



## **2022 to 2023 Groundwater Monitoring Report**

Villeneuve-Calahoo Gravel Extraction Area  
Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M

**Prepared for  
Sturgeon County**

**September 2023**

HCL Project No.: MR-0224.22  
© 2023 hydrogeological consultants ltd.



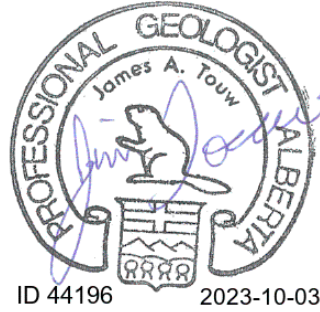
**Groundwater and Surface Water Solutions for a Changing Environment**

---

17740 – 118 Avenue NW, Edmonton, Alberta T5S 2W3 CANADA  
780.483.7240 • 800.661.7972 • [hcl.ca](http://hcl.ca)

# Signatures

Version	Date	Description	Prepared by	Assisted by
1	2023-09-28	Final Report		



Jim Touw, P.Geol.  
Senior Hydrogeologist

*Jennifer Catt*

Jennifer Catt, B.Sc.  
Project Administrator

<b>PERMIT TO PRACTICE</b>	
hydrogeological consultants ltd.	
Signature _____	11656
Date _____	2023-10-04
<b>PERMIT NUMBER P 385</b>	
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	

# TABLE OF CONTENTS

<b>Signatures</b> .....	<b>i</b>
<b>Executive Summary</b> .....	<b>iv</b>
<b>1. Introduction</b> .....	<b>1</b>
1.1. Purpose.....	1
1.2. Scope .....	2
<b>2. Methodology</b> .....	<b>3</b>
2.1. Existing Data Sources.....	3
2.2. Collection of New Data .....	4
2.3. Spatial Coordinates.....	5
2.4. Measurements .....	5
2.5. Other .....	5
<b>3. Background</b> .....	<b>6</b>
3.1. Maps and Aerial Imagery .....	6
3.2. General Hydrogeology .....	6
3.3. Villeneuve–Calahoo Sand and Gravel Extraction ASP .....	9
3.4. Groundwater Monitoring Well Network .....	10
<b>4. Results</b> .....	<b>11</b>
4.1. 2023 Site Visits .....	11
4.2. Water-Level Monitoring.....	11
4.3. Groundwater-Quality Monitoring.....	14
<b>5. Interpretation</b> .....	<b>18</b>
5.1. Water-Level Groups.....	18
5.2. Water-Level Summary .....	24
5.3. Groundwater Chemistry .....	26
<b>6. Conclusions</b> .....	<b>28</b>
<b>7. Recommendations</b> .....	<b>29</b>
<b>8. Bibliography</b> .....	<b>30</b>
<b>9. Supplementary Information</b> .....	<b>33</b>
9.1. Glossary of Terms.....	33
9.2. Glossary of Commonly Used Abbreviations, Acronyms, and Symbols .....	35
9.3. Stratigraphy of the “Undisturbed” Geology of Alberta.....	37
9.4. Guidelines for Canadian Drinking Water Quality – Summary Table.....	38

## LIST OF FIGURES

Figure 1. Index Map – Regional.....	1
Figure 2. Index Map – ASP.....	1
Figure 3. Bedrock Topography, Sturgeon County (adapted from HCL, 2001).....	6
Figure 4. Cross-Section B-B' (adapted from HCL, 2001).....	7
Figure 5. Hydrogeological Map (adapted from Bibby, 1974a, and Ozoray, 1972).....	8
Figure 6. 2022 and 2023 Gravel Pit Activity in the ASP.....	8
Figure 7. Typical Pit Wall.....	9
Figure 8. Groundwater Monitoring Well Network.....	10
Figure 9. Data Logger Monitoring Network.....	12
Figure 10. 2023 Piper Tri-Linear Diagram.....	15
Figure 11. Piper Tri-Linear Diagram for MW04-01 (May 2004 to June 2023).....	15
Figure 12. Monitoring Well Groupings Based on Proximity and Water-Level Change.....	18
Figure 13. Group 1 Hydrograph.....	19
Figure 14. Group 2 Hydrograph.....	20
Figure 15. Group 3 Hydrograph.....	21
Figure 16. Group 4 Hydrograph.....	22
Figure 17. Group 5 Hydrograph.....	23
Figure 18. Contoured Water-Level Change (Pre-Disturbance to June 2023).....	25
Figure 19. Sulfate Concentrations (June 2023).....	27

## LIST OF TABLES

Table 1. 2023 Field Observations.....	11
Table 2. Groundwater Monitoring Network Data Loggers.....	11
Table 3. 2023 Manual Water-Level Measurements.....	13
Table 4. Water-Level Control Points.....	24

## LIST OF APPENDICES

Appendix A – Sturgeon County Groundwater Monitoring Program

Appendix B – Monitoring Well Details

## Executive Summary

The Villeneuve–Calahoo Sand and Gravel Extraction Area Structure Plan (ASP) is an area in Sturgeon County (the County) within Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M.

Hydrogeological Consultants Ltd. (HCL) was retained by the County to monitor groundwater levels and groundwater quality within the ASP, and to present and review the data as part of a groundwater monitoring report associated with the activities of the sand and gravel extractions in the area. The present report, with information to June 2, 2023, includes the data collected since the previous groundwater monitoring report.

Groundwater monitoring began in 2001; the monitoring involves measuring water levels in and collecting groundwater samples from the monitoring wells for chemical analysis. In May and June 2023, data were collected from 21 monitoring wells and 7 private water wells. All monitoring sites are near operating, suspended, or reclaimed gravel pit operations.

The chemical-quality data show that there have been no significant changes in groundwater quality because of gravel extraction. There are elevated concentrations of uranium and arsenic in the groundwaters from four monitoring wells, but these are naturally occurring elements, and the elevated concentrations are believed to represent natural conditions. There have been elevated concentrations of chloride and sulfate in the past, but these are isolated events and are not believed to be related to gravel extraction. In 2023, the antimony concentration was elevated in the groundwater from one monitoring well.

Between 2015 and 2018, water levels in the northwestern part of the ASP declined by as much as approximately 10 metres as a result of nearby active gravel mining operations; however, the water levels in the northwestern part of the ASP have remained relatively constant over the last four years. The expectation is that the water levels will rise once gravel operations cease in the area.

The water-level monitoring data continue to document the low level of impact on groundwater supplies that is resulting from gravel extraction. The groundwater-quality monitoring data show no indication that the aggregate mining or processing activities in the area have had a significant effect on the groundwater quality.

It is recommended that the present groundwater monitoring program be continued. It is also recommended that:

- Local operators share future mining plans to allow for new monitoring wells to be added to the groundwater monitoring program in advance of mining operations
- An abbreviated hydrogeological assessment be completed for the SW 28-054-27 W4M within the Group 1 area before mining activities begin in the quarter section
- The Sturgeon River water-level elevation be added to the monitoring network

# 1. Introduction

The Villeneuve–Calahoo Sand and Gravel Extraction Area Structure Plan (ASP) is situated within Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M, 32 kilometres northwest of the City of Edmonton, as shown in Figure 1, and approximately 5 to 20 kilometres northwest of the City of St. Albert, as shown in Figure 2.

## 1.1. Purpose

Hydrogeological Consultants Ltd. (HCL) was retained by Sturgeon County (the County) to monitor groundwater levels and groundwater quality within the ASP associated with the sand and gravel extraction activities in the area, and to prepare the present report. The present report includes information to June 2, 2023.

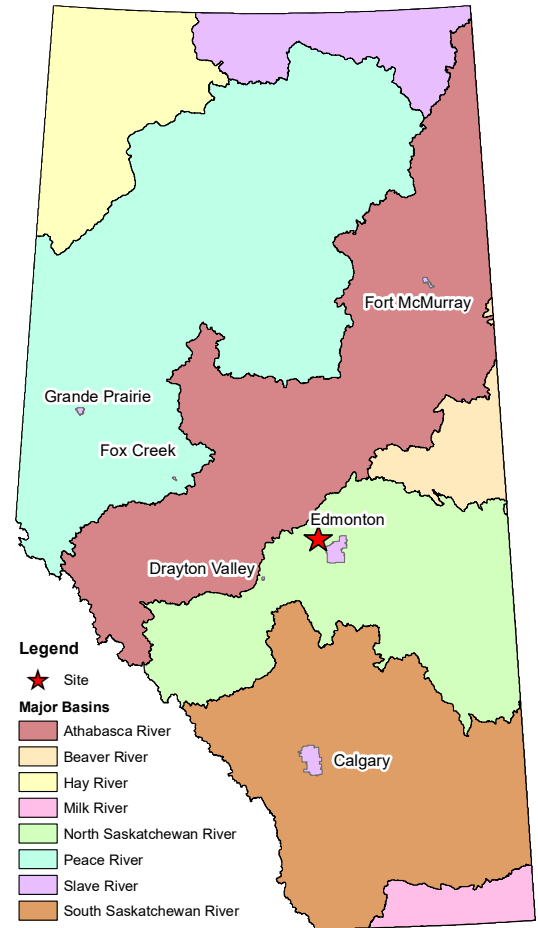


Figure 1. Index Map – Regional

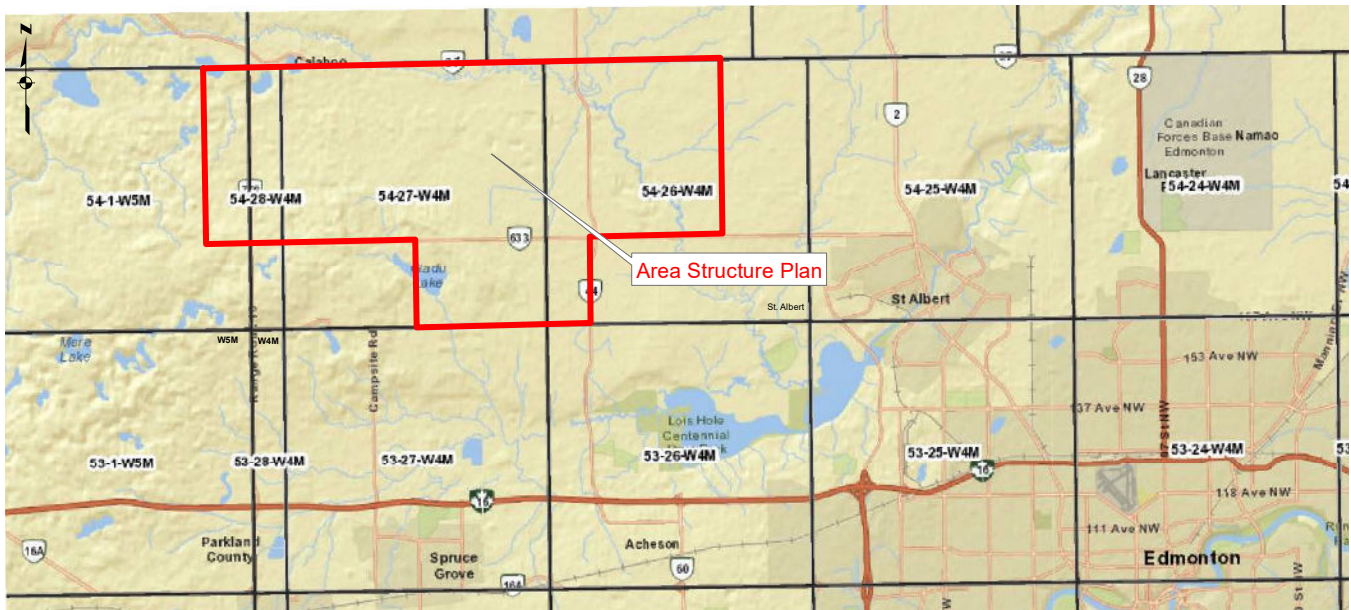


Figure 2. Index Map – ASP

## 1.2. Scope

The present program included the processing of water-level data provided by the County; annual collection of groundwater samples for chemical and physical analyses;<sup>1</sup> analysis and interpretation of the hydrogeological data; preparation of a report; and presentation of the results at a gravel committee meeting. The report includes data collected as part of the present program and documents the collection, synthesis, and interpretation of the data.

The Terms of Reference for the groundwater monitoring program are included in Appendix A. Schedule B of the Terms of Reference lists 21 monitoring wells (MWs) that are to be included as part of the present monitoring report. Addendums to Schedule B resulted in the replacement of one monitoring well, the addition of nine monitoring wells, and the removal of two monitoring wells as itemized below, for a total of 28 monitoring wells:

- MW07-4-14, referred to in Schedule B, was replaced by MW10-01 in June 2010.
- MW05-01 and MW18-01 were added to the groundwater monitoring program in 2018.
- MW11-01 was removed from the groundwater monitoring program in 2020.
- Four domestic water wells<sup>2</sup> were added to the groundwater monitoring program in 2020:
  - 1963 Water Well 12-19 (1963 WW 12-19)
  - 2001 Water Well 14-21 (2001 WW 14-21)
  - 2001 Water Well 16-28 (2001 WW 16-28)
  - 2013 Water Well 01-29 (2013 WW 01-29)
- MW01-03 was reclaimed in March 2022 at the request of the landowner and removed from the groundwater monitoring program.
- Two domestic water wells<sup>2</sup> were added to the groundwater monitoring program in 2022:<sup>3</sup>
  - 1995 Water Well 09-34 (1995 WW 09-34)
  - 2006 Water Well 10-34 (2006 WW 10-34)
- One domestic water well was added to the groundwater monitoring program in 2023:<sup>4</sup>
  - 1987 Water Well 13-26 (1987 WW 13-26)

---

<sup>1</sup> In 2020, the frequency of groundwater sample collection was changed from twice per year to once per year; groundwater samples from the 28 monitoring wells for the current monitoring program were analyzed for routine parameters and dissolved metals.

<sup>2</sup> Per Sturgeon County policy, identifying information for the domestic water well owners has been redacted in the present report.

<sup>3</sup> Water levels in the two domestic water wells have been measured since 2020 as part of other monitoring programs in the area.

<sup>4</sup> Water levels in this domestic water well have been measured since the fall of 2022 as part of other monitoring programs in the area.

## 2. Methodology

### 2.1. Existing Data Sources

#### 2.1.1. Maps and Aerial Imagery

The map reference used is the 1:250,000 National Topographic Series map sheet, with local detail available from the 1:50,000 map sheet.

Digital ortho-imagery is obtained from various websites, depending on the detail available for the area of study (AOS).

#### 2.1.2. Data from Government Sources

##### 2.1.2.1.1. Alberta Water Well Information Database

The Alberta Water Well Information Database<sup>5</sup> includes water well records prepared by water well drillers, water wells identified during various field programs with little or no information, and boreholes with varying amounts of information. The database also includes groundwater-quality information from before 1988 for groundwaters from some water wells. Data collected since 2006 as part of the Baseline Water Well Testing Program are in the Alberta Water Well Information Database.

Many of the records in the Alberta Water Well Information Database have horizontal spatial control based on a land location rather than a point location, and there is very little quality control related to the verification of the land location. Historically, the most commonly used designation is a quarter section, with an area of 640,000 square metres, and the horizontal coordinates given for the water well are the centre of the quarter section. More recently, horizontal coordinates are determined by the water well driller using a consumer-grade handheld GPS (global positioning system receiver).

##### 2.1.2.1.2. Alberta Geological Survey

The Alberta Geological Survey (AGS) regional groundwater reports are referenced and various AGS shapefiles are used as required.

#### 2.1.3. Data from Non-Government Sources

##### 2.1.3.1. The Groundwater Centre Database

The Groundwater Centre (TGWC) is HCL's in-house database of groundwater information for the province of Alberta. The extensive database maintained by TGWC includes records for features within Alberta that directly and indirectly relate to non-saline and saline groundwater.

The data in TGWC database that are related to non-saline groundwater are enhanced versions of the data in the Alberta Water Well Information Database. TGWC database for the AOS also houses hydrogeological data collected during the present program.

Unless more detailed information is available, the horizontal coordinates assigned to groundwater records are the centres of their reported legal locations.

---

<sup>5</sup> <http://groundwater.alberta.ca/WaterWells>



Information in TGWC database has been used in the preparation of thematic maps and to determine regional aquifer parameters.

### 2.1.3.2. HCL Hydrogeology Database

HCL maintains a database of geologic units (geounits) for the geologically undisturbed part of the province. The database includes surface contours for the tops of individual geounits; these surfaces are used on cross-sections and various figures in this report.

### 2.1.4. Published and Unpublished Reports

The Bibliography in Section 8 of this report includes documents that relate to hydrogeology in the general area of the present project.

## 2.2. Collection of New Data

### 2.2.1. Groundwater Sampling

Groundwater samples are collected wearing fresh nitrile gloves for each sampling site. The sample bottle(s) are rinsed with the groundwater to be sampled, unless the sample bottle contains preservatives provided by the laboratory doing the analysis. When samples are collected, the sample bottles are filled to capacity with little or no air space remaining. If the analysis is for dissolved metals, samples are field filtered using a 0.45 micron in-line disposable filter.

Groundwater-quality parameters analyzed by a laboratory can include chemical, physical, and microbiological parameters, which may include the following: (1) Inorganic Non-Metallic; (2) Dissolved Metals; (3) Total Metals; (4) Microbiological; (5) Routine Water; and (6) Physical and Aggregate properties. The groundwater samples are stored in a cooler with ice packs for transport to the laboratory, which is accredited in Alberta to perform the requested analyses.

Field parameters (pH, temperature, and electrical conductivity) are measured after laboratory samples are collected.

The groundwater samples are collected according to the procedures outlined in the HCL field manual.

#### 2.2.1.1. Sampling from a Monitoring Well

The purging and groundwater sampling procedures are to be performed using a dedicated, a new, or a newly cleaned sampling device for each monitoring well.

Each monitoring well is purged prior to sampling to ensure that the groundwater samples are representative of the aquifer. This involves the removal of groundwater until electrical conductivity, pH, and temperature measurements have stabilized. Electrical conductivity of the purged groundwater is measured and recorded by a data logger. In the case of a monitoring well that cannot supply sufficient volumes for conductivity to stabilize, the monitoring well is purged until dry.

After purging and recovery (if necessary), groundwater samples are collected using a small diameter submersible pump; the sampling equipment is decontaminated between monitoring locations. If available, dedicated sampling equipment that has been previously installed in a monitoring well is used to collect groundwater samples.

## 2.3. Spatial Coordinates

Horizontal coordinates are based on a 10-degree Transverse Mercator AEPA (Alberta Environment and Protected Areas) Resource projection, with the central meridian of 115 degrees west longitude, using NAD83 (North American Datum of 1983). Horizontal coordinates are determined for features identified in the field using a consumer-grade handheld GPS. Vertical coordinates are from the digital elevation model (DEM) provided by AltaLIS Ltd., the agent for Alberta Data Partnerships Ltd.

## 2.4. Measurements

Vertical measurements associated with the present report may have been recorded to two or more decimal places. However, most vertical measurements are provided in the report to one decimal place and may therefore not agree with the number of decimals presented in the appendices and in tables. The reference point for water-level measurements is the top of casing, and all water-level measurements are reported as metres below top of casing (BTOC) unless otherwise noted; most other vertical measurements are reported as metres below ground level (BGL).

## 2.5. Other

All gridding uses the Kriging method with a linear variogram model as provided in Surfer, a Golden Software program. Cross-sections are created using AutoCAD and, for illustrative purposes, are enhanced using CorelDRAW. Maps are created and analyzed in ArcGIS.

### 3. Background

#### 3.1. Maps and Aerial Imagery

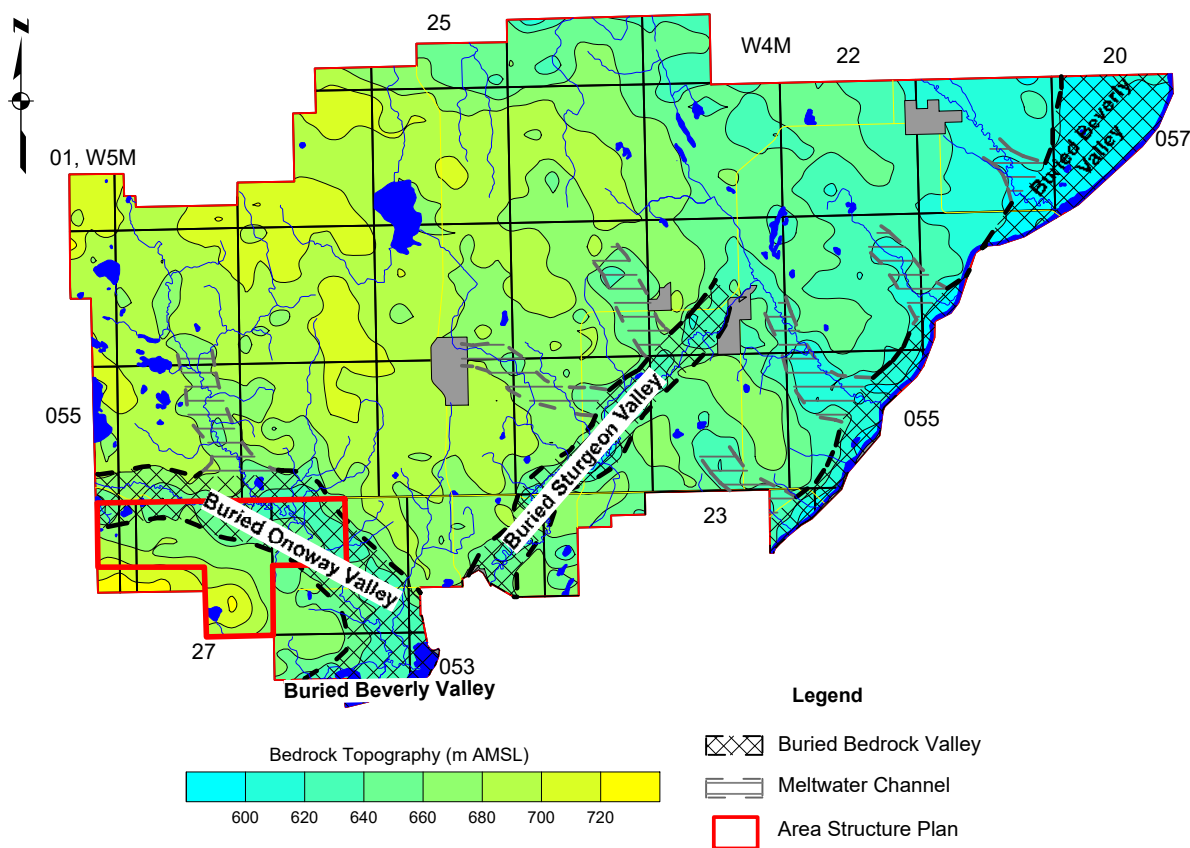
The area of study is situated within the 83G and 83H 1:250,000 National Topographic Series map sheets, with local detail available from the 1:50,000 83G09 and 83H12 map sheets. Digital topographic control is from the 1:20,000 DEM prepared by AltaLIS Ltd.

Digital ortho-imagery for the present program was obtained from Lafarge Canada Inc. (Lafarge) and Google Inc.

#### 3.2. General Hydrogeology

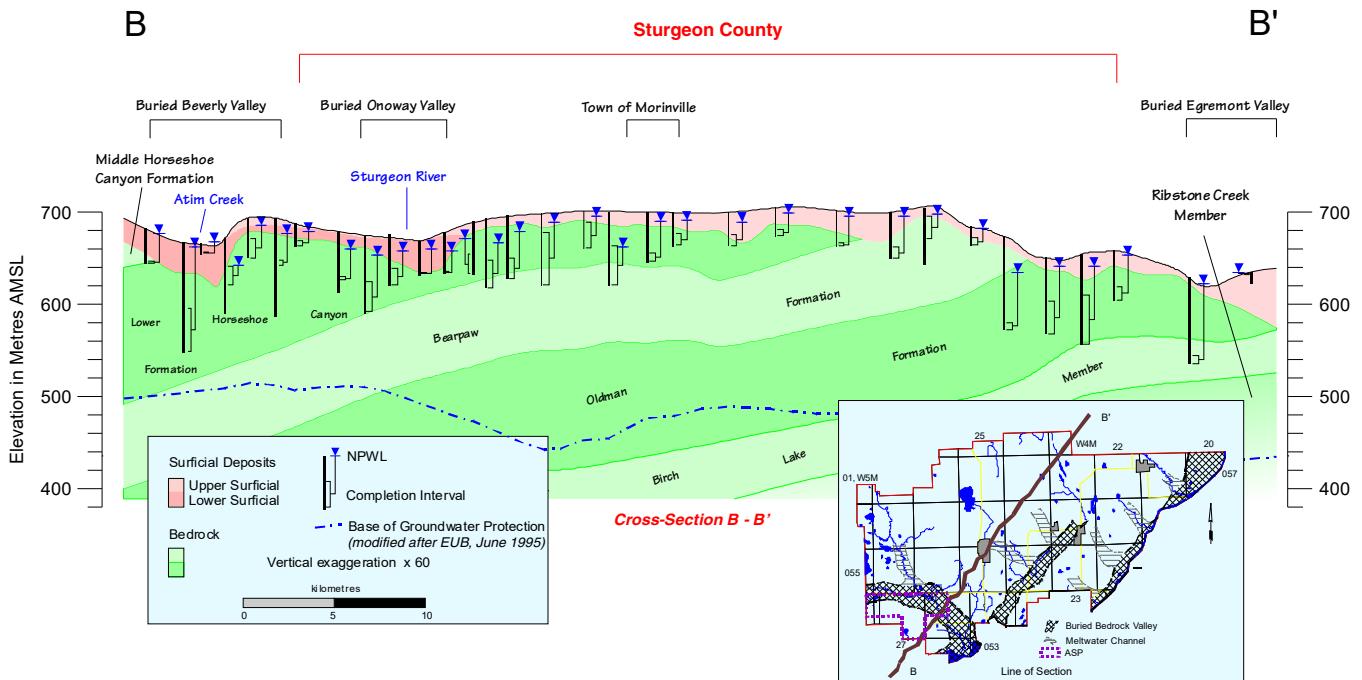
The regional groundwater assessment for Sturgeon County (HCL, 2001) shows the presence of a linear bedrock low identified as the Buried Onoway Valley in the southwestern part of the County. The Buried Onoway Valley mainly parallels the stretch of the present-day Sturgeon River northwest from St. Albert to Calahoo and to the County border. The Buried Onoway Valley is 2 to 8 kilometres wide within the County, with local bedrock relief up to 60 metres. Sand and gravel deposits can be expected in association with this bedrock low, with the thickness of the sand and gravel deposits being generally less than 25 metres.

Figure 3 is a bedrock topography map showing that the Buried Onoway Valley underlies the northern and eastern portions of the ASP and is oriented in a northwest to southeast direction.



**Figure 3. Bedrock Topography, Sturgeon County (adapted from HCL, 2001)**

In the County, the upper bedrock includes the Horseshoe Canyon, the Bearpaw, and the Oldman formations, and the Birch Lake Member, which is part of the Foremost Formation. Figure 4 shows that the uppermost bedrock underlying the Buried Onoway Valley is the lower part of the Horseshoe Canyon Formation, which is comprised of mudstone, sandstone, and carbonaceous shale. The Buried Onoway Valley is shown on the left-hand side of the cross-section, which is in the southwestern part of the County. The Buried Onoway Valley is associated with deposits of sand and gravel that comprise a regional aquifer, which is a groundwater source for some residents in the Sturgeon County area. The base of the Buried Onoway Valley is approximately 40 metres BGL, an elevation of approximately 640 metres above mean sea level (AMSL).



**Figure 4. Cross-Section B-B' (adapted from HCL, 2001)**

Figure 5 on the following page is a hydrogeological map for the area showing that the thalweg of the Buried Onoway Valley (Thalweg) passes beneath the northern and eastern parts of the ASP. The map also shows that groundwater yields from water wells completed in the ASP are expected to vary from 5 to 650 cubic metres per day (m<sup>3</sup>/day). The locations of the 28 monitoring wells that are included as part of the present groundwater monitoring program are also shown in Figure 5.

Stantec Consulting Ltd. (Stantec, 2009) stated that the sand and gravel aquifer within the Buried Onoway Valley is overlain by a confining layer; in the western part of the ASP, the potentiometric surface is above the bottom of the confining layer, resulting in artesian conditions, while in the southeastern part of the ASP, groundwater levels are within the aquifer, indicating unconfined conditions.

Figure 6 on the following page shows the 2022 and 2023 mining and reclamation activities of Lafarge and Heidelberg Materials Canada Limited (Heidelberg Materials) within the ASP.<sup>6</sup>

<sup>6</sup> Activity locations provided by Lafarge and Heidelberg Materials.

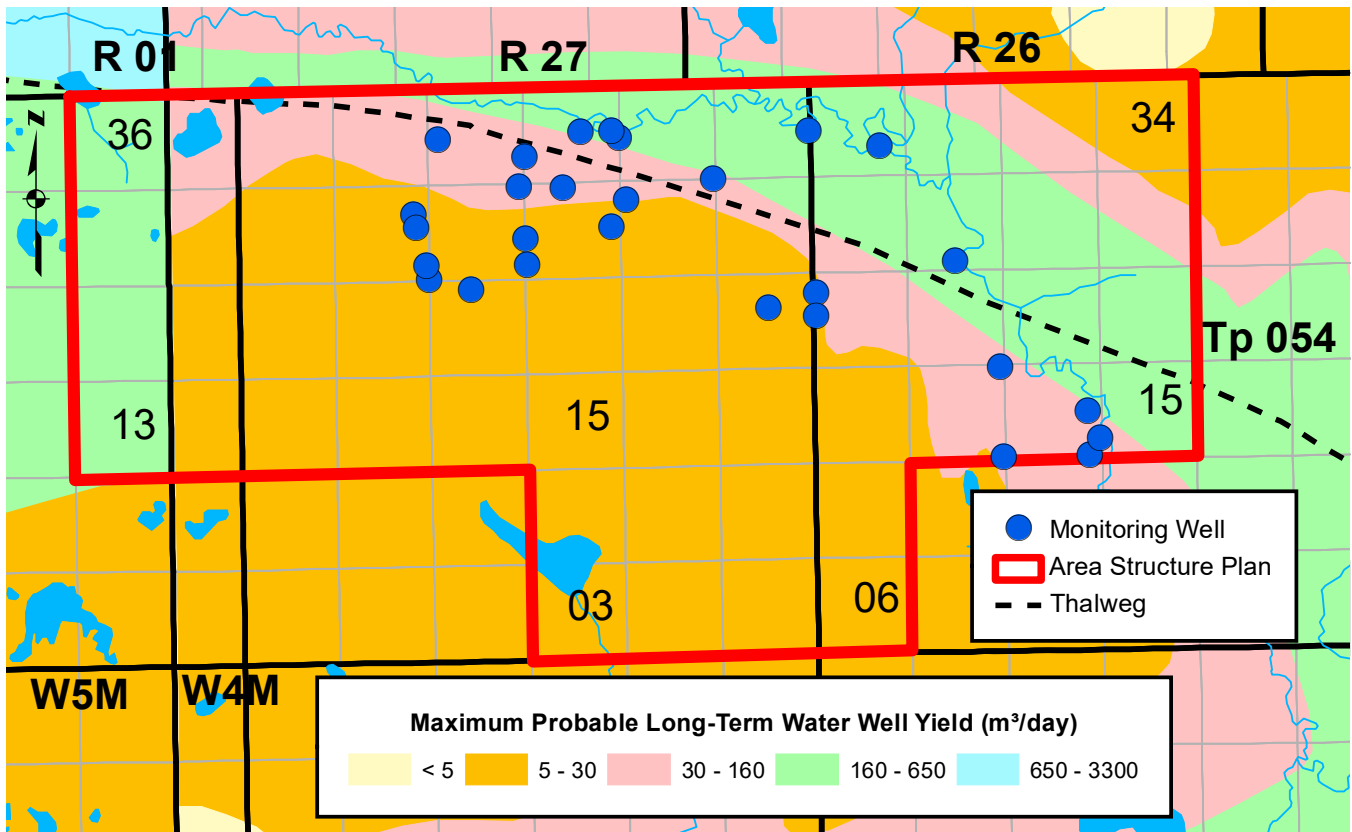


Figure 5. Hydrogeological Map (adapted from Bibby, 1974a, and Ozoray, 1972)

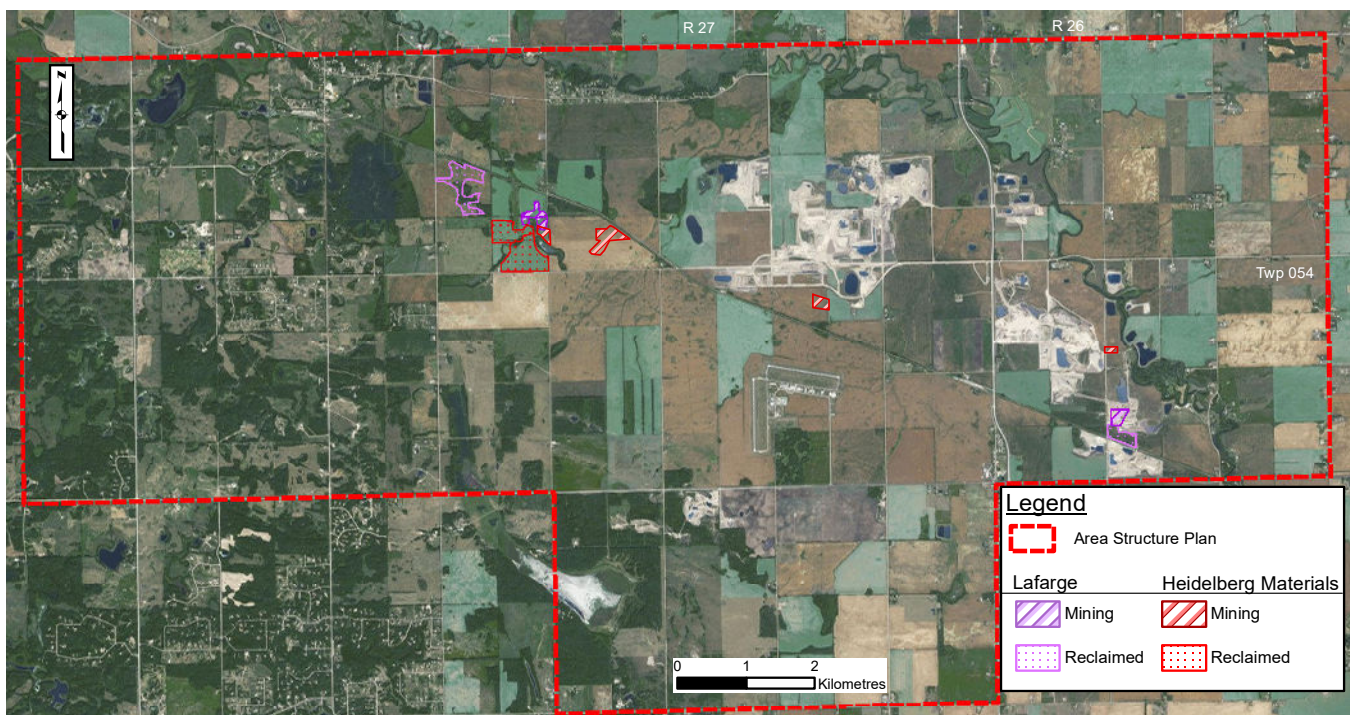


Figure 6. 2022 and 2023 Gravel Pit Activity in the ASP

### 3.3. Villeneuve–Calahoo Sand and Gravel Extraction ASP

County personnel have indicated that the practice for gravel companies within the Villeneuve–Calahoo gravel extraction area is to remove all the gravel deposits once they are exposed. The typical geologic materials in the gravel areas are clay, underlain by sand deposits, gravel layers, and bedrock; an example of a typical pit wall is shown in Figure 7. A gravel pit generally encounters the top of gravel at an approximate depth of 9 metres BGL and the top of bedrock at an approximate depth of 18 metres BGL, although these depths can change significantly from one area to the next.



**Figure 7. Typical Pit Wall**

The County has also stated that reclamation is typically carried out after gravel from a pit has been extracted. The materials used for reclamation are the unused sand and the clay strippings from the new pit. Once reclamation is completed, topsoil is spread onto the fields and the area is reclaimed as farmland, which is seeded and returned to the landowner; land that cannot be reclaimed is converted into lakes or ponds.

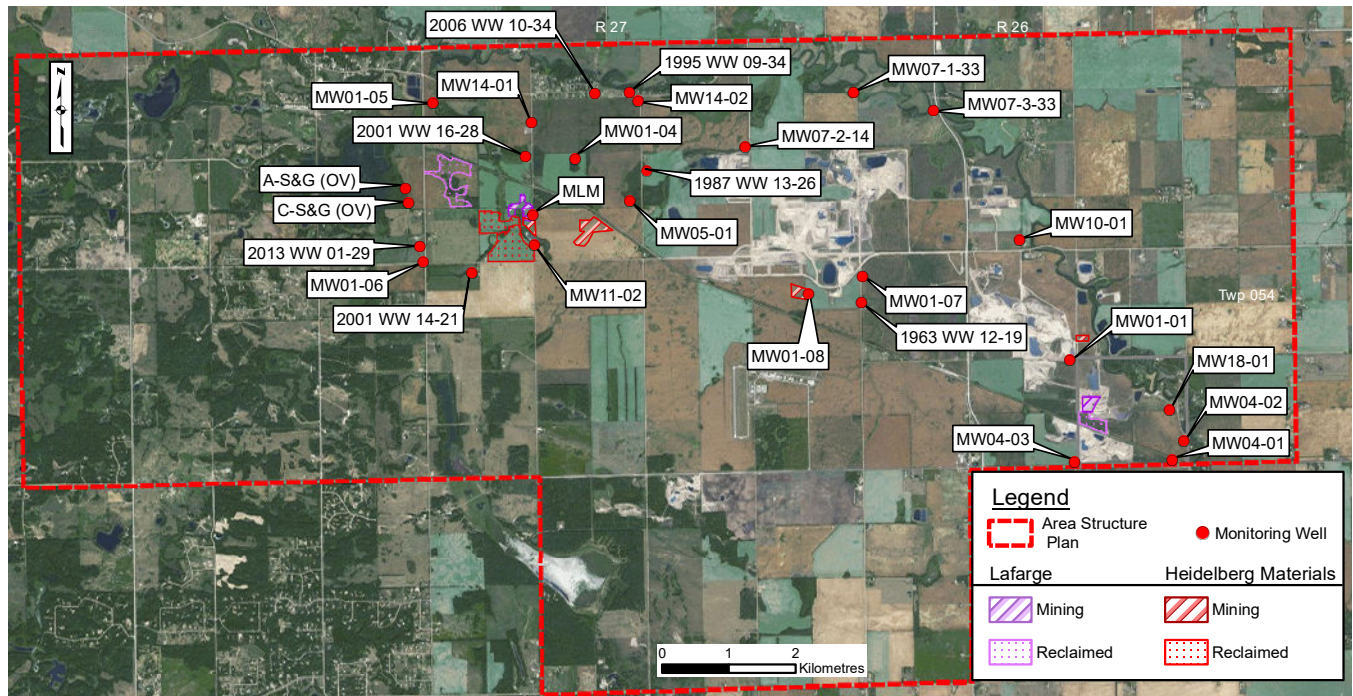
In areas where the bottom of the aggregate is below the top of the saturated zone, dewatering of pits is required for extraction. By employing a pit-to-pit dewatering scheme, the loss of groundwater is restricted to evaporation from pits and the groundwater that adheres to the gravel that is being trucked off site. However, the replacement of the sand and gravel aquifer with a thinner layer of less permeable material has the potential to create mounding of the water-level surface in areas upgradient from the reclaimed areas. Therefore, the present groundwater monitoring program has four main purposes:

- To determine the local drawdown effects of dewatering
- To determine the extent of groundwater mounding in upgradient areas
- To determine whether the extraction and reclamation process is affecting groundwater quality
- To determine if sand and gravel extraction is affecting local groundwater users

### 3.4. Groundwater Monitoring Well Network

The current groundwater monitoring well network includes 28 monitoring wells that are completed in the Buried Onoway Valley sand and gravel deposits within the ASP. The six monitoring wells in the MW01 series were installed in 2001 in support of a lower sand and gravel groundwater assessment (UMA, 2001). MW04-01 and MW04-02 were installed in 2004 on behalf of Yellowhead Aggregates (Westerra, 2004a); MW04-03 was installed in 2004 on behalf of Lafarge (Westerra, 2004b). MW05-01 was completed in 2005 on behalf of Inland Aggregates Ltd. (Inland). A-S&G (OV) and C-S&G (OV) were installed in 2007 in support of the Calahoo Bog Groundwater Study for Lafarge (Westwater, 2007). The three monitoring wells in the MW07 series were installed in 2006 and 2007 under the direction of Stantec on behalf of the County (Stantec, 2008). MW10-01 was drilled in 2010 on behalf of the County. MW11-02 was drilled in 2011 on behalf of Inland. MW14-01 and MW14-02 were installed in 2014 on behalf of the County. MW18-01 was drilled in the summer of 2018 on behalf of Heidelberg Materials. The MLM site is from the 1980s; very little completion information is available for this monitoring well. The four private water wells that were included in the groundwater monitoring program in 2020 were drilled between 1963 and 2013. Two private water wells that were drilled in 1995 and 2006 were added to the groundwater monitoring program in 2022. One private water well that was drilled in 1987 was added to the groundwater monitoring program in 2023. Two additional groundwater monitoring programs in the ASP, which include eight other private water wells, are conducted by HCL on behalf of other companies in the area.<sup>7</sup>

Figure 8 is a map of the groundwater monitoring well network. Monitoring well details are in Appendix B.



**Figure 8. Groundwater Monitoring Well Network**

<sup>7</sup> HCL Project No. MR-0227 is conducted on behalf of Lafarge; HCL Project No. MR-0346 is conducted on behalf of Heidelberg Materials.

## 4. Results

### 4.1. 2023 Site Visits

HCL personnel were on site in the spring of 2023 between May 29 and June 2; results from the 2022 site visits were presented in the previous groundwater monitoring report (HCL, 2022). During the 2023 site visits, water levels in the monitoring wells were measured, data loggers were downloaded, and groundwater samples were collected for chemical analysis and measurement of field parameters.

Notable field observations made by HCL personnel during the 2023 site visits are summarized in Table 1.

Monitoring Well	TGWC ID	Date	Observation	Action
MW10-01	M40337.575466	2023-06-01	Solinst LevelVent 5 data logger issue	Sent data logger to manufacturer on 2023-06-05 for repair under warranty.
MW18-01	M43326.424846	2023-06-02	Solinst LevelVent 5 data logger issue	Sent data logger to manufacturer on 2023-06-02 for repair under warranty; installed a backup LevelVent 5 data logger on 2023-06-02.

**Table 1. 2023 Field Observations**

### 4.2. Water-Level Monitoring

HCL personnel manually measured the water levels in 28 monitoring wells during the 2023 site visits. Water levels were measured to the nearest centimetre from the top of the monitoring well casing using a water-level tape. Data loggers are installed in 26 of the 28 monitoring wells, as shown in Table 2. Each data logger is programmed to record a water-level measurement every hour. Figure 9 on the following page identifies the monitoring wells within the ASP that are equipped with data loggers. Water levels in MW07-1-33 and MW07-3-33 are manually measured during the annual site visits.

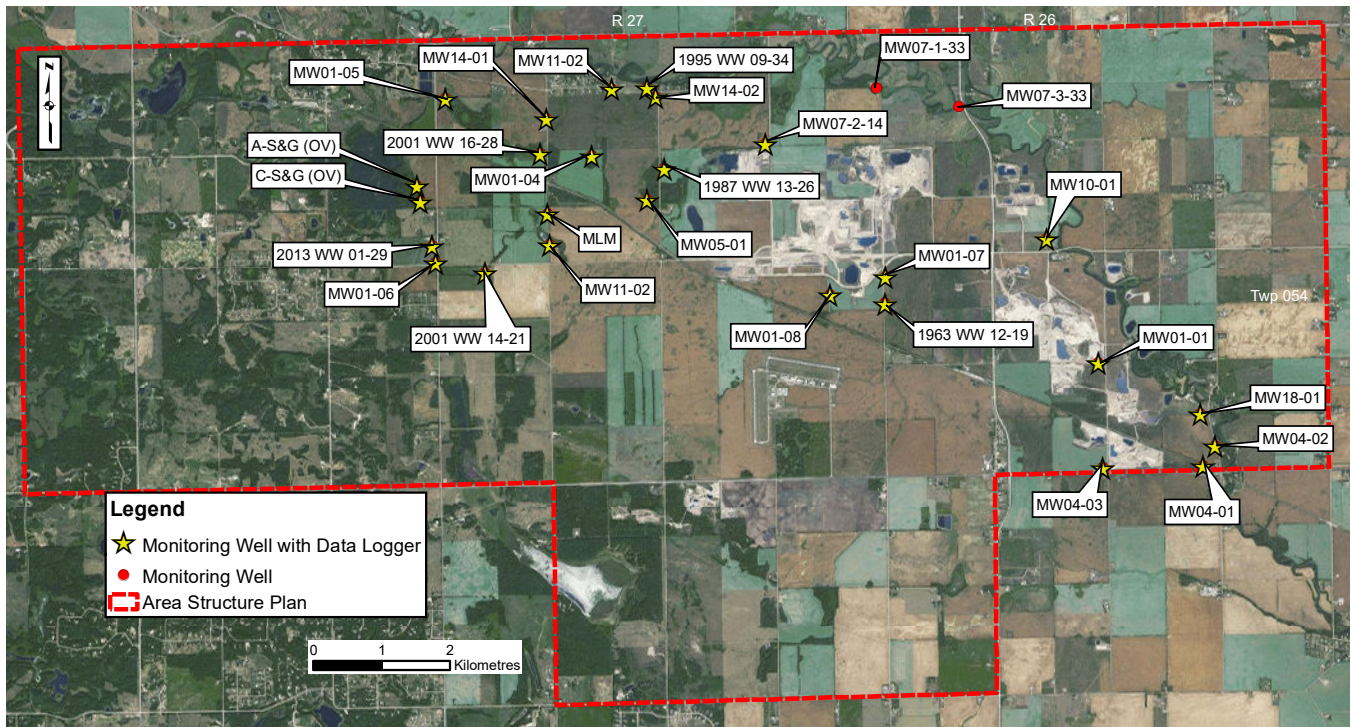
Monitoring Well	AEPA GIC ID	AEPA Approval No.	Required Monitoring Frequency	Data Logger Installed
A-S&G (OV)	–	00314180-00-00	Hourly	Yes
C-S&G (OV)	–	00314180-00-00	Hourly	Yes
MLM	–	00300286-00-00	Weekly	Yes
		00314180-00-00	Monthly	
MW01-01	–	–	–	Yes
MW01-04	–	00300286-00-00	Weekly	Yes
		00314180-00-00	Monthly	
MW01-05	–	00314180-00-00	Monthly	Yes
MW01-06	–	00300286-00-00	Weekly	Yes
		00314180-00-00	Monthly	
MW01-07	297525	–	–	Yes
MW01-08	297529	–	–	Yes
MW04-01	1270001	–	–	Yes
MW04-02	1270002	–	–	Yes
MW04-03	1270003	–	–	Yes

**Table 2. Groundwater Monitoring Network Data Loggers**



**Table 2. Groundwater Monitoring Network Data Loggers (cont.)**

Monitoring Well	AEPA GIC ID	AEPA Approval No.	Required Monitoring Frequency	Data Logger Installed
MW05-01	1495114	–	–	Yes
MW07-1-33	1420667	–	–	No
MW07-2-14	1420665	00314180-00-00	Monthly	Yes
MW07-3-33	1420666	–	–	No
MW10-01	–	–	–	Yes
MW11-02	–	–	–	Yes
MW14-01	–	–	–	Yes
MW14-02	–	–	–	Yes
MW18-01	–	–	–	Yes
1963 WW 12-19	–	–	–	Yes
1987 WW 13-26	264252	–	–	Yes
1995 WW 09-34	–	–	–	Yes
2001 WW 14-21	40335	–	–	Yes
2001 WW 16-28	297091	–	–	Yes
2006 WW 10-34	1715169	–	–	Yes
2013 WW 01-29	1495598	–	–	Yes



**Figure 9. Data Logger Monitoring Network**

Table 3 summarizes the manual water-level measurements recorded in 2023 by HCL personnel, prior to purging the monitoring wells. HCL personnel measured the water levels in metres BTOC; Table 3 displays the water levels in metres BGL (calculated by subtracting the casing stick-up from the water level in metres BTOC), as well as the water-level elevations in metres AMSL. For the monitoring wells that were not surveyed, the water-level elevations in metres AMSL were calculated by subtracting the depth to water in metres BGL from the ground elevation determined from the 1:20,000 DEM prepared by AltaLIS Ltd.

Monitoring Well Name	TGWC ID	Legal Location (W4M)	2023 Manual Water-Level Measurement	
			m BGL	m AMSL
A-S&G (OV)	M40000.652035	09-29-054-27	8.26	677.54
C-S&G (OV)	M40000.652664	09-29-054-27	9.41	678.49
MLM	M40000.651289	05-27-054-27	14.50	671.70
MW01-01	M40000.647826	16-17-054-26	9.89	664.11
MW01-04	M40000.649295	14-27-054-27	7.85	668.05
MW01-05	M40000.649859	05-33-054-27	5.73	672.07
MW01-06	M40000.650496	01-29-054-27	14.93	675.67
MW01-07	M37490.031427	13-19-054-26	3.73	672.17
MW01-08	M37490.031431	10-26-054-27	10.62	671.38
MW04-01	M39227.477799	01-16-054-26	6.15	661.75
MW04-02	M39227.477802	01-16-054-26	9.20	657.70
MW04-03	M39227.477827	01-17-054-26	13.34	663.06
MW05-01	M39227.483721	09-27-054-27	8.24	672.96
MW07-1-33	M39859.704050	08-36-054-27	4.66	662.54
MW07-2-14	M39859.704048	01-35-054-27	4.48	666.92
MW07-3-33	M39859.704049	07-31-054-27	2.90	663.10
MW10-01	M40337.575466	03-29-054-26	7.32	664.08
MW11-02	M41457.432661	04-27-054-27	16.32	674.48
MW14-01	M42473.435942	05-34-054-27	6.60	669.00
MW14-02	M42475.578813	08-34-054-27	4.78	668.52
MW18-01	M43326.424846	08-16-054-26	11.03	658.87
1963 WW 12-19	M40235.411135	NW 19-054-26	11.15	666.15
1987 WW 13-26	M35377.055706	NW 26-054-27	4.56	671.04
1995 WW 09-34	M43987.561869	09-34-054-27	5.48	668.02
2001 WW 14-21	M37841.689687	NW 21-054-27	16.08	676.12
2001 WW 16-28	M37490.030994	NE 28-054-27	7.94	669.76
2006 WW 10-34	M39227.496150	10-34-054-27	6.47	670.83
2013 WW 01-29	M41313.498215	SE 29-054-27	14.04	675.56

**Table 3. 2023 Manual Water-Level Measurements**

In addition to the manual water levels measured by HCL personnel and the hourly water levels recorded by the data loggers, semi-annual water levels measured by County personnel were submitted to HCL in previous years and have been entered into TGWC database. Hydrographs for each monitoring well are in Appendix B.

Between 2019 and 2023, a water-level decline was observed in 12 of the 28 monitoring sites during the spring field event, while a water-level rise was observed in 7 of the 28 monitoring sites; seven of the current monitoring sites were not part of the groundwater monitoring program in 2019. The water-level rises ranged from 0.60 to 8.73 metres; the water-level declines ranged from 0.25 to 7.49 metres. Between 2015 and 2018, significant

water-level declines ranging from approximately 2 to 10 metres were observed in the following nine monitoring wells: A-S&G (OV), C-S&G (OV), MLM, MW01-06, MW05-01, MW07-2-14, MW11-02, the 2001 WW 14-21, and the 2013 WW 01-29. These monitoring wells are all situated in the west-central part of the ASP near active pit areas. Between 2022 and 2023, the water level in the 1987 WW 13-26, which is also in the west-central part of the ASP, declined by approximately one metre.

### 4.3. Groundwater-Quality Monitoring

Groundwater samples from 27 of the 28 monitoring wells were collected by HCL personnel during the 2023 site visits; the 1987 WW 13-26 had been added to the groundwater monitoring program after sampling took place. As standard protocol, HCL personnel performed the following during each sampling event:

- Inspection of monitoring well
- Purging of monitoring well
- Collection of a groundwater sample
- Storage and transportation of the groundwater sample to the laboratory

During HCL's initial inspection of each monitoring well, the coordinates were determined using a consumer-grade handheld GPS, the diameter and material of the casing were noted, the monitoring well was photographed, and the total depth and casing stick-up were measured. During every site visit, the condition of each monitoring well was inspected, and additional information was collected if deemed necessary; for example, if damage was noted, the monitoring well was photographed again, and the casing stick-up and total depth were re-measured.

For sample collection, the monitoring well was purged of the stagnant water with a dedicated bailer or Waterra tubing until at least three monitoring well volumes of groundwater had been removed or the monitoring well was purged dry, or the groundwater being removed from the monitoring well had measured field parameters that were consistent.

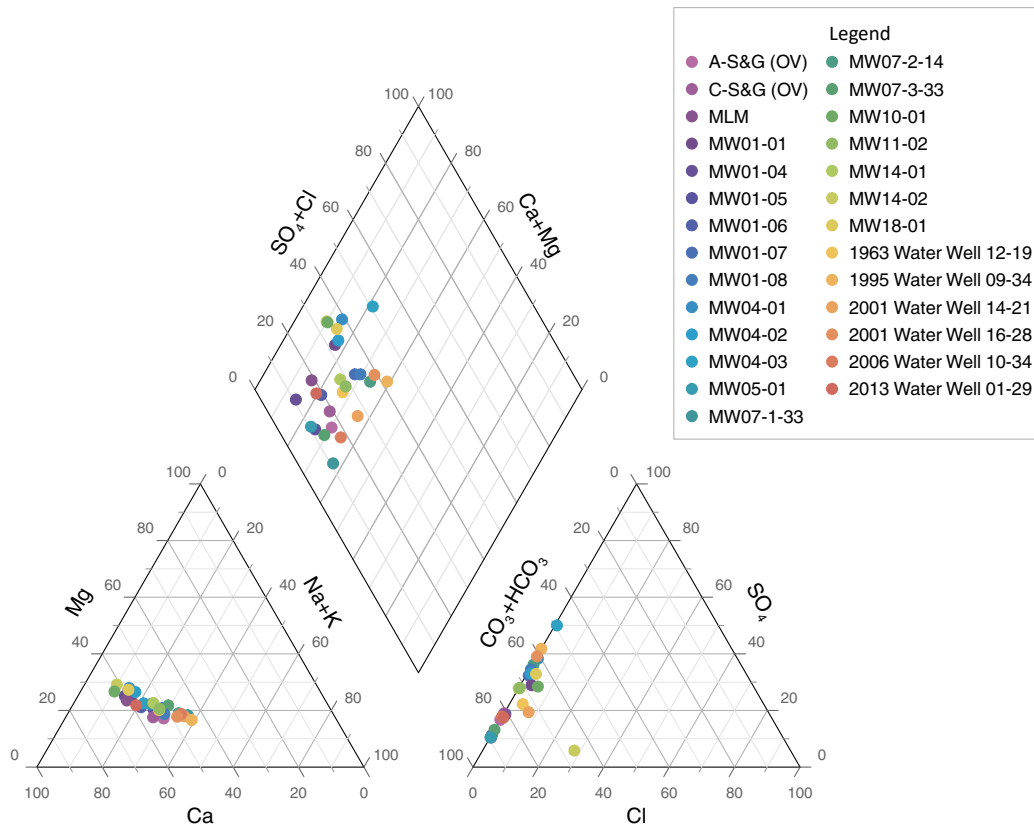
The groundwater samples collected in the spring of 2023 were analyzed for routine parameters and dissolved metals. During each sampling event, all monitoring wells were sampled on the same day that they were purged. All groundwater samples were analyzed by Element Materials Technology Canada Inc.

#### 4.3.1. Groundwater Quality

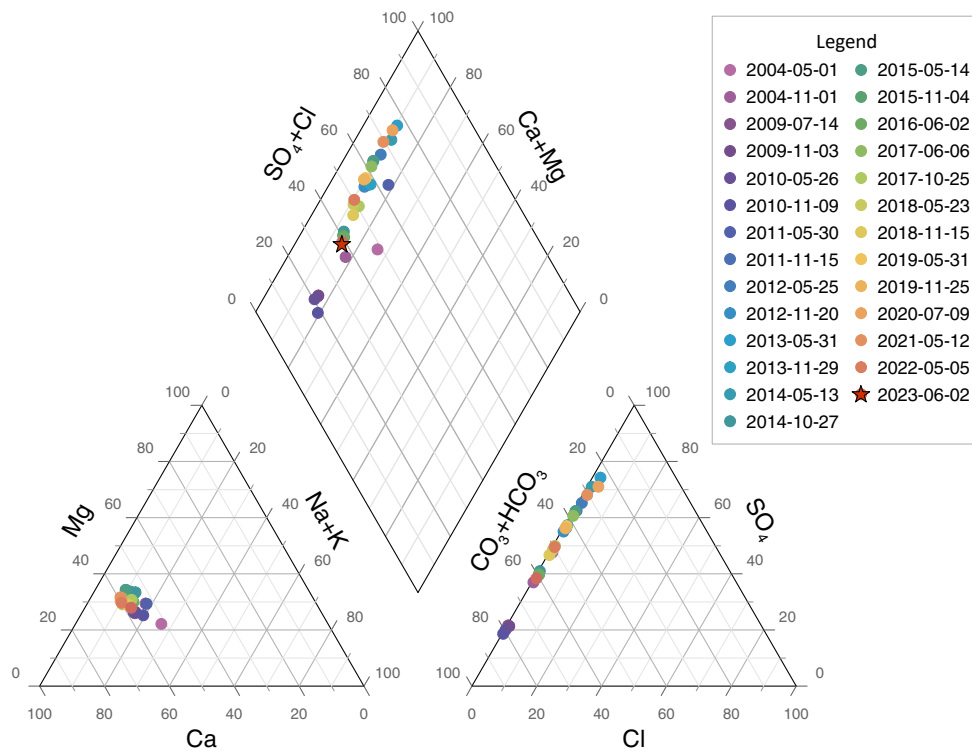
All available groundwater-quality data for each monitoring well have been entered into TGWC database. The 2023 chemical analysis results for the groundwater samples collected from 27 monitoring wells are in Appendix B. Groundwater-quality parameters of particular interest are discussed briefly in the following sections.

Figure 10 on the following page is a Piper tri-linear diagram showing the groundwater quality for samples collected from 27 of the 28 monitoring wells in the spring of 2023. Figure 10 shows that most of the groundwater samples are classified as calcium-bicarbonate-type waters, which are typical of groundwaters from aquifers within the surficial deposits, although there is a range in water quality from a calcium type with no dominant anion to a bicarbonate type with no dominant cation.

In general, groundwater-quality parameters for samples collected in 2023 remain within historical ranges. The groundwaters from MW04-01 and MW04-02 were classified as calcium-bicarbonate-type waters in the early 2000s, as calcium-sulfate-type waters beginning in 2011, and as calcium-chloride-type waters in 2020 and 2021. In 2022 and 2023, the groundwaters from MW04-01 and MW04-02 were classified as calcium-bicarbonate-type waters and have a chemical quality that is similar to the groundwaters from the other monitoring wells. Figure 11 on the following page is a second Piper tri-linear diagram showing the groundwater quality for samples collected from MW04-01 between 2004 and 2023; the Piper tri-linear diagram for MW04-02 is not shown but displays a similar range.



**Figure 10. 2023 Piper Tri-Linear Diagram**



**Figure 11. Piper Tri-Linear Diagram for MW04-01 (May 2004 to June 2023)**

### 4.3.2. Chloride

Chloride concentrations in the groundwater samples collected in 2023 ranged from less than 0.4 to 34.6 milligrams per litre (mg/L) for all monitoring wells except MW14-02. Chloride concentrations have been variable in the groundwaters from monitoring wells MW04-01, MW04-03, and MW14-02 throughout the years, as discussed below:

- The chloride concentration in the groundwater sample collected from MW04-01 in 2023 was 2.6 mg/L; the historical high for chloride in the groundwater from this monitoring well is 41.4 mg/L, which occurred in 2020. The increase in chloride in the groundwater sample from MW04-01 in 2020 is considered to be an anomaly, based on the decreases that have been observed in the samples since 2021.
- Groundwater samples collected from MW04-03 and MW14-02 have had consistently higher chloride concentrations than the groundwater samples collected from the other monitoring wells since sampling began:<sup>8</sup>
  - The chloride concentration in the groundwater sample collected from MW04-03 in 2023 was 5.4 mg/L; the historical high for chloride in the groundwater from this monitoring well is 104 mg/L, which occurred in the spring of 2004. Since 2016, there has been a decreasing trend in the chloride concentration in the groundwater from MW04-03, from 96 to 5.4 mg/L.
  - The chloride concentration in the groundwater sample collected from MW14-02 in 2023 was 163 mg/L. Since 2015, there has been an increasing trend in the chloride concentration in the groundwater collected from MW14-02, from 13 to 211 mg/L in 2020. The chloride concentration decreased in 2021 and 2022 to 99.7 and 107 mg/L, respectively. Currently, there are no extraction activities taking place near MW14-02.

The monitoring wells with chloride exceedances are proximal to paved roads where road salt is used. No groundwater sample from any of the monitoring wells has ever exceeded the aesthetic objective (AO) of 250 mg/L for chloride (Health Canada, 2022).

### 4.3.3. Nitrate

The maximum acceptable concentration (MAC) for nitrate in drinking water based on health objectives is 10 mg/L (Health Canada, 2022). In the spring of 2023, the nitrate concentration was below 0.01 mg/L in the groundwater samples from 15 of the monitoring wells; the highest concentration of nitrate was 1.41 mg/L in the groundwater sample collected from MW04-02.

### 4.3.4. Sulfate

The AO for sulfate is 500 mg/L (Health Canada, 2022). Sulfate concentrations ranged from 45.9 to 569 mg/L in the groundwater samples collected in 2023.

Since 2010, there has been a general increasing trend in the sulfate concentration in the groundwater collected from MW04-01, from 79.6 to 1,150 mg/L in 2020. The sulfate concentration decreased slightly to 1,020 mg/L in 2021, and in 2022, the concentration decreased significantly to 435 mg/L. In 2023, the sulfate concentration in the groundwater from MW04-01 was 202 mg/L.

Since 2007, there has been a general increasing trend in the sulfate concentration in the groundwater collected from MW04-03, from 75.3 to 569 mg/L in 2023, which is above the AO. The sulfate concentration decreased between 2019 and 2020, but has increased since 2021. The areas in which elevated sulfate concentrations have been observed include previously reclaimed pits and an active agricultural area in 17-054-26 W4M, near Highway 633.

---

<sup>8</sup> Groundwater sampling from MW04-03 and MW14-02 began in 2004 and 2015, respectively.

### 4.3.5. Total Dissolved Solids

The AO for total dissolved solids (TDS) is 500 mg/L (Health Canada, 2022). TDS concentrations from 488 to 1,370 mg/L were measured in the groundwater samples collected in 2023. In 2023, all but two groundwater samples (MW01-04 and MW04-02) had TDS concentrations that were above the AO.

### 4.3.6. Electrical Conductivity

Electrical conductivity values ranged from 794 to 1,860 microsiemens per centimetre ( $\mu\text{S}/\text{cm}$ ) for the groundwater samples collected in 2023.

### 4.3.7. Dissolved Metals

The groundwater samples collected from the monitoring wells in 2023 were analyzed for dissolved metals. The results indicated that the concentrations of uranium, arsenic, manganese, and antimony in the following groundwater samples exceeded the MACs for health objectives in 2023:

- Uranium (MAC of 0.02 mg/L): MAC exceedances were observed in the 2023 groundwater samples from MW01-07 (0.0215 mg/L) and MW04-03 (0.0333 mg/L)
- Arsenic (MAC of 0.01 mg/L): MAC exceedances were observed in the 2023 groundwater samples from MW07-2-14 (0.0107 mg/L) and MW14-01 (0.0118 mg/L)
- Manganese (MAC of 0.12 mg/L; AO of 0.02 mg/L): MAC exceedances were observed in the 2023 groundwater samples from all monitoring wells except MW04-01, MW04-03, MW11-02, and the 1963 WW 12-19, and AO exceedances were observed in the groundwater samples from all monitoring wells except MW04-01, MW04-03, and MW11-02
- Antimony (MAC of 0.006 mg/L): The MAC was exceeded in the 2023 groundwater sample from MLM (0.0066 mg/L)

Dissolved metals were first analyzed during the November 2010 sampling event. The uranium concentration in the groundwater samples from MW04-03 has historically been above the MAC of 0.02 mg/L. The arsenic concentration in the groundwater samples from MW07-2-14 has historically been above the MAC of 0.01 mg/L, while the arsenic concentration in the groundwater samples from MW14-01 has only exceeded the MAC since the fall of 2018. The manganese concentrations in the groundwater samples from all monitoring wells except MW01-01, MW04-01, MW04-03, and the 1963 WW 12-19 have historically been above the MAC.<sup>9</sup> The antimony concentration in the groundwater samples from MLM exceeded the MAC in 2021 and 2023.

The results for the 2023 sampling event indicated that the iron concentrations exceeded the AO of 0.3 mg/L in the groundwater samples from all monitoring wells except MLM, MW01-01, MW01-06, MW04-01, MW04-02, MW04-03, MW11-02, and MW14-02.

None of the above exceedances exhibit a noteworthy trend.

---

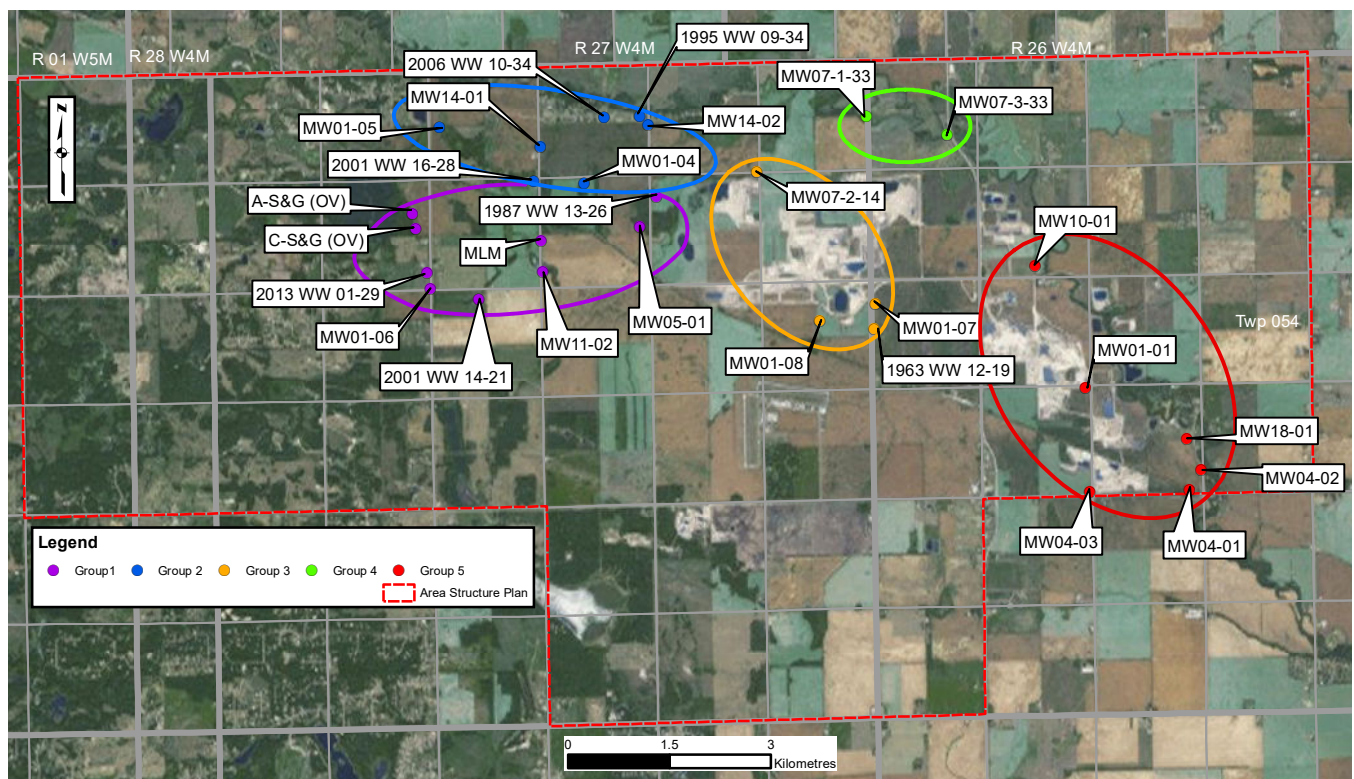
<sup>9</sup> The MAC of 0.12 mg/L for manganese was first established by Health Canada in 2019. Prior to 2019, there was no MAC associated with manganese.

# 5. Interpretation

## 5.1. Water-Level Groups

Based on a review of the water-level measurements and the reported sites of pit activity, the 28 monitoring wells can be arranged into five groups, as shown in Figure 12:

- Group 1 consists of A-S&G (OV), C-S&G (OV), MLM, MW01-06, MW05-01, MW11-02, the 1987 WW 13-26, the 2001 WW 14-21, and the 2013 WW 01-29.
- Group 2 consists of MW01-04, MW01-05, MW14-01, MW14-02, the 1995 WW 09-34, the 2001 WW 16-28, and the 2006 WW 10-34.
- Group 3 consists of MW01-07, MW01-08, MW07-2-14, and the 1963 WW 12-19.
- Group 4 consists of MW07-1-33 and MW07-3-33.
- Group 5 consists of MW01-01, MW04-01, MW04-02, MW04-03, MW10-01, and MW18-01.



**Figure 12. Monitoring Well Groupings Based on Proximity and Water-Level Change**

**Group 1** is in the western portion of the ASP in the vicinity of the Calahoo bog and active gravel pits operated by Lafarge and Heidelberg Materials. Figure 13 shows that there has been a general water-level decline in the Group 1 monitoring wells from 2013 through 2018 that is in the order of 3 to 6 metres, with smaller water-level recoveries in most of the monitoring wells since 2018. Some of the monitoring wells have had earlier water-level recoveries than others, corresponding with shorter distances to reclaimed areas.

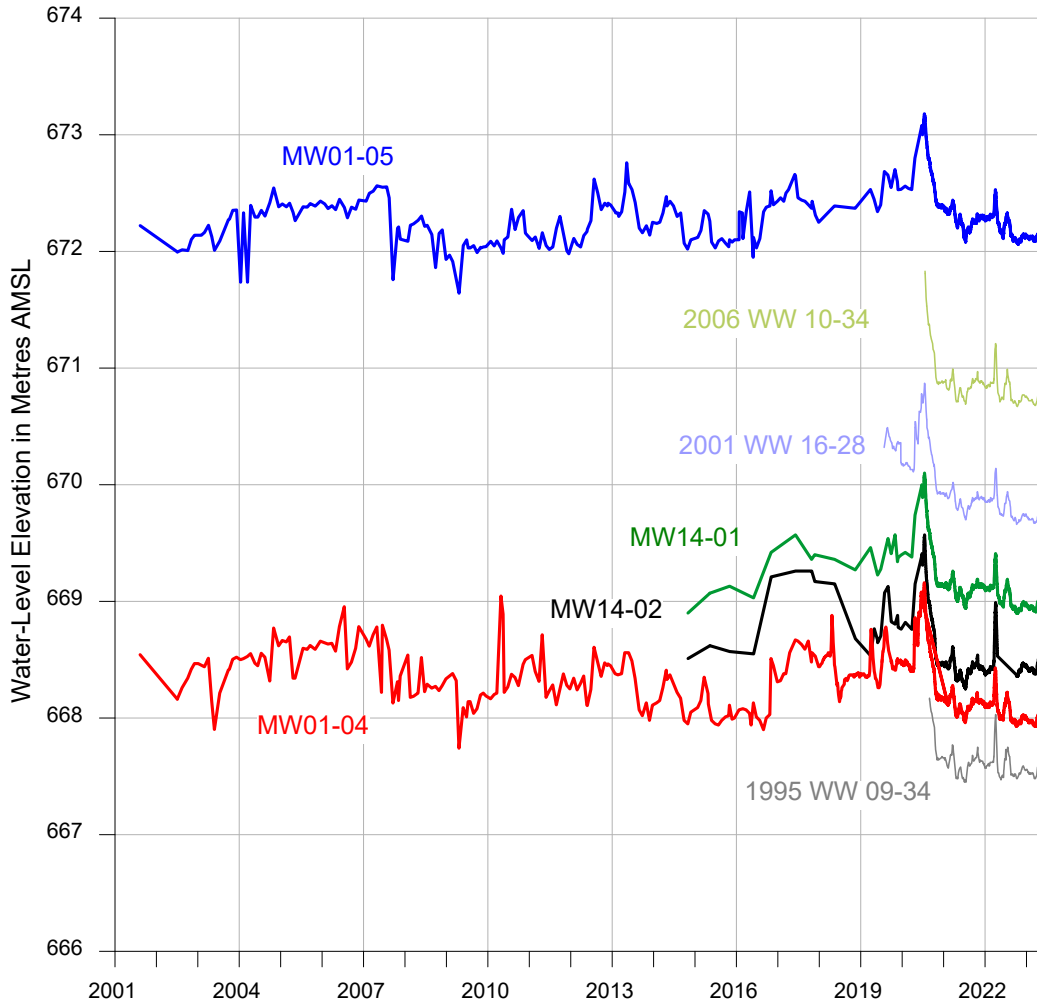
MLM, MW05-01, MW11-02, the 2001 WW 14-21, MW01-06, and the 2013 WW 01-29 have shown an overall water-level decline since 2018, which coincides with nearby mining activities by Heidelberg Materials, reflecting dewatering activities in the western part of 27-054-27 W4M; based on the water levels, the dewatering began in 2013. The 1987 WW 13-26 was added to the groundwater monitoring program in 2023, but water levels have been measured since the fall of 2022. Figure 13 shows the same downward trend for the 1987 WW 13-26 as seen for the 2001 WW 14-21 and MW05-01 since water-level monitoring began. Mining activities in the Group 1 area have likely influenced these water-level declines. MLM and MW11-02 have shown variable water levels since the last half of 2019, which may be caused by several mining and reclamation activities in the surrounding area, and natural seasonal fluctuations. Water levels in MW01-06 and the 2013 WW 01-29 have declined by approximately 3 metres since 2018. A-S&G (OV) and C-S&G (OV) have shown continued water-level recovery since late 2018, which reflects the reclamation in the NE 29-054-27 W4M that Lafarge completed in 2018, the reclamation in the north half of 28-054-27 W4M that took place in 2019, and the start of reclamation by Heidelberg Materials in the southeastern corner of 28-054-27 W4M. Only the Group 1 monitoring wells have shown a declining water-level trend in recent years.



**Figure 13. Group 1 Hydrograph**

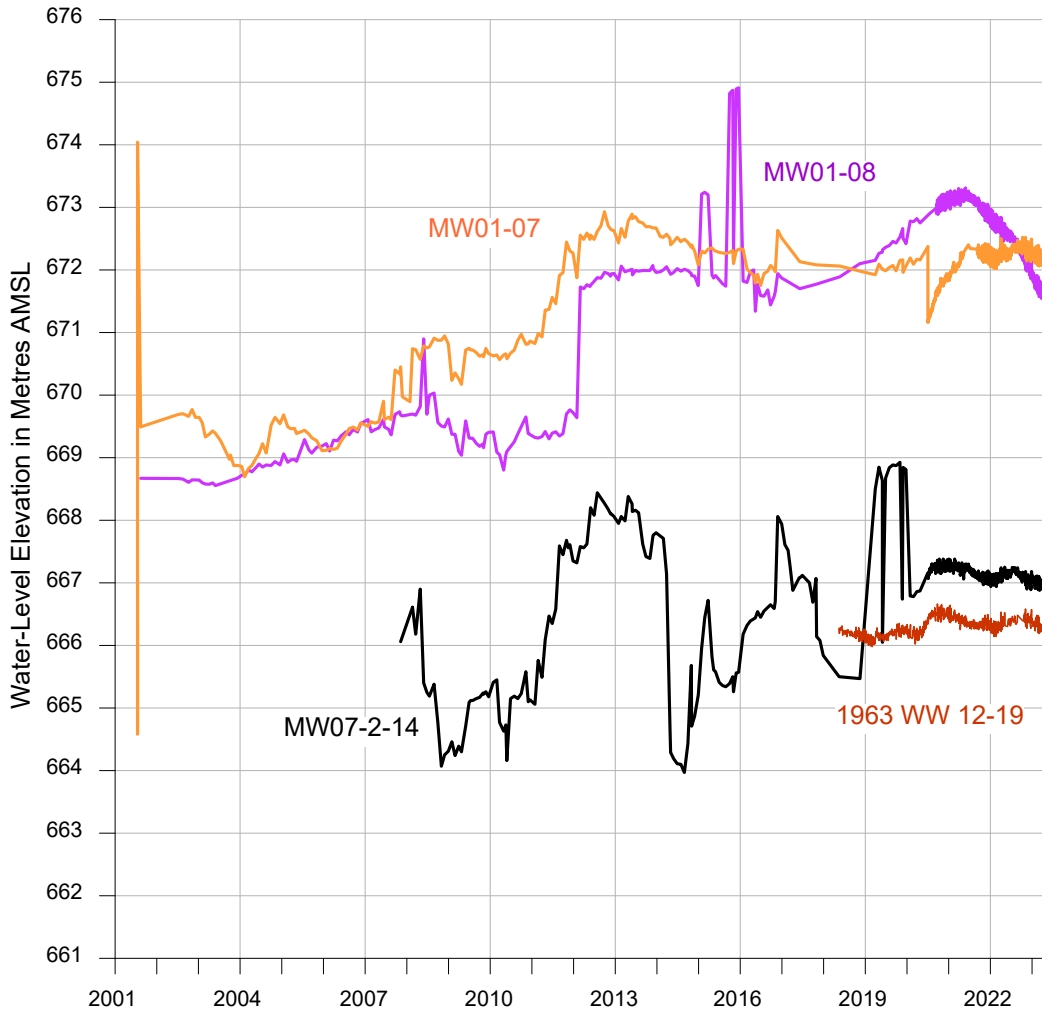


**Group 2** is in the northwestern portion of the ASP, where water levels recorded in the monitoring wells have not changed significantly over the historical record. These monitoring wells are likely not affected by mining activities, as the active pits and reclamation sites are more than 740 metres downgradient from the seven monitoring wells. Figure 14 shows that the Group 2 monitoring wells have an overall horizontal water-level trend, superimposed with seasonal water-level fluctuations of approximately one metre. There was a large recharge event observed in all monitoring wells in 2020 that was due to increased precipitation and runoff. In 2022, the 1995 WW 09-34 and the 2006 WW 10-34 were added to Group 2.



**Figure 14. Group 2 Hydrograph**

**Group 3** is in the central portion of the ASP, which contains mainly reclaimed pits. Water levels in the Group 3 monitoring wells have fluctuated in the past, which reflects dewatering activities when the nearby pits were active. Figure 15 shows that the water levels in MW01-07 and MW01-08 have similar trends and have remained fairly constant since 2012, at an elevation that is approximately 3 metres higher than the measured water levels in the early 2000s; the water-level decline observed in MW01-07 in 2020 is due to a sensor malfunction and can be ignored. MW01-07 and MW01-08 are east of the Schafers 240 Pit and are situated on either side of a pond. In 2020, heavy precipitation, along with mining activities in the area, required water to be diverted into the Schafers 240 Pit, which is west of and upgradient from MW01-07, MW01-08, and the 1963 WW 12-19. The water-level rises observed in MW01-07 and MW01-08 are likely due to recharge from the large amounts of precipitation in 2019 and 2020, along with recharge from the Schafers 240 Pit. Since 2021, water levels in MW01-08 have declined by approximately 1.5 metres due to mining and dewatering activities to the west of the monitoring well.



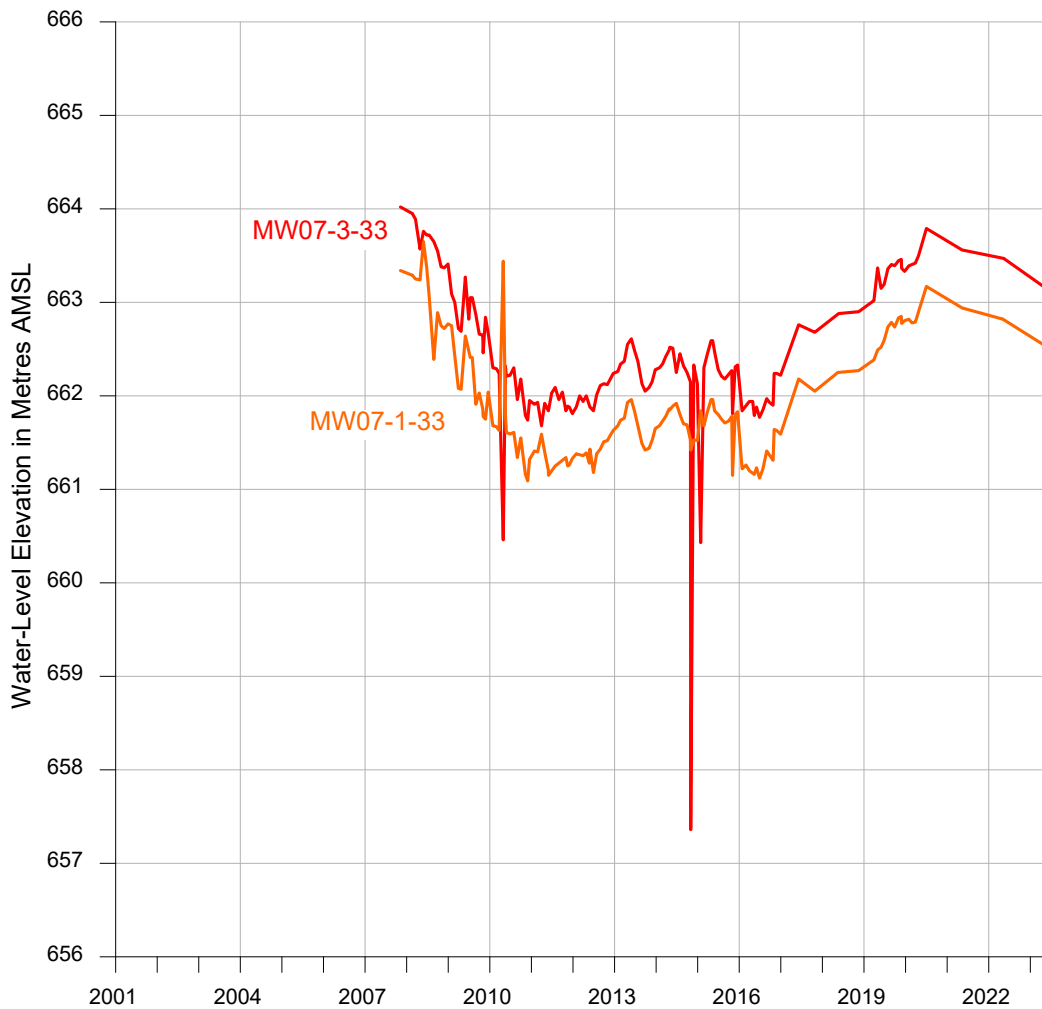
**Figure 15. Group 3 Hydrograph**

Water levels in the 1963 WW 12-19 have remained fairly flat since monitoring began in 2018.

Water levels in MW07-2-14 rose between 2018 and 2020, when dewatering ceased nearby, causing the water levels to recover. In 2020, the water level in MW07-2-14 levelled out and has remained fairly flat since then. The water-level changes observed in MW07-2-14 since 2020 may be due to natural processes taking over since mining activities have slowed down in the area.

**Group 4** is in the northeastern portion of the ASP and is southwest of and in close proximity to the Sturgeon River. Water levels in this area have been on a slow recovery trend since 2016. Figure 16 shows that, between the fall of 2016 and 2020, the water levels in MW07-1-33 and in MW07-3-33 have risen by 2.05 metres and 2.02 metres, respectively, which may be a result of the reclamation of previously active pits south of the two monitoring wells. Since 2021, the water levels have declined by approximately one metre in both monitoring wells.

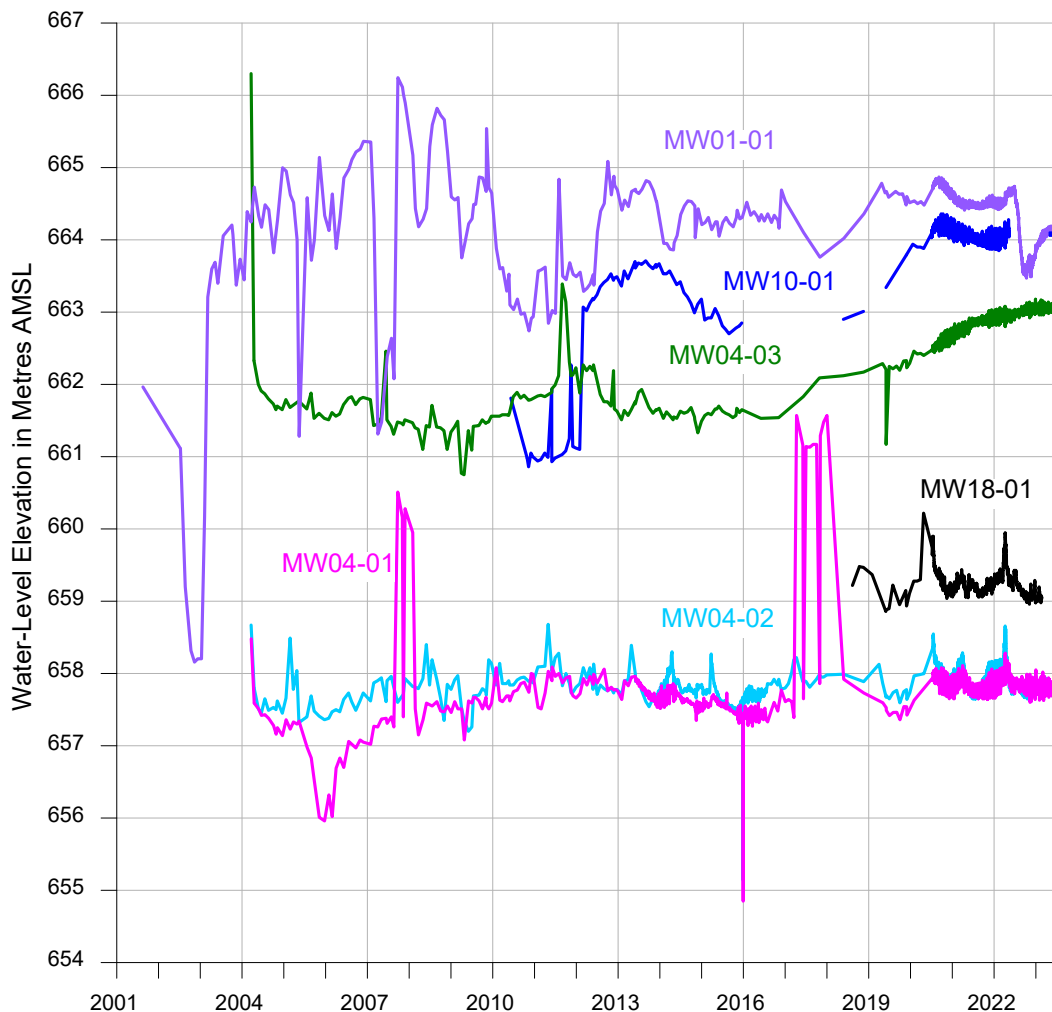
The water-level decline from 2008 through 2010 is believed to be a result of historical mining events and associated dewatering of pits in the area and may also be influenced by Sturgeon River flow fluctuations. The two monitoring wells are at the farthest monitored sites downgradient from the mining activities, and therefore show the slowest water-level recovery since the cessation of dewatering in the nearby reclaimed pits.



**Figure 16. Group 4 Hydrograph**

**Group 5** is in the southeastern portion of the ASP. Similar to the northwestern portion of the ASP, water levels for the monitoring wells in this area have showed little change since 2021. Water-level fluctuations in MW04-01 in 2007 and 2017 are possibly due to reference-point inaccuracies when the measurements were taken. Due to errors in the data, the highs in 2007 and 2017 may be ignored, leaving the data set to follow the historical and the MW04-02 water-level trends more closely.

Figure 17 shows the generally stable nature of the water levels in the Group 5 monitoring wells in 2022 and 2023, indicating natural fluctuations in the water table and coinciding with the lack of mining activity in the area. There has been a water-level rise in MW10-01 and MW04-03 since 2016. This rise may be due to recovery since mining activities have ceased in the area. Water levels in MW01-01 decreased by approximately one metre in the summer of 2022, when mining began to take place north of the monitoring well. Since December 2022, water levels in MW01-01 have recovered by over 0.75 metres. The data loggers in MW10-01 and MW18-01 were unable to be downloaded in 2023, and only manual water levels were recorded for these two monitoring wells; the data loggers from MW10-01 and MW18-01 were removed and sent to the manufacturer for repair in 2023. The hydrograph for the Group 5 monitoring wells is broadly similar to the Group 3 hydrograph in that most of the water-level variations have occurred in the past, when there was active pit dewatering in areas that have since become reclaimed pits. The reclamation of the pits is evident in the reasonably horizontal water levels since 2012.



**Figure 17. Group 5 Hydrograph**

## 5.2. Water-Level Summary

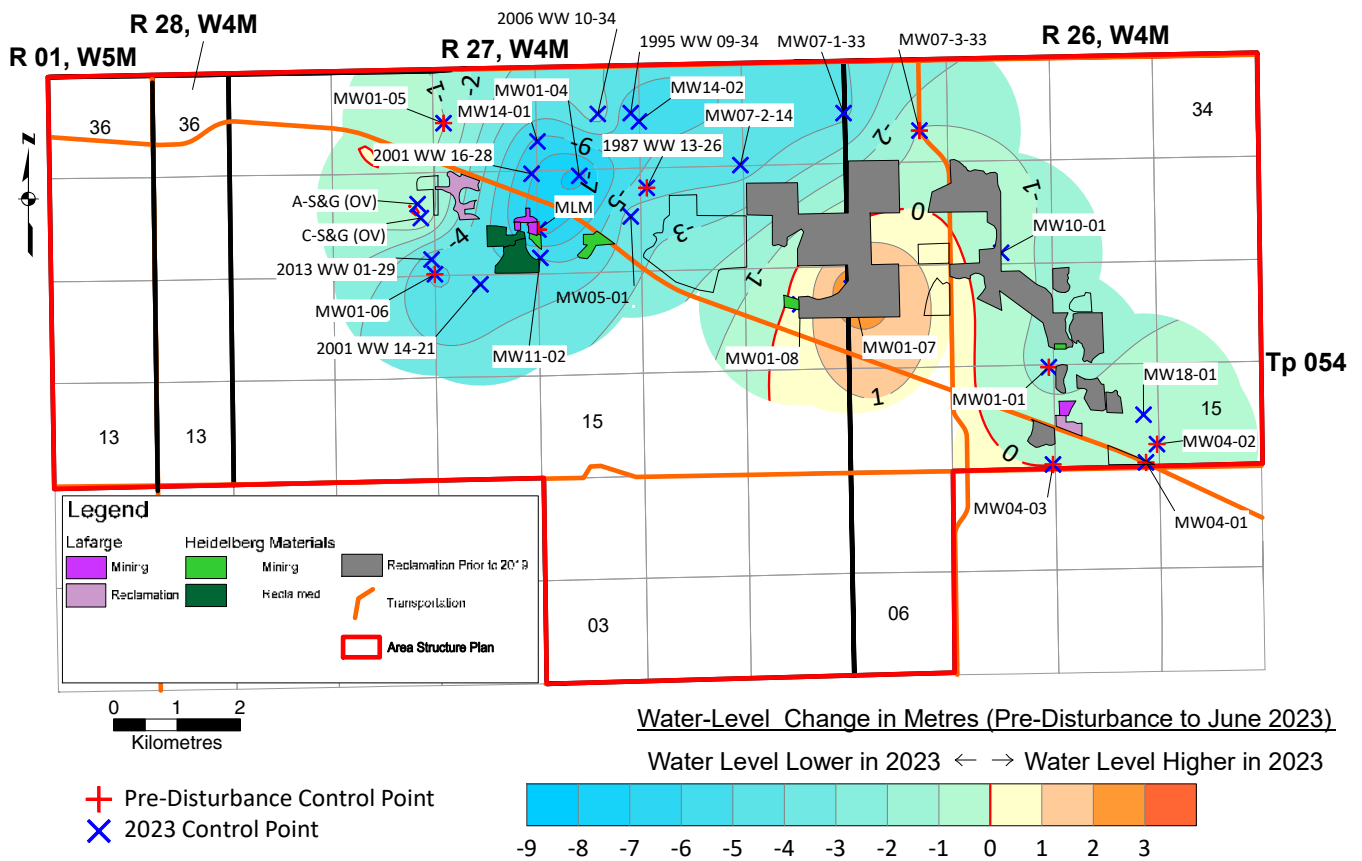
Based on the review of water levels and reported pit activity, recently recorded water-level rises are a result of the cessation of nearby gravel dewatering and extraction. Recent and historical water-level declines are mainly a result of nearby dewatering during mining operations.

