

Real-Time Water Quality Report

Grieg NL Nurseries Ltd Monitoring Well

Deployment Period:
July 19th, 2023 to September 21st, 2023



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

Prepared by:

Victoria Hollohan
Environmental Scientist
Water Resources Management Division
Department of Environment & Climate Change
4th Floor, Confederation Building, West Block
St. John's NL A1B 4J6
Ph. No.: (709) 729 - 5925
Fax No.: (709) 729 - 0320
victoriahollohan@gov.nl.ca

General

The Water Resources Management Division (WRMD) in partnership with Grieg NL Nurseries Ltd, maintain a real-time water quality groundwater monitoring station. The station is located near the Marystown YMCA and Track and Field Complex.

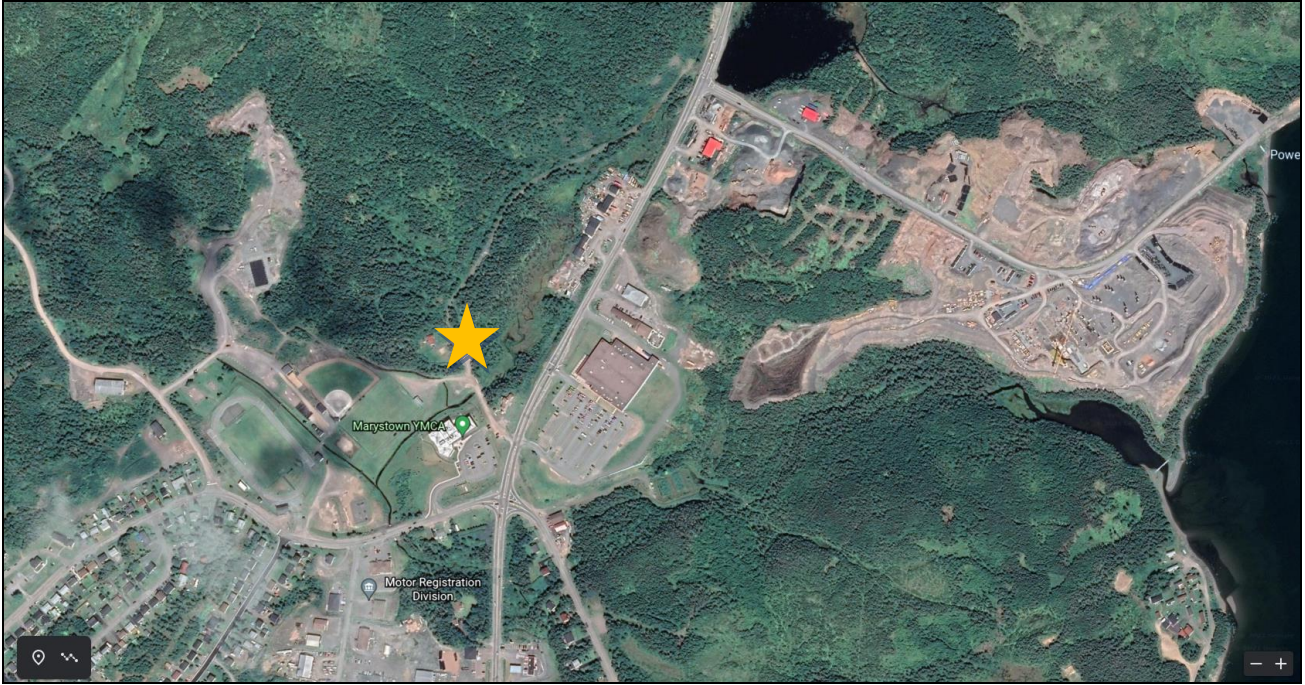


Figure 1: Location of Real-Time Groundwater Well



Figure 2: Hut Structure for groundwater well



Figure 3. View standing in front of well looking toward main road in Marystown, NL



Figure 4: Well Casing in the hut



Figure 5: View looking into well

Quality Assurance and Quality Control

WRMD staff (Environment & Climate Change (ECC)) are responsible for maintenance of the real-time water quality monitoring equipment, as well as recording and managing the water quality data. Grab samples are collected at the beginning of each deployment period to compare against the initial in-situ logged data. Grab samples compliment the real-time data and provide an extra source of water quality data for comparisons when tracking changes over time at the station (Table 1).

