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Groundwater Studies
Geochemistry
Phase I / II
Regional Flow Studies
Contaminant Investigations
OMB Hearings
Water Quality Sampling
Monitoring
Groundwater Protection Studies
Groundwater Modelling
Groundwater Mapping

Our File: 0132

October 29, 2024

Township of Puslinch
7404 Wellington Road 34
Guelph, ON
N1H 6H9

Attention: Courtenay Hoytfox
Acting CAO

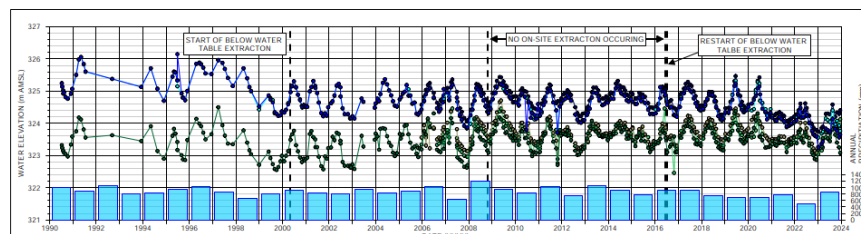
Dear Courtenay:

Re: Dufferin Aggregates Aberfoyle Pit #2 (CRH Canada Group)

Report Reviewed: 2023 Annual Monitoring Report, Aberfoyle Pit No. 2, 18 March 2024, GHD

Our comments on the 2023 Annual Report are as follows:

1) The data presentation in Figures 3.1 through 3.3 provides all historical data in a clear precise manner. As an example, the figure below shows groundwater elevations in upgradient wells (upper line) and downgradient wells (lower line). The interesting observation from this data is how separate the two lines are in the early 1990's (left side of graph) and how close they are on the right hand side in 2023. This is the effect on groundwater levels as a result of creating the pit pond, where the upper line is trending slightly downward and the lower line is trending slightly upward.



In 2021 there was very little groundwater recharge and the upgradient water levels still have not recovered from this event and subsequent very

Dufferin Aberfoyle Pit No. 2

October 29, 2024

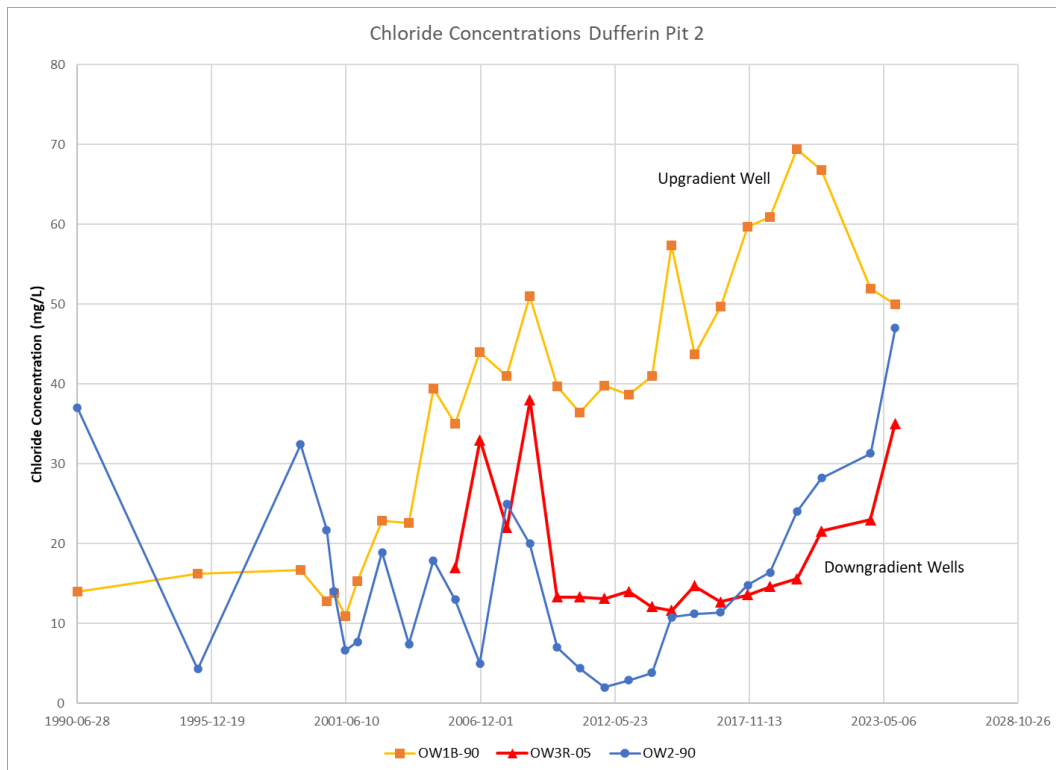
Page 2



low precipitation year of 2022. The same is not true for the downgradient water levels which weathered the low years of 2021/2022 just fine, partially due to the storage in the pit pond.

2) The water levels in the wetland and private pond located north of Dufferin Pit No. 2 and east of the former Tikal Pit are more similar in historical water level pattern to the upgradient monitoring wells in comparison to downgradient monitoring wells. It remains our opinion that the water level in wetland monitor SW2-91 has been mainly dry since the spring of 2020 due to the passive drawdown effect caused by the expansion of below water table extraction in Dufferin Pit No. 2.

3) The history of chloride concentrations in groundwater at the Dufferin Pit No. 2 is depicted below. We interpret this pattern of general increase in chloride concentrations to reflect road salting efforts by the Township and County on both County Road 34 and Watson Road South. There is no other reasonable source of chloride. The drawdown effect of the westward pit pond expansion may alter groundwater flow patterns subtly, by drawing water in from the east and releasing it to the west. That may explain why the chloride concentration in downgradient wells has been increasing. The decreasing chloride concentrations in the upgradient well may be a result of relatively recent efforts by the County and the Township to reduce salt use.





Concluding Remarks

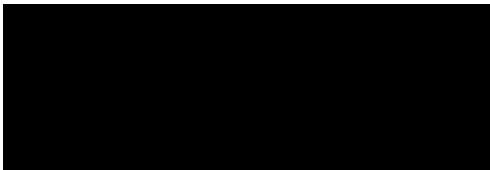
Although the pit is an approved land use, the continued westward expansion of the pit pond will result in greater drawdown of groundwater levels east of the pit. There are wetlands reliant on groundwater in the area of influence of the pit and remedies should be explored to limit those impacts, including the emplacement of fine-grained material along the eastern and northern underwater side slopes of the pit pond.

A land use planner may be able to evaluate if provincial policy statements or official plan policies of the County of Wellington are being contravened. We note that the pit pond extends into the area formerly regulated by the GRCA as shown on the attached map.

The changes in water quality do not require additional investigation at this time.

Sincerely

Harden Environmental Services Ltd.



Stan Denhoed, P.Eng., M.Sc.
Senior Hydrogeologist



Aberfoyle Pit No. 2

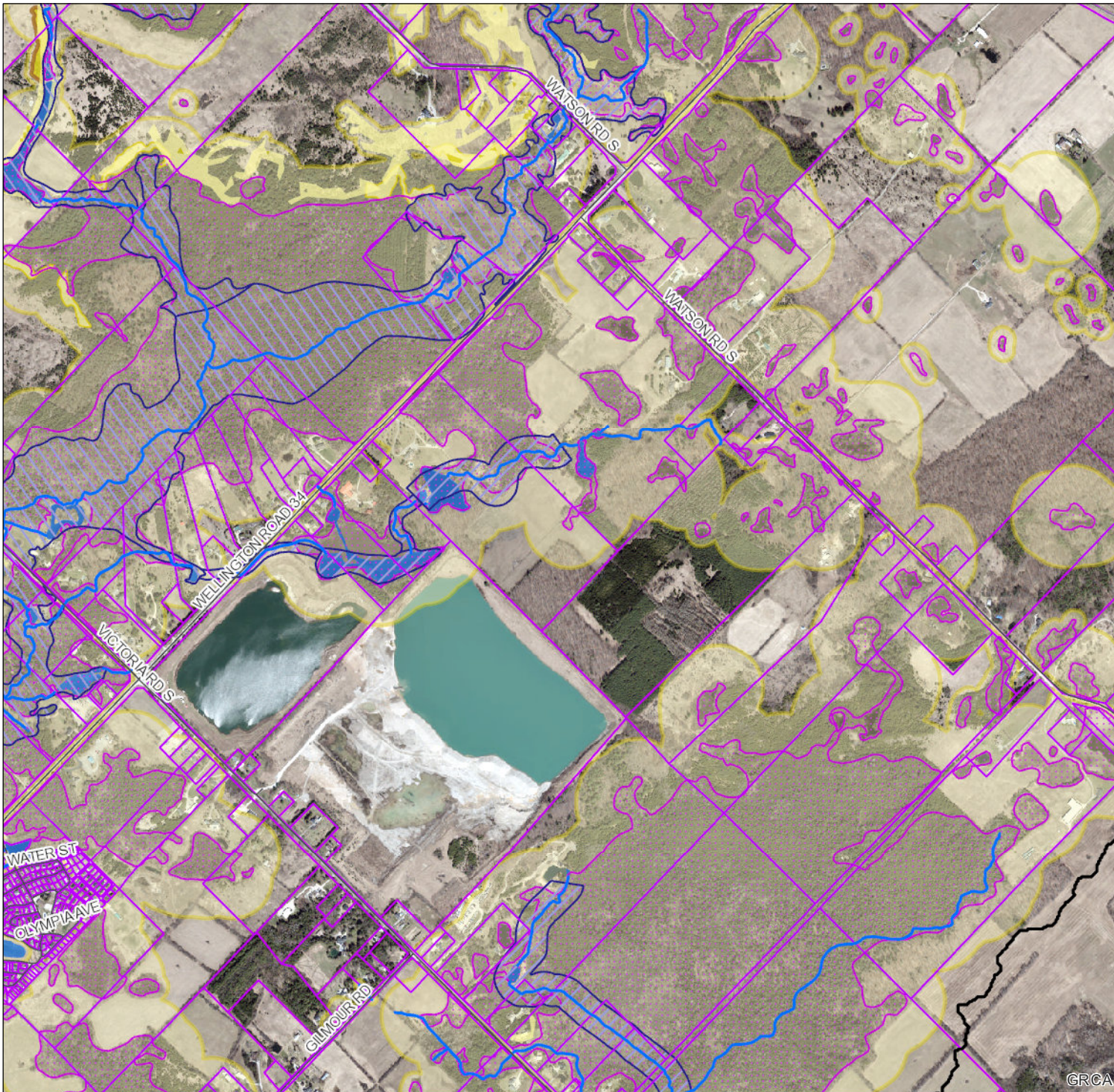
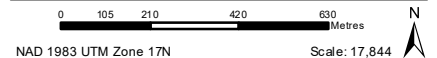


Legend

- Regulation Limit (GRCA)
- Regulated Watercourse (GRCA)
- Regulated Waterbody (GRCA)
- Wetland (GRCA)
- Floodplain (GRCA)
 - Engineered
 - Estimated
 - Approximate
 - Special Policy Area
- Slope Valley (GRCA)
 - Steep
 - Oversteep
 - Steep
- Slope Erosion (GRCA)
 - Oversteep
 - Toe
- Lake Erie Flood (GRCA)
- Lake Erie Shoreline Reach (GRCA)
- Lake Erie Dynamic Beach (GRCA)
- Lake Erie Erosion (GRCA)
- Parcel - Assessment (MPAC/MNRF)

This legend is static and may not fully reflect the layers shown on the map. The text of Ontario Regulation 150/06 supercedes the mapping as represented by these layers.