Table 4 shows the measured water levels that were used to estimate the regional groundwater-level change that has occurred in the ASP as a result of historical and current gravel dewatering and extraction. Although aggregate mining had been occurring in the ASP prior to the development of the Surgeon County water-level monitoring program, an attempt was made to assign “pre-disturbance” water-level elevations to monitoring sites that have a long history of measured water levels in areas that were presumed to be not in close proximity to active dewatering or extraction sites. The table shows nine monitoring sites that satisfy these criteria; these nine monitoring sites were then used to create a pre-disturbance water-level surface. The 27 measured water levels in the last column of Table 4 were then used to create a water-level surface that is current to June 2023.

Monitoring Site	Water-Level Control Points		
	Elevation in Metres AMSL		
	Ground	Pre-Disturbance Water Level	2023 Water Level
A-S&G (OV)	685.8		677.6
C-S&G (OV)	687.9		678.5
MLM	686.2	679.3	671.7
MW01-01	674.0	665.5	664.0
MW01-04	675.9		668.0
MW01-05	677.8	673.0	672.1
MW01-06	690.6	681.0	675.7
MW01-07	675.9		672.2
MW01-08	682.0		671.4
MW04-01	667.9	658.0	657.7
MW04-02	666.9	658.2	657.7
MW04-03	676.4	663.0	663.0
MW05-01	681.2		673.0
MW07-1-33	667.2		662.5
MW07-2-14	671.4		667.0
MW07-3-33	666.0	664.0	663.1
MW10-01	671.4		664.1
MW11-02	690.8		674.5
MW14-01	675.6		669.0
MW14-02	673.3		668.5
MW18-01	669.9		659.2
1995 WW 09-34	673.5		667.6
2001 WW 14-21	692.2		676.1
2001 WW 16-28	677.7		669.8
2006 WW 10-34	674.5		670.8
2013 WW 01-29	689.6		675.6
1987 WW 13-26	675.6	675.6	671.1

**Table 4. Water-Level Control Points**

Figure 18 shows the contoured water-level change in the ASP, which is calculated by subtracting the pre-disturbance water levels from the water levels measured in 2023. The map shows a regional characteristic that is believed to represent current water-level conditions in the sand and gravel aquifer. The water-level decline that is centred near the active Lafarge and Heidelberg Materials pits in the western part of the ASP is associated with nearby pits that have been active since 2020, while the water-level mounding near MW01-07, which is centred near large areas of reclaimed land, is interpreted as groundwater mounding resulting from the replacement of the aggregate with less permeable material.



**Figure 18. Contoured Water-Level Change (Pre-Disturbance to June 2023)**

Figure 18 shows that temporary drawdown near active dewatering pits can be in the order of 4 to 9 metres; water-level recovery is expected after the cessation of dewatering, although full recovery may take several years.

The water-level data show that there can be significant temporary water-level changes in the sand and gravel aquifer associated with pit activities, but these changes typically do not represent an adverse effect on local groundwater users unless significant dewatering occurs in close proximity to a shallow residential water well. However, there can also be a natural fluctuation in measured water levels that is associated with fluctuations in aquifer recharge from precipitation.

### 5.3. Groundwater Chemistry

A review of the groundwater-quality data collected from the monitoring wells in 2023 shows that the southeastern part of the ASP is an area where there are elevated concentrations of chloride, sulfate, and TDS, as observed in the groundwaters from MW04-01, MW04-03, and MW14-02.

The groundwater from MW14-02 has shown a steady increase in chloride concentration since 2015, while the groundwater from MW04-03 has shown a steady decrease in chloride concentration since 2016. The chloride concentration in the groundwater from MW14-02 rose from 133 mg/L during the 2019 sampling event to 211 mg/L during the 2020 sampling event. The chloride concentration in the groundwater from MW14-02 decreased to 99.7 mg/L in 2021, and then increased to 107 mg/L in 2022 and 163 mg/L in 2023. Further investigation is required to assess the sudden increases and decreases in the chloride concentration at this site, which may be associated with the amount of road salt that is used on nearby roads during the winter months. Because the closest aggregate extraction activity is more than 1.8 kilometres from MW14-02, the chemical analysis results are considered to represent baseline conditions.

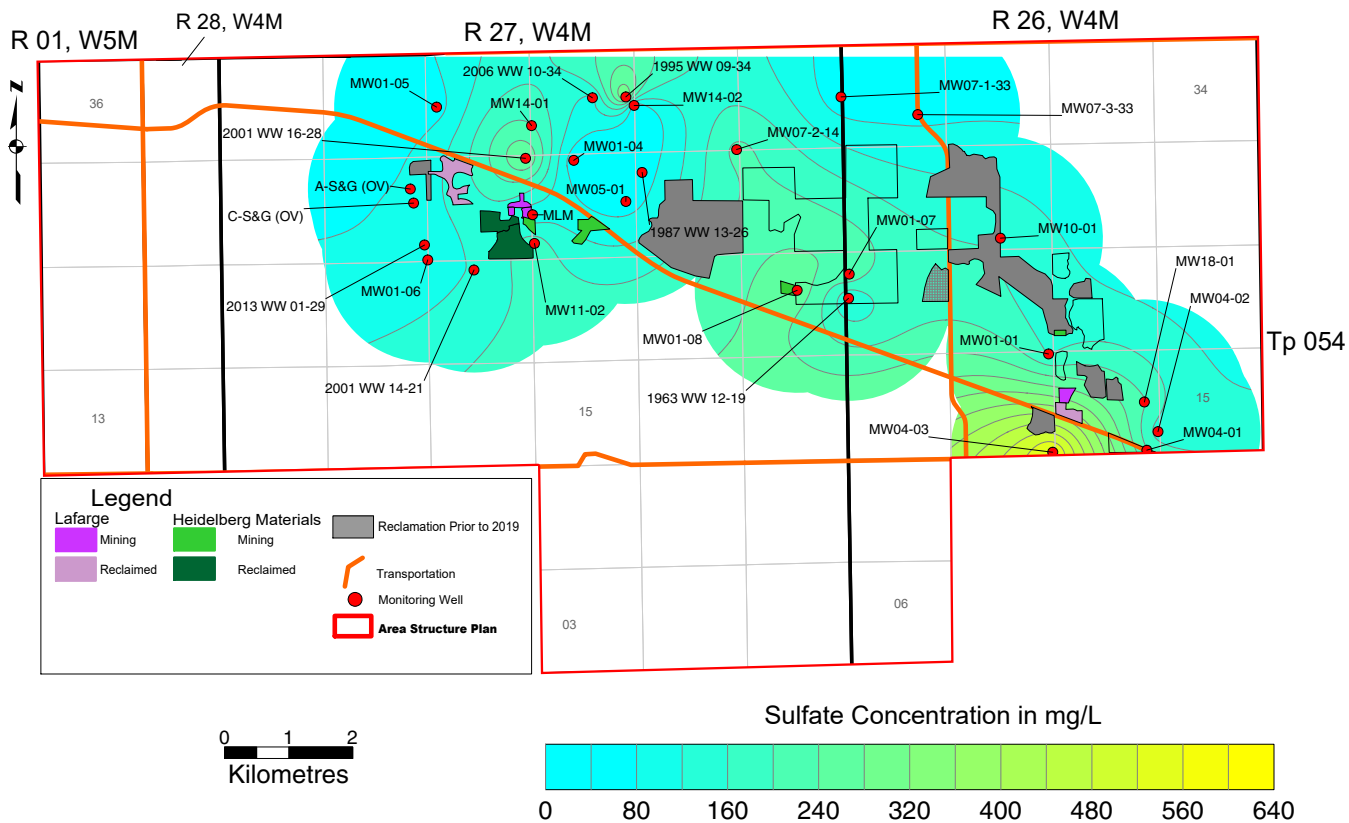
The data show a correlation between sulfate and TDS concentrations, but no trends or relationships are evident when comparing the concentrations of any of these parameters to water-level highs and lows or to the group in which the monitoring wells belong.

Figure 19 on the following page is a map of sulfate concentrations based on the 2023 analyses and shows that sulfate concentrations in the ASP range from 45.9 to 569 mg/L. The lowest sulfate concentrations, which range from 45.9 to 61.6 mg/L, are in the north-central portion of the ASP. Elevated sulfate concentrations are in the southeastern portion of the ASP and range from 331 to 569 mg/L. The groundwater from MW04-01 showed a large increase in the sulfate concentration between 2018 and 2019, but showed a significant decrease in the sulfate concentration from 1,020 to 202 mg/L between 2021 and 2023. There has been an increasing trend in the sulfate concentration in the groundwater from MW04-03 since 2013, steadily increasing from 110 to 569 mg/L in 2023.

Gravel dewatering and extraction activities are not considered to be the cause of any changes in the sulfate or chloride concentrations in the groundwaters. Elevated chloride concentrations may be naturally occurring or related to other activities, such as road maintenance or the use of water softeners.

The groundwaters from four monitoring wells have uranium or arsenic concentrations that exceeded the MACs in 2023. Uranium and arsenic are naturally occurring elements derived from parent material and not from gravel extraction operations; their concentrations in the groundwaters do not show an increasing or decreasing trend. The antimony concentrations in the groundwater from MLM that exceeded the MAC in 2021 and 2023 do not show a trend, but further investigation and monitoring may be required in the future.

At this time, there is no evidence that pit activities are resulting in any changes to the groundwater quality within the ASP.



**Figure 19. Sulfate Concentrations (June 2023)**



## 6. Conclusions

Water-level and chemical-quality data indicate that there have been some changes in the hydrogeological conditions of the sand and gravel aquifer in the Villeneuve–Calahoo Sand and Gravel Extraction ASP since 2004.

There have been two noteworthy trends in groundwater quality in the ASP; both trends are local and are related to only three monitoring wells: MW04-01, MW04-03, and MW14-02. One trend is related to the sulfate concentrations in the groundwaters from MW04-01 and MW04-03 in the southeastern part of the ASP. The second trend is an increase in the chloride concentration in the groundwater from MW14-02 in the northwestern part of the ASP since 2015. Gravel dewatering and extraction activities are not considered to be the cause of any changes in the sulfate or chloride concentrations in the groundwaters. Elevated chloride concentrations may be naturally occurring or related to road maintenance or the use of water softeners.

The groundwaters from four monitoring wells have uranium or arsenic concentrations that exceeded the MACs in 2023; uranium and arsenic are naturally occurring, and their concentrations in the groundwaters do not show an increasing or decreasing trend. The antimony concentration in the groundwater from MLM exceeded the MAC in 2023 and may require continued monitoring and further investigation if a trend becomes apparent.

The groundwaters from all monitoring wells except MW04-01, MW04-03, MW11-02, and the 1963 WW 12-19 had manganese concentrations that exceeded the MAC in 2023. These groundwaters have historically been above the MAC and the AO for manganese; the elevated concentrations are not due to gravel extraction but represent naturally occurring or background conditions.

At this time, there is no evidence that pit activities are resulting in any changes to the groundwater quality within the ASP.

There has previously been a noteworthy decline in the water levels in the western part of the ASP in close proximity to areas that have been recently mined. There was a water-level decline of slightly more than 10 metres in MW11-02 between 2015 and 2018; however, since late 2018, the water level in MW11-02 has begun to stabilize.

Significant declines have also been previously observed in A-S&G (OV), C-S&G (OV), MLM, MW01-06, MW05-01, MW07-2-14, MW11-02, the 1987 Water Well 13-26, the 2001 Water Well 14-21, and the 2013 Water Well 01-29. The water-level data show that there can be significant temporary water-level changes in the sand and gravel aquifer associated with pit activities, but the magnitude of change has so far not represented an adverse effect on local groundwater users. In addition to water-level fluctuations caused by gravel extraction activities, there can also be a natural fluctuation in measured water levels that is associated with fluctuations in aquifer recharge from precipitation.

## 7. Recommendations

The Sturgeon County groundwater monitoring program has continued for several years, and there have been no rapid changes in groundwater quality.

At this time, only Lafarge Canada Inc. and Heidelberg Materials Canada Limited are contacted for annual mining plans; it is recommended that the County confirm all active operators within the Villeneuve–Calahoo Sand and Gravel Extraction Area Structure Plan on an annual basis to ensure that all mining activities are accounted for.

Although the water-level monitoring is very helpful in assessing the impacts of gravel extraction on the water level in the sand and gravel aquifer within the ASP, the water-level monitoring program should be reviewed annually and adjusted as necessary. It is recommended that local operators share future mining plans to allow for new monitoring wells to be added to the groundwater monitoring program in advance of mining operations. This will allow for the collection of baseline data to gain a better understanding of pre-disturbance conditions. Installation of data loggers to collect hourly water-level data in all new monitoring sites is recommended.

An abbreviated hydrogeological assessment should be completed for the SW 28-054-27 W4M within the Group 1 area before mining activities begin in the quarter section, as there have been water-level declines in private water wells in the area, and proactive assessment could determine if further declines could impact domestic groundwater supplies.

It is recommended that the data loggers that are installed in the monitoring wells continue to be downloaded once per year, and that groundwater samples from the monitoring wells continue to be collected annually for analysis of dissolved metals and routine chemical parameters.

It is also recommended that the Sturgeon River water-level elevation be added to the monitoring network to determine if there is a correlation between the River water level and the water levels in the Group 4 monitoring wells.

## 8. Bibliography

- Alberta Energy and Utilities Board. 1995. Alberta's Usable Groundwater Database. Alberta Energy and Utilities Board. Publication ST55, 11 p.
- Andriashek, L. D. 1987a. Alberta Geological Survey. Drift Thickness of the Edmonton Map Area. [AGS MAP 215]
- Andriashek, L. D. 1987b. Alberta Geological Survey. Bedrock Topography and Valley Thalwegs of the Edmonton Map Area. [AGS MAP 216]
- Andriashek, L. D. 1988. Alberta Geological Survey. Quaternary Stratigraphy of the Edmonton Map Area, NTS 83H. [AGS Open File Report 1988-04]
- Bibby, R. 1974a. Hydrogeology of the Edmonton Area (Northwest Segment), Alberta. Alberta Research Council. ARC/AGS Earth Sciences Report 1974-10. Available at: [http://ags.aer.ca/publications/ESR\\_1974\\_10.html](http://ags.aer.ca/publications/ESR_1974_10.html)
- Bibby, R. 1974b. Regional Chemistry and Water Level Distribution of the Near-Surface Groundwaters of the Edmonton Area (Northwest Segment), Alberta. Alberta Research Council. ARC/AGS Earth Sciences Report 1974-06. Available at: [https://ags.aer.ca/publications/ESR\\_1974\\_06.html](https://ags.aer.ca/publications/ESR_1974_06.html)
- Freeze, R. A., and J. A. Cherry. 1979. Groundwater. Prentice Hall. 1st edition (May 8, 1979).
- Glass, D. J. [editor]. 1990. Lexicon of Canadian Stratigraphy, Volume 4: Western Canada, Including British Columbia, Alberta, Saskatchewan and Southern Manitoba. Canadian Society of Petroleum Geologists, Calgary.
- Golder Associates. 2016. Villeneuve-Calahoo Gravel Extraction Area. 2015 Annual Groundwater Monitoring Report. Unpublished Contract Report Prepared for Sturgeon County. [Report No. 1402405]
- Golder Associates. 2017. Villeneuve-Calahoo Gravel Extraction Area. 2016 Annual Groundwater Monitoring Report. Unpublished Contract Report Prepared for Sturgeon County. [Report No. 1654429]
- Health Canada. 2022. Guidelines for Canadian Drinking Water Quality—Summary Tables. Water and Air Quality Bureau. Healthy Environments and Consumer Safety Branch. Health Canada. Ottawa, Ontario.
- Hydrogeological Consultants Ltd. 2001. Regional Groundwater Assessment - FINAL. Part of the North Saskatchewan River Basin. Parts of Tp 053 to 058, R 20 to 28, & Tp 054 to 057, R 01, W5M. Prepared for Sturgeon County. (Unpublished Contract Report – September 2001) [01-0110.00]
- Hydrogeological Consultants Ltd. 2010a. 2009 Annual Groundwater Monitoring Report. Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M. Prepared for Sturgeon County. (Unpublished Contract Report – March 2010) [83H12 .S78C6 2010/03 C095; MR-224.09]
- Hydrogeological Consultants Ltd. 2010b. Monitoring Well Replacement. Villeneuve-Calahoo Gravel Extraction Area. SW 29-054-26 W4M. Prepared for Sturgeon County. (Unpublished Contract Report – July 2010) [83H12 .V548 2010/05 C079; 10-0414.00]
- Hydrogeological Consultants Ltd. 2011a. 2010 Annual Groundwater Monitoring Report. Villeneuve-Calahoo Gravel Extraction Area. Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M. Prepared for Sturgeon County. (Unpublished Contract Report – March 2010) [83H12 .S78C6 2011/03 N492; MR-0224.10]
- Hydrogeological Consultants Ltd. 2011b. Field-Verified Water Well Survey, Villeneuve Area. NE 10-054-27 W4M. Prepared for Sturgeon County. (Unpublished Contract Report – May 2011) [83H12 .V548 2011/05 P585; 11-0234.00]

- Hydrogeological Consultants Ltd. 2012. 2011 Annual Groundwater Monitoring Report. Villeneuve-Calahoo Gravel Extraction Area. Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M. Prepared for Sturgeon County. (Unpublished Contract Report – March 2011) [83H12 .S78C6 2012/03 Z954; MR-0224.11]
- Hydrogeological Consultants Ltd. 2013a. 2012 Annual Groundwater Monitoring Report. Friesen Pit. SW 16-054-26 W4M. Prepared for Sureway Construction Group of Companies. (Unpublished Contract Report – January 2013) [83H12 .C34 2013/01 B045; MR-0241.12]
- Hydrogeological Consultants Ltd. 2013b. 2012 Annual Groundwater Monitoring Report. Villeneuve-Calahoo Gravel Extraction Area. Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M. Prepared for Sturgeon County. (Unpublished Contract Report – March 2013) [83H12 .S78C6 2013/03 G225; MR-0224.12]
- Hydrogeological Consultants Ltd. 2014. 2013 Annual Groundwater Monitoring Report. Villeneuve-Calahoo Gravel Extraction Area. Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M. Prepared for Sturgeon County. (Unpublished Contract Report – Revised April 2014) [83H12 .S78C6 2014/03 S693; MR-0224.13]
- Hydrogeological Consultants Ltd. 2019. 2018 Groundwater Monitoring Report. Villeneuve-Calahoo Gravel Extraction Area. Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M. Prepared for Sturgeon County. (Unpublished Contract Report – Revised April 2019) [MR-0224.18]
- Hydrogeological Consultants Ltd. 2020. 2019 Groundwater Monitoring Report. Villeneuve-Calahoo Gravel Extraction Area. Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M. Prepared for Sturgeon County. (Unpublished Contract Report – April 2020) [MR-0224.19]
- Hydrogeological Consultants Ltd. 2021. 2020 to 2021 Groundwater Monitoring Report. Villeneuve-Calahoo Gravel Extraction Area. Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M. Prepared for Sturgeon County. (Unpublished Contract Report – October 2021) [MR-0224.20]
- Hydrogeological Consultants Ltd. 2021. 2021 and 2022 Groundwater Monitoring Report. Villeneuve-Calahoo Gravel Extraction Area. Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M. Prepared for Sturgeon County. (Unpublished Contract Report – October 2022) [MR-0224.21]
- Ozoray, G. F. 1972. Alberta Geological Survey. Hydrogeology of the Wabamun Lake Area, Alberta. Wabamun Lake Area. [QE 186 P7 no. 72-08]
- Stantec Consulting Ltd. 2008. 2007 Annual Groundwater Monitoring Report: Calahoo-Villeneuve Sand and Gravel Extraction Area Structure Plan. Prepared for Sturgeon County.
- Stantec Consulting Ltd. 2009. 2008 Annual Groundwater Monitoring Report: Calahoo-Villeneuve Sand and Gravel Extraction Area Structure Plan. Prepared for Sturgeon County.
- Stein, R. 1976. Hydrogeology of the Edmonton Area (Northeast Segment), Alberta. Alberta Energy and Utilities Board. ARC/AGS Earth Sciences Report 1976-01. Available at: [http://ags.aer.ca/publications/ESR\\_1976\\_01.html](http://ags.aer.ca/publications/ESR_1976_01.html)
- Thurber Environmental Consultants Ltd. 2004. 2003 Groundwater Monitoring Program. Villeneuve-Calahoo Gravel Extraction Area. Prepared for Sturgeon County.
- UMA Engineering Ltd. 2001. Calahoo-Villeneuve Sand and Gravel Extraction Area Structure Plan. UMA File No. D556-002-00-01.
- Westerra Environmental Management Ltd. 2004a. Ballachay Pit. SE 16-054-26 W4M. Subsurface Investigation and Groundwater Monitoring Well Installation. Prepared for Yellowhead Aggregates.

Westerra Environmental Management Ltd. 2004b. Saligo Pit. SE 17-054-26 W4M. Subsurface Investigation and Groundwater Monitoring Well Installation. Prepared for Lafarge Canada Inc.

Westwater Environmental Ltd. 2007. Report on Results of Field Program – Calahoo Bog Groundwater Study. Prepared for Lafarge Canada Inc.

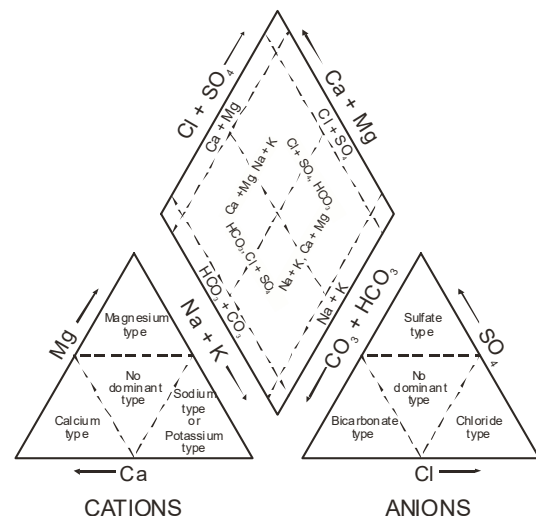
Westwater Environmental Ltd. 2008. Groundwater Investigation for Villeneuve Wash Plant. Unpublished Contract Report Prepared for Lafarge Canada Inc.

## 9. Supplementary Information

### 9.1. Glossary of Terms

aesthetic objective	Health Canada aesthetic quality guidelines addressing parameters that may affect consumer acceptance of drinking water, such as taste, odour, and colour
aquifer	a formation, group of formations or part of a formation that contains saturated permeable rocks capable of transmitting groundwater to water wells or springs in economical quantities
aquitard	a confining bed that retards but does not prevent the flow of water to or from an adjacent aquifer
available drawdown	in a confined aquifer, the distance between the non-pumping water level and the top of the aquifer  in an unconfined aquifer (water table aquifer), two thirds of the saturated thickness of the aquifer and water level within 5 metres of the top of the aquifer
base of groundwater protection	the depth below which groundwater is expected to have a total dissolved solids concentration of more than 4,000 milligrams per litre
geounit	a geologic unit categorized by a similarity in geological feature(s) such as stratigraphic interval, depositional environment, or hydrogeological properties
hydraulic conductivity	the rate of flow of water through a unit cross-section under a unit hydraulic gradient; units are length/time
maximum acceptable concentration	the highest level of chemical substances determined by Health Canada to be allowable in drinking water supplies; these substances are generally only a concern if exposure above guideline levels occurs over an extended time

Piper tri-linear diagram a method to show the composition of water based on major cation and anion composition. This diagram allows groupings or trends in the chemical-quality data to be identified. In Alberta, surface water and shallow groundwater are typically a Ca+Mg-HCO<sub>3</sub>-type water, upper bedrock groundwaters are a Na+K-HCO<sub>3</sub>-type water and deep groundwaters are a Na+K-Cl-type water.



storativity	the volume of water released from storage by a confined aquifer per unit surface area of aquifer per unit decline in hydraulic head (dimensionless)
surficial deposits	all sediments above the bedrock surface

till	a sediment deposited directly by a glacier that is unsorted and consisting of any grain size ranging from clay to boulders
transmissivity	<p>the rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient; a measure of the ease with which groundwater can move through the aquifer</p> <p><u>apparent transmissivity</u>: the value determined from a summary of aquifer test data, usually involving only two water-level readings</p> <p><u>effective transmissivity</u>: the value determined from late pumping and/or late recovery water-level data from an aquifer test</p> <p><u>aquifer transmissivity</u>: the value determined by multiplying the hydraulic conductivity of an aquifer by the thickness of the aquifer</p>
yield	<p>a regional analysis term referring to the rate at which a properly completed water well could be pumped, if fully penetrating the aquifer</p> <p><u>apparent yield</u>: based mainly on apparent transmissivity</p> <p><u>long-term yield</u>: based on effective transmissivity</p> <p><u>sustainable yield</u>: based on aquifer parameters determined from long-term water-level and groundwater diversion monitoring</p>

## 9.2. Glossary of Commonly Used Abbreviations, Acronyms, and Symbols



















AEPA	Alberta Environment and Protected Areas
AER	Alberta Energy Regulator
AMSL	above mean sea level
AO	aesthetic objective
AOI	area of interest
AOS	area of study
ASP	Area Structure Plan
BGL	below ground level
BGWP	base of groundwater protection
BTOC	below top of casing
DEM	digital elevation model
DST	drill-stem test
GCDWQ–ST	Guidelines for Canadian Drinking Water Quality – Summary Table
GPS	global positioning system receiver
GWUDI	groundwater under the direct influence of surface water
km	kilometre(s)
km <sup>2</sup>	square kilometre(s)
Lpm	litre(s) per minute
Lpm/metre	litre(s) per minute per metre
LSD	legal subdivision
m	metre(s)
m <sup>2</sup>	metre(s) squared
m <sup>2</sup> /day	metre(s) squared per day
m <sup>3</sup>	cubic metre(s)
m <sup>3</sup> /day	cubic metre(s) per day
m <sup>3</sup> /year	cubic metre(s) per year
MAC	maximum acceptable concentration
mg/L	milligram(s) per litre



mm	millimetre(s)
MW	monitoring well
NAD83	North American Datum of 1983
NPWL	non-pumping water level
Obs WW	observation water well
TDS	total dissolved solids
TGWC	The Groundwater Centre ( <a href="http://www.tgwc.com">www.tgwc.com</a> )
VE	vertical exaggeration
WSW	water source well
WTH	water test hole
WW	water well

### 9.3. Stratigraphy of the “Undisturbed” Geology of Alberta

(as used by Hydrogeological Consultants Ltd.)

	upper surficial
	lower surficial
	Cypress Hills Fm
	Dalehurst Member
	upper part of Lacombe Member
	lower part of Lacombe Member
	Haynes Member
	upper part of Scollard Fm
	lower part of Scollard Fm
	Battle/Whitemud Fms
	upper part of Horseshoe Canyon Fm
	middle part of Horseshoe Canyon Fm
	lower part of Horseshoe Canyon Fm
	Bearpaw Fm
	Oldman Fm
	Foremost Fm
	Lea Park Fm
	Milk River Fm
	Colorado Shale
	Cardium Fm
	Kaskapau Fm
	Dunvegan Fm
	Shaftesbury Fm
	Viking Fm
	Joli Fou Fm
	upper part of Mannville Grp
	middle part of Mannville Grp
	lower part of Mannville Grp
	Jurassic
	Triassic
	upper part of Paleozoic
	Banff Fm
	Wabamun Group
	Winterburn Group
	Woodbend Group
	Beaverhill Lake Group
	Elk Point Group
	Precambrian

## 9.4. Guidelines for Canadian Drinking Water Quality – Summary Table

Constituent	AO	MAC
pH (pH units)	7.0–10.5	–
Conductivity (µS/cm)	–	–
Total Dissolved Solids	500	–
Sodium	200	–
Potassium	–	–
Calcium	–	–
Magnesium	–	–
Total Hardness	–	–
Manganese	0.02	0.12
Carbonate	–	–
Bicarbonate	–	–
Total Alkalinity	–	–
Sulfate	500	–
Chloride	250	–
Fluoride	–	1.5
Iron	0.3	–
Nitrate (as N)	–	10
Nitrate	–	45
Nitrite (as N)	–	1
Nitrite	–	3
Nitrate + Nitrite (as N)	–	10
Total Coliforms (CFU/100 mL)	–	0
Fecal Coliforms (CFU/100 mL)	–	0
Escherichia coli (CFU/100 mL)	–	0
Ionic Balance (%)	–	–

Concentrations are in milligrams per litre (mg/L) unless otherwise stated.

**Note:** Constituents marked with "–" do not have a recommended maximum concentration associated with them.

**CFU/100 mL** – Colony Forming Units per 100 millilitres

**AO** – Aesthetic Objective

**MAC** – Maximum Acceptable Concentration

**GCDWQ–ST** – Guidelines for Canadian Drinking Water Quality—Summary Tables  
(Health Canada, 2022)

# Appendix A – Sturgeon County Groundwater Monitoring Program

## TABLE OF CONTENTS

Groundwater Monitoring Program – Terms of Reference.....	2
--	---

# **TERMS OF REFERENCE**

## **GROUNDWATER MONITORING PROGRAM**

### **VILLENEUVE – CALAHOO GRAVEL EXTRACTION AREA**

#### **STURGEON COUNTY**

## Introduction

The Calahoo Villeneuve Gravel Extraction Area is located in Sturgeon County approximately eleven to twenty kilometers West of the City of St. Albert.

The plan area extends from Range Road 262 in the East to Range Road 11 in the West and from Highway 633 in the South to Highway 37 in the North.

## Background

The Calahoo - Villeneuve- area has one of the largest reserves of gravel in the Edmonton area. The area has been actively mined for the past 50 years. Recent requests to expand the area has resulted in a two year process to develop an Area Structure Plan for the orderly development of the gravel resources.

Copies of the Calahoo-Villeneuve Sand and Gravel Extraction Area Structure Plan are available online in the Sturgeon County website. Excerpts from recent groundwater studies relevant to this groundwater monitoring program are available for background information.

## Purpose of Study

The purpose of the proposed study is to provide semi-annual testing of the existing groundwater monitoring wells. The monthly water levels will be recorded by Sturgeon County and supplied to the consultant for inclusion in the report. Interpretation on the impact on available groundwater quality and quantity is required. A report shall be generated from this information and the information provided by Sturgeon County.

## Scope of Study

The scope of the study is also to complete semi-annual testing of the groundwater monitoring wells as identified on Map labelled Schedule A. The testing will include the quantity and quality of the groundwater in each well. A total of 21 wells approximately 15m in depth are to be tested.

- A. Groundwater sampling and analysis is required as follows (New Wells to be added once installation is completed):**
- 1) Routine parameters for 21 wells – two sampling events per year in May and November (Calcium, Magnesium, Sodium, Potassium, Carbonate, Bicarbonate, Sulphate, Chloride, Nitrate-Nitrite, Alkalinity, Hardness, Total Dissolved Solids, pH, and electrical conductivity)  
  
Dissolved Metals testing for 21 wells – one sampling event each year in November.
  - 2) Monthly water level data of 19 wells will be provided by Sturgeon County, and is to be compiled and included within the report. Wells A-S&G (OV) / C-S&G (OV) currently have data loggers installed, and consultant is required to download and incorporate information into annual report. Additional Data loggers are continually being implemented, so additional download

information may also be provided). Well location information is as per Schedule "B"

- 3) Interpretation of groundwater analysis results and monthly water level information is to be provided. Consultant is to provide comments on comparative groundwater quality and quantity within reclaimed areas, areas adjacent to active mining operations and areas yet undisturbed by mining operations. The impact, if any, of gravel mining on the local groundwater is to be quantified.
- 4) An annual report compiling the groundwater testing results and interpretation is to be provided prior to March 1 of the following year. Two (2) hard copies of the report and one digital copy of the report in a pdf compatible format to be provided. The consultant is expected to present results at a committee meeting of local residents, political leaders, gravel operators and Albert Environment representatives. The report will also be posted on Sturgeon County website to be made available to the public.

#### Summary of Proposed Tasks

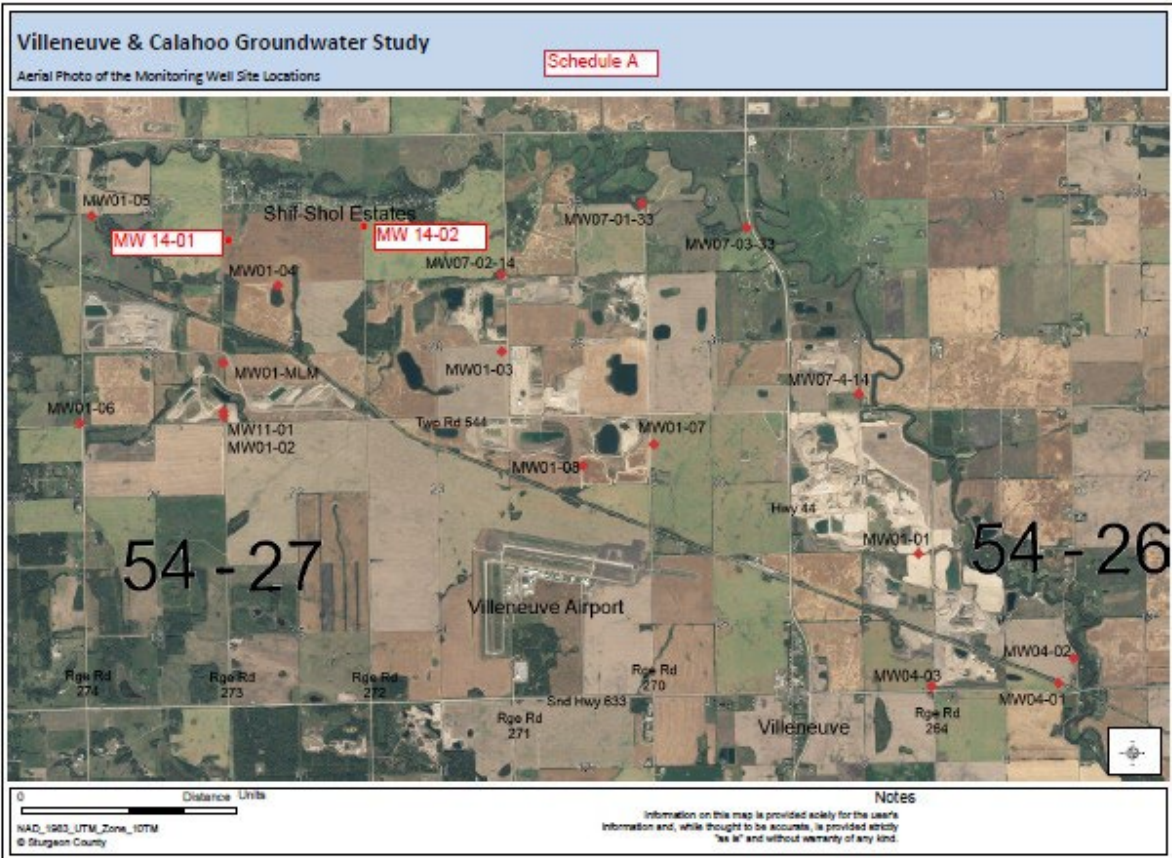
- A.1 Provide semi-annual testing of the existing ground water monitoring wells.
- A.2 Compile monthly water level readings provided by Sturgeon County
- A.3 Provide interpretation on groundwater monitoring results and gravel mining
- A.4 Prepare and present an annual report of the groundwater monitoring results.

#### Project Schedule

The project is expected to continue on a semiannual basis until either party provides thirty days notice to terminate the contract. The initial contract for this project is expected to last 2 years. Active Gravel Extraction Operations requiring long-term monitoring are expected to be in the area for the next 20 to 25 years.

#### Contact Personnel

Chris Pullen, Sturgeon County - (780)939-1319





Schedule B

Well Identification	Legal Location (W4M)	Easting	Northing	Ground Elevation (m asl)
A-S&G (OV)	09-29-054-27	305985.3	5953798.4	685.83
C-S&G(OV)	09-29-054-27	306019.61	5953581.67	687.92
MLM	05-27-054-27	307868.71	5953289.04	686.19
MW01-01	16-17-054-26	315793.79	5950667.83	674.03
MW01-03	14-27-054-27	311070.71	5953243.59	681.14
MW01-04	05-33-054-27	308561.26	5954101.09	675.88
MW01-05	01-29-054-27	308465.83	5955052.93	677.84
MW01-06	13-19-054-26	306195.72	5952686.44	690.64
MW01-07	10-26-054-27	312756.95	5952081.47	575.88
MW01-08	01-16-054-26	311926.29	5951883.29	682.01
MW04-01	01-16-054-26	317243.07	5949083.59	667.78
MW04-02	01-16-054-26	317432.63	5949363.31	666.83
MW04-03	01-17-054-26	315774.51	5949133.86	676.36
MW07-1-33	08-36-054-27	312775.96	5954856.52	667.17
MW07-2-14	01-35-054-27	311113.14	5954131.48	671.43
MW07-3-33	07-31-054-27	313967.36	595418.27	666.04
MW07-4-14	03-29-054-26	315138.86	5952647.5	671.4
MW11-01*	SW-27-054-27	71972	5947083	na
MW11-02*	SW-27-054-27	71965	5947084	691
MW14-01*	SW-34-054-27	307927	5954684	674.941
MW14-02*	SE-34-054-27	309549	5954909	672.241

# Appendix B – Monitoring Well Details

## TABLE OF CONTENTS

A-S&G (OV).....	5
Water Well Diagram.....	6
TGWC – Water Well Drilling Report.....	7
AEPA – Water Well Drilling Report [GIC ID: Unknown].....	8
Chemical Analysis Results (June 12, 2023).....	9
2022 – 2023 Hydrograph.....	19
C-S&G (OV).....	20
Water Well Diagram.....	21
TGWC – Water Well Drilling Report.....	22
AEPA – Water Well Drilling Report [GIC ID: Unknown].....	23
Chemical Analysis Results (June 12, 2023).....	24
2022 – 2023 Hydrograph.....	34
MLM.....	35
Water Well Diagram.....	36
TGWC – Water Well Drilling Report.....	37
AEPA – Water Well Drilling Report [GIC ID: Unknown].....	38
Chemical Analysis Results (June 12, 2023).....	39
2022 – 2023 Hydrograph.....	49
MW01-01.....	50
Water Well Diagram.....	51
TGWC – Water Well Drilling Report.....	52
AEPA – Water Well Drilling Report [GIC ID: Unknown].....	53
Chemical Analysis Results (June 13, 2023).....	54
2022 – 2023 Hydrograph.....	64
MW01-04.....	65
Water Well Diagram.....	66
TGWC – Water Well Drilling Report.....	67
AEPA – Water Well Drilling Report [GIC ID: Unknown].....	68
Chemical Analysis Results (June 13, 2023).....	69
2022 – 2023 Hydrograph.....	79
MW01-05.....	80
Water Well Diagram.....	81
TGWC – Water Well Drilling Report.....	82
AEPA – Water Well Drilling Report [GIC ID: Unknown].....	83
Chemical Analysis Results (June 12, 2023).....	84
2022 – 2023 Hydrograph.....	94
MW01-06.....	95
Water Well Diagram.....	96
TGWC – Water Well Drilling Report.....	97
AEPA – Water Well Drilling Report [GIC ID: Unknown].....	98
Chemical Analysis Results (June 12, 2023).....	99
2022 – 2023 Hydrograph.....	109
MW01-07.....	110

# Appendix B – Monitoring Well Details

## TABLE OF CONTENTS

Water Well Diagram.....	111
TGWC – Water Well Drilling Report.....	112
AEPA – Water Well Drilling Report [GIC ID: 297525].....	113
Chemical Analysis Results (June 20, 2023).....	115
2022 – 2023 Hydrograph.....	125
<b>MW01-08.....</b>	<b>126</b>
Water Well Diagram.....	127
TGWC – Water Well Drilling Report.....	128
AEPA – Water Well Drilling Report [GIC ID: 297529].....	129
Chemical Analysis Results (June 12, 2023).....	131
2022 – 2023 Hydrograph.....	141
<b>MW04-01.....</b>	<b>142</b>
Water Well Diagram.....	143
TGWC – Water Well Drilling Report.....	144
AEPA – Water Well Drilling Report [GIC ID: 1270001].....	145
Chemical Analysis Results (June 14, 2023).....	147
2022 – 2023 Hydrograph.....	157
<b>MW04-02.....</b>	<b>158</b>
Water Well Diagram.....	159
TGWC – Water Well Drilling Report.....	160
AEPA – Water Well Drilling Report [GIC ID: 1270002].....	161
Chemical Analysis Results (June 12, 2023).....	163
2022 – 2023 Hydrograph.....	173
<b>MW04-03.....</b>	<b>174</b>
Water Well Diagram.....	175
TGWC – Water Well Drilling Report.....	176
AEPA – Water Well Drilling Report [GIC ID: 1270003].....	177
Chemical Analysis Results (June 12, 2023).....	179
2022 – 2023 Hydrograph.....	189
<b>MW05-01.....</b>	<b>190</b>
Water Well Diagram.....	191
TGWC – Water Well Drilling Report.....	192
AEPA – Water Well Drilling Report [GIC ID: 1495114].....	193
Chemical Analysis Results (June 12, 2023).....	195
2022 – 2023 Hydrograph.....	205
<b>MW07-1-33.....</b>	<b>206</b>
Water Well Diagram.....	207
TGWC – Water Well Drilling Report.....	208
AEPA – Water Well Drilling Report [GIC ID: 1420667].....	209
Chemical Analysis Results (June 12, 2023).....	211
2022 – 2023 Hydrograph.....	221
<b>MW07-2-14.....</b>	<b>222</b>
Water Well Diagram.....	223

# Appendix B – Monitoring Well Details

## TABLE OF CONTENTS

TGWC – Water Well Drilling Report.....	224
AEPA – Water Well Drilling Report [GIC ID: 1420665].....	225
Chemical Analysis Results (June 12, 2023).....	227
2022 – 2023 Hydrograph.....	237
<b>MW07-3-33.....</b>	<b>238</b>
Water Well Diagram.....	239
TGWC – Water Well Drilling Report.....	240
AEPA – Water Well Drilling Report [GIC ID: 1420666].....	241
Chemical Analysis Results (June 12, 2023).....	243
2022 – 2023 Hydrograph.....	253
<b>MW10-01.....</b>	<b>254</b>
Water Well Diagram.....	255
TGWC – Water Well Drilling Report.....	256
AEPA – Water Well Drilling Report [GIC ID: Unknown].....	257
Chemical Analysis Results (June 12, 2023).....	258
2022 – 2023 Hydrograph.....	268
<b>MW11-02.....</b>	<b>269</b>
Water Well Diagram.....	270
TGWC – Water Well Drilling Report.....	271
AEPA – Water Well Drilling Report [GIC ID: Unknown].....	272
Chemical Analysis Results (June 12, 2023).....	273
2022 – 2023 Hydrograph.....	283
<b>MW14-01.....</b>	<b>284</b>
Water Well Diagram.....	285
TGWC – Water Well Drilling Report.....	286
AEPA – Water Well Drilling Report [GIC ID: Unknown].....	287
Chemical Analysis Results (June 12, 2023).....	288
2022 – 2023 Hydrograph.....	298
<b>MW14-02.....</b>	<b>299</b>
Water Well Diagram.....	300
TGWC – Water Well Drilling Report.....	301
AEPA – Water Well Drilling Report [GIC ID: Unknown].....	302
Chemical Analysis Results (June 13, 2023).....	303
2022 – 2023 Hydrograph.....	313
<b>MW18-01.....</b>	<b>314</b>
Water Well Diagram.....	315
TGWC – Water Well Drilling Report.....	316
AEPA – Water Well Drilling Report [GIC ID: Unknown].....	317
Chemical Analysis Results (June 14, 2023).....	318
2022 – 2023 Hydrograph.....	328
<b>1963 Water Well 12-19.....</b>	<b>329</b>
Water Well Diagram.....	330
TGWC – Water Well Drilling Report.....	331

# Appendix B – Monitoring Well Details

## TABLE OF CONTENTS

AEPA – Water Well Drilling Report [GIC ID: Unknown].....	332
Chemical Analysis Results (June 14, 2023).....	333
2022 – 2023 Hydrograph.....	343
<b>1987 Water Well 13-26.....</b>	<b>344</b>
Water Well Diagram.....	345
TGWC – Water Well Drilling Report.....	346
AEPA – Water Well Drilling Report [GIC ID: 264252].....	347
2022 – 2023 Hydrograph.....	349
<b>1995 Water Well 09-34.....</b>	<b>350</b>
Water Well Diagram.....	351
TGWC – Water Well Drilling Report.....	352
AEPA – Water Well Drilling Report [GIC ID: Unknown].....	353
Chemical Analysis Results (June 12, 2023).....	354
2022 – 2023 Hydrograph.....	364
<b>2001 Water Well 14-21.....</b>	<b>365</b>
Water Well Diagram.....	366
TGWC – Water Well Drilling Report.....	367
AEPA – Water Well Drilling Report [GIC ID: 40335].....	368
Chemical Analysis Results (June 12, 2023).....	370
2022 – 2023 Hydrograph.....	380
<b>2001 Water Well 16-28.....</b>	<b>381</b>
Water Well Diagram.....	382
TGWC – Water Well Drilling Report.....	383
AEPA – Water Well Drilling Report [GIC ID: 297091].....	384
Chemical Analysis Results (June 12, 2023).....	386
2022 – 2023 Hydrograph.....	396
<b>2006 Water Well 10-34.....</b>	<b>397</b>
Water Well Diagram.....	398
TGWC – Water Well Drilling Report.....	399
AEPA – Water Well Drilling Report [GIC ID: 1715169].....	400
Chemical Analysis Results (June 12, 2023).....	402
2022 – 2023 Hydrograph.....	412
<b>2013 Water Well 01-29.....</b>	<b>413</b>
Water Well Diagram.....	414
TGWC – Water Well Drilling Report.....	415
AEPA – Water Well Drilling Report [GIC ID: 1495598].....	416
Chemical Analysis Results (June 13, 2023).....	418
2022 – 2023 Hydrograph.....	428

## A-S&G (OV)

09-29-054-27 W4M  
(M40000.652035)



Well Spatial Location:

Easting: **70,027**

Northing: **5,947,934**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **686**

*(elevation accuracy HCL DEM)*

Date Completed: **February 9, 2007**

Depth Drilled (m): **22.0**

Completion Interval (m): **16.6 – 18.1 \***

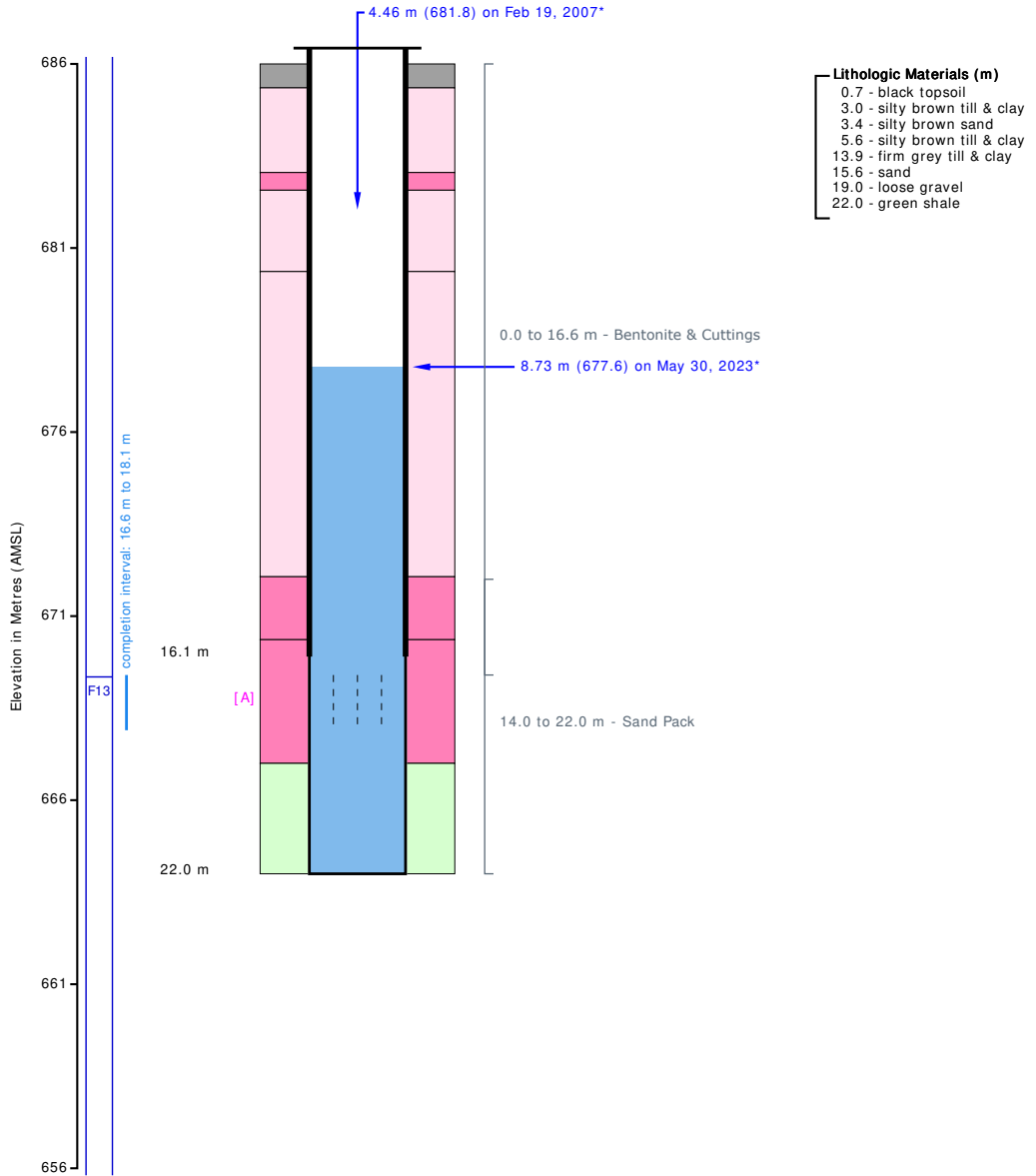
*(\* TGWC determined value)*

Earliest Water Level (m): **4.46 – February 19, 2007**

Most Recent Water Level (m): **8.73 – May 30, 2023 @ 09:34**

GIC ID: **Unknown**

## A-S&G (OV) Water Well Diagram



- Lithologic Materials (m)**
- 0.7 - black topsoil
  - 3.0 - silty brown till & clay
  - 3.4 - silty brown sand
  - 5.6 - silty brown till & clay
  - 13.9 - firm grey till & clay
  - 15.6 - sand
  - 19.0 - loose gravel
  - 22.0 - green shale

Lithology Legend		Geologic Unit Legend (Top) - Regional Analysis	
<p><b>Surficial</b></p> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #f0e6e6; border: 1px solid black; margin-right: 5px;"></span> Unsorted</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #f0e6e6; border: 1px solid black; margin-right: 5px;"></span> Fine Grained</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #f0e6e6; border: 1px solid black; margin-right: 5px;"></span> Coarse Grained</li> </ul>	<p><b>Bedrock</b></p> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #c8e6c9; border: 1px solid black; margin-right: 5px;"></span> Fine Grained</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #c8e6c9; border: 1px solid black; margin-right: 5px;"></span> Coarse Grained</li> </ul>	<p><b>Other</b></p> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #9e9e9e; border: 1px solid black; margin-right: 5px;"></span> Other</li> </ul>	<p>F13 - Lower Horseshoe Canyon Formation</p>

**Summary**

TGWC ID: M40000.652035  
 Well Name: A-S&G (OV)  
 Legal Location: 09-29-054-27 W4M  
 Casing (OD): 152.0 mm; PVC (6.0")  
 Casing Stick-Up: 0.5 m (not drawn to scale)  
 Completion [A]: 16.6 to 18.1 m; Slotted  
 Water Level (recent): 8.73 m (677.6 m AMSL) on May 30, 2023 @ 09:34 - Reference Point: Top of Casing  
 Water Level (oldest): 4.46 m (681.8 m AMSL) on Feb 19, 2007 - Reference Point: Top of Casing

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:48 --- <https://www.hcl.ca>

*do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.*

Owner: **Lafarge Canada Inc**  
**8635 Stadium Rd NW, Edmonton, AB T5H 3X1**  
 Contractor: **Gerald McGinn Drilling Ltd.**  
 Name: **A-S&G (OV)**

Field Action: **Confirmed - Physically, July 14, 2009**  
 Work Type: **Piezometer** Date Started: **February 7, 2007**  
 Drilling Method: **Drilled** Date Completed: **February 9, 2007**  
 Proposed Use: **Monitoring** Well Status: **Observation**  
 Completion Type: **Screen** Feature Class: **Piezometer**

**METRIC REPORT**

09-29-054-27 W4M

**M40000.652035**

Easting (m): **70,027.22\*\***  
 Northing (m): **5,947,933.57\*\***  
 Elevation (m): **686\*\*\***  
 Lot:  
 Block:  
 Plan:

513360; core

Elog Taken: **Yes**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.5**

Presence of Gas: **No**

**General Details** core  
 Depth Completed (m)\*: **18.1** Top of Bedrock: **Surficial Water Well \***  
 Depth Drilled (m): **22.0** Completion Interval (m): **16.6 – 18.1 \***

Sand & Gravel Thickness (m): **5.6 (total) – 4.0 (below 15 m) \***

Most Recent Water Level (m): **8.73 m – May 30, 2023**

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
685.2	0.7	Black Topsoil
682.9	3.0	Silty Brown Till & Clay
682.4	3.4	Silty Brown Sand
680.2	5.6	Silty Brown Till & Clay
671.9	13.9	Firm Grey Till & Clay
670.2	15.6	Sand
666.8	19.0	Loose Gravel
663.8	22.0	Green Shale

**Completion Details**  
 Surface Casing: **PVC – 152.0 mm (O.D.) x 16.1 m (bottom)**  
 Screen Material: **PVC**

**Intervals**  
 Slotted: **16.6 to 18.1 m - 12 - Method: [unknown]**  
 Bentonite & Cuttings: **0.0 to 16.6 m**  
 Sand Pack: **14.0 to 22.0 m**

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: **May 30, 2023 @ 11:00**  
 Report Date: **June 12, 2023 - Element Materials Technology Canada Inc. (1655888-12)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	930	Nitrate as N:	< 0.01	Turbidity (NTU):	17.2
Total Dissolved Solids:	571	Nitrite as N:	< 0.005	Fluoride:	0.07
Hardness (as CaCO3):	370	pH (pH Unit):	7.39	Carbonate:	< 6
T-Alkalinity (as CaCO3):	456	Colour (TCU):	30	Bicarbonate:	556
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	98	Hydroxide:	< 5
Nitrate + Nitrite as N:	< 0.01	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.1	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	112		Mercury:	< 0.000005	
Chloride:	< 0.4		Molybdenum:	< 0.001	
Iron:	1.55		Magnesium:	22.2	
Manganese:	0.694***		Sodium:	71.7	
Aluminum:	< 0.002		Potassium:	3.3	
Arsenic:	0.0079		Vanadium:	< 0.0001	
Barium:	0.035		Strontium:	0.990	
Beryllium:	< 0.0001		Nickel:	0.0010	
Cadmium:	< 0.00001		Zinc:	< 0.001	
Chromium:	< 0.0005		Copper:	< 0.0002	
Cobalt:	0.0011		Lead:	< 0.0001	
Sulfate:	88.1		Uranium:	0.0021	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario. 513360; 1 / 29

**Comments & Observations**

**Aquifer Tests**

**Alias IDs**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM — {Ground; AMSL}





*A-S&G (OV)*  
*AEPA - Water Well Drilling Report*

*— AEPA water well drilling report not available —*

**A-S&G (OV)**  
**Chemical Analysis Results (June 12, 2023)**



Element  
 7217 Roper Road NW  
 Edmonton, Alberta  
 T6B 3J4, Canada

T: +1 (780) 438-5522  
 F: +1 (780) 434-8586  
 E: info.Edmonton@element.com  
 W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880318
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

**Reference Number** 1655888-12  
**Sample Date** May 30, 2023  
**Sample Time** 11:00  
**Sample Location** M40000.652035  
**Sample Description** A-S&G (OV) / 4.3 °C  
**Sample Matrix** Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Metals Dissolved</b>						
Silicon	Dissolved mg/L	7.97	0.05			
Sulfur	Dissolved mg/L	29.4	0.3			
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC	
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG	
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC	
Arsenic	Dissolved mg/L	0.0079	0.0002	0.01	Below MAC	
Barium	Dissolved mg/L	0.035	0.001	2.0	Below MAC	
Beryllium	Dissolved mg/L	<0.0001	0.0001			
Bismuth	Dissolved mg/L	<0.0005	0.0005			
Boron	Dissolved mg/L	0.149	0.002	5	Below MAC	
Cadmium	Dissolved mg/L	<0.00001	0.00001	0.007	Below MAC	
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC	
Cobalt	Dissolved mg/L	0.0011	0.0001			
Copper	Dissolved mg/L	<0.0002	0.0002	1 AO; 2 MAC	Below AO	
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC	
Lithium	Dissolved mg/L	0.084	0.001			
Molybdenum	Dissolved mg/L	<0.001	0.001			
Nickel	Dissolved mg/L	0.0010	0.0005			
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC	
Silver	Dissolved mg/L	<0.00001	0.00001			
Strontium	Dissolved mg/L	0.990	0.001	7.0	Below MAC	
Thallium	Dissolved mg/L	<0.00005	0.00005			
Tin	Dissolved mg/L	<0.001	0.001			
Titanium	Dissolved mg/L	<0.0005	0.0005			
Uranium	Dissolved mg/L	0.0021	0.0005	0.02	Below MAC	
Vanadium	Dissolved mg/L	<0.0001	0.0001			
Zinc	Dissolved mg/L	<0.001	0.001	5	Below AO	
Subsample		Field Filtered				
<b>Physical and Aggregate Properties</b>						
Colour	Apparent, Potable	Colour units	30	5	15	Above AO
Turbidity		NTU	17.2	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>						
pH			7.39	1	7.0-10.5	Within OG Range
Temperature of observed pH		°C	21.1			
Electrical Conductivity	at 25 °C	µS/cm	930	1		
Calcium	Dissolved	mg/L	112	0.2		
Magnesium	Dissolved	mg/L	22.2	0.2		
Sodium	Dissolved	mg/L	71.7	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880318
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-12
<b>Sample Date</b>	May 30, 2023
<b>Sample Time</b>	11:00
<b>Sample Location</b>	M40000.652035
<b>Sample Description</b>	A-S&G (OV) / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Routine Water - Continued</b>						
Potassium	Dissolved	mg/L	3.3	0.4		
Iron	Dissolved	mg/L	1.55	0.01	0.3	Above AO
Manganese	Dissolved	mg/L	0.694	0.005	0.02 AO; 0.12 MAC	Above MAC
Chloride	Dissolved	mg/L	<0.4	0.4	250	Below AO
Fluoride		mg/L	0.07	0.05	1.5	Below MAC
Nitrate - N		mg/L	<0.01	0.01	10	Below MAC
Nitrite - N		mg/L	<0.005	0.005	1	Below MAC
Nitrate and Nitrite - N		mg/L	<0.01	0.01	10	Below MAC
Sulfate (SO4)	Dissolved	mg/L	88.1	0.9	500	Below AO
Hydroxide		mg/L	<5			
Carbonate		mg/L	<6			
Bicarbonate		mg/L	556			
P-Alkalinity	as CaCO3	mg/L	<5	5		
T-Alkalinity	as CaCO3	mg/L	456	5		
Total Dissolved Solids	Calculated	mg/L	571	1	500	Above AO
Hardness	Dissolved as CaCO3	mg/L	370			
Ionic Balance	Dissolved	%	98			

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880318
Sampled By: Ben Gilham Company: HCL		

**Metals Dissolved**

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880318
--	--	--

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880318
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Sulfur	mg/L	33.7	34.4	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	1.1	1.1	10	0.4	yes
Barium	µg/L	48	48	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	109	110	10	4	yes
Cadmium	µg/L	<0.01	<0.01	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.2	1.2	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	71	71	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.9	1.1	10	1.1	yes
Selenium	µg/L	<0.2	<0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	953	947	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.7	3.6	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880318
--	--	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	10.0	9.9	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880318
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

**Routine Water - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.1	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	15.0	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	56.8	57.1	10	0.5	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes
Nitrate - N	mg/L	0.02	0.02	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes



**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880318
--	---	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	121	123	10	0.6	yes
Magnesium	mg/L	23.2	23.7	10	0.7	yes
Sodium	mg/L	64.4	65.8	10	1.2	yes
Potassium	mg/L	3.8	3.8	10	1.2	yes
Iron	mg/L	2.31	2.35	10	0.05	yes
Manganese	mg/L	0.653	0.664	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring	Lot ID: <b>1655888</b>
Attn: Kirby Fromm	Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880318
Sampled By: Ben Gilham Company: HCL	P.O.: 19707 Proj. Acct. code:	

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-12; 8663479: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880318
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

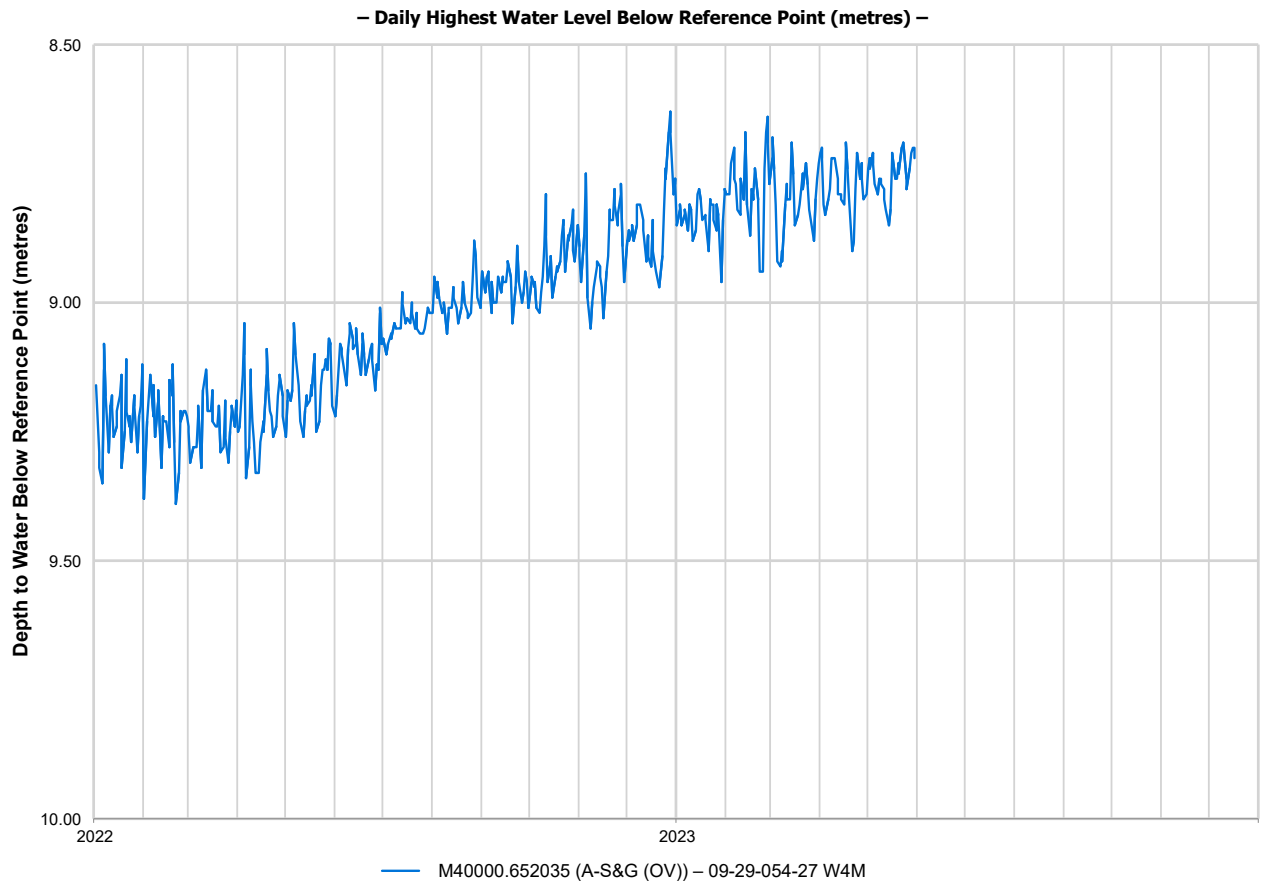
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

*A-S&G (OV)*  
*2022 - 2023 Hydrograph*



## C-S&G (OV)

09-29-054-27 W4M  
(M40000.652664)



### Well Spatial Location:

Easting: **70,078**

Northing: **5,947,714**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **688**

*(elevation accuracy HCL DEM)*

Date Completed: **February 15, 2007**

Depth Drilled (m): **19.5**

Completion Interval (m): **16.1 – 17.6 \***

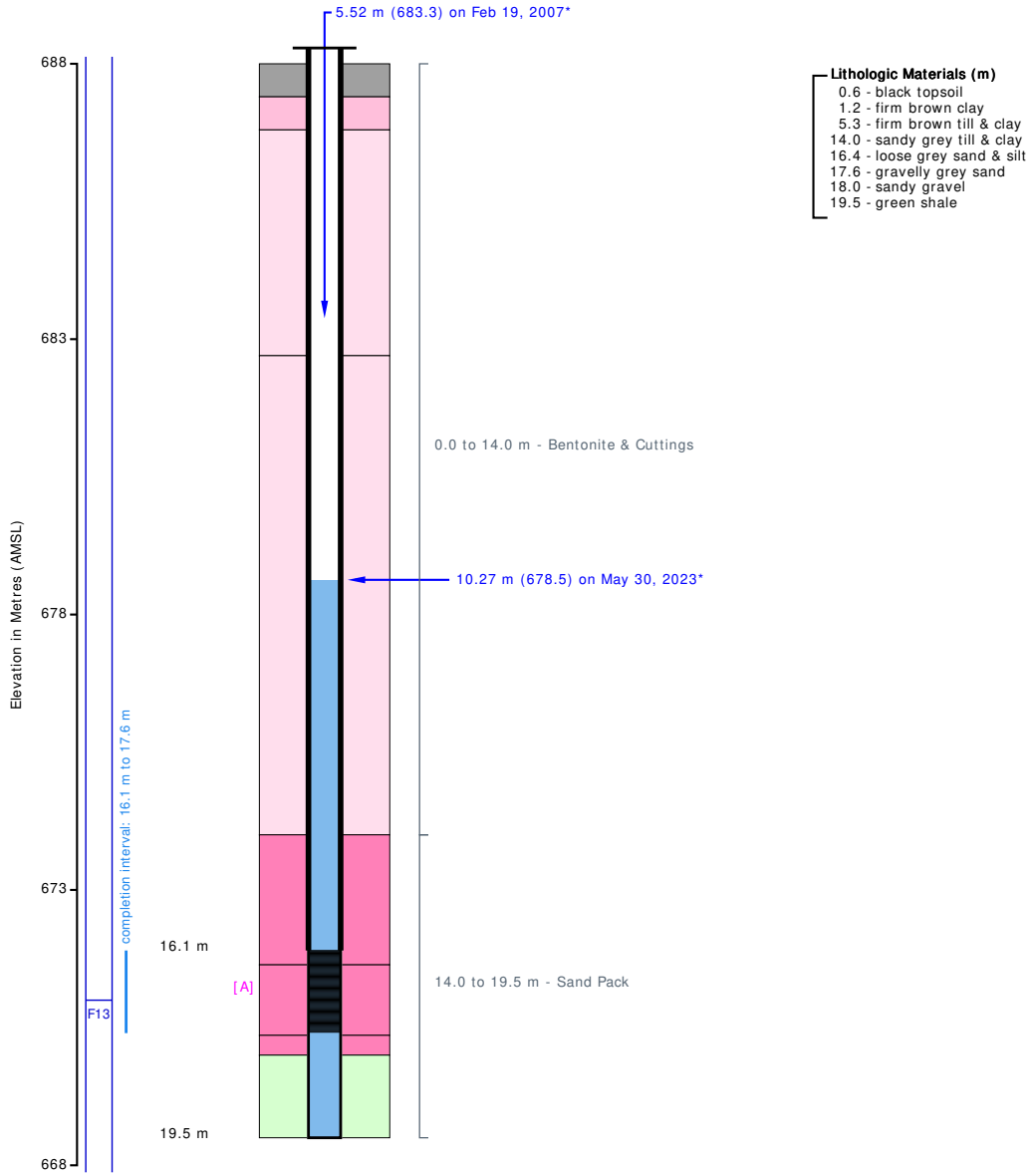
*(\* TGWC determined value)*

Earliest Water Level (m): **5.52 – February 19, 2007**

Most Recent Water Level (m): **10.27 – May 30, 2023 @ 08:39**

GIC ID: **Unknown**

# C-S&G (OV) Water Well Diagram



Lithology Legend		Geologic Unit Legend (Top) - Regional Analysis	
<p><b>Surficial</b></p> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #f08080; border: 1px solid black;"></span> Unsorted</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #ff69b4; border: 1px solid black;"></span> Fine Grained</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #ff1493; border: 1px solid black;"></span> Coarse Grained</li> </ul>	<p><b>Bedrock</b></p> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #90ee90; border: 1px solid black;"></span> Fine Grained</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #32cd32; border: 1px solid black;"></span> Coarse Grained</li> </ul>	<p><span style="display: inline-block; width: 15px; height: 10px; background-color: #808080; border: 1px solid black;"></span> Other</p>	<p>F13 - Lower Horseshoe Canyon Formation</p>

### Summary

TGWC ID: M40000.652664  
 Well Name: C-S&G (OV)  
 Legal Location: 09-29-054-27 W4M  
 Casing (OD): 51.0 mm; PVC (2.0")  
 Casing Stick-Up: 0.9 m (not drawn to scale)  
 Completion [A]: 16.1 to 17.6 m; Screened

Water Level (recent): 10.27 m (678.5 m AMSL) on May 30, 2023 @ 08:39 - Reference Point: Top of Casing  
 Water Level (oldest): 5.52 m (683.3 m AMSL) on Feb 19, 2007 - Reference Point: Top of Casing

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:48 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.

Owner: **Sturgeon County**  
**9613-100 St, Morinville, AB T8R 1L9**  
 Contractor: **Gerald McGinn Drilling Ltd.**  
 Name: **C-S&G (OV)**

Field Action: **Confirmed - Physically, July 13, 2009**  
 Work Type: **Piezometer** Date Started: **February 15, 2007**  
 Drilling Method: **Drilled** Date Completed: **February 15, 2007**  
 Proposed Use: **Monitoring** Well Status: **Observation**  
 Completion Type: **Perforated Casing** Feature Class: **Piezometer**

**METRIC REPORT**

09-29-054-27 W4M

Easting (m): **70,078.36\*\***  
 Northing (m): **5,947,713.76\*\***  
 Elevation (m): **688\*\*\***  
 Lot:  
 Block:  
 Plan:

**M40000.652664**

513357; core

Elog Taken: **Yes**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.9**

Presence of Gas: **No**

**General Details** core  
 Depth Completed (m)\*: **17.6** Top of Bedrock: **Surficial Water Well \***  
 Depth Drilled (m): **19.5** Completion Interval (m): **16.1 – 17.6 \***

Sand & Gravel Thickness (m): **4.0 (total) – 3.0 (below 15 m) \***

Most Recent Water Level (m): **10.27 m – May 30, 2023**

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
687.3	0.6	Black Topsoil
686.7	1.2	Firm Brown Clay
682.6	5.3	Firm Brown Till & Clay
673.9	14.0	Sandy Grey Till & Clay
671.5	16.4	Loose Grey Sand & Silt
670.3	17.6	Gravelly Grey Sand
669.9	18.0	Sandy Gravel
668.4	19.5	Green Shale

**Completion Details**  
 Surface Casing: **PVC – 51.0 mm (O.D.) x 16.1 m (bottom)**

**Intervals**  
 Screen: **16.1 to 17.6 m - 10 (unknown)**  
 Bentonite & Cuttings: **0.0 to 14.0 m**  
 Sand Pack: **14.0 to 19.5 m**

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: **May 30, 2023 @ 09:10**  
 Report Date: **June 12, 2023 - Element Materials Technology Canada Inc. (1655888-9)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	944	Nitrate as N:	< 0.01	Turbidity (NTU):	24.3
Total Dissolved Solids:	583	Nitrite as N:	< 0.005	Fluoride:	0.06
Hardness (as CaCO3):	398	pH (pH Unit):	7.42	Carbonate:	< 6
T-Alkalinity (as CaCO3):	449	Colour (TCU):	45	Bicarbonate:	547
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	99	Hydroxide:	< 5
Nitrate + Nitrite as N:	< 0.01	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.4	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	121		Mercury:	< 0.000005	
Chloride:	< 0.4		Molybdenum:	< 0.001	
Iron:	2.31		Magnesium:	23.2	
Manganese:	0.653***		Sodium:	64.4	
Aluminum:	< 0.002		Potassium:	3.8	
Arsenic:	0.0079		Vanadium:	< 0.0001	
Barium:	0.033		Strontium:	1.18	
Beryllium:	< 0.0001		Nickel:	0.0012	
Cadmium:	< 0.00001		Zinc:	< 0.001	
Chromium:	< 0.0005		Copper:	< 0.0002	
Cobalt:	0.0015		Lead:	< 0.0001	
Sulfate:	101		Uranium:	0.0017	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario. 513357; 1 / 29

**Comments & Observations**

**Aquifer Tests**

**Alias IDs**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS – 10TM Resource NAD83  
 \*\*\* HCL DEM – {Ground; AMSL}



**C-S&G (OV)**  
**AEPA - Water Well Drilling Report**

— AEPA water well drilling report not available —



**C-S&G (OV)**  
**Chemical Analysis Results (June 12, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707 P.O.: Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880315
--	---	--

<b>Reference Number</b>	1655888-9
<b>Sample Date</b>	May 30, 2023
<b>Sample Time</b>	09:10
<b>Sample Location</b>	M40000.652664
<b>Sample Description</b>	C-S&G (OV) / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Metals Dissolved</b>						
Silicon	Dissolved mg/L	8.47	0.05			
Sulfur	Dissolved mg/L	33.7	0.3			
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC	
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG	
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC	
Arsenic	Dissolved mg/L	0.0079	0.0002	0.01	Below MAC	
Barium	Dissolved mg/L	0.033	0.001	2.0	Below MAC	
Beryllium	Dissolved mg/L	<0.0001	0.0001			
Bismuth	Dissolved mg/L	<0.0005	0.0005			
Boron	Dissolved mg/L	0.142	0.002	5	Below MAC	
Cadmium	Dissolved mg/L	<0.00001	0.00001	0.007	Below MAC	
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC	
Cobalt	Dissolved mg/L	0.0015	0.0001			
Copper	Dissolved mg/L	<0.0002	0.0002	1 AO; 2 MAC	Below AO	
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC	
Lithium	Dissolved mg/L	0.074	0.001			
Molybdenum	Dissolved mg/L	<0.001	0.001			
Nickel	Dissolved mg/L	0.0012	0.0005			
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC	
Silver	Dissolved mg/L	<0.00001	0.00001			
Strontium	Dissolved mg/L	1.18	0.001	7.0	Below MAC	
Thallium	Dissolved mg/L	<0.00005	0.00005			
Tin	Dissolved mg/L	<0.001	0.001			
Titanium	Dissolved mg/L	<0.0005	0.0005			
Uranium	Dissolved mg/L	0.0017	0.0005	0.02	Below MAC	
Vanadium	Dissolved mg/L	<0.0001	0.0001			
Zinc	Dissolved mg/L	<0.001	0.001	5	Below AO	
Subsample		Field Filtered				
<b>Physical and Aggregate Properties</b>						
Colour	Apparent, Potable	Colour units	45	5	15	Above AO
Turbidity		NTU	24.3	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>						
pH			7.42	1	7.0-10.5	Within OG Range
Temperature of observed pH		°C	21.4			
Electrical Conductivity	at 25 °C	µS/cm	944	1		
Calcium	Dissolved	mg/L	121	0.2		
Magnesium	Dissolved	mg/L	23.2	0.2		
Sodium	Dissolved	mg/L	64.4	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880315
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-9
<b>Sample Date</b>	May 30, 2023
<b>Sample Time</b>	09:10
<b>Sample Location</b>	M40000.652664
<b>Sample Description</b>	C-S&G (OV) / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved	mg/L	3.8	0.4	
Iron	Dissolved	mg/L	2.31	0.01	0.3 Above AO
Manganese	Dissolved	mg/L	0.653	0.005	0.02 AO; 0.12 MAC Above MAC
Chloride	Dissolved	mg/L	<0.4	0.4	250 Below AO
Fluoride		mg/L	0.06	0.05	1.5 Below MAC
Nitrate - N		mg/L	<0.01	0.01	10 Below MAC
Nitrite - N		mg/L	<0.005	0.005	1 Below MAC
Nitrate and Nitrite - N		mg/L	<0.01	0.01	10 Below MAC
Sulfate (SO4)	Dissolved	mg/L	101	0.9	500 Below AO
Hydroxide		mg/L	<5		
Carbonate		mg/L	<6		
Bicarbonate		mg/L	547		
P-Alkalinity	as CaCO3	mg/L	<5	5	
T-Alkalinity	as CaCO3	mg/L	449	5	
Total Dissolved Solids	Calculated	mg/L	583	1	500 Above AO
Hardness	Dissolved as CaCO3	mg/L	398		
Ionic Balance	Dissolved	%	99		

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880315
--	--	--

### Metals Dissolved

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880315
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880315
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Sulfur	mg/L	1.0	1.1	10	0.1	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	1.1	1.1	10	0.4	yes
Barium	µg/L	48	48	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	109	110	10	4	yes
Cadmium	µg/L	<0.01	<0.01	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.2	1.2	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	71	71	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.9	1.1	10	1.1	yes
Selenium	µg/L	<0.2	<0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	953	947	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.7	3.6	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880315
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	1.4	1.3	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880315
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.1	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	15.0	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	56.8	57.1	10	0.5	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes
Nitrate - N	mg/L	0.02	0.02	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880315
--	--	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	29.6	29.3	10	0.6	yes
Magnesium	mg/L	9.1	9.0	10	0.7	yes
Sodium	mg/L	2.9	2.8	10	1.2	yes
Potassium	mg/L	1.0	1.0	10	1.2	yes
Iron	mg/L	0.18	0.18	10	0.05	yes
Manganese	mg/L	<0.005	<0.005	10	0.010	yes
Date Acquired: June 09, 2023						



## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880315
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-9; 8663476: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880315
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

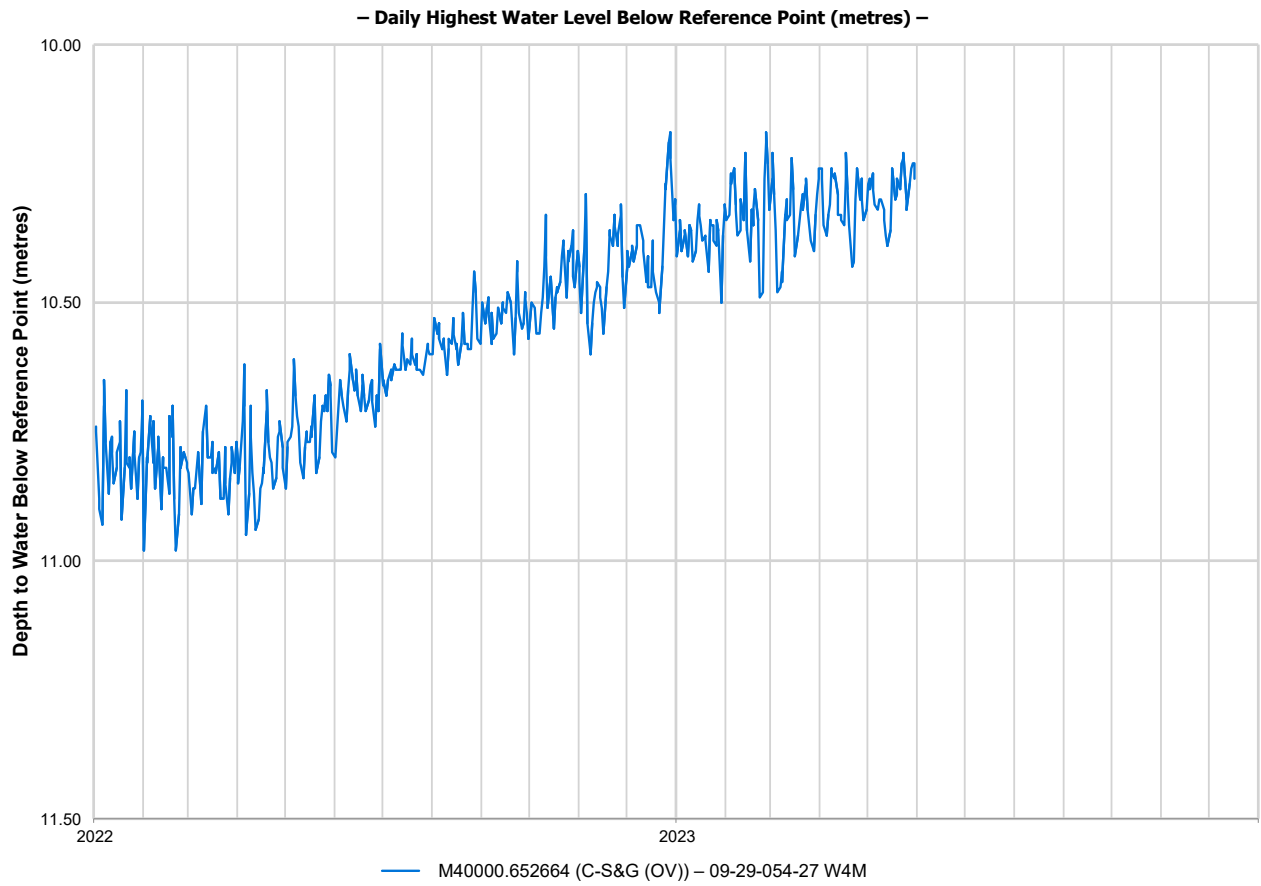
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**C-S&G (OV)**  
**2022 - 2023 Hydrograph**



# MLM

**05-27-054-27 W4M**  
(M40000.651289)



**Well Spatial Location:**

**Easting: 71,935**

**Northing: 5,947,532**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

**Ground Elevation AMSL (m): 686**

*(elevation accuracy HCL DEM)*

**Date Completed: Not Available**

**Depth Drilled (m): 19.4**

**Completion Interval (m): Not Available**

*(\* TGWC determined value)*

**Earliest Water Level (m): 7.97 – August 13, 2001**

**Most Recent Water Level (m): 15.61 – May 29, 2023 @ 12:47**

**GIC ID: Unknown**

**MLM**  
**Water Well Diagram**

*Insufficient information available to draw a water well diagram:*

Owner: **Sturgeon County**  
 9613-100 St, Morinville, AB T8R 1L9

Contractor: **[unknown contractor]**  
 Name: **MLM**

Field Action: **Confirmed - Physically, July 13, 2009**  
 Work Type: **Piezometer**  
 Drilling Method: **[unknown]**  
 Proposed Use: **Monitoring**

Well Status: **Observation**  
 Feature Class: **Piezometer**

### METRIC REPORT

05-27-054-27 W4M

M40000.651289

513366; core

Easting (m): **71,934.80\*\***  
 Northing (m): **5,947,532.25\*\***  
 Elevation (m): **686\*\*\***  
 Lot:  
 Block:  
 Plan:

Elog Taken: **No**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **1.1**

Presence of Gas: **No**

#### General Details core

Depth Drilled (m): **19.4** Top of Bedrock: **Surficial Water Well \***

Most Recent Water Level (m): **15.61 m – May 29, 2023**

#### Completion Details

Surface Casing: **PVC – 50.8 mm (O.D.)**

#### Intervals

#### Lithology Details

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
666.8	19.4	Unknown

#### Chemistry Summary Details (mg/L, except as noted) (recently sampled first)

Sampling Details: **May 28, 2023 @ 13:20**

Report Date: **June 12, 2023 - Element Materials Technology Canada Inc. (1655888-18)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	930	Nitrate as N:	0.03	Turbidity (NTU):	487
Total Dissolved Solids:	573	Nitrite as N:	< 0.005	Fluoride:	0.08
Hardness (as CaCO3):	454	pH (pH Unit):	7.57	Carbonate:	< 6
T-Alkalinity (as CaCO3):	450	Colour (TCU):	> 60	Bicarbonate:	549
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	97	Hydroxide:	< 5
Nitrate + Nitrite as N:	0.03	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.0	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	131		Mercury:	< 0.000005	
Chloride:	2.4		Molybdenum:	< 0.001	
Iron:	0.02		Magnesium:	30.8	
Manganese:	0.583***		Sodium:	36.6	
Aluminum:	< 0.002		Potassium:	3.9	
Arsenic:	0.0008		Vanadium:	< 0.0001	
Barium:	0.087		Strontium:	0.861	
Beryllium:	< 0.0001		Nickel:	0.0034	
Cadmium:	0.00012		Zinc:	0.003	
Chromium:	< 0.0005		Copper:	0.0008	
Cobalt:	0.0008		Lead:	< 0.0001	
Sulfate:	97.8		Uranium:	0.0138	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario. 513366; 1 / 35

#### Comments & Observations

#### Aquifer Tests

#### Alias IDs

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM — {Ground; AMSL}

Created on: August 25, 2023 — Data "AS IS"; no warranty either expressed or implied. [53.692964 -113.910134 (WGS 84)], INT Date End: 2023-06-02

*MLM*  
*AEPA - Water Well Drilling Report*

*— AEPA water well drilling report not available —*

**MLM**  
**Chemical Analysis Results (June 12, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880324
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-18
<b>Sample Date</b>	May 28, 2023
<b>Sample Time</b>	13:20
<b>Sample Location</b>	M40000.651289
<b>Sample Description</b>	MLM / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Metals Dissolved</b>					
Silicon	Dissolved mg/L	5.52	0.05		
Sulfur	Dissolved mg/L	32.6	0.3		
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG
Antimony	Dissolved mg/L	0.0066	0.0002	0.006	Above MAC
Arsenic	Dissolved mg/L	0.0008	0.0002	0.01	Below MAC
Barium	Dissolved mg/L	0.087	0.001	2.0	Below MAC
Beryllium	Dissolved mg/L	<0.0001	0.0001		
Bismuth	Dissolved mg/L	<0.0005	0.0005		
Boron	Dissolved mg/L	0.073	0.002	5	Below MAC
Cadmium	Dissolved mg/L	0.00012	0.00001	0.007	Below MAC
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC
Cobalt	Dissolved mg/L	0.0008	0.0001		
Copper	Dissolved mg/L	0.0008	0.0002	1 AO; 2 MAC	Below AO
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC
Lithium	Dissolved mg/L	0.047	0.001		
Molybdenum	Dissolved mg/L	<0.001	0.001		
Nickel	Dissolved mg/L	0.0034	0.0005		
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC
Silver	Dissolved mg/L	<0.00001	0.00001		
Strontium	Dissolved mg/L	0.861	0.001	7.0	Below MAC
Thallium	Dissolved mg/L	<0.00005	0.00005		
Tin	Dissolved mg/L	<0.001	0.001		
Titanium	Dissolved mg/L	<0.0005	0.0005		
Uranium	Dissolved mg/L	0.0138	0.0005	0.02	Below MAC
Vanadium	Dissolved mg/L	<0.0001	0.0001		
Zinc	Dissolved mg/L	0.003	0.001	5	Below AO
Subsample		Field Filtered			
<b>Physical and Aggregate Properties</b>					
Colour	Apparent, Potable Colour units	>60	5	15	Above AO
Turbidity	NTU	487	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>					
pH		7.57	1	7.0-10.5	Within OG Range
Temperature of observed pH	°C	21.0			
Electrical Conductivity	at 25 °C µS/cm	930	1		
Calcium	Dissolved mg/L	131	0.2		
Magnesium	Dissolved mg/L	30.8	0.2		
Sodium	Dissolved mg/L	36.6	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>




**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880324
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-18
<b>Sample Date</b>	May 28, 2023
<b>Sample Time</b>	13:20
<b>Sample Location</b>	M40000.651289
<b>Sample Description</b>	MLM / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved	mg/L	3.9	0.4	
Iron	Dissolved	mg/L	0.02	0.01	0.3 Below AO
Manganese	Dissolved	mg/L	0.583	0.005	0.02 AO; 0.12 MAC Above MAC
Chloride	Dissolved	mg/L	2.4	0.4	250 Below AO
Fluoride		mg/L	0.08	0.05	1.5 Below MAC
Nitrate - N		mg/L	0.03	0.01	10 Below MAC
Nitrite - N		mg/L	<0.005	0.005	1 Below MAC
Nitrate and Nitrite - N		mg/L	0.03	0.01	10 Below MAC
Sulfate (SO4)	Dissolved	mg/L	97.8	0.9	500 Below AO
Hydroxide		mg/L	<5		
Carbonate		mg/L	<6		
Bicarbonate		mg/L	549		
P-Alkalinity	as CaCO3	mg/L	<5	5	
T-Alkalinity	as CaCO3	mg/L	450	5	
Total Dissolved Solids	Calculated	mg/L	573	1	500 Above AO
Hardness	Dissolved as CaCO3	mg/L	454		
Ionic Balance	Dissolved	%	97		

Approved by:   
Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880324
--	--	--

### Metals Dissolved

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880324
--	--	--

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880324
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Sulfur	mg/L	33.7	34.4	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	<0.2	<0.2	10	0.4	yes
Barium	µg/L	38	38	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	113	114	10	4	yes
Cadmium	µg/L	0.03	0.04	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.4	1.4	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	80	81	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.7	0.7	10	1.1	yes
Selenium	µg/L	0.4	0.4	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	1020	1010	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.2	3.4	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	<1	<1	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880324
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	10.0	9.9	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.08	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2100	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880324
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.9	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	14.9	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	1.5	1.6	10	0.5	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes
Nitrate - N	mg/L	0.02	0.02	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880324
--	--	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	121	123	10	0.6	yes
Magnesium	mg/L	23.2	23.7	10	0.7	yes
Sodium	mg/L	64.4	65.8	10	1.2	yes
Potassium	mg/L	3.8	3.8	10	1.2	yes
Iron	mg/L	2.31	2.35	10	0.05	yes
Manganese	mg/L	0.653	0.664	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880324
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-18; 8663485: Sample received at 4.3 °C



---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880324
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

Please direct any inquiries regarding this report to our Client Services group.