It should be noted that the temperature sensor on any sonde is the most important. All other parameters can be divided into subgroups of temperature dependent, temperature compensated and temperature independent. Due to the temperature sensor's location on the sonde, the entire sonde must be at a constant temperature before the temperature sensor will stabilize. The values may take some time to adjust to the appropriate reading.

Status of Station

Grieg Seafood has two available wells: a main production well that provides new water to the facility as needed, and a monitoring/backup well that houses the WRMD monitoring equipment. To ensure the pump installed in the monitoring/backup well is functioning, the pump is started periodically (about once per week). The WRMD's monitoring equipment is not removed during the pump test and as a result may disrupt the water parameter recordings. This groundwater well shares its aquifer with the main pumping well for the hatchery and variations in the water parameters could be a result of pumping from either well.

In-Situ instrument measurements are recorded shortly after the freshly calibrated instrument is deployed. The limited time for the sonde to reach equilibrium with its surroundings can occasionally lead to variations in values between grab sample results and instrument measurements.

Table 1: Comparison of the In-Situ instrument vs. Grab Sample Results

Date	Parameter of Comparison	In-Situ Instrument	Grab Sample Result	Comparison Ranking
July 19 th , 2023	pH (pH units)	7.51	8.01	Good
	Specific Conductivity ($\mu\text{S}/\text{cm}$)	299.43	310	Good
August 21 st , 2023	pH (pH units)	7.58	8.06	Good
	Specific Conductivity ($\mu\text{S}/\text{cm}$)	300.76	310	Good

Table 2: QAQC Comparison Ranking Chart

Parameter	Excellent	Good	Fair	Marginal	Poor
pH (pH units)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Specific Conductivity (µS/cm)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-10 to 15	>+/-20
Specific Conductivity (µS/cm) > 35 (%)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-10 to 15	>+/-20

Issues during the July 19th – September 21st deployment period

On July 21, 2023, the station ceased transmitting data and went offline. Due to prior commitments for field work, maintenance and troubleshooting could not be conducted until August 21st. Upon reaching the station on August 21st, it was discovered that a blown fuse between the instrument and datalogger had resulted in a power shortage for the instrument. The instrument continued logging measurements internally until its batteries depleted on July 25. After replacing the fuse, the station came back online and appeared to be operating normally. However, on August 24th, 2023, the station went offline again, ceasing data transmission. Troubleshooting and maintenance were performed on September 21st revealing a malfunction in the field cable connecting the instrument and datalogger, causing a loss of power and data collection. The instrument continued to log measurements in an internal logfile until its batteries depleted on August 24th. Following the replacement of the field cable on September 21st, the station resumed normal data transmission.

Due to the power loss issues, there is a lack of data between July 19th to September 21st. This report encompasses two deployment periods – July 19th to August 21st, 2023, as well as August 21st to September 21st, 2023. However there is only data available from July 19th-July 25th and August 21st to August 24th.

Grieg Monitoring Well

Water Temperature

Between July 19th to July 25th, water temperature ranged from 7.37°C to 7.44°C with an average of 7.41°C. From August 21st to August 24th, 2023, water temperature ranged from 7.31°C to 7.43°C with an average of 7.36°C (Figure 6).

Grieg’s monitoring station is a groundwater well; generally, the water temperatures will remain consistent throughout the deployment.