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Disclaimer: This map is for illustrative purposes only. Information contained herein is not a substitute for professional review or a site survey and is subject to change without notice. The Grand River Conservation Authority takes no responsibility for, nor guarantees, the accuracy of the information contained on this map. Any interpretations or conclusions drawn from this map are the sole responsibility of the user.
The source for each data layer is shown in parentheses in the map legend. For a complete listing of sources and citations go to: <https://maps.grandriver.ca/Sources-and-Citations.pdf>





2023 Annual Monitoring Report

Aberfoyle Pit No. 2

Dufferin Aggregates, a CRH Company

18 March 2024

→ The Power of Commitment



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1. Introduction

GHD was retained by Dufferin Aggregates, a CRH Company (Dufferin) to complete the 2023 groundwater sampling program and Annual Monitoring Report (AMR) for Dufferin Aberfoyle Pit No. 2 (Site). The Site is located on part of the west half of Lots 22 and 23, Concession 9, Township of Puslinch, in the County of Wellington as presented on Figure 1.1.

The area licenced for extraction is 78.1 hectares (ha) (193 acres), of which an area of 68.0 ha (168 acres) will be extracted above the water table, and 53.4 ha (132 acres) below the water table. Prior to May 2000, Dufferin only extracted aggregate above the water table as per the phasing of operations on the Site plans approved by the Ministry of Natural Resources and Forestry (MNRF).

Extraction of aggregate below the water table was initiated in 2000. Below water table extraction occurred through to 2008, at which point all on-Site extraction ceased. On-Site extraction (above and below the water table) recommenced in 2016 and continued through 2023. Extraction of aggregate below the water table in 2023 occurred from January 3 to December 15. Please note that a Permit to Take Water (PTTW) is not required for the aggregate operation at the Site since no water taking occurs (i.e., pumping of groundwater or surface water).

The initial monitoring program for the Site was developed by Conestoga-Rovers & Associates (now GHD)^{1,2}. This program was subsequently approved by the Ministry of the Environment, Conservation and Parks (MECP), and was initiated during the summer of 1990.

The primary purpose of the monitoring program is as follows:

- Collect water level and water quality information, during mining of aggregate, to evaluate the impacts of extraction on local shallow groundwater and surface water.
- Provide recommendations regarding the monitoring program, as necessary.

The monitoring program in 2023 consisted of the following:

- Monthly hydraulic (manual water level) monitoring of on-Site monitoring wells and on- and off-Site surface water locations.
- Groundwater quality monitoring at five on-Site monitoring wells.
- Wetland soil water quality monitoring at one off-Site wetland piezometer.

In addition, ARA Site Plans – Operational Plan Note K.8 requires the implementation of the contingency plan outlined in the August 1991 Final Monitoring Report which specifies the following:

- If no precipitation occurs for 30 consecutive days, the mining operation will be adjusted.
- If a long term (100-day) drought should occur, it is planned to operate above the water table to negate any potential impacts to water levels due to drought conditions. In the unlikely event that any water supply was adversely interrupted by on-Site mining of aggregate below the water table, a temporary water supply would be provided immediately, and a new bedrock well would be constructed for the owner.

The following provides a summary of the geological/hydrogeological setting followed by a summary and interpretation of the 2023 hydraulic monitoring and water quality results.

¹ CRA, 1988. Assessment of Mining Impact, Aberfoyle Pit No. 2, Puslinch Township, Wellington County

² CRA, 1991. Final Monitoring Report, Dufferin Aggregates Aberfoyle Pit No. 2, Township of Puslinch, County of Wellington

2. Geological/Hydrogeological Setting

The Site occurs within the Horseshoe Moraines physiographic region (Chapman and Putnam, 1984)³. The Paris and Galt moraines are the two major features, which constitute this region. The Site occurs between these two moraines within a spillway channel that consists of sand, or sand and gravel deposits. This sand and gravel deposit contains the surficial unconfined (water table) aquifer beneath the Site. This deposit has a thickness of about 12 metres (m) in the central portion of the Site and decreases in thickness towards the southwest. Available information indicates that groundwater flow within the water table aquifer occurs in a general southwesterly direction. The surficial sand and gravel deposit is underlain by fine-grained material consisting of clayey silt to silty clay.

Overburden at the Site is underlain by dolostone bedrock of the Middle Silurian Guelph Formation. The Site occurs near the contact with dolostone of the underlying Amabel Formation. Bedrock occurs at a depth of about 15 to 30 m below the original ground surface near the Site and decreases in elevation in a general southwesterly direction. The bedrock aquifer is primarily utilized as a source of domestic water supply in the area.

3. Hydraulic Monitoring Program

The current hydraulic monitoring program consists of monthly water level measurements, completed by Dufferin with support from GHD (as needed), in on-Site monitoring wells, and on- and off-Site surface water locations, as presented on Figure 3.1. Well construction details for the monitoring wells within the program are provided in Table 3.1.

3.1 Precipitation Data

The 2023 daily and monthly precipitation data obtained from Environment Canada for the Region of Waterloo Airport Station (I.D. # 6144239)⁴ are presented on Figure 3.2 and compared to the monthly Environment Canada Climate Normals (1981-2010) prepared for the Station I.D. #6149387 (former station ID for the Region of Waterloo Airport). Where data was unavailable at Station ID #6144239 data from the Environment Canada Roseville Station (ID #6147188) was reviewed and supplemented into the dataset, where applicable.

As shown on Figure 3.2, precipitation totals varied significantly month to month compared to historical averages with very wet periods (Mar/Apr, Jul/Aug) and very dry periods (May/June, Sep/Oct/Nov/Dec).

The 2023 total precipitation (865 millimetres [mm]), was 5.6% less than the annual average precipitation of 916 mm. However, it should be noted that 2022 precipitation totals were significantly below average at 493mm.

3.1.1 Precipitation Contingency Plan

In 2023, no prolonged periods without precipitation were identified (i.e., exceeding 30-days). The longest period without precipitation in 2023 occurred between May 21 and June 8 (19 days); as recorded at the Environment Canada weather station located at the Region of Waterloo Airport (I.D. # 6144239). The lowest 30-day precipitation total in 2023 was observed between August 30 and September 28, at 23.5 mm.

Implementation of the contingency measures was not required in 2023.

³ Chapman, L.J., and Putnam, D.F. 1984: Physiography of Southern Ontario; Ontario Geological Survey

⁴ Environment Canada Station # 6144239 (Region of Waterloo Airport; 21 km west of the Site) data has been reference herein consistent with previous annual monitoring reports. Data from Station ID 6143092 (Guelph Turfgrass Institute; 10 km northwest) has also been review for consistence. Station #6144239 will continue to be reported in subsequent AMRs.

3.2 Hydraulic Monitoring

3.2.1 Monitoring Program

The 2023 water elevations are presented in Table 3.2. Water levels have been monitored since May 1990, with monthly levels generally taken since May 1999. The program currently consists of water level measurements at the following locations:

- Monitoring wells: OW1A/B-90, OW2-90, OW3R-05, OW4R-05, and OW7-05
- Piezometers: WP1-93
- Staff Gauges: SW6-03, SW2-91, Pond 1, and Pond 2

3.2.2 Groundwater Monitoring

Wells OW3R-05 and OW4R-05 were completed in September 2005 as replacement wells for OW3-90 and OW4-90. OW3-90 and OW4-90 were installed around the Site perimeter so that they would not have to be removed during aggregate operations. However, apart from four monitoring events, well OW3-90 had been dry since installation and monitoring well OW4-90 had been continuously dry. The surficial sands and gravels at these two locations were only about 2 m thick and underlain by fine-grained material. The new wells were installed further east of the dry wells where the sands and gravels are thicker, thus allowing monitoring of water levels. OW3-90 and OW4-90 were subsequently sealed and abandoned in 2007. In addition, new monitoring well OW7-05 was also installed in September 2005 to allow monitoring of groundwater levels within the eastern upgradient part of the Site.

Hydrographs presenting the 2023 and historical groundwater elevations for wells located in the sand and gravel are plotted against precipitation on Figure 3.3. The upper and lower panels of Figure 3.3 show the long-term historical and 2023 groundwater elevations, respectively. The locations include OW1A-90, OW1B-90 and OW7-05 in blue shading located along the northeastern (upgradient) property boundary of the Site, OW2-90 and OW4R-05 located near the southwestern (downgradient) property boundary, and OW3R-05 located more central to the Site, all three in green shading.

Review of Figure 3.3 shows that water levels in the upper sand and gravel wells typically exhibit a similar trend each year. In general, groundwater levels increase during the spring, with surplus precipitation relative to potential evapotranspiration. Levels typically decrease toward the latter part of the year, which is attributed to a water deficit, and often increase near the end of the year in response to increased precipitation during the fall. The water levels in these wells generally exhibited the above-noted trend during 2023; however, full recovery of groundwater levels in the fall did not occur due to below average precipitation, as discussed in Section 3.1. Water levels in April 2023 were collected but are not reflected in this Report due to Site personnel changes and documentation missing during handover.

The overall trend in water levels generally follows the trend in total annual precipitation with some degree of lag time as can be observed in the declining water levels between 2020 and 2022. As originally anticipated and approved, an overall flattening of the water table over the pond area (i.e., decreasing water levels on the upgradient side and increasing water levels on the downgradient side) can also be observed in the historical water level data as is to be expected following the advancement of a below water table pond. Below water table extraction at the former Tikal Pit north of the Site was approved after Aberfoyle Pit #2 and has contributed to changes to the local groundwater resources north of the Site. The flattening of the water table has resulted in an overall decrease in water levels immediately upgradient of the Site (as observed at OW1A-90 and OW1B-90; approximately 30 m upgradient from the pond) and an increase in water levels downgradient of the Site (as observed at OW2-90; approximately 320 m downgradient of the pond). The resulting influence is typically negligible within a short distance from the pond extents. No impacts to local private water supply wells have been identified nor are impacts anticipated; even given the cumulative impacts of the former Tikal Pit. During December 2023 monitoring, readings at OW1B-90 and OW4R-05 were erroneous; water levels recorded in January 2024 are presented on Figure 3.3 to illustrate trends.

3.2.3 Surface Water Monitoring

Hydrographs presenting the 2023 and historical surface water elevations are plotted against precipitation on Figure 3.4. The upper and lower panels of Figure 3.4 show the long-term historical and 2023 surface water elevations, respectively. The 2023 surface water monitoring program is outlined below:

- The surface water monitoring program in 2023 consisted of monthly water level measurements at Pond 1, Pond 2, SW2-91, WP1-93, and SW6-03.
- SW6-03 was installed in 2003 to allow measurement of water levels within the on-Site Dufferin pond excavation and reinstalled in May 2022 after being damaged by ice in the winter of 2022.

Some recovery of surface water deficits can be observed following the extended dry period between 2020 and 2022. However, with only slightly below normal precipitation in 2023, full recovery has not been observed. Historical low water levels observed in 2022 were not observed in 2023. On an annual basis, maximum water elevations typically occur in the spring and minimum elevations in the fall or winter. The longer-term surface water level trends typically correspond with trends in annual precipitation.

Surface water features northwest of the Site (monitored by instruments SW2-91, WP1-93, and Pond 2) are plotted with groundwater levels along the northwest Site boundary (OW1A-90 and OW2-90) and precipitation on Figure 3.5. As presented on Figure 3.5, and discussed above, historical low surface water elevations observed in 2022 were not observed in 2023. It should be noted that SW2-91 has been routinely dry since late 2019, however, following significant precipitation in July 2023, SW2-91 remained predominantly wet for the remainder of 2023 with the exception of October. Overall, historical monitoring results, including during extraction, demonstrate a constant downward vertical hydraulic gradient between surface water elevations observed north of the Site and on-Site groundwater elevations.