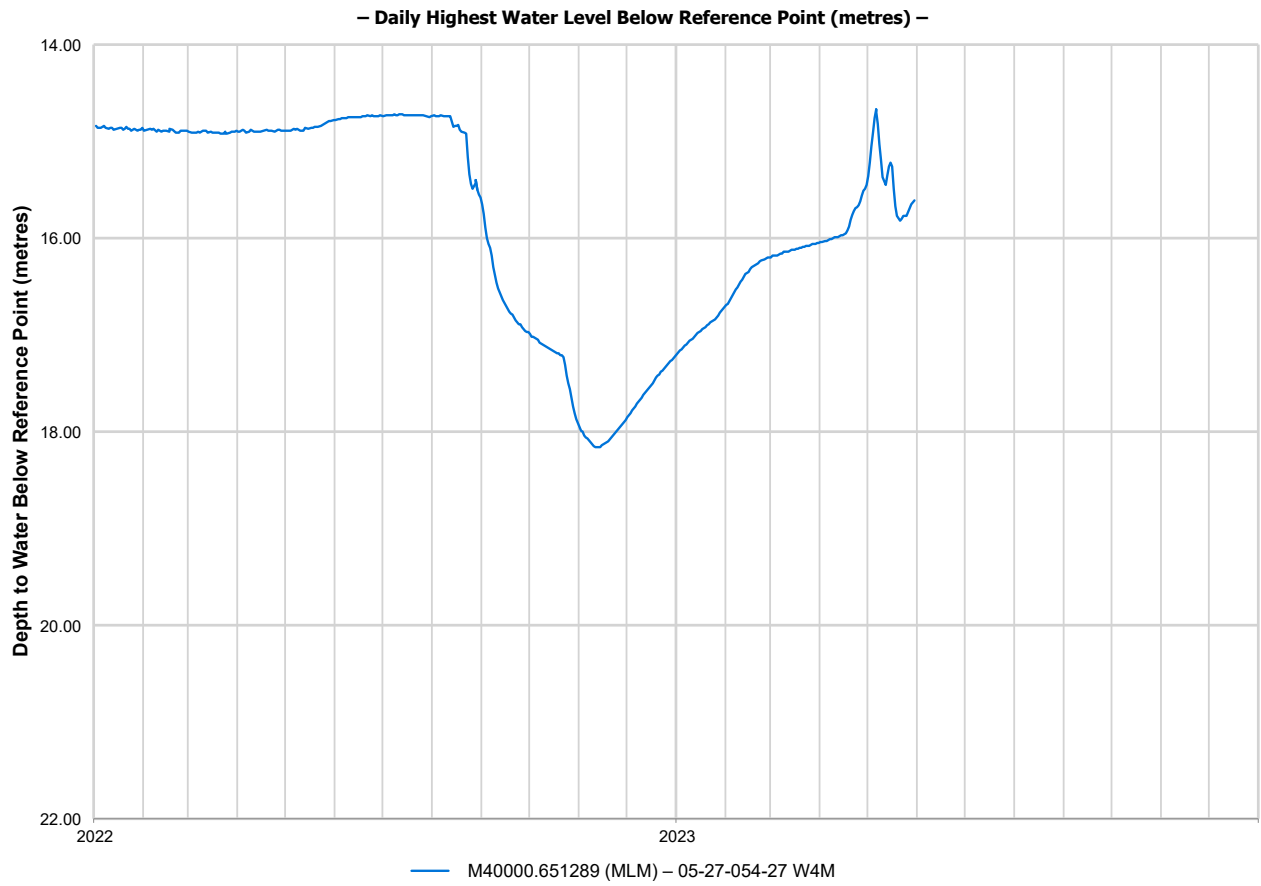
Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

---

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

MLM  
2022 - 2023 Hydrograph



## MW01-01

**16-17-054-26 W4M**  
(M40000.647826)



Photograph taken on May 30, 2011

### Well Spatial Location:

Easting: **79,991**

Northing: **5,945,359**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **674**

*(elevation accuracy HCL DEM)*

Date Completed: **April 18, 2001**

Depth Drilled (m): **22.9**

Completion Interval (m): **19.8 – 22.3 \***

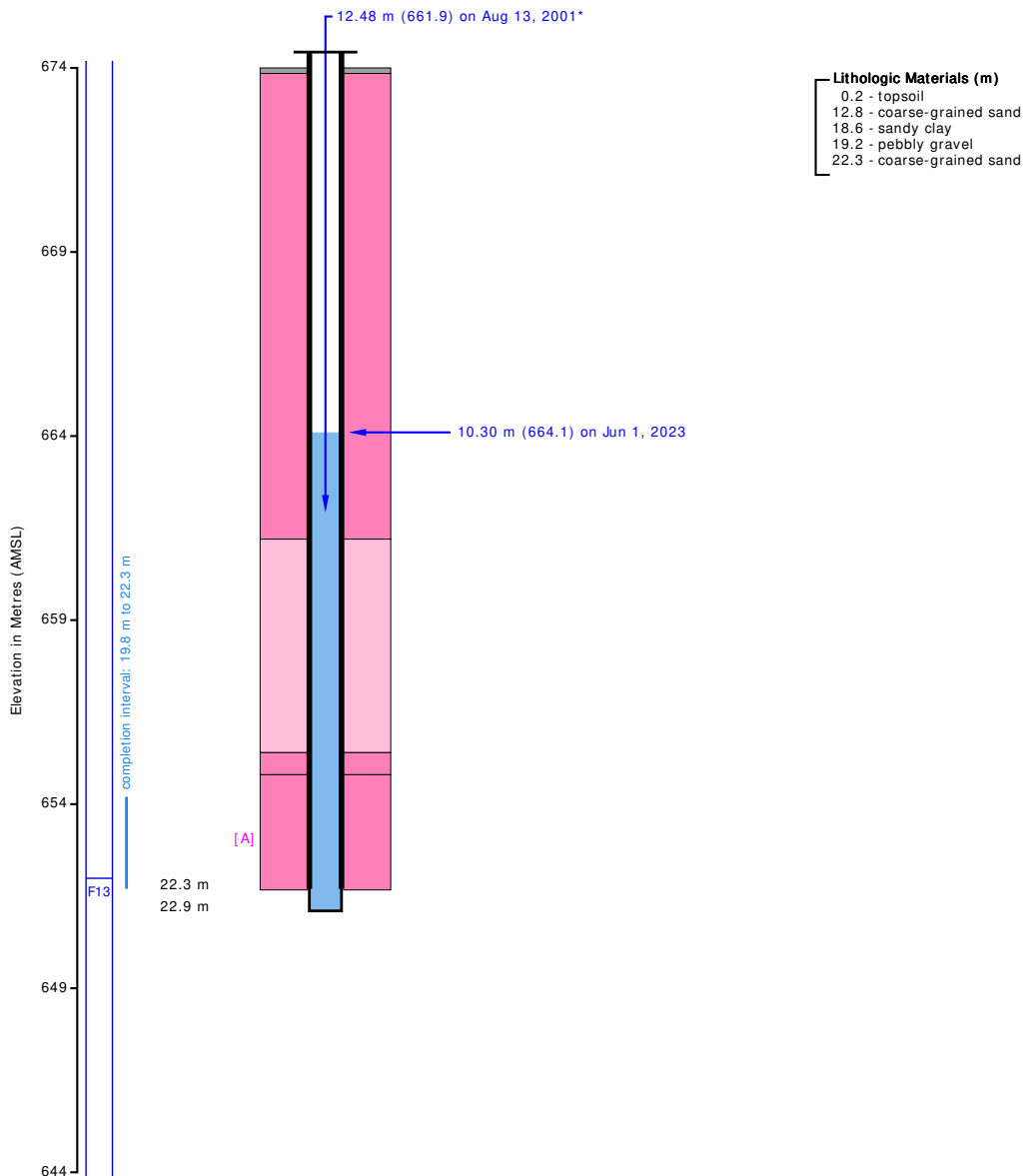
*(\* TGWC determined value)*

Earliest Water Level (m): **12.48 – August 13, 2001**

Most Recent Water Level (m): **10.30 – June 1, 2023 @ 13:38**

GIC ID: **Unknown**

# MW01-01 Water Well Diagram



Lithology Legend			Geologic Unit Legend (Top) - Regional Analysis	
Surficial	Unsorted		Bedrock	F13 - Lower Horseshoe Canyon Formation
	Fine Grained			
	Coarse Grained			
			Fine Grained	Other
			Coarse Grained	

### Summary

TGWC ID: M40000.647826  
 Well Name: MW01-01  
 Legal Location: 16-17-054-26 W4M  
 Casing (OD): 50.8 mm; PVC (2.0")  
 Casing Stick-Up: 0.4 m (not drawn to scale)  
 Completion [A]: 19.8 to 22.3 m; Slotted  
 Water Level (recent): 10.30 m (664.1 m AMSL) on Jun 1, 2023 @ 13:38  
 Water Level (oldest): 12.48 m (661.9 m AMSL) on Aug 13, 2001 - Reference Point: Top of Casing

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:48 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.

Owner: **Sturgeon County**  
 9613-100 St, Morinville, AB T8R 1L9

Contractor: **Mar-Wayne Water Well Drilling Services Ltd.**  
 Name: **MW01-01**

Field Action: **Confirmed - Physically, July 13, 2009**

Work Type: **Piezometer** Date Started: **April 18, 2001**

Drilling Method: **Drilled** Date Completed: **April 18, 2001**

Proposed Use: **Monitoring** Well Status: **Observation**

Feature Class: **Piezometer**

### METRIC REPORT

16-17-054-26 W4M

**M40000.647826**

513371; core

Easting (m): **79,990.83\*\***  
 Northing (m): **5,945,358.84\*\***  
 Elevation (m): **674\*\*\***

Lot:  
 Block:  
 Plan:

Elog Taken: **No**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.4**

Presence of Gas: **No**

**General Details** core

Depth Completed (m)\*: **22.3** Top of Bedrock: **Surficial Water Well \***  
 Depth Drilled (m): **22.9** Completion Interval (m): **19.8 – 22.3 \***

Sand & Gravel Thickness (m): **35.6 (total) – 22.9 (below 15 m) \***

Most Recent Water Level (m): **10.30 m – June 1, 2023**

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
673.9	0.2	Topsoil
661.2	12.8	Coarse-Grained Sand
655.4	18.6	Sandy Clay
654.8	19.2	Pebbly Gravel
651.7	22.3	Coarse-Grained Sand

**Completion Details**

Surface Casing: **PVC – 50.8 mm (O.D.) x 22.3 m (bottom)**

**Intervals**

Slotted: **19.8 to 22.3 m - Method: [unknown]**

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: **June 1, 2023 @ 14:05**  
 Report Date: **June 13, 2023 - Element Materials Technology Canada Inc. (1655888-23)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	968	Nitrate as N:	0.01	Turbidity (NTU):	2.8
Total Dissolved Solids:	612	Nitrite as N:	< 0.005	Fluoride:	0.14
Hardness (as CaCO3):	472	pH (pH Unit):	7.63	Carbonate:	< 6
T-Alkalinity (as CaCO3):	382	Colour (TCU):	10	Bicarbonate:	466
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	100	Hydroxide:	< 5
Nitrate + Nitrite as N:	0.01	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	20.9	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	134		Mercury:	< 0.000005	
Chloride:	13.7		Molybdenum:	< 0.001	
Iron:	0.01		Magnesium:	33.2	
Manganese:	0.207***		Sodium:	39.9	
Aluminum:	< 0.002		Potassium:	5.4	
Arsenic:	0.0003		Vanadium:	0.0002	
Barium:	0.174		Strontium:	0.796	
Beryllium:	< 0.0001		Nickel:	0.0018	
Cadmium:	0.00003		Zinc:	< 0.001	
Chromium:	< 0.0005		Copper:	0.0004	
Cobalt:	< 0.0001		Lead:	< 0.0001	
Sulfate:	157		Uranium:	0.0115	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario.

**Comments & Observations**

**Aquifer Tests**

**Alias IDs**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM — {Ground; AMSL}



**MW01-01**  
**AEPA - Water Well Drilling Report**

— AEPA water well drilling report not available —

**MW01-01**  
**Chemical Analysis Results (June 13, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880329
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

**Reference Number** 1655888-23  
**Sample Date** June 01, 2023  
**Sample Time** 14:05  
**Sample Location** M40000.647826  
**Sample Description** MW01-01 / 4.3 °C  
**Sample Matrix** Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Metals Dissolved</b>						
Silicon	Dissolved mg/L	6.58	0.05			
Sulfur	Dissolved mg/L	52.2	0.3			
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC	
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG	
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC	
Arsenic	Dissolved mg/L	0.0003	0.0002	0.01	Below MAC	
Barium	Dissolved mg/L	0.174	0.001	2.0	Below MAC	
Beryllium	Dissolved mg/L	<0.0001	0.0001			
Bismuth	Dissolved mg/L	<0.0005	0.0005			
Boron	Dissolved mg/L	0.089	0.002	5	Below MAC	
Cadmium	Dissolved mg/L	0.00003	0.00001	0.007	Below MAC	
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC	
Cobalt	Dissolved mg/L	<0.0001	0.0001			
Copper	Dissolved mg/L	0.0004	0.0002	1 AO; 2 MAC	Below AO	
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC	
Lithium	Dissolved mg/L	0.062	0.001			
Molybdenum	Dissolved mg/L	<0.001	0.001			
Nickel	Dissolved mg/L	0.0018	0.0005			
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC	
Silver	Dissolved mg/L	<0.00001	0.00001			
Strontium	Dissolved mg/L	0.796	0.001	7.0	Below MAC	
Thallium	Dissolved mg/L	<0.00005	0.00005			
Tin	Dissolved mg/L	<0.001	0.001			
Titanium	Dissolved mg/L	<0.0005	0.0005			
Uranium	Dissolved mg/L	0.0115	0.0005	0.02	Below MAC	
Vanadium	Dissolved mg/L	0.0002	0.0001			
Zinc	Dissolved mg/L	<0.001	0.001	5	Below AO	
Subsample		Field Filtered				
<b>Physical and Aggregate Properties</b>						
Colour	Apparent, Potable	Colour units	10	5	15	Below AO
Turbidity		NTU	2.8	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>						
pH			7.63	1	7.0-10.5	Within OG Range
Temperature of observed pH		°C	20.9			
Electrical Conductivity	at 25 °C	µS/cm	968	1		
Calcium	Dissolved	mg/L	134	0.2		
Magnesium	Dissolved	mg/L	33.2	0.2		
Sodium	Dissolved	mg/L	39.9	0.4	200	Below AO

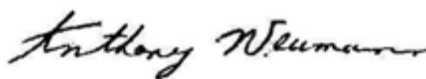
Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880329
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-23
<b>Sample Date</b>	June 01, 2023
<b>Sample Time</b>	14:05
<b>Sample Location</b>	M40000.647826
<b>Sample Description</b>	MW01-01 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Routine Water - Continued</b>						
Potassium	Dissolved	mg/L	5.4	0.4		
Iron	Dissolved	mg/L	0.01	0.01	0.3	Below AO
Manganese	Dissolved	mg/L	0.207	0.005	0.02 AO; 0.12 MAC	Above MAC
Chloride	Dissolved	mg/L	13.7	0.4	250	Below AO
Fluoride		mg/L	0.14	0.05	1.5	Below MAC
Nitrate - N		mg/L	0.01	0.01	10	Below MAC
Nitrite - N		mg/L	<0.005	0.005	1	Below MAC
Nitrate and Nitrite - N		mg/L	0.01	0.01	10	Below MAC
Sulfate (SO4)	Dissolved	mg/L	157	0.9	500	Below AO
Hydroxide		mg/L	<5			
Carbonate		mg/L	<6			
Bicarbonate		mg/L	466			
P-Alkalinity	as CaCO3	mg/L	<5	5		
T-Alkalinity	as CaCO3	mg/L	382	5		
Total Dissolved Solids	Calculated	mg/L	612	1	500	Above AO
Hardness	Dissolved as CaCO3	mg/L	472			
Ionic Balance	Dissolved	%	100			

Approved by:   
Anthony Neumann, MSc  
General Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.  
Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880329
--	--	--

### Metals Dissolved

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880329
--	---	--

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880329
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Sulfur	mg/L	33.7	34.4	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	<0.2	<0.2	10	0.4	yes
Barium	µg/L	38	38	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	113	114	10	4	yes
Cadmium	µg/L	0.03	0.04	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.4	1.4	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	80	81	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.7	0.7	10	1.1	yes
Selenium	µg/L	0.4	0.4	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	1020	1010	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.2	3.4	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	<1	<1	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880329
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	10.0	9.9	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.08	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0.00178586	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2100	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880329
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.9	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	14.9	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.57	7.57	0	0.10	yes
Electrical Conductivity	dS/m	0.930	0.928	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	549	546	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	450	448	10	5	yes
Chloride	mg/L	1.5	1.6	10	0.5	yes
Fluoride	mg/L	0.08	0.08	10	0.05	yes
Nitrate - N	mg/L	0.03	0.03	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880329
--	---	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	121	123	10	0.6	yes
Magnesium	mg/L	23.2	23.7	10	0.7	yes
Sodium	mg/L	64.4	65.8	10	1.2	yes
Potassium	mg/L	3.8	3.8	10	1.2	yes
Iron	mg/L	2.31	2.35	10	0.05	yes
Manganese	mg/L	0.653	0.664	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880329
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-23; 8663490: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 13, 2023
		P.O.:	19707	Report Number:	2880329
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

Please direct any inquiries regarding this report to our Client Services group.

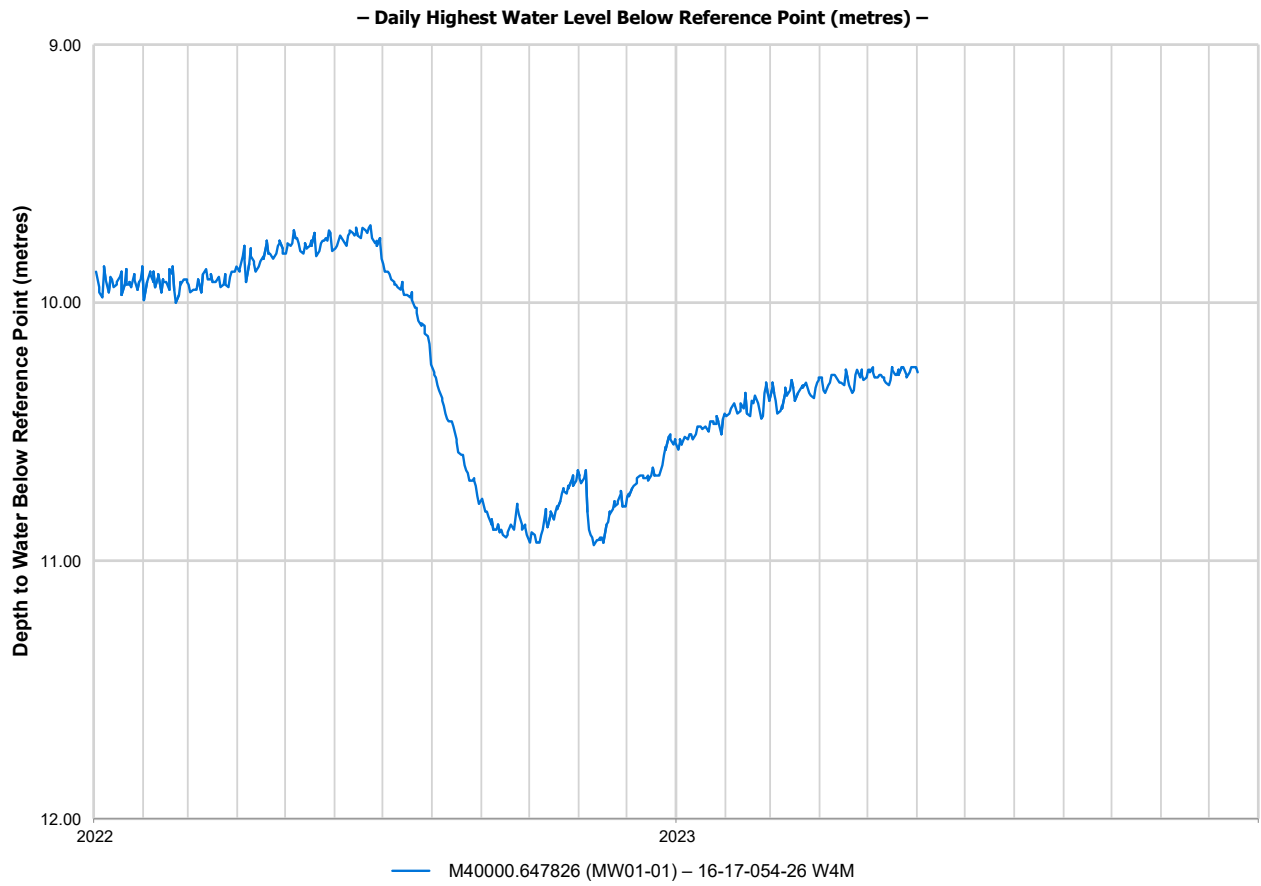
Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>



*MW01-01*  
*2022 - 2023 Hydrograph*



## MW01-04

**14-27-054-27 W4M**  
(M40000.649295)



### Well Spatial Location:

Easting: **72,578**

Northing: **5,948,381**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **676**

*(elevation accuracy HCL DEM)*

Date Completed: **April 24, 2001**

Depth Drilled (m): **19.2**

Completion Interval (m): **15.2 – 18.3 \***

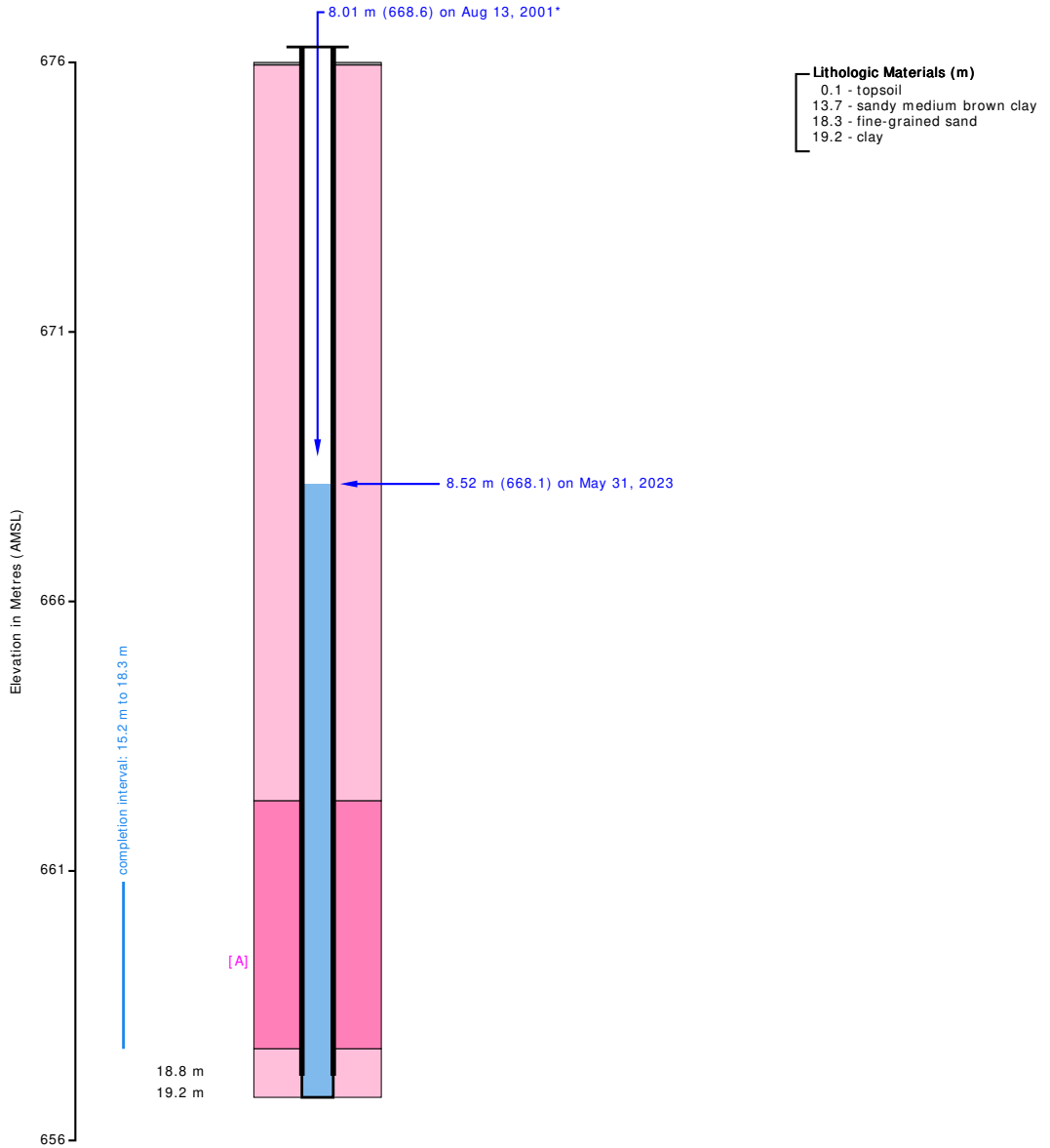
*(\* TGWC determined value)*

Earliest Water Level (m): **8.01 – August 13, 2001**

Most Recent Water Level (m): **8.52 – May 31, 2023 @ 11:00**

GIC ID: **Unknown**

## MW01-04 Water Well Diagram



Lithology Legend		Geologic Unit Legend (Top) - Regional Analysis		
<b>Surficial</b>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p style="font-size: 8px; margin: 0;">Unsorted</p> <p style="font-size: 8px; margin: 0;">Fine Grained</p> <p style="font-size: 8px; margin: 0;">Coarse Grained</p> </div> <div style="width: 45%;"> <p style="font-size: 8px; margin: 0;">Fine Grained</p> <p style="font-size: 8px; margin: 0;">Coarse Grained</p> </div> </div>	<b>Bedrock</b>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p style="font-size: 8px; margin: 0;">Fine Grained</p> <p style="font-size: 8px; margin: 0;">Coarse Grained</p> </div> <div style="width: 45%;"> <p style="font-size: 8px; margin: 0;">Other</p> </div> </div>	<p style="font-size: 8px; margin: 0;">Geologic Unit details not available for this location</p>

### Summary

TGWC ID: M40000.649295  
 Well Name: MW01-04  
 Legal Location: 14-27-054-27 W4M  
 Casing (OD): 50.8 mm; PVC (2.0")  
 Casing Stick-Up: 0.7 m (not drawn to scale)  
 Completion [A]: 15.2 to 18.3 m; Slotted  
 Water Level (recent): 8.52 m (668.1 m AMSL) on May 31, 2023 @ 11:00  
 Water Level (oldest): 8.01 m (668.6 m AMSL) on Aug 13, 2001 - Reference Point: Top of Casing

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:48 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.

Owner: **Sturgeon County**  
 9613-100 St, Morinville, AB T8R 1L9

Contractor: **Mar-Wayne Water Well Drilling Services Ltd.**  
 Name: **MW01-04**

Field Action: **Confirmed - Physically, July 13, 2009**

Work Type: **Piezometer** Date Started: **April 24, 2001**

Drilling Method: **Drilled** Date Completed: **April 24, 2001**

Proposed Use: **Monitoring** Well Status: **Observation**

Completion Type: **Casing** Feature Class: **Piezometer**

### METRIC REPORT

14-27-054-27 W4M

Easting (m): **72,578.47\*\***  
 Northing (m): **5,948,381.15\*\***  
 Elevation (m): **676\*\*\***

Lot:  
 Block:  
 Plan:

**M4000.649295**

513350; core

Elog Taken: **No**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.7**

Presence of Gas: **No**

**General Details** core

Depth Completed (m)\*: **18.3** Top of Bedrock: **Surficial Water Well \***  
 Depth Drilled (m): **19.2** Completion Interval (m): **15.2 – 18.3 \***

Sand & Gravel Thickness (m): **4.6 (total) – 3.3 (below 15 m) \***

Most Recent Water Level (m): **8.52 m – May 31, 2023**

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
675.9	0.1	Topsoil
662.2	13.7	Sandy Medium Brown Clay
657.6	18.3	Fine-Grained Sand
656.7	19.2	Clay

**Completion Details**

Surface Casing: **PVC – 50.8 mm (O.D.) x 18.8 m (bottom)**

**Intervals**

Slotted: **15.2 to 18.3 m - Method: [unknown]**

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: **May 31, 2023 @ 11:25**  
 Report Date: **June 13, 2023 - Element Materials Technology Canada Inc. (1655888-2)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	821	Nitrate as N:	0.02	Turbidity (NTU):	82.7
Total Dissolved Solids:	489	Nitrite as N:	< 0.005	Fluoride:	0.06
Hardness (as CaCO3):	406	pH (pH Unit):	7.55	Carbonate:	< 6
T-Alkalinity (as CaCO3):	438	Colour (TCU):	> 60	Bicarbonate:	533
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	98	Hydroxide:	< 5
Nitrate + Nitrite as N:	0.02	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.0	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	115		Mercury:	< 0.000005	
Chloride:	1.0		Molybdenum:	< 0.001	
Iron:	2.01		Magnesium:	29.0	
Manganese:	0.823***		Sodium:	29.1	
Aluminum:	< 0.002		Potassium:	3.5	
Arsenic:	0.0034		Vanadium:	< 0.0001	
Barium:	0.065		Strontium:	0.795	
Beryllium:	< 0.0001		Nickel:	0.0012	
Cadmium:	0.00017		Zinc:	0.009	
Chromium:	< 0.0005		Copper:	0.0015	
Cobalt:	0.0010		Lead:	< 0.0001	
Sulfate:	49.2		Uranium:	0.0057	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario.

513350; 1 / 34

**Comments & Observations**

**Aquifer Tests**

**Alias IDs**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM — {Ground; AMSL}

Created on: August 25, 2023 — Data "AS IS"; no warranty either expressed or implied. [53.700507 -113.900185 (WGS 84)], INT Date End: 2023-06-02



***MW01-04***  
***AEPA - Water Well Drilling Report***

*— AEPA water well drilling report not available —*

**MW01-04**  
**Chemical Analysis Results (June 13, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882920
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

**Reference Number** 1655888-2  
**Sample Date** May 31, 2023  
**Sample Time** 11:25  
**Sample Location** M40000.649295  
**Sample Description** MW01-04 / 4.3 °C  
**Sample Matrix** Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Metals Dissolved</b>					
Silicon	Dissolved mg/L	7.42	0.05		
Sulfur	Dissolved mg/L	16.4	0.3		
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG
Antimony	Dissolved mg/L	0.0004	0.0002	0.006	Below MAC
Arsenic	Dissolved mg/L	0.0034	0.0002	0.01	Below MAC
Barium	Dissolved mg/L	0.065	0.001	2.0	Below MAC
Beryllium	Dissolved mg/L	<0.0001	0.0001		
Bismuth	Dissolved mg/L	<0.0005	0.0005		
Boron	Dissolved mg/L	0.070	0.002	5	Below MAC
Cadmium	Dissolved mg/L	0.00017	0.00001	0.007	Below MAC
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC
Cobalt	Dissolved mg/L	0.0010	0.0001		
Copper	Dissolved mg/L	0.0015	0.0002	1 AO; 2 MAC	Below AO
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC
Lithium	Dissolved mg/L	0.059	0.001		
Molybdenum	Dissolved mg/L	<0.001	0.001		
Nickel	Dissolved mg/L	0.0012	0.0005		
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC
Silver	Dissolved mg/L	<0.00001	0.00001		
Strontium	Dissolved mg/L	0.795	0.001	7.0	Below MAC
Thallium	Dissolved mg/L	<0.00005	0.00005		
Tin	Dissolved mg/L	<0.001	0.001		
Titanium	Dissolved mg/L	<0.0005	0.0005		
Uranium	Dissolved mg/L	0.0057	0.0005	0.02	Below MAC
Vanadium	Dissolved mg/L	<0.0001	0.0001		
Zinc	Dissolved mg/L	0.009	0.001	5	Below AO
Subsample		Field Filtered			
<b>Physical and Aggregate Properties</b>					
Colour	Apparent, Potable Colour units	>60	5	15	Above AO
Turbidity	NTU	82.7	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>					
pH		7.55	1	7.0-10.5	Within OG Range
Temperature of observed pH	°C	21.0			
Electrical Conductivity	at 25 °C µS/cm	821	1		
Calcium	Dissolved mg/L	115	0.2		
Magnesium	Dissolved mg/L	29.0	0.2		
Sodium	Dissolved mg/L	29.1	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

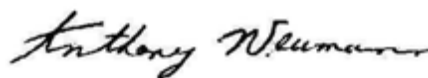
## Analytical Report

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882920
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-2
<b>Sample Date</b>	May 31, 2023
<b>Sample Time</b>	11:25
<b>Sample Location</b>	M40000.649295
<b>Sample Description</b>	MW01-04 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Routine Water - Continued</b>						
Potassium	Dissolved	mg/L	3.5	0.4		
Iron	Dissolved	mg/L	2.01	0.01	0.3	Above AO
Manganese	Dissolved	mg/L	0.823	0.005	0.02 AO; 0.12 MAC	Above MAC
Chloride	Dissolved	mg/L	1.0	0.4	250	Below AO
Fluoride		mg/L	0.06	0.05	1.5	Below MAC
Nitrate - N		mg/L	0.02	0.01	10	Below MAC
Nitrite - N		mg/L	<0.005	0.005	1	Below MAC
Nitrate and Nitrite - N		mg/L	0.02	0.01	10	Below MAC
Sulfate (SO4)	Dissolved	mg/L	49.2	0.9	500	Below AO
Hydroxide		mg/L	<5			
Carbonate		mg/L	<6			
Bicarbonate		mg/L	533			
P-Alkalinity	as CaCO3	mg/L	<5	5		
T-Alkalinity	as CaCO3	mg/L	438	5		
Total Dissolved Solids	Calculated	mg/L	489	1	500	Below AO
Hardness	Dissolved as CaCO3	mg/L	406			
Ionic Balance	Dissolved	%	98			

Approved by:



Anthony Neumann, MSc  
General Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882920
--	--	--

### Metals Dissolved

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes



**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882920
--	--	--

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882920
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Sulfur	mg/L	1.0	1.1	10	0.1	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	1.1	1.1	10	0.4	yes
Barium	µg/L	48	48	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	109	110	10	4	yes
Cadmium	µg/L	<0.01	<0.01	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.2	1.2	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	71	71	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.9	1.1	10	1.1	yes
Selenium	µg/L	<0.2	<0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	953	947	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.7	3.6	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882920
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	1.4	1.3	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.91	9.39	10.59	yes
Nitrate - N	mg/L	9.88	9.03	11.13	yes
Nitrite - N	mg/L	9.83	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882920
Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Iron	mg/L	9.77	9.38	10.16	yes
Manganese	mg/L	2.40	2.320	2.560	yes
Date Acquired: June 09, 2023					
pH		6.88	6.79	6.97	yes
Temperature of observed	°C	20.9	15.5	24.5	yes
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes
P-Alkalinity	mg/L	56	28	72	yes
T-Alkalinity	mg/L	127	114	140	yes
Chloride	mg/L	84.1	74.9	86.9	yes
Fluoride	mg/L	4.82	4.56	5.22	yes
Nitrate - N	mg/L	4.69	4.37	5.33	yes
Nitrite - N	mg/L	4.82	4.370	5.330	yes
Nitrate and Nitrite - N	mg/L	9.51	8.80	10.60	yes
Calcium	mg/L	51.2	44.9	56.9	yes
Magnesium	mg/L	20.1	17.9	22.0	yes
Sodium	mg/L	51.6	47.3	52.7	yes
Potassium	mg/L	50.0	45.8	55.8	yes
Iron	mg/L	2.02	1.90	2.08	yes
Manganese	mg/L	0.499	0.468	0.552	yes
Date Acquired: June 09, 2023					
Chloride	mg/L	15.0	13.3	16.5	yes
Fluoride	mg/L	0.50	0.45	0.57	yes
Nitrate - N	mg/L	0.52	0.42	0.57	yes
Nitrite - N	mg/L	0.506	0.455	0.557	yes
Nitrate and Nitrite - N	mg/L	1.02	0.85	1.15	yes
Calcium	mg/L	5.0	4.7	5.4	yes
Magnesium	mg/L	2.0	1.9	2.2	yes
Sodium	mg/L	4.9	4.7	5.7	yes
Potassium	mg/L	5.0	4.6	5.6	yes
Iron	mg/L	0.19	0.18	0.22	yes
Manganese	mg/L	0.048	0.046	0.057	yes
Date Acquired: June 09, 2023					

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	56.8	57.1	10	0.5	yes
Nitrate - N	mg/L	<0.01	<0.01	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882920
--	--	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	29.6	29.3	10	0.6	yes
Magnesium	mg/L	9.1	9.0	10	0.7	yes
Sodium	mg/L	2.9	2.8	10	1.2	yes
Potassium	mg/L	1.0	1.0	10	1.2	yes
Iron	mg/L	0.18	0.18	10	0.05	yes
Manganese	mg/L	<0.005	<0.005	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882920
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-2; 8663469: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
	17740 - 118 Avenue	Project Name:	2022 Groundwater Monitoring	Control Number:	
	Edmonton, AB, Canada	Project Location:		Date Received:	Jun 5, 2023
	T5S 2W3	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 13, 2023
Attn:	Kirby Fromm	P.O.:	19707	Report Number:	2882920
Sampled By:	Ben Gilham	Proj. Acct. code:			
Company:	HCL				

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

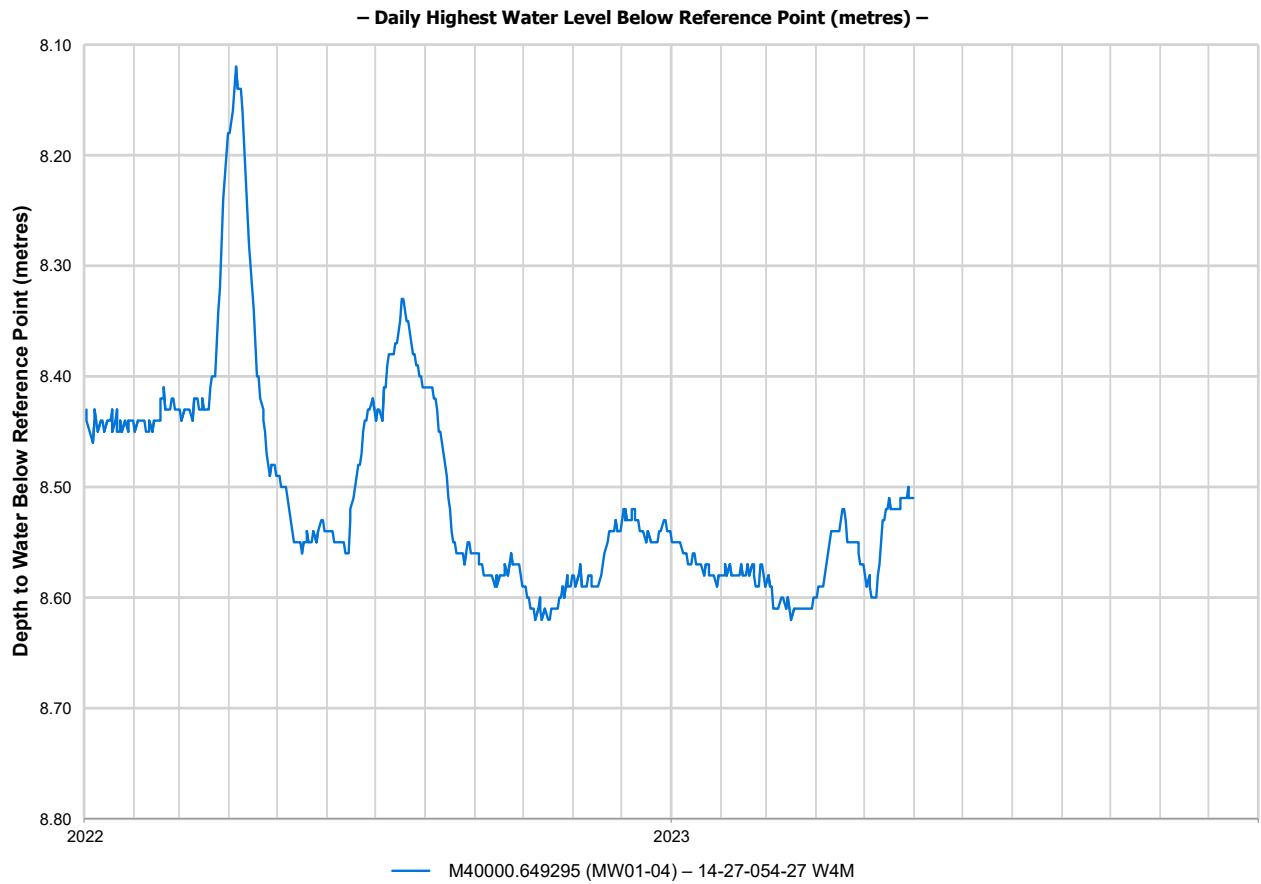
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

MW01-04  
2022 - 2023 Hydrograph





## MW01-05

**05-33-054-27 W4M**  
(M40000.649859)



Well Spatial Location:

Easting: **70,437**

Northing: **5,949,212**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **678**

*(elevation accuracy HCL DEM)*

Date Completed: **April 24, 2001**

Depth Drilled (m): **28.3**

Completion Interval (m): **18.6 – 21.7 \***

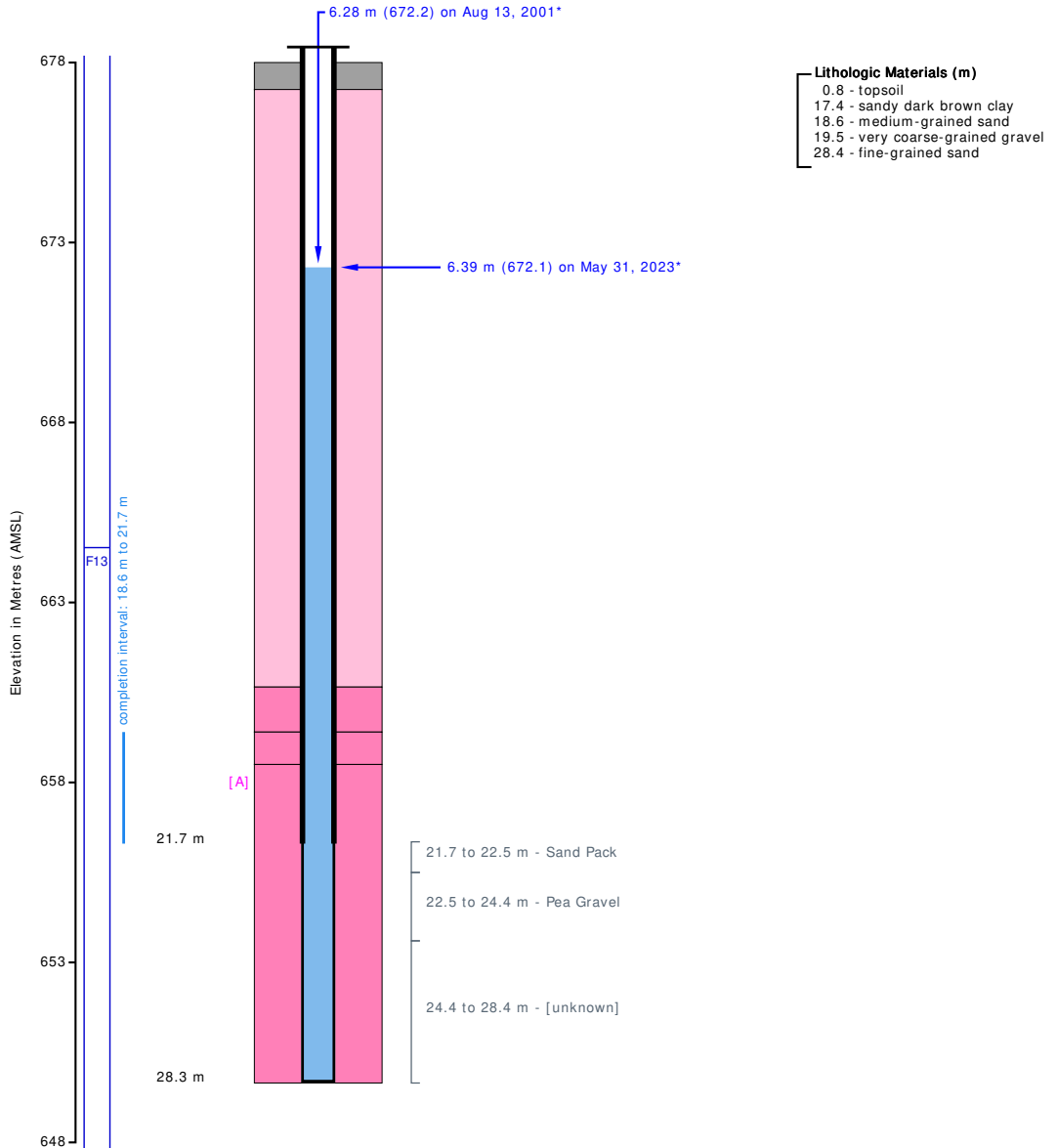
*(\* TGWC determined value)*

Earliest Water Level (m): **6.28 – August 13, 2001**

Most Recent Water Level (m): **6.39 – May 31, 2023 @ 09:34**

GIC ID: **Unknown**

# MW01-05 Water Well Diagram



Lithology Legend			Geologic Unit Legend (Top) - Regional Analysis	
Surficial	Unsorted		Bedrock	F13 - Lower Horseshoe Canyon Formation
	Fine Grained			
	Coarse Grained			

### Summary

TGWC ID: M40000.649859  
 Well Name: MW01-05  
 Legal Location: 05-33-054-27 W4M  
 Casing (OD): 50.8 mm; PVC (2.0")  
 Casing Stick-Up: 0.7 m (not drawn to scale)  
 Completion [A]: 18.6 to 21.7 m; Slotted  
 Water Level (recent): 6.39 m (672.1 m AMSL) on May 31, 2023 @ 09:34 - Reference Point: Top of Casing  
 Water Level (oldest): 6.28 m (672.2 m AMSL) on Aug 13, 2001 - Reference Point: Top of Casing

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:48 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.

Owner: **Sturgeon County**  
**9613-100 St, Morinville, AB T8R 1L9**

Contractor: **Mar-Wayne Water Well Drilling Services Ltd.**  
 Name: **MW01-05**

Field Action: **Confirmed - Physically, July 13, 2009**

Work Type: **Piezometer** Date Started: **April 24, 2001**

Drilling Method: **Drilled** Date Completed: **April 24, 2001**

Proposed Use: **Monitoring** Well Status: **Observation**

Completion Type: **Casing** Feature Class: **Piezometer**

### METRIC REPORT

05-33-054-27 W4M

Easting (m): **70,436.92\*\***  
 Northing (m): **5,949,211.95\*\***  
 Elevation (m): **678\*\*\***

Lot:  
 Block:  
 Plan:

**M4000.649859**

513352; core

Elog Taken: **No**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.7**

Presence of Gas: **No**

**General Details** core

Depth Completed (m)\*: **21.7** Top of Bedrock: **Surficial Water Well \***  
 Depth Drilled (m): **28.3** Completion Interval (m): **18.6 – 21.7 \***

Sand & Gravel Thickness (m): **30.5 (total) – 30.5 (below 15 m) \***

Most Recent Water Level (m): **6.39 m – May 31, 2023**

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
677.1	0.8	Topsoil
660.5	17.4	Sandy Dark Brown Clay
659.2	18.6	Medium-Grained Sand
658.3	19.5	Very Coarse-Grained Gravel
649.5	28.4	Fine-Grained Sand

**Completion Details**

Surface Casing: **PVC – 50.8 mm (O.D.) x 21.7 m (bottom)**

**Intervals**

Slotted: **18.6 to 21.7 m - Method: [unknown]**

Sand Pack: **21.7 to 22.5 m**

Pea Gravel: **22.5 to 24.4 m**

[unknown]: **24.4 to 28.4 m**

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: **May 31, 2023 @ 10:00**  
 Report Date: **June 12, 2023 - Element Materials Technology Canada Inc. (1655888-4)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	946	Nitrate as N:	< 0.01	Turbidity (NTU):	10.8
Total Dissolved Solids:	577	Nitrite as N:	< 0.005	Fluoride:	0.07
Hardness (as CaCO3):	409	pH (pH Unit):	7.44	Carbonate:	< 6
T-Alkalinity (as CaCO3):	505	Colour (TCU):	35	Bicarbonate:	616
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	97	Hydroxide:	< 5
Nitrate + Nitrite as N:	< 0.01	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	20.9	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	119		Mercury:	< 0.000005	
Chloride:	0.5		Molybdenum:	< 0.001	
Iron:	1.06		Magnesium:	27.2	
Manganese:	0.864***		Sodium:	62.0	
Aluminum:	< 0.002		Potassium:	3.7	
Arsenic:	0.0070		Vanadium:	< 0.0001	
Barium:	0.057		Strontium:	1.05	
Beryllium:	< 0.0001		Nickel:	0.0012	
Cadmium:	< 0.00001		Zinc:	< 0.001	
Chromium:	< 0.0005		Copper:	< 0.0002	
Cobalt:	0.0006		Lead:	< 0.0001	
Sulfate:	61.6		Uranium:	0.0035	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario. 513352; 1 / 33

**Comments & Observations**

**Aquifer Tests**

**Alias IDs**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM — {Ground; AMSL}



*MW01-05*  
*AEPA - Water Well Drilling Report*

*— AEPA water well drilling report not available —*

**MW01-05**  
**Chemical Analysis Results (June 12, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880310
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

<b>Reference Number</b>	1655888-4
<b>Sample Date</b>	May 31, 2023
<b>Sample Time</b>	10:00
<b>Sample Location</b>	M40000.649859
<b>Sample Description</b>	MW01-05 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Metals Dissolved</b>						
Silicon	Dissolved mg/L	7.62	0.05			
Sulfur	Dissolved mg/L	20.5	0.3			
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC	
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG	
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC	
Arsenic	Dissolved mg/L	0.0070	0.0002	0.01	Below MAC	
Barium	Dissolved mg/L	0.057	0.001	2.0	Below MAC	
Beryllium	Dissolved mg/L	<0.0001	0.0001			
Bismuth	Dissolved mg/L	<0.0005	0.0005			
Boron	Dissolved mg/L	0.123	0.002	5	Below MAC	
Cadmium	Dissolved mg/L	<0.00001	0.00001	0.007	Below MAC	
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC	
Cobalt	Dissolved mg/L	0.0006	0.0001			
Copper	Dissolved mg/L	<0.0002	0.0002	1 AO; 2 MAC	Below AO	
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC	
Lithium	Dissolved mg/L	0.070	0.001			
Molybdenum	Dissolved mg/L	<0.001	0.001			
Nickel	Dissolved mg/L	0.0012	0.0005			
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC	
Silver	Dissolved mg/L	<0.00001	0.00001			
Strontium	Dissolved mg/L	1.05	0.001	7.0	Below MAC	
Thallium	Dissolved mg/L	<0.00005	0.00005			
Tin	Dissolved mg/L	<0.001	0.001			
Titanium	Dissolved mg/L	<0.0005	0.0005			
Uranium	Dissolved mg/L	0.0035	0.0005	0.02	Below MAC	
Vanadium	Dissolved mg/L	<0.0001	0.0001			
Zinc	Dissolved mg/L	<0.001	0.001	5	Below AO	
Subsample		Field Filtered				
<b>Physical and Aggregate Properties</b>						
Colour	Apparent, Potable	Colour units	35	5	15	Above AO
Turbidity		NTU	10.8	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>						
pH			7.44	1	7.0-10.5	Within OG Range
Temperature of observed pH		°C	20.9			
Electrical Conductivity	at 25 °C	µS/cm	946	1		
Calcium	Dissolved	mg/L	119	0.2		
Magnesium	Dissolved	mg/L	27.2	0.2		
Sodium	Dissolved	mg/L	62.0	0.4	200	Below AO


Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880310
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-4
<b>Sample Date</b>	May 31, 2023
<b>Sample Time</b>	10:00
<b>Sample Location</b>	M40000.649859
<b>Sample Description</b>	MW01-05 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved	mg/L	3.7	0.4	
Iron	Dissolved	mg/L	1.06	0.01	0.3 Above AO
Manganese	Dissolved	mg/L	0.864	0.005	0.02 AO; 0.12 MAC Above MAC
Chloride	Dissolved	mg/L	0.5	0.4	250 Below AO
Fluoride		mg/L	0.07	0.05	1.5 Below MAC
Nitrate - N		mg/L	<0.01	0.01	10 Below MAC
Nitrite - N		mg/L	<0.005	0.005	1 Below MAC
Nitrate and Nitrite - N		mg/L	<0.01	0.01	10 Below MAC
Sulfate (SO4)	Dissolved	mg/L	61.6	0.9	500 Below AO
Hydroxide		mg/L	<5		
Carbonate		mg/L	<6		
Bicarbonate		mg/L	616		
P-Alkalinity	as CaCO3	mg/L	<5	5	
T-Alkalinity	as CaCO3	mg/L	505	5	
Total Dissolved Solids	Calculated	mg/L	577	1	500 Above AO
Hardness	Dissolved as CaCO3	mg/L	409		
Ionic Balance	Dissolved	%	97		

Approved by:   
Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880310
--	--	--

### Metals Dissolved

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880310
--	--	--

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880310
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Sulfur	mg/L	1.0	1.1	10	0.1	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	1.1	1.1	10	0.4	yes
Barium	µg/L	48	48	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	109	110	10	4	yes
Cadmium	µg/L	<0.01	<0.01	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.2	1.2	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	71	71	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.9	1.1	10	1.1	yes
Selenium	µg/L	<0.2	<0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	953	947	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.7	3.6	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880310
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	1.4	1.3	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.91	9.39	10.59	yes
Nitrate - N	mg/L	9.88	9.03	11.13	yes
Nitrite - N	mg/L	9.83	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880310
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

**Routine Water - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Iron	mg/L	9.77	9.38	10.16	yes
Manganese	mg/L	2.40	2.320	2.560	yes
Date Acquired: June 09, 2023					
pH		6.88	6.79	6.97	yes
Temperature of observed	°C	20.9	15.5	24.5	yes
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes
P-Alkalinity	mg/L	56	28	72	yes
T-Alkalinity	mg/L	127	114	140	yes
Chloride	mg/L	84.1	74.9	86.9	yes
Fluoride	mg/L	4.82	4.56	5.22	yes
Nitrate - N	mg/L	4.69	4.37	5.33	yes
Nitrite - N	mg/L	4.82	4.370	5.330	yes
Nitrate and Nitrite - N	mg/L	9.51	8.80	10.60	yes
Calcium	mg/L	51.2	44.9	56.9	yes
Magnesium	mg/L	20.1	17.9	22.0	yes
Sodium	mg/L	51.6	47.3	52.7	yes
Potassium	mg/L	50.0	45.8	55.8	yes
Iron	mg/L	2.02	1.90	2.08	yes
Manganese	mg/L	0.499	0.468	0.552	yes
Date Acquired: June 09, 2023					
Chloride	mg/L	15.0	13.3	16.5	yes
Fluoride	mg/L	0.50	0.45	0.57	yes
Nitrate - N	mg/L	0.52	0.42	0.57	yes
Nitrite - N	mg/L	0.506	0.455	0.557	yes
Nitrate and Nitrite - N	mg/L	1.02	0.85	1.15	yes
Calcium	mg/L	5.0	4.7	5.4	yes
Magnesium	mg/L	2.0	1.9	2.2	yes
Sodium	mg/L	4.9	4.7	5.7	yes
Potassium	mg/L	5.0	4.6	5.6	yes
Iron	mg/L	0.19	0.18	0.22	yes
Manganese	mg/L	0.048	0.046	0.057	yes
Date Acquired: June 09, 2023					

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	56.8	57.1	10	0.5	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes
Nitrate - N	mg/L	0.02	0.02	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880310
--	--	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	29.6	29.3	10	0.6	yes
Magnesium	mg/L	9.1	9.0	10	0.7	yes
Sodium	mg/L	2.9	2.8	10	1.2	yes
Potassium	mg/L	1.0	1.0	10	1.2	yes
Iron	mg/L	0.18	0.18	10	0.05	yes
Manganese	mg/L	<0.005	<0.005	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880310
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-4; 8663471: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880310
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

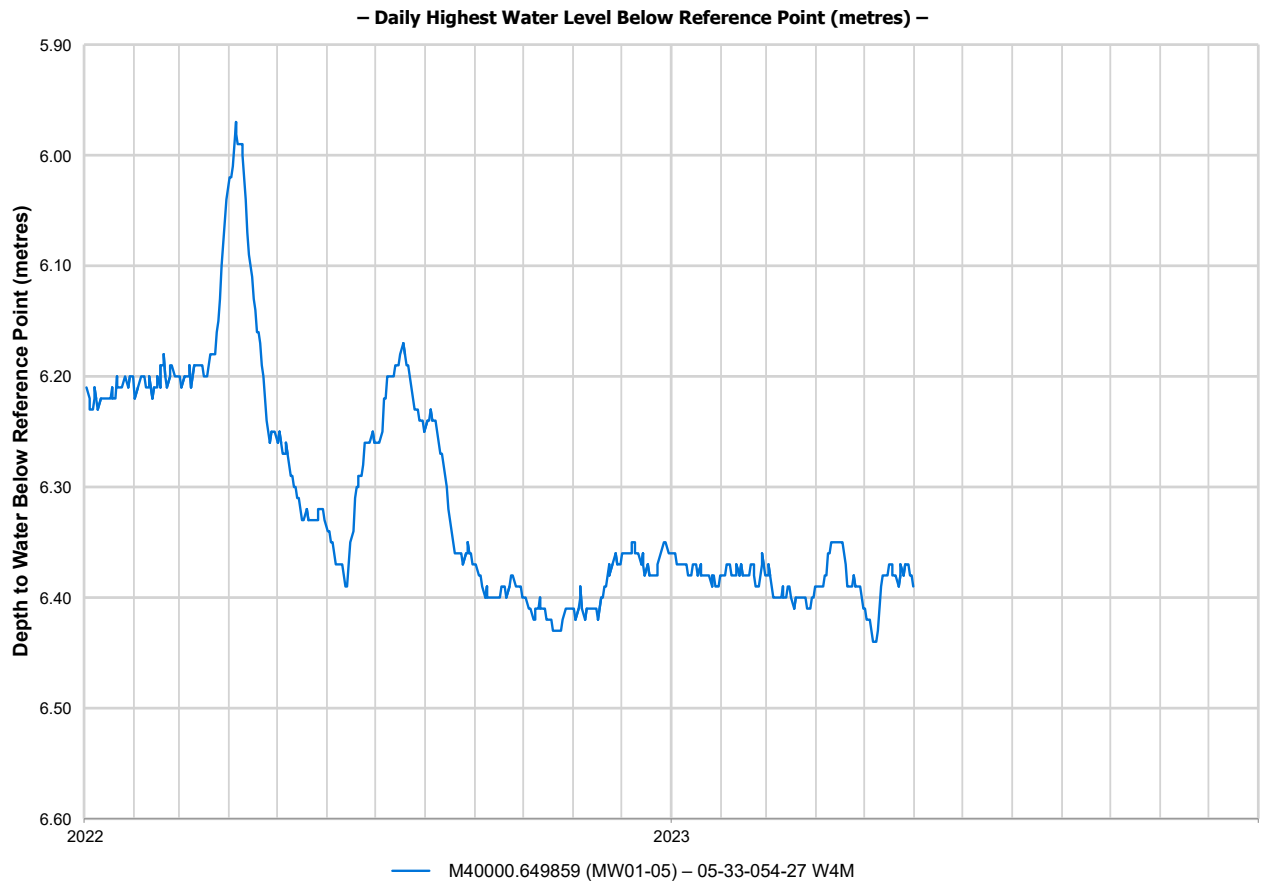
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

MW01-05  
2022 - 2023 Hydrograph



## MW01-06

01-29-054-27 W4M  
(M40000.650496)



Photograph taken on May 29, 2023

### Well Spatial Location:

Easting: **70,299**

Northing: **5,946,826**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **691**

*(elevation accuracy HCL DEM)*

Date Completed: **April 25, 2001**

Depth Drilled (m): **18.3**

Completion Interval (m): **12.8 – 15.9 \***

*(\* TGWC determined value)*

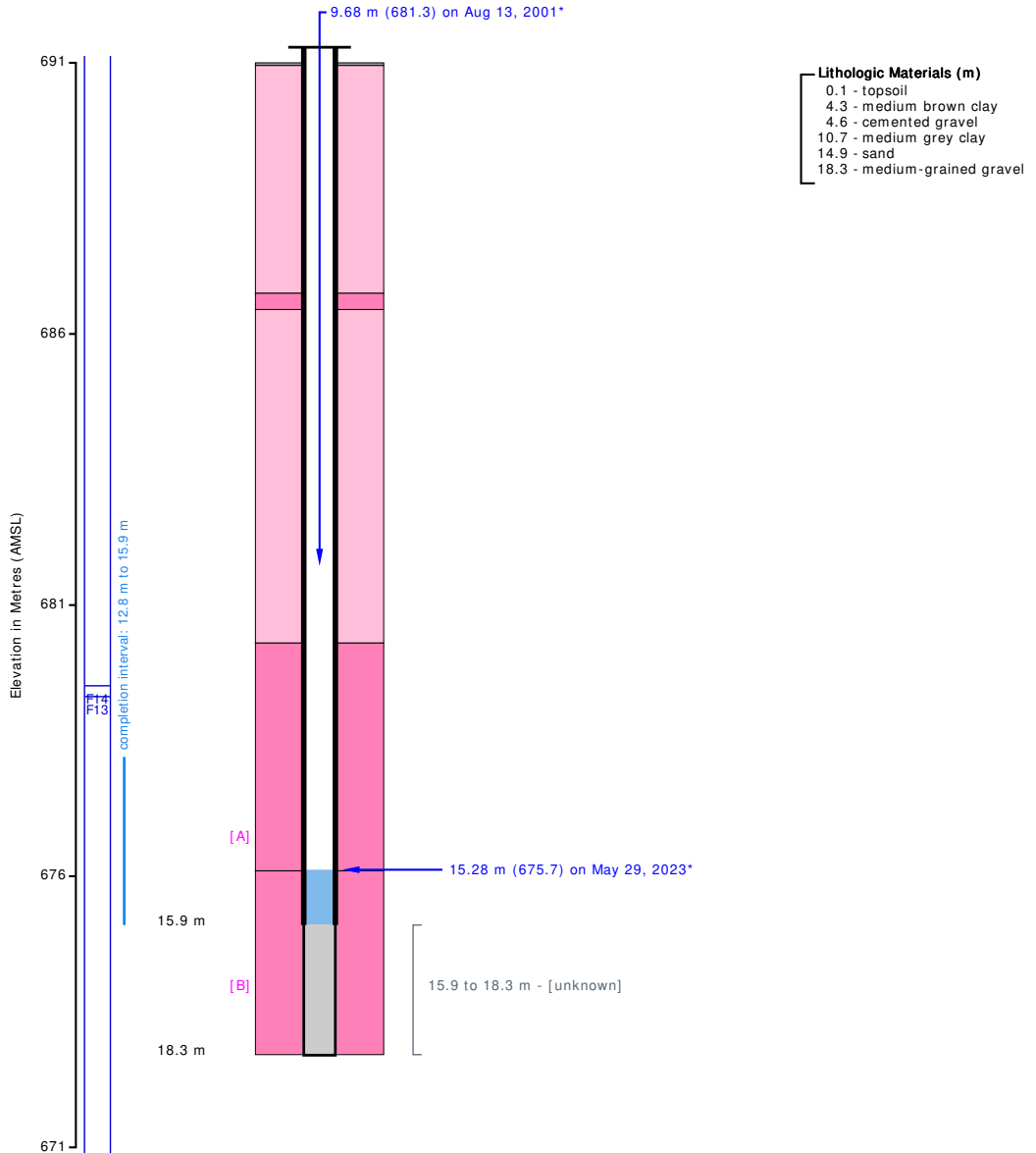
Earliest Water Level (m): **9.68 – August 13, 2001**

Most Recent Water Level (m): **15.28 – May 29, 2023 @ 15:00**

GIC ID: **Unknown**



# MW01-06 Water Well Diagram



Lithology Legend			Geologic Unit Legend (Top) - Regional Analysis	
Surficial	Unsorted		Fine Grained	Other
	Fine Grained		Coarse Grained	
	Coarse Grained			
Bedrock			F14 - Middle Horseshoe Canyon Formation	
			F13 - Lower Horseshoe Canyon Formation	

### Summary

TGWC ID: M40000.650496  
 Well Name: MW01-06  
 Legal Location: 01-29-054-27 W4M  
 Casing (OD): 50.8 mm; PVC (2.0")  
 Casing Stick-Up: 0.4 m (not drawn to scale)  
 Completion [A]: 12.8 to 15.9 m; Slotted  
 Construction [B]: 15.9 to 18.3 m; Plugged; Slough  
 Water Level (recent): 15.28 m (675.7 m AMSL) on May 29, 2023 @ 15:00 - Reference Point: Top of Casing  
 Water Level (oldest): 9.68 m (681.3 m AMSL) on Aug 13, 2001 - Reference Point: Top of Casing

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:49 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.

Owner: **Sturgeon County**  
**9613-100 St, Morinville, AB T8R 1L9**

Contractor: **Mar-Wayne Water Well Drilling Services Ltd.**  
 Name: **MW01-06**

Field Action: **Confirmed - Physically, July 13, 2009**

Work Type: **Piezometer** Date Started: **April 25, 2001**

Drilling Method: **Drilled** Date Completed: **April 25, 2001**

Proposed Use: **Monitoring** Well Status: **Observation**

Completion Type: **Casing** Feature Class: **Piezometer**

### METRIC REPORT

01-29-054-27 W4M

Easting (m): **70,299.24\*\***  
 Northing (m): **5,946,825.77\*\***  
 Elevation (m): **691\*\*\***

Lot:  
 Block:  
 Plan:

**M40000.650496**

513364; core

Elog Taken: **No**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.4**

Presence of Gas: **No**

**General Details** core

Depth Completed (m)\*: **15.9** Top of Bedrock: **Surficial Water Well \***  
 Depth Drilled (m): **18.3** Completion Interval (m): **12.8 – 15.9 \***

Sand & Gravel Thickness (m): **22.8 (total) – 18.3 (below 15 m) \***

Plugged / Backfilled (m): **15.9 – 18.3 (Slough)**

Most Recent Water Level (m): **15.28 m – May 29, 2023**

### Lithology Details

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
690.6	0.1	Topsoil
686.4	4.3	Medium Brown Clay
686.1	4.6	Cemented Gravel
679.9	10.7	Medium Grey Clay
675.7	14.9	Sand
672.3	18.3	Medium-Grained Gravel

**Completion Details**

Surface Casing: **PVC – 50.8 mm (O.D.) x 15.9 m (bottom)**

**Intervals**

Slotted: **12.8 to 15.9 m - Method: [unknown]**

[unknown]: **15.9 to 18.3 m**

### Chemistry Summary Details (mg/L, except as noted) (recently sampled first)

Sampling Details: **May 28, 2023 @ 15:45**

Report Date: **June 12, 2023 - Element Materials Technology Canada Inc. (1655888-16)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	916	Nitrate as N:	0.19	Turbidity (NTU):	54.6
Total Dissolved Solids:	560	Nitrite as N:	0.021	Fluoride:	0.10
Hardness (as CaCO3):	413	pH (pH Unit):	7.56	Carbonate:	< 6
T-Alkalinity (as CaCO3):	434	Colour (TCU):	> 60	Bicarbonate:	530
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	98	Hydroxide:	< 5
Nitrate + Nitrite as N:	0.21	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.1	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	121		Mercury:	< 0.000005	
Chloride:	2.0		Molybdenum:	< 0.001	
Iron:	< 0.01		Magnesium:	27.0	
Manganese:	0.802***		Sodium:	49.2	
Aluminum:	< 0.002		Potassium:	3.5	
Arsenic:	< 0.0002		Vanadium:	< 0.0001	
Barium:	0.038		Strontium:	1.02	
Beryllium:	< 0.0001		Nickel:	0.0007	
Cadmium:	0.00003		Zinc:	< 0.001	
Chromium:	< 0.0005		Copper:	0.0014	
Cobalt:	0.0004		Lead:	< 0.0001	
Sulfate:	97.2		Uranium:	0.0032	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario.

513364; 1 / 34

### Comments & Observations

**Aquifer Tests**

**Alias IDs**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM — {Ground; AMSL}

Created on: August 25, 2023 — Data "AS IS"; no warranty either expressed or implied. [53.686835 -113.935069 (WGS 84)], INT Date End: 2023-06-02



**MW01-06**  
**AEPA - Water Well Drilling Report**

— AEPA water well drilling report not available —

**MW01-06**  
**Chemical Analysis Results (June 12, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880322
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

**Reference Number** 1655888-16  
**Sample Date** May 28, 2023  
**Sample Time** 15:45  
**Sample Location** M40000.650496  
**Sample Description** MW01-06 / 4.3 °C  
**Sample Matrix** Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Metals Dissolved</b>					
Silicon	Dissolved mg/L	7.66	0.05		
Sulfur	Dissolved mg/L	32.4	0.3		
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC
Arsenic	Dissolved mg/L	<0.0002	0.0002	0.01	Below MAC
Barium	Dissolved mg/L	0.038	0.001	2.0	Below MAC
Beryllium	Dissolved mg/L	<0.0001	0.0001		
Bismuth	Dissolved mg/L	<0.0005	0.0005		
Boron	Dissolved mg/L	0.113	0.002	5	Below MAC
Cadmium	Dissolved mg/L	0.00003	0.00001	0.007	Below MAC
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC
Cobalt	Dissolved mg/L	0.0004	0.0001		
Copper	Dissolved mg/L	0.0014	0.0002	1 AO; 2 MAC	Below AO
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC
Lithium	Dissolved mg/L	0.080	0.001		
Molybdenum	Dissolved mg/L	<0.001	0.001		
Nickel	Dissolved mg/L	0.0007	0.0005		
Selenium	Dissolved mg/L	0.0004	0.0002	0.05	Below MAC
Silver	Dissolved mg/L	<0.00001	0.00001		
Strontium	Dissolved mg/L	1.02	0.001	7.0	Below MAC
Thallium	Dissolved mg/L	<0.00005	0.00005		
Tin	Dissolved mg/L	<0.001	0.001		
Titanium	Dissolved mg/L	<0.0005	0.0005		
Uranium	Dissolved mg/L	0.0032	0.0005	0.02	Below MAC
Vanadium	Dissolved mg/L	<0.0001	0.0001		
Zinc	Dissolved mg/L	<0.001	0.001	5	Below AO
Subsample		Field Filtered			
<b>Physical and Aggregate Properties</b>					
Colour	Apparent, Potable Colour units	>60	5	15	Above AO
Turbidity	NTU	54.6	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>					
pH		7.56	1	7.0-10.5	Within OG Range
Temperature of observed pH	°C	21.1			
Electrical Conductivity	at 25 °C µS/cm	916	1		
Calcium	Dissolved mg/L	121	0.2		
Magnesium	Dissolved mg/L	27.0	0.2		
Sodium	Dissolved mg/L	49.2	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880322
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-16
<b>Sample Date</b>	May 28, 2023
<b>Sample Time</b>	15:45
<b>Sample Location</b>	M40000.650496
<b>Sample Description</b>	MW01-06 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved mg/L	3.5	0.4		
Iron	Dissolved mg/L	<0.01	0.01	0.3	Below AO
Manganese	Dissolved mg/L	0.802	0.005	0.02 AO; 0.12 MAC	Above MAC
Chloride	Dissolved mg/L	2.0	0.4	250	Below AO
Fluoride	Dissolved mg/L	0.10	0.05	1.5	Below MAC
Nitrate - N	Dissolved mg/L	0.19	0.01	10	Below MAC
Nitrite - N	Dissolved mg/L	0.021	0.005	1	Below MAC
Nitrate and Nitrite - N	Dissolved mg/L	0.21	0.01	10	Below MAC
Sulfate (SO4)	Dissolved mg/L	97.2	0.9	500	Below AO
Hydroxide	Dissolved mg/L	<5			
Carbonate	Dissolved mg/L	<6			
Bicarbonate	Dissolved mg/L	530			
P-Alkalinity	as CaCO3 mg/L	<5	5		
T-Alkalinity	as CaCO3 mg/L	434	5		
Total Dissolved Solids	Calculated mg/L	560	1	500	Above AO
Hardness	Dissolved as CaCO3 mg/L	413			
Ionic Balance	Dissolved %	98			

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880322
--	--	--

**Metals Dissolved**

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880322
--	--	--

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880322
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Sulfur	mg/L	33.7	34.4	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	1.1	1.1	10	0.4	yes
Barium	µg/L	48	48	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	109	110	10	4	yes
Cadmium	µg/L	<0.01	<0.01	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.2	1.2	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	71	71	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.9	1.1	10	1.1	yes
Selenium	µg/L	<0.2	<0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	953	947	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.7	3.6	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880322
--	--	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	10.0	9.9	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880322
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

**Routine Water - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.1	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	15.0	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	1.5	1.6	10	0.5	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes
Nitrate - N	mg/L	0.02	0.02	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880322
--	--	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	121	123	10	0.6	yes
Magnesium	mg/L	23.2	23.7	10	0.7	yes
Sodium	mg/L	64.4	65.8	10	1.2	yes
Potassium	mg/L	3.8	3.8	10	1.2	yes
Iron	mg/L	2.31	2.35	10	0.05	yes
Manganese	mg/L	0.653	0.664	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring	Lot ID: <b>1655888</b>
Attn: Kirby Fromm	Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880322
Sampled By: Ben Gilham Company: HCL	P.O.: 19707 Proj. Acct. code:	

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-16; 8663483: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880322
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

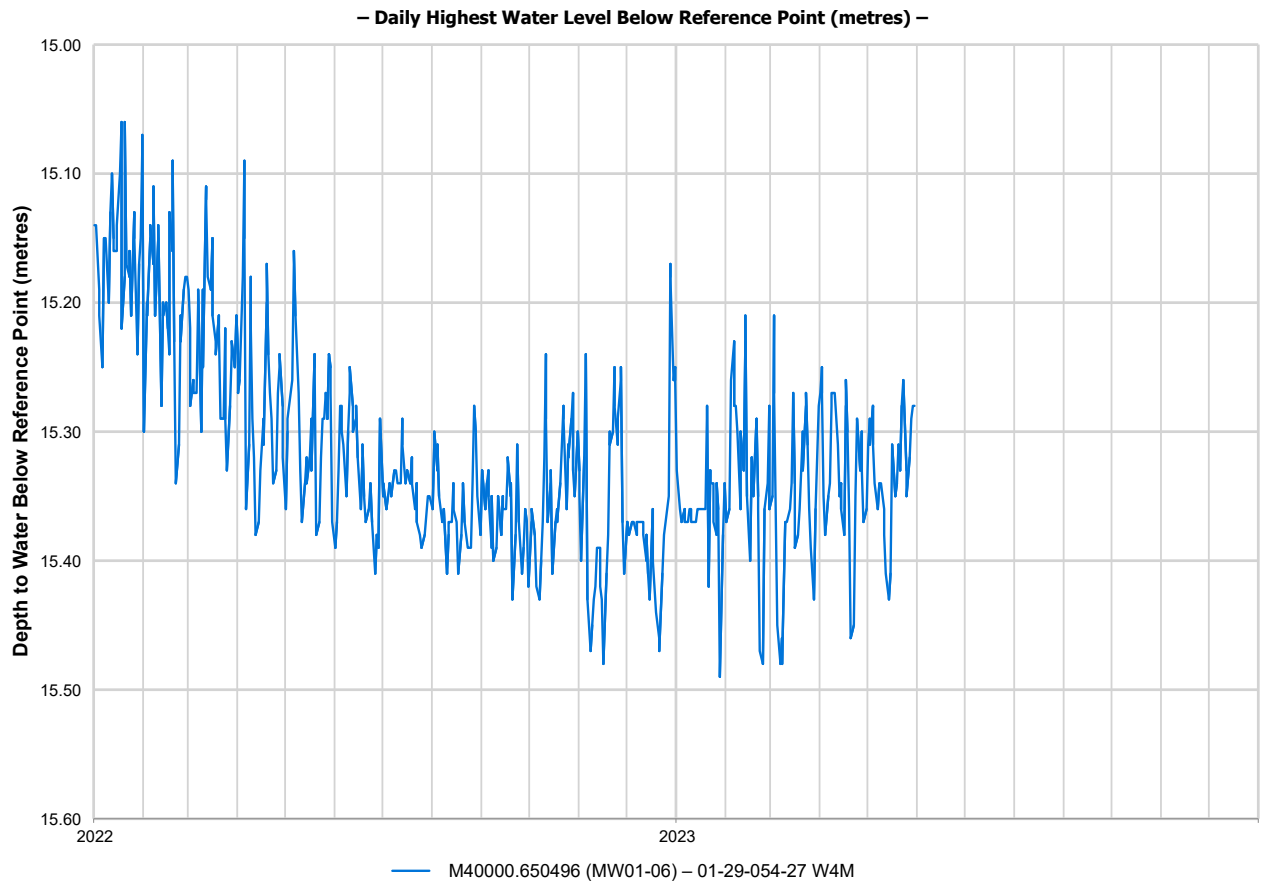
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

*MW01-06*  
*2022 - 2023 Hydrograph*



## MW01-07

**13-19-054-26 W4M**  
(M37490.031427)



### Well Spatial Location:

Easting: **76,879**

Northing: **5,946,605**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **676**

*(elevation accuracy HCL DEM)*

Date Completed: **July 16, 2001**

Depth Drilled (m): **14.9**

Completion Interval (m): **12.8 – 14.3 \***

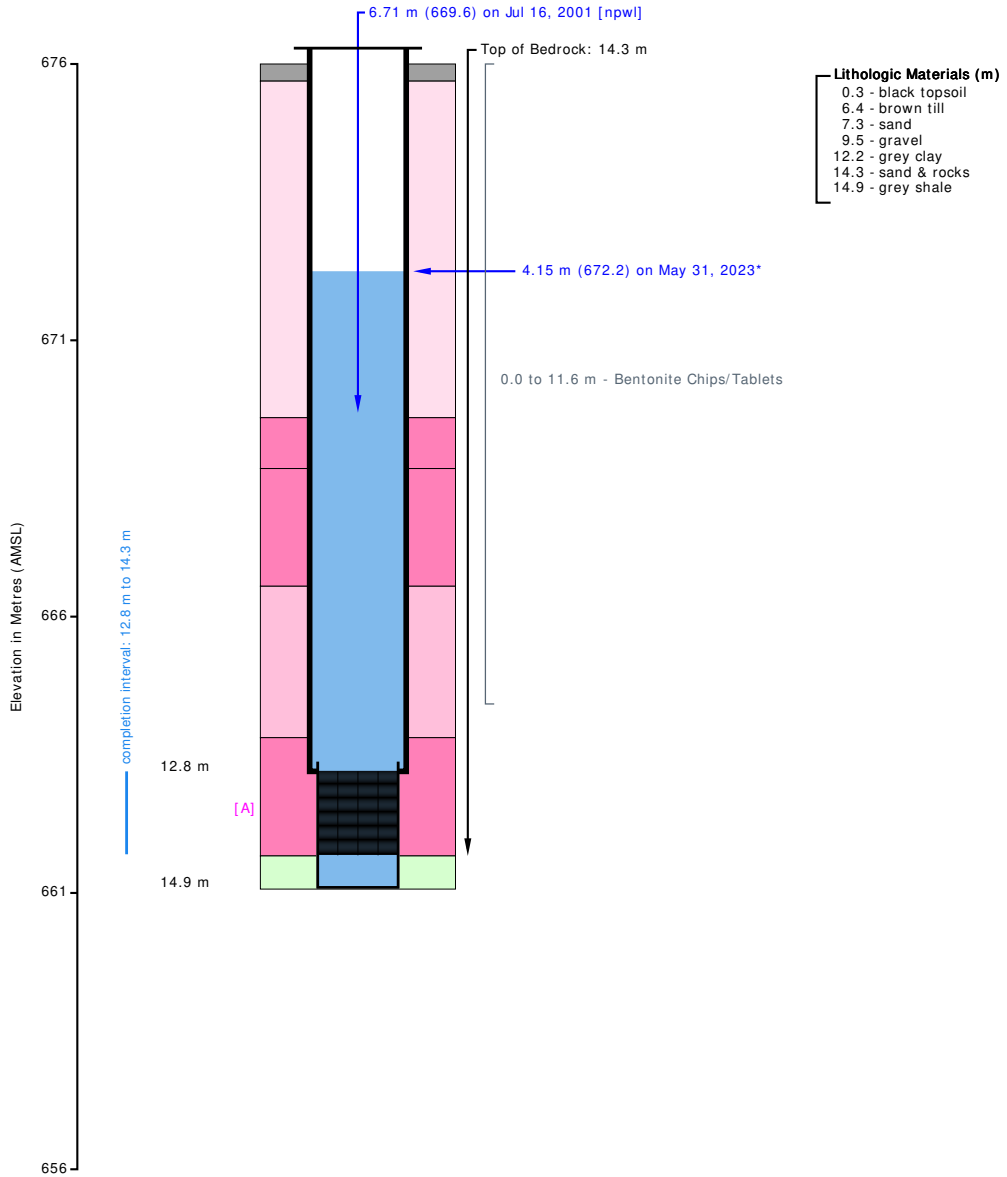
*(\* TGWC determined value)*

Earliest Water Level (m): **6.71 – July 16, 2001 @ 11:00**

Most Recent Water Level (m): **4.15 – May 31, 2023 @ 15:22**

GIC ID: **297525**

# MW01-07 Water Well Diagram



Lithology Legend		Geologic Unit Legend (Top) - Regional Analysis	
Surficial	<ul style="list-style-type: none"> <li>Unsorted</li> <li>Fine Grained</li> <li>Coarse Grained</li> </ul>	Bedrock	<ul style="list-style-type: none"> <li>Fine Grained</li> <li>Coarse Grained</li> <li>Other</li> </ul>
		Geologic Unit details not available for this location	

### Summary

TGWC ID: M37490.031427  
 Well Name: MW01-07  
 Legal Location: 13-19-054-26 W4M  
 Casing (OD): 152.4 mm; Plastic (6.0")  
 Screen (OD): 127.0 mm; Stainless Steel (5.0")  
 Casing Stick-Up: 0.4 m (not drawn to scale)  
 Completion [A]: 12.8 to 14.3 m; Screened  
 Water Level (recent): 4.15 m (672.2 m AMSL) on May 31, 2023 @ 15:22 - Reference Point: Top of Casing  
 Water Level (oldest): 6.71 m (669.6 m AMSL) on Jul 16, 2001 @ 11:00 [npwl]  
 Top of Liner assumed to be 5% of 'non-cased' interval.

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:49 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.



Owner: **Sturgeon County**  
**9613-100 St, Morinville, AB T8R 1L9**

Contractor: **Mar-Wayne Water Well Drilling Services Ltd.**  
 Name: **MW01-07**

Field Action: **Confirmed - Physically, July 13, 2009**

Work Type: **Piezometer** Date Started: **July 16, 2001**

Drilling Method: **Rotary** Date Completed: **July 16, 2001**

Proposed Use: **Monitoring** Well Status: **Observation**

Completion Type: **Screen** Feature Class: **Piezometer**

**METRIC REPORT**

**13-19-054-26 W4M**

Easting (m): **76,878.77\*\***  
 Northing (m): **5,946,604.83\*\***  
 Elevation (m): **676\*\*\***

Lot:  
 Block:  
 Plan:

**M37490.031427**

513355; 334316; core

Elog Taken: **No**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.4**

Presence of Gas: **No**

**General Details** core

Depth Completed (m)\*: **14.3** Top of Bedrock (m): **14.33 \***  
 Depth Drilled (m): **14.9** Completion Interval (m): **12.8 – 14.3 \***

Sand & Gravel Thickness (m): **5.2 (total) – 0.0 (below 15 m) \***

Most Recent Water Level (m): **4.15 m – May 31, 2023**  
 Pump Intake BTOC (m): **12.5 on July 16, 2001**

**Completion Details**

Surface Casing: **Plastic – 152.4 mm (O.D.) x 12.70 mm (thick) x 12.8 m (bottom)**

Screen Material: **Stainless Steel – 127.0 mm (O.D.) (Attached To Casing)**

Fittings: **Top: Coupler – Bottom: Washdown**

**Intervals**

Screen: **12.8 to 14.3 m - 12 Slot**  
 Bentonite Chips/Tables: **0.0 to 11.6 m**

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
675.6	0.3	Black Topsoil
669.5	6.4	Brown Till
668.6	7.3	Sand
666.5	9.5	Gravel
663.7	12.2	Grey Clay
661.6	14.3	Sand & Rocks
661.0	14.9	Grey Shale

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: **May 31, 2023 @ 16:20**

Report Date: **June 20, 2023 - Element Materials Technology Canada Inc. (1655888-7)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	1260	Nitrate as N:	< 0.01	Turbidity (NTU):	13.5
Total Dissolved Solids:	841	Nitrite as N:	< 0.005	Fluoride:	0.08
Hardness (as CaCO3):	548	pH (pH Unit):	7.41	Carbonate:	< 6
T-Alkalinity (as CaCO3):	509	Colour (TCU):	40	Bicarbonate:	621
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	100	Hydroxide:	< 5
Nitrate + Nitrite as N:	< 0.01	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.1	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	156		Mercury:	< 0.000005	
Chloride:	4.7		Molybdenum:	< 0.001	
Iron:	1.25		Magnesium:	38.5	
Manganese:	0.832***		Sodium:	94.4	
Aluminum:	< 0.002		Potassium:	4.9	
Arsenic:	0.0018		Vanadium:	< 0.0001	
Barium:	0.030		Strontium:	1.15	
Beryllium:	< 0.0001		Nickel:	0.0007	
Cadmium:	< 0.00001		Zinc:	< 0.001	
Chromium:	< 0.0005		Copper:	< 0.0002	
Cobalt:	0.0003		Lead:	< 0.0001	
Sulfate:	237		Uranium:	0.0215***	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario. 513355; 1 / 32

**Comments & Observations**

**Initial, Jul 16, 2001: Villeneuve gravel study.**

**Aquifer Tests**

Date & Time	Testing Method / Type	Depth of Test Interval	Duration (minutes)		Avg. Rate (Lpm)	NPWL (metres)	Drawdown (metres)	Pump (metres)	Q20 (m³/day)*		Transmissivity (m²/day)*	
			Pumping	Recovery					Apparent	Effective	Apparent	Aquifer Effective
1 2001-07-16 11:00	Pump	[unknown]	120	120	57.7	6.7	5.0	12.5	47.9		20.8	

**Alias IDs**

GIC ID: **297525**  
 GIC (WellReportId): **297525**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM — {Ground; AMSL}

Created on: August 25, 2023 — Data "AS IS"; no warranty either expressed or implied. [53.683922 -113.835476 (WGS 84)], INT Date End: 2023-06-02



**MW01-07**  
**AEPA - Water Well Drilling Report**



# Water Well Drilling Report

[View in Imperial](#)   [Export to Excel](#)

GIC Well ID                    297525  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received        2001/09/27

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
Owner Name	Address				Town	Province	Country	Postal Code			
STURGEON, COUNTY OF	MORINVILLE										
Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description		
	NW	19	54	26	4						
Measured from Boundary of					GPS Coordinates in Decimal Degrees (NAD 83)			Elevation _____ m			
_____ m from					Latitude <u>53.683426</u> Longitude <u>-113.830311</u>			How Elevation Obtained			
_____ m from					How Location Obtained			Not Obtained			
					Not Verified						

Drilling Information	
<b>Method of Drilling</b> Rotary  <b>Proposed Well Use</b> Observation	<b>Type of Work</b> New Well

Formation Log			Measurement in Metric
Depth from ground level (m)	Water Bearing	Lithology Description	
0.30		Black Topsoil	
6.40		Brown Till	
7.32		Sand	
9.45		Gravel	
12.19		Gray Clay	
14.33		Sand & Rocks	
14.94		Gray Shale	

Yield Test Summary			Measurement in Metric
Recommended Pump Rate	45.46 L/min		
Test Date	Water Removal Rate (L/min)	Static Water Level (m)	
2001/07/16	57.74	6.71	

Well Completion				Measurement in Metric
Total Depth Drilled	Finished Well Depth	Start Date	End Date	
14.94 m		2001/07/16	2001/07/16	
<b>Borehole</b>				
Diameter (cm)	From (m)	To (m)		
0.00	0.00	14.94		
<b>Surface Casing (if applicable)</b>		<b>Well Casing/Liner</b>		
Plastic		Size OD : _____ cm		
Size OD : <u>15.24 cm</u>		Size OD : <u>0.00 cm</u>		
Wall Thickness : <u>1.270 cm</u>		Wall Thickness : <u>0.000 cm</u>		
Bottom at : <u>12.80 m</u>		Top at : <u>0.00 m</u>		
		Bottom at : <u>0.00 m</u>		
<b>Perforations</b>				
From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)
Perforated by				
<b>Annular Seal</b> Bentonite Chips/Tablets				
Placed from <u>0.00 m</u> to <u>11.58 m</u>				
Amount _____				
Other Seals				
Type		At (m)		
<b>Screen Type</b> Stainless Steel				
Size OD : <u>12.70 cm</u>				
From (m)	To (m)	Slot Size (cm)		
12.80	14.33	0.030		
Attachment <u>Attached To Casing</u>				
Top Fittings <u>Coupler</u>		Bottom Fittings <u>Washdown</u>		
<b>Pack</b>				
Type <u>Silica Sand</u>		Grain Size <u>10-20</u>		
Amount <u>500.00 Pounds</u>				

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER	Certification No 1
Company Name MAR-WAYNE WATER WELL DRILLING SERVICES LTD.	Copy of Well report provided to owner    Date approval holder signed



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 297525  
 GoA Well Tag No.  
 Drilling Company Well ID  
 Date Report Received 2001/09/27

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
Owner Name	Address			Town	Province	Country	Postal Code				
STURGEON, COUNTY OF	MORINVILLE										
Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description		
NW	19	54	26	4							
Measured from Boundary of				GPS Coordinates in Decimal Degrees (NAD 83)				Elevation _____ m			
_____ m from				Latitude <u>53.683426</u> Longitude <u>-113.830311</u>				How Elevation Obtained			
_____ m from				How Location Obtained				Not Obtained			
Not Verified											

Additional Information										Measurement in Metric
Distance From Top of Casing to Ground Level _____ cm					Is Flow Control Installed _____					
Is Artesian Flow _____					Rate _____ L/min					Describe _____
Recommended Pump Rate _____ 45.46 L/min					Pump Installed _____ Depth _____ m					
Recommended Pump Intake Depth (From TOC) _____ 12.50 m					Type _____ Make _____ H.P. _____					
					Model (Output Rating) _____					
Did you Encounter Saline Water (>4000 ppm TDS) _____					Depth _____ m					Well Disinfected Upon Completion _____
Remedial Action Taken:					Gas _____ Depth _____ m					Geophysical Log Taken _____
					Submitted to ESRD _____					
Additional Comments on Well					Sample Collected for Potability _____					Submitted to ESRD _____
DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 40 CMS. VILLENEUVE GRAVEL STUDY.										

Yield Test			Taken From Ground Level			Measurement in Metric
Test Date	Start Time	Static Water Level	Depth to water level			
2001/07/16	12:00 AM	6.71 m				
<b>Method of Water Removal</b>			Pumping (m)	Elapsed Time	Recovery (m)	
Type Pump _____				Minutes:Sec		
Removal Rate _____ 57.74 L/min			6.74	0:00	11.72	
Depth Withdrawn From _____ 12.50 m			9.26	1:00	9.71	
			9.98	2:00	8.57	
			10.31	3:00	8.14	
			10.49	4:00	7.97	
			10.59	5:00	7.88	
			10.66	6:00	7.87	
			10.69	7:00	7.85	
			10.73	8:00	7.82	
			10.77	9:00	7.81	
			10.79	10:00	7.79	
			10.83	12:00	7.75	
			10.88	14:00	7.75	
			10.90	16:00	7.73	
			10.98	20:00	7.69	
			11.05	25:00	7.67	
			11.13	30:00	7.63	
			11.21	35:00	7.60	
			11.26	40:00	7.57	
			11.36	50:00	7.56	
			11.47	60:00	7.54	
			11.53	75:00	7.50	
			11.68	90:00	7.46	
			11.70	105:00	7.45	
			11.72	120:00	7.43	

Water Diverted for Drilling		
Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification		
Name of Journeyman responsible for drilling/construction of well	Certification No	
UNKNOWN NA DRILLER	1	
Company Name	Copy of Well report provided to owner	Date approval holder signed
MAR-WAYNE WATER WELL DRILLING SERVICES LTD.		