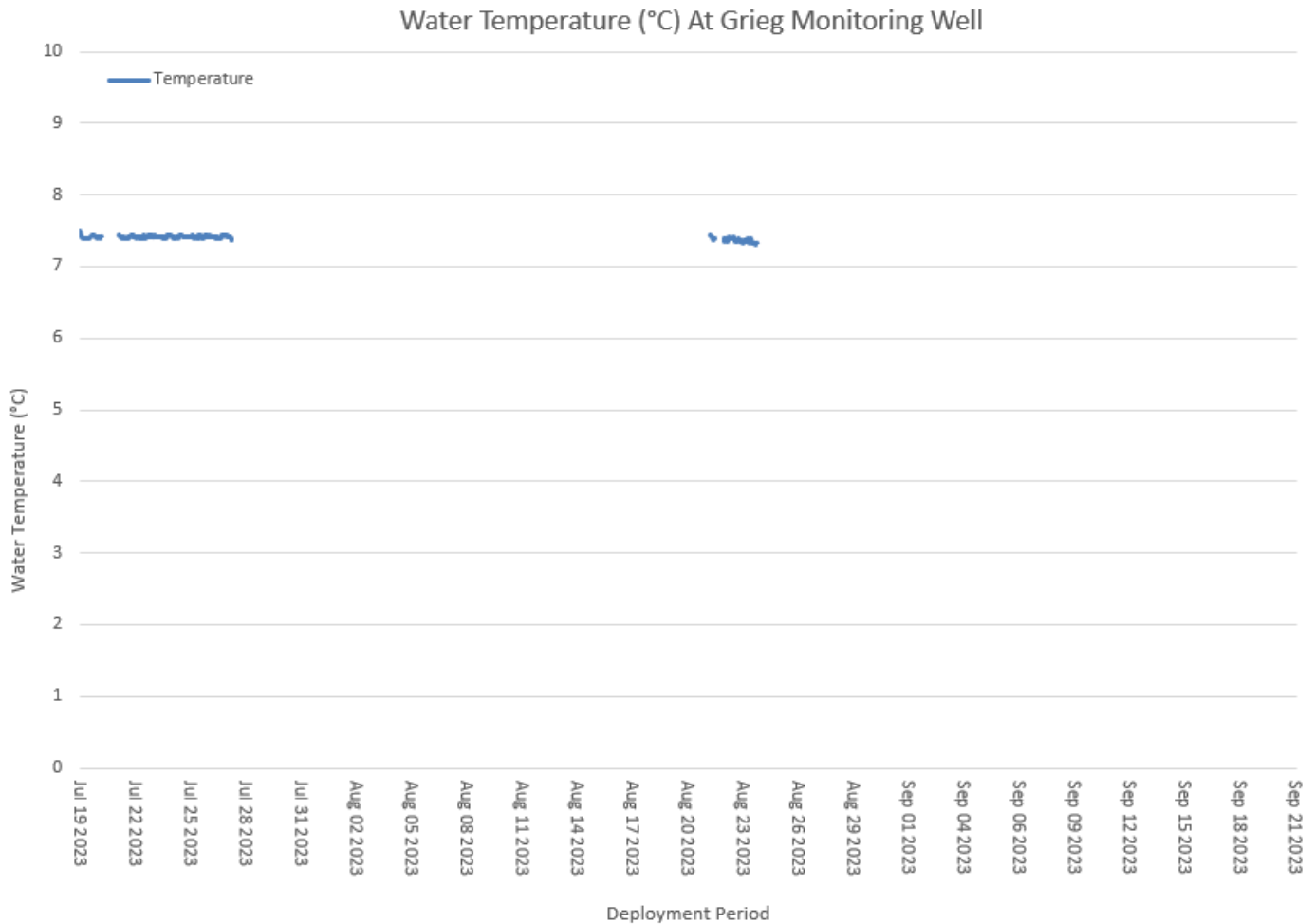


Figure 6: Water temperature (°C) values

pH

Between July 19th to July 25th, pH values ranged between 7.41 pH units and 7.52 pH units with an average of 7.49 pH units. Throughout August 21st to August 24th, pH values ranged between 7.48 pH units and 7.68 pH units with an average of 7.57 pH units (figure 7).

A pH sensor measures the acidity or alkalinity of a water body. pH is a measure of the concentration of hydrogen ions (H⁺) in a solution.

Comparison of the grab sample data for pH indicated the grab sample collected on July 19th had a pH of 8.01 pH units, slightly higher than what was recorded in-situ at 7.51 pH. For August 21st, the grab sample of 8.06 pH, was slightly higher than what was recorded in-situ at 7.58 pH (Table 1). It would be expected that these two pH results would vary slightly. The well was pumped prior to collecting the grab sample, while the in-situ reading was recorded after the pumping of the well had stopped and the water column allowed to settle.