Water level monitoring at Pond 1 has been completed throughout the program. Pond 1 is separated from Aberfoyle Pit #2 by the lake at the former Tikal Pit north of the Site as shown on Figure 3.1. Monitoring at Pond 1 should be removed from the monitoring program, as recommended in previous AMRs since this location, as surface water levels at Pond 1 are dependant on conditions at the former Tikal Pit which was not approved at the time of monitoring program development.

4. Water Quality Monitoring Results

The potential water quality influence of aggregate extraction below the water table is evaluated by comparing background and upgradient water quality in the on-Site monitoring wells with water quality in on-Site/downgradient wells during aggregate operations. The groundwater quality results are also compared to 2020 MECP Ontario Drinking Water Quality Standards (ODWQS), including the Aesthetic Objectives (AO) and Operations Guidelines (OG) revised in June 2006. The monitoring well groundwater quality is compared to the ODWQS for illustrative purposes only since the ODWQS pertain to municipal water supply and are not directly applicable to groundwater quality.

Samples collected from the monitoring locations for analysis of metal parameters were field filtered. Samples collected for general chemistry and petroleum hydrocarbon (PHC) F1 to F4 analysis were not filtered. All samples were collected in laboratory-supplied sample bottles issued by the receiving laboratory (ALS) and placed in an ice-filled cooler for sample preservation. The samples were submitted under chain of custody procedures to ALS Laboratory, Waterloo, Ontario.

Section 4.1 presents the sampling program. A summary of the results is provided in Section 4.2. Copies of the 2023 water quality results, as received from ALS Laboratory, are provided in Appendix A.

4.1 Sampling Program

Prior to initial extraction of aggregate below the water table in May 2000, groundwater sampling was conducted to determine background water quality. In general, three sampling events were conducted for the monitoring wells OW1A-90 / OW1B-90 (upgradient) and OW2-90(downgradient) between 1990 and 1999. Samples were subsequently collected twice per year during 2000 and 2001, and on an annual basis commencing in 2002 (typically during the fall). Upgradient groundwater quality continues to be monitored at OW1A-90 and OW1B-90 annually.

Annual sampling was conducted on October 25, 2023. Groundwater samples were collected from on-Site monitoring wells OW1A-90, OW1B-90, OW2-90, OW3R-05, and OW4R-05. All water samples were analyzed for general chemistry and dissolved metals. Results are presented in Table 4.1. Duplicate general chemistry, dissolved metals, and PHC F1 to F4 samples were collected from OW2-90 for Quality Assurance/Quality Control (QA/QC). Following recommendations from the 2022 AMR, the outdated total petroleum hydrocarbon (TPH) method of analysis was transitioned to PHC F1 to F4 analysis which is the current Ontario method for analyzing hydrocarbons in groundwater. PHC F1 to F4 analysis was performed on samples from OW1B-90, OW2-90 (including duplicate sample), and OW3R-05. PHC F1 to F4 have generally consistent detection limits, for comparable carbon groupings, as the previous TPH analyses.

4.2 Groundwater Quality Assessment

The following provides a summary of the groundwater quality results for the 2023 sampling program. The 2023 groundwater quality data for the monitoring locations are summarized on Table 4.1. Figure 4.1 presents a summary of the historical background (1990 to 1999) and upgradient (OW1A-90 and OW1B-90) water quality results compared to the 2023 Site-wide detections. PHC F1 to F4 analyses were used instead of TPH for 2023 to analyze hydrocarbons in the groundwater. 2023 PHC F1 to F4 results are presented on Figure 4.1; all PHC F1 to F4 2023 sample results were non-detect (ND) at the associated laboratory reporting limits.

Site-wide analytical results for 2023 were all below the ODWQS except for iron at upgradient wells OW1A-90 (0.657 milligrams per litre [mg/L]) and OW1B-90 (0.9 mg/L) which were above the ODWQS of 0.3 mg/L. Dissolved iron is naturally occurring; furthermore, the ODWQS for iron is an aesthetic objective and is not a health concern. As presented on Figure 4.1, iron concentrations, prior to extraction below the water table, ranged from non-detect to 2.51 mg/L and as shown, the iron concentrations detected in 2023 occurred within the historical range.

As further shown on Figure 4.1, in 2023, groundwater concentrations across the Site were within the ranges of background water quality detections between 1990 and 1999 and/or upgradient water quality at OW1A-90 and OW1B-90.

4.3 WP1-93 Sampling Program

Through assessment of the ongoing monitoring, as documented in the GHD letter dated July 14, 2023, it was determined that, though completed, reporting of the WP1-93 water quality program had been excluded from previous reporting. WP1-93 was installed off-Site approximately 200 metres northwest of on-Site monitoring wells OW1A-90 and OW1B-90. Before initial extraction of aggregate below the water table commenced in May 2000, samples were collected to determine background water quality. In general, two sampling events were conducted between 1995 and 1999. Samples were subsequently collected twice per year during 2000 and 2001, and on an annual basis commencing in 2002 (typically during the fall). When WP1-93 was accessible, samples were collected and analyzed for total phosphorus. Sample field temperatures were also recorded. Historically, analytical results have been provided in the corresponding analytical reports provided in the AMRs but not specifically discussed. Table 4.2 summarizes the results available to date.

Table 4.2 WP1-93 Wetland Soil Water Quality Results

Date	Total Phosphorous (mg/l)	Field Temperature (°C)
May 26, 1995	9.80	17.7
Jul 30, 1998	Purged Dry	
Aug 24, 2000	1.60	13.8
Dec 13, 2000	Not Available	4.3
May 29, 2001	0.55	11.1
Nov 26, 2001	0.025	7.8
Nov 29, 2002	Insufficient Water	
Dec 31, 2003	6.05	3.5
Dec 30, 2004	13.9	Insufficient Water for field parameters
Nov 22, 2005	2.60	7.4
Nov 21, 2006	0.330	
2007 to 2014	Blockage and/or access not granted by property owner	
Aug 19, 2015	72.5	Not Available
Sep 9, 2016	0.956	Not Available
Oct 24, 2017	2.83	12.93
Sep 21, 2018	1.39	25.17
Oct 25, 2019	0.846	11.63
Oct 23, 2020	2.04	15.48
Oct 21, 2021	<3.0	13.02
Oct 21, 2022	Dry	Dry
Oct 25, 2023	1.48	14.75

As presented in Table 4.2, there are no discernible trends in the total phosphorus or temperature results; beyond the influence of ambient air temperatures given the time of year of the sampling. Recent phosphorus results are consistent with upgradient groundwater results on-Site (0.008 to 2.92 mg/L, as presented in Figure 4.1). The Site is not a source of phosphorus and no impacts to phosphorus levels at WP1-93 are anticipated to occur as a result of ongoing below water table extraction at the Site. Wetland soil water sampling at WP1-93 should be removed from the monitoring program; however, monthly water elevation monitoring should continue at WP1-93.

5. Conclusions and Recommendations

Based on the results of the 2023 annual monitoring program, the following conclusions are provided:

- The total annual precipitation in 2023 (865 mm) was slightly below the climate normal of 916 mm.
- Groundwater levels in the on-Site monitoring wells are influenced by seasonal fluctuations in precipitation and longer-term precipitation trends as well as a general flattening of the water table in the vicinity of the below water table extraction area pond.
- Water levels at all surface water locations are dependant on precipitation and in 2023 have begun to recover following significantly below average precipitation between 2020-2022.

- The groundwater quality results indicate that the measured parameter concentrations generally occur within the historical range of concentrations and met available health-based ODWQS.
- Water quality in the area has not been impacted by below water table extraction of aggregate.

Based on the results of the 2023 annual monitoring program the following are recommended:

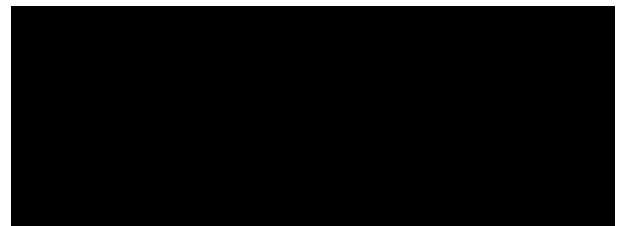
- PHC F1 to F4 analysis at OW1B-90, OW2-90, and OW3R-05 should continue into 2024 to stay in line with current Ontario analytical methods for analyzing hydrocarbons in groundwater.
- Wetland soil water sampling at WP1-93 should be removed from the monitoring program; however, monthly water elevation monitoring should continue at WP1-93.
- Water level monitoring at Pond 1 should be removed from the monitoring program as recommended in previous AMRs since this location is separated from Aberfoyle Pit #2 by the lake at the former Tikal Pit north of the Site.
- The remainder of the 2023 hydraulic and water quality monitoring program be continued in 2024.

All of which is respectfully submitted,

GHD Limited

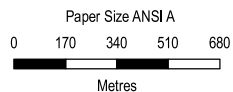
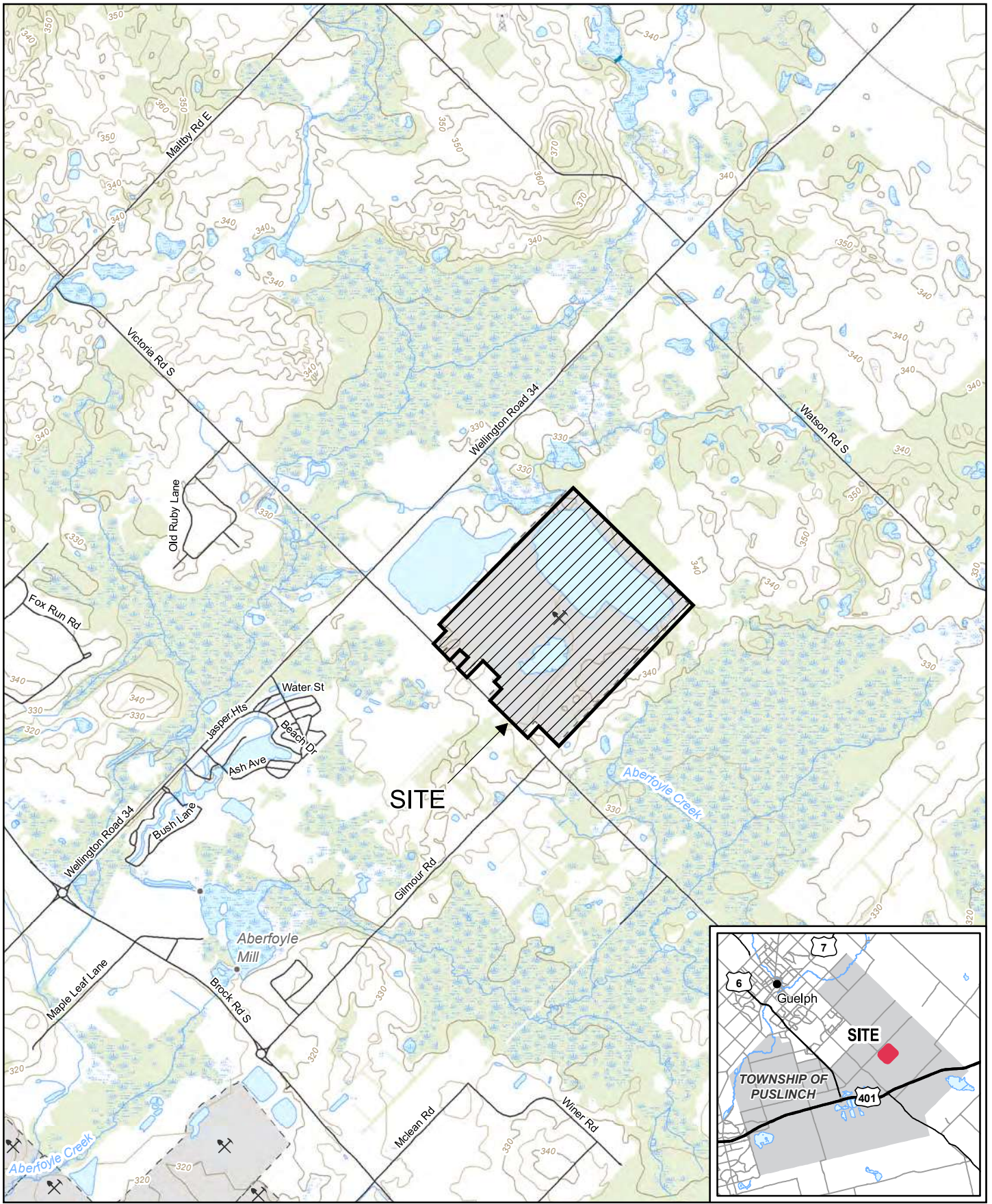


