oxidative throughout the year. MW5/6 fluctuated greatly and was generally oxidative but dropped below zero for several weeks.
- During 2025, the instruments performed well with few issues except for the broken conductivity sensor.

Path Forward

- Staff will continue to monitor the data for issues.
- If necessary, deployment techniques will be evaluated and modified, ensuring secure and suitable conditions for RTWQ monitoring.
- ECC will continue to work on its Automatic Data Retrieval System (ADRS), to incorporate new capabilities in data management and data display.
- Open communication lines will continue to be maintained between ECC and Northern Harvest Smolt Ltd to respond to emerging issues on a proactive basis. Northern Harvest Smolt Ltd. will receive deployment reports and an annual report summarizing the events of the deployment season.

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Appendix 1: Air Temperature and Precipitation at Stephenville, NL