**MW01-07**  
**Chemical Analysis Results (June 20, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 20, 2023 Report Number: 2885474
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-7
<b>Sample Date</b>	May 31, 2023
<b>Sample Time</b>	16:20
<b>Sample Location</b>	M37490.031427
<b>Sample Description</b>	MW01-07 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Metals Dissolved</b>						
Silicon	Dissolved mg/L	6.18	0.05			
Sulfur	Dissolved mg/L	79.0	0.3			
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC	
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG	
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC	
Arsenic	Dissolved mg/L	0.0018	0.0002	0.01	Below MAC	
Barium	Dissolved mg/L	0.030	0.001	2.0	Below MAC	
Beryllium	Dissolved mg/L	<0.0001	0.0001			
Bismuth	Dissolved mg/L	<0.0005	0.0005			
Boron	Dissolved mg/L	0.101	0.002	5	Below MAC	
Cadmium	Dissolved mg/L	<0.00001	0.00001	0.007	Below MAC	
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC	
Cobalt	Dissolved mg/L	0.0003	0.0001			
Copper	Dissolved mg/L	<0.0002	0.0002	1 AO; 2 MAC	Below AO	
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC	
Lithium	Dissolved mg/L	0.126	0.001			
Molybdenum	Dissolved mg/L	<0.001	0.001			
Nickel	Dissolved mg/L	0.0007	0.0005			
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC	
Silver	Dissolved mg/L	<0.00001	0.00001			
Strontium	Dissolved mg/L	1.15	0.001	7.0	Below MAC	
Thallium	Dissolved mg/L	<0.00005	0.00005			
Tin	Dissolved mg/L	<0.001	0.001			
Titanium	Dissolved mg/L	<0.0005	0.0005			
Uranium	Dissolved mg/L	0.0215	0.0005	0.02	Above MAC	
Vanadium	Dissolved mg/L	<0.0001	0.0001			
Zinc	Dissolved mg/L	<0.001	0.001	5	Below AO	
Subsample		Field Filtered				
<b>Physical and Aggregate Properties</b>						
Colour	Apparent, Potable	Colour units	40	5	15	Above AO
Turbidity		NTU	13.5	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>						
pH			7.41	1	7.0-10.5	Within OG Range
Temperature of observed pH		°C	21.1			
Electrical Conductivity	at 25 °C	µS/cm	1260	1		
Calcium	Dissolved	mg/L	156	0.2		
Magnesium	Dissolved	mg/L	38.5	0.2		
Sodium	Dissolved	mg/L	94.4	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 20, 2023 Report Number: 2885474
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-7
<b>Sample Date</b>	May 31, 2023
<b>Sample Time</b>	16:20
<b>Sample Location</b>	M37490.031427
<b>Sample Description</b>	MW01-07 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Routine Water - Continued</b>						
Potassium	Dissolved	mg/L	4.9	0.4		
Iron	Dissolved	mg/L	1.25	0.01	0.3	Above AO
Manganese	Dissolved	mg/L	0.832	0.005	0.02 AO; 0.12 MAC	Above MAC
Chloride	Dissolved	mg/L	4.7	0.4	250	Below AO
Fluoride		mg/L	0.08	0.05	1.5	Below MAC
Nitrate - N		mg/L	<0.01	0.01	10	Below MAC
Nitrite - N		mg/L	<0.005	0.005	1	Below MAC
Nitrate and Nitrite - N		mg/L	<0.01	0.01	10	Below MAC
Sulfate (SO4)	Dissolved	mg/L	237	0.9	500	Below AO
Hydroxide		mg/L	<5			
Carbonate		mg/L	<6			
Bicarbonate		mg/L	621			
P-Alkalinity	as CaCO3	mg/L	<5	5		
T-Alkalinity	as CaCO3	mg/L	509	5		
Total Dissolved Solids	Calculated	mg/L	841	1	500	Above AO
Hardness	Dissolved as CaCO3	mg/L	548			
Ionic Balance	Dissolved	%	100			

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 20, 2023 Report Number: 2885474
--	--	--

**Metals Dissolved**

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 20, 2023 Report Number: 2885474
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 20, 2023 Report Number: 2885474
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Sulfur	mg/L	1.0	1.1	10	0.1	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	1.1	1.1	10	0.4	yes
Barium	µg/L	48	48	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	109	110	10	4	yes
Cadmium	µg/L	<0.01	<0.01	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.2	1.2	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	71	71	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.9	1.1	10	1.1	yes
Selenium	µg/L	<0.2	<0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	953	947	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.7	3.6	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 20, 2023 Report Number: 2885474
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	1.4	1.3	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 20, 2023 Report Number: 2885474
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.1	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	15.0	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	56.8	57.1	10	0.5	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes
Nitrate - N	mg/L	0.02	0.02	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 20, 2023 Report Number: 2885474
--	--	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	29.6	29.3	10	0.6	yes
Magnesium	mg/L	9.1	9.0	10	0.7	yes
Sodium	mg/L	2.9	2.8	10	1.2	yes
Potassium	mg/L	1.0	1.0	10	1.2	yes
Iron	mg/L	0.18	0.18	10	0.05	yes
Manganese	mg/L	<0.005	<0.005	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 20, 2023 Report Number: 2885474
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-7; 8663474: Sample received at 4.3 °C
- Jun 20, 2023 - Sample 1655888-7; 8663474: Report was issued to correct the sampling date for sample 1655888-7 as per Kirby Fromm of HCL on 06/20/2023

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
	17740 - 118 Avenue	Project Name:	2022 Groundwater Monitoring	Control Number:	
	Edmonton, AB, Canada	Project Location:		Date Received:	Jun 5, 2023
	T5S 2W3	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 20, 2023
Attn:	Kirby Fromm	P.O.:	19707	Report Number:	2885474
Sampled By:	Ben Gilham	Proj. Acct. code:			
Company:	HCL				

---

Previous report 2880313.

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

Please direct any inquiries regarding this report to our Client Services group.

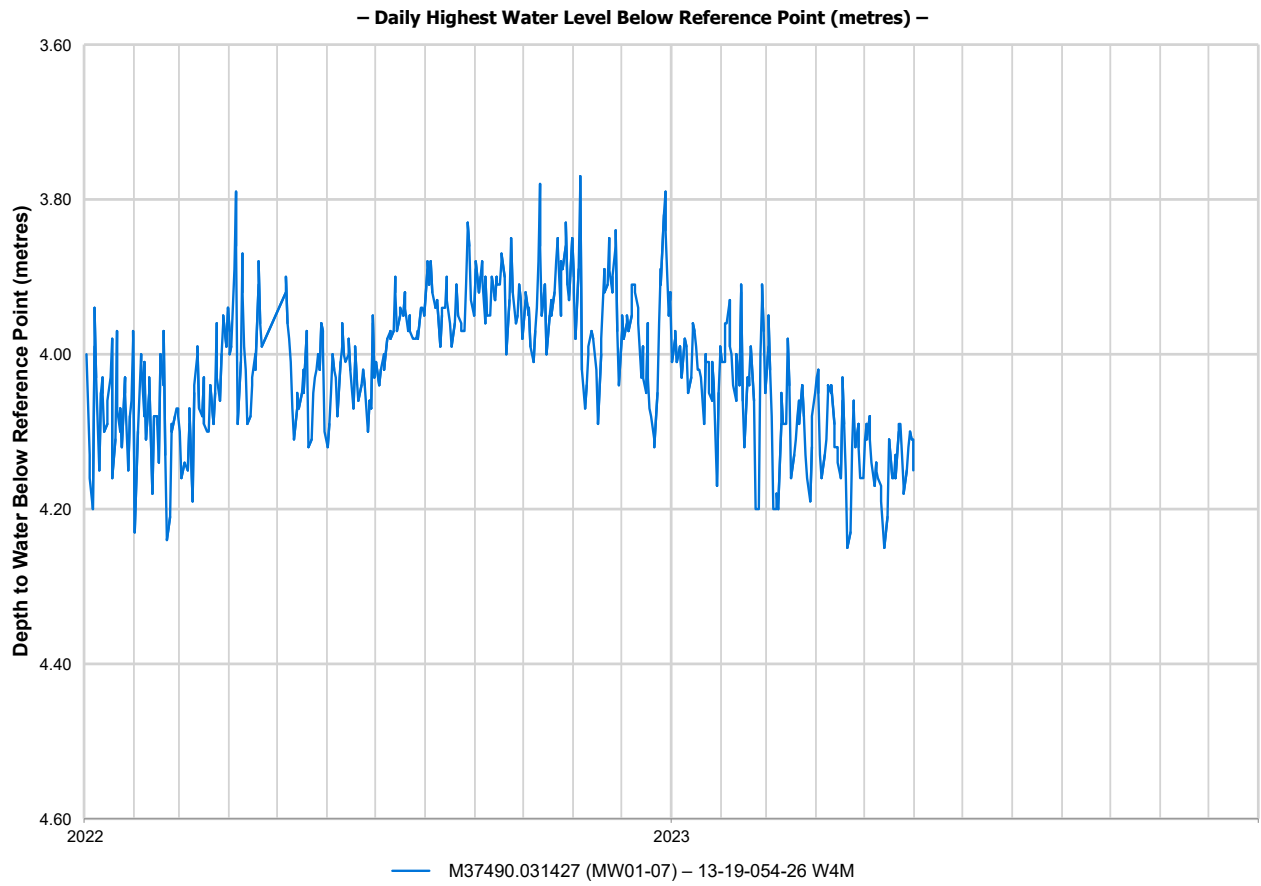
Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

---

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

MW01-07  
2022 - 2023 Hydrograph



## MW01-08

10-24-054-27 W4M  
(M37490.031431)



Photograph taken on June 1, 2023

### Well Spatial Location:

Easting: **76,066**

Northing: **5,946,352**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **682**

*(elevation accuracy HCL DEM)*

Date Completed: **August 15, 2001**

Depth Drilled (m): **14.6**

Completion Interval (m): **13.1 – 14.6 \***

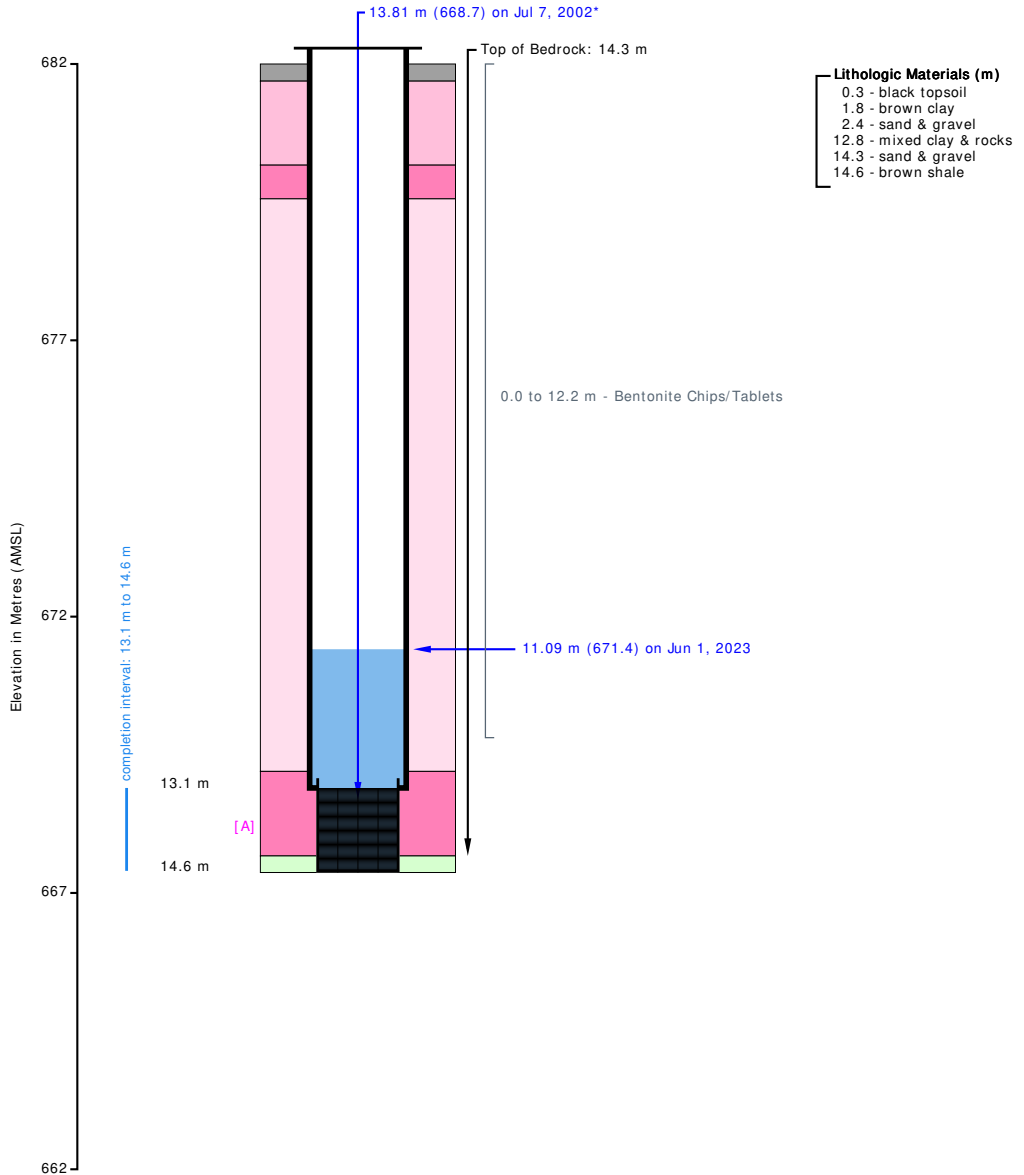
*(\* TGWC determined value)*

Earliest Water Level (m): **13.81 – July 7, 2002**

Most Recent Water Level (m): **11.09 – June 1, 2023 @ 08:50**

GIC ID: **297529**

# MW01-08 Water Well Diagram



Lithology Legend		Geologic Unit Legend (Top) - Regional Analysis	
Surficial	<ul style="list-style-type: none"> <li>Unsorted</li> <li>Fine Grained</li> <li>Coarse Grained</li> </ul>	Bedrock	<ul style="list-style-type: none"> <li>Fine Grained</li> <li>Coarse Grained</li> <li>Other</li> </ul>

Geologic Unit details not available for this location

**Summary**

TGWC ID: M37490.031431  
 Well Name: MW01-08  
 Legal Location: 10-24-054-27 W4M  
 Casing (OD): 152.4 mm; Plastic (6.0")  
 Screen (OD): 127.0 mm; Stainless Steel (5.0")  
 Casing Stick-Up: 0.5 m (not drawn to scale)  
 Completion [A]: 13.1 to 14.6 m; Screened  
 Water Level (recent): 11.09 m (671.4 m AMSL) on Jun 1, 2023 @ 08:50  
 Water Level (oldest): 13.81 m (668.7 m AMSL) on Jul 7, 2002 - Reference Point: Top of Casing  
 Top of Liner assumed to be 5% of 'non-cased' interval.

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:49 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.



Owner: **Sturgeon County**  
**9613-100 St, Morinville, AB T8R 1L9**

Contractor: **Mar-Wayne Water Well Drilling Services Ltd.**  
 Name: **MW01-08**

Field Action: **Confirmed - Physically, July 13, 2009**

Work Type: **Piezometer** Date Started: **August 15, 2001**

Drilling Method: **Rotary** Date Completed: **August 15, 2001**

Proposed Use: **Monitoring** Well Status: **Observation**

Completion Type: **Screen** Feature Class: **Piezometer**

**METRIC REPORT**

10-24-054-27 W4M

Easting (m): **76,066.35\*\***  
 Northing (m): **5,946,351.75\*\***  
 Elevation (m): **682\*\*\***

Lot:  
 Block:  
 Plan:

**M37490.031431**

513368; core

Elog Taken: **No**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.5**

Presence of Gas: **No**

**General Details** core

Depth Completed (m)\*: **14.6** Top of Bedrock (m): **14.33 \***  
 Depth Drilled (m): **14.6** Completion Interval (m): **13.1 – 14.6 \***

Sand & Gravel Thickness (m): **2.1 (total) – 0.0 (below 15 m) \***

Most Recent Water Level (m): **11.09 m – June 1, 2023**

**Completion Details**

Surface Casing: **Plastic – 152.4 mm (O.D.) x 12.70 mm (thick) x 13.1 m (bottom)**

Screen Material: **Stainless Steel – 127.0 mm (O.D.) (Attached To Casing)**

Fittings: **Top: Coupler – Bottom: Plug**

**Intervals**

Screen: **13.1 to 14.6 m - 12 Slot**

Bentonite Chips/Tables: **0.0 to 12.2 m**

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
681.7	0.3	Black Topsoil
680.2	1.8	Brown Clay
679.6	2.4	Sand & Gravel
669.2	12.8	Mixed Clay & Rocks
667.7	14.3	Sand & Gravel
667.4	14.6	Brown Shale

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: **June 1, 2023 @ 09:15**

Report Date: **June 12, 2023 - Element Materials Technology Canada Inc. (1655888-20)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	1330	Nitrate as N:	< 0.01	Turbidity (NTU):	31.0
Total Dissolved Solids:	896	Nitrite as N:	< 0.005	Fluoride:	0.16
Hardness (as CaCO3):	561	pH (pH Unit):	7.50	Carbonate:	< 6
T-Alkalinity (as CaCO3):	525	Colour (TCU):	55	Bicarbonate:	640
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	100	Hydroxide:	< 5
Nitrate + Nitrite as N:	< 0.01	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.0	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	165		Mercury:	< 0.000005	
Chloride:	2.7		Molybdenum:	< 0.001	
Iron:	2.34		Magnesium:	36.4	
Manganese:	1.45***		Sodium:	105	
Aluminum:	< 0.002		Potassium:	5.9	
Arsenic:	0.0013		Vanadium:	< 0.0001	
Barium:	0.111		Strontium:	0.868	
Beryllium:	< 0.0001		Nickel:	0.0023	
Cadmium:	< 0.00001		Zinc:	< 0.001	
Chromium:	< 0.0005		Copper:	< 0.0002	
Cobalt:	0.0007		Lead:	< 0.0001	
Sulfate:	267		Uranium:	0.0101	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario.

513368; 1 / 34

**Comments & Observations**

**Initial, Aug 14, 2001:** Villeneuve gravel study.

**Aquifer Tests**

**Alias IDs**

GIC ID: **297529**  
 GIC (WellReportId): **297529**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM — {Ground; AMSL}

Created on: August 25, 2023 — Data "AS IS"; no warranty either expressed or implied. [53.681765 -113.847841 (WGS 84)], INT Date End: 2023-06-02



**MW01-08**  
**AEPA - Water Well Drilling Report**



# Water Well Drilling Report

[View in Imperial](#)   [Export to Excel](#)

GIC Well ID                    297529  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received        2001/09/27

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
Owner Name		Address			Town		Province		Country		Postal Code
STURGEON, COUNTY OF		MORINVILLE									
Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description		
	NE	24	54	27	4						
Measured from Boundary of					GPS Coordinates in Decimal Degrees (NAD 83)					Elevation _____ m	
_____ m from					Latitude <u>53.683412</u> Longitude <u>-113.842480</u>					How Elevation Obtained	
_____ m from					How Location Obtained					Not Obtained	
					Not Verified						

Drilling Information	
<b>Method of Drilling</b> Rotary  <b>Proposed Well Use</b> Observation	<b>Type of Work</b> New Well

Formation Log			Measurement in Metric
Depth from ground level (m)	Water Bearing	Lithology Description	
0.30		Black Topsoil	
1.83		Brown Clay	
2.44		Sand & Gravel	
12.80		Mixed Clay & Rocks	
14.33		Sand & Gravel	
14.63		Brown Shale	

Yield Test Summary			Measurement in Metric
Recommended Pump Rate _____ L/min			
Test Date	Water Removal Rate (L/min)	Static Water Level (m)	

Well Completion				Measurement in Metric
Total Depth Drilled	Finished Well Depth	Start Date	End Date	
14.63 m		2001/08/15	2001/08/15	
<b>Borehole</b>				
Diameter (cm)	From (m)	To (m)		
0.00	0.00	14.63		
<b>Surface Casing (if applicable)</b>		<b>Well Casing/Liner</b>		
Plastic		Plastic		
Size OD : <u>15.24 cm</u>		Size OD : <u>0.00 cm</u>		
Wall Thickness : <u>1.270 cm</u>		Wall Thickness : <u>0.000 cm</u>		
Bottom at : <u>13.11 m</u>		Top at : <u>0.00 m</u>		
		Bottom at : <u>0.00 m</u>		
<b>Perforations</b>				
From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)
Perforated by				
<b>Annular Seal</b> Bentonite Chips/Tablets				
Placed from <u>0.00 m</u> to <u>12.19 m</u>				
Amount _____				
Other Seals				
Type		At (m)		
<b>Screen Type</b> Stainless Steel				
Size OD : <u>12.70 cm</u>				
From (m)	To (m)	Slot Size (cm)		
13.11	14.63	0.030		
Attachment <u>Attached To Casing</u>				
Top Fittings <u>Coupler</u>		Bottom Fittings <u>Plug</u>		
<b>Pack</b>				
Type <u>Silica Sand</u>		Grain Size <u>#3</u>		
Amount <u>300.00 Pounds</u>				

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER	Certification No 1
Company Name MAR-WAYNE WATER WELL DRILLING SERVICES LTD.	Copy of Well report provided to owner    Date approval holder signed



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 297529  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received 2001/09/27

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b>		<b>Address</b>		<b>Town</b>		<b>Province</b>		<b>Country</b>		<b>Postal Code</b>	
STURGEON, COUNTY OF		MORINVILLE									
<b>Location</b>	<b>1/4 or LSD</b>	<b>SEC</b>	<b>TWP</b>	<b>RGE</b>	<b>W of MER</b>	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b>		
	NE	24	54	27	4						
<b>Measured from Boundary of</b>				<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>				<b>Elevation</b> _____ <b>m</b>			
_____ m from				Latitude <u>53.683412</u> Longitude <u>-113.842480</u>				How Elevation Obtained			
_____ m from				How Location Obtained				Not Obtained			
Not Verified											

Additional Information										Measurement in Metric
Distance From Top of Casing to Ground Level _____ cm					Is Flow Control Installed _____					
Is Artesian Flow _____					Rate _____ L/min					Describe _____
Recommended Pump Rate _____ L/min					Pump Installed _____					Depth _____ m
Recommended Pump Intake Depth (From TOC) _____ m					Type _____					Make _____ H.P. _____
					Model (Output Rating) _____					
Did you Encounter Saline Water (>4000 ppm TDS) _____					Depth _____ m					Well Disinfected Upon Completion _____
Remedial Action Taken _____					Gas _____					Depth _____ m
					Geophysical Log Taken _____					Submitted to ESRD _____
Additional Comments on Well					Sample Collected for Potability _____					Submitted to ESRD _____
DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 39 CMS. VILLENEUVE GRAVEL STUDY.										

Yield Test			Taken From Ground Level	Measurement in Metric
Test Date	Start Time	Static Water Level		
		m		
<b>Method of Water Removal</b>				
Type _____				
Removal Rate _____ L/min				
Depth Withdrawn From _____ m				
If water removal period was < 2 hours, explain why				

Water Diverted for Drilling		
Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well	Certification No
UNKNOWN NA DRILLER	1
Company Name	Copy of Well report provided to owner
MAR-WAYNE WATER WELL DRILLING SERVICES LTD.	Date approval holder signed

**MW01-08**  
**Chemical Analysis Results (June 12, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880326
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

**Reference Number** 1655888-20  
**Sample Date** June 01, 2023  
**Sample Time** 09:15  
**Sample Location** M37490.031431  
**Sample Description** MW01-08 / 4.3 °C  
**Sample Matrix** Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Metals Dissolved</b>					
Silicon	Dissolved mg/L	7.23	0.05		
Sulfur	Dissolved mg/L	88.9	0.3		
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC
Arsenic	Dissolved mg/L	0.0013	0.0002	0.01	Below MAC
Barium	Dissolved mg/L	0.111	0.001	2.0	Below MAC
Beryllium	Dissolved mg/L	<0.0001	0.0001		
Bismuth	Dissolved mg/L	<0.0005	0.0005		
Boron	Dissolved mg/L	0.072	0.002	5	Below MAC
Cadmium	Dissolved mg/L	<0.00001	0.00001	0.007	Below MAC
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC
Cobalt	Dissolved mg/L	0.0007	0.0001		
Copper	Dissolved mg/L	<0.0002	0.0002	1 AO; 2 MAC	Below AO
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC
Lithium	Dissolved mg/L	0.075	0.001		
Molybdenum	Dissolved mg/L	<0.001	0.001		
Nickel	Dissolved mg/L	0.0023	0.0005		
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC
Silver	Dissolved mg/L	<0.00001	0.00001		
Strontium	Dissolved mg/L	0.868	0.001	7.0	Below MAC
Thallium	Dissolved mg/L	<0.00005	0.00005		
Tin	Dissolved mg/L	<0.001	0.001		
Titanium	Dissolved mg/L	<0.0005	0.0005		
Uranium	Dissolved mg/L	0.0101	0.0005	0.02	Below MAC
Vanadium	Dissolved mg/L	<0.0001	0.0001		
Zinc	Dissolved mg/L	<0.001	0.001	5	Below AO
Subsample		Field Filtered			
<b>Physical and Aggregate Properties</b>					
Colour	Apparent, Potable	Colour units	55	5	15 Above AO
Turbidity		NTU	31.0	0.1	0.1/0.3/1.0 OG
<b>Routine Water</b>					
pH			7.50	1	7.0-10.5 Within OG Range
Temperature of observed pH		°C	21.0		
Electrical Conductivity	at 25 °C	µS/cm	1330	1	
Calcium	Dissolved	mg/L	165	0.2	
Magnesium	Dissolved	mg/L	36.4	0.2	
Sodium	Dissolved	mg/L	105	0.4	200 Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

### Analytical Report

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880326
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-20
<b>Sample Date</b>	June 01, 2023
<b>Sample Time</b>	09:15
<b>Sample Location</b>	M37490.031431
<b>Sample Description</b>	MW01-08 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved	mg/L	5.9	0.4	
Iron	Dissolved	mg/L	2.34	0.01	0.3 Above AO
Manganese	Dissolved	mg/L	1.45	0.005	0.02 AO; 0.12 MAC Above MAC
Chloride	Dissolved	mg/L	2.7	0.4	250 Below AO
Fluoride		mg/L	0.16	0.05	1.5 Below MAC
Nitrate - N		mg/L	<0.01	0.01	10 Below MAC
Nitrite - N		mg/L	<0.005	0.005	1 Below MAC
Nitrate and Nitrite - N		mg/L	<0.01	0.01	10 Below MAC
Sulfate (SO4)	Dissolved	mg/L	267	0.9	500 Below AO
Hydroxide		mg/L	<5		
Carbonate		mg/L	<6		
Bicarbonate		mg/L	640		
P-Alkalinity	as CaCO3	mg/L	<5	5	
T-Alkalinity	as CaCO3	mg/L	525	5	
Total Dissolved Solids	Calculated	mg/L	896	1	500 Above AO
Hardness	Dissolved as CaCO3	mg/L	561		
Ionic Balance	Dissolved	%	100		

Approved by:



Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880326
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

**Metals Dissolved**

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880326
--	--	--

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880326
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Sulfur	mg/L	33.7	34.4	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	<0.2	<0.2	10	0.4	yes
Barium	µg/L	38	38	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	113	114	10	4	yes
Cadmium	µg/L	0.03	0.04	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.4	1.4	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	80	81	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.7	0.7	10	1.1	yes
Selenium	µg/L	0.4	0.4	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	1020	1010	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.2	3.4	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	<1	<1	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880326
--	--	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	10.0	9.9	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.08	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2100	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880326
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.9	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	14.9	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.57	7.57	0	0.10	yes
Electrical Conductivity	dS/m	0.930	0.928	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	549	546	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	450	448	10	5	yes
Chloride	mg/L	1.5	1.6	10	0.5	yes
Fluoride	mg/L	0.08	0.08	10	0.05	yes
Nitrate - N	mg/L	0.03	0.03	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880326
--	--	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	121	123	10	0.6	yes
Magnesium	mg/L	23.2	23.7	10	0.7	yes
Sodium	mg/L	64.4	65.8	10	1.2	yes
Potassium	mg/L	3.8	3.8	10	1.2	yes
Iron	mg/L	2.31	2.35	10	0.05	yes
Manganese	mg/L	0.653	0.664	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880326
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-20; 8663487: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880326
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

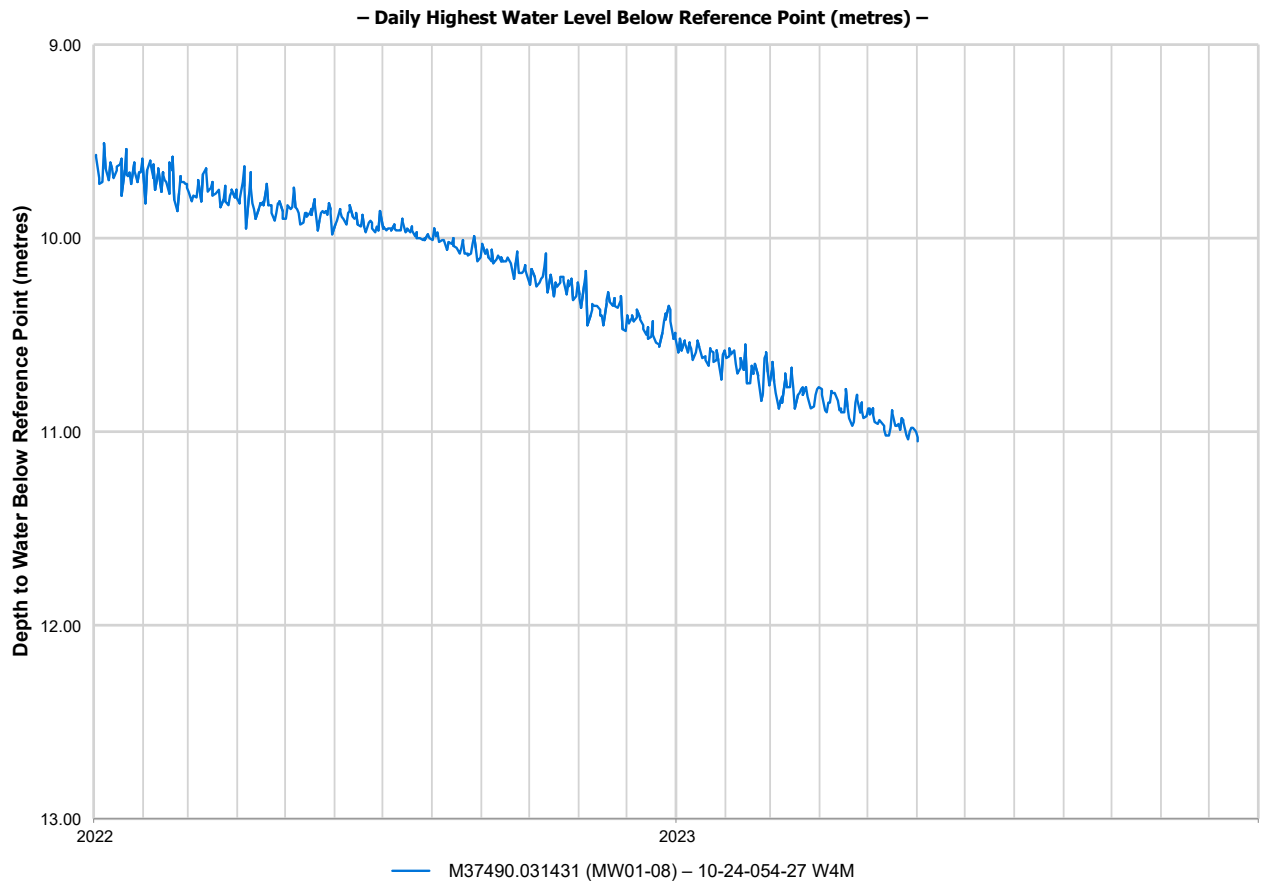
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

MW01-08  
2022 - 2023 Hydrograph



## MW04-01

01-16-054-26 W4M  
(M39227.477799)



Photograph taken on May 30, 2011

### Well Spatial Location:

Easting: **81,525**

Northing: **5,943,856**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **667.9**

*(elevation accuracy Surveyed (other))*

Date Completed: **March 18, 2004**

Depth Drilled (m): **21.6**

Completion Interval (m): **6.1 – 19.8 \***

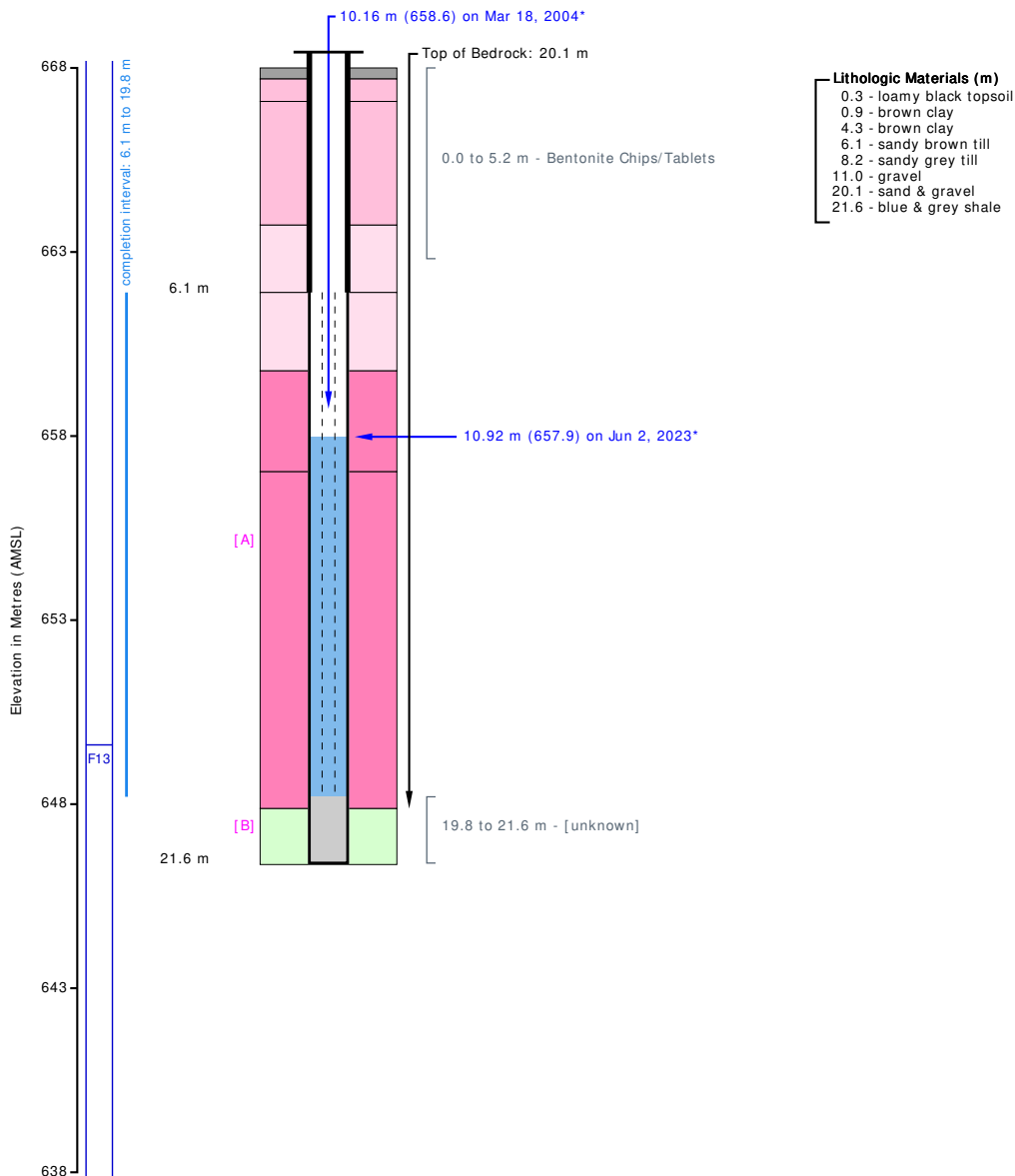
*(\* TGWC determined value)*

Earliest Water Level (m): **10.16 – March 18, 2004**

Most Recent Water Level (m): **10.92 – June 2, 2023 @ 11:00**

GIC ID: **1270001**

# MW04-01 Water Well Diagram



Lithology Legend			Geologic Unit Legend (Top) - Regional Analysis	
Surficial	Unsorted		Bedrock	F13 - Lower Horseshoe Canyon Formation
	Fine Grained			
	Coarse Grained			

### Summary

TGWC ID: M39227.477799  
 Well Name: MW04-01  
 Legal Location: 01-16-054-26 W4M  
 Casing (OD): 60.5 mm; Plastic (2.4")  
 Casing Stick-Up: 0.9 m (not drawn to scale)  
 Completion [A]: 6.1 to 19.8 m; Slotted  
 Construction [B]: 19.8 to 21.6 m; Plugged; [unknown]  
 Water Level (recent): 10.92 m (657.9 m AMSL) on Jun 2, 2023 @ 11:00 - Reference Point: Top of Casing  
 Water Level (oldest): 10.16 m (658.6 m AMSL) on Mar 18, 2004 - Reference Point: Top of Casing

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:49 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.



Owner: **Sturgeon County**  
 9613-100 St, Morinville, AB T8R 1L9

Contractor: **Elk Point Drilling Corp.**  
 Name: **MW04-01**

Field Action: **Confirmed - Physically, July 13, 2009**

Work Type: **Piezometer** Date Started: **March 18, 2004**

Drilling Method: **Rotary** Date Completed: **March 18, 2004**

Proposed Use: **Monitoring** Well Status: **Observation**

Completion Type: **Casing/Open Hole** Feature Class: **Piezometer**

### METRIC REPORT

01-16-054-26 W4M

Easting (m): **81,525.00\*\***  
 Northing (m): **5,943,856.00\*\***  
 Elevation (m): **667.9\*\*\***

Lot:  
 Block:  
 Plan:

**M39227.477799**

513881; core

Elog Taken: **Yes**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.9**

Presence of Gas: **No**

**General Details** core

Depth Completed (m)\*: **19.8** Top of Bedrock (m): **20.12\***  
 Depth Drilled (m): **21.6** Completion Interval (m): **6.1 – 19.8\***

Sand & Gravel Thickness (m): **11.9 (total) – 5.1 (below 15 m)\***

Plugged / Backfilled (m): **19.8 – 21.6**

Most Recent Water Level (m): **10.92 m – June 2, 2023**

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
667.6	0.3	Loamy Black Topsoil
667.0	0.9	Brown Clay
663.6	4.3	Brown Clay
661.8	6.1	Sandy Brown Till
659.7	8.2	Sandy Grey Till
656.9	11.0	Gravel
647.8	20.1	Sand & Gravel
646.3	21.6	Blue & Grey Shale

**Completion Details**

Surface Casing: **Plastic – 60.5 mm (O.D.) x 5.80 mm (thick) x 6.1 m (bottom)**

Screen Material: **[unknown] – ([unknown])**

Fittings: **Top: [unknown] – Bottom: Washdown**

**Intervals**

Slotted: **6.1 to 19.8 m - 0.010 x 2 Inches - Method: Machine**

Bentonite Chips/Tables: **0.0 to 5.2 m**

[unknown]: **19.8 to 21.6 m**

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: **June 2, 2023 @ 12:25**  
 Report Date: **June 14, 2023 - Element Materials Technology Canada Inc. (1655888-25)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	932	Nitrate as N:	0.03	Turbidity (NTU):	24.6
Total Dissolved Solids:	605	Nitrite as N:	< 0.005	Fluoride:	0.18
Hardness (as CaCO3):	467	pH (pH Unit):	7.64	Carbonate:	< 6
T-Alkalinity (as CaCO3):	334	Colour (TCU):	30	Bicarbonate:	408
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	99	Hydroxide:	< 5
Nitrate + Nitrite as N:	0.03	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	20.9	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	126		Mercury:	< 0.000005	
Chloride:	2.6		Molybdenum:	< 0.001	
Iron:	< 0.01		Magnesium:	36.9	
Manganese:	< 0.005		Sodium:	33.0	
Aluminum:	< 0.002		Potassium:	4.5	
Arsenic:	0.0002		Vanadium:	< 0.0001	
Barium:	0.015		Strontium:	0.604	
Beryllium:	< 0.0001		Nickel:	0.0014	
Cadmium:	< 0.00001		Zinc:	0.001	
Chromium:	< 0.0005		Copper:	0.0008	
Cobalt:	< 0.0001		Lead:	< 0.0001	
Sulfate:	202		Uranium:	0.0034	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

*Note: Constituents have been compared to the maximum acceptable concentration, Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario.*

513881; 1 / 37

**Comments & Observations**

**Initial, Mar 18, 2004:** Casing is 91.44 cm (36") above ground level and piezometer pipe is protected with lockable steel protector pipe. GL = 667.65 m; TOC = 668.64 m.

**Aquifer Tests**

**Alias IDs**

GIC ID: **1270001**

GIC (WellReportId): **10781883**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* Surveyed (other) — {Ground; AMSL}



**MW04-01**  
**AEPA - Water Well Drilling Report**



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 1270001  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b> YELLOWHEAD AGGRATES		<b>Address</b> 7731 - 18 STREET			<b>Town</b> EDMONTON		<b>Province</b> AB	<b>Country</b> CA	<b>Postal Code</b> T6P 1P9		
<b>Location</b>	<b>1/4 or LSD</b>	<b>SEC</b>	<b>TWP</b>	<b>RGE</b>	<b>W of MER</b>	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b> #04-01		
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>						
_____ m from _____					Latitude <u>53.658517</u> Longitude <u>-113.765810</u>					Elevation <u>668.73</u> m	
_____ m from _____					How Location Obtained					How Elevation Obtained	
					Not Verified					Surveyed GPS <1m	

Drilling Information	
<b>Method of Drilling</b> Rotary	<b>Type of Work</b> Piezometer
<b>Proposed Well Use</b> Monitoring	

Formation Log			Measurement in Metric
Depth from ground level (m)	Water Bearing	Lithology Description	
0.30		Black Loamy Topsoil	
0.91		Brown Clay	
4.27		Brown Clay	
6.10		Brown Sandy Till	
8.23		Gray Sandy Till	
10.97		Gravel	
20.12		Sand & Gravel	
21.64		Blue Gray Shale	

Yield Test Summary			Measurement in Metric
<b>Recommended Pump Rate</b> _____ L/min			
<b>Test Date</b>	<b>Water Removal Rate (L/min)</b>	<b>Static Water Level (m)</b>	

Well Completion				Measurement in Metric
<b>Total Depth Drilled</b>	<b>Finished Well Depth</b>	<b>Start Date</b>	<b>End Date</b>	
		2004/03/18	2004/03/18	
<b>Borehole</b>				
<b>Diameter (cm)</b>	<b>From (m)</b>	<b>To (m)</b>		
<b>Surface Casing (if applicable)</b>		<b>Well Casing/Liner</b>		
Plastic		Unknown		
<b>Size OD :</b>	<u>6.05</u> cm	<b>Size OD :</b>	_____ cm	
<b>Wall Thickness :</b>	<u>0.584</u> cm	<b>Wall Thickness :</b>	_____ cm	
<b>Bottom at :</b>	<u>6.10</u> m	<b>Top at :</b>	_____ m	
		<b>Bottom at :</b>	_____ m	
<b>Perforations</b>				
<b>From (m)</b>	<b>To (m)</b>	<b>Diameter or Slot Width (cm)</b>	<b>Slot Length (cm)</b>	<b>Hole or Slot Interval (cm)</b>
6.10	19.81	0.025		5.08
Perforated by Machine				
<b>Annular Seal</b> Bentonite Chips/Tablets				
Placed from <u>0.00</u> m to <u>5.18</u> m				
Amount _____				
<b>Other Seals</b>				
Type		At (m)		
<b>Screen Type</b>				
Size OD : _____ cm				
<b>From (m)</b>	<b>To (m)</b>	<b>Slot Size (cm)</b>		
Attachment _____				
Top Fittings _____		Bottom Fittings <u>Washdown</u>		
<b>Pack</b>				
Type <u>Silica Sand</u>		Grain Size <u>10/20</u>		
Amount <u>1250.00</u> Pounds				

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well GERALD TOPILKA	Certification No 3490AD
Company Name ELK POINT DRILLING CORP.	Copy of Well report provided to owner Date approval holder signed



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 1270001  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b> YELLOWHEAD AGGRATES		<b>Address</b> 7731 - 18 STREET			<b>Town</b> EDMONTON		<b>Province</b> AB	<b>Country</b> CA	<b>Postal Code</b> T6P 1P9		
<b>Location</b>	<b>1/4 or LSD</b>	<b>SEC</b>	<b>TWP</b>	<b>RGE</b>	<b>W of MER</b>	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b>		
	1	16	54	26	4				#04-01		
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>						
_____ m from					Latitude <u>53.658517</u> Longitude <u>-113.765810</u>					Elevation <u>668.73</u> m	
_____ m from					How Location Obtained					How Elevation Obtained	
					Not Verified					Surveyed GPS <1m	

Additional Information										Measurement in Metric	
Distance From Top of Casing to Ground Level _____ cm					Is Flow Control Installed _____						
Is Artesian Flow _____					Rate _____ L/min					Describe _____	
Recommended Pump Rate _____ L/min					Pump Installed _____					Depth _____ m	
Recommended Pump Intake Depth (From TOC) _____ m					Type _____					Make _____ H.P. _____	
										Model (Output Rating) _____	
Did you Encounter Saline Water (>4000 ppm TDS) _____					Depth _____ m					Well Disinfected Upon Completion _____	
Remedial Action Taken _____					Gas _____					Depth _____ m	
										Geophysical Log Taken <u>Electric</u>	
										Submitted to ESRD _____	
										Sample Collected for Potability _____	
										Submitted to ESRD _____	
Additional Comments on Well											
CASING IS 36" ABOVE GROUND LEVEL AND PIEZOMETER PIPE PROTECTED WITH LOCKABLE STEEL PROTECTOR PIPE											
N: 5949083.510 E: 317243.040 Z12 GL = 667.65M TOC = 668.64M											

Yield Test			Taken From Ground Level	Measurement in Metric
Test Date	Start Time	Static Water Level		
		m		
<b>Method of Water Removal</b>				
Type _____				
Removal Rate _____ L/min				
Depth Withdrawn From _____ m				
If water removal period was < 2 hours, explain why				

Water Diverted for Drilling		
Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well	Certification No
GERALD TOPILKA	3490AD
Company Name	Copy of Well report provided to owner Date approval holder signed
ELK POINT DRILLING CORP.	

**MW04-01**  
**Chemical Analysis Results (June 14, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880331
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

**Reference Number** 1655888-25  
**Sample Date** June 02, 2023  
**Sample Time** 12:25  
**Sample Location** M39227.477799  
**Sample Description** MW04-01 / 4.3 °C  
**Sample Matrix** Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Metals Dissolved</b>						
Silicon	Dissolved mg/L	7.49	0.05			
Sulfur	Dissolved mg/L	67.2	0.3			
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC	
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG	
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC	
Arsenic	Dissolved mg/L	0.0002	0.0002	0.01	Below MAC	
Barium	Dissolved mg/L	0.015	0.001	2.0	Below MAC	
Beryllium	Dissolved mg/L	<0.0001	0.0001			
Bismuth	Dissolved mg/L	<0.0005	0.0005			
Boron	Dissolved mg/L	0.087	0.002	5	Below MAC	
Cadmium	Dissolved mg/L	<0.00001	0.00001	0.007	Below MAC	
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC	
Cobalt	Dissolved mg/L	<0.0001	0.0001			
Copper	Dissolved mg/L	0.0008	0.0002	1 AO; 2 MAC	Below AO	
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC	
Lithium	Dissolved mg/L	0.066	0.001			
Molybdenum	Dissolved mg/L	<0.001	0.001			
Nickel	Dissolved mg/L	0.0014	0.0005			
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC	
Silver	Dissolved mg/L	<0.00001	0.00001			
Strontium	Dissolved mg/L	0.604	0.001	7.0	Below MAC	
Thallium	Dissolved mg/L	<0.00005	0.00005			
Tin	Dissolved mg/L	<0.001	0.001			
Titanium	Dissolved mg/L	<0.0005	0.0005			
Uranium	Dissolved mg/L	0.0034	0.0005	0.02	Below MAC	
Vanadium	Dissolved mg/L	<0.0001	0.0001			
Zinc	Dissolved mg/L	0.001	0.001	5	Below AO	
Subsample		Field Filtered				
<b>Physical and Aggregate Properties</b>						
Colour	Apparent, Potable	Colour units	30	5	15	Above AO
Turbidity		NTU	24.6	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>						
pH			7.64	1	7.0-10.5	Within OG Range
Temperature of observed pH		°C	20.9			
Electrical Conductivity	at 25 °C	µS/cm	932	1		
Calcium	Dissolved	mg/L	126	0.2		
Magnesium	Dissolved	mg/L	36.9	0.2		
Sodium	Dissolved	mg/L	33.0	0.4	200	Below AO

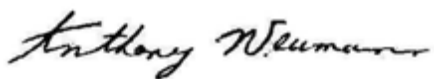
Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880331
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-25
<b>Sample Date</b>	June 02, 2023
<b>Sample Time</b>	12:25
<b>Sample Location</b>	M39227.477799
<b>Sample Description</b>	MW04-01 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved	mg/L	4.5	0.4	
Iron	Dissolved	mg/L	<0.01	0.01	0.3 Below AO
Manganese	Dissolved	mg/L	<0.005	0.005	0.02 AO; 0.12 MAC Below AO
Chloride	Dissolved	mg/L	2.6	0.4	250 Below AO
Fluoride		mg/L	0.18	0.05	1.5 Below MAC
Nitrate - N		mg/L	0.03	0.01	10 Below MAC
Nitrite - N		mg/L	<0.005	0.005	1 Below MAC
Nitrate and Nitrite - N		mg/L	0.03	0.01	10 Below MAC
Sulfate (SO4)	Dissolved	mg/L	202	0.9	500 Below AO
Hydroxide		mg/L	<5		
Carbonate		mg/L	<6		
Bicarbonate		mg/L	408		
P-Alkalinity	as CaCO3	mg/L	<5	5	
T-Alkalinity	as CaCO3	mg/L	334	5	
Total Dissolved Solids	Calculated	mg/L	605	1	500 Above AO
Hardness	Dissolved as CaCO3	mg/L	467		
Ionic Balance	Dissolved	%	99		

Approved by:   
Anthony Neumann, MSc  
General Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880331
--	--	--

### Metals Dissolved

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00805925	-0.04	0.05	yes
Sulfur	mg/L	0.0373027	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880331
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880331
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.63	8.77	10	0.01	yes
Sulfur	mg/L	190	190	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	<0.2	<0.2	10	0.4	yes
Barium	µg/L	38	38	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	113	114	10	4	yes
Cadmium	µg/L	0.03	0.04	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.4	1.4	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	80	81	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.7	0.7	10	1.1	yes
Selenium	µg/L	0.4	0.4	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	1020	1010	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.2	3.4	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	<1	<1	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes

Date Acquired: June 07, 2023

Turbidity	NTU	0.115	0.0	0.1	yes
-----------	-----	-------	-----	-----	-----

Date Acquired: June 07, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes

Date Acquired: June 07, 2023

Turbidity	NTU	5200	4441.7	6661.7	yes
-----------	-----	------	--------	--------	-----

Date Acquired: June 07, 2023



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880331
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	10.0	9.9	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.08	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0.00178586	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.0306783	-0.2	0.2	yes
Magnesium	mg/L	0.0071963	-0.1	0.1	yes
Sodium	mg/L	0.0125338	-0.4	0.4	yes
Potassium	mg/L	-0.044862	-0.4	0.4	yes
Iron	mg/L	-0.00263048	-0.01	0.01	yes
Manganese	mg/L	-0.000222904	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2100	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.96	9.03	11.13	yes
Nitrite - N	mg/L	9.95	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.90	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880331
Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.9	74.9	86.9	yes	
Fluoride	mg/L	4.73	4.56	5.22	yes	
Nitrate - N	mg/L	4.73	4.37	5.33	yes	
Nitrite - N	mg/L	4.87	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.60	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	14.9	13.3	16.5	yes	
Fluoride	mg/L	0.50	0.45	0.57	yes	
Nitrate - N	mg/L	0.51	0.42	0.57	yes	
Nitrite - N	mg/L	0.509	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	1.02	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.57	7.57	0	0.10	yes
Electrical Conductivity	dS/m	0.930	0.928	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	549	546	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	450	448	10	5	yes
Chloride	mg/L	1.5	1.6	10	0.5	yes
Fluoride	mg/L	0.08	0.08	10	0.05	yes
Nitrate - N	mg/L	0.03	0.03	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880331
--	--	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	263	265	10	0.6	yes
Magnesium	mg/L	64.0	64.9	10	0.7	yes
Sodium	mg/L	110	109	10	1.2	yes
Potassium	mg/L	8.4	8.4	10	1.2	yes
Iron	mg/L	<0.01	<0.01	10	0.05	yes
Manganese	mg/L	<0.005	<0.005	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880331
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 13, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-25; 8663492: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880331
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: 19707 Proj. Acct. code:	

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

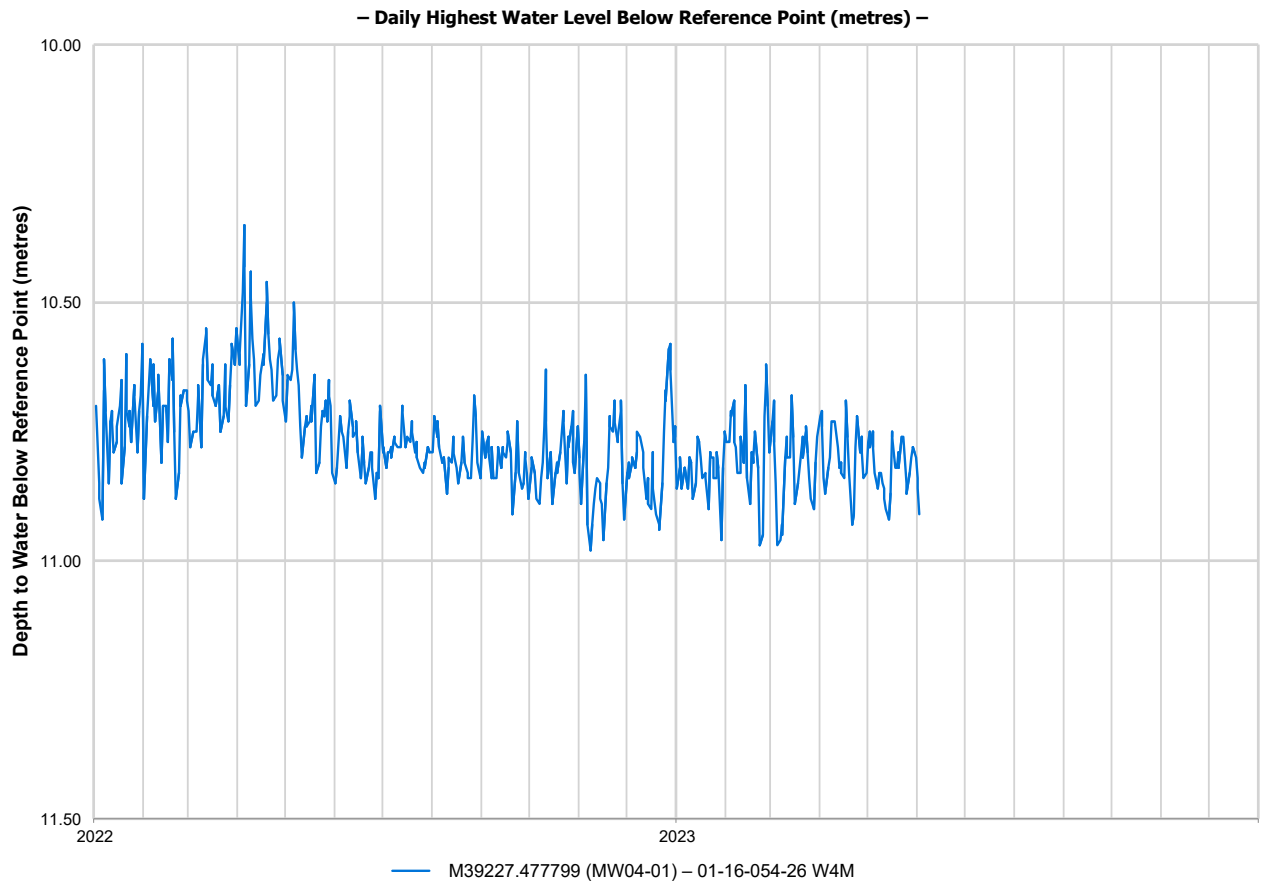
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

MW04-01  
2022 - 2023 Hydrograph



## MW04-02

**01-16-054-26 W4M**  
(M39227.477802)



Photograph taken on May 30, 2011

### Well Spatial Location:

Easting: **81,699**

Northing: **5,944,146**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **666.9**

*(elevation accuracy Surveyed (other))*

Date Completed: **March 18, 2004**

Depth Drilled (m): **19.8**

Completion Interval (m): **7.6 – 18.3 \***

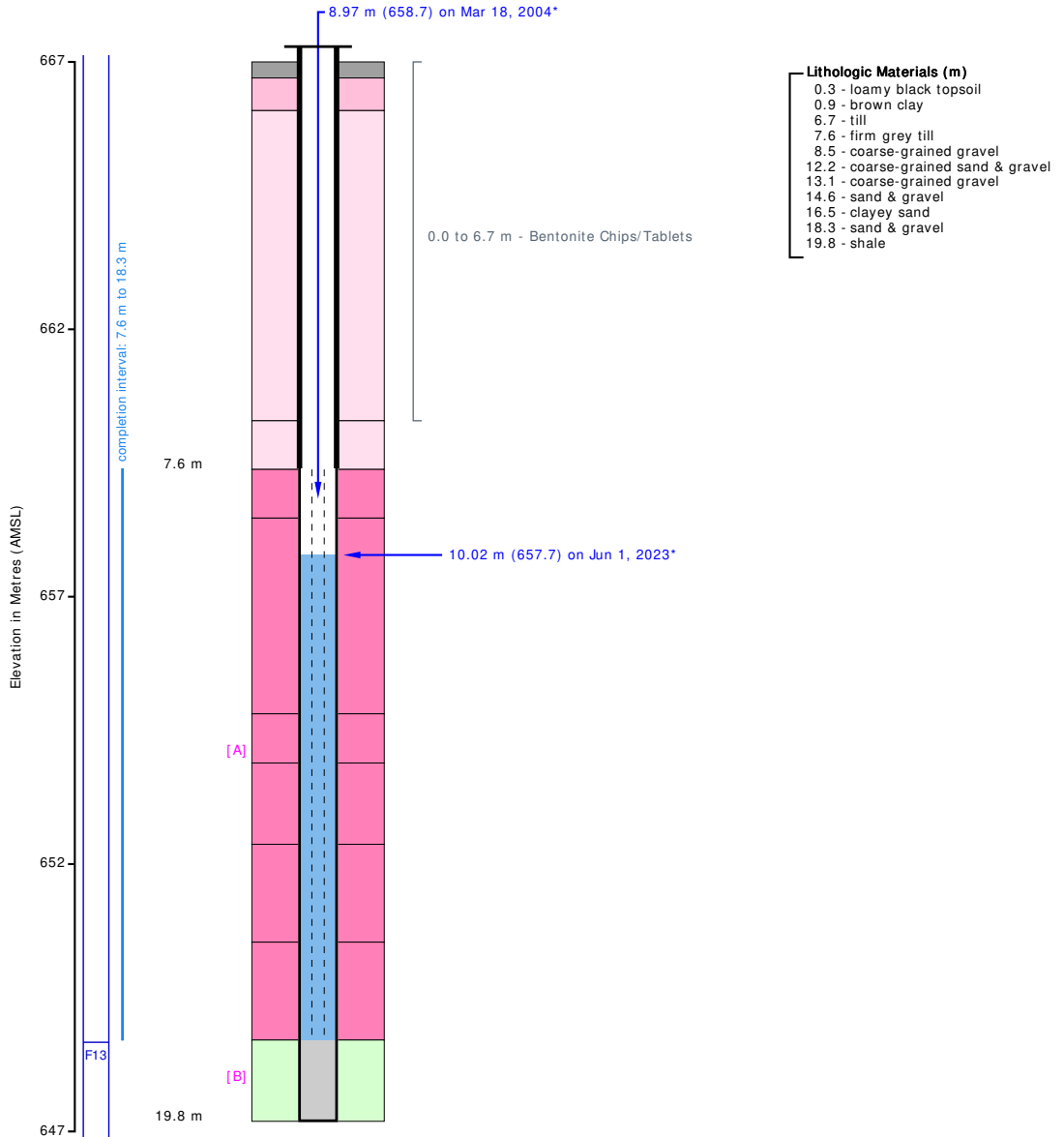
*(\* TGWC determined value)*

Earliest Water Level (m): **8.97 – March 18, 2004**

Most Recent Water Level (m): **10.02 – June 1, 2023 @ 12:39**

GIC ID: **1270002**

# MW04-02 Water Well Diagram



Lithology Legend			Geologic Unit Legend (Top) - Regional Analysis	
Surficial		Unsorted	Bedrock	F13 - Lower Horseshoe Canyon Formation
		Fine Grained		
		Coarse Grained		
		Fine Grained		Other
		Coarse Grained		

### Summary

TGWC ID: M39227.477802  
 Well Name: MW04-02  
 Legal Location: 01-16-054-26 W4M  
 Casing (OD): 60.5 mm; Plastic (2.4")  
 Casing Stick-Up: 0.8 m (not drawn to scale)  
 Completion [A]: 7.6 to 18.3 m; Slotted  
 Construction [B]: 18.3 to 19.8 m; Plugged; [unknown]  
 Water Level (recent): 10.02 m (657.7 m AMSL) on Jun 1, 2023 @ 12:39 - Reference Point: Top of Casing  
 Water Level (oldest): 8.97 m (658.7 m AMSL) on Mar 18, 2004 - Reference Point: Top of Casing

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:49 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.



Owner: **Sturgeon County**  
**9613-100 St, Morinville, AB T8R 1L9**

Contractor: **Elk Point Drilling Corp.**  
 Name: **MW04-02**

Field Action: **Confirmed - Physically, July 13, 2009**

Work Type: **Piezometer** Date Started: **March 18, 2004**

Drilling Method: **Rotary** Date Completed: **March 18, 2004**

Proposed Use: **Monitoring** Well Status: **Observation**

Completion Type: **Casing/Open Hole** Feature Class: **Piezometer**

### METRIC REPORT

01-16-054-26 W4M

Easting (m): **81,699.00\*\***  
 Northing (m): **5,944,146.00\*\***  
 Elevation (m): **666.9\*\*\***

Lot:  
 Block:  
 Plan:

**M39227.477802**

513367; 1449740; core

Elog Taken: **Yes**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.8**

Presence of Gas: **No**

**General Details** core

Depth Completed (m)\*: **18.3** Top of Bedrock: **Surficial Water Well \***  
 Depth Drilled (m): **19.8** Completion Interval (m): **7.6 – 18.3 \***

Sand & Gravel Thickness (m): **10.7 (total) – 10.7 (below 15 m) \***

Plugged / Backfilled (m): **18.3 – 19.8**

Most Recent Water Level (m): **10.02 m – June 1, 2023**

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
666.6	0.3	Loamy Black Topsoil
666.0	0.9	Brown Clay
660.2	6.7	Till
659.3	7.6	Firm Grey Till
658.4	8.5	Coarse-Grained Gravel
654.7	12.2	Coarse-Grained Sand & Gravel
653.8	13.1	Coarse-Grained Gravel
652.3	14.6	Sand & Gravel
650.4	16.5	Clayey Sand
648.6	18.3	Sand & Gravel
647.1	19.8	Shale

**Completion Details**

Surface Casing: **Plastic – 60.5 mm (O.D.) x 5.80 mm (thick) x 7.6 m (bottom)**

Screen Material: **[unknown] – ([unknown])**

Fittings: **Top: Threaded – Bottom: Washdown**

**Intervals**

Slotted: **7.6 to 18.3 m - 0.012 x 2 Inches - Method: Machine**

Bentonite Chips/Tables: **0.0 to 6.7 m**

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: **June 1, 2023 @ 13:05**  
 Report Date: **June 12, 2023 - Element Materials Technology Canada Inc. (1655888-19)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	794	Nitrate as N:	1.41	Turbidity (NTU):	0.7
Total Dissolved Solids:	488	Nitrite as N:	0.007	Fluoride:	0.11
Hardness (as CaCO3):	369	pH (pH Unit):	7.63	Carbonate:	< 6
T-Alkalinity (as CaCO3):	295	Colour (TCU):	5	Bicarbonate:	360
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	99	Hydroxide:	< 5
Nitrate + Nitrite as N:	1.41	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.0	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	101		Mercury:	< 0.000005	
Chloride:	3.7		Molybdenum:	< 0.001	
Iron:	< 0.01		Magnesium:	28.7	
Manganese:	0.792***		Sodium:	31.7	
Aluminum:	< 0.002		Potassium:	4.7	
Arsenic:	0.0006		Vanadium:	< 0.0001	
Barium:	0.020		Strontium:	0.648	
Beryllium:	< 0.0001		Nickel:	0.0011	
Cadmium:	0.00002		Zinc:	< 0.001	
Chromium:	< 0.0005		Copper:	0.003	
Cobalt:	0.0001		Lead:	< 0.0001	
Sulfate:	142		Uranium:	0.0045	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario.

513367; 1 / 39

**Comments & Observations**

**Initial, Mar 18, 2004:** Casing is 91.44 cm (36") above ground level and piezometer pipe is protected with lockable steel protector pipe. GL = 666.672 m; TOC = 667.622 m.

**Aquifer Tests**

Date & Time	Testing Method / Type	Depth of Test Interval	Duration (minutes)		Avg. Rate (Lpm)	NPWL (metres)	Drawdown (metres)	Pump (metres)	Q20 (m³/day)*		Transmissivity (m²/day)*	
			Pumping	Recovery					Apparent	Effective	Apparent	Aquifer Effective
1 2004-03-18	Other	[unknown]	120	0		0.0	—	—				

**Alias IDs**

GIC ID: **1270002**

GIC (WellReportId): **10781936**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* Surveyed (other) — {Ground; AMSL}



**MW04-02**  
**AEPA - Water Well Drilling Report**



# Water Well Drilling Report

[View in Imperial](#)   [Export to Excel](#)

GIC Well ID                      1270002  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b> YELLOWHEAD AGGRATES		<b>Address</b> 7731 - 18 STREET			<b>Town</b>		<b>Province</b> AB		<b>Country</b> CA		<b>Postal Code</b> T6P 1P9
<b>Location</b>	<b>1/4 or LSD</b> 8	<b>SEC</b> 16	<b>TWP</b> 54	<b>RGE</b> 26	<b>W of MER</b> 4	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b> # 04-02		
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>						
_____ m from _____					Latitude <u>53.661095</u> Longitude <u>-113.763108</u>					Elevation <u>667.51</u> m	
_____ m from _____					How Location Obtained					How Elevation Obtained	
					Not Verified					Surveyed GPS <1m	

Drilling Information	
<b>Method of Drilling</b> Rotary	<b>Type of Work</b> Piezometer
<b>Proposed Well Use</b> Monitoring	

Formation Log			Measurement in Metric
Depth from ground level (m)	Water Bearing	Lithology Description	
0.30		Black Loamy Topsoil	
0.91		Brown Clay	
6.71		Brown Till	
7.62		Gray Firm Till	
8.53		Coarse Grained Gravel	
12.19		Coarse Grained Sand & Gravel	
13.11		Coarse Grained Gravel	
14.63		Sand & Gravel	
16.46		Clayey Sand	
18.29		Sand & Gravel	
19.81		Shale	

Yield Test Summary			Measurement in Metric
<b>Recommended Pump Rate</b>		L/min	
<b>Test Date</b>	<b>Water Removal Rate (L/min)</b>	<b>Static Water Level (m)</b>	
	0.00		

Well Completion				Measurement in Metric
<b>Total Depth Drilled</b>	<b>Finished Well Depth</b>	<b>Start Date</b>	<b>End Date</b>	
18.29 m		2004/03/18	2004/03/18	
<b>Borehole</b>				
<b>Diameter (cm)</b>	<b>From (m)</b>	<b>To (m)</b>		
15.56	0.00	18.29		
<b>Surface Casing (if applicable)</b>		<b>Well Casing/Liner</b>		
Plastic		Unknown		
<b>Size OD :</b>	<u>6.05</u> cm	<b>Size OD :</b> _____ cm		
<b>Wall Thickness :</b>	<u>0.579</u> cm	<b>Wall Thickness :</b> _____ cm		
<b>Bottom at :</b>	<u>7.62</u> m	<b>Top at :</b> _____ m		
		<b>Bottom at :</b> _____ m		
<b>Perforations</b>				
<b>From (m)</b>	<b>To (m)</b>	<b>Diameter or Slot Width (cm)</b>	<b>Slot Length (cm)</b>	<b>Hole or Slot Interval (cm)</b>
7.62	18.29	0.030		5.08
Perforated by      Machine				
<b>Annular Seal</b> Bentonite Chips/Tablets				
Placed from <u>0.00</u> m    to <u>6.71</u> m				
Amount      _____				
<b>Other Seals</b>				
Type		At (m)		
_____		_____		
<b>Screen Type</b> Unknown				
Size OD :      _____ cm				
From (m)		To (m)		Slot Size (cm)
_____		_____		_____
Attachment    Unknown				
Top Fittings    Threaded		Bottom Fittings    Washdown		
_____		_____		
<b>Pack</b>				
Type    Silica Sand		Grain Size    10-20		
Amount    1000.00 Pounds		_____		

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well GERALD TOPILKA	Certification No 3490AD
Company Name ELK POINT DRILLING CORP.	Copy of Well report provided to owner      Date approval holder signed



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 1270002  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b> YELLOWHEAD AGGRATES		<b>Address</b> 7731 - 18 STREET			<b>Town</b>			<b>Province</b> AB		<b>Country</b> CA	<b>Postal Code</b> T6P 1P9
<b>Location</b>	<b>1/4 or LSD</b> 8	<b>SEC</b> 16	<b>TWP</b> 54	<b>RGE</b> 26	<b>W of MER</b> 4	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b> # 04-02		
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>						
_____ m from					Latitude <u>53.661095</u> Longitude <u>-113.763108</u>					Elevation <u>667.51 m</u>	
_____ m from					How Location Obtained					How Elevation Obtained	
					Not Verified					Surveyed GPS <1m	

Additional Information										Measurement in Metric
<b>Distance From Top of Casing to Ground Level</b> _____ cm										
<b>Is Artesian Flow</b> _____					<b>Is Flow Control Installed</b> _____					
<b>Rate</b> _____ L/min					<b>Describe</b> _____					
<b>Recommended Pump Rate</b> _____ L/min					<b>Pump Installed</b> _____		<b>Depth</b> _____ m			
<b>Recommended Pump Intake Depth (From TOC)</b> _____ m					<b>Type</b> _____		<b>Make</b> _____		<b>H.P.</b> _____	
										<b>Model (Output Rating)</b> _____
<b>Did you Encounter Saline Water (&gt;4000 ppm TDS)</b> _____					<b>Depth</b> _____ m		<b>Well Disinfected Upon Completion</b> _____			
<b>Remedial Action Taken</b> _____					<b>Gas</b> _____		<b>Depth</b> _____ m		<b>Geophysical Log Taken</b> <u>Electric</u>	
										<b>Submitted to ESRD</b> _____
										<b>Sample Collected for Potability</b> _____ <b>Submitted to ESRD</b> _____
<b>Additional Comments on Well</b>										
CASING IS 36" ABOVE GROUND LEVEL AND PIEZOMETER PIPE PROTECTED WITH LOCKABLE PROTECTOR PIPE. N: 5949363.299; E: = 317432.643 Z12; GL = 666.672M; TOC = 667.622M.										

Yield Test			Taken From Ground Level		Measurement in Metric
			<i>Depth to water level</i>		
<b>Test Date</b>	<b>Start Time</b> 12:00 AM	<b>Static Water Level</b> _____ m			
			<b>Pumping (m)</b>	<b>Elapsed Time</b> Minutes:Sec	<b>Recovery (m)</b>
<b>Method of Water Removal</b>					
<b>Type</b> <u>Unknown</u>					
<b>Removal Rate</b> _____ 0.00 L/min					
<b>Depth Withdrawn From</b> _____ m					
If water removal period was < 2 hours, explain why					

Water Diverted for Drilling		
<b>Water Source</b>	<b>Amount Taken</b> _____ L	<b>Diversion Date &amp; Time</b>

Contractor Certification	
<b>Name of Journeyman responsible for drilling/construction of well</b> GERALD TOPILKA	<b>Certification No</b> 3490AD
<b>Company Name</b> ELK POINT DRILLING CORP.	<b>Copy of Well report provided to owner</b> _____ <b>Date approval holder signed</b> _____

**MW04-02**  
**Chemical Analysis Results (June 12, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880325
Attn: Kirby Fromm	P.O.:	
Sampled By: Ben Gilham	Proj. Acct. code:	
Company: HCL		

<b>Reference Number</b>	1655888-19
<b>Sample Date</b>	June 01, 2023
<b>Sample Time</b>	13:05
<b>Sample Location</b>	M39227.477802
<b>Sample Description</b>	MW04-02 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Metals Dissolved</b>					
Silicon	Dissolved	mg/L	6.97	0.05	
Sulfur	Dissolved	mg/L	47.4	0.3	
Mercury	Dissolved	mg/L	<0.000005	0.000005	0.001 Below MAC
Aluminum	Dissolved	mg/L	<0.002	0.002	0.1 OG; 2.9 MAC Below OG
Antimony	Dissolved	mg/L	<0.0002	0.0002	0.006 Below MAC
Arsenic	Dissolved	mg/L	0.0006	0.0002	0.01 Below MAC
Barium	Dissolved	mg/L	0.020	0.001	2.0 Below MAC
Beryllium	Dissolved	mg/L	<0.0001	0.0001	
Bismuth	Dissolved	mg/L	<0.0005	0.0005	
Boron	Dissolved	mg/L	0.085	0.002	5 Below MAC
Cadmium	Dissolved	mg/L	0.00002	0.00001	0.007 Below MAC
Chromium	Dissolved	mg/L	<0.0005	0.0005	0.05 Below MAC
Cobalt	Dissolved	mg/L	0.0001	0.0001	
Copper	Dissolved	mg/L	0.0003	0.0002	1 AO; 2 MAC Below AO
Lead	Dissolved	mg/L	<0.0001	0.0001	0.005 Below MAC
Lithium	Dissolved	mg/L	0.066	0.001	
Molybdenum	Dissolved	mg/L	<0.001	0.001	
Nickel	Dissolved	mg/L	0.0011	0.0005	
Selenium	Dissolved	mg/L	0.0036	0.0002	0.05 Below MAC
Silver	Dissolved	mg/L	<0.00001	0.00001	
Strontium	Dissolved	mg/L	0.648	0.001	7.0 Below MAC
Thallium	Dissolved	mg/L	<0.00005	0.00005	
Tin	Dissolved	mg/L	<0.001	0.001	
Titanium	Dissolved	mg/L	<0.0005	0.0005	
Uranium	Dissolved	mg/L	0.0045	0.0005	0.02 Below MAC
Vanadium	Dissolved	mg/L	<0.0001	0.0001	
Zinc	Dissolved	mg/L	<0.001	0.001	5 Below AO
Subsample			Field Filtered		
<b>Physical and Aggregate Properties</b>					
Colour	Apparent, Potable	Colour units	5	5	15 Below AO
Turbidity		NTU	0.7	0.1	0.1/0.3/1.0 OG
<b>Routine Water</b>					
pH			7.63	1	7.0-10.5 Within OG Range
Temperature of observed pH		°C	21.0		
Electrical Conductivity	at 25 °C	µS/cm	794	1	
Calcium	Dissolved	mg/L	101	0.2	
Magnesium	Dissolved	mg/L	28.7	0.2	
Sodium	Dissolved	mg/L	31.7	0.4	200 Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880325
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-19
<b>Sample Date</b>	June 01, 2023
<b>Sample Time</b>	13:05
<b>Sample Location</b>	M39227.477802
<b>Sample Description</b>	MW04-02 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved	mg/L	4.7	0.4	
Iron	Dissolved	mg/L	<0.01	0.01	0.3 Below AO
Manganese	Dissolved	mg/L	0.792	0.005	0.02 AO; 0.12 MAC Above MAC
Chloride	Dissolved	mg/L	3.7	0.4	250 Below AO
Fluoride		mg/L	0.11	0.05	1.5 Below MAC
Nitrate - N		mg/L	1.41	0.01	10 Below MAC
Nitrite - N		mg/L	0.007	0.005	1 Below MAC
Nitrate and Nitrite - N		mg/L	1.41	0.01	10 Below MAC
Sulfate (SO4)	Dissolved	mg/L	142	0.9	500 Below AO
Hydroxide		mg/L	<5		
Carbonate		mg/L	<6		
Bicarbonate		mg/L	360		
P-Alkalinity	as CaCO3	mg/L	<5	5	
T-Alkalinity	as CaCO3	mg/L	295	5	
Total Dissolved Solids	Calculated	mg/L	488	1	500 Below AO
Hardness	Dissolved as CaCO3	mg/L	369		
Ionic Balance	Dissolved	%	99		

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880325
--	--	--

### Metals Dissolved

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880325
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880325
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Sulfur	mg/L	33.7	34.4	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	<0.2	<0.2	10	0.4	yes
Barium	µg/L	38	38	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	113	114	10	4	yes
Cadmium	µg/L	0.03	0.04	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.4	1.4	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	80	81	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.7	0.7	10	1.1	yes
Selenium	µg/L	0.4	0.4	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	1020	1010	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.2	3.4	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	<1	<1	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880325
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	10.0	9.9	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.08	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2100	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880325
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

**Routine Water - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.9	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	14.9	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.57	7.57	0	0.10	yes
Electrical Conductivity	dS/m	0.930	0.928	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	549	546	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	450	448	10	5	yes
Chloride	mg/L	1.5	1.6	10	0.5	yes
Fluoride	mg/L	0.08	0.08	10	0.05	yes
Nitrate - N	mg/L	0.03	0.03	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880325
--	---	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	121	123	10	0.6	yes
Magnesium	mg/L	23.2	23.7	10	0.7	yes
Sodium	mg/L	64.4	65.8	10	1.2	yes
Potassium	mg/L	3.8	3.8	10	1.2	yes
Iron	mg/L	2.31	2.35	10	0.05	yes
Manganese	mg/L	0.653	0.664	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880325
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-19; 8663486: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880325
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

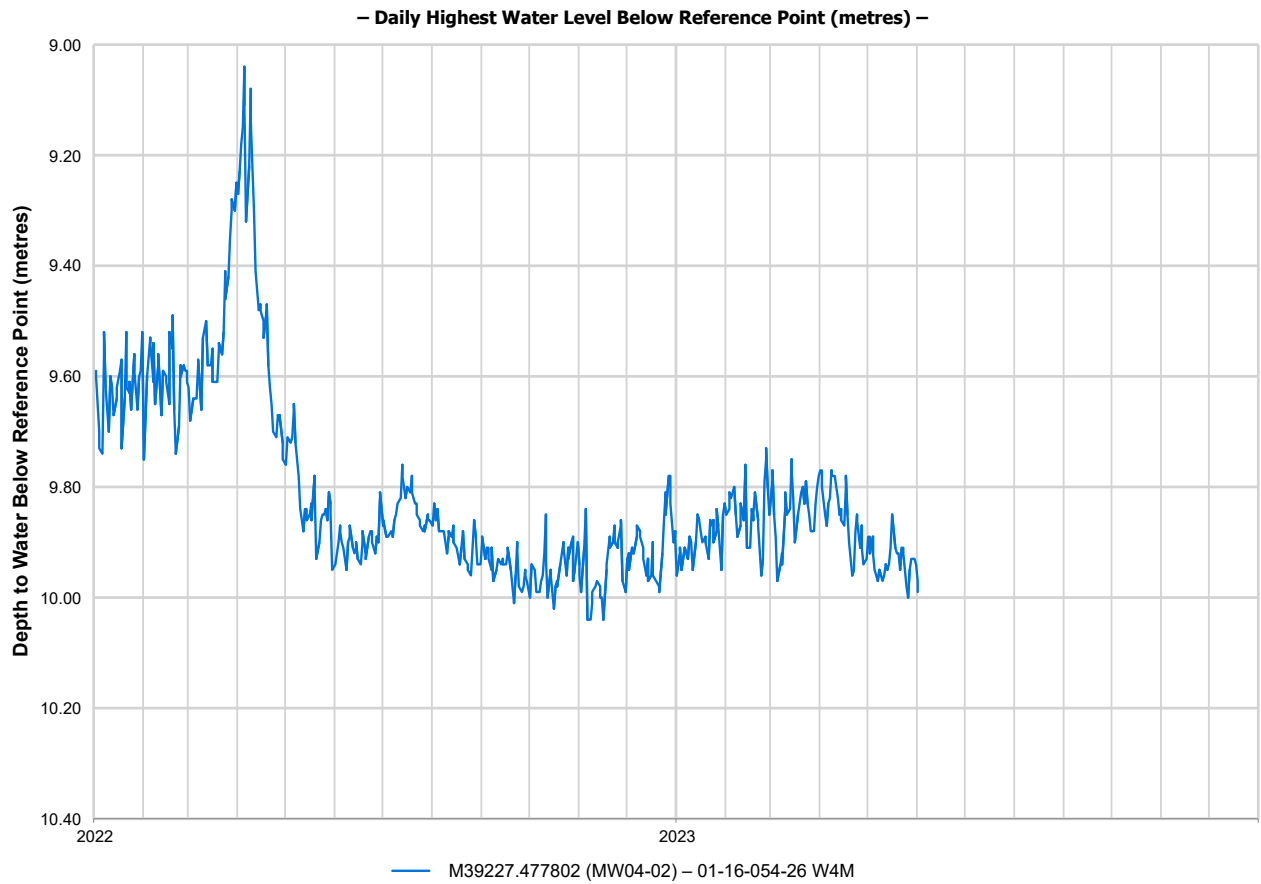
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

MW04-02  
2022 - 2023 Hydrograph



## MW04-03

**01-17-054-26 W4M**  
(M39227.477827)



Photograph taken on May 30, 2011

### Well Spatial Location:

Easting: **80,056**

Northing: **5,943,825**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **676**

*(elevation accuracy HCL DEM)*

Date Completed: **March 19, 2004**

Depth Drilled (m): **17.7**

Completion Interval (m): **8.2 – 15.8 \***

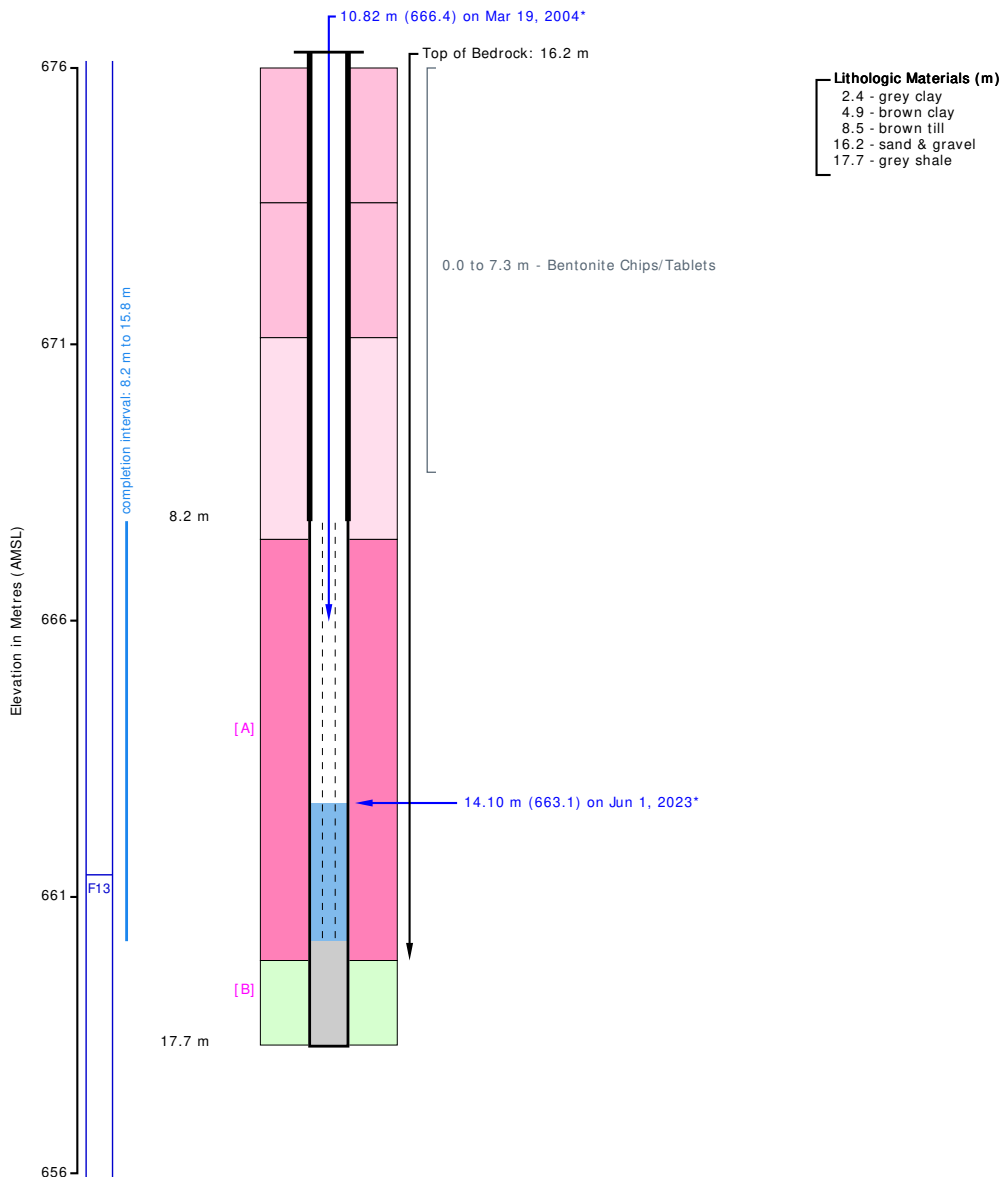
*(\* TGWC determined value)*

Earliest Water Level (m): **10.82 – March 19, 2004**

Most Recent Water Level (m): **14.10 – June 1, 2023 @ 14:30**

GIC ID: **1270003**

## MW04-03 Water Well Diagram



Lithology Legend			Geologic Unit Legend (Top) - Regional Analysis		
Surficial	Unsorted		Bedrock	Fine Grained	Other
	Fine Grained			Coarse Grained	
	Coarse Grained				
			F13 - Lower Horseshoe Canyon Formation		

### Summary

TGWC ID: M39227.477827  
 Well Name: MW04-03  
 Legal Location: 01-17-054-26 W4M  
 Casing (OD): 60.5 mm; Plastic (2.4")  
 Casing Stick-Up: 0.8 m (not drawn to scale)  
 Completion [A]: 8.2 to 15.8 m; Slotted  
 Construction [B]: 15.8 to 17.7 m; Plugged; Unknown  
 Water Level (recent): 14.10 m (663.1 m AMSL) on Jun 1, 2023 @ 14:30 - Reference Point: Top of Casing  
 Water Level (oldest): 10.82 m (666.4 m AMSL) on Mar 19, 2004 - Reference Point: Top of Casing

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:49 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.



Owner: **Sturgeon County**  
**9613-100 St, Morinville, AB T8R 1L9**

Contractor: **Elk Point Drilling Corp.**  
 Name: **MW04-03**

Field Action: **Confirmed - Physically, July 13, 2009**

Work Type: **Piezometer** Date Started: **March 19, 2004**

Drilling Method: **Rotary** Date Completed: **March 19, 2004**

Proposed Use: **Monitoring** Well Status: **Observation**

Completion Type: **Casing/Open Hole** Feature Class: **Piezometer**

### METRIC REPORT

01-17-054-26 W4M

Easting (m): **80,056.02\*\***  
 Northing (m): **5,943,824.91\*\***  
 Elevation (m): **676\*\*\***

Lot:  
 Block:  
 Plan:

**M39227.477827**

513372; core

Elog Taken: **Yes**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.8**

Presence of Gas: **No**

#### General Details core

Depth Completed (m)\*: **15.8** Top of Bedrock (m): **16.15\***  
 Depth Drilled (m): **17.7** Completion Interval (m): **8.2 – 15.8\***

Sand & Gravel Thickness (m): **7.6 (total) – 1.2 (below 15 m)\***

Plugged / Backfilled (m): **15.8 – 17.7 (Unknown)**

Most Recent Water Level (m): **14.10 m – June 1, 2023**

#### Completion Details

Surface Casing: **Plastic – 60.5 mm (O.D.) x 5.80 mm (thick) x 8.2 m (bottom)**

Screen Material: **[unknown] – ([unknown])**

Fittings: **Top: Threaded – Bottom: Washdown**

#### Intervals

Slotted: **8.2 to 15.8 m - 0.010 x 2 Inches - Method: Machine**

Bentonite Chips/Tables: **0.0 to 7.3 m**

#### Lithology Details

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
674.0	2.4	Grey Clay
671.5	4.9	Brown Clay
667.9	8.5	Brown Till
660.3	16.2	Sand & Gravel
658.7	17.7	Grey Shale

#### Chemistry Summary Details (mg/L, except as noted) (recently sampled first)

Sampling Details: **June 1, 2023 @ 14:55**

Report Date: **June 12, 2023 - Element Materials Technology Canada Inc. (1655888-24)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	1860	Nitrate as N:	0.77	Turbidity (NTU):	0.6
Total Dissolved Solids:	1370	Nitrite as N:	< 0.005	Fluoride:	0.10
Hardness (as CaCO3):	919	pH (pH Unit):	7.30	Carbonate:	< 6
T-Alkalinity (as CaCO3):	584	Colour (TCU):	5	Bicarbonate:	712
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	99	Hydroxide:	< 5
Nitrate + Nitrite as N:	0.77	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.1	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	263		Mercury:	< 0.000005	
Chloride:	5.4		Molybdenum:	< 0.001	
Iron:	< 0.01		Magnesium:	64.0	
Manganese:	< 0.005		Sodium:	110	
Aluminum:	< 0.002		Potassium:	8.4	
Arsenic:	< 0.0002		Vanadium:	< 0.0001	
Barium:	0.062		Strontium:	1.76	
Beryllium:	< 0.0001		Nickel:	0.0012	
Cadmium:	0.00001		Zinc:	< 0.001	
Chromium:	< 0.0005		Copper:	0.0006	
Cobalt:	< 0.0001		Lead:	< 0.0001	
Sulfate:	569		Uranium:	0.0333***	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario.

513372; 1 / 33

#### Comments & Observations

**Initial, Mar 19, 2004:** Casing is 91.44 cm (36") above ground level and piezometer pipe is protected with a lockable steel protector pipe. GL = 674.573 m; TOC = 675.434 m.

#### Aquifer Tests

#### Alias IDs

GIC ID: **1270003**  
 GIC (WellReportId): **10782647**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM — {Ground; AMSL}

Created on: August 25, 2023 — Data "AS IS"; no warranty either expressed or implied. [53.658453 -113.788077 (WGS 84)], INT Date End: 2023-06-02

**MW04-03**  
**AEPA - Water Well Drilling Report**



# Water Well Drilling Report

[View in Imperial](#)   [Export to Excel](#)

GIC Well ID                    1270003  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b> LAFARGE CANADA INC		<b>Address</b> 8635 STADIUM ROAD			<b>Town</b> EDMONTON		<b>Province</b> AB	<b>Country</b> CA	<b>Postal Code</b> T5J 2J1		
<b>Location</b>	<b>1/4 or LSD</b>	<b>SEC</b>	<b>TWP</b>	<b>RGE</b>	<b>W of MER</b>	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b>		
	1	17	54	26	4			# 04 - 03			
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>						
_____ m from _____					Latitude <u>53.658454</u> Longitude <u>-113.788035</u>			Elevation <u>675.44</u> m			
_____ m from _____					How Location Obtained			How Elevation Obtained			
					Not Verified			Surveyed GPS <1m			

Drilling Information	
<b>Method of Drilling</b> Rotary	<b>Type of Work</b> New Well
<b>Proposed Well Use</b> Monitoring	

Formation Log			Measurement in Metric
Depth from ground level (m)	Water Bearing	Lithology Description	
2.44		Gray Clay	
4.88		Brown Clay	
8.53		Brown Till	
16.15		Sand & Gravel	
17.68		Gray Shale	

Yield Test Summary			Measurement in Metric
<b>Recommended Pump Rate</b> _____ L/min			
<b>Test Date</b>	<b>Water Removal Rate (L/min)</b>	<b>Static Water Level (m)</b>	

Well Completion				Measurement in Metric
<b>Total Depth Drilled</b>	<b>Finished Well Depth</b>	<b>Start Date</b>	<b>End Date</b>	
15.85 m		2004/03/19	2004/03/19	
<b>Borehole</b>				
<b>Diameter (cm)</b>	<b>From (m)</b>	<b>To (m)</b>		
15.56	0.00	15.85		
<b>Surface Casing (if applicable)</b>		<b>Well Casing/Liner</b>		
Plastic		Unknown		
<b>Size OD :</b>	<u>6.05</u> cm	<b>Size OD :</b> _____ cm		
<b>Wall Thickness :</b>	<u>0.584</u> cm	<b>Wall Thickness :</b> _____ cm		
<b>Bottom at :</b>	<u>8.23</u> m	<b>Top at :</b> _____ m		
		<b>Bottom at :</b> _____ m		
<b>Perforations</b>				
<b>From (m)</b>	<b>To (m)</b>	<b>Diameter or Slot Width (cm)</b>	<b>Slot Length (cm)</b>	<b>Hole or Slot Interval (cm)</b>
8.23	15.85	0.025		5.08
Perforated by    Machine				
<b>Annular Seal</b> Bentonite Chips/Tablets				
Placed from <u>0.00</u> m    to <u>7.32</u> m				
Amount _____				
<b>Other Seals</b>				
Type _____		At (m) _____		
<b>Screen Type</b> Unknown				
Size OD : _____ cm				
<b>From (m)</b>	<b>To (m)</b>	<b>Slot Size (cm)</b>		
Attachment <u>Unknown</u>				
Top Fittings <u>Threaded</u>		Bottom Fittings <u>Washdown</u>		
<b>Pack</b>				
Type <u>Silica Sand</u>		Grain Size <u>10 - 20</u>		
Amount <u>750.00</u> Pounds				

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well GERALD TOPILKA	Certification No 3490AD
Company Name ELK POINT DRILLING CORP.	Copy of Well report provided to owner    Date approval holder signed



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 1270003  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric
<b>Owner Name</b>		<b>Address</b>			<b>Town</b>		<b>Province</b>	<b>Country</b>	<b>Postal Code</b>	
LAFARGE CANADA INC		8635 STADIUM ROAD			EDMONTON		AB	CA	T5J 2J1	
<b>Location</b>	<b>1/4 or LSD</b>	<b>SEC</b>	<b>TWP</b>	<b>RGE</b>	<b>W of MER</b>	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b>	
1		17	54	26	4				# 04 - 03	
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>					
_____ m from					Latitude <u>53.658454</u> Longitude <u>-113.788035</u>					Elevation <u>675.44</u> m
_____ m from					How Location Obtained					How Elevation Obtained
					Not Verified					Surveyed GPS <1m

Additional Information										Measurement in Metric
Distance From Top of Casing to Ground Level _____ cm										
Is Artesian Flow _____					Is Flow Control Installed _____					
Rate _____ L/min					Describe _____					
Recommended Pump Rate _____ L/min					Pump Installed _____		Depth _____ m			
Recommended Pump Intake Depth (From TOC) _____ m					Type _____	Make _____	H.P. _____	Model (Output Rating) _____		
Did you Encounter Saline Water (>4000 ppm TDS) _____					Depth _____ m		Well Disinfected Upon Completion _____			
Remedial Action Taken _____					Gas _____	Depth _____ m	Geophysical Log Taken <u>Electric</u>			
					Submitted to ESRD _____					
					Sample Collected for Potability _____					Submitted to ESRD _____
Additional Comments on Well										
CASING IS 36" ABOVE GROUND LEVEL AND IS PROTECTED WITH A LOCKABLE STEEL PROTECTOR PIPE. N: 5949133.840; E: 315774.526 Z12; GL = 674.573M; TOC = 675.434M										

Yield Test			Taken From Ground Level	Measurement in Metric
Test Date	Start Time	Static Water Level		
		m		
<b>Method of Water Removal</b>				
Type _____				
Removal Rate _____ L/min				
Depth Withdrawn From _____ m				
If water removal period was < 2 hours, explain why				

Water Diverted for Drilling		
Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well	Certification No
GERALD TOPILKA	3490AD
Company Name	Copy of Well report provided to owner Date approval holder signed
ELK POINT DRILLING CORP.	