Richard Chatfield, P. Eng.
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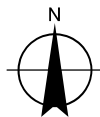


Dan Puddephatt, P. Geo (Limited)
Dan.Puddephatt@ghd.com

Figures



Map Projection: Transverse Mercator
 Horizontal Datum: North American 1983
 Grid: NAD 1983 UTM Zone 17N

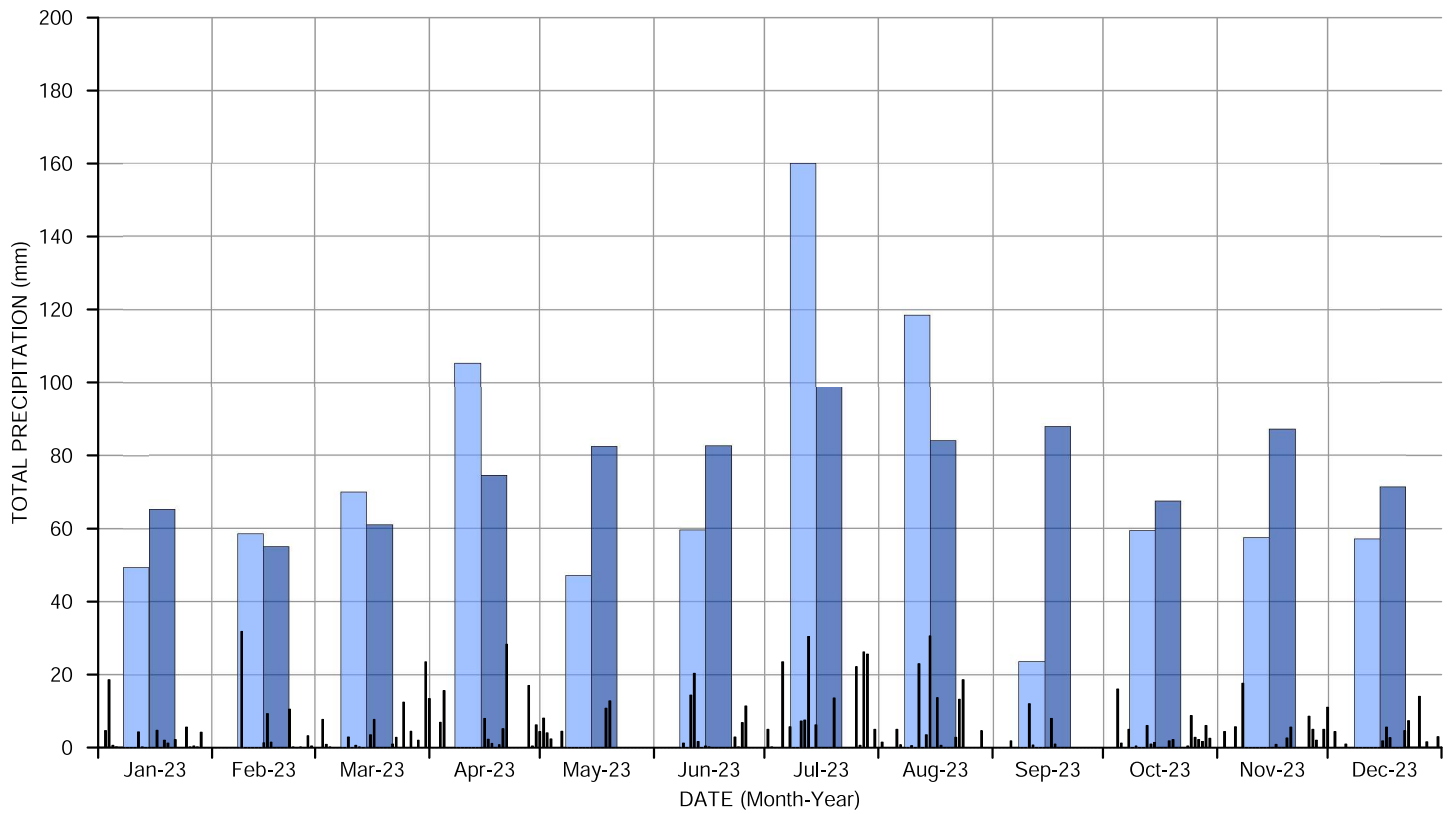


**DUFFERIN AGGREGATES
 ABERFOYLE PIT NO. 2
 TOWNSHIP OF PUSLINCH, ONTARIO
 2023 ANNUAL MONITORING REPORT**

Project No. 12575802
 Revision No. -
 Date Jan 31, 2024

SITE LOCATION MAP

FIGURE 1.1



NOTE:
 (1) Kitchener/Waterloo data obtained for Environment Canada Station #6144239.
 (2) Climate Normals obtained from Waterloo Wellington A (Environment Canada Station #6149387).

LEGEND

- Monthly Precipitation
- Daily Precipitation
- Climate Normals (1981-2010, Region of Waterloo Airport)