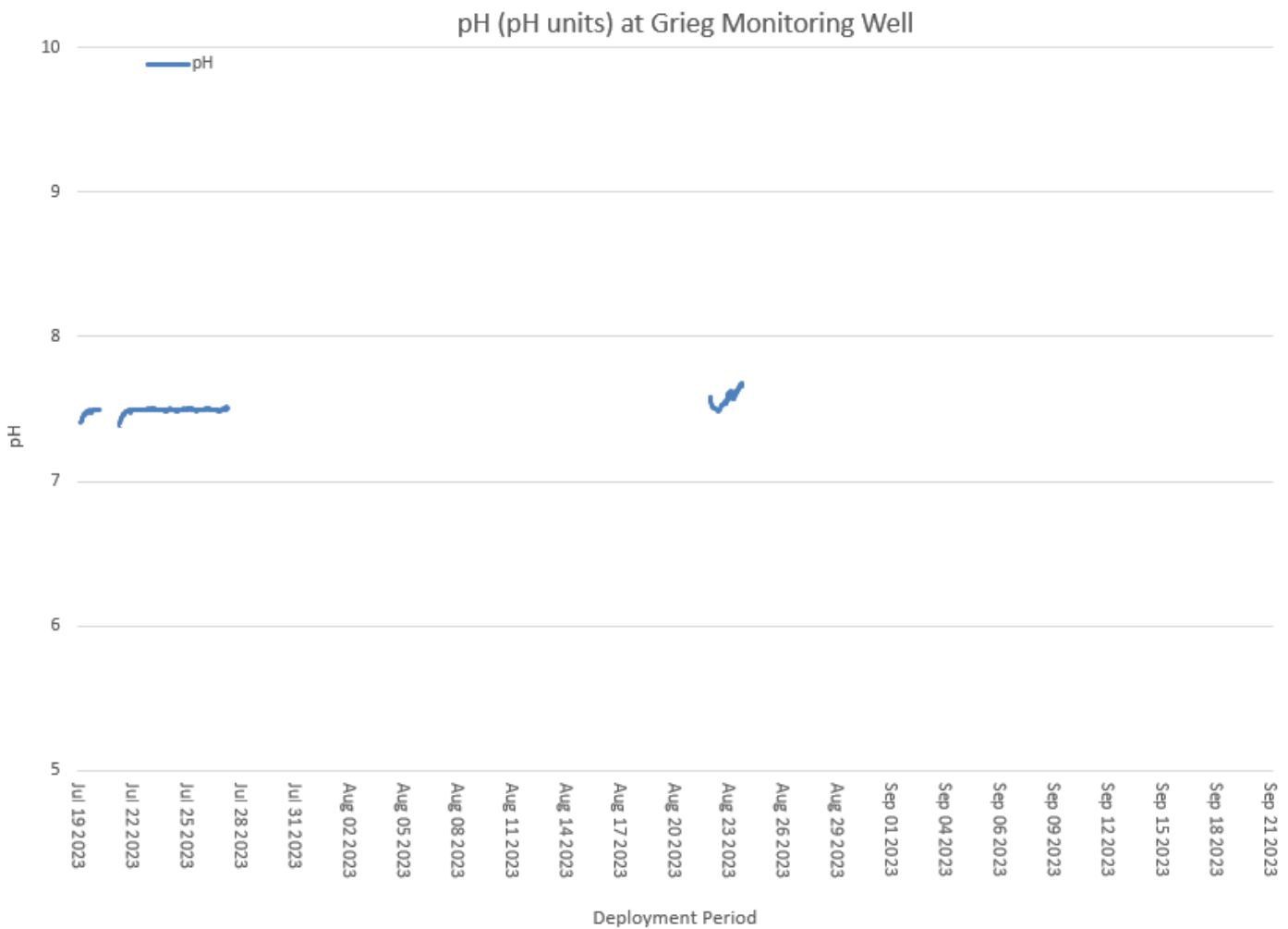


Figure 7: pH (pH units) values

Specific Conductivity & Total Dissolved Solids (TDS)

Between July 19th to July 25th, specific conductivity levels were within 296.9 $\mu\text{S}/\text{cm}$ and 321.5 $\mu\text{S}/\text{cm}$, with an average of 305.1 $\mu\text{S}/\text{cm}$. Throughout August 21st to August 24th, specific conductivity levels were within 277.6 $\mu\text{S}/\text{cm}$ and 309.6 $\mu\text{S}/\text{cm}$, with an average of 289.0 $\mu\text{S}/\text{cm}$ (Figure 8). The specific conductivity probe measures the presence of diluted salts and inorganic materials in a water source.

TDS data is derived from the specific conductivity data. The water quality instrument is programmed to calculate an estimated TDS value from a conductivity value. TDS data will mirror the movement of the specific conductivity data; however the TDS is calculated in g/L (Figure 9). TDS ranged within 0.19 g/L to 0.21 g/L during July 19th to 25th, and ranged within 0.18 g/L to 0.20 g/L between August 21st to August 24th.