**MW04-03**  
**Chemical Analysis Results (June 12, 2023)**



Element  
 7217 Roper Road NW  
 Edmonton, Alberta  
 T6B 3J4, Canada

T: +1 (780) 438-5522  
 F: +1 (780) 434-8586  
 E: info.Edmonton@element.com  
 W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880330
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

**Reference Number** 1655888-24  
**Sample Date** June 01, 2023  
**Sample Time** 14:55  
**Sample Location** M39227.477827  
**Sample Description** MW04-03 / 4.3 °C  
**Sample Matrix** Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Metals Dissolved</b>					
Silicon	Dissolved mg/L	8.63	0.05		
Sulfur	Dissolved mg/L	190	0.3		
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC
Arsenic	Dissolved mg/L	<0.0002	0.0002	0.01	Below MAC
Barium	Dissolved mg/L	0.062	0.001	2.0	Below MAC
Beryllium	Dissolved mg/L	<0.0001	0.0001		
Bismuth	Dissolved mg/L	<0.0005	0.0005		
Boron	Dissolved mg/L	0.125	0.002	5	Below MAC
Cadmium	Dissolved mg/L	0.00001	0.00001	0.007	Below MAC
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC
Cobalt	Dissolved mg/L	<0.0001	0.0001		
Copper	Dissolved mg/L	0.0006	0.0002	1 AO; 2 MAC	Below AO
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC
Lithium	Dissolved mg/L	0.140	0.001		
Molybdenum	Dissolved mg/L	<0.001	0.001		
Nickel	Dissolved mg/L	0.0012	0.0005		
Selenium	Dissolved mg/L	0.0117	0.0002	0.05	Below MAC
Silver	Dissolved mg/L	<0.00001	0.00001		
Strontium	Dissolved mg/L	1.76	0.001	7.0	Below MAC
Thallium	Dissolved mg/L	<0.00005	0.00005		
Tin	Dissolved mg/L	<0.001	0.001		
Titanium	Dissolved mg/L	<0.0005	0.0005		
Uranium	Dissolved mg/L	0.0333	0.0005	0.02	Above MAC
Vanadium	Dissolved mg/L	<0.0001	0.0001		
Zinc	Dissolved mg/L	<0.001	0.001	5	Below AO
Subsample		Field Filtered			
<b>Physical and Aggregate Properties</b>					
Colour	Apparent, Potable Colour units	5	5	15	Below AO
Turbidity	NTU	0.6	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>					
pH		7.30	1	7.0-10.5	Within OG Range
Temperature of observed pH	°C	21.1			
Electrical Conductivity	at 25 °C µS/cm	1860	1		
Calcium	Dissolved mg/L	263	0.2		
Magnesium	Dissolved mg/L	64.0	0.2		
Sodium	Dissolved mg/L	110	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880330
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-24
<b>Sample Date</b>	June 01, 2023
<b>Sample Time</b>	14:55
<b>Sample Location</b>	M39227.477827
<b>Sample Description</b>	MW04-03 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved	mg/L	8.4	0.4	
Iron	Dissolved	mg/L	<0.01	0.01	0.3 Below AO
Manganese	Dissolved	mg/L	<0.005	0.005	0.02 AO; 0.12 MAC Below AO
Chloride	Dissolved	mg/L	5.4	0.4	250 Below AO
Fluoride		mg/L	0.10	0.05	1.5 Below MAC
Nitrate - N		mg/L	0.77	0.01	10 Below MAC
Nitrite - N		mg/L	<0.005	0.005	1 Below MAC
Nitrate and Nitrite - N		mg/L	0.77	0.01	10 Below MAC
Sulfate (SO4)	Dissolved	mg/L	569	0.9	500 Above AO
Hydroxide		mg/L	<5		
Carbonate		mg/L	<6		
Bicarbonate		mg/L	712		
P-Alkalinity	as CaCO3	mg/L	<5	5	
T-Alkalinity	as CaCO3	mg/L	584	5	
Total Dissolved Solids	Calculated	mg/L	1370	1	500 Above AO
Hardness	Dissolved as CaCO3	mg/L	919		
Ionic Balance	Dissolved	%	99		

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880330
--	--	--

**Metals Dissolved**

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880330
--	--	--

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880330
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Sulfur	mg/L	33.7	34.4	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	<0.2	<0.2	10	0.4	yes
Barium	µg/L	38	38	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	113	114	10	4	yes
Cadmium	µg/L	0.03	0.04	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.4	1.4	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	80	81	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.7	0.7	10	1.1	yes
Selenium	µg/L	0.4	0.4	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	1020	1010	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.2	3.4	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	<1	<1	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880330
--	--	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	10.0	9.9	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.08	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0.00178586	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2100	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880330
--	--	--

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.9	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	14.9	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.57	7.57	0	0.10	yes
Electrical Conductivity	dS/m	0.930	0.928	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	549	546	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	450	448	10	5	yes
Chloride	mg/L	1.5	1.6	10	0.5	yes
Fluoride	mg/L	0.08	0.08	10	0.05	yes
Nitrate - N	mg/L	0.03	0.03	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880330
--	---	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	121	123	10	0.6	yes
Magnesium	mg/L	23.2	23.7	10	0.7	yes
Sodium	mg/L	64.4	65.8	10	1.2	yes
Potassium	mg/L	3.8	3.8	10	1.2	yes
Iron	mg/L	2.31	2.35	10	0.05	yes
Manganese	mg/L	0.653	0.664	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880330
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-24; 8663491: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880330
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

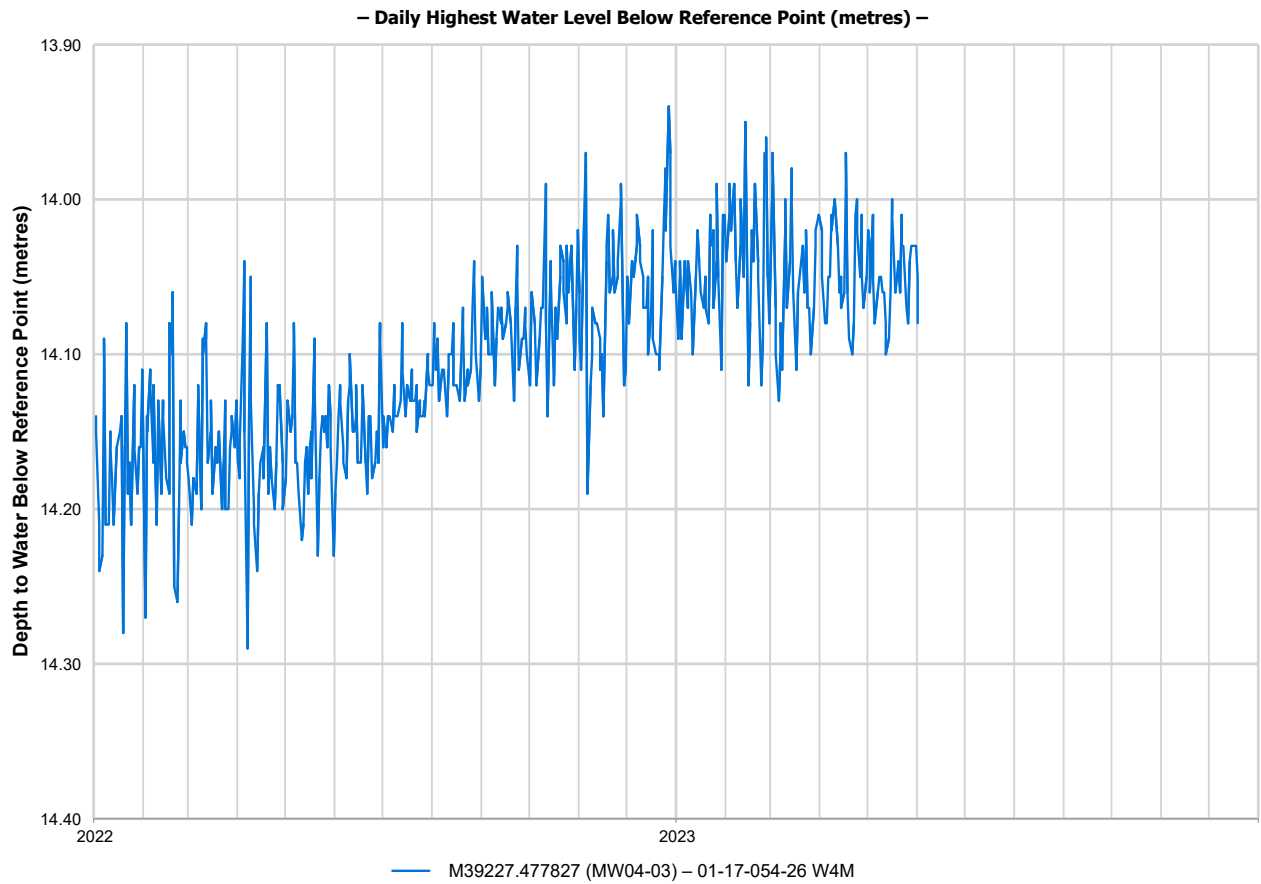
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**MW04-03**  
**2022 - 2023 Hydrograph**



## MW05-01

(2005 Observation Water Well No. 09-27)

**09-27-054-27 W4M**

(M39227.483721)



Photograph taken on May 31, 2023

### Well Spatial Location:

Easting: **73,392**

Northing: **5,947,739**

(spatial accuracy HCL GPS — 10TM Resource NAD83)

Ground Elevation AMSL (m): **681**

(elevation accuracy HCL DEM)

Date Completed: **April 26, 2005**

Depth Drilled (m): **17.1**

Completion Interval (m): **15.2 – 16.8 \***

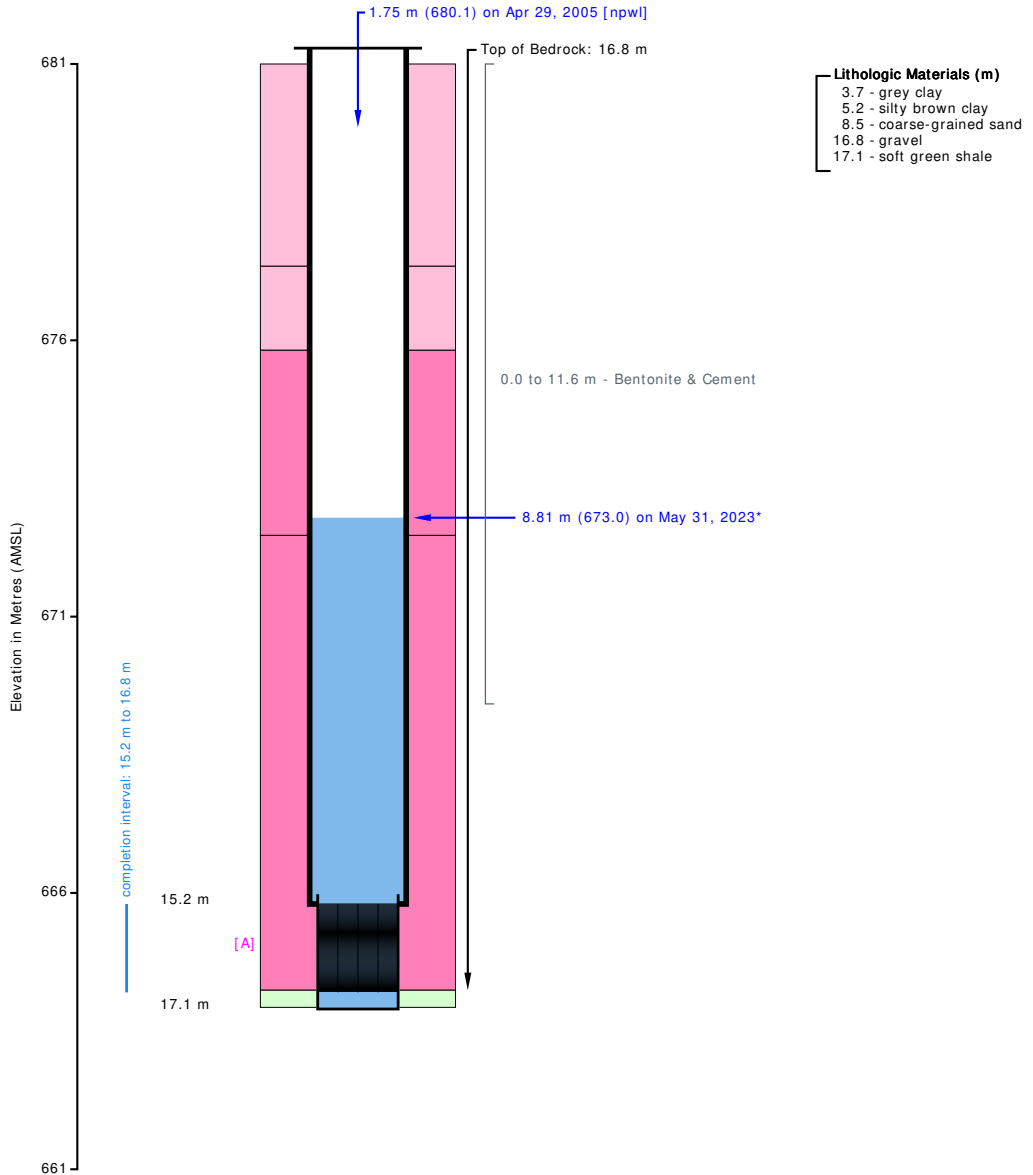
(\* TGWC determined value)

Earliest Water Level (m): **1.75 – April 29, 2005 @ 12:00**

Most Recent Water Level (m): **8.81 – May 31, 2023 @ 11:57**

GIC ID: **1495114**

# MW05-01 Water Well Diagram



- Lithologic Materials (m)**
- 3.7 - grey clay
  - 5.2 - silty brown clay
  - 8.5 - coarse-grained sand
  - 16.8 - gravel
  - 17.1 - soft green shale

Lithology Legend		Geologic Unit Legend (Top) - Regional Analysis	
Surficial	<span style="display: inline-block; width: 10px; height: 10px; background-color: #f08080; border: 1px solid black;"></span> Unsorted	Bedrock	<span style="display: inline-block; width: 10px; height: 10px; background-color: #90ee90; border: 1px solid black;"></span> Fine Grained
	<span style="display: inline-block; width: 10px; height: 10px; background-color: #90ee90; border: 1px solid black;"></span> Coarse Grained		<span style="display: inline-block; width: 10px; height: 10px; background-color: #808080; border: 1px solid black;"></span> Other
			Geologic Unit details not available for this location

### Summary

TGWC ID: M39227.483721  
 Well Name: MW05-01  
 Legal Location: 09-27-054-27 W4M  
 Casing (OD): 152.4 mm; Plastic (6.0")  
 Screen (OD): 127.0 mm; Stainless Steel (5.0")  
 Casing Stick-Up: 0.6 m (not drawn to scale)  
 Completion [A]: 15.2 to 16.8 m; Screened  
 Water Level (recent): 8.81 m (673.0 m AMSL) on May 31, 2023 @ 11:57 - Reference Point: Top of Casing  
 Water Level (oldest): 1.75 m (680.1 m AMSL) on Apr 29, 2005 @ 12:00 [npwl]  
 Top of Liner assumed to be 5% of 'non-cased' interval.

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:49 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.



Owner: **Inland Aggregates Ltd.**  
**15015 123rd Avenue, Edmonton, AB T5V 1J7**

Contractor: **Mar-Wayne Water Well Drilling Services Ltd.**  
 Name: **MW05-01 (2005 Observation Water Well No. 09-27)**

Field Action: **Confirmed - Physically, October 12, 2017**  
 Work Type: **New Well** Date Started: **April 26, 2005**  
 Drilling Method: **Rotary** Date Completed: **April 26, 2005**  
 Proposed Use: **Observation** Well Status: **Observation**  
 Completion Type: **Screen** Feature Class: **Water Well**

**METRIC REPORT**

**09-27-054-27 W4M**

Easting (m): **73,391.50\*\***  
 Northing (m): **5,947,738.50\*\***  
 Elevation (m): **681\*\*\***  
 Lot:  
 Block:  
 Plan:  
 Presence of Gas: **No**

**M39227.483721**

513353; 462746; core

Elog Taken: **No**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.6**

**General Details** core

Depth Completed (m)\*: **16.8** Top of Bedrock (m): **16.76 \***  
 Depth Drilled (m): **17.1** Completion Interval (m): **15.2 – 16.8 \***

Sand & Gravel Thickness (m): **3.4 (total) – 1.8 (below 15 m) \***

Most Recent Water Level (m): **8.81 m – May 31, 2023**  
 Pump Intake BTOC (m): **13.0 on April 29, 2005**

**Completion Details**

Surface Casing: **Plastic – 152.4 mm (O.D.) x 12.70 mm (thick) x 15.2 m (bottom)**

Screen Material: **Stainless Steel – 127.0 mm (O.D.) (Attached To Casing)**  
 Fittings: **Top: Coupler – Bottom: Plug**

**Intervals**

Screen: **15.2 to 16.8 m - 0.03 cm ([unknown])**  
 Bentonite & Cement: **0.0 to 11.6 m**

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
677.5	3.7	Grey Clay
676.0	5.2	Silty Brown Clay
672.7	8.5	Coarse-Grained Sand
664.4	16.8	Gravel
664.1	17.1	Soft Green Shale

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: **May 31, 2023 @ 12:50**  
 Report Date: **June 12, 2023 - Element Materials Technology Canada Inc. (1655888-5)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	960	Nitrate as N:	< 0.01	Turbidity (NTU):	22.2
Total Dissolved Solids:	586	Nitrite as N:	< 0.005	Fluoride:	< 0.05
Hardness (as CaCO3):	432	pH (pH Unit):	7.50	Carbonate:	< 6
T-Alkalinity (as CaCO3):	518	Colour (TCU):	40	Bicarbonate:	632
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	99	Hydroxide:	< 5
Nitrate + Nitrite as N:	< 0.01	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.0	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	122		Mercury:	< 0.000005	
Chloride:	0.4		Molybdenum:	< 0.001	
Iron:	1.94		Magnesium:	30.6	
Manganese:	0.788***		Sodium:	59.5	
Aluminum:	< 0.002		Potassium:	3.4	
Arsenic:	0.0014		Vanadium:	< 0.0001	
Barium:	0.067		Strontium:	0.845	
Beryllium:	< 0.0001		Nickel:	0.0011	
Cadmium:	< 0.00001		Zinc:	< 0.001	
Chromium:	< 0.0005		Copper:	< 0.0002	
Cobalt:	0.0006		Lead:	< 0.0001	
Sulfate:	58.4		Uranium:	0.0065	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario. 513353; 1 / 8

**Comments & Observations (2 total events)**

**Field Survey (HCL), Oct 12, 2017:** Hydrogeological Consultants Ltd. (HCL) confirmed observation water well is situated along treeline. HCL padlock installed. Observation water well was drilled and completed for Inland but is situated on Lafarge property; Bill Gowdy with Lafarge confirmed that observation water well is on Lafarge property. Original legal location on water well drilling report: SE 27-054-27 W4M; legal location updated to 09-27 after field confirmation.  
**Initial, Apr 26, 2005:** LSD: North PM. SE. Water well drilling report listed screen O.D.

**Aquifer Tests**

Date & Time	Testing Method / Type	Depth of Test Interval	Duration (minutes)		Avg. Rate (Lpm)	NPWL (metres)	Drawdown (metres)	Pump (metres)	Q20 (m³/day)*		Transmissivity (m²/day)*	
			Pumping	Recovery					Apparent	Effective	Apparent	Aquifer Effective
1 2005-04-29 12:00	Pump	[unknown]	120	120	60.0	1.8	9.2	13.0	57.9		11.3	

**Alias IDs**

GIC ID: **1495114**  
 GIC (WellReportId): **10958608**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM — {Ground; AMSL}



**MW05-01**  
**AEPA - Water Well Drilling Report**



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 1495114  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b> INLAND AGGREGATES		<b>Address</b> 15015 - 123 AVE			<b>Town</b> EDMONTON		<b>Province</b> AB	<b>Country</b> CA	<b>Postal Code</b> T5V 1J7		
<b>Location</b>	<b>1/4 or LSD</b>	<b>SEC</b>	<b>TWP</b>	<b>RGE</b>	<b>W of MER</b>	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b>		
	SE	27	54	27	4						
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>			<b>Elevation</b> _____ <b>m</b>			
_____ m from _____					Latitude <u>53.690500</u> Longitude <u>-113.892000</u>			How Elevation Obtained _____			
_____ m from _____					How Location Obtained _____			Not Obtained			
					Not Verified						

Drilling Information	
<b>Method of Drilling</b> Rotary	<b>Type of Work</b> New Well
<b>Proposed Well Use</b> Observation	

Formation Log			Measurement in Metric
Depth from ground level (m)	Water Bearing	Lithology Description	
3.66		Gray Clay	
5.18		Brown Silty Clay	
8.53		Coarse Grained Sand	
16.76		Gravel	
17.07		Green Soft Shale	

Yield Test Summary			Measurement in Metric
<b>Recommended Pump Rate</b>	60.01 L/min		
<b>Test Date</b>	<b>Water Removal Rate (L/min)</b>	<b>Static Water Level (m)</b>	
2005/04/29	60.01	1.75	

Well Completion				Measurement in Metric
<b>Total Depth Drilled</b>	<b>Finished Well Depth</b>	<b>Start Date</b>	<b>End Date</b>	
17.07 m		2005/04/26	2005/04/26	
<b>Borehole</b>				
<b>Diameter (cm)</b>	<b>From (m)</b>	<b>To (m)</b>		
20.32	0.00	17.07		
<b>Surface Casing (if applicable)</b>		<b>Well Casing/Liner</b>		
Plastic		Unknown		
<b>Size OD :</b> 15.24 cm		<b>Size OD :</b> _____ cm		
<b>Wall Thickness :</b> 1.270 cm		<b>Wall Thickness :</b> _____ cm		
<b>Bottom at :</b> 15.24 m		<b>Top at :</b> _____ m		
		<b>Bottom at :</b> _____ m		
<b>Perforations</b>				
From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)
Perforated by Unknown				
<b>Annular Seal</b> Bentonite & Cement				
Placed from 0.00 m to 11.58 m				
Amount _____				
<b>Other Seals</b>				
Type		At (m)		
<b>Screen Type</b> Stainless Steel				
Size OD : 12.70 cm				
<b>From (m)</b>	<b>To (m)</b>	<b>Slot Size (cm)</b>		
15.24	16.76	0.030		
Attachment Attached To Casing				
Top Fittings Coupler		Bottom Fittings Plug		
<b>Pack</b>				
Type Artificial		Grain Size #3 GRIT		
Amount 250.00 Pounds				

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well TERRY BERGSTREISER	Certification No 41955A
Company Name MAR-WAYNE WATER WELL DRILLING SERVICES LTD.	Copy of Well report provided to owner Date approval holder signed



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 1495114  
 GoA Well Tag No.  
 Drilling Company Well ID  
 Date Report Received

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b> INLAND AGGREGATES		<b>Address</b> 15015 - 123 AVE			<b>Town</b> EDMONTON			<b>Province</b> AB	<b>Country</b> CA	<b>Postal Code</b> T5V 1J7	
<b>Location</b>	<b>1/4 or LSD</b> SE	<b>SEC</b> 27	<b>TWP</b> 54	<b>RGE</b> 27	<b>W of MER</b> 4	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b>		
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>						
_____ m from _____					Latitude <u>53.690500</u> Longitude <u>-113.892000</u>					Elevation _____ m	
_____ m from _____					How Location Obtained					How Elevation Obtained	
					Not Verified					Not Obtained	

Additional Information										Measurement in Metric	
<b>Distance From Top of Casing to Ground Level</b> _____ <b>50.01 cm</b>					<b>Is Artesian Flow</b> _____					<b>Is Flow Control Installed</b> _____	
<b>Rate</b> _____ <b>L/min</b>					<b>Describe</b> _____						
<b>Recommended Pump Rate</b> _____ <b>60.01 L/min</b>					<b>Pump Installed</b> _____					<b>Depth</b> _____ <b>m</b>	
<b>Recommended Pump Intake Depth (From TOC)</b> _____ <b>13.00 m</b>					<b>Type</b> _____					<b>Make</b> _____ <b>H.P.</b> _____	
										<b>Model (Output Rating)</b> _____	
<b>Did you Encounter Saline Water (&gt;4000 ppm TDS)</b> _____					<b>Depth</b> _____ <b>m</b>					<b>Well Disinfected Upon Completion</b> _____	
<b>Remedial Action Taken:</b>					<b>Gas</b> _____					<b>Depth</b> _____ <b>m</b>	
										<b>Geophysical Log Taken</b> _____	
										<b>Submitted to ESRD</b> _____	
<b>Additional Comments on Well</b>					<b>Sample Collected for Potability</b> _____					<b>Submitted to ESRD</b> _____	

Yield Test			Taken From Ground Level	Measurement in Metric	
			<i>Depth to water level</i>		
<b>Test Date</b> 2005/04/29	<b>Start Time</b> 12:00 AM	<b>Static Water Level</b> 1.75 m	<b>Pumping (m)</b>	<b>Elapsed Time Minutes:Sec</b>	<b>Recovery (m)</b>
<b>Method of Water Removal</b>			1.75	0:00	10.92
<b>Type Pump</b> _____			4.83	1:00	7.36
<b>Removal Rate</b> _____ <b>60.01 L/min</b>			6.61	2:00	5.18
<b>Depth Withdrawn From</b> _____ <b>13.00 m</b>			7.74	3:00	3.88
<b>If water removal period was &lt; 2 hours, explain why</b>			8.50	4:00	3.08
			8.99	5:00	2.59
			9.32	6:00	2.27
			9.55	7:00	2.10
			9.71	8:00	1.99
			9.83	9:00	1.93
			9.93	10:00	1.89
			10.06	12:00	1.86
			10.15	14:00	1.84
			10.22	16:00	1.83
			10.33	20:00	1.82
			10.45	25:00	1.81
			10.53	30:00	1.81
			10.55	35:00	1.80
			10.58	40:00	1.80
			10.70	50:00	1.79
			10.75	60:00	1.79
			10.77	75:00	1.78
			10.84	90:00	1.78
			10.89	105:00	1.77
			10.92	120:00	1.77

Water Diverted for Drilling		
<b>Water Source</b>	<b>Amount Taken</b>	<b>Diversion Date &amp; Time</b>
	L	

Contractor Certification		
<b>Name of Journeyman responsible for drilling/construction of well</b> TERRY BERGSTREISER	<b>Certification No</b> 41955A	
<b>Company Name</b> MAR-WAYNE WATER WELL DRILLING SERVICES LTD.	<b>Copy of Well report provided to owner</b>	<b>Date approval holder signed</b>

**MW05-01**  
**Chemical Analysis Results (June 12, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880311
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-5
<b>Sample Date</b>	May 31, 2023
<b>Sample Time</b>	12:50
<b>Sample Location</b>	M39227.483721
<b>Sample Description</b>	MW05-01 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Metals Dissolved</b>						
Silicon	Dissolved mg/L	7.33	0.05			
Sulfur	Dissolved mg/L	19.5	0.3			
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC	
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG	
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC	
Arsenic	Dissolved mg/L	0.0014	0.0002	0.01	Below MAC	
Barium	Dissolved mg/L	0.067	0.001	2.0	Below MAC	
Beryllium	Dissolved mg/L	<0.0001	0.0001			
Bismuth	Dissolved mg/L	<0.0005	0.0005			
Boron	Dissolved mg/L	0.074	0.002	5	Below MAC	
Cadmium	Dissolved mg/L	<0.00001	0.00001	0.007	Below MAC	
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC	
Cobalt	Dissolved mg/L	0.0006	0.0001			
Copper	Dissolved mg/L	<0.0002	0.0002	1 AO; 2 MAC	Below AO	
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC	
Lithium	Dissolved mg/L	0.075	0.001			
Molybdenum	Dissolved mg/L	<0.001	0.001			
Nickel	Dissolved mg/L	0.0011	0.0005			
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC	
Silver	Dissolved mg/L	<0.00001	0.00001			
Strontium	Dissolved mg/L	0.845	0.001	7.0	Below MAC	
Thallium	Dissolved mg/L	<0.00005	0.00005			
Tin	Dissolved mg/L	<0.001	0.001			
Titanium	Dissolved mg/L	<0.0005	0.0005			
Uranium	Dissolved mg/L	0.0065	0.0005	0.02	Below MAC	
Vanadium	Dissolved mg/L	<0.0001	0.0001			
Zinc	Dissolved mg/L	<0.001	0.001	5	Below AO	
Subsample		Field Filtered				
<b>Physical and Aggregate Properties</b>						
Colour	Apparent, Potable	Colour units	40	5	15	Above AO
Turbidity		NTU	22.2	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>						
pH			7.50	1	7.0-10.5	Within OG Range
Temperature of observed pH		°C	21.0			
Electrical Conductivity	at 25 °C	µS/cm	960	1		
Calcium	Dissolved	mg/L	122	0.2		
Magnesium	Dissolved	mg/L	30.6	0.2		
Sodium	Dissolved	mg/L	59.5	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880311
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-5
<b>Sample Date</b>	May 31, 2023
<b>Sample Time</b>	12:50
<b>Sample Location</b>	M39227.483721
<b>Sample Description</b>	MW05-01 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved mg/L	3.4	0.4		
Iron	Dissolved mg/L	1.94	0.01	0.3	Above AO
Manganese	Dissolved mg/L	0.788	0.005	0.02 AO; 0.12 MAC	Above MAC
Chloride	Dissolved mg/L	0.4	0.4	250	Below AO
Fluoride	mg/L	<0.05	0.05	1.5	Below MAC
Nitrate - N	mg/L	<0.01	0.01	10	Below MAC
Nitrite - N	mg/L	<0.005	0.005	1	Below MAC
Nitrate and Nitrite - N	mg/L	<0.01	0.01	10	Below MAC
Sulfate (SO4)	Dissolved mg/L	58.4	0.9	500	Below AO
Hydroxide	mg/L	<5			
Carbonate	mg/L	<6			
Bicarbonate	mg/L	632			
P-Alkalinity	as CaCO3 mg/L	<5	5		
T-Alkalinity	as CaCO3 mg/L	518	5		
Total Dissolved Solids	Calculated mg/L	586	1	500	Above AO
Hardness	Dissolved as CaCO3 mg/L	432			
Ionic Balance	Dissolved %	99			

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880311
--	--	--

**Metals Dissolved**

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880311
--	--	--

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880311
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Sulfur	mg/L	1.0	1.1	10	0.1	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	1.1	1.1	10	0.4	yes
Barium	µg/L	48	48	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	109	110	10	4	yes
Cadmium	µg/L	<0.01	<0.01	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.2	1.2	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	71	71	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.9	1.1	10	1.1	yes
Selenium	µg/L	<0.2	<0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	953	947	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.7	3.6	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880311
--	--	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	1.4	1.3	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.91	9.39	10.59	yes
Nitrate - N	mg/L	9.88	9.03	11.13	yes
Nitrite - N	mg/L	9.83	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880311
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.1	74.9	86.9	yes	
Fluoride	mg/L	4.82	4.56	5.22	yes	
Nitrate - N	mg/L	4.69	4.37	5.33	yes	
Nitrite - N	mg/L	4.82	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.51	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	15.0	13.3	16.5	yes	
Fluoride	mg/L	0.50	0.45	0.57	yes	
Nitrate - N	mg/L	0.52	0.42	0.57	yes	
Nitrite - N	mg/L	0.506	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	1.02	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	56.8	57.1	10	0.5	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes
Nitrate - N	mg/L	0.02	0.02	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880311
--	---	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	29.6	29.3	10	0.6	yes
Magnesium	mg/L	9.1	9.0	10	0.7	yes
Sodium	mg/L	2.9	2.8	10	1.2	yes
Potassium	mg/L	1.0	1.0	10	1.2	yes
Iron	mg/L	0.18	0.18	10	0.05	yes
Manganese	mg/L	<0.005	<0.005	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880311
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-5; 8663472: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880311
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

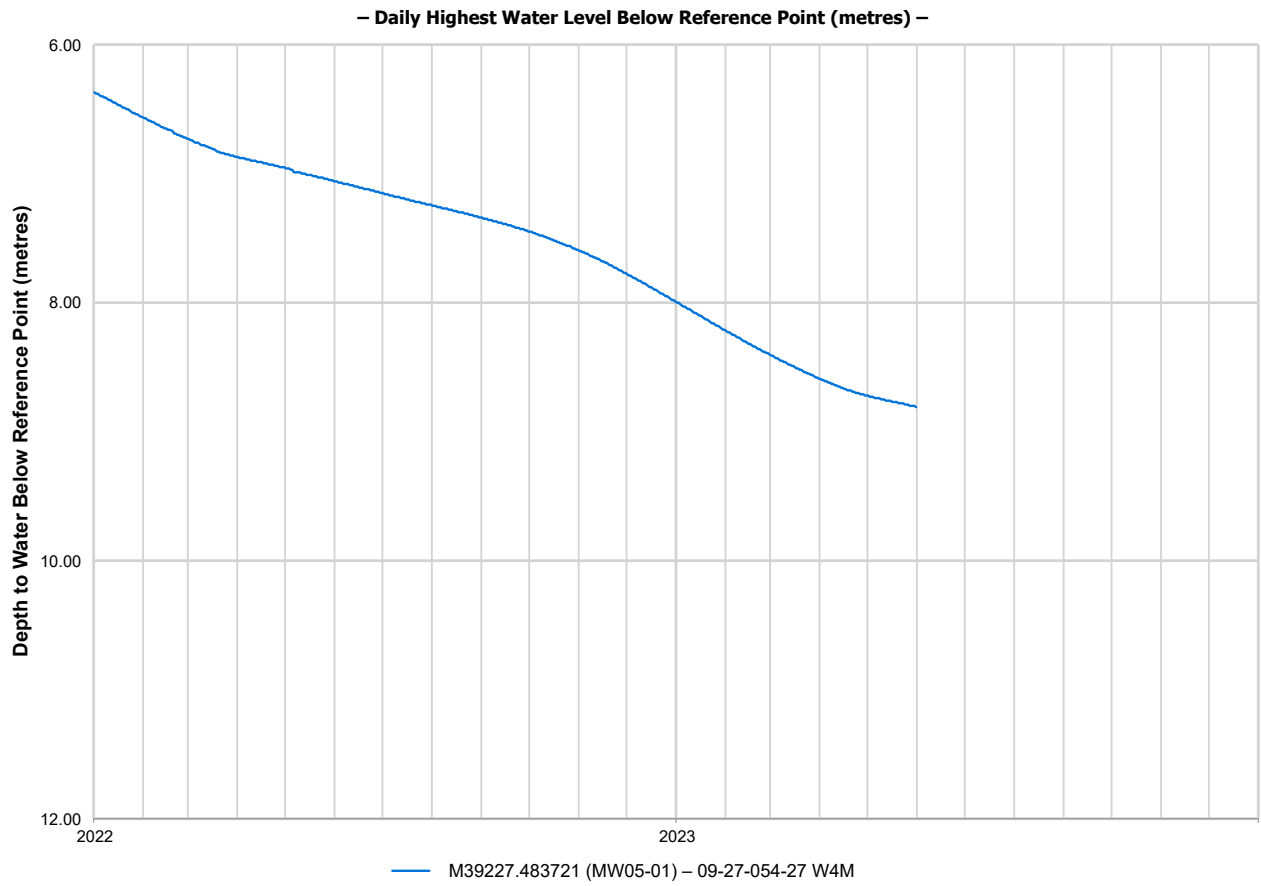
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

MW05-01  
2022 - 2023 Hydrograph



## MW07-1-33

08-36-054-27 W4M  
(M39859.704050)



Photograph taken on July 13, 2009

### Well Spatial Location:

Easting: **76,750**

Northing: **5,949,371**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **667**

*(elevation accuracy HCL DEM)*

Date Completed: **July 24, 2007**

Depth Drilled (m): **36.6**

Completion Interval (m): **26.8 – 32.9 \***

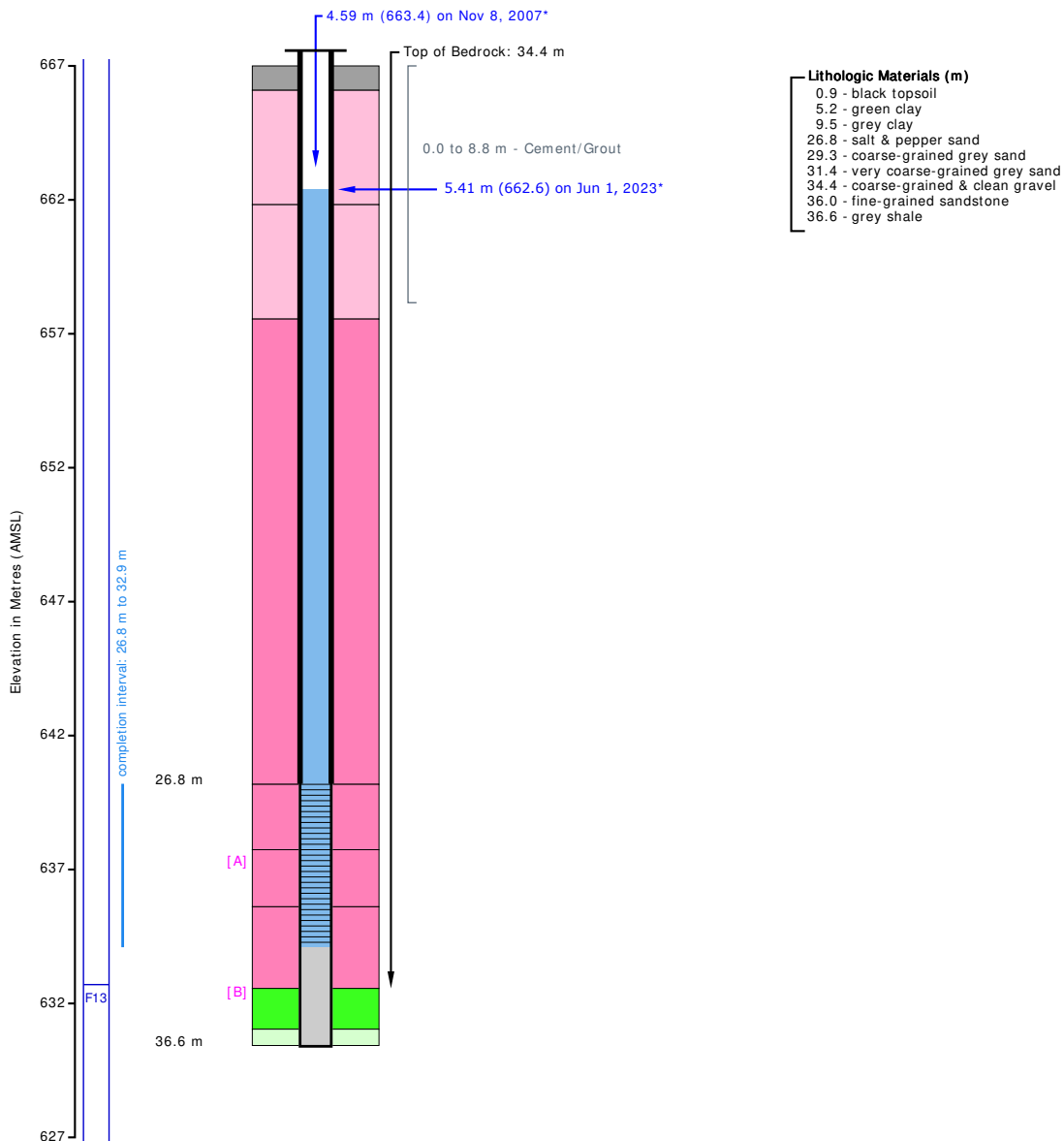
*(\* TGWC determined value)*

Earliest Water Level (m): **4.59 – November 8, 2007**

Most Recent Water Level (m): **5.41 – June 1, 2023 @ 09:44**

GIC ID: **1420667**

# MW07-1-33 Water Well Diagram



Lithology Legend			Geologic Unit Legend (Top) - Regional Analysis		
Surficial	Unsorted		Bedrock	Fine Grained	Other
	Fine Grained			Coarse Grained	
	Coarse Grained				
			F13 - Lower Horseshoe Canyon Formation		

### Summary

TGWC ID: M39859.704050  
 Well Name: MW07-1-33  
 Legal Location: 08-36-054-27 W4M  
 Casing (OD): 50.8 mm; Plastic (2.0")  
 Screen (OD): 50.8 mm; Plastic (2.0")  
 Casing Stick-Up: 0.8 m (not drawn to scale)  
 Completion [A]: 26.8 to 32.9 m; Screened  
 Construction [B]: 32.9 to 36.6 m; Plugged; Unknown  
 Water Level (recent): 5.41 m (662.6 m AMSL) on Jun 1, 2023 @ 09:44 - Reference Point: Top of Casing  
 Water Level (oldest): 4.59 m (663.4 m AMSL) on Nov 8, 2007 - Reference Point: Top of Casing  
 Top of Liner assumed to be 5% of 'non-cased' interval.

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:50 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.



Owner: **Sturgeon County**  
 9613-100 St, Morinville, AB T8R 1L9

Contractor: **Lakeland Drilling Ltd.**  
 Name: **MW07-1-33**

Field Action: **Confirmed - Physically, July 13, 2009**

Work Type: **Piezometer** Date Started: **July 24, 2007**

Drilling Method: **Rotary** Date Completed: **July 24, 2007**

Proposed Use: **Monitoring** Well Status: **Observation**

Completion Type: **Screen** Feature Class: **Piezometer**

### METRIC REPORT

08-36-054-27 W4M

Easting (m): **76,749.72\*\***  
 Northing (m): **5,949,370.73\*\***  
 Elevation (m): **667\*\*\***

Lot:  
 Block:  
 Plan:

**M39859.704050**

513369; core

Elog Taken: **No**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.8**

Presence of Gas: **No**

**General Details** core

Depth Completed (m)\*: **32.9** Top of Bedrock (m): **34.44 \***  
 Depth Drilled (m): **36.6** Completion Interval (m): **26.8 – 32.9 \***

Sand & Gravel Thickness (m): **21.9 (total) – 16.4 (below 15 m) \***  
 Plugged / Backfilled (m): **32.9 – 36.6 (Unknown)**  
 Most Recent Water Level (m): **5.41 m – June 1, 2023**

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
666.3	0.9	Black Topsoil
662.0	5.2	Green Clay
657.8	9.5	Grey Clay
640.4	26.8	Salt & Pepper Sand
637.9	29.3	Coarse-Grained Grey Sand
635.8	31.4	Very Coarse-Grained Grey Sand
632.8	34.4	Coarse-Grained & Clean Gravel
631.2	36.0	Fine-Grained Sandstone
630.6	36.6	Grey Shale

**Completion Details**

Surface Casing: **Plastic – 50.8 mm (O.D.) x 5.50 mm (thick) x 26.8 m (bottom)**

Screen Material: **Plastic – 50.8 mm (O.D.) (Attached To Casing)**

Fittings: **Top: Coupler – Bottom: Plug**

**Intervals**

Screen: **26.8 to 32.9 m - .051 cm (unknown)]**

Cement/Grout: **0.0 to 8.8 m**

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: **June 1, 2023 @ 10:00**  
 Report Date: **June 12, 2023 - Element Materials Technology Canada Inc. (1655888-21)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	865	Nitrate as N:	< 0.01	Turbidity (NTU):	4.5
Total Dissolved Solids:	521	Nitrite as N:	< 0.005	Fluoride:	0.09
Hardness (as CaCO3):	314	pH (pH Unit):	7.56	Carbonate:	< 6
T-Alkalinity (as CaCO3):	452	Colour (TCU):	10	Bicarbonate:	551
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	99	Hydroxide:	< 5
Nitrate + Nitrite as N:	< 0.01	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.0	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	89.3		Mercury:	< 0.000005	
Chloride:	0.6		Molybdenum:	< 0.001	
Iron:	0.80		Magnesium:	22.2	
Manganese:	0.902***		Sodium:	82.2	
Aluminum:	< 0.002		Potassium:	4.1	
Arsenic:	0.0026		Vanadium:	< 0.0001	
Barium:	0.053		Strontium:	0.609	
Beryllium:	< 0.0001		Nickel:	0.0015	
Cadmium:	< 0.00001		Zinc:	< 0.001	
Chromium:	< 0.0005		Copper:	< 0.0002	
Cobalt:	0.0005		Lead:	< 0.0001	
Sulfate:	52.0		Uranium:	0.0031	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Saftey Branch. Health Canada, Ottawa, Ontario.

513369; 1 / 27

**Comments & Observations**

**Aquifer Tests**

**Alias IDs**

GIC ID: **1420667**  
 GIC (WellReportId): **11427134**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM — {Ground; AMSL}

Created on: August 25, 2023 — Data "AS IS"; no warranty either expressed or implied. [53.708806 -113.836744 (WGS 84)], INT Date End: 2023-06-02



**MW07-1-33**  
**AEPA - Water Well Drilling Report**



# Water Well Drilling Report

[View in Imperial](#)   [Export to Excel](#)

GIC Well ID                      1420667  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b> STANTEC		<b>Address</b> 10160 - 112 ST			<b>Town</b> EDMONTON		<b>Province</b> AB	<b>Country</b> CA	<b>Postal Code</b> T5K 2L6		
<b>Location</b>	<b>1/4 or LSD</b> SE	<b>SEC</b> 36	<b>TWP</b> 54	<b>RGE</b> 27	<b>W of MER</b> 4	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b> WELL # 07-7-33		
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>					Elevation _____ m	
_____ m from					Latitude <u>53.705300</u> Longitude <u>-113.843000</u>					How Elevation Obtained	
_____ m from					How Location Obtained					Not Obtained	
					Not Verified						

Drilling Information	
<b>Method of Drilling</b> Rotary	<b>Type of Work</b> Piezometer
<b>Proposed Well Use</b> Observation	

Formation Log			Measurement in Metric
Depth from ground level (m)	Water Bearing	Lithology Description	
0.91		Black Topsoil	
5.18		Green Clay	
9.45		Gray Clay	
26.82		Salt & Pepper Sand	
29.26		Gray Coarse Grained Sand	
31.39		Gray Coarse Grained Sand	
34.44		Coarse Grained Gravel	
35.97		Fine Grained Sandstone	
36.58		Gray Shale	

Yield Test Summary			Measurement in Metric
<b>Recommended Pump Rate</b> _____ L/min			
<b>Test Date</b>	<b>Water Removal Rate (L/min)</b>	<b>Static Water Level (m)</b>	
2007/07/24			

Well Completion				Measurement in Metric
<b>Total Depth Drilled</b>	<b>Finished Well Depth</b>	<b>Start Date</b>	<b>End Date</b>	
36.58 m		2007/07/24	2007/07/24	
<b>Borehole</b>				
<b>Diameter (cm)</b>	<b>From (m)</b>	<b>To (m)</b>		
15.88	0.00	36.58		
<b>Surface Casing (if applicable)</b>		<b>Well Casing/Liner</b>		
Plastic		Unknown		
Size OD : <u>5.08 cm</u>		Size OD : _____ cm		
Wall Thickness : <u>0.554 cm</u>		Wall Thickness : _____ cm		
Bottom at : <u>26.82 m</u>		Top at : _____ m		
		Bottom at : _____ m		
<b>Perforations</b>				
<b>From (m)</b>	<b>To (m)</b>	<b>Diameter or Slot Width (cm)</b>	<b>Slot Length (cm)</b>	<b>Hole or Slot Interval(cm)</b>
Perforated by    Unknown				
<b>Annular Seal</b> Cement/Grout				
Placed from <u>0.00 m</u> to <u>8.84 m</u>				
Amount _____				
<b>Other Seals</b>				
Type _____		At (m) _____		
<b>Screen Type</b> Plastic				
Size OD : <u>5.08 cm</u>				
<b>From (m)</b>	<b>To (m)</b>	<b>Slot Size (cm)</b>		
26.82	32.92	0.051		
Attachment <u>Attached To Casing</u>				
Top Fittings <u>Coupler</u>		Bottom Fittings <u>Plug</u>		
<b>Pack</b>				
Type <u>Artificial</u>		Grain Size <u>10-20</u>		
Amount <u>42.00</u> Bags				

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well LEONARD MUDRYK	Certification No 28916A
Company Name LAKELAND DRILLING LTD.	Copy of Well report provided to owner    Date approval holder signed



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 1420667  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric
<b>Owner Name</b> STANTEC		<b>Address</b> 10160 - 112 ST			<b>Town</b> EDMONTON		<b>Province</b> AB	<b>Country</b> CA	<b>Postal Code</b> T5K 2L6	
<b>Location</b>	<b>1/4 or LSD</b> SE	<b>SEC</b> 36	<b>TWP</b> 54	<b>RGE</b> 27	<b>W of MER</b> 4	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b> WELL # 07-7-33	
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>					
_____ m from					Latitude <u>53.705300</u> Longitude <u>-113.843000</u>					Elevation _____ m
_____ m from					How Location Obtained					How Elevation Obtained
					Not Verified					Not Obtained

Additional Information										Measurement in Metric
<b>Distance From Top of Casing to Ground Level</b> _____					<b>76.20 cm</b>					
<b>Is Artesian Flow</b> _____					<b>Is Flow Control Installed</b> _____					
<b>Rate</b> _____ <b>L/min</b>					<b>Describe</b> _____					
<b>Recommended Pump Rate</b> _____ <b>L/min</b>					<b>Pump Installed</b> _____		<b>Depth</b> _____ <b>m</b>			
<b>Recommended Pump Intake Depth (From TOC)</b> _____ <b>m</b>					<b>Type</b> _____	<b>Make</b> _____	<b>H.P.</b> _____	<b>Model (Output Rating)</b> _____		
<b>Did you Encounter Saline Water (&gt;4000 ppm TDS)</b> _____					<b>Depth</b> _____ <b>m</b>		<b>Well Disinfected Upon Completion</b> _____			
<b>Remedial Action Taken</b>					<b>Gas</b> _____	<b>Depth</b> _____ <b>m</b>	<b>Geophysical Log Taken</b> _____			
					<b>Submitted to ESRD</b> _____					
<b>Additional Comments on Well</b>					<b>Sample Collected for Potability</b> _____			<b>Submitted to ESRD</b> _____		
96' - 103' VERY COARSE GRAY SAND, 103' - 113' COARSE CLEAN GRAVEL, PROPOSED WELL USE - PIEZOMETER										

Yield Test			Taken From Ground Level		Measurement in Metric
			<i>Depth to water level</i>		
<b>Test Date</b> 2007/07/24	<b>Start Time</b> 12:00 AM	<b>Static Water Level</b> _____ <b>m</b>			
			<b>Pumping (m)</b>	<b>Elapsed Time</b> Minutes:Sec	<b>Recovery (m)</b>
<b>Method of Water Removal</b>					
<b>Type</b> <u>Unknown</u>					
<b>Removal Rate</b> _____ <b>L/min</b>					
<b>Depth Withdrawn From</b> _____ <b>m</b>					
<i>If water removal period was &lt; 2 hours, explain why</i>					

Water Diverted for Drilling		
<b>Water Source</b>	<b>Amount Taken</b>	<b>Diversion Date &amp; Time</b>
	L	

Contractor Certification	
<b>Name of Journeyman responsible for drilling/construction of well</b> LEONARD MUDRYK	<b>Certification No</b> 28916A
<b>Company Name</b> LAKELAND DRILLING LTD.	<b>Copy of Well report provided to owner</b> _____ <b>Date approval holder signed</b> _____

**MW07-1-33**  
**Chemical Analysis Results (June 12, 2023)**



Element  
 7217 Roper Road NW  
 Edmonton, Alberta  
 T6B 3J4, Canada

T: +1 (780) 438-5522  
 F: +1 (780) 434-8586  
 E: info.Edmonton@element.com  
 W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880327
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-21
<b>Sample Date</b>	June 01, 2023
<b>Sample Time</b>	10:00
<b>Sample Location</b>	M39859.704050
<b>Sample Description</b>	MW07-1-33 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Metals Dissolved</b>						
Silicon	Dissolved mg/L	6.61	0.05			
Sulfur	Dissolved mg/L	17.3	0.3			
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC	
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG	
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC	
Arsenic	Dissolved mg/L	0.0026	0.0002	0.01	Below MAC	
Barium	Dissolved mg/L	0.053	0.001	2.0	Below MAC	
Beryllium	Dissolved mg/L	<0.0001	0.0001			
Bismuth	Dissolved mg/L	<0.0005	0.0005			
Boron	Dissolved mg/L	0.067	0.002	5	Below MAC	
Cadmium	Dissolved mg/L	<0.00001	0.00001	0.007	Below MAC	
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC	
Cobalt	Dissolved mg/L	0.0005	0.0001			
Copper	Dissolved mg/L	<0.0002	0.0002	1 AO; 2 MAC	Below AO	
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC	
Lithium	Dissolved mg/L	0.055	0.001			
Molybdenum	Dissolved mg/L	<0.001	0.001			
Nickel	Dissolved mg/L	0.0015	0.0005			
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC	
Silver	Dissolved mg/L	<0.00001	0.00001			
Strontium	Dissolved mg/L	0.609	0.001	7.0	Below MAC	
Thallium	Dissolved mg/L	<0.00005	0.00005			
Tin	Dissolved mg/L	<0.001	0.001			
Titanium	Dissolved mg/L	<0.0005	0.0005			
Uranium	Dissolved mg/L	0.0031	0.0005	0.02	Below MAC	
Vanadium	Dissolved mg/L	<0.0001	0.0001			
Zinc	Dissolved mg/L	<0.001	0.001	5	Below AO	
Subsample		Field Filtered				
<b>Physical and Aggregate Properties</b>						
Colour	Apparent, Potable	Colour units	10	5	15	Below AO
Turbidity		NTU	4.5	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>						
pH			7.56	1	7.0-10.5	Within OG Range
Temperature of observed pH		°C	21.0			
Electrical Conductivity	at 25 °C	µS/cm	865	1		
Calcium	Dissolved	mg/L	89.3	0.2		
Magnesium	Dissolved	mg/L	22.2	0.2		
Sodium	Dissolved	mg/L	82.2	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880327
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-21
<b>Sample Date</b>	June 01, 2023
<b>Sample Time</b>	10:00
<b>Sample Location</b>	M39859.704050
<b>Sample Description</b>	MW07-1-33 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved mg/L	4.1	0.4		
Iron	Dissolved mg/L	0.80	0.01	0.3	Above AO
Manganese	Dissolved mg/L	0.902	0.005	0.02 AO; 0.12 MAC	Above MAC
Chloride	Dissolved mg/L	0.6	0.4	250	Below AO
Fluoride	mg/L	0.09	0.05	1.5	Below MAC
Nitrate - N	mg/L	<0.01	0.01	10	Below MAC
Nitrite - N	mg/L	<0.005	0.005	1	Below MAC
Nitrate and Nitrite - N	mg/L	<0.01	0.01	10	Below MAC
Sulfate (SO4)	Dissolved mg/L	52.0	0.9	500	Below AO
Hydroxide	mg/L	<5			
Carbonate	mg/L	<6			
Bicarbonate	mg/L	551			
P-Alkalinity	as CaCO3 mg/L	<5	5		
T-Alkalinity	as CaCO3 mg/L	452	5		
Total Dissolved Solids	Calculated mg/L	521	1	500	Above AO
Hardness	Dissolved as CaCO3 mg/L	314			
Ionic Balance	Dissolved %	99			

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880327
--	--	--

**Metals Dissolved**

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880327
--	--	--

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880327
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Sulfur	mg/L	33.7	34.4	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	<0.2	<0.2	10	0.4	yes
Barium	µg/L	38	38	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	113	114	10	4	yes
Cadmium	µg/L	0.03	0.04	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.4	1.4	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	80	81	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.7	0.7	10	1.1	yes
Selenium	µg/L	0.4	0.4	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	1020	1010	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.2	3.4	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	<1	<1	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880327
--	--	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	10.0	9.9	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.08	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0.00178586	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2100	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880327
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

**Routine Water - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.9	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	14.9	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.57	7.57	0	0.10	yes
Electrical Conductivity	dS/m	0.930	0.928	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	549	546	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	450	448	10	5	yes
Chloride	mg/L	1.5	1.6	10	0.5	yes
Fluoride	mg/L	0.08	0.08	10	0.05	yes
Nitrate - N	mg/L	0.03	0.03	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880327
--	--	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	121	123	10	0.6	yes
Magnesium	mg/L	23.2	23.7	10	0.7	yes
Sodium	mg/L	64.4	65.8	10	1.2	yes
Potassium	mg/L	3.8	3.8	10	1.2	yes
Iron	mg/L	2.31	2.35	10	0.05	yes
Manganese	mg/L	0.653	0.664	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880327
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-21; 8663488: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880327
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

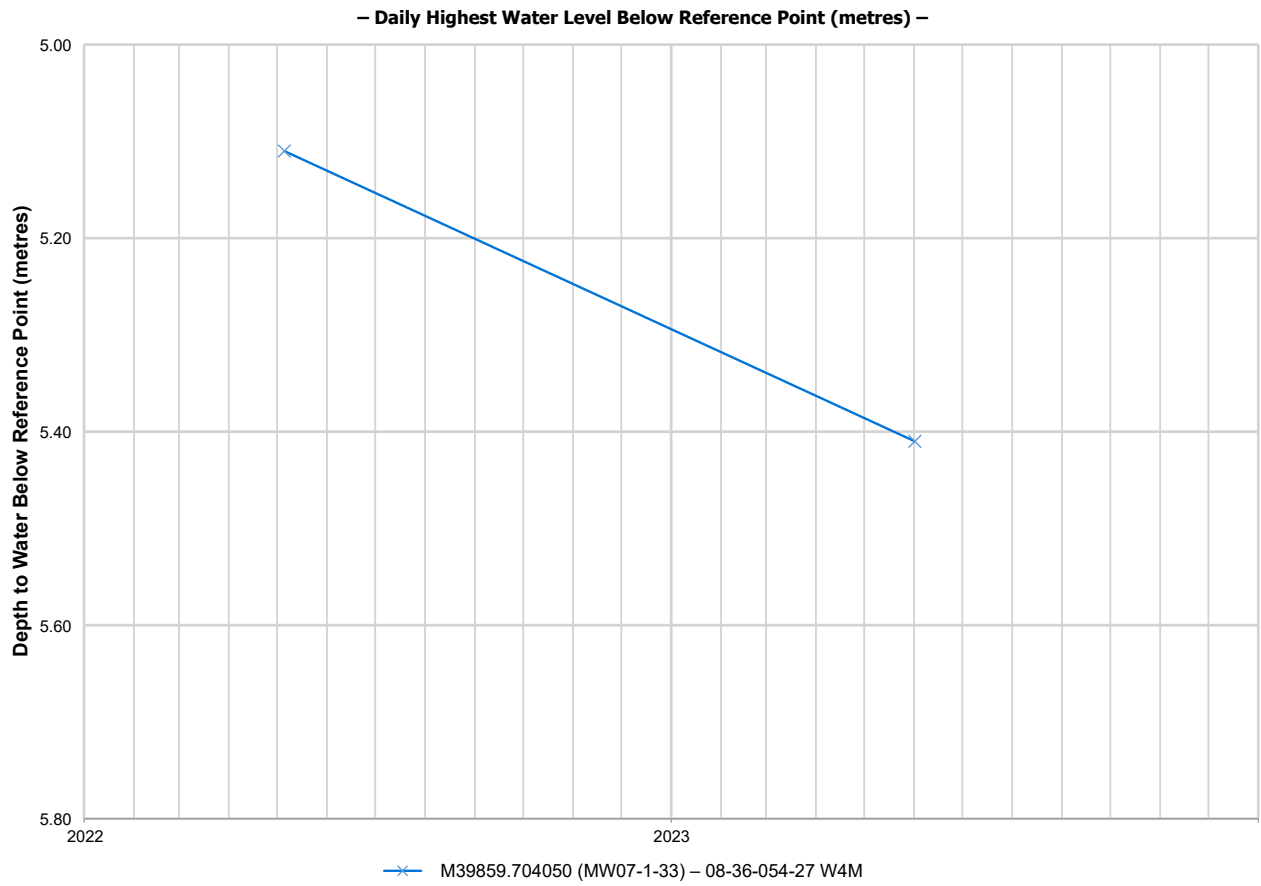
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

MW07-1-33  
2022 - 2023 Hydrograph



## MW07-2-14

**01-35-054-27 W4M**  
(M39859.704048)



**Well Spatial Location:**

**Easting: 75,121**

**Northing: 5,948,549**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

**Ground Elevation AMSL (m): 671**

*(elevation accuracy HCL DEM)*

**Date Completed: July 24, 2007**

**Depth Drilled (m): 14.3**

**Completion Interval (m): 11.6 – 13.7 \***

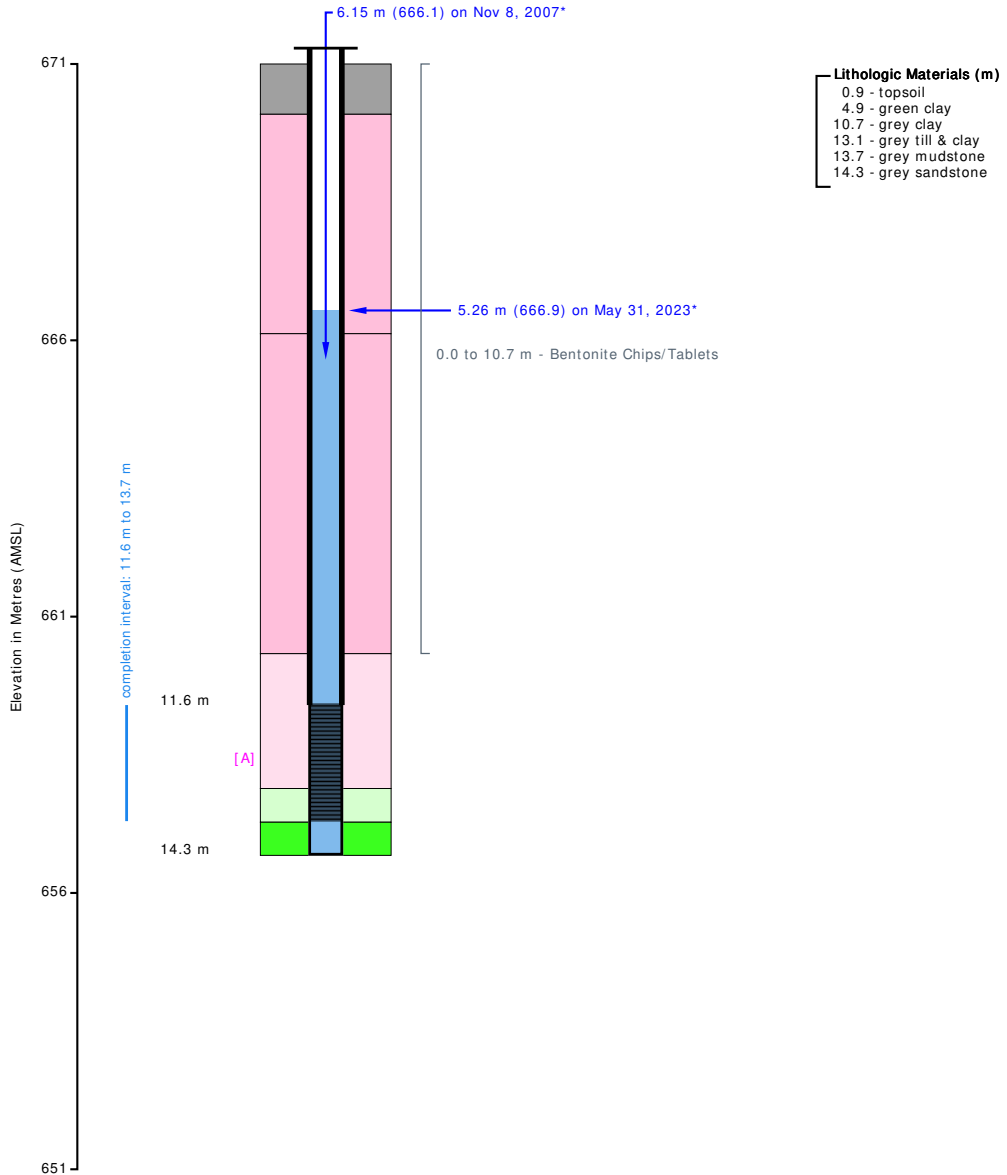
*(\* TGWC determined value)*

**Earliest Water Level (m): 6.15 – November 8, 2007**

**Most Recent Water Level (m): 5.26 – May 31, 2023 @ 13:22**

**GIC ID: 1420665**

# MW07-2-14 Water Well Diagram



Lithology Legend			Geologic Unit Legend (Top) - Regional Analysis	
Surficial		Unsorted		Fine Grained
		Fine Grained		
		Coarse Grained		Coarse Grained
	Fine Grained			
Bedrock		Fine Grained		Coarse Grained
		Coarse Grained		
		Other		

Geologic Unit details not available for this location

### Summary

TGWC ID: M39859.704048  
 Well Name: MW07-2-14  
 Legal Location: 01-35-054-27 W4M  
 Casing (OD): 50.8 mm; Plastic (2.0")  
 Screen (OD): 50.8 mm; Plastic (2.0")  
 Casing Stick-Up: 0.8 m (not drawn to scale)  
 Completion [A]: 11.6 to 13.7 m; Screened  
 Water Level (recent): 5.26 m (666.9 m AMSL) on May 31, 2023 @ 13:22 - Reference Point: Top of Casing  
 Water Level (oldest): 6.15 m (666.1 m AMSL) on Nov 8, 2007 - Reference Point: Top of Casing  
 Top of Liner assumed to be 5% of 'non-cased' interval.

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:50 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.



Owner: **Sturgeon County**  
 9613-100 St, Morinville, AB T8R 1L9

Contractor: **Lakeland Drilling Ltd.**  
 Name: **MW07-2-14**

Field Action: **Confirmed - Physically, July 13, 2009**

Work Type: **Piezometer** Date Started: **July 24, 2007**

Drilling Method: **Rotary** Date Completed: **July 24, 2007**

Proposed Use: **Monitoring** Well Status: **Observation**

Completion Type: **Screen** Feature Class: **Piezometer**

### METRIC REPORT

01-35-054-27 W4M

Easting (m): **75,120.54\*\***  
 Northing (m): **5,948,549.20\*\***  
 Elevation (m): **671\*\*\***

Lot:  
 Block:  
 Plan:

**M39859.704048**

513351; core

Elog Taken: **No**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.8**

Presence of Gas: **No**

#### General Details core

Depth Completed (m)\*: **13.7** Top of Bedrock: **Surficial Water Well \***  
 Depth Drilled (m): **14.3** Completion Interval (m): **11.6 – 13.7 \***

Most Recent Water Level (m): **5.26 m – May 31, 2023**

#### Completion Details

Surface Casing: **Plastic – 50.8 mm (O.D.) x 5.50 mm (thick) x 11.6 m (bottom)**

Screen Material: **Plastic – 50.8 mm (O.D.) (Attached To Casing)**

Fittings: **Top: Coupler – Bottom: Plug**

#### Intervals

Screen: **11.6 to 13.7 m - 0.05 cm ([unknown])**

Bentonite Chips/Tables: **0.0 to 10.7 m**

#### Lithology Details

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
670.5	0.9	Topsoil
666.5	4.9	Green Clay
660.7	10.7	Grey Clay
658.3	13.1	Grey Till & Clay
657.7	13.7	Grey Mudstone
657.1	14.3	Grey Sandstone

#### Chemistry Summary Details (mg/L, except as noted) (recently sampled first)

Sampling Details: **May 31, 2023 @ 13:45**

Report Date: **June 12, 2023 - Element Materials Technology Canada Inc. (1655888-3)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	<b>1040</b>	Nitrate as N:	<b>&lt; 0.01</b>	Turbidity (NTU):	<b>25.1</b>
Total Dissolved Solids:	<b>685</b>	Nitrite as N:	<b>&lt; 0.005</b>	Fluoride:	<b>0.09</b>
Hardness (as CaCO3):	<b>402</b>	pH (pH Unit):	<b>7.51</b>	Carbonate:	<b>&lt; 6</b>
T-Alkalinity (as CaCO3):	<b>387</b>	Colour (TCU):	<b>55</b>	Bicarbonate:	<b>472</b>
P-Alkalinity (as CaCO3):	<b>&lt; 5</b>	Ion Balance (%):	<b>101</b>	Hydroxide:	<b>&lt; 5</b>
Nitrate + Nitrite as N:	<b>&lt; 0.01</b>	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	<b>21.0</b>	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	<b>115</b>		Mercury:	<b>&lt; 0.000005</b>	
Chloride:	<b>1.8</b>		Molybdenum:	<b>&lt; 0.001</b>	
Iron:	<b>2.69</b>		Magnesium:	<b>28.2</b>	
Manganese:	<b>0.889***</b>		Sodium:	<b>92.4</b>	
Aluminum:	<b>&lt; 0.002</b>		Potassium:	<b>4.0</b>	
Arsenic:	<b>0.0107***</b>		Vanadium:	<b>&lt; 0.0001</b>	
Barium:	<b>0.018</b>		Strontium:	<b>0.808</b>	
Beryllium:	<b>&lt; 0.0001</b>		Nickel:	<b>0.0007</b>	
Cadmium:	<b>&lt; 0.00001</b>		Zinc:	<b>0.002</b>	
Chromium:	<b>&lt; 0.0005</b>		Copper:	<b>&lt; 0.0002</b>	
Cobalt:	<b>0.0007</b>		Lead:	<b>&lt; 0.0001</b>	
Sulfate:	<b>212</b>		Uranium:	<b>0.0037</b>	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Saftey Branch. Health Canada, Ottawa, Ontario.

513351; 1 / 26

#### Comments & Observations

#### Aquifer Tests

#### Alias IDs

GIC ID: **1420665**  
 GIC (WellReportId): **11427102**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM — {Ground; AMSL}

Created on: August 25, 2023 — Data "AS IS"; no warranty either expressed or implied. [53.701658 -113.861631 (WGS 84)], INT Date End: 2023-06-02

MW07-2-14  
 AEPA - Water Well Drilling Report



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 1420665  
 GoA Well Tag No.  
 Drilling Company Well ID  
 Date Report Received

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric
<b>Owner Name</b> STANTEC		Address 10160 - 112 ST			Town EDMONTON		Province AB	Country CA	Postal Code T5K 2L6	
<b>Location</b>	1/4 or LSD SE	SEC 35	TWP 54	RGE 27	W of MER 4	Lot	Block	Plan	Additional Description WELL # 07-2-14	
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>			Elevation _____ m		
_____ m from _____					Latitude <u>53.705200</u> Longitude <u>-113.867000</u>			How Elevation Obtained _____		
_____ m from _____					How Location Obtained _____			Not Obtained		
					Not Verified					

Drilling Information	
<b>Method of Drilling</b> Rotary	<b>Type of Work</b> Piezometer
<b>Proposed Well Use</b> Observation	

Formation Log			Measurement in Metric
Depth from ground level (m)	Water Bearing	Lithology Description	
0.91		Topsoil	
4.88		Green Clay	
10.67		Gray Clay	
13.11		Gray Till & Clay	
13.72		Gray Mudstone	
14.33		Gray Sandstone	

Yield Test Summary			Measurement in Metric
Recommended Pump Rate _____ L/min			
Test Date	Water Removal Rate (L/min)	Static Water Level (m)	
2007/07/24			

Well Completion				Measurement in Metric
Total Depth Drilled	Finished Well Depth	Start Date	End Date	
14.33 m		2007/07/24	2007/07/24	
<b>Borehole</b>				
Diameter (cm)	From (m)	To (m)		
15.88	0.00	14.33		
<b>Surface Casing (if applicable)</b>		<b>Well Casing/Liner</b>		
Plastic		Unknown		
Size OD :	5.08 cm	Size OD :	_____ cm	
Wall Thickness :	0.554 cm	Wall Thickness :	_____ cm	
Bottom at :	11.58 m	Top at :	_____ m	
		Bottom at :	_____ m	
<b>Perforations</b>				
From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)
Perforated by Unknown				
<b>Annular Seal</b> Bentonite Chips/Tablets				
Placed from 0.00 m to 10.67 m				
Amount _____				
<b>Other Seals</b>				
Type		At (m)		
<b>Screen Type</b> Plastic				
Size OD : 5.08 cm				
From (m)	To (m)	Slot Size (cm)		
11.58	13.72	0.051		
Attachment Attached To Casing				
Top Fittings Coupler		Bottom Fittings Plug		
<b>Pack</b>				
Type Artificial		Grain Size 10-20		
Amount 4.00 Bags				

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well LEONARD MUDRYK	Certification No 28916A
Company Name LAKELAND DRILLING LTD.	Copy of Well report provided to owner Date approval holder signed



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 1420665  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric
<b>Owner Name</b> STANTEC		<b>Address</b> 10160 - 112 ST			<b>Town</b> EDMONTON		<b>Province</b> AB	<b>Country</b> CA	<b>Postal Code</b> T5K 2L6	
<b>Location</b>	<b>1/4 or LSD</b> SE	<b>SEC</b> 35	<b>TWP</b> 54	<b>RGE</b> 27	<b>W of MER</b> 4	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b> WELL # 07-2-14	
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>					
_____ m from					Latitude <u>53.705200</u> Longitude <u>-113.867000</u>					Elevation _____ m
_____ m from					How Location Obtained					How Elevation Obtained
					Not Verified					Not Obtained

Additional Information										Measurement in Metric
Distance From Top of Casing to Ground Level _____					76.20 cm					
Is Artesian Flow _____					Is Flow Control Installed _____					
Rate _____ L/min					Describe _____					
Recommended Pump Rate _____ L/min					Pump Installed _____					Depth _____ m
Recommended Pump Intake Depth (From TOC) _____ m					Type _____					Make _____ H.P. _____
					Model (Output Rating) _____					
Did you Encounter Saline Water (>4000 ppm TDS) _____					Depth _____ m					Well Disinfected Upon Completion _____
Remedial Action Taken _____					Gas _____					Depth _____ m
					Geophysical Log Taken _____					Submitted to ESRD _____
Additional Comments on Well					Sample Collected for Potability _____					Submitted to ESRD _____
PROPOSED WELL USE - PIEZOMETER										

Yield Test			Taken From Ground Level	Measurement in Metric
<b>Test Date</b> 2007/07/24	<b>Start Time</b> 12:00 AM	<b>Static Water Level</b> _____ m	<b>Depth to water level</b>	
			Pumping (m)	Recovery (m)
			Elapsed Time Minutes:Sec	
<b>Method of Water Removal</b>				
Type <u>Unknown</u>				
Removal Rate _____ L/min				
Depth Withdrawn From _____ m				
If water removal period was < 2 hours, explain why				

Water Diverted for Drilling		
<b>Water Source</b>	<b>Amount Taken</b>	<b>Diversion Date &amp; Time</b>
	L	

Contractor Certification	
<b>Name of Journeyman responsible for drilling/construction of well</b> LEONARD MUDRYK	<b>Certification No</b> 28916A
<b>Company Name</b> LAKELAND DRILLING LTD.	<b>Copy of Well report provided to owner</b> _____ <b>Date approval holder signed</b> _____

**MW07-2-14**  
**Chemical Analysis Results (June 12, 2023)**



Element  
 7217 Roper Road NW  
 Edmonton, Alberta  
 T6B 3J4, Canada

T: +1 (780) 438-5522  
 F: +1 (780) 434-8586  
 E: info.Edmonton@element.com  
 W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880309
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-3
<b>Sample Date</b>	May 31, 2023
<b>Sample Time</b>	13:45
<b>Sample Location</b>	M39859.704048
<b>Sample Description</b>	MW07-2-14 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Metals Dissolved</b>					
Silicon	Dissolved mg/L	7.65	0.05		
Sulfur	Dissolved mg/L	70.6	0.3		
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC
Arsenic	Dissolved mg/L	0.0107	0.0002	0.01	Above MAC
Barium	Dissolved mg/L	0.018	0.001	2.0	Below MAC
Beryllium	Dissolved mg/L	<0.0001	0.0001		
Bismuth	Dissolved mg/L	<0.0005	0.0005		
Boron	Dissolved mg/L	0.099	0.002	5	Below MAC
Cadmium	Dissolved mg/L	<0.00001	0.00001	0.007	Below MAC
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC
Cobalt	Dissolved mg/L	0.0007	0.0001		
Copper	Dissolved mg/L	<0.0002	0.0002	1 AO; 2 MAC	Below AO
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC
Lithium	Dissolved mg/L	0.117	0.001		
Molybdenum	Dissolved mg/L	<0.001	0.001		
Nickel	Dissolved mg/L	0.0007	0.0005		
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC
Silver	Dissolved mg/L	<0.00001	0.00001		
Strontium	Dissolved mg/L	0.808	0.001	7.0	Below MAC
Thallium	Dissolved mg/L	<0.00005	0.00005		
Tin	Dissolved mg/L	<0.001	0.001		
Titanium	Dissolved mg/L	<0.0005	0.0005		
Uranium	Dissolved mg/L	0.0037	0.0005	0.02	Below MAC
Vanadium	Dissolved mg/L	<0.0001	0.0001		
Zinc	Dissolved mg/L	0.002	0.001	5	Below AO
Subsample		Field Filtered			
<b>Physical and Aggregate Properties</b>					
Colour	Apparent, Potable	Colour units	55	5	15 Above AO
Turbidity		NTU	25.1	0.1	0.1/0.3/1.0 OG
<b>Routine Water</b>					
pH			7.51	1	7.0-10.5 Within OG Range
Temperature of observed pH		°C	21.0		
Electrical Conductivity	at 25 °C	µS/cm	1040	1	
Calcium	Dissolved	mg/L	115	0.2	
Magnesium	Dissolved	mg/L	28.2	0.2	
Sodium	Dissolved	mg/L	92.4	0.4	200 Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880309
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-3
<b>Sample Date</b>	May 31, 2023
<b>Sample Time</b>	13:45
<b>Sample Location</b>	M39859.704048
<b>Sample Description</b>	MW07-2-14 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved	mg/L	4.0	0.4	
Iron	Dissolved	mg/L	2.69	0.01	0.3 Above AO
Manganese	Dissolved	mg/L	0.889	0.005	0.02 AO; 0.12 MAC Above MAC
Chloride	Dissolved	mg/L	1.8	0.4	250 Below AO
Fluoride		mg/L	0.09	0.05	1.5 Below MAC
Nitrate - N		mg/L	<0.01	0.01	10 Below MAC
Nitrite - N		mg/L	<0.005	0.005	1 Below MAC
Nitrate and Nitrite - N		mg/L	<0.01	0.01	10 Below MAC
Sulfate (SO4)	Dissolved	mg/L	212	0.9	500 Below AO
Hydroxide		mg/L	<5		
Carbonate		mg/L	<6		
Bicarbonate		mg/L	472		
P-Alkalinity	as CaCO3	mg/L	<5	5	
T-Alkalinity	as CaCO3	mg/L	387	5	
Total Dissolved Solids	Calculated	mg/L	685	1	500 Above AO
Hardness	Dissolved as CaCO3	mg/L	402		
Ionic Balance	Dissolved	%	101		

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880309
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

**Metals Dissolved**

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880309
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880309
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Sulfur	mg/L	1.0	1.1	10	0.1	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	1.1	1.1	10	0.4	yes
Barium	µg/L	48	48	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	109	110	10	4	yes
Cadmium	µg/L	<0.01	<0.01	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.2	1.2	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	71	71	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.9	1.1	10	1.1	yes
Selenium	µg/L	<0.2	<0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	953	947	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.7	3.6	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes

Date Acquired: June 07, 2023

Turbidity	NTU	0.115	0.0	0.1	yes
-----------	-----	-------	-----	-----	-----

Date Acquired: June 07, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes

Date Acquired: June 07, 2023

Turbidity	NTU	5200	4441.7	6661.7	yes
-----------	-----	------	--------	--------	-----

Date Acquired: June 07, 2023



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880309
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	1.4	1.3	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.91	9.39	10.59	yes
Nitrate - N	mg/L	9.88	9.03	11.13	yes
Nitrite - N	mg/L	9.83	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880309
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Iron	mg/L	9.77	9.38	10.16	yes
Manganese	mg/L	2.40	2.320	2.560	yes
Date Acquired: June 09, 2023					
pH		6.88	6.79	6.97	yes
Temperature of observed	°C	20.9	15.5	24.5	yes
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes
P-Alkalinity	mg/L	56	28	72	yes
T-Alkalinity	mg/L	127	114	140	yes
Chloride	mg/L	84.1	74.9	86.9	yes
Fluoride	mg/L	4.82	4.56	5.22	yes
Nitrate - N	mg/L	4.69	4.37	5.33	yes
Nitrite - N	mg/L	4.82	4.370	5.330	yes
Nitrate and Nitrite - N	mg/L	9.51	8.80	10.60	yes
Calcium	mg/L	51.2	44.9	56.9	yes
Magnesium	mg/L	20.1	17.9	22.0	yes
Sodium	mg/L	51.6	47.3	52.7	yes
Potassium	mg/L	50.0	45.8	55.8	yes
Iron	mg/L	2.02	1.90	2.08	yes
Manganese	mg/L	0.499	0.468	0.552	yes
Date Acquired: June 09, 2023					
Chloride	mg/L	15.0	13.3	16.5	yes
Fluoride	mg/L	0.50	0.45	0.57	yes
Nitrate - N	mg/L	0.52	0.42	0.57	yes
Nitrite - N	mg/L	0.506	0.455	0.557	yes
Nitrate and Nitrite - N	mg/L	1.02	0.85	1.15	yes
Calcium	mg/L	5.0	4.7	5.4	yes
Magnesium	mg/L	2.0	1.9	2.2	yes
Sodium	mg/L	4.9	4.7	5.7	yes
Potassium	mg/L	5.0	4.6	5.6	yes
Iron	mg/L	0.19	0.18	0.22	yes
Manganese	mg/L	0.048	0.046	0.057	yes
Date Acquired: June 09, 2023					

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	56.8	57.1	10	0.5	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes
Nitrate - N	mg/L	0.02	0.02	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880309
--	---	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	29.6	29.3	10	0.6	yes
Magnesium	mg/L	9.1	9.0	10	0.7	yes
Sodium	mg/L	2.9	2.8	10	1.2	yes
Potassium	mg/L	1.0	1.0	10	1.2	yes
Iron	mg/L	0.18	0.18	10	0.05	yes
Manganese	mg/L	<0.005	<0.005	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880309
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-3; 8663470: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880309
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

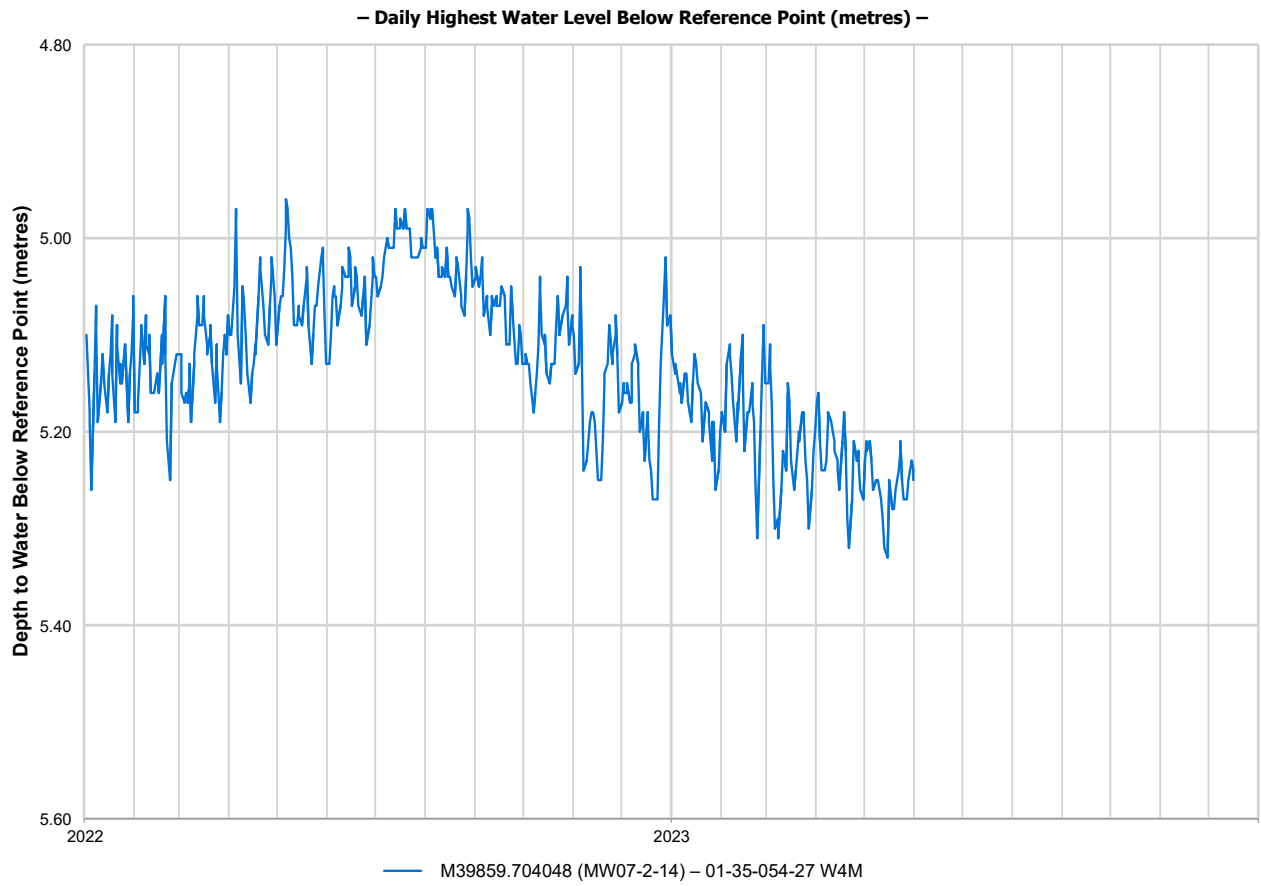
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

MW07-2-14  
2022 - 2023 Hydrograph



## MW07-3-33

07-31-054-26 W4M  
(M39859.704049)



Photograph taken on May 30, 2011

### Well Spatial Location:

Easting: **77,948**

Northing: **5,949,095**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **666**

*(elevation accuracy HCL DEM)*

Date Completed: **July 26, 2006**

Depth Drilled (m): **35.7**

Completion Interval (m): **27.1 – 33.2 \***

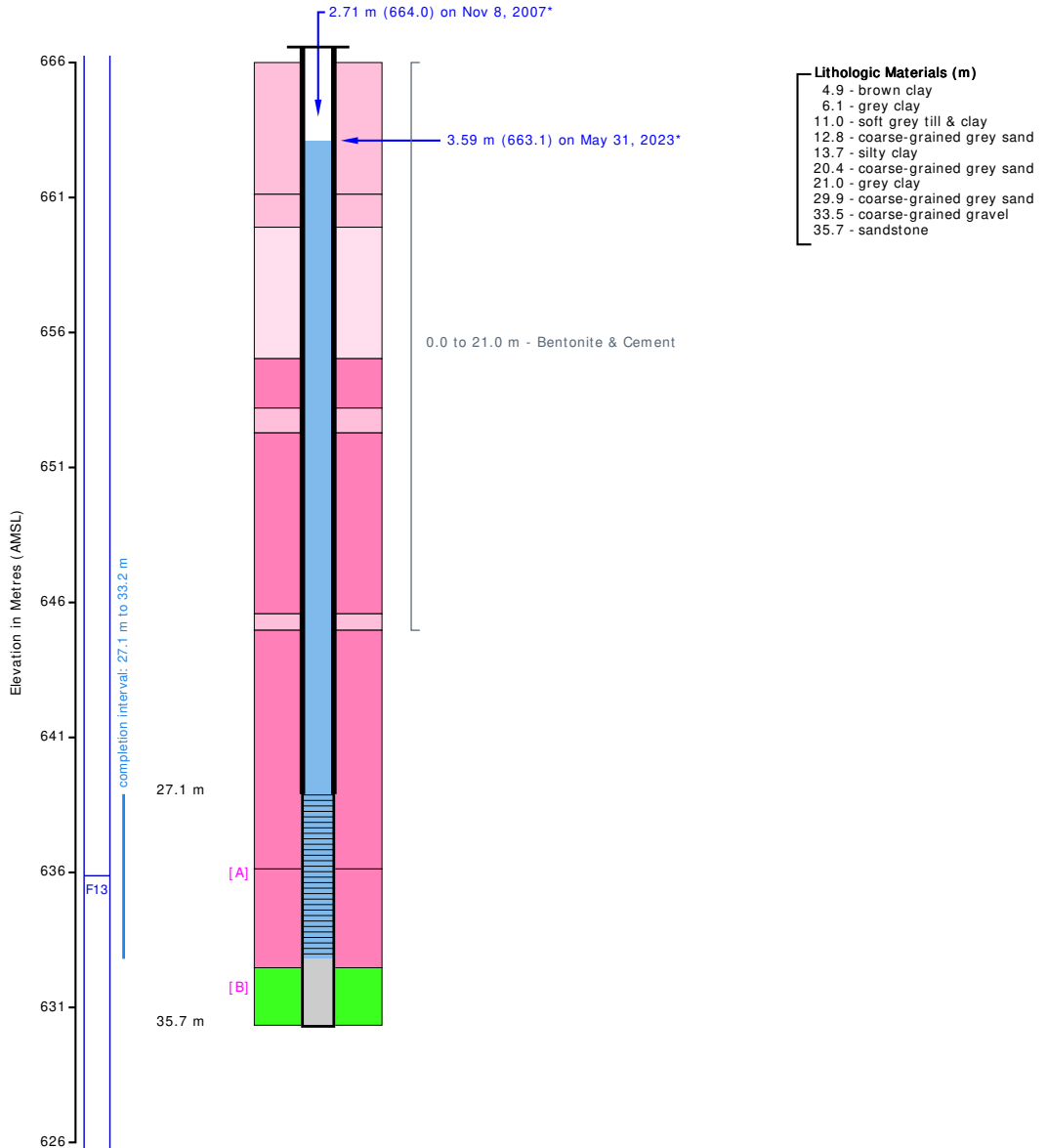
*(\* TGWC determined value)*

Earliest Water Level (m): **2.71 – November 8, 2007**

Most Recent Water Level (m): **3.59 – May 31, 2023 @ 14:36**

GIC ID: **1420666**

# MW07-3-33 Water Well Diagram



- Lithologic Materials (m)**
- 4.9 - brown clay
  - 6.1 - grey clay
  - 11.0 - soft grey till & clay
  - 12.8 - coarse-grained grey sand
  - 13.7 - silty clay
  - 20.4 - coarse-grained grey sand
  - 21.0 - grey clay
  - 29.9 - coarse-grained grey sand
  - 33.5 - coarse-grained gravel
  - 35.7 - sandstone

Lithology Legend			Geologic Unit Legend (Top) - Regional Analysis		
Surficial		Unsorted	Bedrock		F13 - Lower Horseshoe Canyon Formation
		Fine Grained			
		Coarse Grained			
		Fine Grained			
		Coarse Grained			
				Other	

**Summary**

TGWC ID: M39859.704049  
 Well Name: MW07-3-33  
 Legal Location: 07-31-054-26 W4M  
 Casing (OD): 50.8 mm; Plastic (2.0")  
 Screen (OD): 50.8 mm; Plastic (2.0")  
 Casing Stick-Up: 0.7 m (not drawn to scale)  
 Completion [A]: 27.1 to 33.2 m; Screened  
 Construction [B]: 33.2 to 35.7 m; Plugged; Unknown  
 Water Level (recent): 3.59 m (663.1 m AMSL) on May 31, 2023 @ 14:36 - Reference Point: Top of Casing  
 Water Level (oldest): 2.71 m (664.0 m AMSL) on Nov 8, 2007 - Reference Point: Top of Casing  
 Top of Liner assumed to be 5% of 'non-cased' interval.

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:50 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.