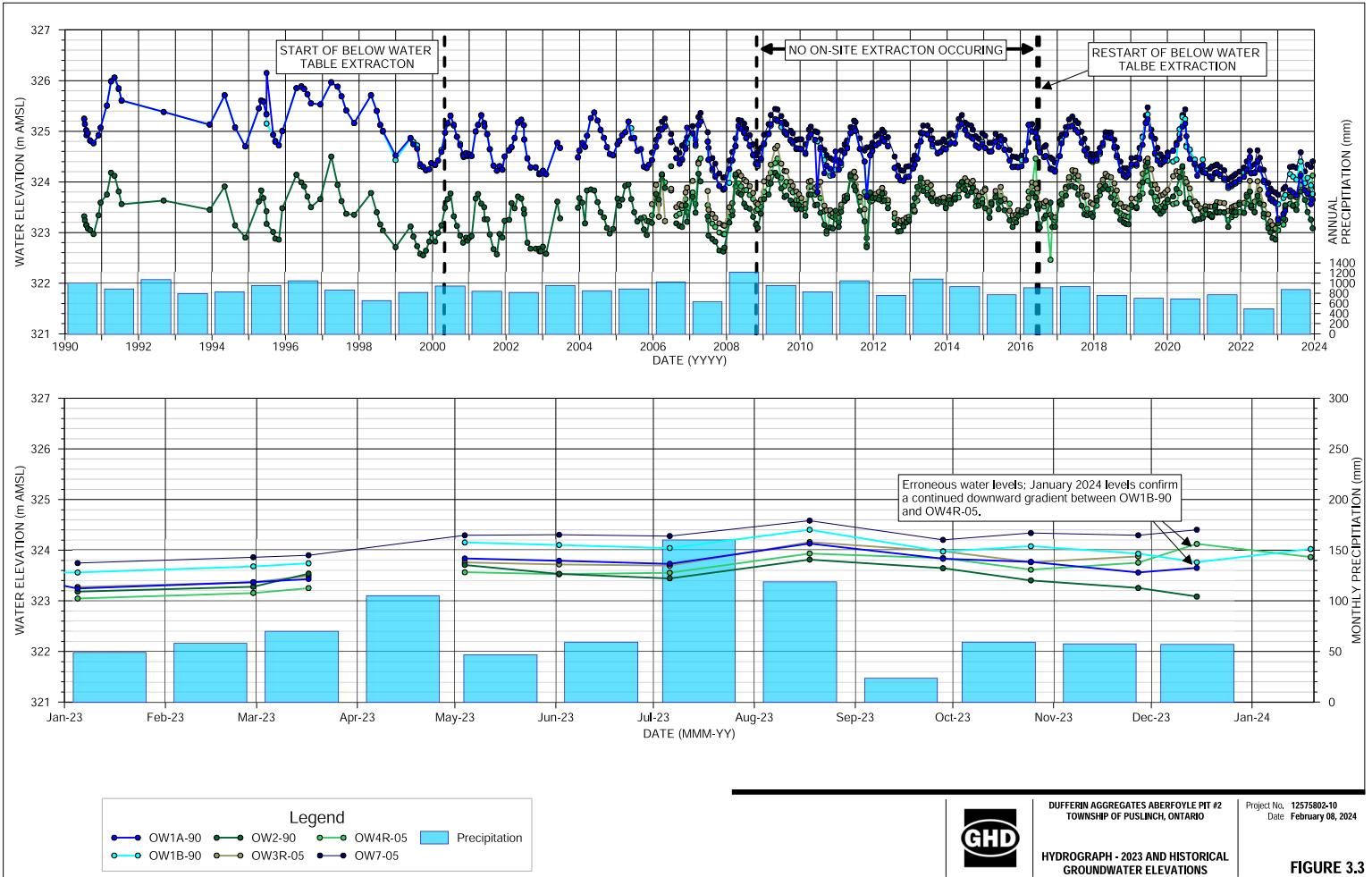


**DUFFERIN AGGREGATES - ABERFOYLE PIT #2
 TOWNSHIP OF PUSLINCH, ONTARIO**

Project No. 12575802-20
 Date January 29, 2024

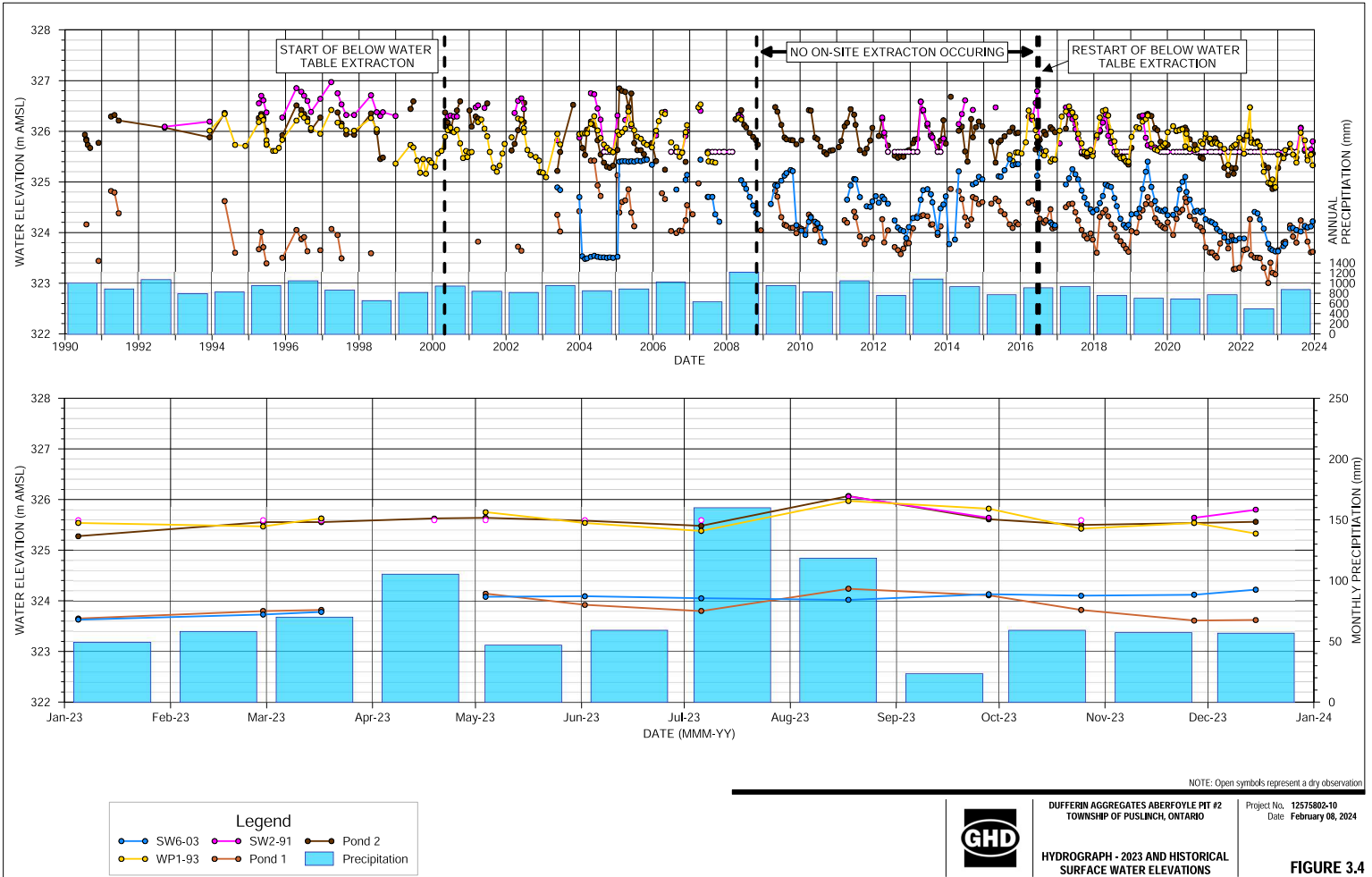
2023 PRECIPITATION SUMMARY

FIGURE 3.2

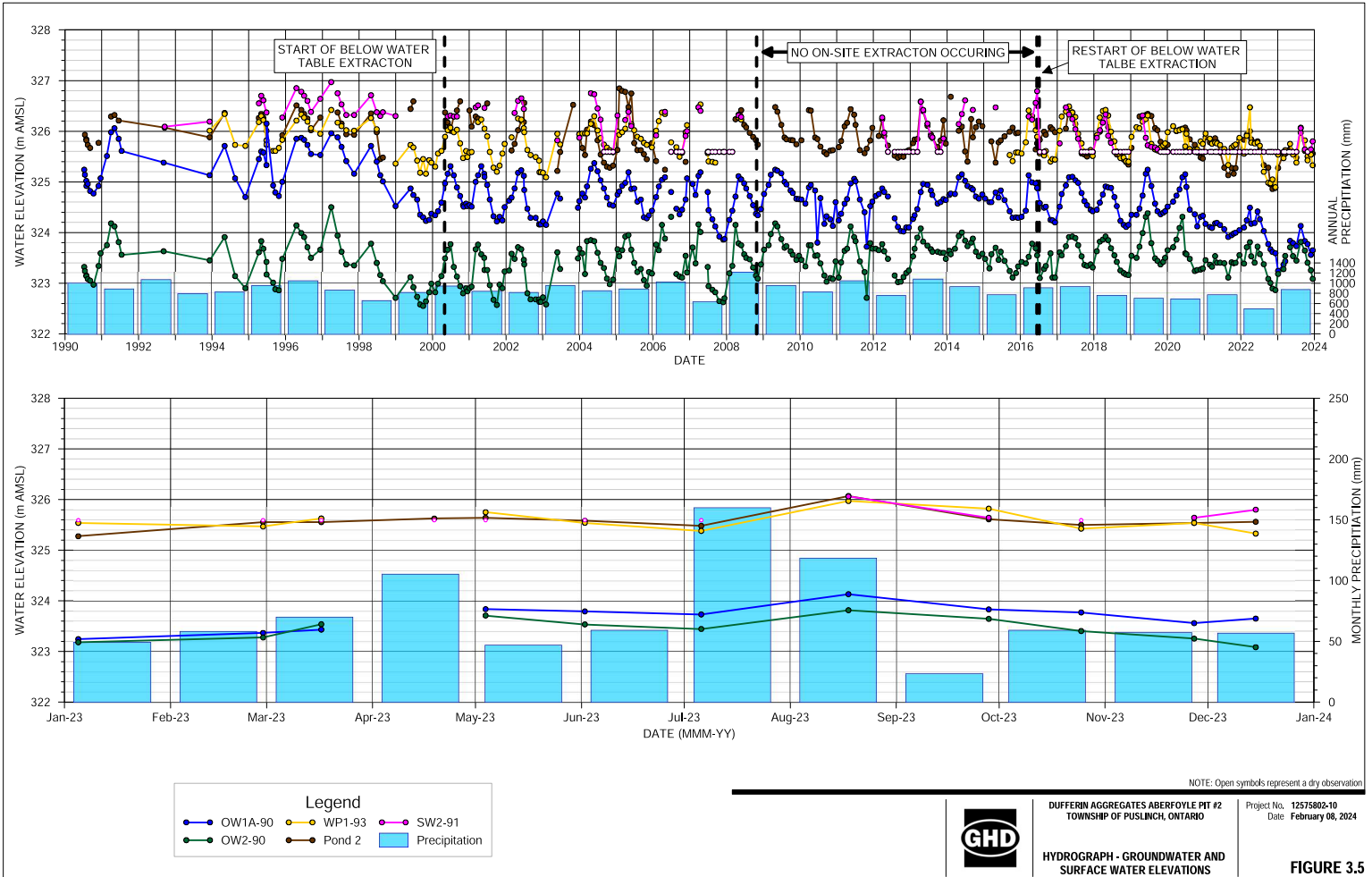


HEG:\ib: highdel\ghd\CA\Waterko\Projects\12575802\Workshare\Grapher\AMR\2023\Figure 3.3-Groundwater Hydrograph.gpf

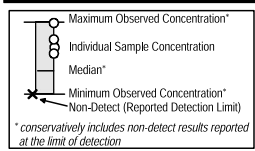
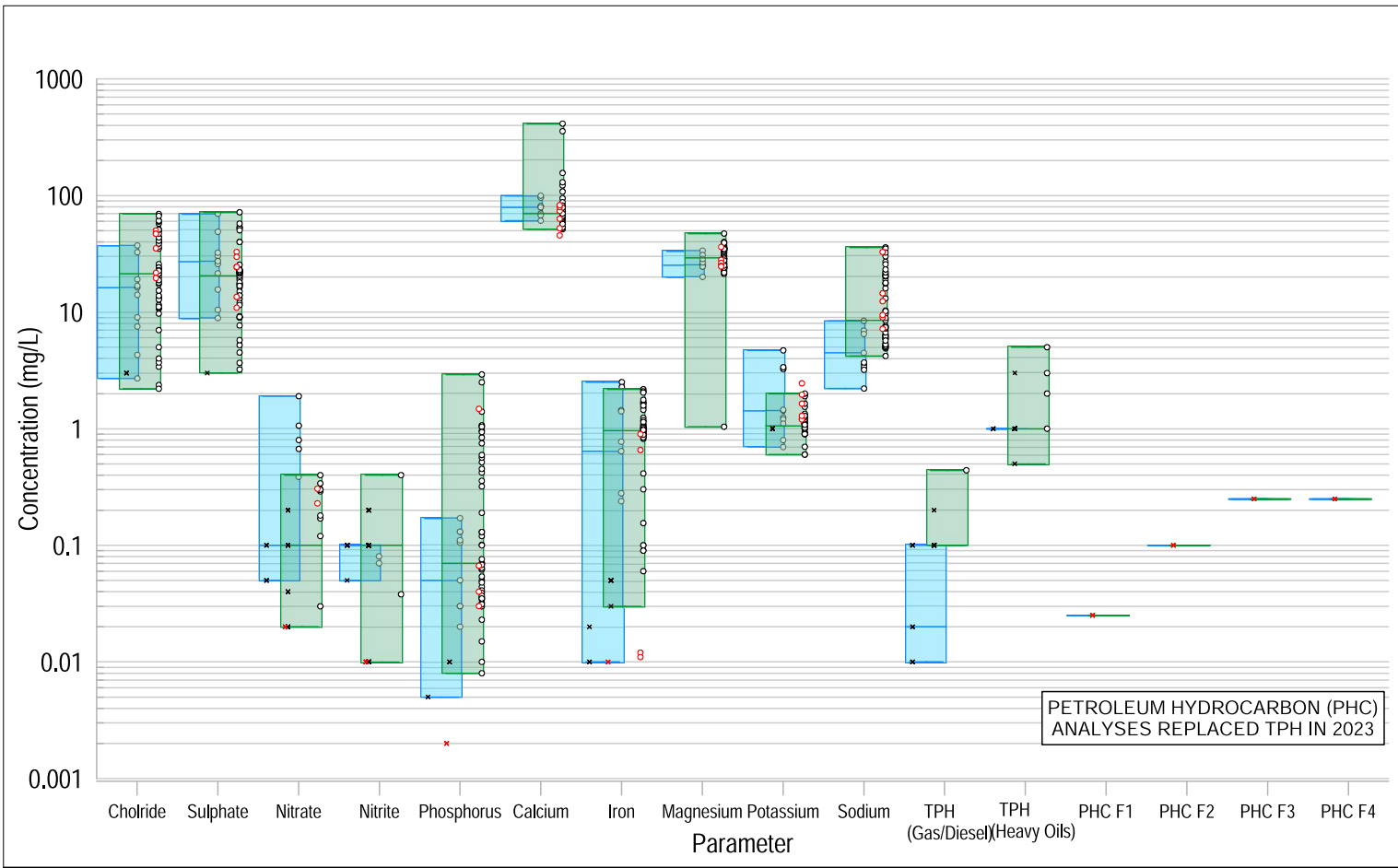
FIGURE 3.3



HEG:\ib: hghd\gtd\CA\Water\Projects\12575802\Workshare\Grapher\AMR\2023\Figure 3.4-Surface Water Hydrograph.gif



HEG file: h:\ghd\gtd\CA\Water\Projects\162\12575802\Workshare\Grapher\AMR\2023\Figure 3.5-SW GW Hydrograph.gpj



■ Background - OW1A-90, OW1B-90, and OW2-90 (1990 to 1999)
■ Upgradient - OW1A-90 and OW1B-90 (2000 to 2022)
○ 2023 Result
× 2023 Non-Detect Result