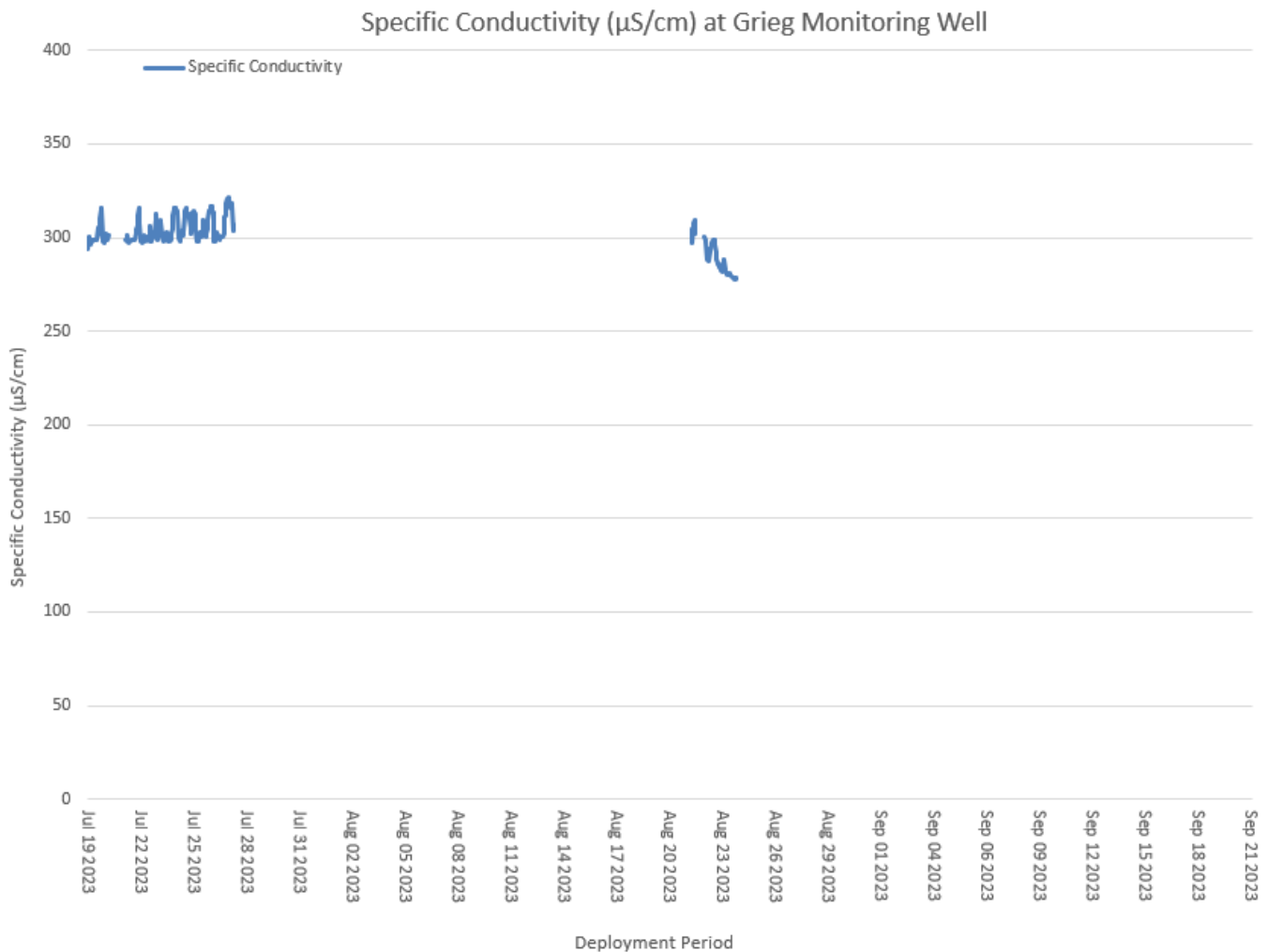


Figure 8: Specific conductivity ($\mu\text{S}/\text{cm}$) values

Total Dissolved Solids at Grieg Monitoring Well

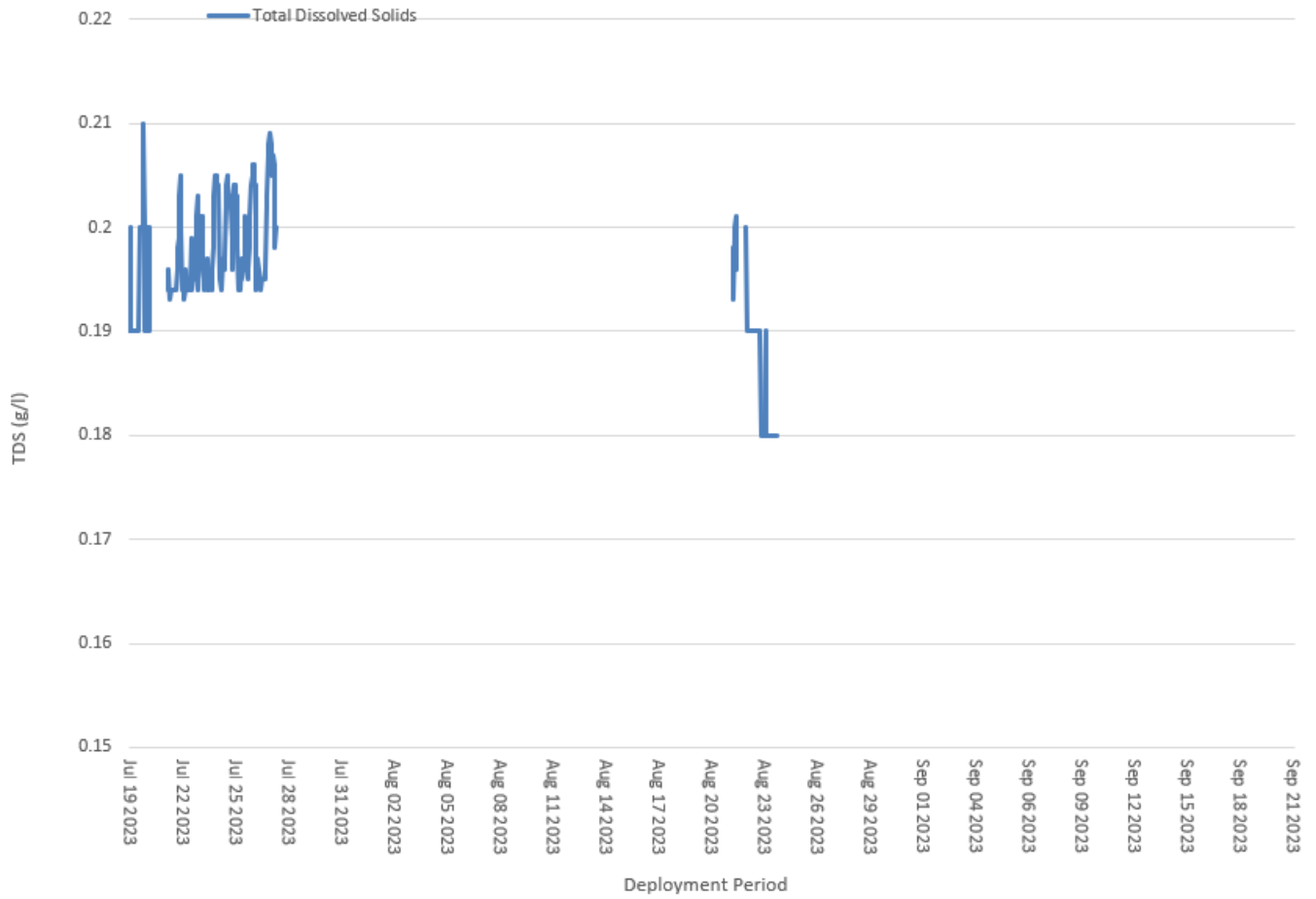


Figure 9: Total Dissolved Solids (TDS)

Oxidation-Reduction Potential (ORP)

ORP levels during July 19th to July 25th ranged within 209.3 mV to 324.8 mV with an average of 277.68 mV. Between August 21st and August 24th, ORP ranged within 126.4 mV to 214.8 mV with an average of 179.4 (Figure 11).

Oxidation-Reduction Potential is used to determine the oxidizing-reduction potential of the groundwater. The 'redox potential' of the groundwater can indicate the presence of agents that may contaminate groundwater. ORP is individual and specific to each water body and gathering background data is essential in understanding what the changes in the data represent.