Owner: **Sturgeon County**  
**9613-100 St, Morinville, AB T8R 1L9**

Contractor: **Lakeland Drilling Ltd.**  
 Name: **MW07-3-33**

Field Action: **Confirmed - Physically, July 13, 2009**

Work Type: **Piezometer** Date Started: **July 26, 2006**

Drilling Method: **Rotary** Date Completed: **July 26, 2006**

Proposed Use: **Monitoring** Well Status: **Observation**

Completion Type: **Screen** Feature Class: **Piezometer**

### METRIC REPORT

07-31-054-26 W4M

Easting (m): **77,947.78\*\***  
 Northing (m): **5,949,094.52\*\***  
 Elevation (m): **666\*\*\***

Lot:  
 Block:  
 Plan:

**M39859.704049**

513354; core

Elog Taken: **No**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.7**

Presence of Gas: **No**

#### General Details core

Depth Completed (m)\*: **33.2** Top of Bedrock: **Surficial Water Well \***  
 Depth Drilled (m): **35.7** Completion Interval (m): **27.1 – 33.2 \***

Sand & Gravel Thickness (m): **21.0 (total) – 17.9 (below 15 m) \***

Plugged / Backfilled (m): **33.2 – 35.7 (Unknown)**

Most Recent Water Level (m): **3.59 m – May 31, 2023**

#### Completion Details

Surface Casing: **Plastic – 50.8 mm (O.D.) x 5.50 mm (thick) x 27.1 m (bottom)**

Screen Material: **Plastic – 50.8 mm (O.D.) (Attached To Casing)**

Fittings: **Top: Coupler – Bottom: Plug**

#### Intervals

Screen: **27.1 to 33.2 m - 0.05 cm ([unknown])**

Bentonite & Cement: **0.0 to 21.0 m**

#### Lithology Details

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
661.1	4.9	Brown Clay
659.9	6.1	Grey Clay
655.0	11.0	Soft Grey Till & Clay
653.2	12.8	Coarse-Grained Grey Sand
652.3	13.7	Silty Clay
645.6	20.4	Coarse-Grained Grey Sand
645.0	21.0	Grey Clay
636.1	29.9	Coarse-Grained Grey Sand
632.5	33.5	Coarse-Grained Gravel
630.3	35.7	Sandstone

#### Chemistry Summary Details (mg/L, except as noted) (recently sampled first)

Sampling Details: **May 31, 2023 @ 14:55**

Report Date: **June 12, 2023 - Element Materials Technology Canada Inc. (1655888-6)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	937	Nitrate as N:	< 0.01	Turbidity (NTU):	20.1
Total Dissolved Solids:	574	Nitrite as N:	< 0.005	Fluoride:	0.15
Hardness (as CaCO3):	391	pH (pH Unit):	7.54	Carbonate:	< 6
T-Alkalinity (as CaCO3):	484	Colour (TCU):	30	Bicarbonate:	590
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	100	Hydroxide:	< 5
Nitrate + Nitrite as N:	< 0.01	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.0	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	108		Mercury:	< 0.000005	
Chloride:	< 0.4		Molybdenum:	< 0.001	
Iron:	1.75		Magnesium:	29.2	
Manganese:	0.945***		Sodium:	72.0	
Aluminum:	< 0.002		Potassium:	3.6	
Arsenic:	0.0040		Vanadium:	< 0.0001	
Barium:	0.045		Strontium:	0.687	
Beryllium:	< 0.0001		Nickel:	0.0021	
Cadmium:	< 0.00001		Zinc:	< 0.001	
Chromium:	< 0.0005		Copper:	< 0.0002	
Cobalt:	0.0006		Lead:	< 0.0001	
Sulfate:	70.5		Uranium:	0.0037	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Saftey Branch. Health Canada, Ottawa, Ontario.

513354; 1 / 26

#### Comments & Observations

#### Aquifer Tests

#### Alias IDs

GIC ID: **1420666**  
 GIC (WellReportId): **11427112**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM — {Ground; AMSL}

Created on: August 25, 2023 — Data "AS IS"; no warranty either expressed or implied. [53.706146 -113.818660 (WGS 84)], INT Date End: 2023-06-02

**MW07-3-33**  
**AEPA - Water Well Drilling Report**



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 1420666  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b> STANTEC		<b>Address</b> 10160 - 112 ST			<b>Town</b> EDMONTON		<b>Province</b> AB	<b>Country</b> CA	<b>Postal Code</b> T5K 2L6		
<b>Location</b>	<b>1/4 or LSD</b> SE	<b>SEC</b> 36	<b>TWP</b> 54	<b>RGE</b> 27	<b>W of MER</b> 4	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b> WELL # 07-3-33		
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>						
_____ m from _____					Latitude <u>53.705300</u> Longitude <u>-113.843000</u>					Elevation _____ m	
_____ m from _____					How Location Obtained					How Elevation Obtained	
					Not Verified					Not Obtained	

Drilling Information	
<b>Method of Drilling</b> Rotary	<b>Type of Work</b> Piezometer
<b>Proposed Well Use</b> Observation	

Formation Log			Measurement in Metric
Depth from ground level (m)	Water Bearing	Lithology Description	
4.88		Brown Clay	
6.10		Gray Clay	
10.97		Gray Soft Till & Clay	
12.80		Gray Coarse Grained Sand	
13.72		Silty Clay	
20.42		Gray Coarse Grained Sand	
21.03		Gray Clay	
29.87		Gray Coarse Grained Sand	
33.53		Coarse Grained Gravel	
35.66		Sandstone	

Yield Test Summary			Measurement in Metric
<b>Recommended Pump Rate</b> _____ L/min			
<b>Test Date</b>	<b>Water Removal Rate (L/min)</b>	<b>Static Water Level (m)</b>	
2006/07/26			

Well Completion				Measurement in Metric
<b>Total Depth Drilled</b>	<b>Finished Well Depth</b>	<b>Start Date</b>	<b>End Date</b>	
35.66 m		2006/07/26	2006/07/26	
<b>Borehole</b>				
<b>Diameter (cm)</b>	<b>From (m)</b>	<b>To (m)</b>		
15.88	0.00	35.66		
<b>Surface Casing (if applicable)</b>		<b>Well Casing/Liner</b>		
Plastic		Unknown		
<b>Size OD :</b> 5.08 cm		<b>Size OD :</b> _____ cm		
<b>Wall Thickness :</b> 0.554 cm		<b>Wall Thickness :</b> _____ cm		
<b>Bottom at :</b> 27.13 m		<b>Top at :</b> _____ m		
		<b>Bottom at :</b> _____ m		
<b>Perforations</b>				
<b>From (m)</b>	<b>To (m)</b>	<b>Diameter or Slot Width (cm)</b>	<b>Slot Length (cm)</b>	<b>Hole or Slot Interval(cm)</b>
Perforated by Unknown				
<b>Annular Seal</b> Bentonite & Cement				
Placed from 0.00 m to 21.03 m				
Amount _____				
<b>Other Seals</b>				
Type		At (m)		
<b>Screen Type</b> Plastic				
<b>Size OD :</b> 5.08 cm				
<b>From (m)</b>	<b>To (m)</b>	<b>Slot Size (cm)</b>		
27.13	33.22	0.051		
Attachment Attached To Casing				
Top Fittings Coupler		Bottom Fittings Plug		
<b>Pack</b>				
Type Artificial		Grain Size 10-20		
Amount 42.00 Bags				

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well LEONARD MUDRYK	Certification No 28916A
Company Name LAKELAND DRILLING LTD.	Copy of Well report provided to owner Date approval holder signed



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 1420666  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b> STANTEC		<b>Address</b> 10160 - 112 ST			<b>Town</b> EDMONTON		<b>Province</b> AB	<b>Country</b> CA	<b>Postal Code</b> T5K 2L6		
<b>Location</b>	<b>1/4 or LSD</b> SE	<b>SEC</b> 36	<b>TWP</b> 54	<b>RGE</b> 27	<b>W of MER</b> 4	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b> WELL # 07-3-33		
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>						
_____ m from					Latitude <u>53.705300</u> Longitude <u>-113.843000</u>					Elevation _____ m	
_____ m from					How Location Obtained					How Elevation Obtained	
					Not Verified					Not Obtained	

Additional Information										Measurement in Metric
<b>Distance From Top of Casing to Ground Level</b> _____ <b>76.20 cm</b>										
<b>Is Artesian Flow</b> _____					<b>Is Flow Control Installed</b> _____					
<b>Rate</b> _____ <b>L/min</b>					<b>Describe</b> _____					
<b>Recommended Pump Rate</b> _____ <b>L/min</b>					<b>Pump Installed</b> _____		<b>Depth</b> _____ <b>m</b>			
<b>Recommended Pump Intake Depth (From TOC)</b> _____ <b>m</b>					<b>Type</b> _____	<b>Make</b> _____	<b>H.P.</b> _____	<b>Model (Output Rating)</b> _____		
<b>Did you Encounter Saline Water (&gt;4000 ppm TDS)</b> _____					<b>Depth</b> _____ <b>m</b>		<b>Well Disinfected Upon Completion</b> _____			
<b>Remedial Action Taken:</b>					<b>Gas</b> _____	<b>Depth</b> _____ <b>m</b>	<b>Geophysical Log Taken</b> _____			
					<b>Submitted to ESRD</b> _____					
<b>Additional Comments on Well</b>					<b>Sample Collected for Potability</b> _____			<b>Submitted to ESRD</b> _____		
PROPOSED WELL USE - PIEZOMETER										

Yield Test			Taken From Ground Level		Measurement in Metric
			<i>Depth to water level</i>		
<b>Test Date</b> 2006/07/26	<b>Start Time</b> 12:00 AM	<b>Static Water Level</b> _____ <b>m</b>			
			<b>Pumping (m)</b>	<b>Elapsed Time</b> Minutes:Sec	<b>Recovery (m)</b>
<b>Method of Water Removal</b>					
<b>Type</b> <u>Unknown</u>					
<b>Removal Rate</b> _____ <b>L/min</b>					
<b>Depth Withdrawn From</b> _____ <b>m</b>					
If water removal period was < 2 hours, explain why					

Water Diverted for Drilling		
<b>Water Source</b>	<b>Amount Taken</b> _____ <b>L</b>	<b>Diversion Date &amp; Time</b>

Contractor Certification	
<b>Name of Journeyman responsible for drilling/construction of well</b> LEONARD MUDRYK	<b>Certification No</b> 28916A
<b>Company Name</b> LAKELAND DRILLING LTD.	<b>Copy of Well report provided to owner</b> _____ <b>Date approval holder signed</b> _____

**MW07-3-33**  
**Chemical Analysis Results (June 12, 2023)**



Element  
 7217 Roper Road NW  
 Edmonton, Alberta  
 T6B 3J4, Canada

T: +1 (780) 438-5522  
 F: +1 (780) 434-8586  
 E: info.Edmonton@element.com  
 W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707 P.O.: Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880312
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

<b>Reference Number</b>	1655888-6
<b>Sample Date</b>	May 31, 2023
<b>Sample Time</b>	14:55
<b>Sample Location</b>	M39859.704049
<b>Sample Description</b>	MW07-3-33 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Metals Dissolved</b>					
Silicon	Dissolved mg/L	6.83	0.05		
Sulfur	Dissolved mg/L	23.5	0.3		
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC
Arsenic	Dissolved mg/L	0.0040	0.0002	0.01	Below MAC
Barium	Dissolved mg/L	0.045	0.001	2.0	Below MAC
Beryllium	Dissolved mg/L	<0.0001	0.0001		
Bismuth	Dissolved mg/L	<0.0005	0.0005		
Boron	Dissolved mg/L	0.097	0.002	5	Below MAC
Cadmium	Dissolved mg/L	<0.00001	0.00001	0.007	Below MAC
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC
Cobalt	Dissolved mg/L	0.0006	0.0001		
Copper	Dissolved mg/L	<0.0002	0.0002	1 AO; 2 MAC	Below AO
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC
Lithium	Dissolved mg/L	0.080	0.001		
Molybdenum	Dissolved mg/L	<0.001	0.001		
Nickel	Dissolved mg/L	0.0021	0.0005		
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC
Silver	Dissolved mg/L	<0.00001	0.00001		
Strontium	Dissolved mg/L	0.687	0.001	7.0	Below MAC
Thallium	Dissolved mg/L	<0.00005	0.00005		
Tin	Dissolved mg/L	<0.001	0.001		
Titanium	Dissolved mg/L	<0.0005	0.0005		
Uranium	Dissolved mg/L	0.0037	0.0005	0.02	Below MAC
Vanadium	Dissolved mg/L	<0.0001	0.0001		
Zinc	Dissolved mg/L	<0.001	0.001	5	Below AO
Subsample		Field Filtered			
<b>Physical and Aggregate Properties</b>					
Colour	Apparent, Potable	Colour units	30	5	15 Above AO
Turbidity		NTU	20.1	0.1	0.1/0.3/1.0 OG
<b>Routine Water</b>					
pH			7.54	1	7.0-10.5 Within OG Range
Temperature of observed pH		°C	21.0		
Electrical Conductivity	at 25 °C	µS/cm	937	1	
Calcium	Dissolved	mg/L	108	0.2	
Magnesium	Dissolved	mg/L	29.2	0.2	
Sodium	Dissolved	mg/L	72.0	0.4	200 Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880312
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-6
<b>Sample Date</b>	May 31, 2023
<b>Sample Time</b>	14:55
<b>Sample Location</b>	M39859.704049
<b>Sample Description</b>	MW07-3-33 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved	mg/L	3.6	0.4	
Iron	Dissolved	mg/L	1.75	0.01	0.3 Above AO
Manganese	Dissolved	mg/L	0.945	0.005	0.02 AO; 0.12 MAC Above MAC
Chloride	Dissolved	mg/L	<0.4	0.4	250 Below AO
Fluoride		mg/L	0.15	0.05	1.5 Below MAC
Nitrate - N		mg/L	<0.01	0.01	10 Below MAC
Nitrite - N		mg/L	<0.005	0.005	1 Below MAC
Nitrate and Nitrite - N		mg/L	<0.01	0.01	10 Below MAC
Sulfate (SO4)	Dissolved	mg/L	70.5	0.9	500 Below AO
Hydroxide		mg/L	<5		
Carbonate		mg/L	<6		
Bicarbonate		mg/L	590		
P-Alkalinity	as CaCO3	mg/L	<5	5	
T-Alkalinity	as CaCO3	mg/L	484	5	
Total Dissolved Solids	Calculated	mg/L	574	1	500 Above AO
Hardness	Dissolved as CaCO3	mg/L	391		
Ionic Balance	Dissolved	%	100		

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880312
--	--	--

### Metals Dissolved

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880312
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880312
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Sulfur	mg/L	1.0	1.1	10	0.1	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	1.1	1.1	10	0.4	yes
Barium	µg/L	48	48	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	109	110	10	4	yes
Cadmium	µg/L	<0.01	<0.01	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.2	1.2	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	71	71	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.9	1.1	10	1.1	yes
Selenium	µg/L	<0.2	<0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	953	947	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.7	3.6	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880312
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	1.4	1.3	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.91	9.39	10.59	yes
Nitrate - N	mg/L	9.88	9.03	11.13	yes
Nitrite - N	mg/L	9.83	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880312
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

**Routine Water - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Iron	mg/L	9.77	9.38	10.16	yes
Manganese	mg/L	2.40	2.320	2.560	yes
Date Acquired: June 09, 2023					
pH		6.88	6.79	6.97	yes
Temperature of observed	°C	20.9	15.5	24.5	yes
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes
P-Alkalinity	mg/L	56	28	72	yes
T-Alkalinity	mg/L	127	114	140	yes
Chloride	mg/L	84.1	74.9	86.9	yes
Fluoride	mg/L	4.82	4.56	5.22	yes
Nitrate - N	mg/L	4.69	4.37	5.33	yes
Nitrite - N	mg/L	4.82	4.370	5.330	yes
Nitrate and Nitrite - N	mg/L	9.51	8.80	10.60	yes
Calcium	mg/L	51.2	44.9	56.9	yes
Magnesium	mg/L	20.1	17.9	22.0	yes
Sodium	mg/L	51.6	47.3	52.7	yes
Potassium	mg/L	50.0	45.8	55.8	yes
Iron	mg/L	2.02	1.90	2.08	yes
Manganese	mg/L	0.499	0.468	0.552	yes
Date Acquired: June 09, 2023					
Chloride	mg/L	15.0	13.3	16.5	yes
Fluoride	mg/L	0.50	0.45	0.57	yes
Nitrate - N	mg/L	0.52	0.42	0.57	yes
Nitrite - N	mg/L	0.506	0.455	0.557	yes
Nitrate and Nitrite - N	mg/L	1.02	0.85	1.15	yes
Calcium	mg/L	5.0	4.7	5.4	yes
Magnesium	mg/L	2.0	1.9	2.2	yes
Sodium	mg/L	4.9	4.7	5.7	yes
Potassium	mg/L	5.0	4.6	5.6	yes
Iron	mg/L	0.19	0.18	0.22	yes
Manganese	mg/L	0.048	0.046	0.057	yes
Date Acquired: June 09, 2023					

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	56.8	57.1	10	0.5	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes
Nitrate - N	mg/L	0.02	0.02	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880312
--	---	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	29.6	29.3	10	0.6	yes
Magnesium	mg/L	9.1	9.0	10	0.7	yes
Sodium	mg/L	2.9	2.8	10	1.2	yes
Potassium	mg/L	1.0	1.0	10	1.2	yes
Iron	mg/L	0.18	0.18	10	0.05	yes
Manganese	mg/L	<0.005	<0.005	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880312
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-6; 8663473: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
	17740 - 118 Avenue	Project Name:	2022 Groundwater Monitoring	Control Number:	
	Edmonton, AB, Canada	Project Location:		Date Received:	Jun 5, 2023
	T5S 2W3	LSD:	Tp 054, R 26 to 28, W4M	Date Reported:	Jun 12, 2023
Attn:	Kirby Fromm		and Tp 054, R 01, W5M	Report Number:	2880312
Sampled By:	Ben Gilham	P.O.:	19707		
Company:	HCL	Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

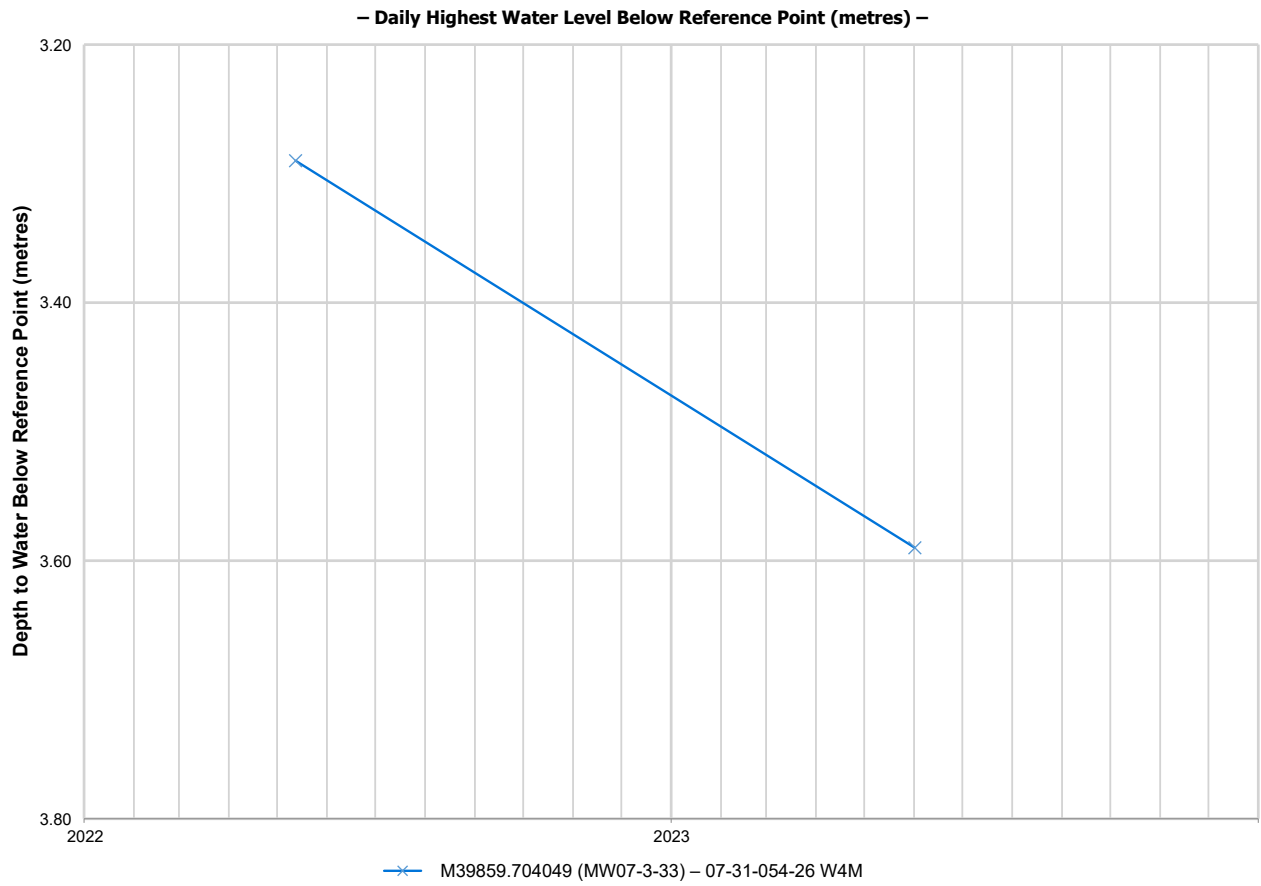
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

MW07-3-33  
2022 - 2023 Hydrograph



## MW10-01

(Water Test Hole No. 1-10)

**03-29-054-26 W4M**

(M40337.575466)



### Well Spatial Location:

Easting: **79,239**

Northing: **5,947,166**

(spatial accuracy HCL GPS — 10TM Resource NAD83)

Ground Elevation AMSL (m): **671.4**

(elevation accuracy MT Surveyed)

Date Completed: **June 7, 2010**

Depth Drilled (m): **18.3**

Completion Interval (m): **9.0 – 12.0 \***

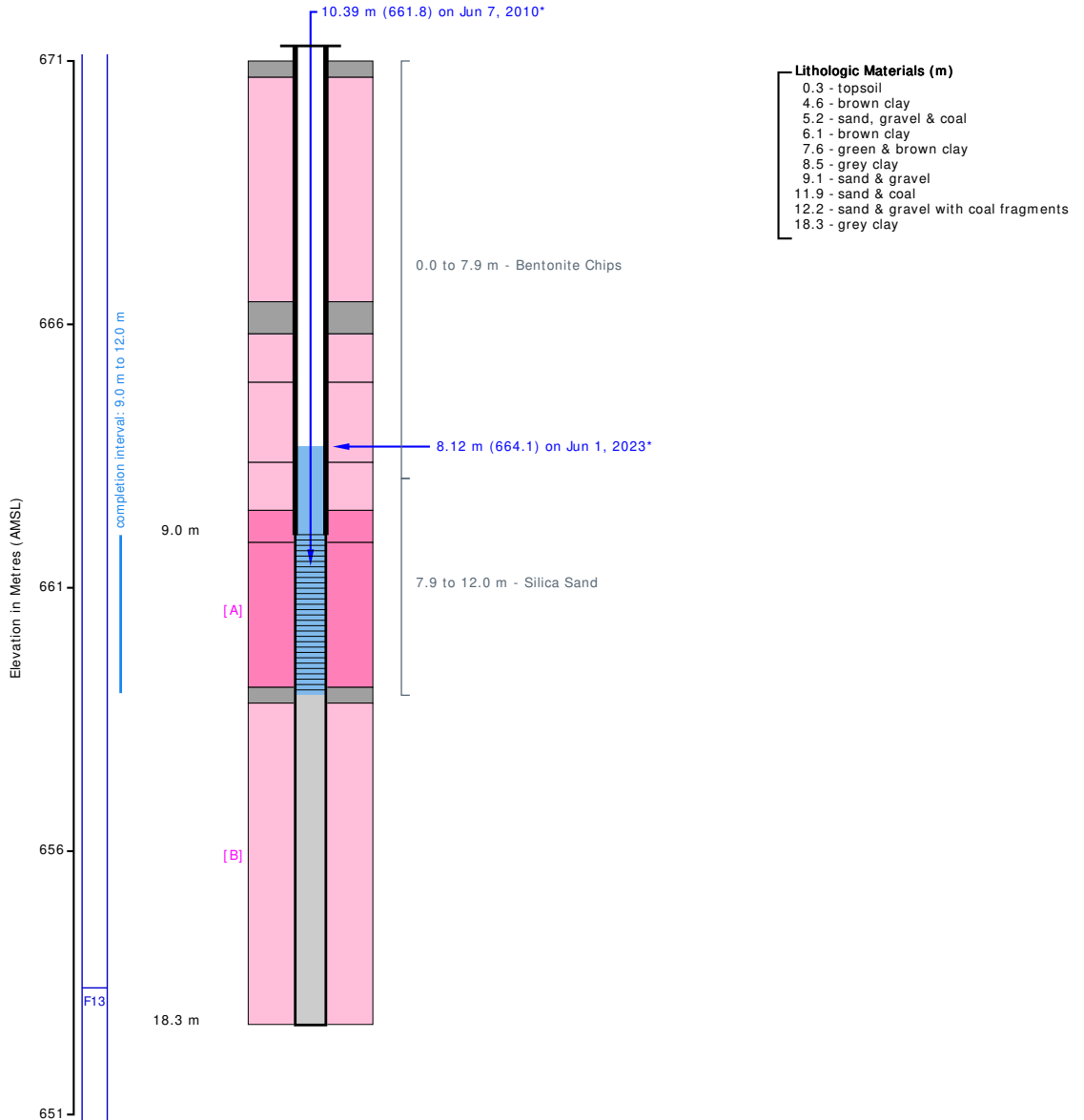
(\* TGWC determined value)

Earliest Water Level (m): **10.39 – June 7, 2010 @ 13:42**

Most Recent Water Level (m): **8.12 – June 1, 2023 @ 11:16**

GIC ID: **Unknown**

# MW10-01 Water Well Diagram



Lithology Legend			Geologic Unit Legend (Top) - Regional Analysis				
Surficial		Unsorted	Bedrock		F13 - Lower Horseshoe Canyon Formation		
		Fine Grained					Fine Grained
		Coarse Grained					Coarse Grained
				Other			

### Summary

TGWC ID: M40337.575466  
 Well Name: MW10-01  
 Legal Location: 03-29-054-26 W4M  
 Casing (OD): 50.8 mm; Plastic (2.0")  
 Screen (OD): 50.8 mm; Plastic (2.0")  
 Casing Stick-Up: 0.8 m (not drawn to scale)  
 Completion [A]: 9.0 to 12.0 m; Screened  
 Construction [B]: 12.0 to 18.3 m; Plugged; Bentonite Chips  
 Water Level (recent): 8.12 m (664.1 m AMSL) on Jun 1, 2023 @ 11:16 - Reference Point: Top of Casing  
 Water Level (oldest): 10.39 m (661.8 m AMSL) on Jun 7, 2010 @ 13:42 - Reference Point: Top of Casing  
 Top of Liner assumed to be 5% of 'non-cased' interval.

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:50 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.



Owner: **Sturgeon County**  
**9613 100 St, Morinville, AB T8R 1L9**

Contractor: **Mar-Wayne Water Well Drilling Services Ltd.**  
 Name: **MW10-01 (Water Test Hole No. 1-10)**

Field Action: **Confirmed - Physically, June 7, 2010**

Work Type: **Piezometer** Date Started: **June 7, 2010**

Drilling Method: **Drilled** Date Completed: **June 7, 2010**

Proposed Use: **Monitoring** Well Status: **Observation**

Completion Type: **Screen** Feature Class: **Piezometer**

### METRIC REPORT

03-29-054-26 W4M

Easting (m): **79,238.99\*\***  
 Northing (m): **5,947,165.83\*\***  
 Elevation (m): **671.4\*\*\***

Lot:  
 Block:  
 Plan:

**M40337.575466**

513370; core

Elog Taken: **No**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.8**

Presence of Gas: **No**

#### General Details core

Depth Completed (m)\*: **12.0** Top of Bedrock: **Surficial Water Well \***  
 Depth Drilled (m): **18.3** Completion Interval (m): **9.0 – 12.0 \***

Sand & Gravel Thickness (m): **3.4 (total) – 0.0 (below 15 m) \***

Plugged / Backfilled (m): **12.0 – 18.3 (Bentonite Chips)**

Most Recent Water Level (m): **8.12 m – June 1, 2023**

#### Completion Details

Surface Casing: **Plastic – 50.8 mm (O.D.) x 5.50 mm (thick) x 9.0 m (bottom)**

Screen Material: **Plastic – 50.8 mm (O.D.) (Attached To Casing)**

Fittings: **Top: Coupler – Bottom: Plug**

#### Intervals

Screen: **9.0 to 12.0 m - 0.10 (Machine)**

Bentonite Chips: **0.0 to 7.9 m**

Silica Sand: **7.9 to 12.0 m**

#### Lithology Details

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
671.1	0.3	Topsoil
666.8	4.6	Brown Clay
666.2	5.2	Sand, Gravel & Coal
665.3	6.1	Brown Clay
663.8	7.6	Green & Brown Clay
662.9	8.5	Grey Clay
662.3	9.1	Sand & Gravel
659.5	11.9	Sand & Coal
659.2	12.2	Sand & Gravel with Coal Fragments
653.1	18.3	Grey Clay

#### Chemistry Summary Details (mg/L, except as noted) (recently sampled first)

Sampling Details: **June 1, 2023 @ 11:55**

Report Date: **June 12, 2023 - Element Materials Technology Canada Inc. (1655888-22)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	991	Nitrate as N:	< 0.01	Turbidity (NTU):	35.0
Total Dissolved Solids:	619	Nitrite as N:	< 0.005	Fluoride:	0.12
Hardness (as CaCO3):	510	pH (pH Unit):	7.48	Carbonate:	< 6
T-Alkalinity (as CaCO3):	379	Colour (TCU):	55	Bicarbonate:	462
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	100	Hydroxide:	< 5
Nitrate + Nitrite as N:	< 0.01	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.0	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	143		Mercury:	< 0.000005	
Chloride:	22.9		Molybdenum:	< 0.001	
Iron:	1.42		Magnesium:	36.8	
Manganese:	0.630***		Sodium:	20.5	
Aluminum:	< 0.002		Potassium:	11.0	
Arsenic:	0.0073		Vanadium:	< 0.0001	
Barium:	0.043		Strontium:	0.823	
Beryllium:	< 0.0001		Nickel:	0.0018	
Cadmium:	0.00002		Zinc:	0.002	
Chromium:	< 0.0005		Copper:	0.0008	
Cobalt:	0.0008		Lead:	< 0.0001	
Sulfate:	157		Uranium:	0.0044	

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario.

513370; 1 / 19

#### Comments & Observations

**Initial, Jun 7, 2010:** MW10-01 was drilled as a replacement for MW07-4-14 (M39859.704051). The elevation difference was surveyed by Hydrogeological Consultants Ltd. (HCL) and then calculated from the DEM elevation for MW07-4-14. Measured from top of casing, MW07-4-14 is 0.28 m lower than MW10-01.

#### Aquifer Tests

#### Alias IDs

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* MT Surveyed — {Ground; AMSL}

Created on: August 25, 2023 — Data "AS IS"; no warranty either expressed or implied. [53.688612 -113.799589 (WGS 84)], INT Date End: 2023-06-02

**MW10-01**  
**AEPA - Water Well Drilling Report**

— AEPA water well drilling report not available —

**MW10-01**  
**Chemical Analysis Results (June 12, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880328
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

<b>Reference Number</b>	1655888-22
<b>Sample Date</b>	June 01, 2023
<b>Sample Time</b>	11:55
<b>Sample Location</b>	M40337.575466
<b>Sample Description</b>	MW10-01 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Metals Dissolved</b>						
Silicon	Dissolved mg/L	5.87	0.05			
Sulfur	Dissolved mg/L	52.4	0.3			
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC	
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG	
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC	
Arsenic	Dissolved mg/L	0.0073	0.0002	0.01	Below MAC	
Barium	Dissolved mg/L	0.043	0.001	2.0	Below MAC	
Beryllium	Dissolved mg/L	<0.0001	0.0001			
Bismuth	Dissolved mg/L	<0.0005	0.0005			
Boron	Dissolved mg/L	0.092	0.002	5	Below MAC	
Cadmium	Dissolved mg/L	0.00002	0.00001	0.007	Below MAC	
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC	
Cobalt	Dissolved mg/L	0.0008	0.0001			
Copper	Dissolved mg/L	0.0008	0.0002	1 AO; 2 MAC	Below AO	
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC	
Lithium	Dissolved mg/L	0.071	0.001			
Molybdenum	Dissolved mg/L	<0.001	0.001			
Nickel	Dissolved mg/L	0.0018	0.0005			
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC	
Silver	Dissolved mg/L	<0.00001	0.00001			
Strontium	Dissolved mg/L	0.823	0.001	7.0	Below MAC	
Thallium	Dissolved mg/L	<0.00005	0.00005			
Tin	Dissolved mg/L	<0.001	0.001			
Titanium	Dissolved mg/L	<0.0005	0.0005			
Uranium	Dissolved mg/L	0.0044	0.0005	0.02	Below MAC	
Vanadium	Dissolved mg/L	<0.0001	0.0001			
Zinc	Dissolved mg/L	0.002	0.001	5	Below AO	
Subsample		Field Filtered				
<b>Physical and Aggregate Properties</b>						
Colour	Apparent, Potable	Colour units	55	5	15	Above AO
Turbidity		NTU	35.0	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>						
pH			7.48	1	7.0-10.5	Within OG Range
Temperature of observed pH		°C	21.0			
Electrical Conductivity	at 25 °C	µS/cm	991	1		
Calcium	Dissolved	mg/L	143	0.2		
Magnesium	Dissolved	mg/L	36.8	0.2		
Sodium	Dissolved	mg/L	20.5	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880328
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-22
<b>Sample Date</b>	June 01, 2023
<b>Sample Time</b>	11:55
<b>Sample Location</b>	M40337.575466
<b>Sample Description</b>	MW10-01 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Routine Water - Continued</b>						
Potassium	Dissolved	mg/L	11.0	0.4		
Iron	Dissolved	mg/L	1.42	0.01	0.3	Above AO
Manganese	Dissolved	mg/L	0.630	0.005	0.02 AO; 0.12 MAC	Above MAC
Chloride	Dissolved	mg/L	22.9	0.4	250	Below AO
Fluoride		mg/L	0.12	0.05	1.5	Below MAC
Nitrate - N		mg/L	<0.01	0.01	10	Below MAC
Nitrite - N		mg/L	<0.005	0.005	1	Below MAC
Nitrate and Nitrite - N		mg/L	<0.01	0.01	10	Below MAC
Sulfate (SO4)	Dissolved	mg/L	157	0.9	500	Below AO
Hydroxide		mg/L	<5			
Carbonate		mg/L	<6			
Bicarbonate		mg/L	462			
P-Alkalinity	as CaCO3	mg/L	<5	5		
T-Alkalinity	as CaCO3	mg/L	379	5		
Total Dissolved Solids	Calculated	mg/L	619	1	500	Above AO
Hardness	Dissolved as CaCO3	mg/L	510			
Ionic Balance	Dissolved	%	100			

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880328
--	--	--

### Metals Dissolved

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880328
--	---	--

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880328
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Sulfur	mg/L	33.7	34.4	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	<0.2	<0.2	10	0.4	yes
Barium	µg/L	38	38	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	113	114	10	4	yes
Cadmium	µg/L	0.03	0.04	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.4	1.4	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	80	81	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.7	0.7	10	1.1	yes
Selenium	µg/L	0.4	0.4	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	1020	1010	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.2	3.4	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	<1	<1	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880328
--	--	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	10.0	9.9	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.08	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0.00178586	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2100	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880328
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.9	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	14.9	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.57	7.57	0	0.10	yes
Electrical Conductivity	dS/m	0.930	0.928	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	549	546	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	450	448	10	5	yes
Chloride	mg/L	1.5	1.6	10	0.5	yes
Fluoride	mg/L	0.08	0.08	10	0.05	yes
Nitrate - N	mg/L	0.03	0.03	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880328
--	---	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	121	123	10	0.6	yes
Magnesium	mg/L	23.2	23.7	10	0.7	yes
Sodium	mg/L	64.4	65.8	10	1.2	yes
Potassium	mg/L	3.8	3.8	10	1.2	yes
Iron	mg/L	2.31	2.35	10	0.05	yes
Manganese	mg/L	0.653	0.664	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880328
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-22; 8663489: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880328
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

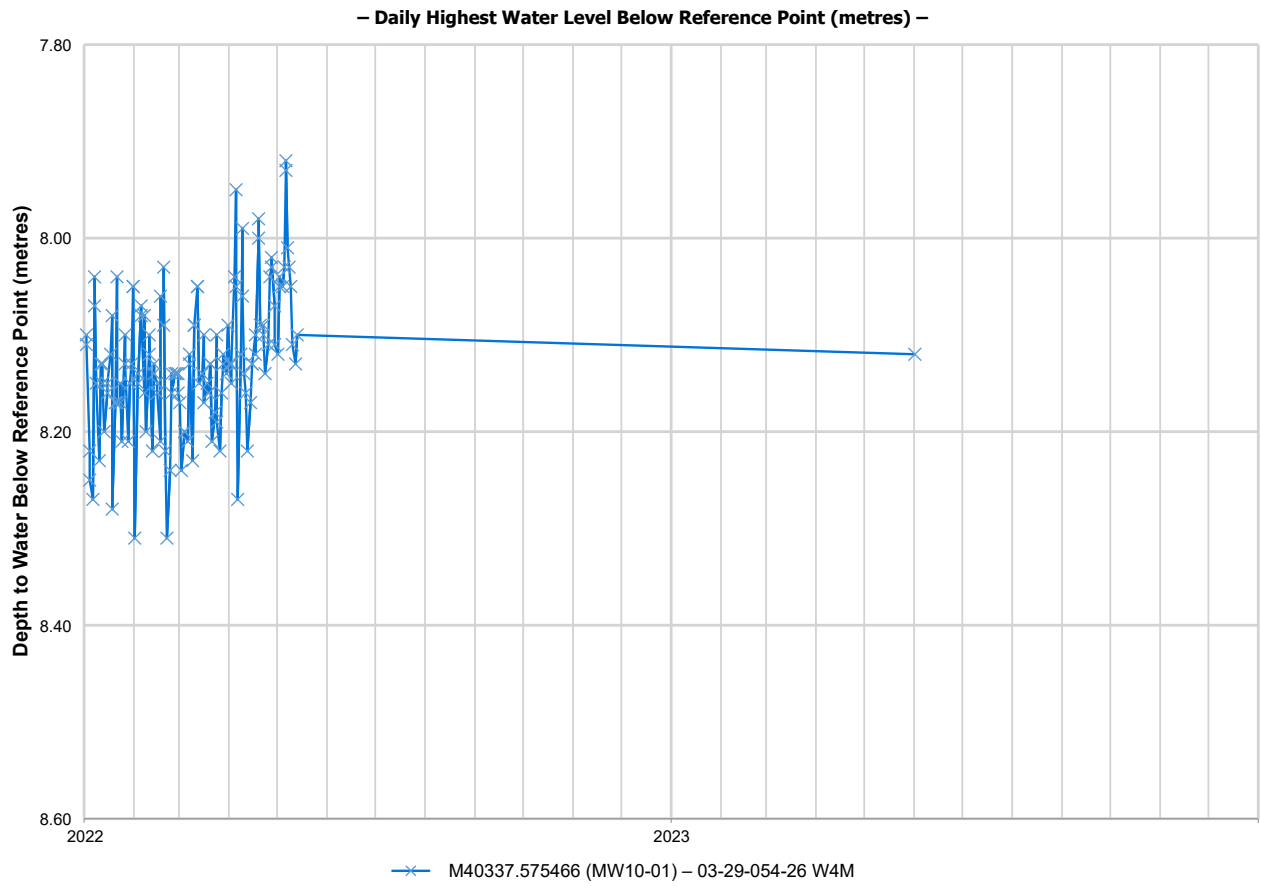
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

MW10-01  
2022 - 2023 Hydrograph



## MW11-02

04-27-054-27 W4M  
(M41457.432661)



Well Spatial Location:

Easting: **71,965**

Northing: **5,947,084**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **691**

*(elevation accuracy MT GPS (Elevation))*

Date Completed: **May 20, 2011**

Depth Drilled (m): **23.2**

Completion Interval (m): **10.4 – 22.6 \***

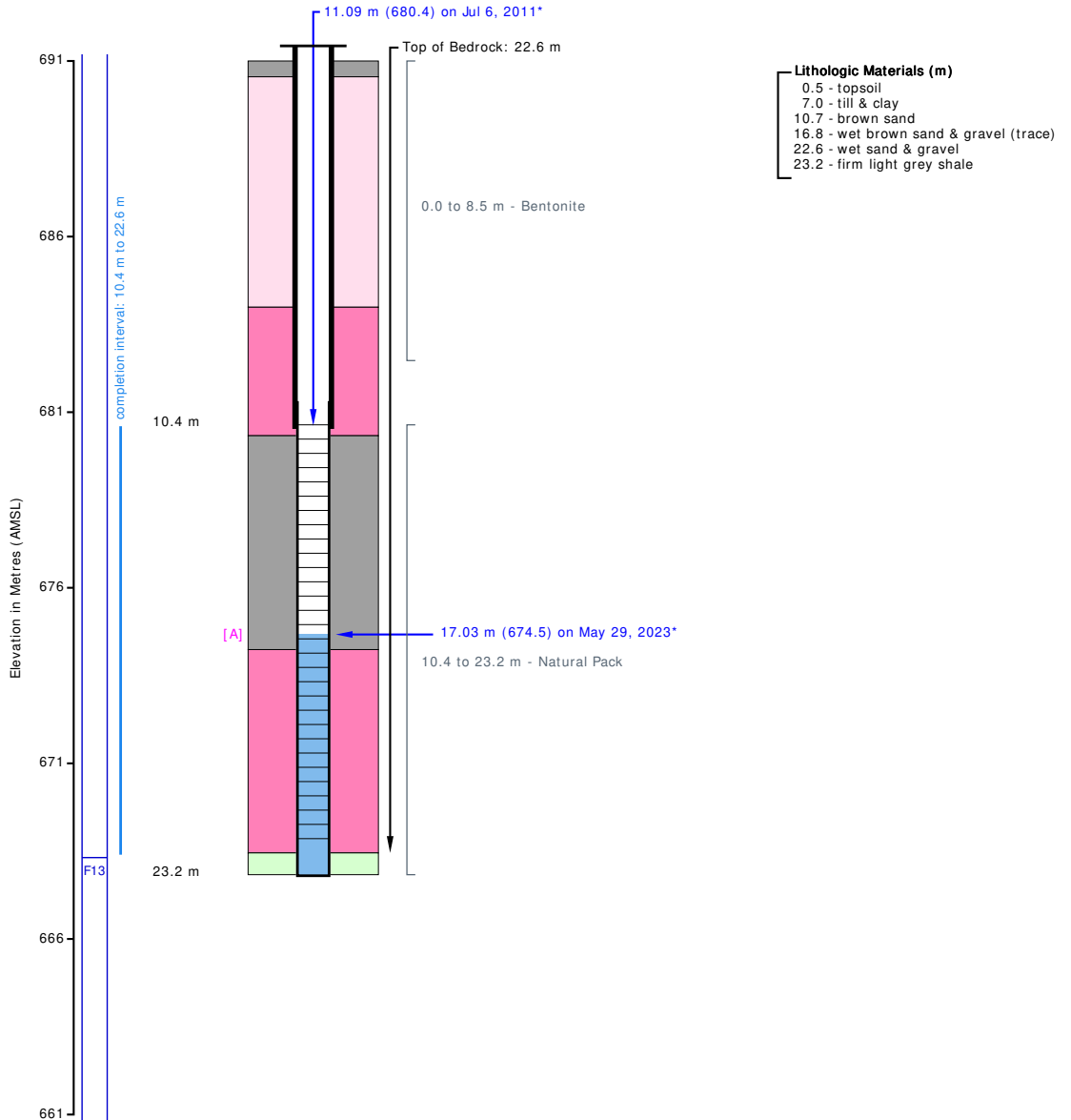
*(\* TGWC determined value)*

Earliest Water Level (m): **11.09 – July 6, 2011 @ 12:00**

Most Recent Water Level (m): **17.03 – May 29, 2023 @ 14:25**

GIC ID: **Unknown**

# MW11-02 Water Well Diagram



Lithology Legend			Geologic Unit Legend (Top) - Regional Analysis	
Surficial		Unsorted		Other
		Fine Grained		
		Coarse Grained		Fine Grained
Bedrock		Fine Grained		Coarse Grained
		Coarse Grained		

### Summary

TGWC ID: M41457.432661  
 Well Name: MW11-02  
 Legal Location: 04-27-054-27 W4M  
 Casing (OD): 60.3 mm; PVC (2.4")  
 Screen (OD): 52.5 mm; PVC (2.1")  
 Casing Stick-Up: 0.7 m (not drawn to scale)  
 Completion [A]: 10.4 to 22.6 m; Screened  
 Water Level (recent): 17.03 m (674.5 m AMSL) on May 29, 2023 @ 14:25 - Reference Point: Top of Casing  
 Water Level (oldest): 11.09 m (680.4 m AMSL) on Jul 6, 2011 @ 12:00 - Reference Point: Top of Casing  
 Top of Liner assumed to be 5% of 'non-cased' interval.

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:50 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.

Owner: **Heidelberg Materials Canada Limited**  
**Suite 100, 15015 123 Avenue Northwest, Edmonton, AB T5V 1J7**  
 Contractor: **Mobile Augers and Research Ltd.**  
 Name: **MW11-02**

Field Action: **Confirmed - Physically, June 27, 2013**  
 Work Type: **Piezometer** Date Started: **May 20, 2011**  
 Drilling Method: **Hollow-Stem Auger** Date Completed: **May 20, 2011**  
 Proposed Use: **Monitoring** Well Status: **Monitoring**  
 Completion Type: **Screen** Feature Class: **Piezometer**

**METRIC REPORT**

04-27-054-27 W4M

Easting (m): **71,964.95\*\***  
 Northing (m): **5,947,084.13\*\***  
 Elevation (m): **691\*\*\***  
 Lot:  
 Block:  
 Plan:

**M41457.432661**

513363; core

Elog Taken: **No**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.7**

Presence of Gas: **No**

**General Details** core

Depth Completed (m)\*: **22.6** Top of Bedrock (m): **22.55\***  
 Depth Drilled (m): **23.2** Completion Interval (m): **10.4 – 22.6\***

Sand & Gravel Thickness (m): **9.5 (total) – 9.5 (below 15 m)\***

Most Recent Water Level (m): **17.03 m – May 29, 2023**

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
690.4	0.5	Topsoil
683.8	7.0	Till & Clay
680.1	10.7	Brown Sand
674.0	16.8	Wet Brown Sand & Gravel (trace)
668.3	22.6	Wet Sand & Gravel
667.6	23.2	Firm Light Grey Shale

**Completion Details**

Surface Casing: **PVC – 60.3 mm (O.D.) x 7.80 mm (thick) x 10.4 m (bottom)**

Screen Material: **PVC – 52.5 mm (O.D.) (Attached To Casing)**  
 Fittings: **Top: Threaded – Bottom: [unknown]**

**Intervals**

Screen: **10.4 to 22.6 m - 10 (Machine)**  
 Bentonite: **0.0 to 8.5 m**  
 Natural Pack: **10.4 to 23.2 m**

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: **May 28, 2023 @ 14:55**  
 Report Date: **June 12, 2023 - Element Materials Technology Canada Inc. (1655888-15)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	1150	Nitrate as N:	1.28	Turbidity (NTU):	157
Total Dissolved Solids:	745	Nitrite as N:	< 0.005	Fluoride:	0.07
Hardness (as CaCO3):	497	pH (pH Unit):	7.50	Carbonate:	< 6
T-Alkalinity (as CaCO3):	492	Colour (TCU):	> 60	Bicarbonate:	599
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	99	Hydroxide:	< 5
Nitrate + Nitrite as N:	1.28	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.1	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	143		Mercury:	< 0.000005	
Chloride:	1.5		Molybdenum:	< 0.001	
Iron:	< 0.01		Magnesium:	34.2	
Manganese:	< 0.005		Sodium:	82.8	
Aluminum:	< 0.002		Potassium:	4.5	
Arsenic:	< 0.0002		Vanadium:	< 0.0001	
Barium:	0.074		Strontium:	0.910	
Beryllium:	< 0.0001		Nickel:	0.0015	
Cadmium:	0.00002		Zinc:	< 0.001	
Chromium:	< 0.0005		Copper:	0.0003	
Cobalt:	< 0.0001		Lead:	< 0.0001	
Sulfate:	184		Uranium:	0.0099	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

*Note: Constituents have been compared to the maximum acceptable concentration, Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada. Ottawa, Ontario.*

513363; 1 / 17

**Comments & Observations**

**Aquifer Tests**

**Alias IDs**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* MT GPS (Elevation) — {Ground; AMSL}





**MW11-02**  
**AEPA - Water Well Drilling Report**

— AEPA water well drilling report not available —

**MW11-02**  
**Chemical Analysis Results (June 12, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880321
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

**Reference Number** 1655888-15  
**Sample Date** May 28, 2023  
**Sample Time** 14:55  
**Sample Location** M41457.432661  
**Sample Description** MW11-02 / 4.3 °C  
**Sample Matrix** Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Metals Dissolved</b>					
Silicon	Dissolved mg/L	6.58	0.05		
Sulfur	Dissolved mg/L	61.4	0.3		
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC
Arsenic	Dissolved mg/L	<0.0002	0.0002	0.01	Below MAC
Barium	Dissolved mg/L	0.074	0.001	2.0	Below MAC
Beryllium	Dissolved mg/L	<0.0001	0.0001		
Bismuth	Dissolved mg/L	<0.0005	0.0005		
Boron	Dissolved mg/L	0.091	0.002	5	Below MAC
Cadmium	Dissolved mg/L	0.00002	0.00001	0.007	Below MAC
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC
Cobalt	Dissolved mg/L	<0.0001	0.0001		
Copper	Dissolved mg/L	0.0003	0.0002	1 AO; 2 MAC	Below AO
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC
Lithium	Dissolved mg/L	0.078	0.001		
Molybdenum	Dissolved mg/L	<0.001	0.001		
Nickel	Dissolved mg/L	0.0015	0.0005		
Selenium	Dissolved mg/L	0.0329	0.0002	0.05	Below MAC
Silver	Dissolved mg/L	<0.00001	0.00001		
Strontium	Dissolved mg/L	0.910	0.001	7.0	Below MAC
Thallium	Dissolved mg/L	<0.00005	0.00005		
Tin	Dissolved mg/L	<0.001	0.001		
Titanium	Dissolved mg/L	<0.0005	0.0005		
Uranium	Dissolved mg/L	0.0099	0.0005	0.02	Below MAC
Vanadium	Dissolved mg/L	<0.0001	0.0001		
Zinc	Dissolved mg/L	<0.001	0.001	5	Below AO
Subsample		Field Filtered			
<b>Physical and Aggregate Properties</b>					
Colour	Apparent, Potable Colour units	>60	5	15	Above AO
Turbidity	NTU	157	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>					
pH		7.50	1	7.0-10.5	Within OG Range
Temperature of observed pH	°C	21.1			
Electrical Conductivity	at 25 °C µS/cm	1150	1		
Calcium	Dissolved mg/L	143	0.2		
Magnesium	Dissolved mg/L	34.2	0.2		
Sodium	Dissolved mg/L	82.8	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880321
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-15
<b>Sample Date</b>	May 28, 2023
<b>Sample Time</b>	14:55
<b>Sample Location</b>	M41457.432661
<b>Sample Description</b>	MW11-02 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Routine Water - Continued</b>						
Potassium	Dissolved	mg/L	4.5	0.4		
Iron	Dissolved	mg/L	<0.01	0.01	0.3	Below AO
Manganese	Dissolved	mg/L	<0.005	0.005	0.02 AO; 0.12 MAC	Below AO
Chloride	Dissolved	mg/L	1.5	0.4	250	Below AO
Fluoride		mg/L	0.07	0.05	1.5	Below MAC
Nitrate - N		mg/L	1.28	0.01	10	Below MAC
Nitrite - N		mg/L	<0.005	0.005	1	Below MAC
Nitrate and Nitrite - N		mg/L	1.28	0.01	10	Below MAC
Sulfate (SO4)	Dissolved	mg/L	184	0.9	500	Below AO
Hydroxide		mg/L	<5			
Carbonate		mg/L	<6			
Bicarbonate		mg/L	599			
P-Alkalinity	as CaCO3	mg/L	<5	5		
T-Alkalinity	as CaCO3	mg/L	492	5		
Total Dissolved Solids	Calculated	mg/L	745	1	500	Above AO
Hardness	Dissolved as CaCO3	mg/L	497			
Ionic Balance	Dissolved	%	99			

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880321
--	--	--

**Metals Dissolved**

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880321
Sampled By: Ben Gilham Company: HCL		

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880321
--	--	--

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Sulfur	mg/L	33.7	34.4	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	1.1	1.1	10	0.4	yes
Barium	µg/L	48	48	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	109	110	10	4	yes
Cadmium	µg/L	<0.01	<0.01	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.2	1.2	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	71	71	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.9	1.1	10	1.1	yes
Selenium	µg/L	<0.2	<0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	953	947	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.7	3.6	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880321
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	10.0	9.9	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880321
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.1	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	15.0	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	56.8	57.1	10	0.5	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes
Nitrate - N	mg/L	0.02	0.02	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes



**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880321
--	--	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	121	123	10	0.6	yes
Magnesium	mg/L	23.2	23.7	10	0.7	yes
Sodium	mg/L	64.4	65.8	10	1.2	yes
Potassium	mg/L	3.8	3.8	10	1.2	yes
Iron	mg/L	2.31	2.35	10	0.05	yes
Manganese	mg/L	0.653	0.664	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880321
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-15; 8663482: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880321
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

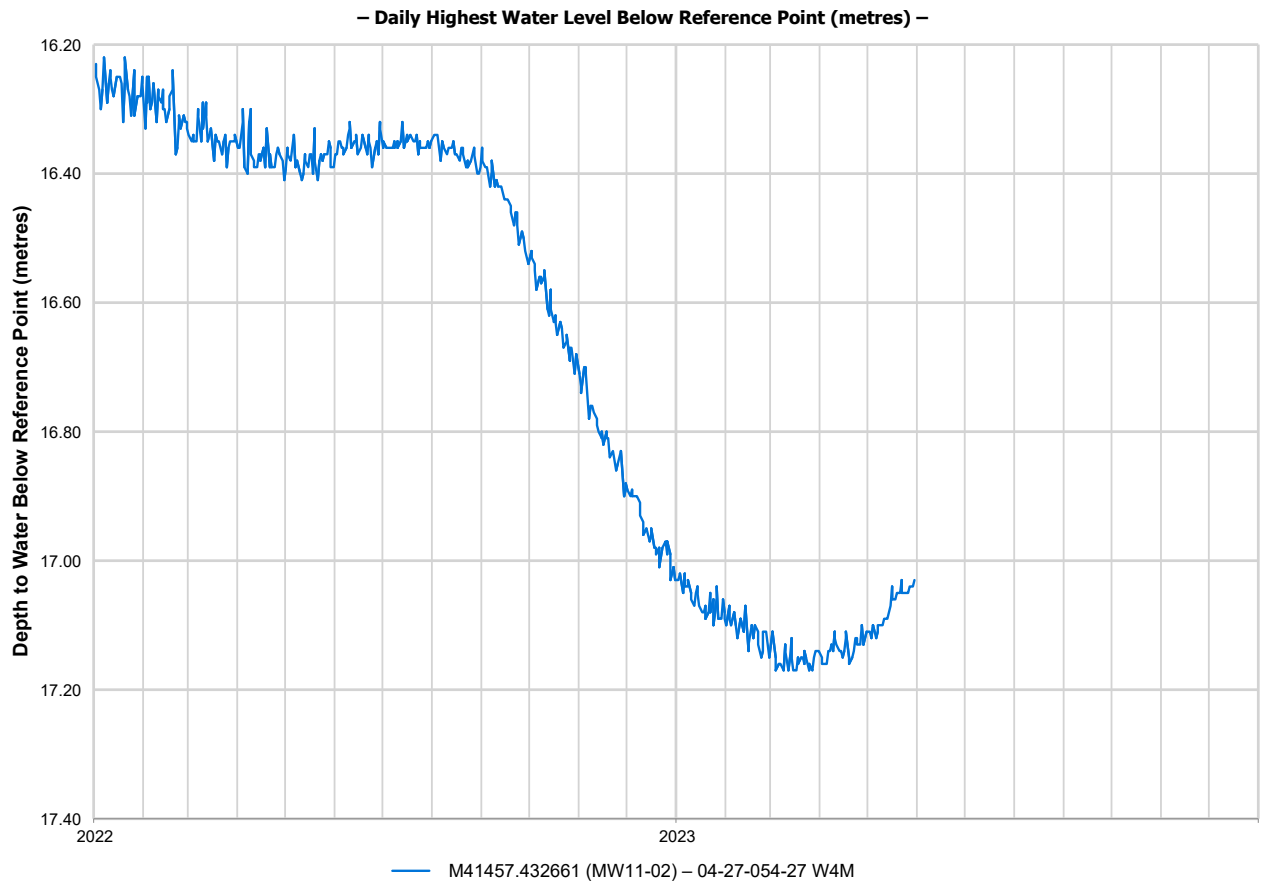
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

MW11-02  
2022 - 2023 Hydrograph



## MW14-01

**05-34-054-27 W4M**  
(M42473.435942)



Photograph taken on May 29, 2023

### Well Spatial Location:

Easting: **71,919**

Northing: **5,948,923**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **676**

*(elevation accuracy HCL DEM)*

Date Completed: **October 10, 2014**

Depth Drilled (m): **18.3**

Completion Interval (m): **13.8 – 16.8 \***

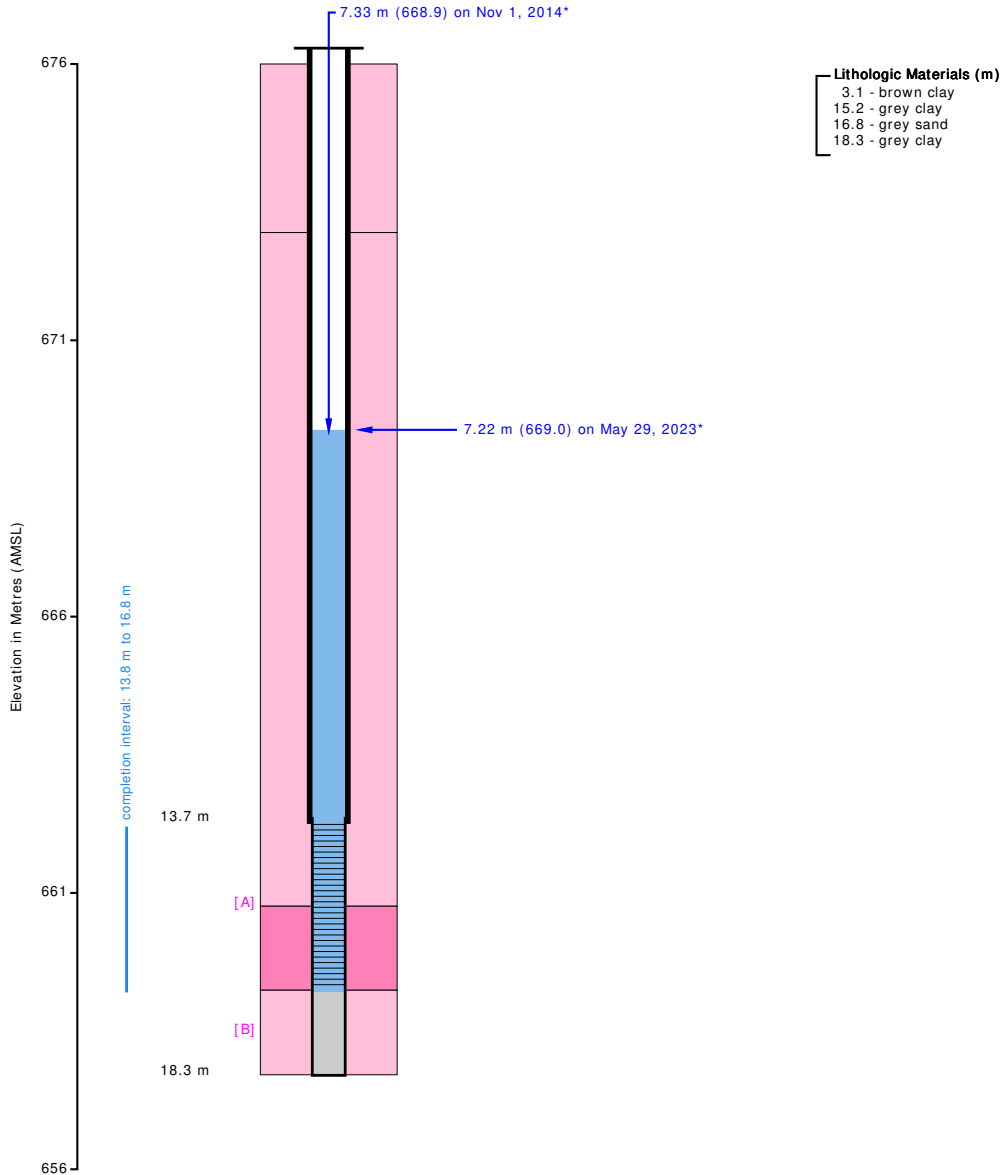
*(\* TGWC determined value)*

Earliest Water Level (m): **7.33 – November 1, 2014**

Most Recent Water Level (m): **7.22 – May 29, 2023 @ 16:07**

GIC ID: **Unknown**

# MW14-01 Water Well Diagram



Lithology Legend		Geologic Unit Legend (Top) - Regional Analysis	
<b>Surficial</b>	<ul style="list-style-type: none"> <li>Unsorted</li> <li>Fine Grained</li> <li>Coarse Grained</li> </ul>	<b>Bedrock</b>	<ul style="list-style-type: none"> <li>Fine Grained</li> <li>Coarse Grained</li> <li>Other</li> </ul>

**Summary**

TGWC ID: M42473.435942  
 Well Name: MW14-01  
 Legal Location: 05-34-054-27 W4M  
 Casing (OD): 60.3 mm; PVC (2.4")  
 Screen (OD): 52.0 mm; PVC (2.0")  
 Casing Stick-Up: 0.6 m (not drawn to scale)  
 Completion [A]: 13.8 to 16.8 m; Screened  
 Construction [B]: 16.8 to 18.3 m; Plugged; Slough

Water Level (recent): 7.22 m (669.0 m AMSL) on May 29, 2023 @ 16:07 - Reference Point: Top of Casing  
 Water Level (oldest): 7.33 m (668.9 m AMSL) on Nov 1, 2014 - Reference Point: Top of Casing

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:50 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.

Owner: **Sturgeon County**  
 9613 100 St, Morinville, AB T8R 1L9

Contractor: **Summers Drilling Ltd.**  
 Name: **MW14-01**

Field Action: **Confirmed - Physically, November 22, 2017**

Work Type: **Piezometer** Date Started: **October 10, 2014**

Drilling Method: **Rotary - Mud** Date Completed: **October 10, 2014**

Proposed Use: **Observation** Well Status: **Monitoring**

Completion Type: **Casing/Liner/Screen** Feature Class: **Piezometer**

**METRIC REPORT**

05-34-054-27 W4M

Easting (m): **71,918.63\*\***  
 Northing (m): **5,948,923.49\*\***  
 Elevation (m): **676\*\*\***

Lot:  
 Block:  
 Plan:

Presence of Gas: **No**

**M42473.435942**

513362; core

Elog Taken: **No**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.6**

**General Details** core

Depth Completed (m)\*: **16.8** Top of Bedrock: **Surficial Water Well \***  
 Depth Drilled (m): **18.3** Completion Interval (m): **13.8 – 16.8 \***

Sand & Gravel Thickness (m): **1.5 (total) – 1.5 (below 15 m) \***  
 Plugged / Backfilled (m): **16.8 – 18.3 (Slough)**  
 Most Recent Water Level (m): **7.22 m – May 29, 2023**

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
672.6	3.1	Brown Clay
660.4	15.2	Grey Clay
658.8	16.8	Grey Sand
657.3	18.3	Grey Clay

**Completion Details**

Surface Casing: **PVC – 60.3 mm (O.D.) x 3.40 mm (thick) x 13.7 m (bottom)**

Screen Material: **PVC – 52.0 mm (O.D.) (Attached To Casing)**

Fittings: **Top: Tie On – Bottom: Plug**

**Intervals**

Screen: **13.8 to 16.8 m - 0.0254 cm (Other)**

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: **May 28, 2023 @ 16:30**  
 Report Date: **June 12, 2023 - Element Materials Technology Canada Inc. (1655888-14)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	1260	Nitrate as N:	< 0.01	Turbidity (NTU):	26.4
Total Dissolved Solids:	816	Nitrite as N:	< 0.005	Fluoride:	0.07
Hardness (as CaCO3):	566	pH (pH Unit):	7.36	Carbonate:	< 6
T-Alkalinity (as CaCO3):	546	Colour (TCU):	50	Bicarbonate:	666
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	100	Hydroxide:	< 5
Nitrate + Nitrite as N:	< 0.01	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.1	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	159		Mercury:	< 0.000005	
Chloride:	0.4		Molybdenum:	< 0.001	
Iron:	2.87		Magnesium:	41.2	
Manganese:	0.526***		Sodium:	80.7	
Aluminum:	< 0.002		Potassium:	4.8	
Arsenic:	0.0118***		Vanadium:	< 0.0001	
Barium:	0.024		Strontium:	1.47	
Beryllium:	< 0.0001		Nickel:	0.0021	
Cadmium:	< 0.00001		Zinc:	< 0.001	
Chromium:	< 0.0005		Copper:	< 0.0002	
Cobalt:	0.0016		Lead:	< 0.0001	
Sulfate:	202		Uranium:	0.0037	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario.

513362; 1 / 14

**Comments & Observations**

Field Survey (HCL), Nov 22, 2017: Piezometer in ditch along road; no padlock.

**Aquifer Tests**

**Alias IDs**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM — {Ground; AMSL}



**MW14-01**  
**AEPA - Water Well Drilling Report**

— AEPA water well drilling report not available —



**MW14-01**  
**Chemical Analysis Results (June 12, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707 P.O.: Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880320
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

<b>Reference Number</b>	1655888-14
<b>Sample Date</b>	May 28, 2023
<b>Sample Time</b>	16:30
<b>Sample Location</b>	M42473.435942
<b>Sample Description</b>	MW14-01 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Metals Dissolved</b>					
Silicon	Dissolved mg/L	8.20	0.05		
Sulfur	Dissolved mg/L	67.4	0.3		
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC
Arsenic	Dissolved mg/L	0.0118	0.0002	0.01	Above MAC
Barium	Dissolved mg/L	0.024	0.001	2.0	Below MAC
Beryllium	Dissolved mg/L	<0.0001	0.0001		
Bismuth	Dissolved mg/L	<0.0005	0.0005		
Boron	Dissolved mg/L	0.167	0.002	5	Below MAC
Cadmium	Dissolved mg/L	<0.00001	0.00001	0.007	Below MAC
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC
Cobalt	Dissolved mg/L	0.0016	0.0001		
Copper	Dissolved mg/L	<0.0002	0.0002	1 AO; 2 MAC	Below AO
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC
Lithium	Dissolved mg/L	0.123	0.001		
Molybdenum	Dissolved mg/L	<0.001	0.001		
Nickel	Dissolved mg/L	0.0021	0.0005		
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC
Silver	Dissolved mg/L	<0.00001	0.00001		
Strontium	Dissolved mg/L	1.47	0.001	7.0	Below MAC
Thallium	Dissolved mg/L	<0.00005	0.00005		
Tin	Dissolved mg/L	<0.001	0.001		
Titanium	Dissolved mg/L	<0.0005	0.0005		
Uranium	Dissolved mg/L	0.0037	0.0005	0.02	Below MAC
Vanadium	Dissolved mg/L	<0.0001	0.0001		
Zinc	Dissolved mg/L	<0.001	0.001	5	Below AO
Subsample		Field Filtered			
<b>Physical and Aggregate Properties</b>					
Colour	Apparent, Potable Colour units	50	5	15	Above AO
Turbidity	NTU	26.4	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>					
pH		7.36	1	7.0-10.5	Within OG Range
Temperature of observed pH	°C	21.1			
Electrical Conductivity	at 25 °C µS/cm	1260	1		
Calcium	Dissolved mg/L	159	0.2		
Magnesium	Dissolved mg/L	41.2	0.2		
Sodium	Dissolved mg/L	80.7	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880320
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-14
<b>Sample Date</b>	May 28, 2023
<b>Sample Time</b>	16:30
<b>Sample Location</b>	M42473.435942
<b>Sample Description</b>	MW14-01 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved	mg/L	4.8	0.4	
Iron	Dissolved	mg/L	2.87	0.01	0.3 Above AO
Manganese	Dissolved	mg/L	0.526	0.005	0.02 AO; 0.12 MAC Above MAC
Chloride	Dissolved	mg/L	0.4	0.4	250 Below AO
Fluoride		mg/L	0.07	0.05	1.5 Below MAC
Nitrate - N		mg/L	<0.01	0.01	10 Below MAC
Nitrite - N		mg/L	<0.005	0.005	1 Below MAC
Nitrate and Nitrite - N		mg/L	<0.01	0.01	10 Below MAC
Sulfate (SO4)	Dissolved	mg/L	202	0.9	500 Below AO
Hydroxide		mg/L	<5		
Carbonate		mg/L	<6		
Bicarbonate		mg/L	666		
P-Alkalinity	as CaCO3	mg/L	<5	5	
T-Alkalinity	as CaCO3	mg/L	546	5	
Total Dissolved Solids	Calculated	mg/L	816	1	500 Above AO
Hardness	Dissolved as CaCO3	mg/L	566		
Ionic Balance	Dissolved	%	100		

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880320
--	--	--

**Metals Dissolved**

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880320
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880320
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Sulfur	mg/L	33.7	34.4	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	1.1	1.1	10	0.4	yes
Barium	µg/L	48	48	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	109	110	10	4	yes
Cadmium	µg/L	<0.01	<0.01	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.2	1.2	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	71	71	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.9	1.1	10	1.1	yes
Selenium	µg/L	<0.2	<0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	953	947	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.7	3.6	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880320
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	10.0	9.9	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880320
Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.1	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	15.0	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	56.8	57.1	10	0.5	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes
Nitrate - N	mg/L	0.02	0.02	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880320
--	---	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	121	123	10	0.6	yes
Magnesium	mg/L	23.2	23.7	10	0.7	yes
Sodium	mg/L	64.4	65.8	10	1.2	yes
Potassium	mg/L	3.8	3.8	10	1.2	yes
Iron	mg/L	2.31	2.35	10	0.05	yes
Manganese	mg/L	0.653	0.664	10	0.010	yes
Date Acquired: June 09, 2023						



## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring	Lot ID: <b>1655888</b>
Attn: Kirby Fromm	Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880320
Sampled By: Ben Gilham Company: HCL	P.O.: 19707 Proj. Acct. code:	

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-14; 8663481: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880320
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

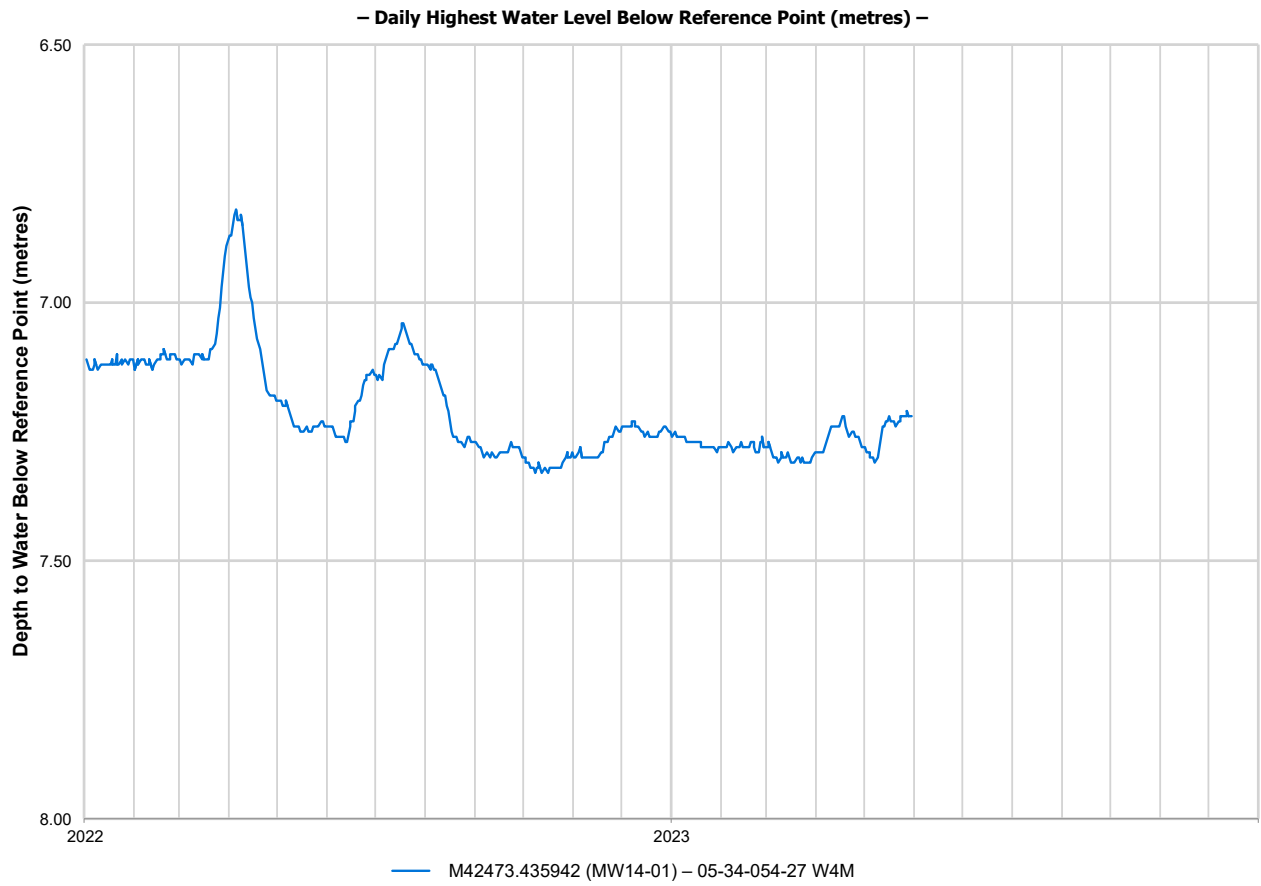
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

MW14-01  
2022 - 2023 Hydrograph



## MW14-02

**08-34-054-27 W4M**  
(M42475.578813)



**Well Spatial Location:**

**Easting: 73,520**

**Northing: 5,949,238**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

**Ground Elevation AMSL (m): 673**

*(elevation accuracy HCL DEM)*

**Date Completed: October 10, 2014**

**Depth Drilled (m): 18.3**

**Completion Interval (m): 12.2 – 15.2 \***

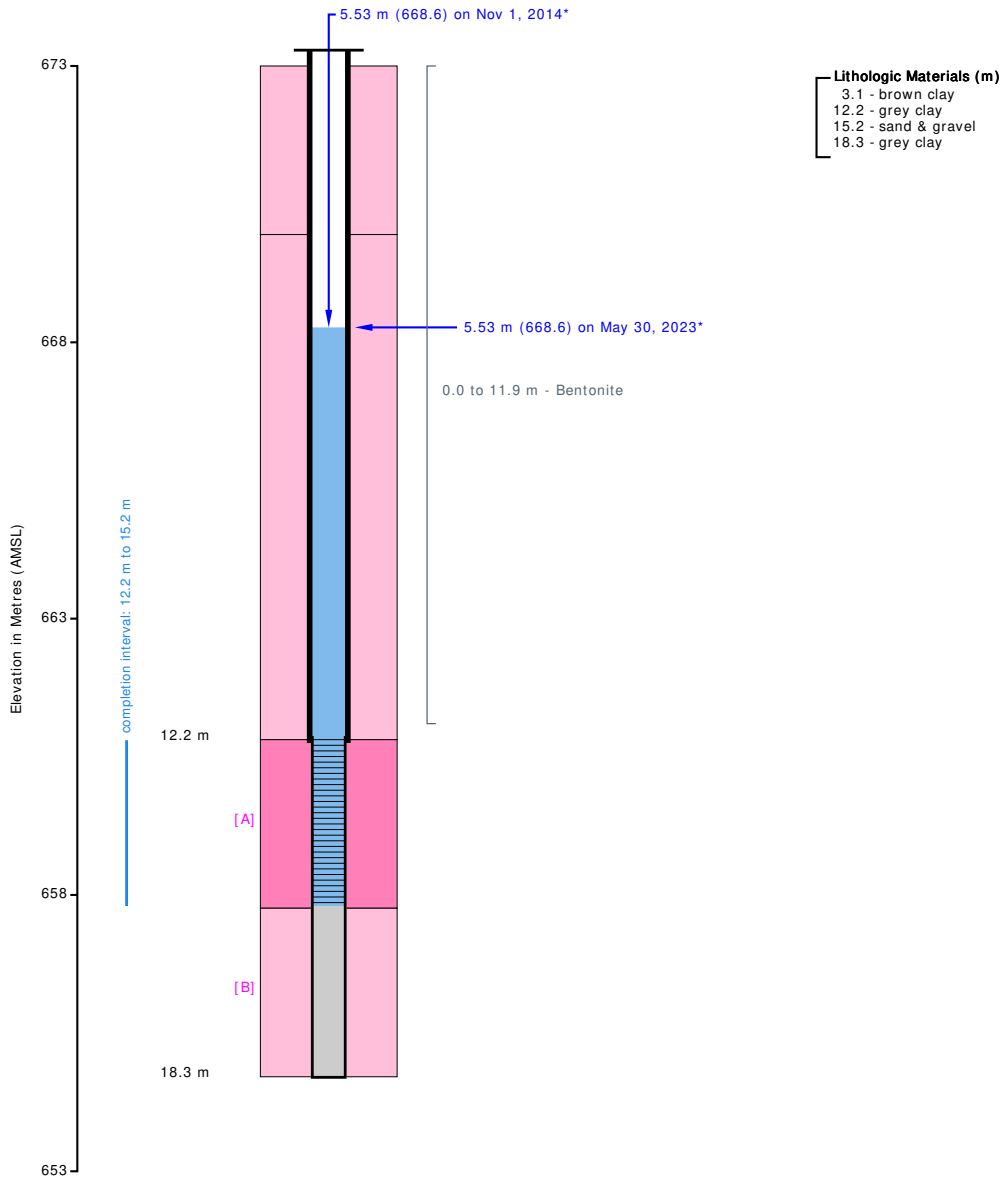
*(\* TGWC determined value)*

**Earliest Water Level (m): 5.53 – November 1, 2014**

**Most Recent Water Level (m): 5.53 – May 30, 2023 @ 14:00**

**GIC ID: Unknown**

# MW14-02 Water Well Diagram



Lithology Legend		Geologic Unit Legend (Top) - Regional Analysis	
Surficial	<ul style="list-style-type: none"> <li>Unsorted</li> <li>Fine Grained</li> <li>Coarse Grained</li> </ul>	Bedrock	<ul style="list-style-type: none"> <li>Fine Grained</li> <li>Coarse Grained</li> <li>Other</li> </ul>
		Geologic Unit details not available for this location	

### Summary

TGWC ID: M42475.578813  
 Well Name: MW14-02  
 Legal Location: 08-34-054-27 W4M  
 Casing (OD): 60.3 mm; PVC (2.4")  
 Screen (OD): 52.0 mm; PVC (2.0")  
 Casing Stick-Up: 0.8 m (not drawn to scale)  
 Completion [A]: 12.2 to 15.2 m; Screened  
 Construction [B]: 15.2 to 18.3 m; Plugged; Slough  
 Water Level (recent): 5.53 m (668.6 m AMSL) on May 30, 2023 @ 14:00 - Reference Point: Top of Casing  
 Water Level (oldest): 5.53 m (668.6 m AMSL) on Nov 1, 2014 - Reference Point: Top of Casing

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:50 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.

Owner: **Sturgeon County**  
 9613 100 St, Morinville, AB T8R 1L9

Contractor: **Summers Drilling Ltd.**  
 Name: **MW14-02**

Field Action: **Confirmed - Physically, November 22, 2017**

Work Type: **Piezometer** Date Started: **October 10, 2014**

Drilling Method: **Rotary - Mud** Date Completed: **October 10, 2014**

Proposed Use: **Observation** Well Status: **Monitoring**

Completion Type: **Casing/Liner/Screen** Feature Class: **Piezometer**

### METRIC REPORT

08-34-054-27 W4M

Easting (m): **73,520.29\*\***  
 Northing (m): **5,949,238.39\*\***  
 Elevation (m): **673\*\*\***

Lot:  
 Block:  
 Plan:

**M42475.578813**

513361; core

Elog Taken: **No**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.8**

Presence of Gas: **No**

**General Details** core

Depth Completed (m)\*: **15.2** Top of Bedrock: **Surficial Water Well \***  
 Depth Drilled (m): **18.3** Completion Interval (m): **12.2 – 15.2 \***

Sand & Gravel Thickness (m): **3.1 (total) – 3.1 (below 15 m) \***

Plugged / Backfilled (m): **15.2 – 18.3 (Slough)**

Most Recent Water Level (m): **5.53 m – May 30, 2023**

**Completion Details**

Surface Casing: **PVC – 60.3 mm (O.D.) x 3.40 mm (thick) x 12.2 m (bottom)**

Screen Material: **PVC – 52.0 mm (O.D.) (Attached To Casing)**

Fittings: **Top: Threaded – Bottom: Plug**

**Intervals**

Screen: **12.2 to 15.2 m - 0.0254 cm (Machine)**

Bentonite: **0.0 to 11.9 m**

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
670.3	3.1	Brown Clay
661.1	12.2	Grey Clay
658.1	15.2	Sand & Gravel
655.0	18.3	Grey Clay

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: **May 30, 2023 @ 14:20**

Report Date: **June 13, 2023 - Element Materials Technology Canada Inc. (1655888-13)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	1450	Nitrate as N:	< 0.01	Turbidity (NTU):	8.2
Total Dissolved Solids:	824	Nitrite as N:	< 0.005	Fluoride:	0.17
Hardness (as CaCO3):	721	pH (pH Unit):	7.25	Carbonate:	< 6
T-Alkalinity (as CaCO3):	541	Colour (TCU):	10	Bicarbonate:	660
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	98	Hydroxide:	< 5
Nitrate + Nitrite as N:	< 0.01	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.0	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	195		Mercury:	< 0.000005	
Chloride:	163		Molybdenum:	< 0.001	
Iron:	0.05		Magnesium:	56.5	
Manganese:	0.148***		Sodium:	34.1	
Aluminum:	< 0.002		Potassium:	3.6	
Arsenic:	0.0008		Vanadium:	0.0001	
Barium:	0.293		Strontium:	1.48	
Beryllium:	< 0.0001		Nickel:	0.0051	
Cadmium:	0.00005		Zinc:	0.002	
Chromium:	< 0.0005		Copper:	0.0004	
Cobalt:	0.0013		Lead:	< 0.0001	
Sulfate:	45.9		Uranium:	0.0085	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario.

513361; 1 / 14

**Comments & Observations**

**Field Survey (HCL), Nov 22, 2017:** Situated in northeast corner of the field; bailer installed and no padlock.

**Aquifer Tests**

**Alias IDs**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM — {Ground; AMSL}

Created on: August 25, 2023 — Data "AS IS"; no warranty either expressed or implied. [53.708082 -113.885712 (WGS 84)], INT Date End: 2023-06-02

**MW14-02**  
**AEPA - Water Well Drilling Report**

— AEPA water well drilling report not available —

**MW14-02**  
**Chemical Analysis Results (June 13, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880319
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

**Reference Number** 1655888-13  
**Sample Date** May 30, 2023  
**Sample Time** 14:20  
**Sample Location** M42475.578813  
**Sample Description** MW14-02 / 4.3 °C  
**Sample Matrix** Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Metals Dissolved</b>						
Silicon	Dissolved mg/L	8.27	0.05			
Sulfur	Dissolved mg/L	15.3	0.3			
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC	
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG	
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC	
Arsenic	Dissolved mg/L	0.0008	0.0002	0.01	Below MAC	
Barium	Dissolved mg/L	0.293	0.001	2.0	Below MAC	
Beryllium	Dissolved mg/L	<0.0001	0.0001			
Bismuth	Dissolved mg/L	<0.0005	0.0005			
Boron	Dissolved mg/L	0.094	0.002	5	Below MAC	
Cadmium	Dissolved mg/L	0.00005	0.00001	0.007	Below MAC	
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC	
Cobalt	Dissolved mg/L	0.0013	0.0001			
Copper	Dissolved mg/L	0.0004	0.0002	1 AO; 2 MAC	Below AO	
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC	
Lithium	Dissolved mg/L	0.110	0.001			
Molybdenum	Dissolved mg/L	<0.001	0.001			
Nickel	Dissolved mg/L	0.0051	0.0005			
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC	
Silver	Dissolved mg/L	<0.00001	0.00001			
Strontium	Dissolved mg/L	1.48	0.001	7.0	Below MAC	
Thallium	Dissolved mg/L	<0.00005	0.00005			
Tin	Dissolved mg/L	<0.001	0.001			
Titanium	Dissolved mg/L	<0.0005	0.0005			
Uranium	Dissolved mg/L	0.0085	0.0005	0.02	Below MAC	
Vanadium	Dissolved mg/L	0.0001	0.0001			
Zinc	Dissolved mg/L	0.002	0.001	5	Below AO	
Subsample		Field Filtered				
<b>Physical and Aggregate Properties</b>						
Colour	Apparent, Potable	Colour units	10	5	15	Below AO
Turbidity		NTU	8.2	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>						
pH			7.25	1	7.0-10.5	Within OG Range
Temperature of observed pH		°C	21.0			
Electrical Conductivity	at 25 °C	µS/cm	1450	1		
Calcium	Dissolved	mg/L	195	0.2		
Magnesium	Dissolved	mg/L	56.5	0.2		
Sodium	Dissolved	mg/L	34.1	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

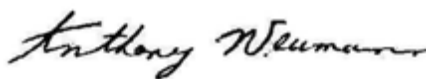


**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880319
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-13
<b>Sample Date</b>	May 30, 2023
<b>Sample Time</b>	14:20
<b>Sample Location</b>	M42475.578813
<b>Sample Description</b>	MW14-02 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved	mg/L	3.6	0.4	
Iron	Dissolved	mg/L	0.05	0.01	0.3 Below AO
Manganese	Dissolved	mg/L	0.148	0.005	0.02 AO; 0.12 MAC Above MAC
Chloride	Dissolved	mg/L	163	0.4	250 Below AO
Fluoride		mg/L	0.17	0.05	1.5 Below MAC
Nitrate - N		mg/L	<0.01	0.01	10 Below MAC
Nitrite - N		mg/L	<0.005	0.005	1 Below MAC
Nitrate and Nitrite - N		mg/L	<0.01	0.01	10 Below MAC
Sulfate (SO4)	Dissolved	mg/L	45.9	0.9	500 Below AO
Hydroxide		mg/L	<5		
Carbonate		mg/L	<6		
Bicarbonate		mg/L	660		
P-Alkalinity	as CaCO3	mg/L	<5	5	
T-Alkalinity	as CaCO3	mg/L	541	5	
Total Dissolved Solids	Calculated	mg/L	824	1	500 Above AO
Hardness	Dissolved as CaCO3	mg/L	721		
Ionic Balance	Dissolved	%	98		

Approved by:   
Anthony Neumann, MSc  
General Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880319
--	--	--

**Metals Dissolved**

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880319
--	--	--

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880319
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Sulfur	mg/L	33.7	34.4	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	1.1	1.1	10	0.4	yes
Barium	µg/L	48	48	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	109	110	10	4	yes
Cadmium	µg/L	<0.01	<0.01	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.2	1.2	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	71	71	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.9	1.1	10	1.1	yes
Selenium	µg/L	<0.2	<0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	953	947	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.7	3.6	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880319
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	10.0	9.9	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880319
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.1	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	15.0	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	56.8	57.1	10	0.5	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes
Nitrate - N	mg/L	0.02	0.02	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880319
--	---	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	121	123	10	0.6	yes
Magnesium	mg/L	23.2	23.7	10	0.7	yes
Sodium	mg/L	64.4	65.8	10	1.2	yes
Potassium	mg/L	3.8	3.8	10	1.2	yes
Iron	mg/L	2.31	2.35	10	0.05	yes
Manganese	mg/L	0.653	0.664	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2880319
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-13; 8663480: Sample received at 4.3 °C



---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 13, 2023
		P.O.:	19707	Report Number:	2880319
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

Please direct any inquiries regarding this report to our Client Services group.