**DUFFERIN AGGREGATES ABERFOYLE PIT #2
TOWNSHIP OF PUSLINCH, ONTARIO**

Project No. 12575802
Date February 21, 2024

**HISTORICAL WATER QUALITY
RESULTS SUMMARY**

FIGURE 4.1

Tables

Table 3.1

**Monitoring Network Details
Dufferin Aggregates Aberfoyle Pit No. 2
Township of Puslinch, Ontario**

Monitoring Location No.	Ground Surface Elevation ⁽³⁾ (m)	Reference Elevation (m)	Reference Elevation Survey Date	Total Depth Drilled (m)	Screened Interval		Screened Material
					Depth (m bgs)	Elevation (m)	
Monitoring Wells							
OW1A-90	329.89	330.71	10/5/2017	20.42	18.3 - 19.8	311.60 - 310.08	Sand and Gravel
OW1B-90	329.92	330.843	10/5/2017	11.28	9.14 - 10.7	320.78 - 319.25	Sand
OW2-90	325.83	326.874	10/5/2017	9.75	5.18 - 6.71	320.65 - 319.12	Sand and Gravel
OW3R-05 ⁽¹⁾	324.27	325.299	10/5/2017	13.4	3.4 - 6.6	320.87 - 317.67	Sand and Gravel
OW4R-05 ⁽¹⁾	339.51	340.274	10/5/2017	26.8	20 - 23.4	319.51 - 316.11	Sand and Gravel
OW7-05 ⁽¹⁾	333.41	334.324	10/5/2017	23.8	11.2 - 14.3	322.21 - 319.11	Gravelly Sand
Surface Water							
SW2-91	325.55	325.59 ⁽²⁾	10/5/2017	--	--	--	Surface Water
SW6-03	--	324.18 ⁽²⁾	4/29/2022	--	--	--	Surface Water
Pond 1	--	323.60 ⁽²⁾	10/5/2017	--	--	--	Surface Water
Pond 2	--	324.50 ⁽²⁾	4/19/2023	--	--	--	Surface Water
Pezometers							
WP1-93	--	327.05	10/5/2017	--	0.76 - 1.52	--	Shallow Sand

Notes:

- (1) Installed by Jagger Hims Limited. Screened intervals based on estimate from borehole logs.
(2) Zero mark on staff gauge plate
(3) Historical ground surface elevation; survey dates vary.

Table 3.2

**2023 Water Elevation Data
Dufferin Aggregates Aberfoyle Pit No. 2
Township of Puslinch, Ontario**

Location: Date	OW1A-90	OW1B-90	OW2-90	OW3R-05	OW4R-05	OW7-05	SW2-91	SW6-03	Pond 1	Pond 2	WP1-93
01/05/2023	323.24	323.56	323.18	323.27	323.05	323.75	DRY	323.63	323.65	325.28	325.54
02/28/2023	323.37	323.68	323.28	323.37	323.16	323.86	DRY	323.73	323.80	325.56	325.47
03/17/2023	323.43	323.74	323.54	323.49	323.25	323.90	DRY	323.78	323.82	325.56	325.63
04/19/2023	NM	NM	NM	NM	NM	NM	DRY	NM	NM	325.63	NM
05/04/2023	323.84	324.15	323.71	323.76	323.56	324.29	DRY	324.08	324.14	325.64	325.75
06/02/2023	323.79	324.10	323.53	323.72	323.52	324.30	DRY	324.09	323.92	325.58	325.54
07/06/2023	323.73	324.04	323.44	323.69	323.55	324.28	DRY	324.05	323.80	325.48	325.38
08/18/2023	324.13	324.40	323.81	324.16	323.93	324.58	326.06	324.02	324.24	326.07	325.97
09/28/2023	323.83	323.97	323.64	323.98	323.84	324.20	325.64	324.13	324.11	325.61	325.82
10/25/2023	323.77	324.08	323.40	323.76	323.61	324.34	DRY	324.10	323.82	325.50	325.43
11/27/2023	323.56	323.93	323.25	323.88	323.75	324.29	325.64	324.12	323.61	325.54	325.54
12/15/2023	323.65	323.76	323.08	INACCESSIBLE	324.12	324.40	325.80	324.22	323.62	325.56	325.33

Notes:

All elevations shown are in meters above mean sea level (m AMSL)
 NM - No measurement recorded on indicated date

Table 4.1
2023 Water Quality Results
Dufferin Aggregates Aberfoyle Pit No. 2
Township of Puslinch, Ontario

Sample Location:	OW1A-90	OW1B-90	OW2-90	OW2-90	OW3R-05	OW4R-05	WP1-93		
Sample ID:	GW-12575802-102523-EH-006	GW-12575802-102523-EH-005	GW-12575802-102523-EH-001	GW-12575802-102523-EH-002	GW-12575802-102523-EH-003	GW-12575802-102523-EH-004	SW-12575802-102523-EH-001		
Sample Date:	25-Oct-2023	25-Oct-2023	25-Oct-2023	25-Oct-2023	25-Oct-2023	25-Oct-2023	25-Oct-2023		
Parameters	Units	ODWQS		Duplicate					
field pH		6.5-8.5	7.24	7.17	6.72	6.72	7.45	7.59	7.62
field Conductivity	µS/cm	-	568	653	637	637	511	436	809
Chloride	mg/L	250	21.7	50	47.1	47	35.2	19.6	-
Nitrate (as N)	mg/L	10	<0.020	<0.020	<0.020	<0.020	0.306	0.229	-
Nitrite (as N)	mg/L	1	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-
Phosphorus, total	mg/L	-	0.0667	0.041	<0.0020	<0.0020	<0.0020	0.0301	1.48
Sulphate (as SO ₄)	mg/L	500	13.5	10.9	24.3	24.4	32.8	29.8	-
Calcium, dissolved	mg/L	-	63.2	73.8	79.7	82.7	52.4	45.5	-
Iron, dissolved	mg/L	0.3	0.657	0.9	0.012	0.011	<0.010	<0.010	-
Magnesium, dissolved	mg/L	-	36.2	25.2	28.1	26.4	24.9	24.6	-
Potassium, dissolved	mg/L	-	1.64	2.45	1.96	1.21	1.2	1.29	-
Sodium, dissolved	mg/L	200	12.4	32.8	14.5	7.19	8.99	9.45	-
F1 (C6-C10)	mg/L	-	-	<0.025	<0.025	<0.025	<0.025	-	-
F2 (C10-C16)	mg/L	-	-	<0.1	<0.1	<0.1	<0.1	-	-
F3 (C16-C34)	mg/L	-	-	<0.25	<0.25	<0.25	<0.25	-	-
F4 (C34-C50)	mg/L	-	-	<0.25	<0.25	<0.25	<0.25	-	-
Hydrocarbons, total (C6-C50)	mg/L	-	-	<0.37	<0.37	<0.37	<0.37	-	-

Notes:

- ODWQS Ontario Drinking Water Quality Standards, 2020, including June 2003, revised 2006 Aesthetic Objective and Operational Guidelines.
- Not analyzed.
- < Not detected at the associated reporting limit
- µS/cm MicroSiemens per centimetre
- µg/L Microgram per litre
- mg/L Milligram per litre
- 0.9** Concentration detected above the ODWQS

**Background and Upgradient Water Quality Statistics
Dufferin Aggregates Aberfoyle Pit No. 2
Township of Puslinch, Ontario**

Parameters	Units	Number of Samples ⁽¹⁾	Minimum	Maximum	Average ⁽²⁾
field pH	--	59	6.13	8.86	7.26
field Conductivity	µS/cm	59	200	1040	538
Chloride	mg/L	57	ND	69.4	24.0
Nitrate (as N)	mg/L	57	ND	1.9	0.12
Nitrite (as N)	mg/L	57	ND	0.4	0.01
Phosphorus, total	mg/L	57	ND	2.92	0.33
Sulphate (as SO ₄)	mg/L	57	ND	71.8	23.2
Calcium, dissolved	mg/L	57	51.3	413	85.0
Iron, dissolved	mg/L	57	0.00	2.51	0.89
Magnesium, dissolved	mg/L	57	1.04	47.2	29.2
Potassium, dissolved	mg/L	57	ND	4.7	1.1
Sodium, dissolved	mg/L	57	2.21	35.9	11.28
TPH (Gas/Diesel) (µg/L)	mg/L	31	ND	0.44	0.01
TPH (Heavy Oils)	mg/L	27	ND	2.4	0.21

Notes:

- (1) Background includes all samples from 1990 to 1999 and upgradient samples include all results from OW1A-90 and OW1B-90 (1990 to 2021).
- (2) Non-detect results reported as "0" for calculation of average concentrations and where duplicate results are present, the higher concentration was used for

ND Not detected
 µS/cm MicroSiemens per centimetre
 mg/L Milligram per litre

Appendices

Appendix A

2023 ALS Laboratory Water Quality Analyses



CERTIFICATE OF ANALYSIS

<p>Work Order : WT2334782</p> <p>Client : GHD Limited</p> <p>Contact : Kory Ozgun</p> <p>Address : 455 Phillip Street Waterloo ON Canada N2L 3X2</p> <p>Telephone : ----</p> <p>Project : 12575802-20Y23-01</p> <p>PO : 735-004153-1</p> <p>C-O-C number : ----</p> <p>Sampler : Ethan Haight</p> <p>Site : ----</p> <p>Quote number : 12575802-20Y22-01 -SSOW-735-004153-1</p> <p>No. of samples received : 6</p> <p>No. of samples analysed : 6</p>	<p>Page : 1 of 6</p> <p>Laboratory : ALS Environmental - Waterloo</p> <p>Account Manager : Rick Hawthorne</p> <p>Address : 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8</p> <p>Telephone : +1 519 886 6910</p> <p>Date Samples Received : 25-Oct-2023 17:50</p> <p>Date Analysis : 26-Oct-2023</p> <p>Commenced : 01-Nov-2023 13:04</p> <p>Issue Date : 01-Nov-2023 13:04</p>
--	--

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Greg Pokocky	Manager - Inorganics	Inorganics, Waterloo, Ontario
Greg Pokocky	Manager - Inorganics	Metals, Waterloo, Ontario
Jeremy Gingras	Supervisor - Semi-Volatile Instrumentation	Organics, Waterloo, Ontario
Jocelyn Kennedy	Department Manager - Semi-Volatile Organics	Organics, Waterloo, Ontario
Sarah Birch	VOC Section Supervisor	VOC, Waterloo, Ontario



General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances

LOR: Limit of Reporting (detection limit).

Measurement Uncertainty: The reported uncertainties in this report are expanded uncertainties calculated using a coverage factor of 2, which gives a level of confidence of approximately 95%.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

<i>Unit</i>	<i>Description</i>
-	no units
µg/L	micrograms per litre
mg/L	milligrams per litre

>: greater than.

<: less than.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.