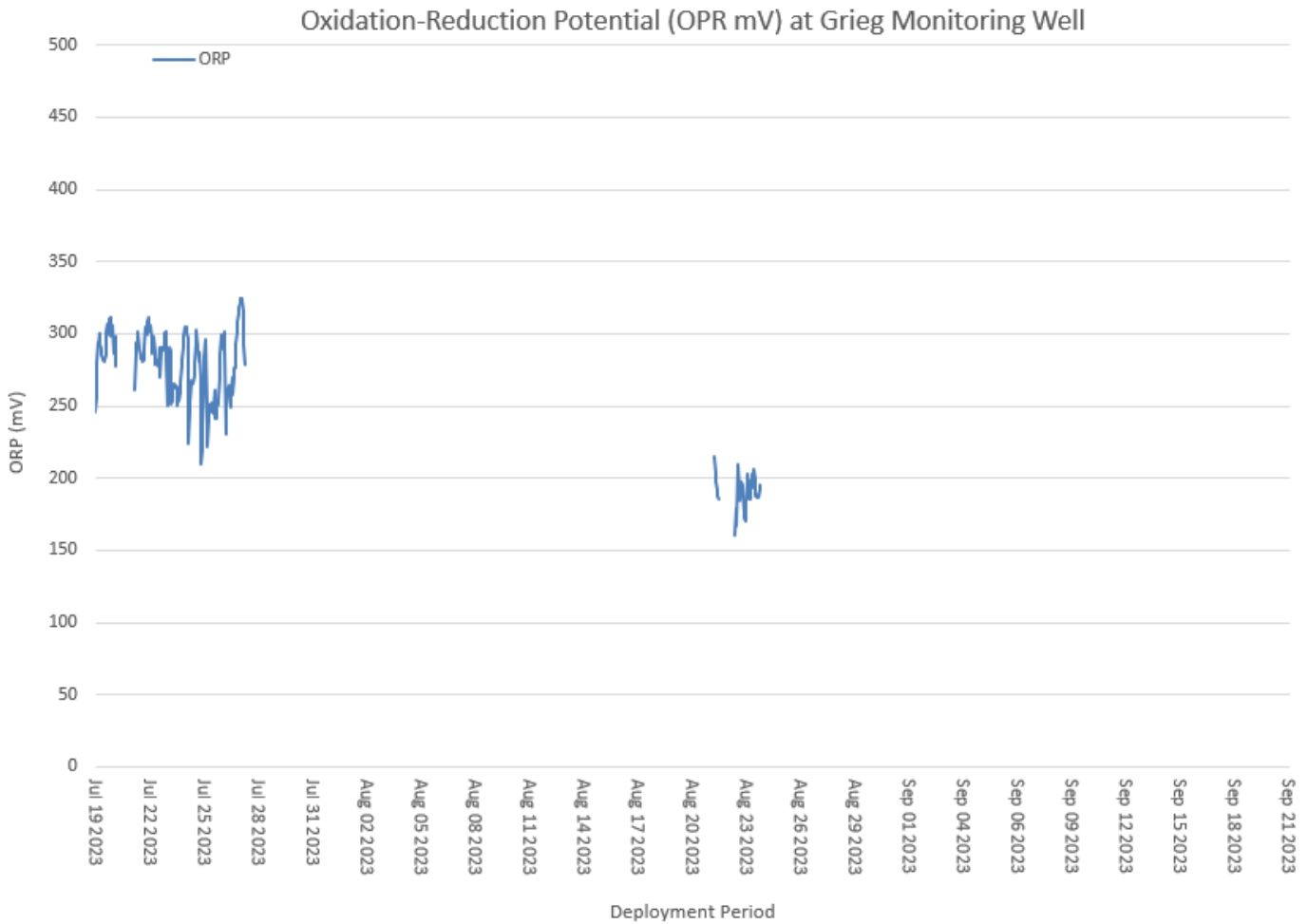


Figure 11: ORP values (mV)

Water Elevation

Water elevation at the monitoring well, ranged within 31.79 m to 34.53 m between July 19th to July 25th. The data set had an average of 33.30 m. Between August 21st to 24th, water elevation ranged within 33.4 m to 34.8 m with an average of 34.52 m Generally, water elevation within a groundwater well is consistent if the water is not drawn for use.