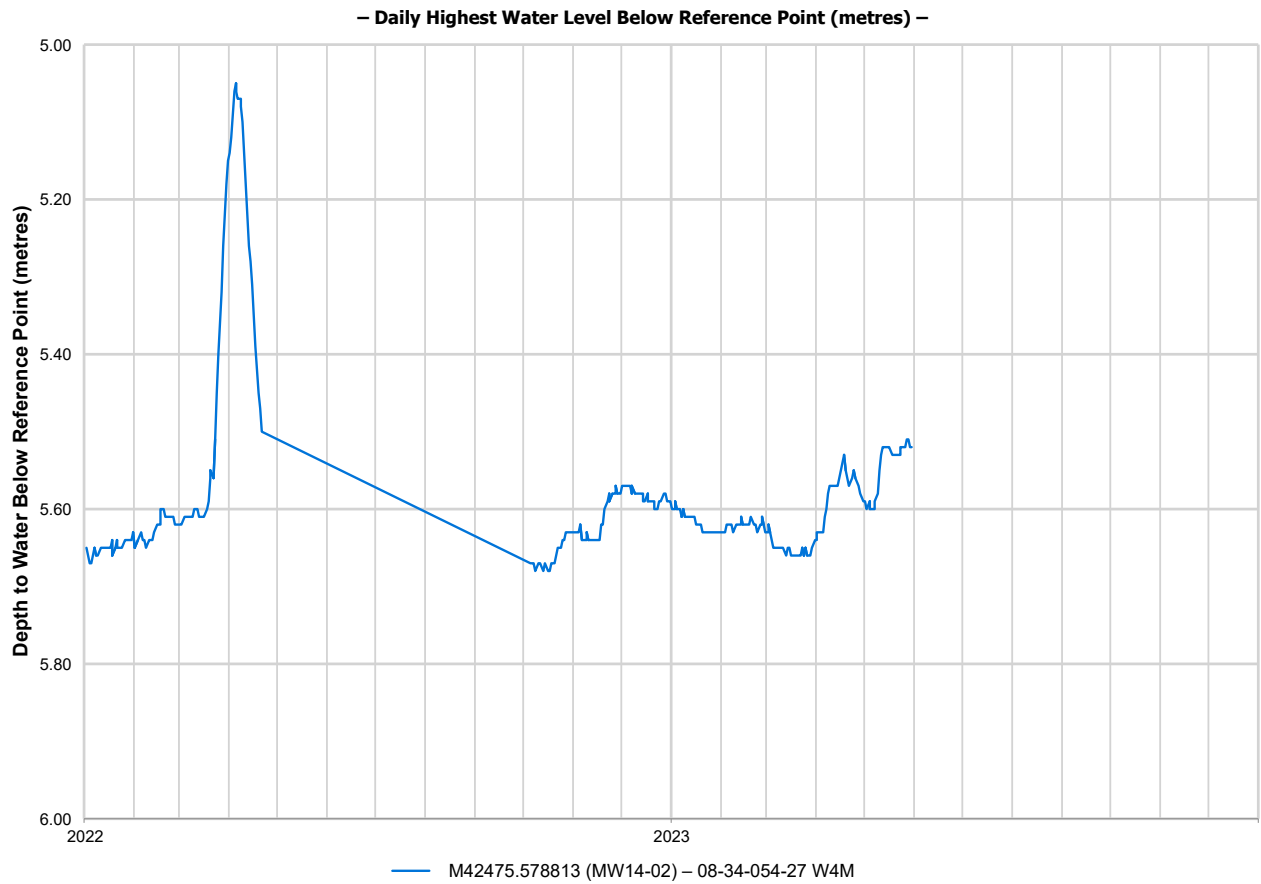
Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

---

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

MW14-02  
2022 - 2023 Hydrograph



## MW18-01

**08-16-054-26 W4M**  
(M43326.424846)



**Well Spatial Location:**

**Easting: 81,486**

**Northing: 5,944,609**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

**Ground Elevation AMSL (m): 670**

*(elevation accuracy HCL DEM (2016))*

**Date Completed: August 11, 2018**

**Depth Drilled (m): 25.3**

**Completion Interval (m): 13.1 – 22.3 \***

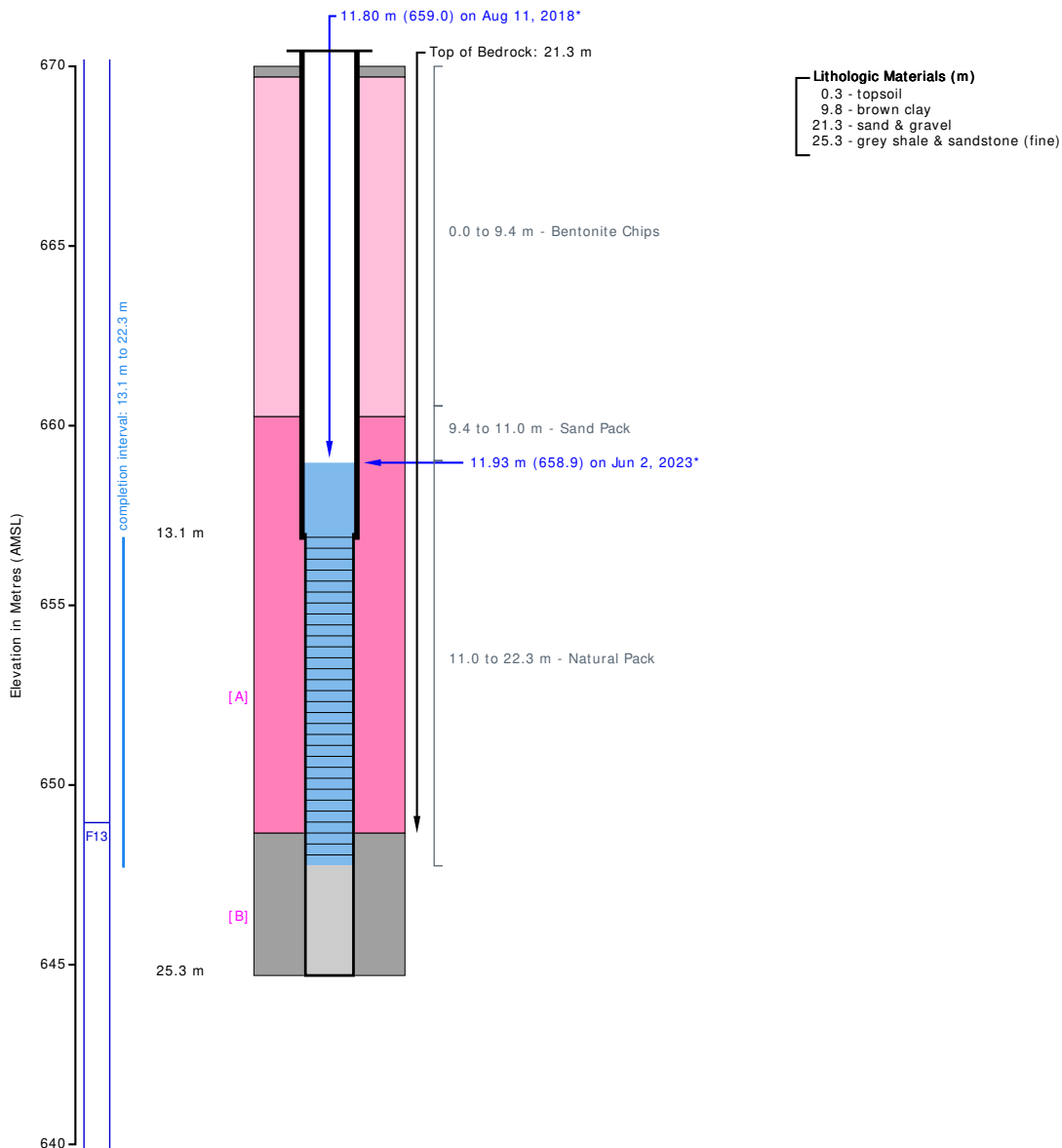
*(\* TGWC determined value)*

**Earliest Water Level (m): 11.80 – August 11, 2018 @ 11:00**

**Most Recent Water Level (m): 11.93 – June 2, 2023 @ 08:32**

**GIC ID: Unknown**

# MW18-01 Water Well Diagram



Lithology Legend		Geologic Unit Legend (Top) - Regional Analysis	
<b>Surficial</b>	<ul style="list-style-type: none"> <li>Unsorted</li> <li>Fine Grained</li> <li>Coarse Grained</li> </ul>	<b>Bedrock</b>	<ul style="list-style-type: none"> <li>Fine Grained</li> <li>Coarse Grained</li> <li>Other</li> </ul>
		F13 - Lower Horseshoe Canyon Formation	

**Summary**

TGWC ID: M43326.424846  
 Well Name: MW18-01  
 Legal Location: 08-16-054-26 W4M  
 Casing (OD): 88.9 mm; PVC (3.5")  
 Screen (OD): 77.9 mm; PVC (3.1")  
 Casing Stick-Up: 0.9 m (not drawn to scale)  
 Completion [A]: 13.1 to 22.3 m; Screened  
 Construction [B]: 22.3 to 25.3 m; Plugged; Slough

Water Level (recent): 11.93 m (658.9 m AMSL) on Jun 2, 2023 @ 08:32 - Reference Point: Top of Casing  
 Water Level (oldest): 11.80 m (659.0 m AMSL) on Aug 11, 2018 @ 11:00 - Reference Point: Top of Casing

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:51 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.

Owner: **Lehigh Hanson Materials Limited**  
 15015 123 Ave NW, Edmonton, AB T5V 1J7

Contractor: **Canadian Geological Drilling Ltd.**  
 Name: **MW18-01**

Field Action: **Confirmed - Physically, August 11, 2018**

Work Type: **Piezometer** Date Started: **August 10, 2018**

Drilling Method: **Hollow-Stem Auger** Date Completed: **August 11, 2018**

Proposed Use: **Observation** Well Status: **Observation**

Completion Type: **Screen** Feature Class: **Piezometer**

### METRIC REPORT

08-16-054-26 W4M

Easting (m): **81,486.00\*\***  
 Northing (m): **5,944,609.00\*\***  
 Elevation (m): **670\*\*\***

Lot:  
 Block:  
 Plan:

**M43326.424846**

513883; core

Elog Taken: **No**  
 Gamma Taken: **No**  
 Flowing: **No**  
 Stick Up (m): **0.9**

Presence of Gas: **No**

**General Details** core

Depth Completed (m)\*: **22.3** Top of Bedrock (m): **21.34\***  
 Depth Drilled (m): **25.3** Completion Interval (m): **13.1 – 22.3\***

Sand & Gravel Thickness (m): **11.6 (total) – 11.6 (below 15 m)\***  
 Plugged / Backfilled (m): **22.3 – 25.3 (Slough)**  
 Most Recent Water Level (m): **11.93 m – June 2, 2023**

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
669.6	0.3	Topsoil
660.2	9.8	Brown Clay
648.6	21.3	Sand & Gravel
644.6	25.3	Grey Shale & Sandstone (fine)

**Completion Details**

Surface Casing: **PVC – 88.9 mm (O.D.) x 5.50 mm (thick) x 13.1 m (bottom)**

Screen Material: **PVC – 77.9 mm (O.D.) (Attached To Casing)**

Fittings: **Top: Threaded – Bottom: Plug**

**Intervals**

Screen: **13.1 to 22.3 m - 20 Slot (Machine)**

Bentonite Chips: **0.0 to 9.4 m**

Sand Pack: **9.4 to 11.0 m**

Natural Pack: **11.0 to 22.3 m**

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: **June 2, 2023 @ 09:10**  
 Report Date: **June 14, 2023 - Element Materials Technology Canada Inc. (1655888-27)**

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	1080	Nitrate as N:	0.03	Turbidity (NTU):	7.1
Total Dissolved Solids:	704	Nitrite as N:	< 0.005	Fluoride:	0.09
Hardness (as CaCO3):	551	pH (pH Unit):	7.63	Carbonate:	< 6
T-Alkalinity (as CaCO3):	415	Colour (TCU):	25	Bicarbonate:	506
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	101	Hydroxide:	< 5
Nitrate + Nitrite as N:	0.03	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	20.7	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	150		Mercury:	< 0.000005	
Chloride:	12.9		Molybdenum:	< 0.001	
Iron:	1.16		Magnesium:	42.6	
Manganese:	2.48***		Sodium:	38.9	
Aluminum:	< 0.002		Potassium:	5.8	
Arsenic:	0.0021		Vanadium:	< 0.0001	
Barium:	0.031		Strontium:	0.828	
Beryllium:	< 0.0001		Nickel:	0.0012	
Cadmium:	< 0.00001		Zinc:	< 0.001	
Chromium:	< 0.0005		Copper:	< 0.0002	
Cobalt:	0.0008		Lead:	< 0.0001	
Sulfate:	204		Uranium:	0.0051	

Extractable - unfiltered  
Dissolved - filtered

Comments: **Sample collected by Hydrogeological Consultants Ltd.**

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario. 513883; 1 / 8

**Comments & Observations**

**Field Survey (HCL), Aug 11, 2018:** MW18-01 is completed 20 metres east of bee boxes along the northern quarter boundary.

**Aquifer Tests**

**Alias IDs**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM (2016) — {Ground; AMSL}



**MW18-01**  
**AEPA - Water Well Drilling Report**

— AEPA water well drilling report not available —

**MW18-01**  
**Chemical Analysis Results (June 14, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880333
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

**Reference Number** 1655888-27  
**Sample Date** June 02, 2023  
**Sample Time** 09:10  
**Sample Location** M43326.424846  
**Sample Description** MW18-01 / 4.3 °C  
**Sample Matrix** Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Metals Dissolved</b>					
Silicon	Dissolved mg/L	8.11	0.05		
Sulfur	Dissolved mg/L	68.0	0.3		
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC
Arsenic	Dissolved mg/L	0.0021	0.0002	0.01	Below MAC
Barium	Dissolved mg/L	0.031	0.001	2.0	Below MAC
Beryllium	Dissolved mg/L	<0.0001	0.0001		
Bismuth	Dissolved mg/L	<0.0005	0.0005		
Boron	Dissolved mg/L	0.060	0.002	5	Below MAC
Cadmium	Dissolved mg/L	<0.00001	0.00001	0.007	Below MAC
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC
Cobalt	Dissolved mg/L	0.0008	0.0001		
Copper	Dissolved mg/L	<0.0002	0.0002	1 AO; 2 MAC	Below AO
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC
Lithium	Dissolved mg/L	0.046	0.001		
Molybdenum	Dissolved mg/L	<0.001	0.001		
Nickel	Dissolved mg/L	0.0012	0.0005		
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC
Silver	Dissolved mg/L	<0.00001	0.00001		
Strontium	Dissolved mg/L	0.828	0.001	7.0	Below MAC
Thallium	Dissolved mg/L	<0.00005	0.00005		
Tin	Dissolved mg/L	<0.001	0.001		
Titanium	Dissolved mg/L	<0.0005	0.0005		
Uranium	Dissolved mg/L	0.0051	0.0005	0.02	Below MAC
Vanadium	Dissolved mg/L	<0.0001	0.0001		
Zinc	Dissolved mg/L	<0.001	0.001	5	Below AO
Subsample		Field Filtered			
<b>Physical and Aggregate Properties</b>					
Colour	Apparent, Potable	Colour units	25	5	15 Above AO
Turbidity		NTU	7.1	0.1	0.1/0.3/1.0 OG
<b>Routine Water</b>					
pH			7.63	1	7.0-10.5 Within OG Range
Temperature of observed pH		°C	20.7		
Electrical Conductivity	at 25 °C	µS/cm	1080	1	
Calcium	Dissolved	mg/L	150	0.2	
Magnesium	Dissolved	mg/L	42.6	0.2	
Sodium	Dissolved	mg/L	38.9	0.4	200 Below AO

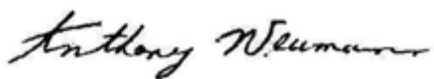
Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880333
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-27
<b>Sample Date</b>	June 02, 2023
<b>Sample Time</b>	09:10
<b>Sample Location</b>	M43326.424846
<b>Sample Description</b>	MW18-01 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved	mg/L	5.8	0.4	
Iron	Dissolved	mg/L	1.16	0.01	0.3 Above AO
Manganese	Dissolved	mg/L	2.48	0.005	0.02 AO; 0.12 MAC Above MAC
Chloride	Dissolved	mg/L	12.9	0.4	250 Below AO
Fluoride		mg/L	0.09	0.05	1.5 Below MAC
Nitrate - N		mg/L	0.03	0.01	10 Below MAC
Nitrite - N		mg/L	<0.005	0.005	1 Below MAC
Nitrate and Nitrite - N		mg/L	0.03	0.01	10 Below MAC
Sulfate (SO4)	Dissolved	mg/L	204	0.9	500 Below AO
Hydroxide		mg/L	<5		
Carbonate		mg/L	<6		
Bicarbonate		mg/L	506		
P-Alkalinity	as CaCO3	mg/L	<5	5	
T-Alkalinity	as CaCO3	mg/L	415	5	
Total Dissolved Solids	Calculated	mg/L	704	1	500 Above AO
Hardness	Dissolved as CaCO3	mg/L	551		
Ionic Balance	Dissolved	%	101		

Approved by:   
Anthony Neumann, MSc  
General Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880333
--	--	--

### Metals Dissolved

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00805925	-0.04	0.05	yes
Sulfur	mg/L	0.0373027	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880333
--	--	--

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880333
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.63	8.77	10	0.01	yes
Sulfur	mg/L	190	190	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	<0.2	<0.2	10	0.4	yes
Barium	µg/L	38	38	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	113	114	10	4	yes
Cadmium	µg/L	0.03	0.04	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.4	1.4	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	80	81	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.7	0.7	10	1.1	yes
Selenium	µg/L	0.4	0.4	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	1020	1010	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.2	3.4	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	<1	<1	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880333
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	10.0	9.9	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.08	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0.00178586	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.0306783	-0.2	0.2	yes
Magnesium	mg/L	0.0071963	-0.1	0.1	yes
Sodium	mg/L	0.0125338	-0.4	0.4	yes
Potassium	mg/L	-0.044862	-0.4	0.4	yes
Iron	mg/L	-0.00263048	-0.01	0.01	yes
Manganese	mg/L	-0.000222904	-0.004	0.004	yes
Date Acquired: June 09, 2023					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2100	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.96	9.03	11.13	yes
Nitrite - N	mg/L	9.95	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.90	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880333
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.9	74.9	86.9	yes	
Fluoride	mg/L	4.73	4.56	5.22	yes	
Nitrate - N	mg/L	4.73	4.37	5.33	yes	
Nitrite - N	mg/L	4.87	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.60	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	14.9	13.3	16.5	yes	
Fluoride	mg/L	0.50	0.45	0.57	yes	
Nitrate - N	mg/L	0.51	0.42	0.57	yes	
Nitrite - N	mg/L	0.509	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	1.02	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.57	7.57	0	0.10	yes
Electrical Conductivity	dS/m	0.930	0.928	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	549	546	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	450	448	10	5	yes
Chloride	mg/L	1.5	1.6	10	0.5	yes
Fluoride	mg/L	0.08	0.08	10	0.05	yes
Nitrate - N	mg/L	0.03	0.03	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880333
--	--	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	263	265	10	0.6	yes
Magnesium	mg/L	64.0	64.9	10	0.7	yes
Sodium	mg/L	110	109	10	1.2	yes
Potassium	mg/L	8.4	8.4	10	1.2	yes
Iron	mg/L	<0.01	<0.01	10	0.05	yes
Manganese	mg/L	<0.005	<0.005	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880333
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 13, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 8, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-27; 8663494: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 14, 2023
		P.O.:	19707	Report Number:	2880333
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

Please direct any inquiries regarding this report to our Client Services group.

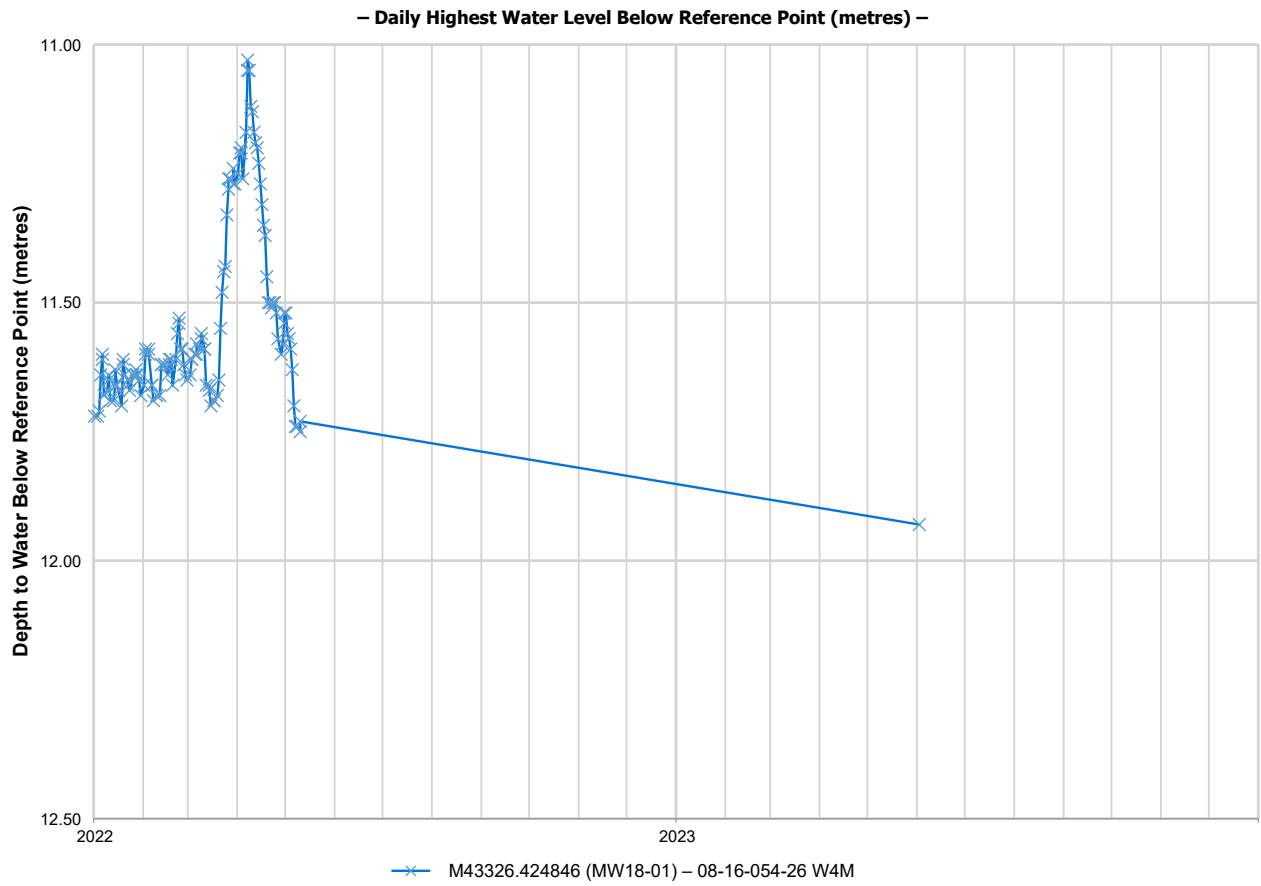
Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>



MW18-01  
2022 - 2023 Hydrograph



## 1963 Water Well 12-19

**12-19-054-26 W4M**  
(M40235.411135)



Photograph taken on May 14, 2018

### Well Spatial Location:

Easting: **76,869**

Northing: **5,946,227**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **677**

*(elevation accuracy HCL DEM)*

Date Completed: **January 1, 1963**

Depth Drilled (m): **14.7**

Completion Interval (m): **Not Available**

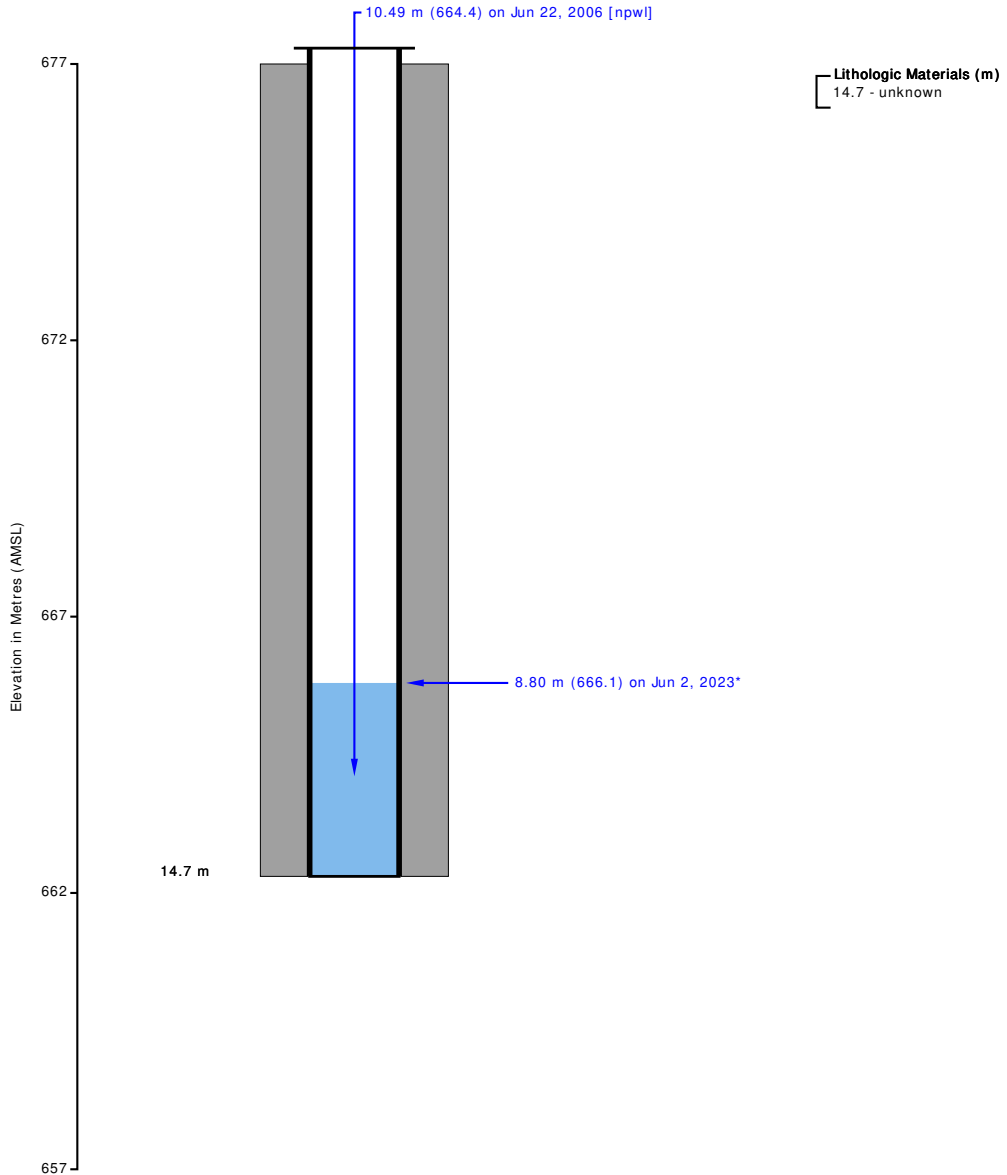
*(\* TGWC determined value)*

Earliest Water Level (m): **10.49 – June 22, 2006 @ 11:53**

Most Recent Water Level (m): **8.80 – June 2, 2023 @ 23:50**

GIC ID: **Unknown**

## 1963 Water Well 12-19 Water Well Diagram



Lithology Legend		Geologic Unit Legend (Top) - Regional Analysis		
<b>Surficial</b>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p style="font-size: 8px; margin: 0;">Unsorted</p> <p style="font-size: 8px; margin: 0;">Fine Grained</p> <p style="font-size: 8px; margin: 0;">Coarse Grained</p> </div> <div style="width: 45%;"> <p style="font-size: 8px; margin: 0;">Fine Grained</p> <p style="font-size: 8px; margin: 0;">Coarse Grained</p> </div> </div>	<b>Bedrock</b>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p style="font-size: 8px; margin: 0;">Fine Grained</p> <p style="font-size: 8px; margin: 0;">Coarse Grained</p> </div> <div style="width: 45%;"> <p style="font-size: 8px; margin: 0;">Other</p> </div> </div>	<p style="font-size: 8px; margin: 0;">Geologic Unit details not available for this location</p>

**Summary**

TGWC ID: M40235.411135  
 Well Name: 1963 Water Well 12-19  
 Legal Location: 12-19-054-26 W4M  
 Casing (OD): 141.2 mm; Steel (5.6")  
 Casing Stick-Up: -2.4 m (not drawn to scale)  
 Water Level (recent): 8.80 m (666.1 m AMSL) on Jun 2, 2023 @ 23:50 - Reference Point: Top of Casing  
 Water Level (oldest): 10.49 m (664.4 m AMSL) on Jun 22, 2006 @ 11:53 [npwl]

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:51 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.

**METRIC REPORT**

12-19-054-26 W4M

**M40235.411135**

513882; 1457884; core

Contractor: *[unknown contractor]*  
Name: *1963 Water Well 12-19*

Field Action: *Confirmed - Physically, March 29, 2010*  
Work Type: *Well Inventory*  
Drilling Method: *Drilled*  
Proposed Use: *Domestic & Stock*

Date Completed: *January 1, 1963*  
Well Status: *Producing*  
Feature Class: *Water Well*

Easting (m): *76,869.01\*\**  
Northing (m): *5,946,226.89\*\**  
Elevation (m): *677\*\*\**  
Lot:  
Block:  
Plan:  
Rural Address: *54317B RR 270*  
Presence of Gas: *No*

Elog Taken: *No*  
Gamma Taken: *No*  
Flowing: *No*  
Stick Up (m): *-2.4*

**General Details** core

Depth Completed (m)\*: *12.8* Top of Bedrock: *Surficial Water Well \**  
Depth Drilled (m): *14.7*

Most Recent Water Level (m): *8.80 m – June 2, 2023*  
Pump Intake BTOC (m): *11.8 on May 14, 2018*

**Completion Details**

Surface Casing: *Steel – 141.2 mm (O.D.) x 14.7 m (bottom)*

**Intervals**

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
662.6	14.7	Unknown

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: *June 2, 2023 @ 11:20*

Report Date: *June 14, 2023 - Element Materials Technology Canada Inc. (1655888-26)*

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	<i>968</i>	Nitrate as N:	<i>0.78</i>	Turbidity (NTU):	<i>7.7</i>
Total Dissolved Solids:	<i>599</i>	Nitrite as N:	<i>&lt; 0.005</i>	Fluoride:	<i>0.12</i>
Hardness (as CaCO3):	<i>407</i>	pH (pH Unit):	<i>7.72</i>	Carbonate:	<i>&lt; 6</i>
T-Alkalinity (as CaCO3):	<i>410</i>	Colour (TCU):	<i>25</i>	Bicarbonate:	<i>500</i>
P-Alkalinity (as CaCO3):	<i>&lt; 5</i>	Ion Balance (%):	<i>101</i>	Hydroxide:	<i>&lt; 5</i>
Nitrate + Nitrite as N:	<i>0.78</i>	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	<i>20.8</i>	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	<i>118</i>		Mercury:	<i>&lt; 0.000005</i>	
Chloride:	<i>16.1</i>		Molybdenum:	<i>&lt; 0.001</i>	
Iron:	<i>0.52</i>		Magnesium:	<i>27.5</i>	
Manganese:	<i>0.078</i>		Sodium:	<i>67.2</i>	
Aluminum:	<i>&lt; 0.002</i>		Potassium:	<i>5.4</i>	
Arsenic:	<i>&lt; 0.0002</i>		Vanadium:	<i>&lt; 0.0001</i>	
Barium:	<i>0.050</i>		Strontium:	<i>0.796</i>	
Beryllium:	<i>&lt; 0.0001</i>		Nickel:	<i>0.0013</i>	
Cadmium:	<i>0.00003</i>		Zinc:	<i>0.003</i>	
Chromium:	<i>&lt; 0.0005</i>		Copper:	<i>0.0014</i>	
Cobalt:	<i>&lt; 0.0001</i>		Lead:	<i>&lt; 0.0001</i>	
Sulfate:	<i>119</i>		Uranium:	<i>0.0153</i>	

Comments: *Sample collected by Hydrogeological Consultants Ltd.*

*Note: Constituents have been compared to the maximum acceptable concentration, Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada. Ottawa. Ontario.* 513882; 1 / 6

**Comments & Observations (3 total events)**

*Field Survey (HCL), May 14, 2018:* Water well pit specifications - shed floor to water well pit floor: 3.07 metres; shed floor to top of casing in water well pit: 2.85 metres; water well casing stick-up in pit: 0.22 metres; shed floor to top of monitoring tube: 1.10 metres, which is 3.95 metres above top of casing; ground level (outside shed) to shed floor: 0.50 metres. Downhole camera inspection completed using the R-Cam 1000. Measured total depth - prior to AT III: 12.4 metres BTOC; after AT III: 12.3 metres BTOC. Water levels measured from May 14, 2018, onward are from top of monitoring tube.

**Aquifer Tests**

Date & Time	Testing Method / Type	Depth of Test Interval	Duration (minutes)		Avg. Rate (Lpm)	NPWL (metres)	Drawdown (metres)	Pump (metres)	Q20 (m³/day)*		Transmissivity (m²/day)*	
			Pumping	Recovery					Apparent	Effective	Apparent	Effective
3 2018-05-14 11:40	Pump	[unknown]	120	88	46.2	4.6	5.5	11.8				15.1
2 2018-05-14 10:30	Pump	[unknown]	35	25	32.9	4.6	5.0	12.2				10.6
1 2006-06-22 11:53	Pump	[unknown]	120	120	26.5	10.5	4.7	—				9.8

**Alias IDs**

\* The Groundwater Centre (TGWC) calculated or determined value.  
\*\* HCL GPS — 10TM Resource NAD83  
\*\*\* HCL DEM — {Ground; AMSL}

Created on: August 25, 2023 — Data "AS IS"; no warranty either expressed or implied. [53.680525 -113.835717 (WGS 84)], INT Date End: 2023-06-02



**1963 Water Well 12-19**  
**AEPA - Water Well Drilling Report**

— AEPA water well drilling report not available —

**1963 Water Well 12-19**  
**Chemical Analysis Results (June 14, 2023)**



Element  
 7217 Roper Road NW  
 Edmonton, Alberta  
 T6B 3J4, Canada

T: +1 (780) 438-5522  
 F: +1 (780) 434-8586  
 E: info.Edmonton@element.com  
 W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880332
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

**Reference Number** 1655888-26  
**Sample Date** June 02, 2023  
**Sample Time** 11:20  
**Sample Location** M40235.411135  
**Sample Description** 1963 WW 12-19 / 4.3 °C  
**Sample Matrix** Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Metals Dissolved</b>					
Silicon	Dissolved mg/L	6.74	0.05		
Sulfur	Dissolved mg/L	39.7	0.3		
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC
Arsenic	Dissolved mg/L	<0.0002	0.0002	0.01	Below MAC
Barium	Dissolved mg/L	0.050	0.001	2.0	Below MAC
Beryllium	Dissolved mg/L	<0.0001	0.0001		
Bismuth	Dissolved mg/L	<0.0005	0.0005		
Boron	Dissolved mg/L	0.066	0.002	5	Below MAC
Cadmium	Dissolved mg/L	0.00003	0.00001	0.007	Below MAC
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC
Cobalt	Dissolved mg/L	<0.0001	0.0001		
Copper	Dissolved mg/L	0.0014	0.0002	1 AO; 2 MAC	Below AO
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC
Lithium	Dissolved mg/L	0.081	0.001		
Molybdenum	Dissolved mg/L	<0.001	0.001		
Nickel	Dissolved mg/L	0.0013	0.0005		
Selenium	Dissolved mg/L	0.0452	0.0002	0.05	Below MAC
Silver	Dissolved mg/L	<0.00001	0.00001		
Strontium	Dissolved mg/L	0.796	0.001	7.0	Below MAC
Thallium	Dissolved mg/L	<0.00005	0.00005		
Tin	Dissolved mg/L	<0.001	0.001		
Titanium	Dissolved mg/L	<0.0005	0.0005		
Uranium	Dissolved mg/L	0.0153	0.0005	0.02	Below MAC
Vanadium	Dissolved mg/L	<0.0001	0.0001		
Zinc	Dissolved mg/L	0.003	0.001	5	Below AO
Subsample		Field Filtered			
<b>Physical and Aggregate Properties</b>					
Colour	Apparent, Potable Colour units	25	5	15	Above AO
Turbidity	NTU	7.7	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>					
pH		7.72	1	7.0-10.5	Within OG Range
Temperature of observed pH	°C	20.8			
Electrical Conductivity	at 25 °C µS/cm	968	1		
Calcium	Dissolved mg/L	118	0.2		
Magnesium	Dissolved mg/L	27.5	0.2		
Sodium	Dissolved mg/L	67.2	0.4	200	Below AO

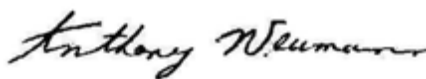
Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880332
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-26
<b>Sample Date</b>	June 02, 2023
<b>Sample Time</b>	11:20
<b>Sample Location</b>	M40235.411135
<b>Sample Description</b>	1963 WW 12-19 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved	mg/L	5.4	0.4	
Iron	Dissolved	mg/L	0.52	0.01	0.3 Above AO
Manganese	Dissolved	mg/L	0.078	0.005	0.02 AO; 0.12 MAC Above AO
Chloride	Dissolved	mg/L	16.1	0.4	250 Below AO
Fluoride		mg/L	0.12	0.05	1.5 Below MAC
Nitrate - N		mg/L	0.78	0.01	10 Below MAC
Nitrite - N		mg/L	<0.005	0.005	1 Below MAC
Nitrate and Nitrite - N		mg/L	0.78	0.01	10 Below MAC
Sulfate (SO4)	Dissolved	mg/L	119	0.9	500 Below AO
Hydroxide		mg/L	<5		
Carbonate		mg/L	<6		
Bicarbonate		mg/L	500		
P-Alkalinity	as CaCO3	mg/L	<5	5	
T-Alkalinity	as CaCO3	mg/L	410	5	
Total Dissolved Solids	Calculated	mg/L	599	1	500 Above AO
Hardness	Dissolved as CaCO3	mg/L	407		
Ionic Balance	Dissolved	%	101		

Approved by:   
Anthony Neumann, MSc  
General Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880332
--	--	--

**Metals Dissolved**

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00805925	-0.04	0.05	yes
Sulfur	mg/L	0.0373027	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes



**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880332
--	--	--

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880332
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.63	8.77	10	0.01	yes
Sulfur	mg/L	190	190	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	<0.2	<0.2	10	0.4	yes
Barium	µg/L	38	38	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	113	114	10	4	yes
Cadmium	µg/L	0.03	0.04	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.4	1.4	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	80	81	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.7	0.7	10	1.1	yes
Selenium	µg/L	0.4	0.4	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	1020	1010	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.2	3.4	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	<1	<1	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880332
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	10.0	9.9	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.08	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0.00178586	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.0306783	-0.2	0.2	yes
Magnesium	mg/L	0.0071963	-0.1	0.1	yes
Sodium	mg/L	0.0125338	-0.4	0.4	yes
Potassium	mg/L	-0.044862	-0.4	0.4	yes
Iron	mg/L	-0.00263048	-0.01	0.01	yes
Manganese	mg/L	-0.000222904	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2100	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.96	9.03	11.13	yes
Nitrite - N	mg/L	9.95	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.90	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880332
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.9	74.9	86.9	yes	
Fluoride	mg/L	4.73	4.56	5.22	yes	
Nitrate - N	mg/L	4.73	4.37	5.33	yes	
Nitrite - N	mg/L	4.87	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.60	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	14.9	13.3	16.5	yes	
Fluoride	mg/L	0.50	0.45	0.57	yes	
Nitrate - N	mg/L	0.51	0.42	0.57	yes	
Nitrite - N	mg/L	0.509	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	1.02	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.57	7.57	0	0.10	yes
Electrical Conductivity	dS/m	0.930	0.928	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	549	546	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	450	448	10	5	yes
Chloride	mg/L	1.5	1.6	10	0.5	yes
Fluoride	mg/L	0.08	0.08	10	0.05	yes
Nitrate - N	mg/L	0.03	0.03	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880332
--	--	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	263	265	10	0.6	yes
Magnesium	mg/L	64.0	64.9	10	0.7	yes
Sodium	mg/L	110	109	10	1.2	yes
Potassium	mg/L	8.4	8.4	10	1.2	yes
Iron	mg/L	<0.01	<0.01	10	0.05	yes
Manganese	mg/L	<0.005	<0.005	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring	Lot ID: <b>1655888</b>
Attn: Kirby Fromm	Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 14, 2023 Report Number: 2880332
Sampled By: Ben Gilham Company: HCL	P.O.: 19707 Proj. Acct. code:	

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 13, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-26; 8663493: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 14, 2023
		P.O.:	19707	Report Number:	2880332
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

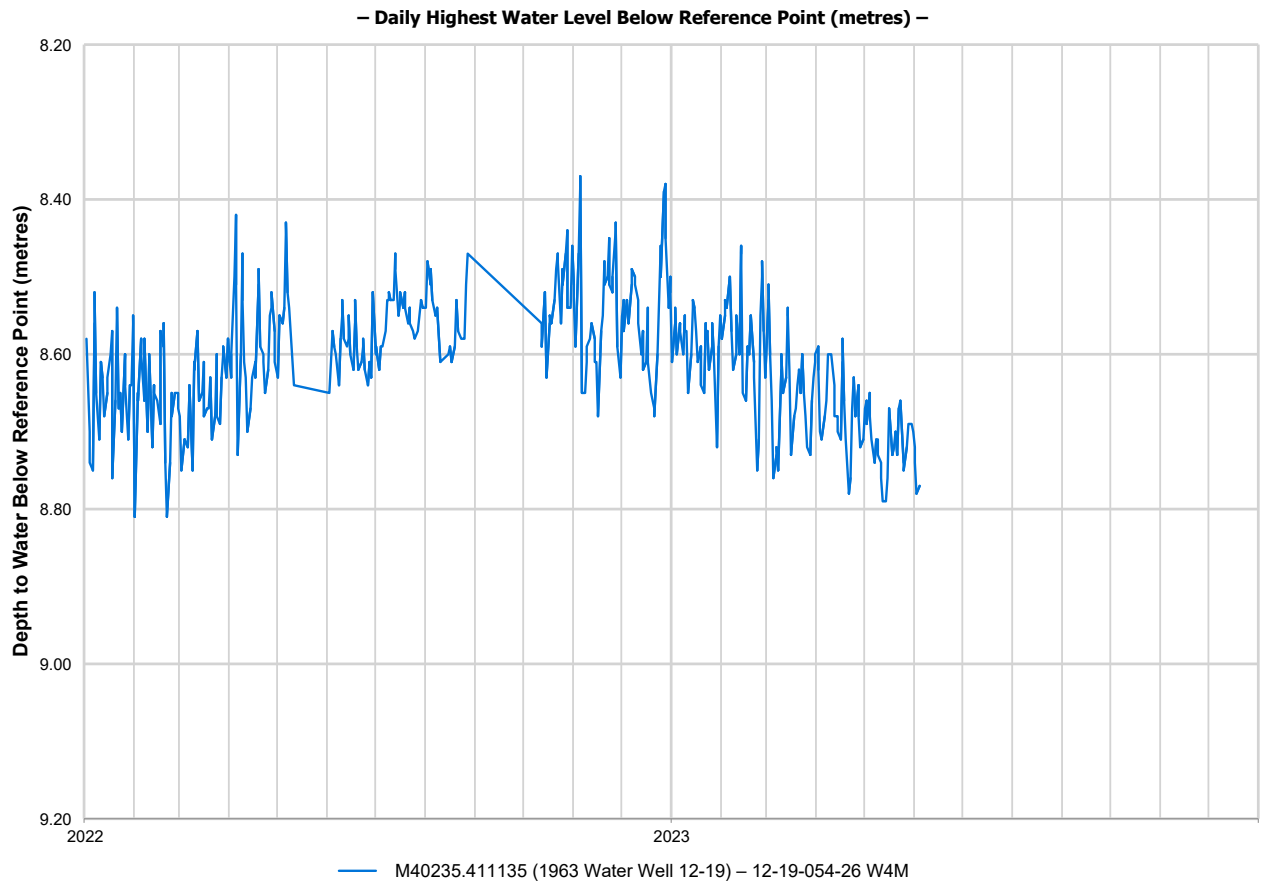
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

1963 Water Well 12-19  
2022 - 2023 Hydrograph





# 1987 Water Well 13-26

**13-26-054-27 W4M**  
(M35377.055706)



**Well Spatial Location:**

**Easting: 73,645**

**Northing: 5,948,192**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

**Ground Elevation AMSL (m): 675**

*(elevation accuracy LiDAR)*

**Date Completed: May 12, 1987**

**Depth Drilled (m): 18.3**

**Completion Interval (m): 10.4 – 11.6 \***

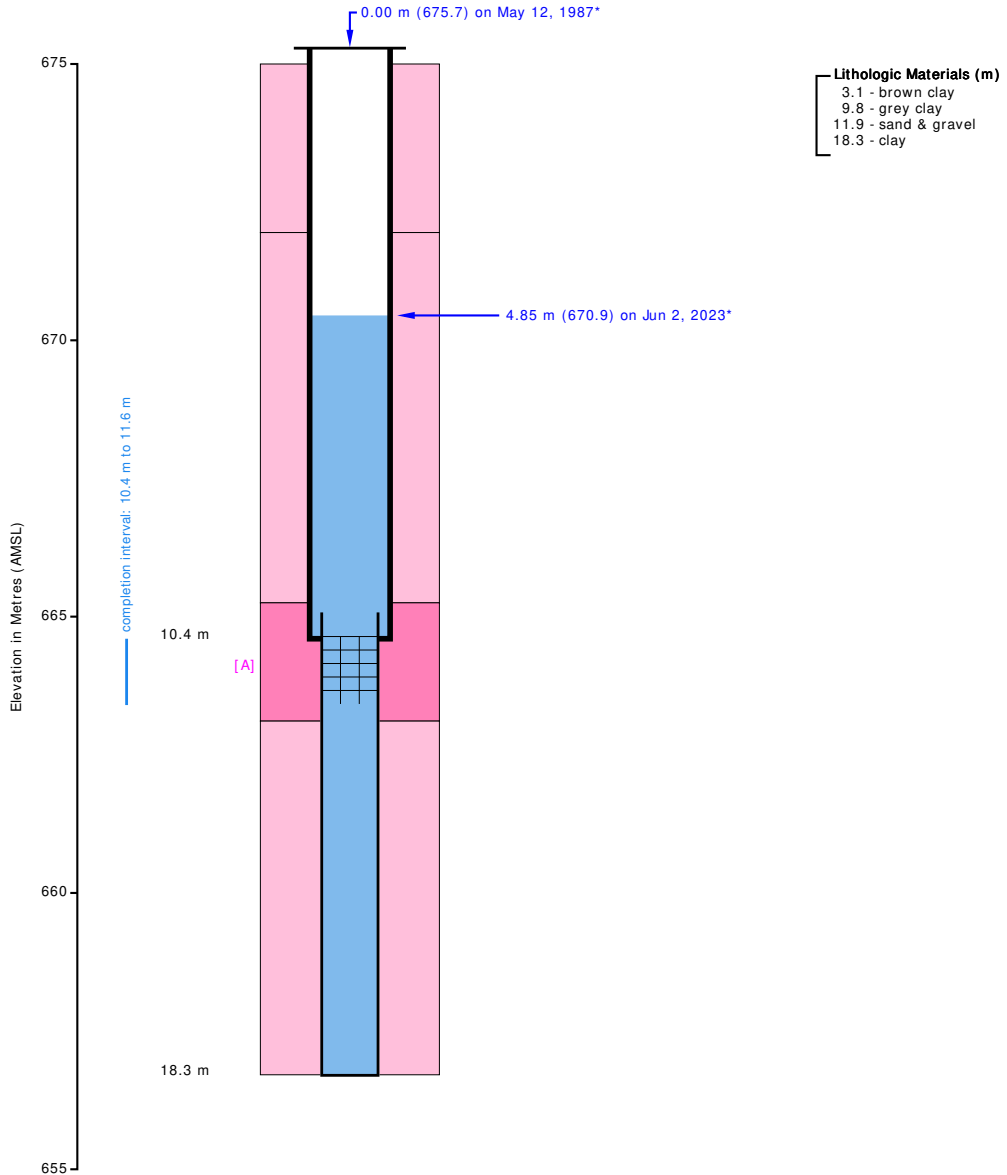
*(\* TGWC determined value)*

**Earliest Water Level (m): 0.00 – May 12, 1987**

**Most Recent Water Level (m): 4.85 – June 2, 2023 @ 23:00**

**GIC ID: 264252**

# 1987 Water Well 13-26 Water Well Diagram



Lithology Legend		Geologic Unit Legend (Top) - Regional Analysis	
<b>Surficial</b>	<ul style="list-style-type: none"> <li>Unsorted</li> <li>Fine Grained</li> <li>Coarse Grained</li> </ul>	<b>Bedrock</b>	<ul style="list-style-type: none"> <li>Fine Grained</li> <li>Coarse Grained</li> <li>Other</li> </ul>
		Geologic Unit details not available for this location	

**Summary**

TGWC ID: M35377.055706  
 Well Name: 1987 Water Well 13-26  
 Legal Location: 13-26-054-27 W4M  
 Casing (OD): 127.0 mm; Plastic (5.0")  
 Screen (OD): 88.9 mm; Stainless Steel (3.5")  
 Casing Stick-Up: 0.3 m (not drawn to scale)  
 Completion [A]: 10.4 to 11.6 m; Screened

Water Level (recent): 4.85 m (670.9 m AMSL) on Jun 2, 2023 @ 23:00 - Reference Point: Top of Casing  
 Water Level (oldest): 0.00 m (675.7 m AMSL) on May 12, 1987 - Reference Point: Top of Casing  
 Top of Liner assumed to be 5% of 'non-cased' interval.

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:51 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.

Contractor: *Mar-Wayne Water Well Drilling Services Ltd.*  
 Name: *1987 Water Well 13-26*

Field Action: *Confirmed - Physically, March 19, 2010*  
 Work Type: *New Well*  
 Drilling Method: *Rotary*  
 Proposed Use: *Domestic*  
 Completion Type: *Screen*

Date Started: *May 12, 1987*  
 Date Completed: *May 12, 1987*  
 Well Status: *Producing*  
 Feature Class: *Water Well*

**METRIC REPORT**

13-26-054-27 W4M

**M35377.055706**

Easting (m): *73,644.84\*\**  
 Northing (m): *5,948,191.65\*\**  
 Elevation (m): *675\*\*\**  
 Lot:  
 Block:  
 Plan:

526829; 103785; core

Elog Taken: *No*  
 Gamma Taken: *No*  
 Flowing: *Yes; 45.5 Lpm*  
 Stick Up (m): *0.3*

Presence of Gas: *No*

**General Details** core

Depth Completed (m)\*: *11.6*      Top of Bedrock: *Surficial Water Well \**  
 Depth Drilled (m): *18.3*      Completion Interval (m): *10.4 – 11.6 \**  
 Completion Aquifer: *Lower Surficial \**  
 Sand & Gravel Thickness (m): *2.1 (total) – 0.0 (below 15 m) \**

Most Recent Water Level (m): *4.85 m – June 2, 2023*  
 Pump Intake BTOC (m): *9.2 on September 15, 2022*

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
672.4	3.1	Brown Clay
665.7	9.8	Grey Clay
663.5	11.9	Sand & Gravel
657.1	18.3	Clay

**Completion Details**

Surface Casing: *Plastic – 127.0 mm (O.D.) x 10.4 m (bottom)*

Screen Material: *Stainless Steel – 88.9 mm (O.D.) (Attached To Casing)*  
 Fittings: *Top: Threaded – Bottom: Plug*

**Intervals**

Screen: *10.4 to 11.6 m - 10 Slot*

**Chemistry Summary Details** (mg/L, except as noted) (recently sampled first)

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

**Comments & Observations**

*Field Survey (HCL), Mar 25, 2010:* Water well is under a tan-coloured tub, 15 metres south of the house. Water well flowed when tap was opened on water well head.

**Aquifer Tests**

Date & Time	Testing Method / Type	Depth of Test Interval	Duration (minutes)		Avg. Rate (Lpm)	NPWL (metres)	Drawdown (metres)	Pump (metres)	Q20 (m <sup>3</sup> /day)*		Transmissivity (m <sup>2</sup> /day)*	
			Pumping	Recovery					Apparent	Effective	Apparent	Aquifer Effective
1 1987-05-12 11:00	Air	<i>[unknown]</i>			45.5	0.0	—	—				

**Alias IDs**

GIC ID: *264252*  
 GIC (WellReportId): *264252*

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* LiDAR — {Ground; AMSL}



**1987 Water Well 13-26**  
**AEPA - Water Well Drilling Report**



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 264252  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received 1987/06/01

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b>		Address		Town		Province		Country		Postal Code	
[REDACTED]											
<b>Location</b>	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description		
	NW	26	54	27	4						
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>					Elevation _____ m	
_____ m from _____					Latitude <u>53.697942</u> Longitude <u>-113.879201</u>					How Elevation Obtained _____	
_____ m from _____					How Location Obtained _____					Map _____	
					Map					Not Obtained	

Drilling Information	
<b>Method of Drilling</b> Rotary	<b>Type of Work</b> New Well
<b>Proposed Well Use</b> Domestic	

Formation Log			Measurement in Metric
Depth from ground level (m)	Water Bearing	Lithology Description	
3.05		Brown Clay	
9.75		Gray Clay	
11.89		Sand & Gravel	
18.29		Clay	

Yield Test Summary			Measurement in Metric
Recommended Pump Rate	27.28 L/min		
Test Date	Water Removal Rate (L/min)	Static Water Level (m)	
1987/05/12	45.46	0.00	

Well Completion				Measurement in Metric
Total Depth Drilled	Finished Well Depth	Start Date	End Date	
18.29 m		1987/05/12	1987/05/12	
<b>Borehole</b>				
Diameter (cm)	From (m)	To (m)		
0.00	0.00	18.29		
<b>Surface Casing (if applicable)</b>		<b>Well Casing/Liner</b>		
Plastic				
Size OD :	12.70 cm	Size OD :	0.00 cm	
Wall Thickness :	0.000 cm	Wall Thickness :	0.000 cm	
Bottom at :	10.36 m	Top at :	0.00 m	
		Bottom at :	0.00 m	
<b>Perforations</b>				
From (m)	To (m)	Diameter or Slot Width (cm)	Slot Length (cm)	Hole or Slot Interval(cm)
Perforated by _____				
<b>Annular Seal</b> Unknown				
Placed from _____ 0.00 m to _____ 0.00 m				
Amount _____				
Other Seals				
Type		At (m)		
<b>Screen Type</b> Stainless Steel				
Size OD : 8.89 cm				
From (m)	To (m)	Slot Size (cm)		
10.36	11.58	0.025		
Attachment Attached To Casing				
Top Fittings Threaded		Bottom Fittings Plug		
<b>Pack</b>				
Type Washed Sand		Grain Size _____		
Amount 1200.00 Pounds				

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well UNKNOWN NA DRILLER	Certification No 1
Company Name MAR-WAYNE WATER WELL DRILLING SERVICES LTD.	Copy of Well report provided to owner Date approval holder signed



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 264252  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received 1987/06/01

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b>	Address			Town		Province		Country		Postal Code	
<b>Location</b>	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description		
	NW	26	54	27	4						
<b>Measured from Boundary of</b>				<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>				Elevation _____ m			
_____ m from				Latitude <u>53.697942</u> Longitude <u>-113.879201</u>				How Elevation Obtained			
_____ m from				How Location Obtained				Not Obtained			
Map											

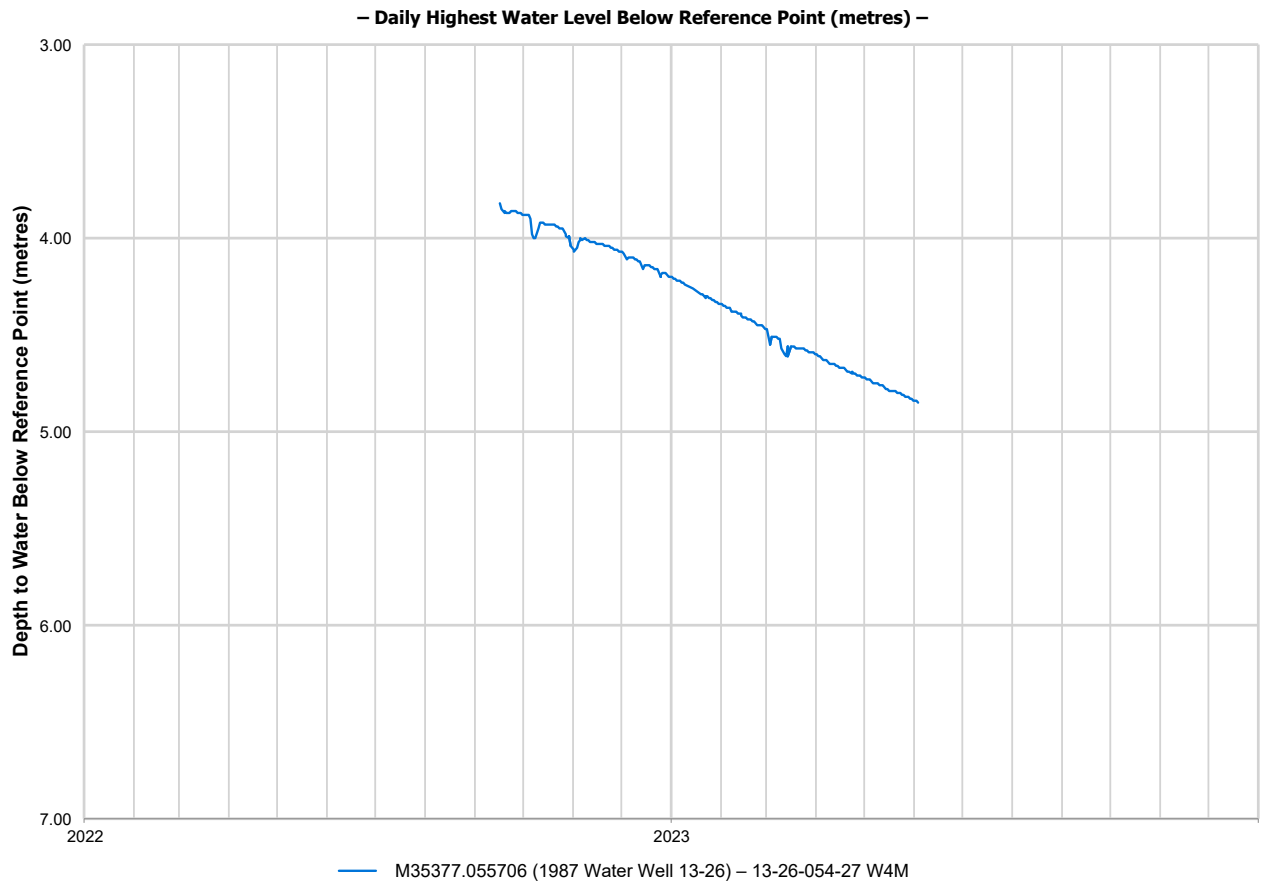
Additional Information										Measurement in Metric
Distance From Top of Casing to Ground Level _____ cm					Is Flow Control Installed _____					
Is Artesian Flow <b>Yes</b>					Rate <u>45.46 L/min</u>					Describe _____
Recommended Pump Rate _____ 27.28 L/min					Pump Installed <b>Yes</b>					Depth _____ m
Recommended Pump Intake Depth (From TOC) _____ 7.62 m					Type <u>SUB</u>					Make _____ H.P. <u>.5</u>
										Model (Output Rating) _____
Did you Encounter Saline Water (>4000 ppm TDS) _____					Depth _____ m		Well Disinfected Upon Completion _____			
Remedial Action Taken _____					Gas _____		Depth _____ m		Geophysical Log Taken _____	
										Submitted to ESRD _____
Additional Comments on Well					Sample Collected for Potability _____					Submitted to ESRD _____
ORIGINAL LSD WH										

Yield Test			Taken From Ground Level		Measurement in Metric
			Depth to water level		
Test Date	Start Time	Static Water Level			
1987/05/12	12:00 AM	0.00 m			
			Pumping (m)	Elapsed Time	Recovery (m)
				Minutes:Sec	
<b>Method of Water Removal</b>					
Type <u>Air</u>					
Removal Rate <u>45.46 L/min</u>					
Depth Withdrawn From <u>0.00 m</u>					
If water removal period was < 2 hours, explain why					

Water Diverted for Drilling		
Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well	Certification No
UNKNOWN NA DRILLER	1
Company Name	Copy of Well report provided to owner Date approval holder signed
MAR-WAYNE WATER WELL DRILLING SERVICES LTD.	

1987 Water Well 13-26  
2022 - 2023 Hydrograph



# 1995 Water Well 09-34

**09-34-054-27 W4M**  
(M43987.561869)



Photograph taken on June 5, 2020

**Well Spatial Location:**

**Easting: 73,391**

**Northing: 5,949,371**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

**Ground Elevation AMSL (m): 674**

*(elevation accuracy HCL DEM (2016))*

**Date Completed: *Not Available***

**Depth Drilled (m): 33.5**

**Completion Interval (m): *Not Available***

*(\* TGWC determined value)*

**Earliest Water Level (m): 5.58 – July 6, 2006 @ 11:00**

**Most Recent Water Level (m): 5.99 – May 30, 2023 @ 13:24**

**GIC ID: *Unknown***

**1995 Water Well 09-34  
Water Well Diagram**

*Insufficient information available to draw a water well diagram*



**METRIC REPORT**

09-34-054-27 W4M

**M43987.561869**

513358; 1606528; core

Easting (m): 73,391.00\*\*  
 Northing (m): 5,949,371.00\*\*  
 Elevation (m): 674\*\*\*  
 Lot: 29  
 Block: 2  
 Plan: 8020013  
 Rural Address: 72, 54519 RR 273  
 Presence of Gas: No

Elog Taken: No  
 Gamma Taken: No  
 Flowing: No  
 Stick Up (m): 0.1

Contractor: *Mar-Wayne Water Well Drilling Services Ltd.*  
 Name: *1995 Water Well 09-34*

Field Action: *Confirmed - Physically, June 5, 2020*

Work Type: *Well Inventory*  
 Drilling Method: *Rotary - Mud*  
 Proposed Use: *Domestic*

Well Status: *Producing*  
 Feature Class: *Water Well*

**General Details** core

Depth Drilled (m): 33.5  
 Most Recent Water Level (m): 5.99 m – May 30, 2023

**Completion Details**

Surface Casing: *PVC – 152.4 mm (O.D.)*

**Intervals**

**Lithology Details**

Elevation Depth  
 (AMSL) (BGL) Lithology Descriptions  
*lithology not provided*

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: *May 30, 2023 @ 13:45*

Report Date: *June 12, 2023 - Element Materials Technology Canada Inc. (1655888-10)*

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	1380	Nitrate as N:	< 0.01	Turbidity (NTU):	10.9
Total Dissolved Solids:	945	Nitrite as N:	< 0.005	Fluoride:	0.05
Hardness (as CaCO3):	498	pH (pH Unit):	7.56	Carbonate:	< 6
T-Alkalinity (as CaCO3):	480	Colour (TCU):	20	Bicarbonate:	585
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	100	Hydroxide:	< 5
Nitrate + Nitrite as N:	< 0.01	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.2	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	145		Mercury:	< 0.000005	
Chloride:	< 0.4		Molybdenum:	< 0.001	
Iron:	1.53		Magnesium:	33.0	
Manganese:	1.43***		Sodium:	144	
Aluminum:	< 0.002		Potassium:	4.0	
Arsenic:	0.0037		Vanadium:	< 0.0001	
Barium:	0.027		Strontium:	1.12	
Beryllium:	< 0.0001		Nickel:	0.0012	
Cadmium:	< 0.00001		Zinc:	0.009	
Chromium:	< 0.0005		Copper:	0.0012	
Cobalt:	0.0009		Lead:	< 0.0001	
Sulfate:	331		Uranium:	0.0028	

Extractable - unfiltered  
Dissolved - filtered

Comments: *Sample collected by Hydrogeological Consultants Ltd.*

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario. 513358; 1 / 5

**Comments & Observations**

*Field Survey (HCL), Jun 5, 2020:* Water well is 5 metres west of the house. Landowner confirmed that water well is 33.5 metres deep and that Mar-Wayne Water Well Drilling Services Ltd. drilled water well in 1995. Confirmed with Marv Perrott that Mar-Wayne did drill water well, but the water well drilling report is not available.

**Aquifer Tests**

Date & Time	Testing Method / Type	Depth of Test Interval	Duration (minutes)		Avg. Rate (Lpm)	NPWL (metres)	Drawdown (metres)	Pump (metres)	Q20 (m <sup>3</sup> /day)*		Transmissivity (m <sup>2</sup> /day)*	
			Pumping	Recovery					Apparent	Effective	Apparent	Aquifer Effective
2 2006-09-19 11:00	Pump	[unknown]	60	7	22.7	5.6	0.4	—				114
1 2006-07-06 11:00	Pump	[unknown]	60	2	22.7	5.6	0.4	—				110

**Alias IDs**

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* HCL DEM (2016) — {Ground; AMSL}



*1995 Water Well 09-34  
AEPA - Water Well Drilling Report*

*— AEPA water well drilling report not available —*

**1995 Water Well 09-34  
Chemical Analysis Results (June 12, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880316
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

**Reference Number** 1655888-10  
**Sample Date** May 30, 2023  
**Sample Time** 13:45  
**Sample Location** M43987.561869  
**Sample Description** 1995 WW 09-34 / 4.3 °C  
**Sample Matrix** Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Metals Dissolved</b>						
Silicon	Dissolved mg/L	6.80	0.05			
Sulfur	Dissolved mg/L	110	0.3			
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC	
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG	
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC	
Arsenic	Dissolved mg/L	0.0037	0.0002	0.01	Below MAC	
Barium	Dissolved mg/L	0.027	0.001	2.0	Below MAC	
Beryllium	Dissolved mg/L	<0.0001	0.0001			
Bismuth	Dissolved mg/L	<0.0005	0.0005			
Boron	Dissolved mg/L	0.139	0.002	5	Below MAC	
Cadmium	Dissolved mg/L	<0.00001	0.00001	0.007	Below MAC	
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC	
Cobalt	Dissolved mg/L	0.0009	0.0001			
Copper	Dissolved mg/L	0.0012	0.0002	1 AO; 2 MAC	Below AO	
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC	
Lithium	Dissolved mg/L	0.108	0.001			
Molybdenum	Dissolved mg/L	<0.001	0.001			
Nickel	Dissolved mg/L	0.0012	0.0005			
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC	
Silver	Dissolved mg/L	<0.00001	0.00001			
Strontium	Dissolved mg/L	1.12	0.001	7.0	Below MAC	
Thallium	Dissolved mg/L	<0.00005	0.00005			
Tin	Dissolved mg/L	<0.001	0.001			
Titanium	Dissolved mg/L	<0.0005	0.0005			
Uranium	Dissolved mg/L	0.0028	0.0005	0.02	Below MAC	
Vanadium	Dissolved mg/L	<0.0001	0.0001			
Zinc	Dissolved mg/L	0.009	0.001	5	Below AO	
Subsample		Field Filtered				
<b>Physical and Aggregate Properties</b>						
Colour	Apparent, Potable	Colour units	20	5	15	Above AO
Turbidity		NTU	10.9	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>						
pH			7.56	1	7.0-10.5	Within OG Range
Temperature of observed pH		°C	21.2			
Electrical Conductivity	at 25 °C	µS/cm	1380	1		
Calcium	Dissolved	mg/L	145	0.2		
Magnesium	Dissolved	mg/L	33.0	0.2		
Sodium	Dissolved	mg/L	144	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880316
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-10
<b>Sample Date</b>	May 30, 2023
<b>Sample Time</b>	13:45
<b>Sample Location</b>	M43987.561869
<b>Sample Description</b>	1995 WW 09-34 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Routine Water - Continued</b>						
Potassium	Dissolved	mg/L	4.0	0.4		
Iron	Dissolved	mg/L	1.53	0.01	0.3	Above AO
Manganese	Dissolved	mg/L	1.43	0.005	0.02 AO; 0.12 MAC	Above MAC
Chloride	Dissolved	mg/L	<0.4	0.4	250	Below AO
Fluoride		mg/L	0.05	0.05	1.5	Below MAC
Nitrate - N		mg/L	<0.01	0.01	10	Below MAC
Nitrite - N		mg/L	<0.005	0.005	1	Below MAC
Nitrate and Nitrite - N		mg/L	<0.01	0.01	10	Below MAC
Sulfate (SO4)	Dissolved	mg/L	331	0.9	500	Below AO
Hydroxide		mg/L	<5			
Carbonate		mg/L	<6			
Bicarbonate		mg/L	585			
P-Alkalinity	as CaCO3	mg/L	<5	5		
T-Alkalinity	as CaCO3	mg/L	480	5		
Total Dissolved Solids	Calculated	mg/L	945	1	500	Above AO
Hardness	Dissolved as CaCO3	mg/L	498			
Ionic Balance	Dissolved	%	100			

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880316
--	--	--

**Metals Dissolved**

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880316
--	--	--

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880316
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Sulfur	mg/L	33.7	34.4	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	1.1	1.1	10	0.4	yes
Barium	µg/L	48	48	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	109	110	10	4	yes
Cadmium	µg/L	<0.01	<0.01	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.2	1.2	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	71	71	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.9	1.1	10	1.1	yes
Selenium	µg/L	<0.2	<0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	953	947	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.7	3.6	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880316
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	1.4	1.3	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880316
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.1	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	15.0	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	56.8	57.1	10	0.5	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes
Nitrate - N	mg/L	0.02	0.02	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880316
--	--	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	121	123	10	0.6	yes
Magnesium	mg/L	23.2	23.7	10	0.7	yes
Sodium	mg/L	64.4	65.8	10	1.2	yes
Potassium	mg/L	3.8	3.8	10	1.2	yes
Iron	mg/L	2.31	2.35	10	0.05	yes
Manganese	mg/L	0.653	0.664	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880316
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-10; 8663477: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
	17740 - 118 Avenue	Project Name:	2022 Groundwater Monitoring	Control Number:	
	Edmonton, AB, Canada	Project Location:		Date Received:	Jun 5, 2023
	T5S 2W3	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
Attn:	Kirby Fromm	P.O.:	19707	Report Number:	2880316
Sampled By:	Ben Gilham	Proj. Acct. code:			
Company:	HCL				

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

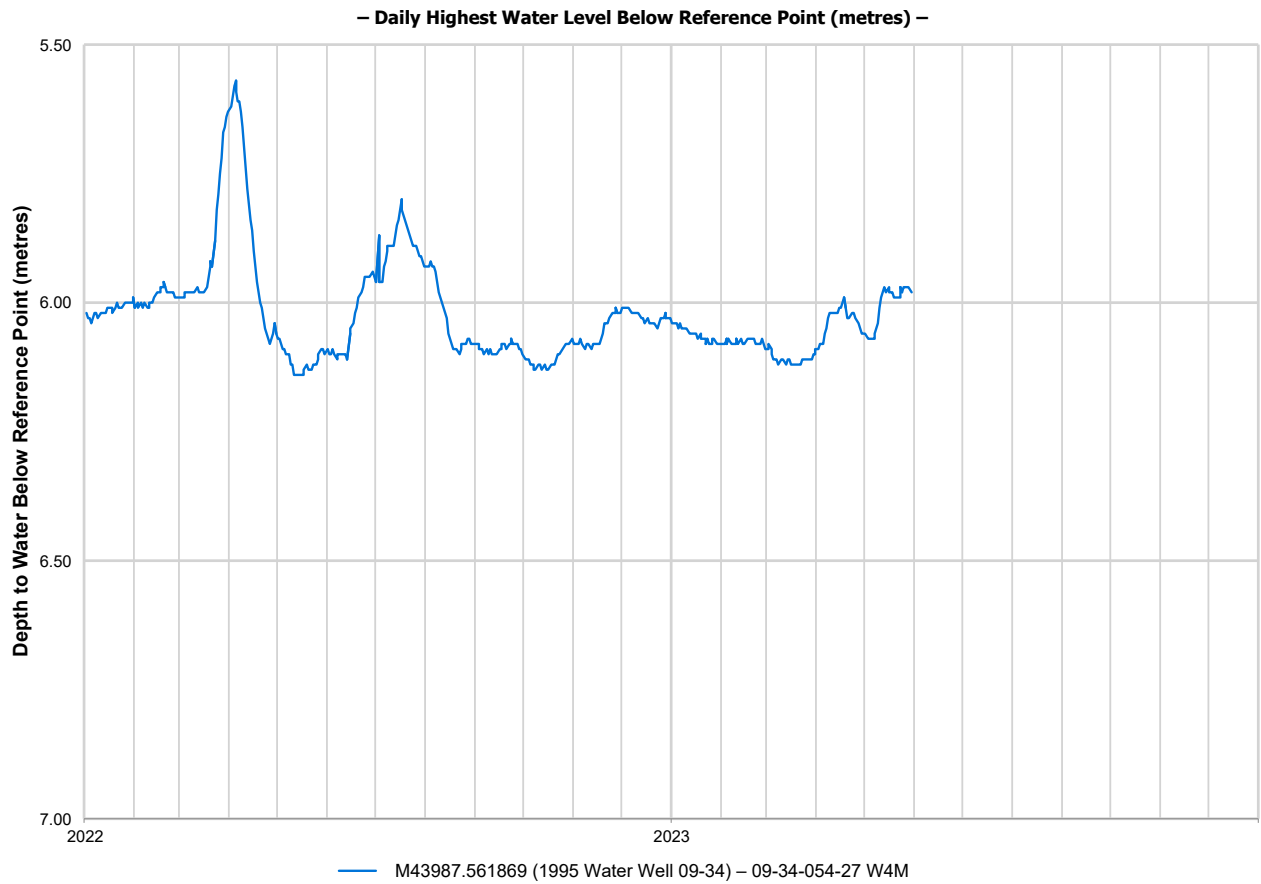
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

1995 Water Well 09-34  
2022 - 2023 Hydrograph



## 2001 Water Well 14-21

**14-21-054-27 W4M**  
(M37841.689687)



Photograph taken on June 27, 2013

### Well Spatial Location:

Easting: **71,020**

Northing: **5,946,669**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **692**

*(elevation accuracy MT GPS (Elevation))*

Date Completed: **September 10, 2001**

Depth Drilled (m): **30.5**

Completion Interval (m): **18.3 – 19.8 \***

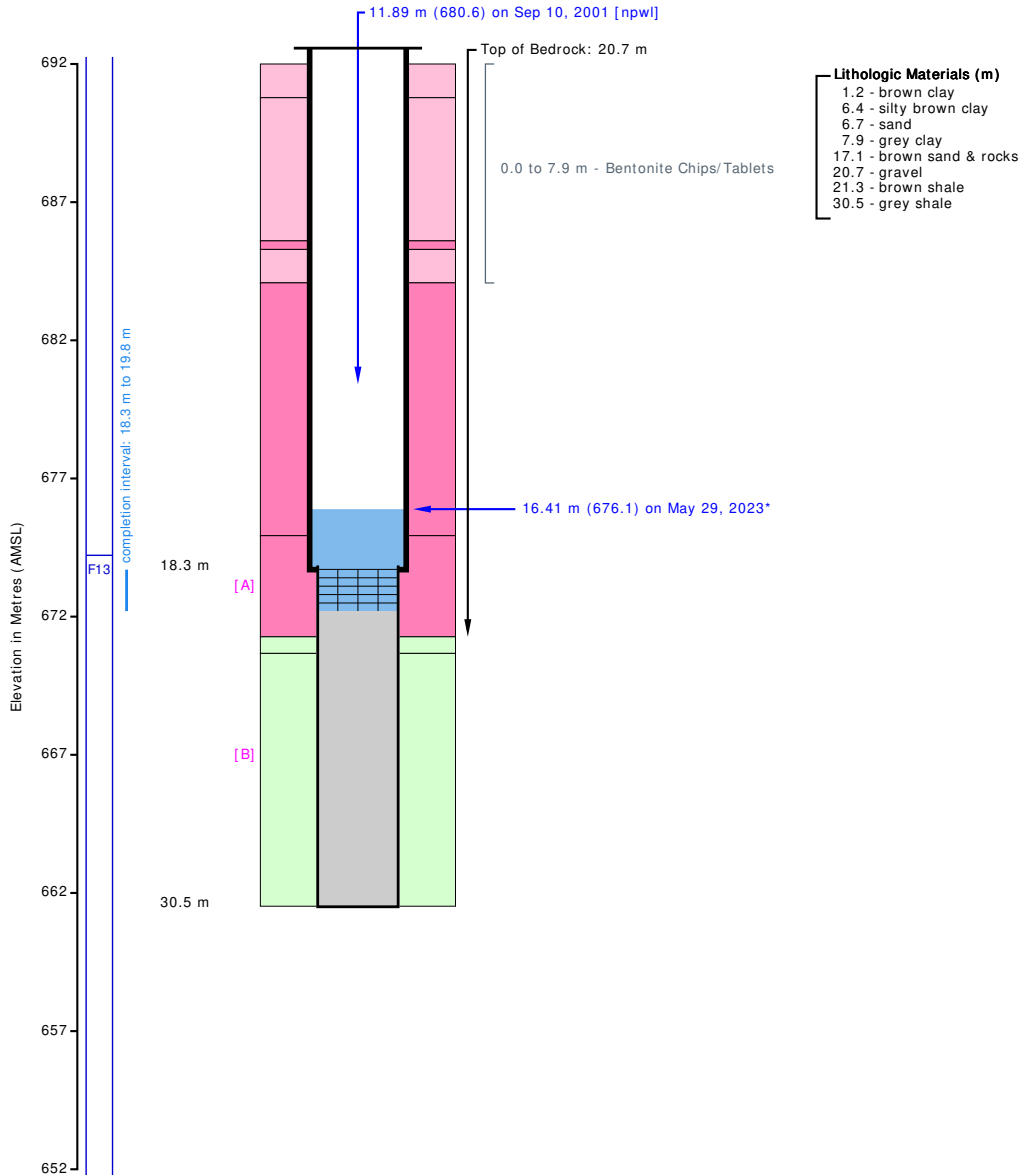
*(\* TGWC determined value)*

Earliest Water Level (m): **11.89 – September 10, 2001 @ 11:00**

Most Recent Water Level (m): **16.41 – May 29, 2023 @ 10:41**

GIC ID: **40335**

## 2001 Water Well 14-21 Water Well Diagram



Lithology Legend			Geologic Unit Legend (Top) - Regional Analysis	
Surficial	<span style="display: inline-block; width: 15px; height: 15px; background-color: #f08080; border: 1px solid black;"></span> Unsorted	Bedrock	<span style="display: inline-block; width: 15px; height: 15px; background-color: #90ee90; border: 1px solid black;"></span> Fine Grained	F13 - Lower Horseshoe Canyon Formation
	<span style="display: inline-block; width: 15px; height: 15px; background-color: #800080; border: 1px solid black;"></span> Fine Grained		<span style="display: inline-block; width: 15px; height: 15px; background-color: #808080; border: 1px solid black;"></span> Other	
	<span style="display: inline-block; width: 15px; height: 15px; background-color: #ff0000; border: 1px solid black;"></span> Coarse Grained	<span style="display: inline-block; width: 15px; height: 15px; background-color: #008000; border: 1px solid black;"></span> Coarse Grained		

### Summary

TGWC ID: M37841.689687  
 Well Name: 2001 Water Well 14-21  
 Legal Location: 14-21-054-27 W4M  
 Casing (OD): 152.4 mm; Plastic (6.0")  
 Screen (OD): 127.0 mm; Stainless Steel (5.0")  
 Casing Stick-Up: 0.3 m (not drawn to scale)  
 Completion [A]: 18.3 to 19.8 m; Screened  
 Construction [B]: 19.8 to 30.5 m; Plugged; Natural Material  
 Water Level (recent): 16.41 m (676.1 m AMSL) on May 29, 2023 @ 10:41 - Reference Point: Top of Casing  
 Water Level (oldest): 11.89 m (680.6 m AMSL) on Sep 10, 2001 @ 11:00 [npwl]

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:51 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.

**METRIC REPORT**

14-21-054-27 W4M

**M37841.689687**

513365; 338356; core

Easting (m): 71,019.99\*\*  
 Northing (m): 5,946,669.05\*\*  
 Elevation (m): 692\*\*\*  
 Lot:  
 Block:  
 Plan:

Elog Taken: No  
 Gamma Taken: No  
 Flowing: No  
 Stick Up (m): 0.3

Presence of Gas: No

Contractor: Mar-Wayne Water Well Drilling Services Ltd.  
 Name: 2001 Water Well 14-21

Field Action: Confirmed - Physically, June 27, 2013

Work Type: New Well Date Started: September 10, 2001  
 Drilling Method: Rotary Date Completed: September 10, 2001  
 Proposed Use: Stock Well Status: Producing  
 Completion Type: Screen Feature Class: Water Well

**General Details** core

Depth Completed (m)\*: 19.8 Top of Bedrock (m): 20.73 \*  
 Depth Drilled (m): 30.5 Completion Interval (m): 18.3 – 19.8 \*

Sand & Gravel Thickness (m): 13.1 (total) – 5.7 (below 15 m) \*

Plugged / Backfilled (m): 19.8 – 30.5 (Natural Material)  
 Most Recent Water Level (m): 16.41 m – May 29, 2023

Pump Intake BTOC (m): 0.0 on September 10, 2001

**Completion Details**

Surface Casing: Plastic – 152.4 mm (O.D.) x 12.70 mm (thick) x 18.3 m (bottom)

Screen Material: Stainless Steel – 127.0 mm (O.D.) (Attached To Casing)

Fittings: Top: Coupler – Bottom: Plug

**Intervals**

Screen: 18.3 to 19.8 m - 0.025 (unknown)

Bentonite Chips/Tables: 0.0 to 7.9 m

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
691.0	1.2	Brown Clay
685.8	6.4	Silty Brown Clay
685.5	6.7	Sand
684.3	7.9	Grey Clay
675.1	17.1	Brown Sand & Rocks
671.5	20.7	Gravel
670.9	21.3	Brown Shale
661.7	30.5	Grey Shale

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: May 28, 2023 @ 11:15

Report Date: June 12, 2023 - Element Materials Technology Canada Inc. (1655888-17)

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	1150	Nitrate as N:	0.67	Turbidity (NTU):	1.7
Total Dissolved Solids:	710	Nitrite as N:	0.011	Fluoride:	0.09
Hardness (as CaCO3):	417	pH (pH Unit):	7.46	Carbonate:	< 6
T-Alkalinity (as CaCO3):	488	Colour (TCU):	5	Bicarbonate:	595
P-Alkalinity (as CaCO3):	< 5	Ion Balance (%):	98	Hydroxide:	< 5
Nitrate + Nitrite as N:	0.68	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	21.2	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	120		Mercury:	< 0.000005	
Chloride:	34.6		Molybdenum:	< 0.001	
Iron:	0.42		Magnesium:	28.4	
Manganese:	0.881***		Sodium:	106	
Aluminum:	< 0.002		Potassium:	3.5	
Arsenic:	0.0010		Vanadium:	< 0.0001	
Barium:	0.041		Strontium:	0.886	
Beryllium:	< 0.0001		Nickel:	0.0012	
Cadmium:	0.00001		Zinc:	0.005	
Chromium:	< 0.0005		Copper:	0.0040	
Cobalt:	0.0005		Lead:	< 0.0001	
Sulfate:	124		Uranium:	0.0057	

Extractable - unfiltered  
Dissolved - filtered

Comments: Sample collected by Hydrogeological Consultants Ltd.

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario. 513365; 1 / 6

**Comments & Observations**

Field Survey (HCL), Mar 31, 2014: Water well is 30 metres southwest of house in backyard. Installed Level TROLL data logger in water well.

**Aquifer Tests**

Date & Time	Testing Method / Type	Depth of Test Interval	Duration (minutes)		Avg. Rate (Lpm)	NPWL (metres)	Drawdown (metres)	Pump (metres)	Q20 (m³/day)*		Transmissivity (m²/day)*	
			Pumping	Recovery					Apparent	Effective	Apparent	Effective
1 2001-09-10 11:00	Air	unknown	120	6	45.5	11.9	3.0	0.0	66.3		27.3	

**Alias IDs**

GIC ID: 40335  
 GIC (WellReportId): 40335

\* The Groundwater Centre (TGWC) calculated or determined value.  
 \*\* HCL GPS — 10TM Resource NAD83  
 \*\*\* MT GPS (Elevation) — {Ground; AMSL}

Created on: August 25, 2023 — Data "AS IS"; no warranty either expressed or implied. [53.685329 -113.924189 (WGS 84)], INT Date End: 2023-06-02





**2001 Water Well 14-21  
AEPA - Water Well Drilling Report**



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 40335  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received 2001/09/27

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b>		<b>Address</b>		<b>Town</b>		<b>Province</b>		<b>Country</b>		<b>Postal Code</b>	
[REDACTED]		[REDACTED]		[REDACTED]		[REDACTED]		[REDACTED]		[REDACTED]	
<b>Location</b>	<b>1/4 or LSD</b>	<b>SEC</b>	<b>TWP</b>	<b>RGE</b>	<b>W of MER</b>	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b>		
	NW	21	54	27	4						
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>					<b>Elevation</b> _____ <b>m</b>	
_____ m from _____					Latitude <u>53.683028</u> Longitude <u>-113.928572</u>					How Elevation Obtained _____	
_____ m from _____					How Location Obtained _____					Map _____	
					Map					Not Obtained	

Drilling Information	
<b>Method of Drilling</b> Rotary	<b>Type of Work</b> New Well
<b>Proposed Well Use</b> Domestic	

Formation Log			Measurement in Metric
Depth from ground level (m)	Water Bearing	Lithology Description	
1.22		Brown Clay	
6.40		Brown Silty Clay	
6.71		Sand	
7.92		Gray Clay	
17.07		Brown Sand & Rocks	
20.73		Gravel	
21.34		Brown Shale	
30.48		Gray Shale	

Yield Test Summary			Measurement in Metric
<b>Recommended Pump Rate</b>	45.46 L/min		
<b>Test Date</b>	<b>Water Removal Rate (L/min)</b>	<b>Static Water Level (m)</b>	
2001/09/10	45.46	11.89	

Well Completion				Measurement in Metric
<b>Total Depth Drilled</b>	<b>Finished Well Depth</b>	<b>Start Date</b>	<b>End Date</b>	
30.48 m		2001/09/10	2001/09/10	
<b>Borehole</b>				
<b>Diameter (cm)</b>	<b>From (m)</b>	<b>To (m)</b>		
0.00	0.00	30.48		
<b>Surface Casing (if applicable)</b>		<b>Well Casing/Liner</b>		
Plastic		Plastic		
<b>Size OD :</b>	15.24 cm	<b>Size OD :</b>	0.00 cm	
<b>Wall Thickness :</b>	1.270 cm	<b>Wall Thickness :</b>	0.000 cm	
<b>Bottom at :</b>	18.29 m	<b>Top at :</b>	0.00 m	
		<b>Bottom at :</b>	0.00 m	
<b>Perforations</b>				
<b>From (m)</b>	<b>To (m)</b>	<b>Diameter or Slot Width (cm)</b>	<b>Slot Length (cm)</b>	<b>Hole or Slot Interval (cm)</b>
Perforated by _____				
<b>Annular Seal</b> Bentonite Chips/Tablets				
Placed from 0.00 m to 7.92 m				
Amount _____				
<b>Other Seals</b>				
Type		At (m)		
<b>Screen Type</b> Stainless Steel				
Size OD : 12.70 cm				
<b>From (m)</b>	<b>To (m)</b>	<b>Slot Size (cm)</b>		
18.29	19.81	0.025		
Attachment Attached To Casing				
Top Fittings Coupler		Bottom Fittings Plug		
<b>Pack</b>				
Type Artificial		Grain Size .275		
Amount 550.00 Pounds				

Contractor Certification	
<b>Name of Journeyman responsible for drilling/construction of well</b> UNKNOWN NA DRILLER	<b>Certification No</b> 1
<b>Company Name</b> MAR-WAYNE WATER WELL DRILLING SERVICES LTD.	<b>Copy of Well report provided to owner</b> _____ <b>Date approval holder signed</b> _____



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 40335  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received 2001/09/27

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b>		<b>Address</b>			<b>Town</b>		<b>Province</b>		<b>Country</b>		<b>Postal Code</b>
[REDACTED]		[REDACTED]			[REDACTED]		[REDACTED]		[REDACTED]		[REDACTED]
<b>Location</b>	<b>1/4 or LSD</b>	<b>SEC</b>	<b>TWP</b>	<b>RGE</b>	<b>W of MER</b>	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b>		
	NW	21	54	27	4						
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>						
_____ m from _____					Latitude <u>53.683028</u> Longitude <u>-113.928572</u>					Elevation _____ m	
_____ m from _____					How Location Obtained _____					How Elevation Obtained _____	
Map _____					Map _____					Not Obtained	

Additional Information										Measurement in Metric	
Distance From Top of Casing to Ground Level _____ cm											
Is Artesian Flow _____					Is Flow Control Installed _____						
Rate _____ L/min					Describe _____						
Recommended Pump Rate _____ 45.46 L/min					Pump Installed <u>Yes</u>					Depth _____ m	
Recommended Pump Intake Depth (From TOC) _____ 17.98 m					Type <u>SUB</u>					Make _____ H.P. _____	
										Model (Output Rating) _____	
Did you Encounter Saline Water (>4000 ppm TDS) _____					Depth _____ m		Well Disinfected Upon Completion _____				
Remedial Action Taken: _____					Gas _____ Depth _____ m		Geophysical Log Taken _____				
										Submitted to ESRD _____	
										Sample Collected for Potability _____ Submitted to ESRD _____	
Additional Comments on Well											
DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 39 CM.											

Yield Test			Taken From Ground Level		Measurement in Metric
			Depth to water level		
Test Date	Start Time	Static Water Level			
2001/09/10	12:00 AM	11.89 m			
<b>Method of Water Removal</b>					
Type <u>Air</u>					
Removal Rate _____ 45.46 L/min					
Depth Withdrawn From _____ 0.00 m					
If water removal period was < 2 hours, explain why _____					
			<b>Pumping (m)</b>	<b>Elapsed Time</b>	<b>Recovery (m)</b>
				Minutes:Sec	
				0:00	15.00
				1:00	13.01
				2:00	12.30
				3:00	12.13
				4:00	12.07
				5:00	12.06
				6:00	12.05

Water Diverted for Drilling		
Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well	Certification No
UNKNOWN NA DRILLER	1
Company Name	Copy of Well report provided to owner Date approval holder signed
MAR-WAYNE WATER WELL DRILLING SERVICES LTD.	