Analytical Results

WT2334782-001

Sub-Matrix: Water

(Matrix: Water)

Client sample ID: GW-12575802-102523-EH-001

Client sampling date / time: 25-Oct-2023 10:35

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Anions and Nutrients								
Chloride	16887-00-6	47.1	0.50	mg/L	E235.CI/WT	27-Oct-2023	27-Oct-2023	1209905
Nitrate (as N)	14797-55-8	<0.020	0.020	mg/L	E235.NO3/WT	27-Oct-2023	27-Oct-2023	1209903
Nitrite (as N)	14797-65-0	<0.010	0.010	mg/L	E235.NO2/WT	27-Oct-2023	27-Oct-2023	1209904
Phosphorus, total	7723-14-0	<0.0020	0.0020	mg/L	E372-U/WT	27-Oct-2023	30-Oct-2023	1207775
Sulfate (as SO4)	14808-79-8	24.3	0.30	mg/L	E235.SO4/WT	27-Oct-2023	27-Oct-2023	1209907
Dissolved Metals								
Calcium, dissolved	7440-70-2	79.7	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Iron, dissolved	7439-89-6	0.012	0.010	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Magnesium, dissolved	7439-95-4	28.1	0.0050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Potassium, dissolved	7440-09-7	1.96	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Sodium, dissolved	7440-23-5	14.5	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Dissolved metals filtration location	---	Field	-	-	EP421/WT	-	26-Oct-2023	1206460
Hydrocarbons								
F1 (C6-C10)	---	<25	25	µg/L	E581.F1-L/WT	31-Oct-2023	31-Oct-2023	1214510
F2 (C10-C16)	---	<100	100	µg/L	E601.SG/WT	27-Oct-2023	30-Oct-2023	1210017
F3 (C16-C34)	---	<250	250	µg/L	E601.SG/WT	27-Oct-2023	30-Oct-2023	1210017
F4 (C34-C50)	---	<250	250	µg/L	E601.SG/WT	27-Oct-2023	30-Oct-2023	1210017
Hydrocarbons, total (C6-C50)	n/a	<370	370	µg/L	EC581SG/WT	-	30-Oct-2023	-
Chromatogram to baseline at nC50	n/a	YES	-	-	E601.SG/WT	27-Oct-2023	30-Oct-2023	1210017
Hydrocarbons Surrogates								
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	392-83-6	86.5	1.0	%	E601.SG/WT	27-Oct-2023	30-Oct-2023	1210017
Dichlorotoluene, 3,4-	95-75-0	92.6	1.0	%	E581.F1-L/WT	31-Oct-2023	31-Oct-2023	1214510

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

WT2334782-002

Sub-Matrix: Water

(Matrix: Water)

Client sample ID: GW-12575802-102523-EH-002

Client sampling date / time: 25-Oct-2023 10:35

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Anions and Nutrients								
Chloride	16887-00-6	47.0	0.50	mg/L	E235.CI/WT	27-Oct-2023	27-Oct-2023	1209905
Nitrate (as N)	14797-55-8	<0.020	0.020	mg/L	E235.NO3/WT	27-Oct-2023	27-Oct-2023	1209903
Nitrite (as N)	14797-65-0	<0.010	0.010	mg/L	E235.NO2/WT	27-Oct-2023	27-Oct-2023	1209904
Phosphorus, total	7723-14-0	<0.0020	0.0020	mg/L	E372-U/WT	27-Oct-2023	30-Oct-2023	1207775
Sulfate (as SO4)	14808-79-8	24.4	0.30	mg/L	E235.SO4/WT	27-Oct-2023	27-Oct-2023	1209907
Dissolved Metals								
Calcium, dissolved	7440-70-2	82.7	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Iron, dissolved	7439-89-6	0.011	0.010	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Magnesium, dissolved	7439-95-4	26.4	0.0050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Potassium, dissolved	7440-09-7	1.21	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Sodium, dissolved	7440-23-5	7.19	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Dissolved metals filtration location	---	Field	-	-	EP421/WT	-	26-Oct-2023	1206460



Analytical Results

WT2334782-002

Sub-Matrix: Water

(Matrix: Water)

Client sample ID: GW-12575802-102523-EH-002

Client sampling date / time: 25-Oct-2023 10:35

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Hydrocarbons								
F1 (C6-C10)	---	<25	25	µg/L	E581.F1-L/WT	31-Oct-2023	31-Oct-2023	1214510
F2 (C10-C16)	---	<100	100	µg/L	E601.SG/WT	27-Oct-2023	30-Oct-2023	1210017
F3 (C16-C34)	---	<250	250	µg/L	E601.SG/WT	27-Oct-2023	30-Oct-2023	1210017
F4 (C34-C50)	---	<250	250	µg/L	E601.SG/WT	27-Oct-2023	30-Oct-2023	1210017
Hydrocarbons, total (C6-C50)	n/a	<370	370	µg/L	EC581SG/WT	-	30-Oct-2023	-
Chromatogram to baseline at nC50	n/a	YES	-	-	E601.SG/WT	27-Oct-2023	30-Oct-2023	1210017
Hydrocarbons Surrogates								
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	392-83-6	80.5	1.0	%	E601.SG/WT	27-Oct-2023	30-Oct-2023	1210017
Dichlorotoluene, 3,4-	95-75-0	87.4	1.0	%	E581.F1-L/WT	31-Oct-2023	31-Oct-2023	1214510

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

WT2334782-003

Sub-Matrix: Water

(Matrix: Water)

Client sample ID: GW-12575802-102523-EH-003

Client sampling date / time: 25-Oct-2023 11:15

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Anions and Nutrients								
Chloride	16887-00-6	35.2	0.50	mg/L	E235.CI/WT	27-Oct-2023	27-Oct-2023	1209905
Nitrate (as N)	14797-55-8	0.306	0.020	mg/L	E235.NO3/WT	27-Oct-2023	27-Oct-2023	1209903
Nitrite (as N)	14797-65-0	<0.010	0.010	mg/L	E235.NO2/WT	27-Oct-2023	27-Oct-2023	1209904
Phosphorus, total	7723-14-0	<0.0020	0.0020	mg/L	E372-U/WT	27-Oct-2023	30-Oct-2023	1207775
Sulfate (as SO4)	14808-79-8	32.8	0.30	mg/L	E235.SO4/WT	27-Oct-2023	27-Oct-2023	1209907
Dissolved Metals								
Calcium, dissolved	7440-70-2	52.4	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Iron, dissolved	7439-89-6	<0.010	0.010	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Magnesium, dissolved	7439-95-4	24.9	0.0050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Potassium, dissolved	7440-09-7	1.20	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Sodium, dissolved	7440-23-5	8.99	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Dissolved metals filtration location	---	Field	-	-	EP421/WT	-	26-Oct-2023	1206460
Hydrocarbons								
F1 (C6-C10)	---	<25	25	µg/L	E581.F1-L/WT	31-Oct-2023	31-Oct-2023	1214510
F2 (C10-C16)	---	<100	100	µg/L	E601.SG/WT	27-Oct-2023	31-Oct-2023	1210017
F3 (C16-C34)	---	<250	250	µg/L	E601.SG/WT	27-Oct-2023	31-Oct-2023	1210017
F4 (C34-C50)	---	<250	250	µg/L	E601.SG/WT	27-Oct-2023	31-Oct-2023	1210017
Hydrocarbons, total (C6-C50)	n/a	<370	370	µg/L	EC581SG/WT	-	31-Oct-2023	-
Chromatogram to baseline at nC50	n/a	YES	-	-	E601.SG/WT	27-Oct-2023	31-Oct-2023	1210017
Hydrocarbons Surrogates								
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	392-83-6	83.0	1.0	%	E601.SG/WT	27-Oct-2023	31-Oct-2023	1210017
Dichlorotoluene, 3,4-	95-75-0	91.3	1.0	%	E581.F1-L/WT	31-Oct-2023	31-Oct-2023	1214510

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.



Analytical Results

WT2334782-004

Sub-Matrix: Water

(Matrix: Water)

Client sample ID: GW-12575802-102523-EH-004

Client sampling date / time: 25-Oct-2023 12:03

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Anions and Nutrients								
Chloride	16887-00-6	19.6	0.50	mg/L	E235.CI/WT	27-Oct-2023	27-Oct-2023	1209905
Nitrate (as N)	14797-55-8	0.229	0.020	mg/L	E235.NO3/WT	27-Oct-2023	27-Oct-2023	1209903
Nitrite (as N)	14797-65-0	<0.010	0.010	mg/L	E235.NO2/WT	27-Oct-2023	27-Oct-2023	1209904
Phosphorus, total	7723-14-0	0.0301	0.0020	mg/L	E372-U/WT	29-Oct-2023	30-Oct-2023	1211615
Sulfate (as SO4)	14808-79-8	29.8	0.30	mg/L	E235.SO4/WT	27-Oct-2023	27-Oct-2023	1209907
Dissolved Metals								
Calcium, dissolved	7440-70-2	45.5	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Iron, dissolved	7439-89-6	<0.010	0.010	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Magnesium, dissolved	7439-95-4	24.6	0.0050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Potassium, dissolved	7440-09-7	1.29	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Sodium, dissolved	7440-23-5	9.45	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Dissolved metals filtration location	---	Field	-	-	EP421/WT	-	26-Oct-2023	1206460

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

WT2334782-005

Sub-Matrix: Water

(Matrix: Water)

Client sample ID: GW-12575802-102523-EH-005

Client sampling date / time: 25-Oct-2023 14:10

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Anions and Nutrients								
Chloride	16887-00-6	50.0	0.50	mg/L	E235.CI/WT	27-Oct-2023	27-Oct-2023	1209905
Nitrate (as N)	14797-55-8	<0.020	0.020	mg/L	E235.NO3/WT	27-Oct-2023	27-Oct-2023	1209903
Nitrite (as N)	14797-65-0	<0.010	0.010	mg/L	E235.NO2/WT	27-Oct-2023	27-Oct-2023	1209904
Phosphorus, total	7723-14-0	0.0410	0.0020	mg/L	E372-U/WT	29-Oct-2023	30-Oct-2023	1211615
Sulfate (as SO4)	14808-79-8	10.9	0.30	mg/L	E235.SO4/WT	27-Oct-2023	27-Oct-2023	1209907
Dissolved Metals								
Calcium, dissolved	7440-70-2	73.8	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Iron, dissolved	7439-89-6	0.900	0.010	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Magnesium, dissolved	7439-95-4	25.2	0.0050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Potassium, dissolved	7440-09-7	2.45	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Sodium, dissolved	7440-23-5	32.8	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Dissolved metals filtration location	---	Field	-	-	EP421/WT	-	26-Oct-2023	1206460
Hydrocarbons								
F1 (C6-C10)	---	<25	25	µg/L	E581.F1-L/WT	31-Oct-2023	31-Oct-2023	1214510
F2 (C10-C16)	---	<100	100	µg/L	E601.SG/WT	27-Oct-2023	30-Oct-2023	1210017
F3 (C16-C34)	---	<250	250	µg/L	E601.SG/WT	27-Oct-2023	30-Oct-2023	1210017
F4 (C34-C50)	---	<250	250	µg/L	E601.SG/WT	27-Oct-2023	30-Oct-2023	1210017
Hydrocarbons, total (C6-C50)	n/a	<370	370	µg/L	EC581SG/WT	-	30-Oct-2023	-
Chromatogram to baseline at nC50	n/a	YES	-	-	E601.SG/WT	27-Oct-2023	30-Oct-2023	1210017
Hydrocarbons Surrogates								
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	392-83-6	80.0	1.0	%	E601.SG/WT	27-Oct-2023	30-Oct-2023	1210017
Dichlorotoluene, 3,4-	95-75-0	96.6	1.0	%	E581.F1-L/WT	31-Oct-2023	31-Oct-2023	1214510



Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Analytical Results

WT2334782-006

Sub-Matrix: **Water**

(Matrix: **Water**)