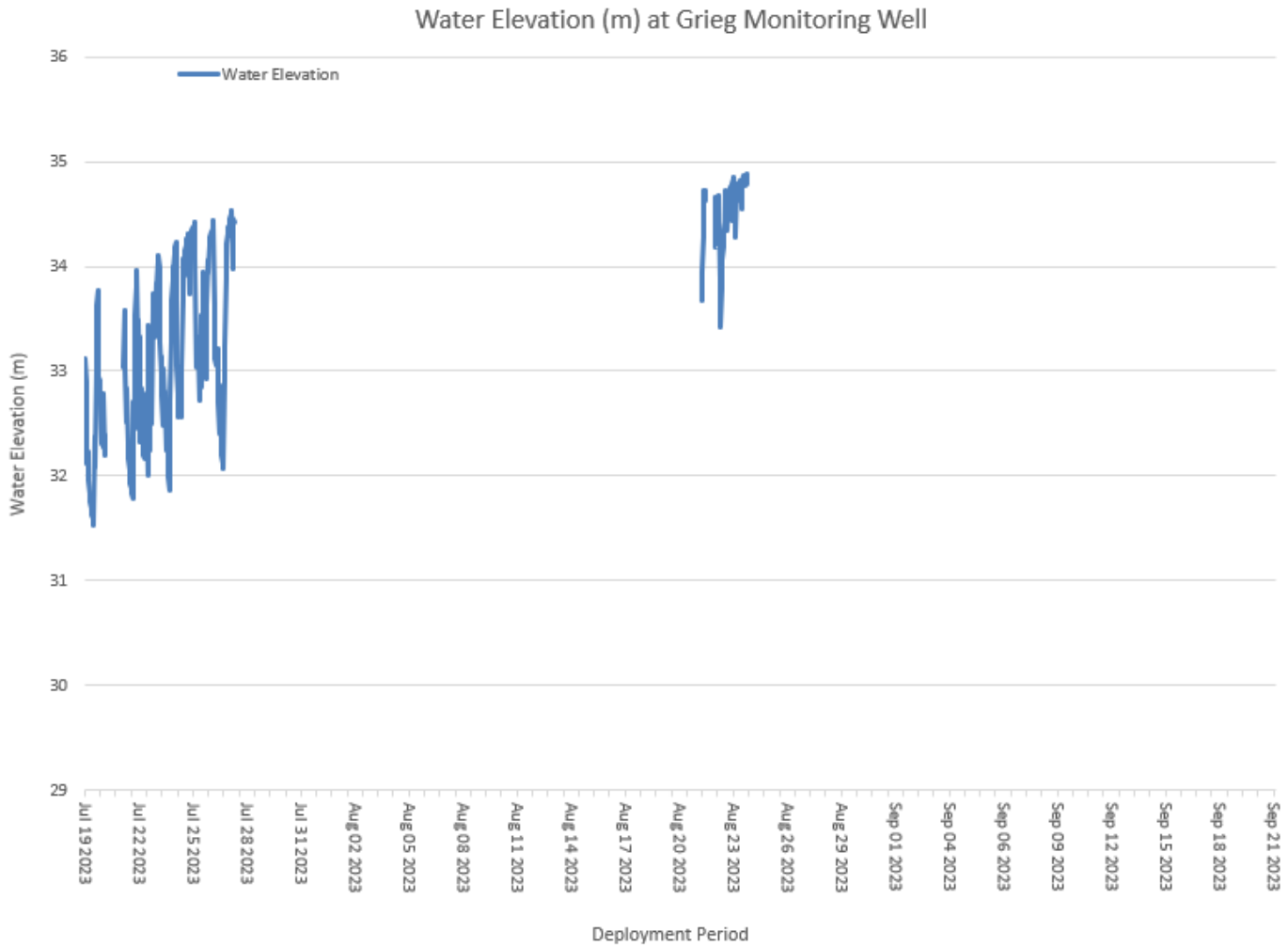


Figure 12: Water Elevation (m)

Appendix I

Water Quality Statistics of Grieg Groundwater Well

July 19th – July 25th

July 19-25	Water Temperature (oC)	pH (pH units)	Specific Conductivity (uS/cm)	TDS(g/L)	ORP (mV)	Water Elevation (m)
MIN	7.37	7.41	294.01	0.19	209.30	31.81
MAX	7.50	7.52	321.50	0.21	324.80	34.02
MEDIAN	7.41	7.50	301.65	0.20	284.10	32.63
MEAN	7.41	7.49	304.46	0.20	279.84	32.72

August 21st – August 24th

Aug. 21-24	Water Temperature (oC)	pH (pH units)	Specific Conductivity (uS/cm)	TDS(g/L)	ORP (mV)	Water Elevation (m)
MIN	7.31	7.48	277.61	0.18	159.80	33.62
MAX	7.43	7.68	309.60	0.20	214.80	35.08
MEDIAN	7.36	7.56	286.94	0.19	191.00	34.82
MEAN	7.36	7.57	289.00	0.19	190.52	34.68