**2001 Water Well 14-21  
Chemical Analysis Results (June 12, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada  
T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880323
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

**Reference Number** 1655888-17  
**Sample Date** May 28, 2023  
**Sample Time** 11:15  
**Sample Location** M37841.689687  
**Sample Description** 2001 WW 14-21 / 4.3 °C  
**Sample Matrix** Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Metals Dissolved</b>						
Silicon	Dissolved mg/L	7.59	0.05			
Sulfur	Dissolved mg/L	41.5	0.3			
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC	
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG	
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC	
Arsenic	Dissolved mg/L	0.0010	0.0002	0.01	Below MAC	
Barium	Dissolved mg/L	0.041	0.001	2.0	Below MAC	
Beryllium	Dissolved mg/L	<0.0001	0.0001			
Bismuth	Dissolved mg/L	<0.0005	0.0005			
Boron	Dissolved mg/L	0.111	0.002	5	Below MAC	
Cadmium	Dissolved mg/L	0.00001	0.00001	0.007	Below MAC	
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC	
Cobalt	Dissolved mg/L	0.0005	0.0001			
Copper	Dissolved mg/L	0.0040	0.0002	1 AO; 2 MAC	Below AO	
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC	
Lithium	Dissolved mg/L	0.087	0.001			
Molybdenum	Dissolved mg/L	<0.001	0.001			
Nickel	Dissolved mg/L	0.0012	0.0005			
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC	
Silver	Dissolved mg/L	<0.00001	0.00001			
Strontium	Dissolved mg/L	0.886	0.001	7.0	Below MAC	
Thallium	Dissolved mg/L	<0.00005	0.00005			
Tin	Dissolved mg/L	<0.001	0.001			
Titanium	Dissolved mg/L	<0.0005	0.0005			
Uranium	Dissolved mg/L	0.0057	0.0005	0.02	Below MAC	
Vanadium	Dissolved mg/L	<0.0001	0.0001			
Zinc	Dissolved mg/L	0.005	0.001	5	Below AO	
Subsample		Field Filtered				
<b>Physical and Aggregate Properties</b>						
Colour	Apparent, Potable	Colour units	5	5	15	Below AO
Turbidity		NTU	1.7	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>						
pH			7.46	1	7.0-10.5	Within OG Range
Temperature of observed pH		°C	21.2			
Electrical Conductivity	at 25 °C	µS/cm	1150	1		
Calcium	Dissolved	mg/L	120	0.2		
Magnesium	Dissolved	mg/L	28.4	0.2		
Sodium	Dissolved	mg/L	106	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880323
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

<b>Reference Number</b>	1655888-17
<b>Sample Date</b>	May 28, 2023
<b>Sample Time</b>	11:15
<b>Sample Location</b>	M37841.689687
<b>Sample Description</b>	2001 WW 14-21 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved mg/L	3.5	0.4		
Iron	Dissolved mg/L	0.42	0.01	0.3	Above AO
Manganese	Dissolved mg/L	0.881	0.005	0.02 AO; 0.12 MAC	Above MAC
Chloride	Dissolved mg/L	34.6	0.4	250	Below AO
Fluoride	mg/L	0.09	0.05	1.5	Below MAC
Nitrate - N	mg/L	0.67	0.01	10	Below MAC
Nitrite - N	mg/L	0.011	0.005	1	Below MAC
Nitrate and Nitrite - N	mg/L	0.68	0.01	10	Below MAC
Sulfate (SO4)	Dissolved mg/L	124	0.9	500	Below AO
Hydroxide	mg/L	<5			
Carbonate	mg/L	<6			
Bicarbonate	mg/L	595			
P-Alkalinity	as CaCO3 mg/L	<5	5		
T-Alkalinity	as CaCO3 mg/L	488	5		
Total Dissolved Solids	Calculated mg/L	710	1	500	Above AO
Hardness	Dissolved as CaCO3 mg/L	417			
Ionic Balance	Dissolved %	98			

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880323
Sampled By: Ben Gilham Company: HCL		

**Metals Dissolved**

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880323
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880323
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Sulfur	mg/L	33.7	34.4	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	<0.2	<0.2	10	0.4	yes
Barium	µg/L	38	38	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	113	114	10	4	yes
Cadmium	µg/L	0.03	0.04	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.4	1.4	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	80	81	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.7	0.7	10	1.1	yes
Selenium	µg/L	0.4	0.4	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	1020	1010	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.2	3.4	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	<1	<1	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880323
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	10.0	9.9	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880323
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.1	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	15.0	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	1.5	1.6	10	0.5	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes
Nitrate - N	mg/L	0.02	0.02	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880323
--	--	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	121	123	10	0.6	yes
Magnesium	mg/L	23.2	23.7	10	0.7	yes
Sodium	mg/L	64.4	65.8	10	1.2	yes
Potassium	mg/L	3.8	3.8	10	1.2	yes
Iron	mg/L	2.31	2.35	10	0.05	yes
Manganese	mg/L	0.653	0.664	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880323
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-17; 8663484: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880323
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

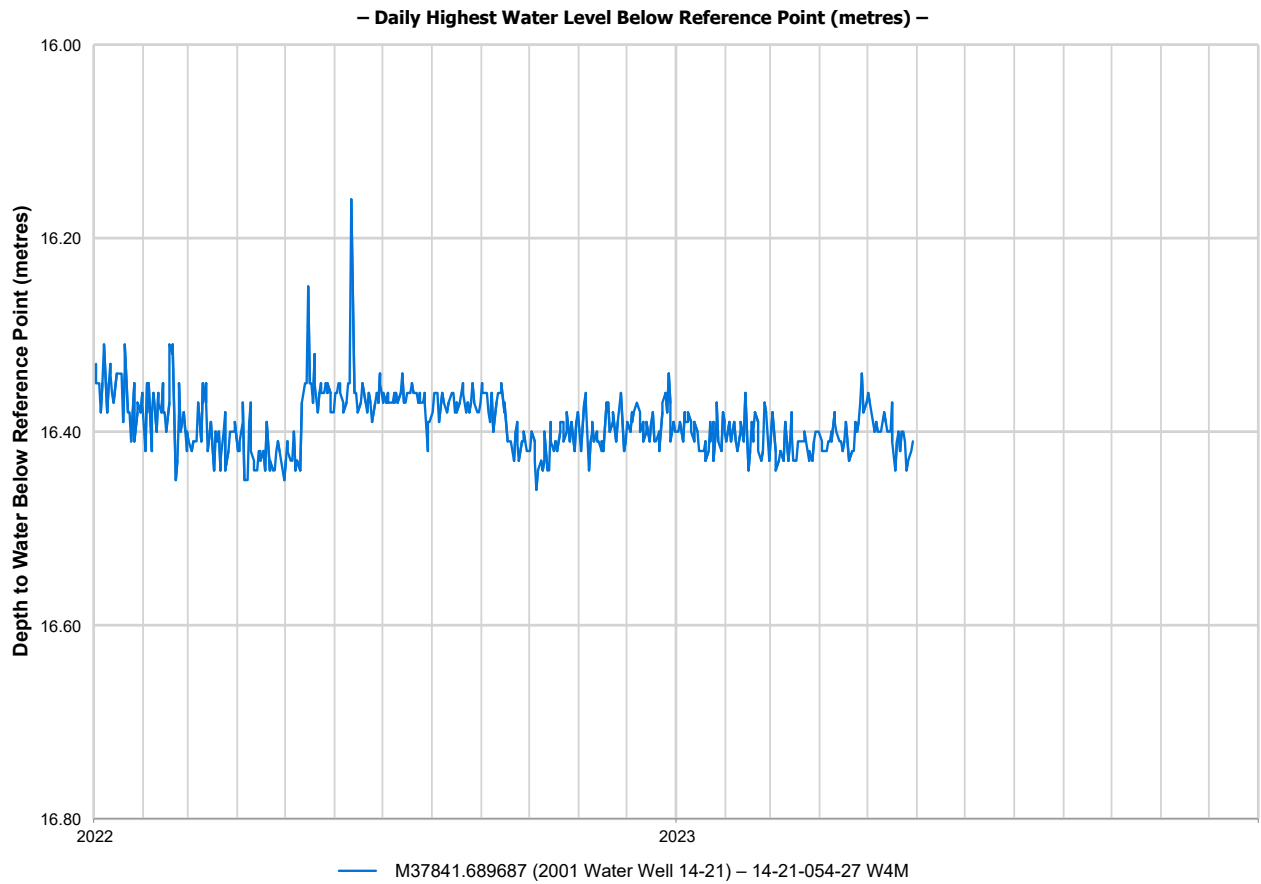
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

2001 Water Well 14-21  
2022 - 2023 Hydrograph



## 2001 Water Well 16-28

**16-28-054-27 W4M**  
(M37490.030994)



Photograph taken on July 26, 2019

### Well Spatial Location:

Easting: **71,826**

Northing: **5,948,412**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **678**

*(elevation accuracy HCL DEM)*

Date Completed: **July 20, 2001**

Depth Drilled (m): **37.5**

Completion Interval (m): **30.2 – 31.7 \***

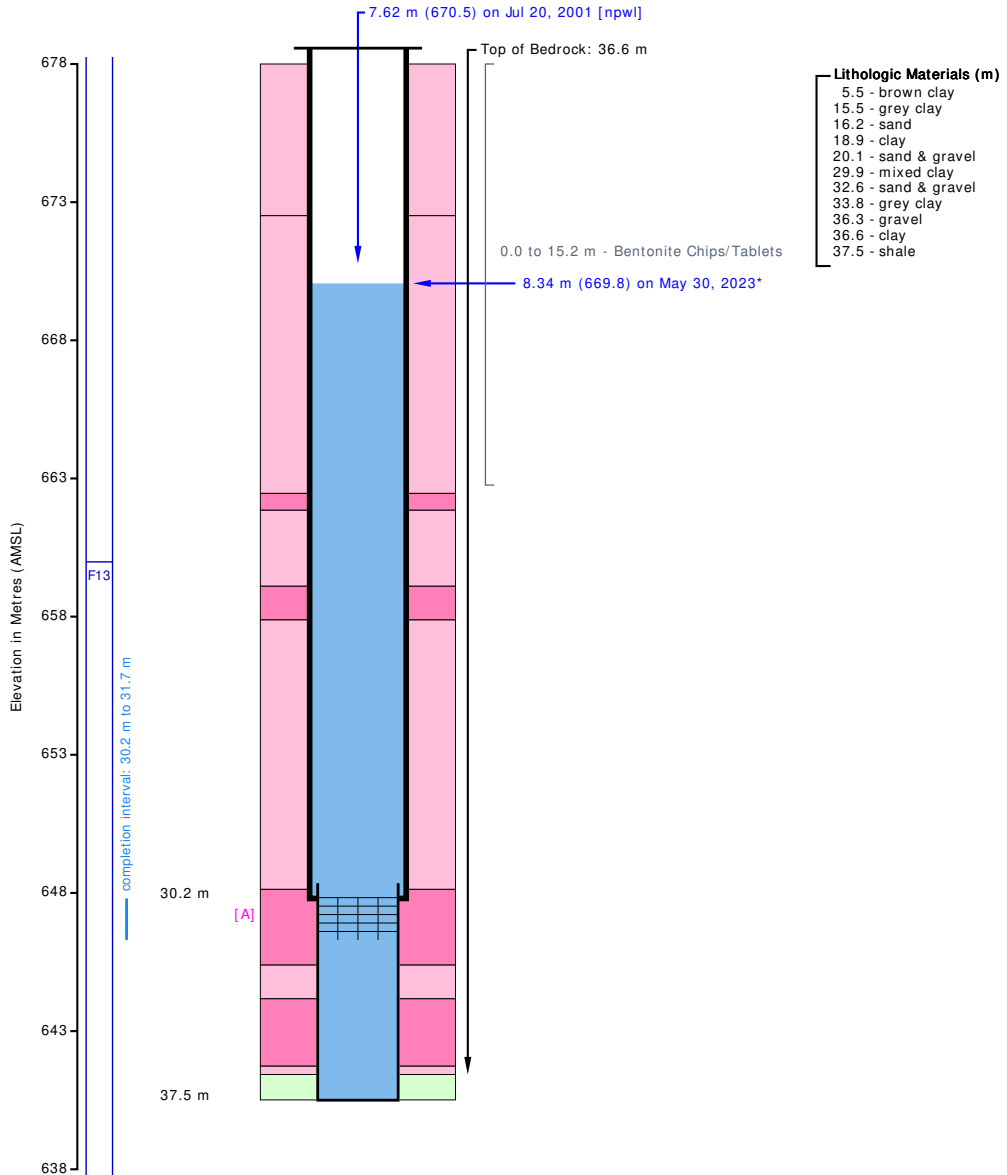
*(\* TGWC determined value)*

Earliest Water Level (m): **7.62 – July 20, 2001 @ 11:00**

Most Recent Water Level (m): **8.34 – May 30, 2023 @ 14:40**

GIC ID: **297091**

## 2001 Water Well 16-28 Water Well Diagram



Lithology Legend		Geologic Unit Legend (Top) - Regional Analysis	
<b>Surficial</b> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #f08080; border: 1px solid black; margin-right: 5px;"></span> Unsorted</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #f08080; border: 1px solid black; margin-right: 5px;"></span> Fine Grained</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #f08080; border: 1px solid black; margin-right: 5px;"></span> Coarse Grained</li> </ul> </div> <div style="width: 45%;"> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #90ee90; border: 1px solid black; margin-right: 5px;"></span> Fine Grained</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #32cd32; border: 1px solid black; margin-right: 5px;"></span> Coarse Grained</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #808080; border: 1px solid black; margin-right: 5px;"></span> Other</li> </ul> </div> </div>	<b>Bedrock</b> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #90ee90; border: 1px solid black; margin-right: 5px;"></span> Fine Grained</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #32cd32; border: 1px solid black; margin-right: 5px;"></span> Coarse Grained</li> </ul>	F13 - Lower Horseshoe Canyon Formation	

### Summary

TGWC ID: M37490.030994  
 Well Name: 2001 Water Well 16-28  
 Legal Location: 16-28-054-27 W4M  
 Casing (OD): 152.4 mm; Plastic (6.0")  
 Screen (OD): 127.0 mm; Stainless Steel (5.0")  
 Casing Stick-Up: 0.4 m (not drawn to scale)  
 Completion [A]: 30.2 to 31.7 m; Screened  
 Water Level (recent): 8.34 m (669.8 m AMSL) on May 30, 2023 @ 14:40 - Reference Point: Top of Casing  
 Water Level (oldest): 7.62 m (670.5 m AMSL) on Jul 20, 2001 @ 11:00 [npwl]  
 Top of Liner assumed to be 5% of 'non-cased' interval.

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:52 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.

**METRIC REPORT**

16-28-054-27 W4M

**M37490.030994**

Contractor: *Mar-Wayne Water Well Drilling Services Ltd.*  
Name: *2001 Water Well 16-28*

Field Action: *Confirmed - Physically, November 24, 2017*

Work Type: *New Well* Date Started: *July 19, 2001*  
Drilling Method: *Rotary* Date Completed: *July 20, 2001*  
Proposed Use: *Domestic* Well Status: *Producing*  
Completion Type: *Screen* Feature Class: *Water Well*

Easting (m): *71,826.20\*\**  
Northing (m): *5,948,412.40\*\**  
Elevation (m): *678\*\*\**  
Lot:  
Block:  
Plan:  
Rural Address: *54432 RR 273*  
Presence of Gas: *No*

513356; 333974; core

Elog Taken: *No*  
Gamma Taken: *No*  
Flowing: *No*  
Stick Up (m): *0.4*

**General Details** core

Depth Completed (m)\*: *31.7* Top of Bedrock (m): *36.57 \**  
Depth Drilled (m): *37.5* Completion Interval (m): *30.2 – 31.7 \**  
  
Sand & Gravel Thickness (m): *7.0 (total) – 7.0 (below 15 m) \**  
  
Most Recent Water Level (m): *8.34 m – May 30, 2023*  
Pump Intake BTOC (m): *24.1 on July 20, 2001*

**Completion Details**

Surface Casing: *Plastic – 152.4 mm (O.D.) x 12.70 mm (thick) x 30.2 m (bottom)*

Screen Material: *Stainless Steel – 127.0 mm (O.D.) (Attached To Casing)*

Fittings: *Top: Coupler – Bottom: Plug*

**Intervals**

Screen: *30.2 to 31.7 m - 10 Slot*  
Bentonite Chips/Tables: *0.0 to 15.2 m*

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
672.2	5.5	Brown Clay
662.2	15.5	Grey Clay
661.6	16.2	Sand
658.8	18.9	Clay
657.6	20.1	Sand & Gravel
647.8	29.9	Mixed Clay
645.1	32.6	Sand & Gravel
643.9	33.8	Grey Clay
641.4	36.3	Gravel
641.1	36.6	Clay
640.2	37.5	Shale

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: *May 30, 2023 @ 15:00*

Report Date: *June 12, 2023 - Element Materials Technology Canada Inc. (1655888-8)*

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	<i>1300</i>	Nitrate as N:	<i>&lt; 0.01</i>	Turbidity (NTU):	<i>16.3</i>
Total Dissolved Solids:	<i>869</i>	Nitrite as N:	<i>&lt; 0.005</i>	Fluoride:	<i>0.08</i>
Hardness (as CaCO3):	<i>500</i>	pH (pH Unit):	<i>7.47</i>	Carbonate:	<i>&lt; 6</i>
T-Alkalinity (as CaCO3):	<i>469</i>	Colour (TCU):	<i>30</i>	Bicarbonate:	<i>571</i>
P-Alkalinity (as CaCO3):	<i>&lt; 5</i>	Ion Balance (%):	<i>99</i>	Hydroxide:	<i>&lt; 5</i>
Nitrate + Nitrite as N:	<i>&lt; 0.01</i>	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	<i>21.2</i>	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	<i>146</i>		Mercury:	<i>&lt; 0.000005</i>	
Chloride:	<i>&lt; 0.4</i>		Molybdenum:	<i>&lt; 0.001</i>	
Iron:	<i>1.90</i>		Magnesium:	<i>32.8</i>	
Manganese:	<i>1.38***</i>		Sodium:	<i>116</i>	
Aluminum:	<i>&lt; 0.002</i>		Potassium:	<i>3.6</i>	
Arsenic:	<i>0.0036</i>		Vanadium:	<i>&lt; 0.0001</i>	
Barium:	<i>0.015</i>		Strontium:	<i>1.13</i>	
Beryllium:	<i>&lt; 0.0001</i>		Nickel:	<i>0.0007</i>	
Cadmium:	<i>&lt; 0.00001</i>		Zinc:	<i>0.090</i>	
Chromium:	<i>&lt; 0.0005</i>		Copper:	<i>0.0006</i>	
Cobalt:	<i>0.0009</i>		Lead:	<i>&lt; 0.0001</i>	
Sulfate:	<i>289</i>		Uranium:	<i>0.0026</i>	

Comments: *Sample collected by Hydrogeological Consultants Ltd.*

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario. 513356; 1 / 4

**Comments & Observations**

*Field Survey (HCL), Nov 24, 2017: Water well is 20 metres northeast of the house.*

**Aquifer Tests**

Date & Time	Testing Method / Type	Depth of Test Interval	Duration (minutes)		Avg. Rate (Lpm)	NPWL (metres)	Drawdown (metres)	Pump (metres)	Q20 (m³/day)*		Transmissivity (m²/day)*	
			Pumping	Recovery					Apparent	Effective	Apparent	Aquifer Effective
1 2001-07-20 11:00	Pump	30.2 to 31.7	120	120	53.6	7.6	6.9	24.1	116.6		13.6	

**Alias IDs**

GIC ID: *297091*  
GIC (WellReportId): *297091*

\* The Groundwater Centre (TGWC) calculated or determined value.  
\*\* HCL GPS — 10TM Resource NAD83  
\*\*\* HCL DEM — {Ground; AMSL}

Created on: August 25, 2023 — Data "AS IS"; no warranty either expressed or implied. [53.700892 -113.911575 (WGS 84)], INT Date End: 2023-06-02





**2001 Water Well 16-28  
AEPA - Water Well Drilling Report**



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 297091  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received 2001/08/14

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b>		<b>Address</b>		<b>Town</b>		<b>Province</b>		<b>Country</b>		<b>Postal Code</b>	
[REDACTED]		[REDACTED]		[REDACTED]		[REDACTED]		[REDACTED]		[REDACTED]	
<b>Location</b>	<b>1/4 or LSD</b>	<b>SEC</b>	<b>TWP</b>	<b>RGE</b>	<b>W of MER</b>	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b>		
	NE	28	54	27	4						
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>					<b>Elevation</b> _____ <b>m</b>	
_____ m from _____					Latitude <u>53.697665</u> Longitude <u>-113.916417</u>					How Elevation Obtained _____	
_____ m from _____					How Location Obtained _____					Not Obtained	
Not Verified											

Drilling Information	
<b>Method of Drilling</b> Rotary	<b>Type of Work</b> New Well
<b>Proposed Well Use</b> Domestic	

Formation Log			Measurement in Metric
Depth from ground level (m)	Water Bearing	Lithology Description	
5.49		Brown Clay	
15.54		Gray Clay	
16.15		Sand	
18.90		Clay	
20.12		Sand & Gravel	
29.87		Mixed Clay	
32.61		Sand & Gravel	
33.83		Gray Clay	
36.27		Gravel	
36.58		Clay	
37.49		Shale	

Yield Test Summary			Measurement in Metric
<b>Recommended Pump Rate</b>	50.01 L/min		
<b>Test Date</b>	<b>Water Removal Rate (L/min)</b>	<b>Static Water Level (m)</b>	
2001/07/20	53.64	7.62	

Well Completion				Measurement in Metric
<b>Total Depth Drilled</b>	<b>Finished Well Depth</b>	<b>Start Date</b>	<b>End Date</b>	
37.49 m		2001/07/19	2001/07/20	
<b>Borehole</b>				
<b>Diameter (cm)</b>	<b>From (m)</b>	<b>To (m)</b>		
0.00	0.00	37.49		
<b>Surface Casing (if applicable)</b>		<b>Well Casing/Liner</b>		
Plastic		Plastic		
<b>Size OD :</b>	15.24 cm	<b>Size OD :</b>	0.00 cm	
<b>Wall Thickness :</b>	1.270 cm	<b>Wall Thickness :</b>	0.000 cm	
<b>Bottom at :</b>	30.18 m	<b>Top at :</b>	0.00 m	
		<b>Bottom at :</b>	0.00 m	
<b>Perforations</b>				
<b>From (m)</b>	<b>To (m)</b>	<b>Diameter or Slot Width (cm)</b>	<b>Slot Length (cm)</b>	<b>Hole or Slot Interval(cm)</b>
Perforated by _____				
<b>Annular Seal</b> Bentonite Chips/Tablets				
Placed from 0.00 m to 15.24 m				
Amount _____				
<b>Other Seals</b>				
Type _____		At (m) _____		
<b>Screen Type</b> Stainless Steel				
Size OD : 12.70 cm				
<b>From (m)</b>	<b>To (m)</b>	<b>Slot Size (cm)</b>		
30.18	31.70	0.025		
Attachment Attached To Casing				
Top Fittings Coupler		Bottom Fittings Plug		
<b>Pack</b>				
Type Silica Sand		Grain Size #3		
Amount 700.00 Pounds				

Contractor Certification	
<b>Name of Journeyman responsible for drilling/construction of well</b> UNKNOWN NA DRILLER	<b>Certification No</b> 1
<b>Company Name</b> MAR-WAYNE WATER WELL DRILLING SERVICES LTD.	<b>Copy of Well report provided to owner</b> _____ <b>Date approval holder signed</b> _____



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 297091  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received 2001/08/14

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
Owner Name	Address			Town		Province		Country		Postal Code	
Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description		
	NE	28	54	27	4						
Measured from Boundary of				GPS Coordinates in Decimal Degrees (NAD 83)				Elevation _____ m			
_____ m from				Latitude <u>53.697665</u> Longitude <u>-113.916417</u>				How Elevation Obtained			
_____ m from				How Location Obtained				Not Obtained			
				Not Verified							

Additional Information										Measurement in Metric
Distance From Top of Casing to Ground Level _____ cm					Is Flow Control Installed _____					
Is Artesian Flow _____					Rate _____ L/min					Describe _____
Recommended Pump Rate _____ 50.01 L/min					Pump Installed <u>Yes</u>					Depth _____ m
Recommended Pump Intake Depth (From TOC) _____ 28.04 m					Type <u>SUB</u>					Make _____ H.P. <u>.5</u>
										Model (Output Rating) _____
Did you Encounter Saline Water (>4000 ppm TDS) _____					Depth _____ m					Well Disinfected Upon Completion _____
Remedial Action Taken _____					Gas _____					Depth _____ m
										Geophysical Log Taken _____
										Submitted to ESRD _____
										Sample Collected for Potability _____
										Submitted to ESRD _____
Additional Comments on Well										
DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 40 CMS.										

Yield Test			Taken From Ground Level	Measurement in Metric
			Depth to water level	
Test Date	Start Time	Static Water Level		
2001/07/20	12:00 AM	7.62 m		
<b>Method of Water Removal</b>			Pumping (m)	Elapsed Time
Type <u>Air</u>				Minutes:Sec
Removal Rate _____ 53.64 L/min				
Depth Withdrawn From _____ 24.08 m				Recovery (m)
If water removal period was < 2 hours, explain why			10.46	0:00
			11.90	1:00
			12.70	2:00
			13.27	3:00
			13.62	4:00
			13.89	5:00
			14.04	6:00
			14.14	7:00
			14.23	8:00
			14.27	9:00
			14.31	10:00
			14.36	12:00
			14.37	14:00
			14.39	16:00
			14.40	20:00
			14.43	25:00
			14.43	30:00
			14.45	35:00
			14.46	40:00
			14.48	50:00
			14.49	60:00
			14.50	75:00
			14.50	90:00
			14.50	105:00
			14.51	120:00

Water Diverted for Drilling		
Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification		
Name of Journeyman responsible for drilling/construction of well	Certification No	
UNKNOWN NA DRILLER	1	
Company Name	Copy of Well report provided to owner	Date approval holder signed
MAR-WAYNE WATER WELL DRILLING SERVICES LTD.		

**2001 Water Well 16-28**  
**Chemical Analysis Results (June 12, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880314
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-8
<b>Sample Date</b>	May 30, 2023
<b>Sample Time</b>	15:00
<b>Sample Location</b>	M37490.030994
<b>Sample Description</b>	2001 WW 16-28 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Metals Dissolved</b>						
Silicon	Dissolved mg/L	7.03	0.05			
Sulfur	Dissolved mg/L	96.4	0.3			
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC	
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG	
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC	
Arsenic	Dissolved mg/L	0.0036	0.0002	0.01	Below MAC	
Barium	Dissolved mg/L	0.015	0.001	2.0	Below MAC	
Beryllium	Dissolved mg/L	<0.0001	0.0001			
Bismuth	Dissolved mg/L	<0.0005	0.0005			
Boron	Dissolved mg/L	0.152	0.002	5	Below MAC	
Cadmium	Dissolved mg/L	<0.00001	0.00001	0.007	Below MAC	
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC	
Cobalt	Dissolved mg/L	0.0009	0.0001			
Copper	Dissolved mg/L	0.0006	0.0002	1 AO; 2 MAC	Below AO	
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC	
Lithium	Dissolved mg/L	0.115	0.001			
Molybdenum	Dissolved mg/L	<0.001	0.001			
Nickel	Dissolved mg/L	0.0007	0.0005			
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC	
Silver	Dissolved mg/L	<0.00001	0.00001			
Strontium	Dissolved mg/L	1.13	0.001	7.0	Below MAC	
Thallium	Dissolved mg/L	<0.00005	0.00005			
Tin	Dissolved mg/L	<0.001	0.001			
Titanium	Dissolved mg/L	<0.0005	0.0005			
Uranium	Dissolved mg/L	0.0026	0.0005	0.02	Below MAC	
Vanadium	Dissolved mg/L	<0.0001	0.0001			
Zinc	Dissolved mg/L	0.090	0.001	5	Below AO	
Subsample		Field Filtered				
<b>Physical and Aggregate Properties</b>						
Colour	Apparent, Potable	Colour units	30	5	15	Above AO
Turbidity		NTU	16.3	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>						
pH			7.47	1	7.0-10.5	Within OG Range
Temperature of observed pH		°C	21.2			
Electrical Conductivity	at 25 °C	µS/cm	1300	1		
Calcium	Dissolved	mg/L	146	0.2		
Magnesium	Dissolved	mg/L	32.8	0.2		
Sodium	Dissolved	mg/L	116	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880314
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

<b>Reference Number</b>	1655888-8
<b>Sample Date</b>	May 30, 2023
<b>Sample Time</b>	15:00
<b>Sample Location</b>	M37490.030994
<b>Sample Description</b>	2001 WW 16-28 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved	mg/L	3.6	0.4	
Iron	Dissolved	mg/L	1.90	0.01	0.3 Above AO
Manganese	Dissolved	mg/L	1.38	0.005	0.02 AO; 0.12 MAC Above MAC
Chloride	Dissolved	mg/L	<0.4	0.4	250 Below AO
Fluoride		mg/L	0.08	0.05	1.5 Below MAC
Nitrate - N		mg/L	<0.01	0.01	10 Below MAC
Nitrite - N		mg/L	<0.005	0.005	1 Below MAC
Nitrate and Nitrite - N		mg/L	<0.01	0.01	10 Below MAC
Sulfate (SO4)	Dissolved	mg/L	289	0.9	500 Below AO
Hydroxide		mg/L	<5		
Carbonate		mg/L	<6		
Bicarbonate		mg/L	571		
P-Alkalinity	as CaCO3	mg/L	<5	5	
T-Alkalinity	as CaCO3	mg/L	469	5	
Total Dissolved Solids	Calculated	mg/L	869	1	500 Above AO
Hardness	Dissolved as CaCO3	mg/L	500		
Ionic Balance	Dissolved	%	99		

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880314
--	--	--

**Metals Dissolved**

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880314
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880314
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Sulfur	mg/L	1.0	1.1	10	0.1	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	1.1	1.1	10	0.4	yes
Barium	µg/L	48	48	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	109	110	10	4	yes
Cadmium	µg/L	<0.01	<0.01	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.2	1.2	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	71	71	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.9	1.1	10	1.1	yes
Selenium	µg/L	<0.2	<0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	953	947	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.7	3.6	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880314
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	1.4	1.3	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880314
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.1	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	15.0	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	56.8	57.1	10	0.5	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes
Nitrate - N	mg/L	0.02	0.02	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880314
--	--	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	29.6	29.3	10	0.6	yes
Magnesium	mg/L	9.1	9.0	10	0.7	yes
Sodium	mg/L	2.9	2.8	10	1.2	yes
Potassium	mg/L	1.0	1.0	10	1.2	yes
Iron	mg/L	0.18	0.18	10	0.05	yes
Manganese	mg/L	<0.005	<0.005	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring	Lot ID: <b>1655888</b>
Attn: Kirby Fromm	Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880314
Sampled By: Ben Gilham Company: HCL	P.O.: 19707 Proj. Acct. code:	

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-8; 8663475: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880314
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

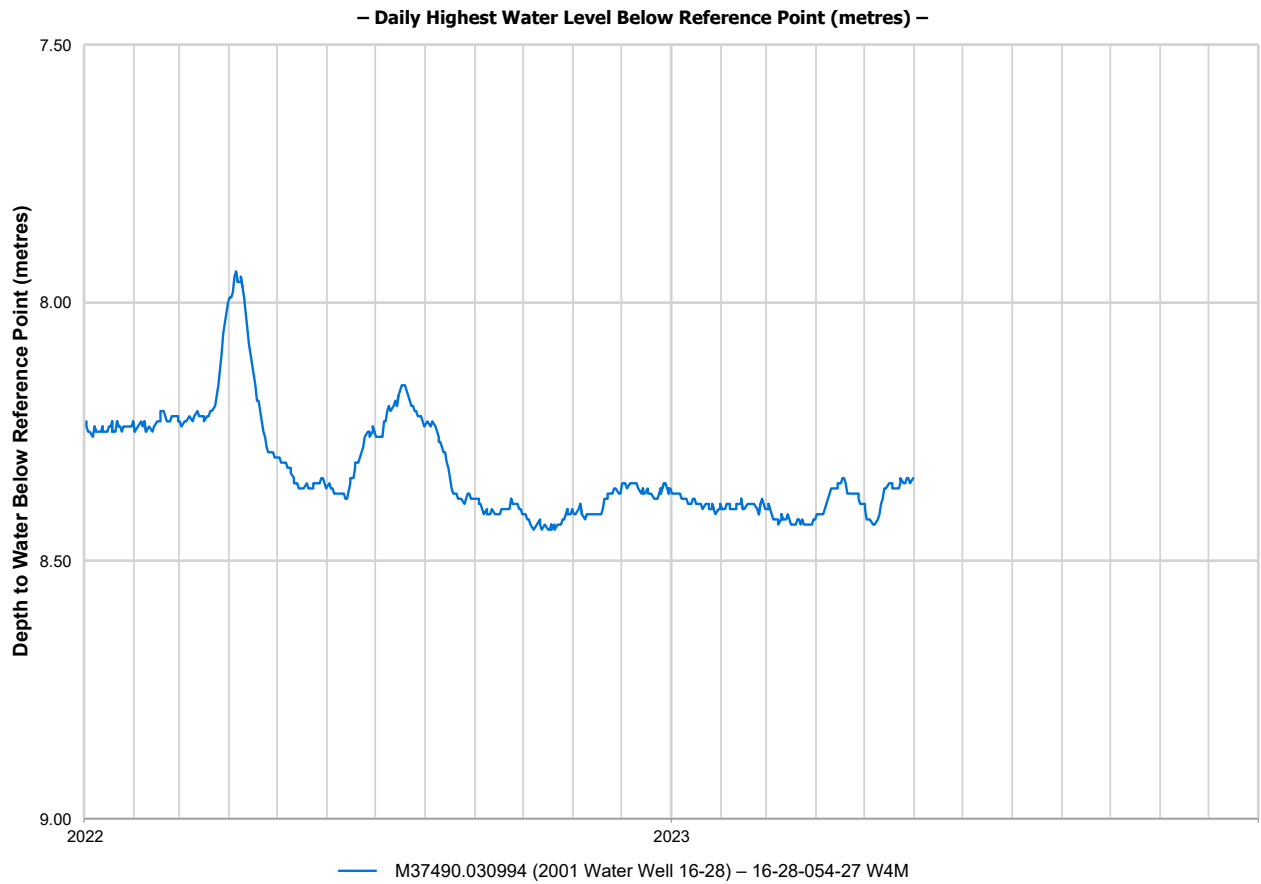
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

2001 Water Well 16-28  
2022 - 2023 Hydrograph



## 2006 Water Well 10-34

**10-34-054-27 W4M**  
(M39227.496150)



Photograph taken on June 5, 2020

### Well Spatial Location:

Easting: **72,870**

Northing: **5,949,358**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

Ground Elevation AMSL (m): **675**

*(elevation accuracy HCL DEM (2016))*

Date Completed: **April 13, 2006**

Depth Drilled (m): **32.0**

Completion Interval (m): **29.0 – 30.5 \***

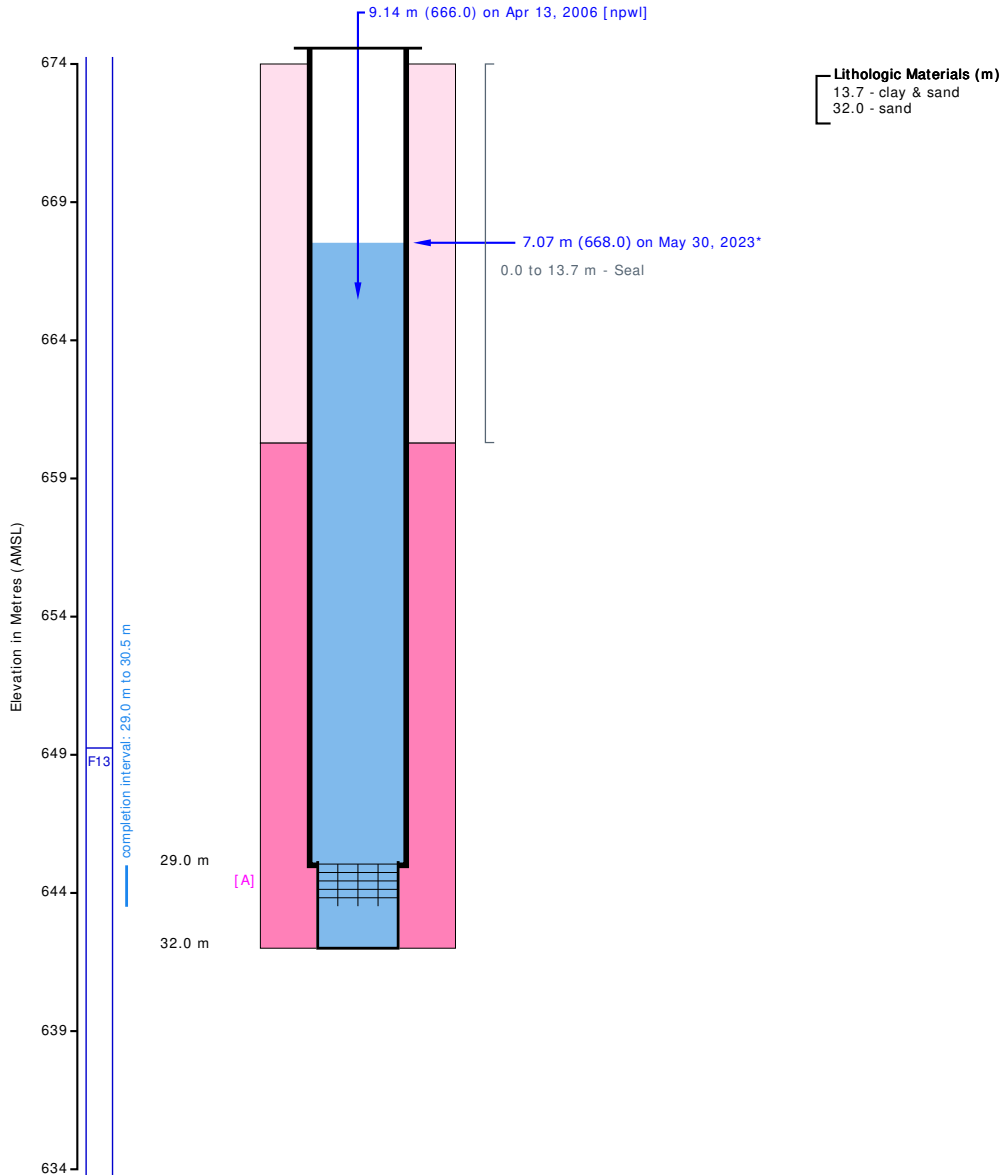
*(\* TGWC determined value)*

Earliest Water Level (m): **9.14 – April 13, 2006 @ 11:00**

Most Recent Water Level (m): **7.07 – May 30, 2023 @ 12:51**

GIC ID: **1715169**

## 2006 Water Well 10-34 Water Well Diagram



Lithology Legend		Geologic Unit Legend (Top) - Regional Analysis	
<p><b>Surficial</b></p> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #f08080; border: 1px solid black; margin-right: 5px;"></span> Unsorted</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #ff69b4; border: 1px solid black; margin-right: 5px;"></span> Fine Grained</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #ff1493; border: 1px solid black; margin-right: 5px;"></span> Coarse Grained</li> </ul>	<p><b>Bedrock</b></p> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #90ee90; border: 1px solid black; margin-right: 5px;"></span> Fine Grained</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #32cd32; border: 1px solid black; margin-right: 5px;"></span> Coarse Grained</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #808080; border: 1px solid black; margin-right: 5px;"></span> Other</li> </ul>	<p>F13 - Lower Horseshoe Canyon Formation</p>	

### Summary

TGWC ID: M39227.496150  
 Well Name: 2006 Water Well 10-34  
 Legal Location: 10-34-054-27 W4M  
 Casing (OD): 152.4 mm; Plastic (6.0")  
 Screen (OD): 127.0 mm; Stainless Steel (5.0")  
 Casing Stick-Up: 0.6 m (not drawn to scale)  
 Completion [A]: 29.0 to 30.5 m; Screened  
 Water Level (recent): 7.07 m (668.0 m AMSL) on May 30, 2023 @ 12:51 - Reference Point: Top of Casing  
 Water Level (oldest): 9.14 m (666.0 m AMSL) on Apr 13, 2006 @ 11:00 [npwl]

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:52 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.

**METRIC REPORT**

10-34-054-27 W4M

**M39227.496150**

513359; 473574; core

Contractor: *Summers Drilling Ltd.*  
Name: *2006 Water Well 10-34*

Field Action: *Confirmed - Physically, June 5, 2020*

Work Type: *New Well*

Drilling Method: *Rotary - Mud*

Proposed Use: *Domestic*

Completion Type: *Screen*

Date Started: *April 13, 2006*

Date Completed: *April 13, 2006*

Well Status: *Producing*

Feature Class: *Water Well*

Easting (m): *72,870.43\*\**  
Northing (m): *5,949,358.08\*\**  
Elevation (m): *675\*\*\**

Lot: *8A*

Block: *4*

Plan: *0620740*

Rural Address: *15, 54519 RR 273*

Presence of Gas: *No*

Elog Taken: *No*  
Gamma Taken: *No*  
Flowing: *No*

Stick Up (m): *0.6*

**General Details** core

Depth Completed (m)\*: *30.5* Top of Bedrock: *Surficial Water Well \**  
Depth Drilled (m): *32.0* Completion Interval (m): *29.0 – 30.5 \**

Sand & Gravel Thickness (m): *18.3 (total) – 17.0 (below 15 m) \**

Most Recent Water Level (m): *7.07 m – May 30, 2023*

Pump Intake BTOC (m): *27.4 on April 13, 2006*

**Completion Details**

Surface Casing: *Plastic – 152.4 mm (O.D.) x 9.90 mm (thick) x 29.0 m (bottom)*

Screen Material: *Stainless Steel – 127.0 mm (O.D.) (Attached To Casing)*

Fittings: *Top: Coupler – Bottom: Plug*

**Intervals**

Screen: *29.0 to 30.5 m - 12 Slot*

Seal: *0.0 to 13.7 m*

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
660.8	13.7	Clay & Sand
642.5	32.0	Sand

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: *May 30, 2023 @ 13:10*

Report Date: *June 12, 2023 - Element Materials Technology Canada Inc. (1655888-11)*

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	<i>1090</i>	Nitrate as N:	<i>&lt; 0.01</i>	Turbidity (NTU):	<i>10.0</i>
Total Dissolved Solids:	<i>687</i>	Nitrite as N:	<i>&lt; 0.005</i>	Fluoride:	<i>&lt; 0.05</i>
Hardness (as CaCO3):	<i>418</i>	pH (pH Unit):	<i>7.45</i>	Carbonate:	<i>&lt; 6</i>
T-Alkalinity (as CaCO3):	<i>539</i>	Colour (TCU):	<i>30</i>	Bicarbonate:	<i>657</i>
P-Alkalinity (as CaCO3):	<i>&lt; 5</i>	Ion Balance (%):	<i>99</i>	Hydroxide:	<i>&lt; 5</i>
Nitrate + Nitrite as N:	<i>&lt; 0.01</i>	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	<i>21.1</i>	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	<i>119</i>		Mercury:	<i>&lt; 0.000005</i>	
Chloride:	<i>&lt; 0.4</i>		Molybdenum:	<i>&lt; 0.001</i>	
Iron:	<i>1.53</i>		Magnesium:	<i>29.2</i>	
Manganese:	<i>1.43***</i>		Sodium:	<i>100</i>	
Aluminum:	<i>&lt; 0.002</i>		Potassium:	<i>3.3</i>	
Arsenic:	<i>0.0056</i>		Vanadium:	<i>&lt; 0.0001</i>	
Barium:	<i>0.031</i>		Strontium:	<i>1.05</i>	
Beryllium:	<i>&lt; 0.0001</i>		Nickel:	<i>0.0007</i>	
Cadmium:	<i>&lt; 0.00001</i>		Zinc:	<i>0.006</i>	
Chromium:	<i>&lt; 0.0005</i>		Copper:	<i>0.0032</i>	
Cobalt:	<i>0.0008</i>		Lead:	<i>&lt; 0.0001</i>	
Sulfate:	<i>112</i>		Uranium:	<i>0.0027</i>	

Comments: *Sample collected by Hydrogeological Consultants Ltd.*

*\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario.*

513359; 1 / 2

**Comments & Observations (2 total events)**

*Field Survey (HCL), Jun 5, 2020: Water well is 5 metres northeast of the house. Casing stick-up measured and updated.*  
*Initial, Apr 13, 2006: Screen diameter (ID) not provided; assumed to be same as casing diameter (OD).*

**Aquifer Tests**

Date & Time	Testing Method / Type	Depth of Test Interval	Duration (minutes)		Avg. Rate (Lpm)	NPWL (metres)	Drawdown (metres)	Pump (metres)	Q20 (m³/day)*		Transmissivity (m²/day)*	
			Pumping	Recovery					Apparent	Effective	Apparent	Aquifer Effective
1 2006-04-13 11:00	Air	[unknown]	120	5	90.9	9.1	18.3	27.4	63.5		8.4	

**Alias IDs**

GIC ID: *1715169*  
GIC (WellReportId): *11301534*

*\* The Groundwater Centre (TGWC) calculated or determined value.*  
*\*\* HCL GPS — 10TM Resource NAD83*  
*\*\*\* HCL DEM (2016) — {Ground; AMSL}*

Created on: August 25, 2023 — Data "AS IS"; no warranty either expressed or implied. [53.709249 -113.895531 (WGS 84)], INT Date End: 2023-06-02



**2006 Water Well 10-34  
AEPA - Water Well Drilling Report**



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 1715169  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received 2006/07/06

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b>		<b>Address</b>			<b>Town</b>		<b>Province</b>		<b>Country</b>	<b>Postal Code</b>	
[REDACTED]		[REDACTED]			[REDACTED]		[REDACTED]		[REDACTED]	[REDACTED]	
<b>Location</b>	<b>1/4 or LSD</b>	<b>SEC</b>	<b>TWP</b>	<b>RGE</b>	<b>W of MER</b>	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b>		
	10	34	54	27	4	8A	4	0620740			
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>					<b>Elevation</b> _____ <b>m</b>	
_____ m from _____					Latitude <u>53.708944</u> Longitude <u>-113.895548</u>					How Elevation Obtained _____	
_____ m from _____					How Location Obtained _____					Not Obtained	
					Lat/Long calculated to centre of lot						

Drilling Information	
<b>Method of Drilling</b> Unknown	<b>Type of Work</b> New Well
<b>Proposed Well Use</b> Domestic	

Formation Log			Measurement in Metric
Depth from ground level (m)	Water Bearing	Lithology Description	
13.72		Clay & Sand	
32.00		Sand	

Yield Test Summary			Measurement in Metric
<b>Recommended Pump Rate</b>	45.46 L/min		
<b>Test Date</b>	<b>Water Removal Rate (L/min)</b>	<b>Static Water Level (m)</b>	
2006/04/13	90.92	9.14	

Well Completion				Measurement in Metric
<b>Total Depth Drilled</b>	<b>Finished Well Depth</b>	<b>Start Date</b>	<b>End Date</b>	
32.00 m	32.00 m	2006/04/13	2006/04/13	
<b>Borehole</b>				
<b>Diameter (cm)</b>	<b>From (m)</b>	<b>To (m)</b>		
20.00	0.00	32.00		
<b>Surface Casing (if applicable)</b>		<b>Well Casing/Liner</b>		
Plastic		Unknown		
<b>Size OD :</b>	15.24 cm	<b>Size OD :</b>	_____ cm	
<b>Wall Thickness :</b>	0.991 cm	<b>Wall Thickness :</b>	_____ cm	
<b>Bottom at :</b>	28.96 m	<b>Top at :</b>	_____ m	
		<b>Bottom at :</b>	_____ m	
<b>Perforations</b>				
<b>From (m)</b>	<b>To (m)</b>	<b>Diameter or Slot Width (cm)</b>	<b>Slot Length (cm)</b>	<b>Hole or Slot Interval(cm)</b>
Perforated by _____				
<b>Annular Seal</b> Unknown				
Placed from _____ 0.00 m to _____ 13.72 m				
Amount _____				
<b>Other Seals</b>				
Type		At (m)		
<b>Screen Type</b> Stainless Steel				
Size OD : 12.70 cm				
<b>From (m)</b>	<b>To (m)</b>	<b>Slot Size (cm)</b>		
28.96	30.48	0.030		
Attachment Attached To Casing				
Top Fittings Coupler		Bottom Fittings Plug		
<b>Pack</b>				
Type Unknown		Grain Size COARSE		
Amount 1000.00 Pounds				

Contractor Certification			
<b>Name of Journeyman responsible for drilling/construction of well</b>		<b>Certification No</b>	
DARIN (NEW) CAOUETTE		3537713	
<b>Company Name</b>		<b>Copy of Well report provided to owner</b>	
SUMMERS DRILLING LTD.		Date approval holder signed	
		2006/04/13	



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 1715169  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received 2006/07/06

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
Owner Name	Address			Town		Province		Country	Postal Code		
Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description		
	10	34	54	27	4	8A	4	0620740			
Measured from Boundary of					GPS Coordinates in Decimal Degrees (NAD 83)					Elevation _____ m	
_____ m from					Latitude <u>53.708944</u> Longitude <u>-113.895548</u>					How Elevation Obtained	
_____ m from					How Location Obtained					Not Obtained	
					Lat/Long calculated to centre of lot						

Additional Information										Measurement in Metric	
Distance From Top of Casing to Ground Level					45.72 cm						
Is Artesian Flow					Is Flow Control Installed						
Rate _____ L/min					Describe _____						
Recommended Pump Rate					45.46 L/min					Pump Installed _____ Depth _____ m	
Recommended Pump Intake Depth (From TOC)					18.29 m					Type _____ Make _____ H.P. _____	
										Model (Output Rating) _____	
Did you Encounter Saline Water (>4000 ppm TDS)					Depth _____ m					Well Disinfected Upon Completion _____	
Remedial Action Taken:					Gas _____ Depth _____ m					Geophysical Log Taken _____	
										Submitted to ESRD _____	
Additional Comments on Well					Sample Collected for Potability _____					Submitted to ESRD _____	

Yield Test			Taken From Ground Level	Measurement in Metric																					
			Depth to water level																						
Test Date	Start Time	Static Water Level																							
2006/04/13	12:00 AM	9.14 m																							
Method of Water Removal																									
Type Air																									
Removal Rate 90.92 L/min																									
Depth Withdrawn From 27.43 m																									
If water removal period was < 2 hours, explain why																									
			<table border="1"> <thead> <tr> <th>Pumping (m)</th> <th>Elapsed Time Minutes:Sec</th> <th>Recovery (m)</th> </tr> </thead> <tbody> <tr><td></td><td>0:00</td><td>27.43</td></tr> <tr><td></td><td>1:00</td><td>12.80</td></tr> <tr><td></td><td>2:00</td><td>10.97</td></tr> <tr><td></td><td>3:00</td><td>10.36</td></tr> <tr><td></td><td>4:00</td><td>9.75</td></tr> <tr><td></td><td>5:00</td><td>9.45</td></tr> </tbody> </table>		Pumping (m)	Elapsed Time Minutes:Sec	Recovery (m)		0:00	27.43		1:00	12.80		2:00	10.97		3:00	10.36		4:00	9.75		5:00	9.45
Pumping (m)	Elapsed Time Minutes:Sec	Recovery (m)																							
	0:00	27.43																							
	1:00	12.80																							
	2:00	10.97																							
	3:00	10.36																							
	4:00	9.75																							
	5:00	9.45																							

Water Diverted for Drilling		
Water Source	Amount Taken	Diversion Date & Time
	L	

Contractor Certification			
Name of Journeyman responsible for drilling/construction of well		Certification No	
DARIN (NEW) CAOUETTE		3537713	
Company Name		Copy of Well report provided to owner	
SUMMERS DRILLING LTD.		Date approval holder signed	
		2006/04/13	

**2006 Water Well 10-34  
Chemical Analysis Results (June 12, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880317
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-11
<b>Sample Date</b>	May 30, 2023
<b>Sample Time</b>	13:10
<b>Sample Location</b>	M39227.496150
<b>Sample Description</b>	2006 WW 10-34 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Metals Dissolved</b>						
Silicon	Dissolved mg/L	6.73	0.05			
Sulfur	Dissolved mg/L	37.4	0.3			
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC	
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG	
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC	
Arsenic	Dissolved mg/L	0.0056	0.0002	0.01	Below MAC	
Barium	Dissolved mg/L	0.031	0.001	2.0	Below MAC	
Beryllium	Dissolved mg/L	<0.0001	0.0001			
Bismuth	Dissolved mg/L	<0.0005	0.0005			
Boron	Dissolved mg/L	0.156	0.002	5	Below MAC	
Cadmium	Dissolved mg/L	<0.00001	0.00001	0.007	Below MAC	
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC	
Cobalt	Dissolved mg/L	0.0008	0.0001			
Copper	Dissolved mg/L	0.0032	0.0002	1 AO; 2 MAC	Below AO	
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC	
Lithium	Dissolved mg/L	0.086	0.001			
Molybdenum	Dissolved mg/L	<0.001	0.001			
Nickel	Dissolved mg/L	0.0007	0.0005			
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC	
Silver	Dissolved mg/L	<0.00001	0.00001			
Strontium	Dissolved mg/L	1.05	0.001	7.0	Below MAC	
Thallium	Dissolved mg/L	<0.00005	0.00005			
Tin	Dissolved mg/L	<0.001	0.001			
Titanium	Dissolved mg/L	<0.0005	0.0005			
Uranium	Dissolved mg/L	0.0027	0.0005	0.02	Below MAC	
Vanadium	Dissolved mg/L	<0.0001	0.0001			
Zinc	Dissolved mg/L	0.006	0.001	5	Below AO	
Subsample		Field Filtered				
<b>Physical and Aggregate Properties</b>						
Colour	Apparent, Potable	Colour units	30	5	15	Above AO
Turbidity		NTU	10.0	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>						
pH			7.45	1	7.0-10.5	Within OG Range
Temperature of observed pH		°C	21.1			
Electrical Conductivity	at 25 °C	µS/cm	1090	1		
Calcium	Dissolved	mg/L	119	0.2		
Magnesium	Dissolved	mg/L	29.2	0.2		
Sodium	Dissolved	mg/L	100	0.4	200	Below AO

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880317
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-11
<b>Sample Date</b>	May 30, 2023
<b>Sample Time</b>	13:10
<b>Sample Location</b>	M39227.496150
<b>Sample Description</b>	2006 WW 10-34 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Routine Water - Continued</b>					
Potassium	Dissolved mg/L	3.3	0.4		
Iron	Dissolved mg/L	1.53	0.01	0.3	Above AO
Manganese	Dissolved mg/L	1.43	0.005	0.02 AO; 0.12 MAC	Above MAC
Chloride	Dissolved mg/L	<0.4	0.4	250	Below AO
Fluoride	mg/L	<0.05	0.05	1.5	Below MAC
Nitrate - N	mg/L	<0.01	0.01	10	Below MAC
Nitrite - N	mg/L	<0.005	0.005	1	Below MAC
Nitrate and Nitrite - N	mg/L	<0.01	0.01	10	Below MAC
Sulfate (SO4)	Dissolved mg/L	112	0.9	500	Below AO
Hydroxide	mg/L	<5			
Carbonate	mg/L	<6			
Bicarbonate	mg/L	657			
P-Alkalinity	as CaCO3 mg/L	<5	5		
T-Alkalinity	as CaCO3 mg/L	539	5		
Total Dissolved Solids	Calculated mg/L	687	1	500	Above AO
Hardness	Dissolved as CaCO3 mg/L	418			
Ionic Balance	Dissolved %	99			

Approved by: 

Benjamin Morris, B.Sc  
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880317
--	--	--

### Metals Dissolved

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.001691	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880317
--	--	--

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000023	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880317
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Sulfur	mg/L	33.7	34.4	10	0.1	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	1.1	1.1	10	0.4	yes
Barium	µg/L	48	48	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	109	110	10	4	yes
Cadmium	µg/L	<0.01	<0.01	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.2	1.2	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	71	71	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.9	1.1	10	1.1	yes
Selenium	µg/L	<0.2	<0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	953	947	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.7	3.6	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880317
--	---	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	1.4	1.3	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.80	9.39	10.59	yes
Nitrate - N	mg/L	9.92	9.03	11.13	yes
Nitrite - N	mg/L	9.74	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes



**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880317
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

**Routine Water - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Iron	mg/L	9.77	9.38	10.16	yes	
Manganese	mg/L	2.40	2.320	2.560	yes	
Date Acquired: June 09, 2023						
pH		6.88	6.79	6.97	yes	
Temperature of observed	°C	20.9	15.5	24.5	yes	
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes	
P-Alkalinity	mg/L	56	28	72	yes	
T-Alkalinity	mg/L	127	114	140	yes	
Chloride	mg/L	84.1	74.9	86.9	yes	
Fluoride	mg/L	4.77	4.56	5.22	yes	
Nitrate - N	mg/L	4.77	4.37	5.33	yes	
Nitrite - N	mg/L	4.79	4.370	5.330	yes	
Nitrate and Nitrite - N	mg/L	9.56	8.80	10.60	yes	
Calcium	mg/L	51.2	44.9	56.9	yes	
Magnesium	mg/L	20.1	17.9	22.0	yes	
Sodium	mg/L	51.6	47.3	52.7	yes	
Potassium	mg/L	50.0	45.8	55.8	yes	
Iron	mg/L	2.02	1.90	2.08	yes	
Manganese	mg/L	0.499	0.468	0.552	yes	
Date Acquired: June 09, 2023						
Chloride	mg/L	15.0	13.3	16.5	yes	
Fluoride	mg/L	0.52	0.45	0.57	yes	
Nitrate - N	mg/L	0.50	0.42	0.57	yes	
Nitrite - N	mg/L	0.494	0.455	0.557	yes	
Nitrate and Nitrite - N	mg/L	0.99	0.85	1.15	yes	
Calcium	mg/L	5.0	4.7	5.4	yes	
Magnesium	mg/L	2.0	1.9	2.2	yes	
Sodium	mg/L	4.9	4.7	5.7	yes	
Potassium	mg/L	5.0	4.6	5.6	yes	
Iron	mg/L	0.19	0.18	0.22	yes	
Manganese	mg/L	0.048	0.046	0.057	yes	
Date Acquired: June 09, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	56.8	57.1	10	0.5	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes
Nitrate - N	mg/L	0.02	0.02	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880317
--	---	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	121	123	10	0.6	yes
Magnesium	mg/L	23.2	23.7	10	0.7	yes
Sodium	mg/L	64.4	65.8	10	1.2	yes
Potassium	mg/L	3.8	3.8	10	1.2	yes
Iron	mg/L	2.31	2.35	10	0.05	yes
Manganese	mg/L	0.653	0.664	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 12, 2023 Report Number: 2880317
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-11; 8663478: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 12, 2023
		P.O.:	19707	Report Number:	2880317
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

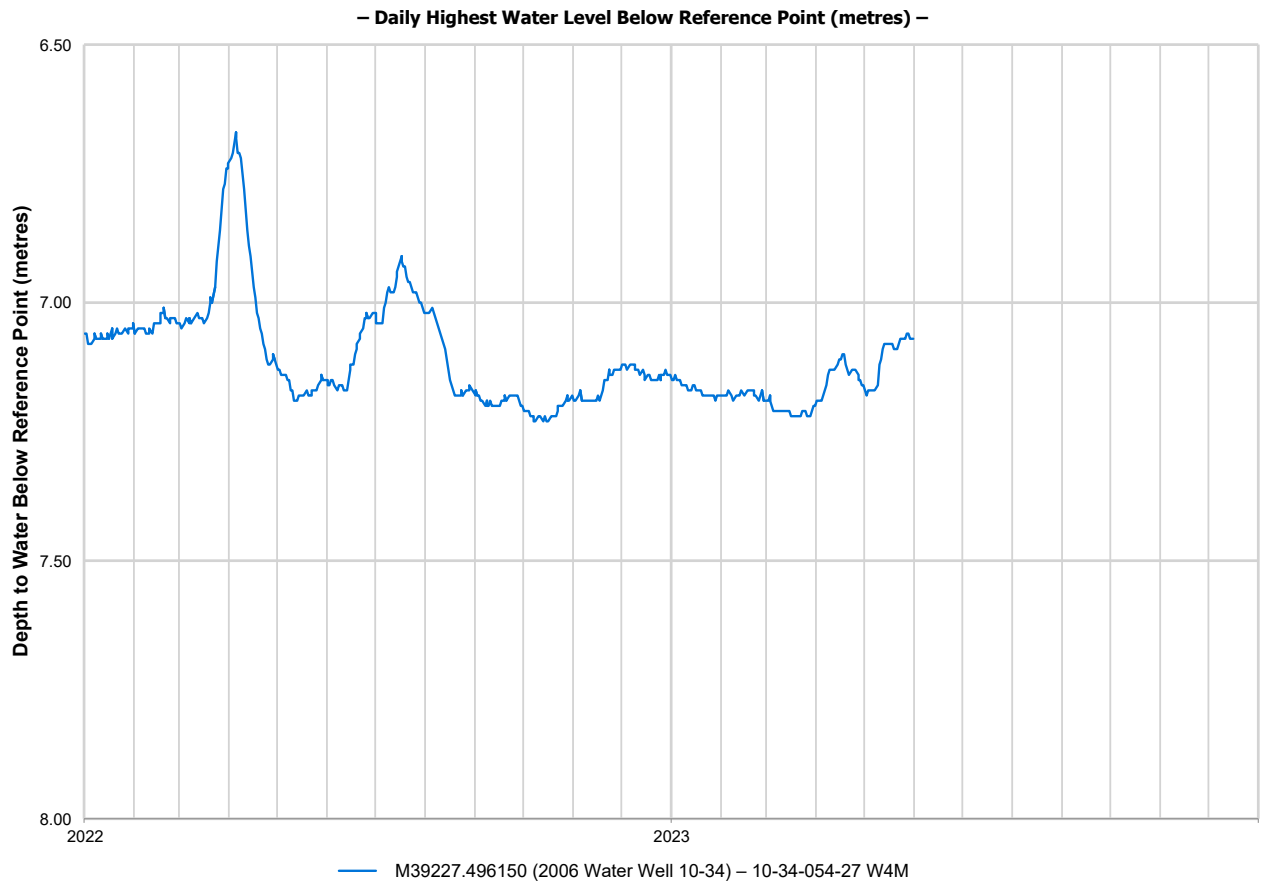
Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

2006 Water Well 10-34  
2022 - 2023 Hydrograph



## 2013 Water Well 01-29

**01-29-054-27 W4M**  
(M41313.498215)



**Well Spatial Location:**

**Easting: 70,248**

**Northing: 5,947,060**

*(spatial accuracy HCL GPS — 10TM Resource NAD83)*

**Ground Elevation AMSL (m): 690**

*(elevation accuracy HCL DEM)*

**Date Completed: February 7, 2013**

**Depth Drilled (m): 22.9**

**Completion Interval (m): 20.4 – 21.9 \***

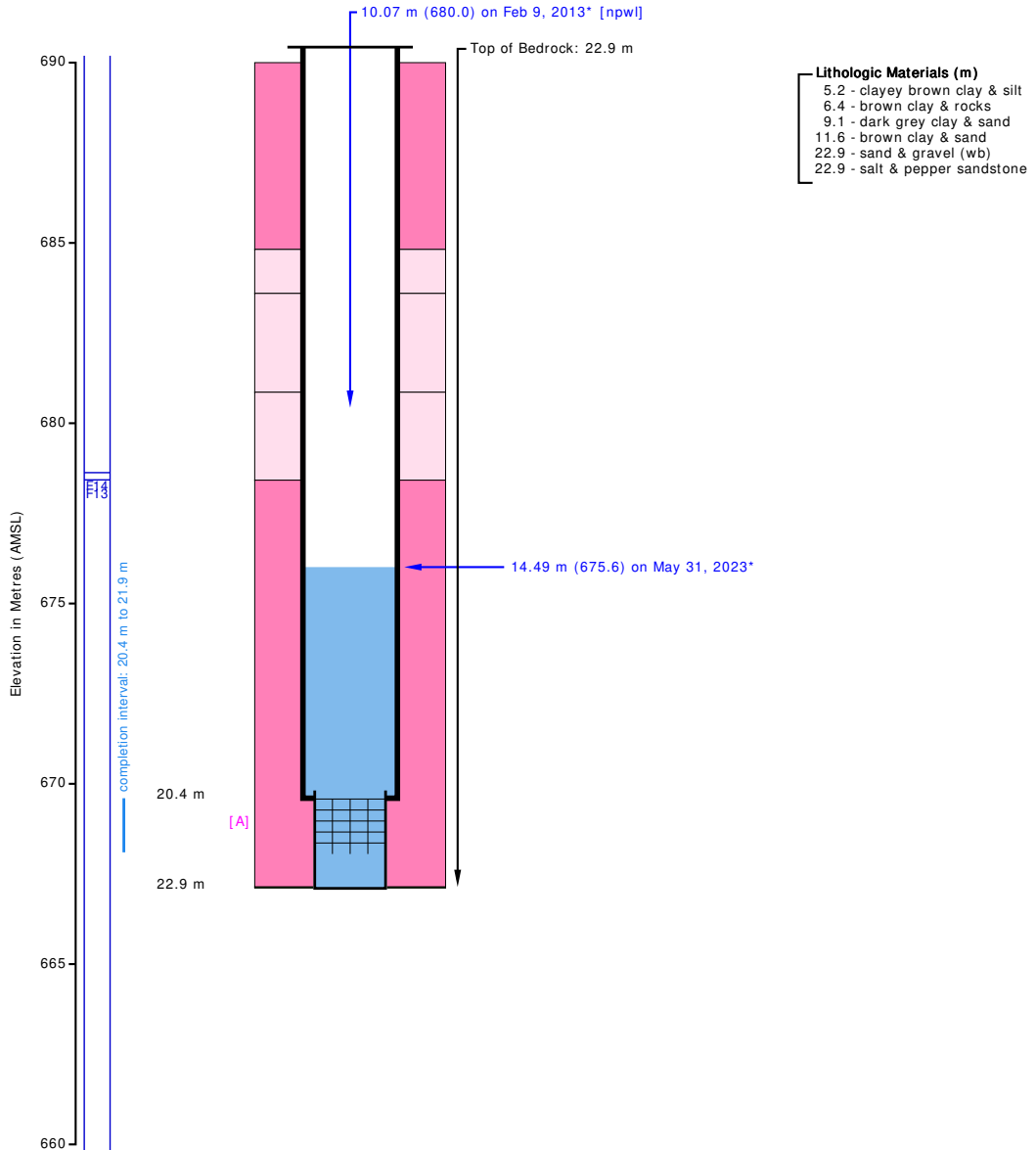
*(\* TGWC determined value)*

**Earliest Water Level (m): 10.07 – February 9, 2013 @ 11:00**

**Most Recent Water Level (m): 14.49 – May 31, 2023 @ 08:50**

**GIC ID: 1495598**

## 2013 Water Well 01-29 Water Well Diagram



Lithology Legend		Geologic Unit Legend (Top) - Regional Analysis	
<b>Surficial</b> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #f08080; border: 1px solid black; margin-right: 5px;"></span> Unsorted</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #f08080; border: 1px solid black; margin-right: 5px;"></span> Fine Grained</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #f08080; border: 1px solid black; margin-right: 5px;"></span> Coarse Grained</li> </ul> </div> <div style="width: 45%;"> <b>Bedrock</b>  <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #90ee90; border: 1px solid black; margin-right: 5px;"></span> Fine Grained</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #32cd32; border: 1px solid black; margin-right: 5px;"></span> Coarse Grained</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: #808080; border: 1px solid black; margin-right: 5px;"></span> Other</li> </ul> </div> </div>	<ul style="list-style-type: none"> <li>F14 - Middle Horseshoe Canyon Formation</li> <li>F13 - Lower Horseshoe Canyon Formation</li> </ul>		

**Summary**

TGWC ID: M41313.498215  
 Well Name: 2013 Water Well 01-29  
 Legal Location: 01-29-054-27 W4M  
 Casing (OD): 152.4 mm; PVC (6.0")  
 Screen (OD): 114.3 mm; Stainless Steel (4.5")  
 Casing Stick-Up: 0.5 m (not drawn to scale)  
 Completion [A]: 20.4 to 21.9 m; Screened  
 Water Level (recent): 14.49 m (675.6 m AMSL) on May 31, 2023 @ 08:50 - Reference Point: Top of Casing  
 Water Level (oldest): 10.07 m (680.0 m AMSL) on Feb 9, 2013 @ 11:00 - Reference Point: Top of Casing [npwl]  
 Top of Liner assumed to be 5% of 'non-cased' interval.

\* Water-Level Measurements are measured from reference point listed.  
 NOTE: Geologic Unit is a guide based on a regional groundwater assessment completed by Hydrogeological Consultants Ltd. (HCL) (<http://www.hcl.ca>) on behalf of Sturgeon County in conjunction with Prairie Farm Rehabilitation Administration (P.F.R.A.).  
 Drawn: August 25, 2023 @ 10:52 --- <https://www.hcl.ca>

do not copy, cite, or distribute without the express written consent of The Groundwater Centre, a division of hydrogeological consultants ltd.

**METRIC REPORT**

01-29-054-27 W4M

**M41313.498215**

513349; 864648; core

Contractor: *Mar-Wayne Water Well Drilling Services Ltd.*  
Name: *2013 Water Well 01-29*

Field Action: *Confirmed - Physically, February 7, 2013*

Work Type: *New Well* Date Started: *February 7, 2013*  
Drilling Method: *Drilled* Date Completed: *February 7, 2013*  
Proposed Use: *Domestic* Well Status: *Producing*  
Completion Type: *Well Screen* Feature Class: *Water Well*

Easting (m): *70,247.74\*\**  
Northing (m): *5,947,059.96\*\**  
Elevation (m): *690\*\*\**  
Lot:  
Block:  
Plan:  
Rural Address: *54406 RR 274*  
Presence of Gas: *No*

Elog Taken: *No*  
Gamma Taken: *No*  
Flowing: *No*  
Stick Up (m): *0.5*

**General Details** core

Depth Completed (m)\*: *21.9* Top of Bedrock (m): *22.86 \**  
Depth Drilled (m): *22.9* Completion Interval (m): *20.4 – 21.9 \**  
  
Sand & Gravel Thickness (m): *11.3 (total) – 11.3 (below 15 m) \**

Most Recent Water Level (m): *14.49 m – May 31, 2023*  
Pump Intake BTOC (m): *18.3 on February 9, 2013*

**Completion Details**

Surface Casing: *PVC – 152.4 mm (O.D.) x 9.50 mm (thick) x 20.4 m (bottom)*

Screen Material: *Stainless Steel – 114.3 mm (O.D.) (Attached To Casing)*

Fittings: *Top: Coupler – Bottom: Plug*

**Intervals**

Screen: *20.4 to 21.9 m - 0.100 inch (Machine)*

**Lithology Details**

Elevation (AMSL)	Depth (BGL)	Lithology Descriptions
684.4	5.2	Clayey Brown Clay & Silt
683.2	6.4	Brown Clay & Rocks
680.5	9.1	Dark Grey Clay & Sand
678.0	11.6	Brown Clay & Sand
666.7	22.9	Water-Bearing Sand & Gravel
666.7	22.9	Salt & Pepper Sandstone

**Chemistry Summary Details (mg/L, except as noted)** (recently sampled first)

Sampling Details: *May 31, 2023 @ 09:10*

Report Date: *June 13, 2023 - Element Materials Technology Canada Inc. (1655888-1)*

Constituent	Result	Constituent	Result	Constituent	Result
Conductivity (µS/cm):	<i>924</i>	Nitrate as N:	<i>0.31</i>	Turbidity (NTU):	<i>14.9</i>
Total Dissolved Solids:	<i>575</i>	Nitrite as N:	<i>&lt; 0.005</i>	Fluoride:	<i>0.10</i>
Hardness (as CaCO3):	<i>441</i>	pH (pH Unit):	<i>7.54</i>	Carbonate:	<i>&lt; 6</i>
T-Alkalinity (as CaCO3):	<i>453</i>	Colour (TCU):	<i>25</i>	Bicarbonate:	<i>553</i>
P-Alkalinity (as CaCO3):	<i>&lt; 5</i>	Ion Balance (%):	<i>100</i>	Hydroxide:	<i>&lt; 5</i>
Nitrate + Nitrite as N:	<i>0.31</i>	Total Coliforms:**:		Total Iron:	
Total Suspended Solids:		Fecal Coliforms:**:		Total Mn:	
Temperature (°C):	<i>21.0</i>	Escherichia coli:**:			

Constituent	Extractable	Dissolved	Constituent	Extractable	Dissolved
Calcium:	<i>129</i>		Mercury:	<i>&lt; 0.000005</i>	
Chloride:	<i>2.3</i>		Molybdenum:	<i>&lt; 0.001</i>	
Iron:	<i>1.02</i>		Magnesium:	<i>29.1</i>	
Manganese:	<i>0.650***</i>		Sodium:	<i>47.1</i>	
Aluminum:	<i>&lt; 0.002</i>		Potassium:	<i>3.3</i>	
Arsenic:	<i>0.0011</i>		Vanadium:	<i>&lt; 0.0001</i>	
Barium:	<i>0.048</i>		Strontium:	<i>0.953</i>	
Beryllium:	<i>&lt; 0.0001</i>		Nickel:	<i>0.0009</i>	
Cadmium:	<i>&lt; 0.00001</i>		Zinc:	<i>0.003</i>	
Chromium:	<i>&lt; 0.0005</i>		Copper:	<i>0.0012</i>	
Cobalt:	<i>0.0004</i>		Lead:	<i>&lt; 0.0001</i>	
Sulfate:	<i>93.0</i>		Uranium:	<i>0.0037</i>	

Comments: *Sample collected by Hydrogeological Consultants Ltd.*

\*\*\*Exceeded the maximum acceptable concentration (MAC), Health Canada, 2022. Guidelines for Canadian Drinking Water Quality – Summary Tables. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Health Canada, Ottawa, Ontario. 513349; 1 / 4

**Comments & Observations**

*Field Survey (HCL), Feb 7, 2013: Water well is 5 metres south of mobile home.*

**Aquifer Tests**

Date & Time	Testing Method / Type	Depth of Test Interval	Duration (minutes)		Avg. Rate (Lpm)	NPWL (metres)	Drawdown (metres)	Pump (metres)	Q20 (m <sup>3</sup> /day)*		Transmissivity (m <sup>2</sup> /day)*	
			Pumping	Recovery					Apparent	Effective	Apparent	Aquifer Effective
1 2013-02-09 11:00	Air	20.4 to 21.9	120	10	59.1	10.1	7.3	18.3	55.6		14.2	

**Alias IDs**

GIC ID: *1495598*  
GIC (WellReportId): *12015662*

\* The Groundwater Centre (TGWC) calculated or determined value.  
\*\* HCL GPS — 10TM Resource NAD83  
\*\*\* HCL DEM — {Ground; AMSL}

Created on: August 25, 2023 — Data "AS IS"; no warranty either expressed or implied. [53.688948 -113.935796 (WGS 84)], INT Date End: 2023-06-02





**2013 Water Well 01-29  
AEPA - Water Well Drilling Report**



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 1495598  
GoA Well Tag No.  
Drilling Company Well ID  
Date Report Received 2013/03/05

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
<b>Owner Name</b>		<b>Address</b>			<b>Town</b>		<b>Province</b>	<b>Country</b>	<b>Postal Code</b>		
[REDACTED]		[REDACTED]			[REDACTED]		[REDACTED]	[REDACTED]	[REDACTED]		
<b>Location</b>	<b>1/4 or LSD</b>	<b>SEC</b>	<b>TWP</b>	<b>RGE</b>	<b>W of MER</b>	<b>Lot</b>	<b>Block</b>	<b>Plan</b>	<b>Additional Description</b>		
	1	29	54	27	4						
<b>Measured from Boundary of</b>					<b>GPS Coordinates in Decimal Degrees (NAD 83)</b>					<b>Elevation</b> _____ <b>m</b>	
_____ m from _____					Latitude <u>53.688980</u> Longitude <u>-113.935792</u>					How Elevation Obtained _____	
_____ m from _____					How Location Obtained _____					Not Obtained	
					Hand held autonomous GPS 20-30m						

Drilling Information	
<b>Method of Drilling</b> Rotary - Mud	<b>Type of Work</b> New Well
<b>Proposed Well Use</b> Domestic	

Formation Log			Measurement in Metric
Depth from ground level (m)	Water Bearing	Lithology Description	
5.18		Brown Clayey Clay & Silt	
6.40		Brown Clay & Rocks	
9.14		Dark Gray Clay & Sand	
11.58		Brown Sand & Clay	
22.86	Yes	Sand & Gravel	
22.86		Gray Salt & Pepper Sandstone	

Yield Test Summary			Measurement in Metric
<b>Recommended Pump Rate</b>	45.46 L/min		
<b>Test Date</b>	<b>Water Removal Rate (L/min)</b>	<b>Static Water Level (m)</b>	
2013/02/09	59.10	10.07	

Well Completion				Measurement in Metric
<b>Total Depth Drilled</b>	<b>Finished Well Depth</b>	<b>Start Date</b>	<b>End Date</b>	
22.86 m	21.95 m	2013/02/07	2013/02/07	
<b>Borehole</b>				
<b>Diameter (cm)</b>	<b>From (m)</b>	<b>To (m)</b>		
20.00	0.00	21.95		
<b>Surface Casing (if applicable)</b>		<b>Well Casing/Liner</b>		
Plastic		Plastic		
<b>Size OD :</b>	15.24 cm	<b>Size OD :</b>	_____ cm	
<b>Wall Thickness :</b>	0.953 cm	<b>Wall Thickness :</b>	_____ cm	
<b>Bottom at :</b>	20.42 m	<b>Top at :</b>	_____ m	
		<b>Bottom at :</b>	_____ m	
<b>Perforations</b>				
<b>From (m)</b>	<b>To (m)</b>	<b>Diameter or Slot Width (cm)</b>	<b>Slot Length (cm)</b>	<b>Hole or Slot Interval(cm)</b>
Perforated by _____				
<b>Annular Seal</b>				
Placed from _____ m to _____ m				
Amount _____				
<b>Other Seals</b>				
Type		At (m)		
<b>Screen Type</b> Stainless Steel				
Size OD : 12.00 cm				
<b>From (m)</b>	<b>To (m)</b>	<b>Slot Size (cm)</b>		
20.42	21.95	0.254		
Attachment Attached To Casing				
Top Fittings Coupler		Bottom Fittings Plug		
<b>Pack</b>				
Type Washed Sand		Grain Size _____		
Amount _____				

Contractor Certification	
<b>Name of Journeyman responsible for drilling/construction of well</b> TERRY BERGSTREISER	<b>Certification No</b> 41955A
<b>Company Name</b> MAR-WAYNE WATER WELL DRILLING SERVICES LTD.	<b>Copy of Well report provided to owner</b> _____ <b>Date approval holder signed</b> Yes



# Water Well Drilling Report

[View in Imperial](#) [Export to Excel](#)

GIC Well ID 1495598  
 GoA Well Tag No.  
 Drilling Company Well ID  
 Date Report Received 2013/03/05

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GOWN ID

Well Identification and Location										Measurement in Metric	
Owner Name	Address			Town		Province	Country	Postal Code			
Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description		
	1	29	54	27	4						
Measured from Boundary of					GPS Coordinates in Decimal Degrees (NAD 83)					Elevation _____ m	
_____ m from					Latitude <u>53.688980</u> Longitude <u>-113.935792</u>					How Elevation Obtained	
_____ m from					How Location Obtained					Not Obtained	
					Hand held autonomous GPS 20-30m						

Additional Information										Measurement in Metric	
Distance From Top of Casing to Ground Level					40.64 cm						
Is Artesian Flow					Is Flow Control Installed						
Rate _____ L/min					Describe _____						
Recommended Pump Rate					45.46 L/min					Pump Installed <u>Yes</u>	
Recommended Pump Intake Depth (From TOC)					19.81 m					Depth <u>19.81 m</u>	
					Type <u>Submersible</u>					Make _____ H.P. <u>0.75</u>	
										Model (Output Rating) _____	
Did you Encounter Saline Water (>4000 ppm TDS)					Depth _____ m					Well Disinfected Upon Completion <u>Yes</u>	
Remedial Action Taken:					Gas _____ Depth _____ m					Geophysical Log Taken _____	
										Submitted to ESRD _____	
Additional Comments on Well					Sample Collected for Potability _____					Submitted to ESRD _____	

Yield Test			Taken From Top of Casing	Measurement in Metric
			Depth to water level	
Test Date	Start Time	Static Water Level		
2013/02/09	11:00 AM	10.07 m		
Method of Water Removal			Pumping (m)	Elapsed Time
Type <u>PUMP</u>				Minutes:Sec
Removal Rate <u>59.10 L/min</u>				
Depth Withdrawn From <u>18.29 m</u>				
If water removal period was < 2 hours, explain why				
				Recovery (m)
				0:00 17.39
				1:00 13.88
				2:00 12.06
				3:00 11.13
				4:00 10.63
				5:00 10.38
				6:00 10.27
				7:00 10.21
				8:00 10.18
				9:00 10.17
				10:00 10.16

Water Diverted for Drilling		
Water Source	Amount Taken	Diversion Date & Time
SHOP WELL	13638.28 L	2013/02/06 9:00 AM

Contractor Certification	
Name of Journeyman responsible for drilling/construction of well	Certification No
TERRY BERGSTREISER	41955A
Company Name	Copy of Well report provided to owner
MAR-WAYNE WATER WELL DRILLING SERVICES LTD.	Yes
	Date approval holder signed



**2013 Water Well 01-29**  
**Chemical Analysis Results (June 13, 2023)**



Element  
7217 Roper Road NW  
Edmonton, Alberta  
T6B 3J4, Canada

T: +1 (780) 438-5522  
F: +1 (780) 434-8586  
E: info.Edmonton@element.com  
W: www.element.com

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882919
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-1
<b>Sample Date</b>	May 31, 2023
<b>Sample Time</b>	09:10
<b>Sample Location</b>	M41313.498215
<b>Sample Description</b>	2013 WW 01-29 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
<b>Metals Dissolved</b>					
Silicon	Dissolved mg/L	8.32	0.05		
Sulfur	Dissolved mg/L	31.0	0.3		
Mercury	Dissolved mg/L	<0.000005	0.000005	0.001	Below MAC
Aluminum	Dissolved mg/L	<0.002	0.002	0.1 OG; 2.9 MAC	Below OG
Antimony	Dissolved mg/L	<0.0002	0.0002	0.006	Below MAC
Arsenic	Dissolved mg/L	0.0011	0.0002	0.01	Below MAC
Barium	Dissolved mg/L	0.048	0.001	2.0	Below MAC
Beryllium	Dissolved mg/L	<0.0001	0.0001		
Bismuth	Dissolved mg/L	<0.0005	0.0005		
Boron	Dissolved mg/L	0.109	0.002	5	Below MAC
Cadmium	Dissolved mg/L	<0.00001	0.00001	0.007	Below MAC
Chromium	Dissolved mg/L	<0.0005	0.0005	0.05	Below MAC
Cobalt	Dissolved mg/L	0.0004	0.0001		
Copper	Dissolved mg/L	0.0012	0.0002	1 AO; 2 MAC	Below AO
Lead	Dissolved mg/L	<0.0001	0.0001	0.005	Below MAC
Lithium	Dissolved mg/L	0.071	0.001		
Molybdenum	Dissolved mg/L	<0.001	0.001		
Nickel	Dissolved mg/L	0.0009	0.0005		
Selenium	Dissolved mg/L	<0.0002	0.0002	0.05	Below MAC
Silver	Dissolved mg/L	<0.00001	0.00001		
Strontium	Dissolved mg/L	0.953	0.001	7.0	Below MAC
Thallium	Dissolved mg/L	<0.00005	0.00005		
Tin	Dissolved mg/L	<0.001	0.001		
Titanium	Dissolved mg/L	<0.0005	0.0005		
Uranium	Dissolved mg/L	0.0037	0.0005	0.02	Below MAC
Vanadium	Dissolved mg/L	<0.0001	0.0001		
Zinc	Dissolved mg/L	0.003	0.001	5	Below AO
Subsample		Field Filtered			
<b>Physical and Aggregate Properties</b>					
Colour	Apparent, Potable Colour units	25	5	15	Above AO
Turbidity	NTU	14.9	0.1	0.1/0.3/1.0 OG	
<b>Routine Water</b>					
pH		7.54	1	7.0-10.5	Within OG Range
Temperature of observed pH	°C	21.0			
Electrical Conductivity	at 25 °C µS/cm	924	1		
Calcium	Dissolved mg/L	129	0.2		
Magnesium	Dissolved mg/L	29.1	0.2		
Sodium	Dissolved mg/L	47.1	0.4	200	Below AO

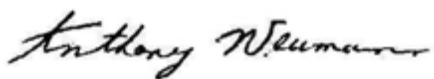
Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Analytical Report**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M 19707	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882919
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	P.O.: Proj. Acct. code:	

<b>Reference Number</b>	1655888-1
<b>Sample Date</b>	May 31, 2023
<b>Sample Time</b>	09:10
<b>Sample Location</b>	M41313.498215
<b>Sample Description</b>	2013 WW 01-29 / 4.3 °C
<b>Sample Matrix</b>	Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments	
<b>Routine Water - Continued</b>						
Potassium	Dissolved	mg/L	3.3	0.4		
Iron	Dissolved	mg/L	1.02	0.01	0.3	Above AO
Manganese	Dissolved	mg/L	0.650	0.005	0.02 AO; 0.12 MAC	Above MAC
Chloride	Dissolved	mg/L	2.3	0.4	250	Below AO
Fluoride		mg/L	0.10	0.05	1.5	Below MAC
Nitrate - N		mg/L	0.31	0.01	10	Below MAC
Nitrite - N		mg/L	<0.005	0.005	1	Below MAC
Nitrate and Nitrite - N		mg/L	0.31	0.01	10	Below MAC
Sulfate (SO4)	Dissolved	mg/L	93.0	0.9	500	Below AO
Hydroxide		mg/L	<5			
Carbonate		mg/L	<6			
Bicarbonate		mg/L	553			
P-Alkalinity	as CaCO3	mg/L	<5	5		
T-Alkalinity	as CaCO3	mg/L	453	5		
Total Dissolved Solids	Calculated	mg/L	575	1	500	Above AO
Hardness	Dissolved as CaCO3	mg/L	441			
Ionic Balance	Dissolved	%	100			

Approved by:   
Anthony Neumann, MSc  
General Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).  
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882919
Sampled By: Ben Gilham Company: HCL		

**Metals Dissolved**

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.0004298	-0.051000	0.051000	yes
Silicon	mg/L	0.00459951	-0.04	0.05	yes
Sulfur	mg/L	0.108511	-0.3	0.2	yes
Aluminum	µg/L	0.0374898	-2	2	yes
Antimony	µg/L	-0.0027847	-0.2	0.2	yes
Arsenic	µg/L	-0.013379	-0.2	0.2	yes
Barium	µg/L	0.0072568	-1	1	yes
Beryllium	µg/L	0.00205173	-0.1	0.1	yes
Boron	µg/L	0.62169	-2	2	yes
Cadmium	µg/L	-0.00056175	-0.01	0.01	yes
Chromium	µg/L	0.0217306	-0.5	0.5	yes
Cobalt	µg/L	6.29694e-005	-0.1	0.1	yes
Copper	µg/L	0.00860625	-0.2	0.2	yes
Lead	µg/L	0.00644901	-0.1	0.1	yes
Lithium	µg/L	0.0246303	-1	1	yes
Molybdenum	µg/L	-0.0943041	-1	1	yes
Nickel	µg/L	0.0247517	-0.5	0.5	yes
Selenium	µg/L	0.00118284	-0.2	0.2	yes
Silver	µg/L	-0.000165969	-0.01	0.01	yes
Strontium	µg/L	0.0130627	-1	1	yes
Thallium	µg/L	0.0196182	-0.50	0.50	yes
Tin	µg/L	0.0476563	-1	1	yes
Titanium	µg/L	0.0174193	-0.5	0.5	yes
Uranium	µg/L	0.00428352	-0.5	0.5	yes
Vanadium	µg/L	-0.0845429	-0.1	0.1	yes
Zinc	µg/L	0.159046	-1	1	yes

Date Acquired: June 09, 2023

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	1010	902	1058	yes
Antimony	µg/L	39.4	36.4	44.2	yes
Arsenic	µg/L	39.2	37.7	42.5	yes
Barium	µg/L	194	181	211	yes
Beryllium	µg/L	19.7	17.6	21.2	yes
Bismuth	µg/L	93.6	90.6	106.8	yes
Boron	µg/L	387	351	427	yes
Cadmium	µg/L	1.95	1.87	2.23	yes
Chromium	µg/L	99.5	90.8	108.8	yes
Cobalt	µg/L	19.8	18.4	21.2	yes
Copper	µg/L	201	185.4	215.4	yes
Lead	µg/L	19.4	18.3	21.3	yes
Lithium	µg/L	192	178	214	yes
Molybdenum	µg/L	201	178	219	yes
Nickel	µg/L	101	93.3	105.9	yes
Selenium	µg/L	39.6	36.9	42.9	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882919
--	--	--

**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	µg/L	19.5	18.00	21.60	yes
Strontium	µg/L	204	183	219	yes
Thallium	µg/L	9.95	8.90	10.70	yes
Tin	µg/L	204	187	217	yes
Titanium	µg/L	100.0	91.0	109.0	yes
Uranium	µg/L	98.7	89.5	107.5	yes
Vanadium	µg/L	20.6	18.3	21.3	yes
Zinc	µg/L	204	184	217	yes
Date Acquired: June 09, 2023					
Mercury	mg/L	0.000095	0.000070	0.000130	yes
Date Acquired: June 08, 2023					
Mercury	mg/L	0.000022	0.000006	0.000036	yes
Aluminum	µg/L	52	46	56	yes
Antimony	µg/L	2.0	1.8	2.2	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.1	4.4	5.6	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.12	yes
Chromium	µg/L	5.0	4.6	5.4	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10.2	9.1	10.9	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.2	4.6	5.4	yes
Selenium	µg/L	2.1	1.8	2.1	yes
Silver	µg/L	1.00	0.92	1.06	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.54	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.4	5.5	yes
Uranium	µg/L	5.1	4.5	5.6	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	11	9	11	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	10.3	9.51	10.89	yes
Sulfur	mg/L	147	141.6	156.6	yes
Date Acquired: June 09, 2023					
Silicon	mg/L	2.12	1.88	2.24	yes
Sulfur	mg/L	10.0	9.1	10.6	yes
Date Acquired: June 09, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882919
Sampled By: Ben Gilham Company: HCL		

### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	3.0	2.6	3.1	yes

Date Acquired: June 09, 2023

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Sulfur	mg/L	1.0	1.1	10	0.1	yes
Silicon	mg/L	8.47	8.58	10	0.01	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	1.1	1.1	10	0.4	yes
Barium	µg/L	48	48	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	109	110	10	4	yes
Cadmium	µg/L	<0.01	<0.01	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.4	0.4	10	0.2	yes
Copper	µg/L	1.2	1.2	10	2.2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	71	71	10	2	yes
Molybdenum	µg/L	<1	<1	10	2	yes
Nickel	µg/L	0.9	1.1	10	1.1	yes
Selenium	µg/L	<0.2	<0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	953	947	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	3.7	3.6	10	1.1	yes
Vanadium	µg/L	<0.1	<0.1	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes

Date Acquired: June 09, 2023

### Physical and Aggregate Properties

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	0.099	-0.1	0.1	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	0.115	0.0	0.1	yes
Date Acquired: June 07, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	1840	1799.3	2005.7	yes
Date Acquired: June 07, 2023					
Turbidity	NTU	5200	4441.7	6661.7	yes
Date Acquired: June 07, 2023					

### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882919
--	--	--

### Physical and Aggregate Properties - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC	
Colour	Colour units	10	10	10	yes	
Turbidity	NTU	142	132.1	162.1	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	13.9	12.6	15.6	yes	
Date Acquired: June 07, 2023						
Turbidity	NTU	1.6	1.0	2.2	yes	
Date Acquired: June 07, 2023						
Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	1.4	1.3	10	0.2	yes
Date Acquired: June 07, 2023						

### Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0.09	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes
Calcium	mg/L	0.00899787	-0.2	0.2	yes
Magnesium	mg/L	0.00799609	-0.1	0.1	yes
Sodium	mg/L	0.0213189	-0.4	0.4	yes
Potassium	mg/L	0.0342252	-0.4	0.4	yes
Iron	mg/L	0.00533791	-0.01	0.01	yes
Manganese	mg/L	0.00044077	-0.004	0.004	yes
Date Acquired: June 09, 2023					
Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	2070	1847.4	2256.0	yes
Date Acquired: June 09, 2023					
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes
Date Acquired: June 07, 2023					
pH		9.18	8.90	9.44	yes
Temperature of observed	°C	21.1	15.5	24.5	yes
Electrical Conductivity	dS/m	2.72	2.631	2.829	yes
P-Alkalinity	mg/L	529	442	584	yes
T-Alkalinity	mg/L	1000	958	1059	yes
Fluoride	mg/L	9.91	9.39	10.59	yes
Nitrate - N	mg/L	9.88	9.03	11.13	yes
Nitrite - N	mg/L	9.83	9.010	10.990	yes
Nitrate and Nitrite - N	mg/L	19.70	19.10	20.90	yes
Calcium	mg/L	247	230.0	260.0	yes
Magnesium	mg/L	96.8	92.6	104.6	yes
Sodium	mg/L	245	234.6	259.2	yes
Potassium	mg/L	249	229.0	259.0	yes



### Quality Control

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882919
Sampled By: Ben Gilham Company: HCL		

### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Iron	mg/L	9.77	9.38	10.16	yes
Manganese	mg/L	2.40	2.320	2.560	yes
Date Acquired: June 09, 2023					
pH		6.88	6.79	6.97	yes
Temperature of observed	°C	20.9	15.5	24.5	yes
Electrical Conductivity	dS/m	0.075	0.069	0.085	yes
P-Alkalinity	mg/L	56	28	72	yes
T-Alkalinity	mg/L	127	114	140	yes
Chloride	mg/L	84.1	74.9	86.9	yes
Fluoride	mg/L	4.82	4.56	5.22	yes
Nitrate - N	mg/L	4.69	4.37	5.33	yes
Nitrite - N	mg/L	4.82	4.370	5.330	yes
Nitrate and Nitrite - N	mg/L	9.51	8.80	10.60	yes
Calcium	mg/L	51.2	44.9	56.9	yes
Magnesium	mg/L	20.1	17.9	22.0	yes
Sodium	mg/L	51.6	47.3	52.7	yes
Potassium	mg/L	50.0	45.8	55.8	yes
Iron	mg/L	2.02	1.90	2.08	yes
Manganese	mg/L	0.499	0.468	0.552	yes
Date Acquired: June 09, 2023					
Chloride	mg/L	15.0	13.3	16.5	yes
Fluoride	mg/L	0.50	0.45	0.57	yes
Nitrate - N	mg/L	0.52	0.42	0.57	yes
Nitrite - N	mg/L	0.506	0.455	0.557	yes
Nitrate and Nitrite - N	mg/L	1.02	0.85	1.15	yes
Calcium	mg/L	5.0	4.7	5.4	yes
Magnesium	mg/L	2.0	1.9	2.2	yes
Sodium	mg/L	4.9	4.7	5.7	yes
Potassium	mg/L	5.0	4.6	5.6	yes
Iron	mg/L	0.19	0.18	0.22	yes
Manganese	mg/L	0.048	0.046	0.057	yes
Date Acquired: June 09, 2023					

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.54	7.49	0	0.10	yes
Electrical Conductivity	dS/m	0.924	0.942	10	0.002	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	<6	<6	10	6	yes
Bicarbonate	mg/L	553	547	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	453	448	10	5	yes
Chloride	mg/L	56.8	57.1	10	0.5	yes
Nitrate - N	mg/L	<0.01	<0.01	10	0.01	yes
Nitrite - N	mg/L	<0.005	<0.005	10	0.010	yes
Fluoride	mg/L	0.06	0.06	10	0.05	yes

**Quality Control**

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3 Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882919
--	---	--

**Routine Water - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Calcium	mg/L	29.6	29.3	10	0.6	yes
Magnesium	mg/L	9.1	9.0	10	0.7	yes
Sodium	mg/L	2.9	2.8	10	1.2	yes
Potassium	mg/L	1.0	1.0	10	1.2	yes
Iron	mg/L	0.18	0.18	10	0.05	yes
Manganese	mg/L	<0.005	<0.005	10	0.010	yes
Date Acquired: June 09, 2023						

## Methodology and Notes

Bill To: Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID: MR-0224.22 Project Name: 2022 Groundwater Monitoring Project Location: LSD: Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M P.O.: 19707 Proj. Acct. code:	Lot ID: <b>1655888</b> Control Number: Date Received: Jun 5, 2023 Date Reported: Jun 13, 2023 Report Number: 2882919
Attn: Kirby Fromm Sampled By: Ben Gilham Company: HCL		

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Alkalinity - Titration Method, 2320 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Jun 7, 2023	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Jun 7, 2023	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Jun 9, 2023	Element Edmonton - Roper Road
Approval-Edmonton	APHA	Checking Correctness of Analyses, 1030 E	Jun 12, 2023	Element Edmonton - Roper Road
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Jun 9, 2023	Element Edmonton - Roper Road
Colour (Apparent) in water	APHA	* Visual Comparison Method, 2120 B	Jun 7, 2023	Element Edmonton - Roper Road
Mercury (Dissolved) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Jun 8, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Jun 9, 2023	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Jun 9, 2023	Element Edmonton - Roper Road
Turbidity in Water	APHA	* Turbidity - Nephelometric Method, 2130 B	Jun 7, 2023	Element Edmonton - Roper Road

\* Reference Method Modified

## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

## Guidelines

Guideline Description	Health Canada GCDWQ
Guideline Source	Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020
Guideline Comments	MAC = Maximum Acceptable Concentration AO = Aesthetic Objective OG = Operational Guideline for Water Treatment Plants (does not apply to private groundwater wells). Refer to Health Canada for complete guidelines at <a href="http://www.hc-sc.gc.ca">www.hc-sc.gc.ca</a>

## Comments:

- Jun 06, 2023 - Sample 1655888-1; 8663468: Sample received at 4.3 °C

---

### Methodology and Notes

Bill To:	Hydrogeological Consultants 17740 - 118 Avenue Edmonton, AB, Canada T5S 2W3	Project ID:	MR-0224.22	Lot ID:	<b>1655888</b>
Attn:	Kirby Fromm	Project Name:	2022 Groundwater Monitoring	Control Number:	
Sampled By:	Ben Gilham	Project Location:		Date Received:	Jun 5, 2023
Company:	HCL	LSD:	Tp 054, R 26 to 28, W4M and Tp 054, R 01, W5M	Date Reported:	Jun 13, 2023
		P.O.:	19707	Report Number:	2882919
		Proj. Acct. code:			

---

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Terms and Conditions: <https://www.element.com/terms/terms-and-conditions>

2013 Water Well 01-29  
2022 - 2023 Hydrograph