Client sample ID: GW-12575802-102523-EH-006

Client sampling date / time: 25-Oct-2023 14:50

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Anions and Nutrients								
Chloride	16887-00-6	21.7	0.50	mg/L	E235.CI/WT	27-Oct-2023	27-Oct-2023	1209905
Nitrate (as N)	14797-55-8	<0.020	0.020	mg/L	E235.NO3/WT	27-Oct-2023	27-Oct-2023	1209903
Nitrite (as N)	14797-65-0	<0.010	0.010	mg/L	E235.NO2/WT	27-Oct-2023	27-Oct-2023	1209904
Phosphorus, total	7723-14-0	0.0667	0.0020	mg/L	E372-U/WT	29-Oct-2023	30-Oct-2023	1211615
Sulfate (as SO4)	14808-79-8	13.5	0.30	mg/L	E235.SO4/WT	27-Oct-2023	27-Oct-2023	1209907
Dissolved Metals								
Calcium, dissolved	7440-70-2	63.2	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Iron, dissolved	7439-89-6	0.657	0.010	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Magnesium, dissolved	7439-95-4	36.2	0.0050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Potassium, dissolved	7440-09-7	1.64	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Sodium, dissolved	7440-23-5	12.4	0.050	mg/L	E421/WT	26-Oct-2023	26-Oct-2023	1206460
Dissolved metals filtration location	---	Field	-	-	EP421/WT	-	26-Oct-2023	1206460

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

QUALITY CONTROL INTERPRETIVE REPORT

<p>Work Order : WT2334782</p> <p>Client : GHD Limited</p> <p>Contact : Kory Ozgun</p> <p>Address : 455 Phillip Street Waterloo ON Canada N2L 3X2</p> <p>Telephone : ---</p> <p>Project : 12575802-20Y23-01</p> <p>PO : 735-004153-1</p> <p>C-O-C number : ---</p> <p>Sampler : Ethan Haight</p> <p>Site : ---</p> <p>Quote number : 12575802-20Y22-01 -SSOW-735-004153-1</p> <p>No. of samples received : 6</p> <p>No. of samples analysed : 6</p>	<p>Page : 1 of 11</p> <p>Laboratory : ALS Environmental - Waterloo</p> <p>Account Manager : Rick Hawthorne</p> <p>Address : 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8</p> <p>Telephone : +1 519 886 6910</p> <p>Date Samples Received : 25-Oct-2023 17:50</p> <p>Issue Date : 01-Nov-2023 13:05</p>
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This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

- Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
- CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
- DQO: Data Quality Objective.
- LOR: Limit of Reporting (detection limit).
- RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.



Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times Rec Actual		Eval	Analysis Date	Holding Times Rec Actual		Eval	
Anions and Nutrients : Chloride in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-001	E235.Cl	25-Oct-2023	27-Oct-2023	28 days	2 days	✔	27-Oct-2023	28 days	2 days	✔	
Anions and Nutrients : Chloride in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-002	E235.Cl	25-Oct-2023	27-Oct-2023	28 days	2 days	✔	27-Oct-2023	28 days	2 days	✔	
Anions and Nutrients : Chloride in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-003	E235.Cl	25-Oct-2023	27-Oct-2023	28 days	2 days	✔	27-Oct-2023	28 days	2 days	✔	
Anions and Nutrients : Chloride in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-004	E235.Cl	25-Oct-2023	27-Oct-2023	28 days	2 days	✔	27-Oct-2023	28 days	2 days	✔	
Anions and Nutrients : Chloride in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-005	E235.Cl	25-Oct-2023	27-Oct-2023	28 days	2 days	✔	27-Oct-2023	28 days	2 days	✔	
Anions and Nutrients : Chloride in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-006	E235.Cl	25-Oct-2023	27-Oct-2023	28 days	2 days	✔	27-Oct-2023	28 days	2 days	✔	
Anions and Nutrients : Nitrate in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-001	E235.NO3	25-Oct-2023	27-Oct-2023	7 days	2 days	✔	27-Oct-2023	7 days	2 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times Rec Actual		Eval	Analysis Date	Holding Times Rec Actual		Eval	
Anions and Nutrients : Nitrate in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-002	E235.NO3	25-Oct-2023	27-Oct-2023	7 days	2 days	✔	27-Oct-2023	7 days	2 days	✔	
Anions and Nutrients : Nitrate in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-003	E235.NO3	25-Oct-2023	27-Oct-2023	7 days	2 days	✔	27-Oct-2023	7 days	2 days	✔	
Anions and Nutrients : Nitrate in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-004	E235.NO3	25-Oct-2023	27-Oct-2023	7 days	2 days	✔	27-Oct-2023	7 days	2 days	✔	
Anions and Nutrients : Nitrate in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-005	E235.NO3	25-Oct-2023	27-Oct-2023	7 days	2 days	✔	27-Oct-2023	7 days	2 days	✔	
Anions and Nutrients : Nitrate in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-006	E235.NO3	25-Oct-2023	27-Oct-2023	7 days	2 days	✔	27-Oct-2023	7 days	2 days	✔	
Anions and Nutrients : Nitrite in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-001	E235.NO2	25-Oct-2023	27-Oct-2023	7 days	2 days	✔	27-Oct-2023	7 days	2 days	✔	
Anions and Nutrients : Nitrite in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-002	E235.NO2	25-Oct-2023	27-Oct-2023	7 days	2 days	✔	27-Oct-2023	7 days	2 days	✔	
Anions and Nutrients : Nitrite in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-003	E235.NO2	25-Oct-2023	27-Oct-2023	7 days	2 days	✔	27-Oct-2023	7 days	2 days	✔	
Anions and Nutrients : Nitrite in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-004	E235.NO2	25-Oct-2023	27-Oct-2023	7 days	2 days	✔	27-Oct-2023	7 days	2 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times Rec Actual		Eval	Analysis Date	Holding Times Rec Actual		Eval	
Anions and Nutrients : Nitrite in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-005	E235.NO2	25-Oct-2023	27-Oct-2023	7 days	2 days	✔	27-Oct-2023	7 days	2 days	✔	
Anions and Nutrients : Nitrite in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-006	E235.NO2	25-Oct-2023	27-Oct-2023	7 days	2 days	✔	27-Oct-2023	7 days	2 days	✔	
Anions and Nutrients : Sulfate in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-001	E235.SO4	25-Oct-2023	27-Oct-2023	28 days	2 days	✔	27-Oct-2023	28 days	2 days	✔	
Anions and Nutrients : Sulfate in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-002	E235.SO4	25-Oct-2023	27-Oct-2023	28 days	2 days	✔	27-Oct-2023	28 days	2 days	✔	
Anions and Nutrients : Sulfate in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-003	E235.SO4	25-Oct-2023	27-Oct-2023	28 days	2 days	✔	27-Oct-2023	28 days	2 days	✔	
Anions and Nutrients : Sulfate in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-004	E235.SO4	25-Oct-2023	27-Oct-2023	28 days	2 days	✔	27-Oct-2023	28 days	2 days	✔	
Anions and Nutrients : Sulfate in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-005	E235.SO4	25-Oct-2023	27-Oct-2023	28 days	2 days	✔	27-Oct-2023	28 days	2 days	✔	
Anions and Nutrients : Sulfate in Water by IC											
HDPE [ON MECP] GW-12575802-102523-EH-006	E235.SO4	25-Oct-2023	27-Oct-2023	28 days	2 days	✔	27-Oct-2023	28 days	2 days	✔	
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)											
Amber glass total (sulfuric acid) [ON MECP] GW-12575802-102523-EH-001	E372-U	25-Oct-2023	27-Oct-2023	28 days	2 days	✔	30-Oct-2023	28 days	5 days	✔	

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 Work Order : WT2334782
 Client : GHD Limited
 Project : 12575802-20Y23-01



Matrix: Water											Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time		
Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis						
			Preparation Date	Holding Times Rec Actual		Eval	Analysis Date	Holding Times Rec Actual		Eval			
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)													
Amber glass total (sulfuric acid) [ON MECP] GW-12575802-102523-EH-002	E372-U	25-Oct-2023	27-Oct-2023	28 days	2 days	✔	30-Oct-2023	28 days	5 days	✔			
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)													
Amber glass total (sulfuric acid) [ON MECP] GW-12575802-102523-EH-003	E372-U	25-Oct-2023	27-Oct-2023	28 days	2 days	✔	30-Oct-2023	28 days	5 days	✔			
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)													
Amber glass total (sulfuric acid) [ON MECP] GW-12575802-102523-EH-004	E372-U	25-Oct-2023	29-Oct-2023	28 days	4 days	✔	30-Oct-2023	28 days	5 days	✔			
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)													
Amber glass total (sulfuric acid) [ON MECP] GW-12575802-102523-EH-005	E372-U	25-Oct-2023	29-Oct-2023	28 days	4 days	✔	30-Oct-2023	28 days	5 days	✔			
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)													
Amber glass total (sulfuric acid) [ON MECP] GW-12575802-102523-EH-006	E372-U	25-Oct-2023	29-Oct-2023	28 days	4 days	✔	30-Oct-2023	28 days	5 days	✔			
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS													
HDPE dissolved (nitric acid) GW-12575802-102523-EH-001	E421	25-Oct-2023	26-Oct-2023	180 days	1 days	✔	26-Oct-2023	180 days	1 days	✔			
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS													
HDPE dissolved (nitric acid) GW-12575802-102523-EH-002	E421	25-Oct-2023	26-Oct-2023	180 days	1 days	✔	26-Oct-2023	180 days	1 days	✔			
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS													
HDPE dissolved (nitric acid) GW-12575802-102523-EH-003	E421	25-Oct-2023	26-Oct-2023	180 days	1 days	✔	26-Oct-2023	180 days	1 days	✔			
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS													
HDPE dissolved (nitric acid) GW-12575802-102523-EH-004	E421	25-Oct-2023	26-Oct-2023	180 days	1 days	✔	26-Oct-2023	180 days	1 days	✔			



Matrix: Water											
Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time											
Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times Rec Actual		Eval	Analysis Date	Holding Times Rec Actual		Eval	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) GW-12575802-102523-EH-005	E421	25-Oct-2023	26-Oct-2023	180 days	1 days	✔	26-Oct-2023	180 days	1 days	✔	✔
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) GW-12575802-102523-EH-006	E421	25-Oct-2023	26-Oct-2023	180 days	1 days	✔	26-Oct-2023	180 days	1 days	✔	✔
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID (Low Level)											
Glass vial (sodium bisulfate) GW-12575802-102523-EH-001	E581.F1-L	25-Oct-2023	31-Oct-2023	14 days	6 days	✔	31-Oct-2023	14 days	6 days	✔	✔
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID (Low Level)											
Glass vial (sodium bisulfate) GW-12575802-102523-EH-002	E581.F1-L	25-Oct-2023	31-Oct-2023	14 days	6 days	✔	31-Oct-2023	14 days	6 days	✔	✔
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID (Low Level)											
Glass vial (sodium bisulfate) GW-12575802-102523-EH-003	E581.F1-L	25-Oct-2023	31-Oct-2023	14 days	6 days	✔	31-Oct-2023	14 days	6 days	✔	✔
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID (Low Level)											
Glass vial (sodium bisulfate) GW-12575802-102523-EH-005	E581.F1-L	25-Oct-2023	31-Oct-2023	14 days	6 days	✔	31-Oct-2023	14 days	6 days	✔	✔
Hydrocarbons : Silica Gel Treated CCME PHCs - F2-F4sg by GC-FID											
Amber glass/Teflon lined cap (sodium bisulfate) [ON MECP] GW-12575802-102523-EH-001	E601.SG	25-Oct-2023	27-Oct-2023	40 days	2 days	✔	30-Oct-2023	40 days	3 days	✔	✔
Hydrocarbons : Silica Gel Treated CCME PHCs - F2-F4sg by GC-FID											
Amber glass/Teflon lined cap (sodium bisulfate) [ON MECP] GW-12575802-102523-EH-002	E601.SG	25-Oct-2023	27-Oct-2023	40 days	2 days	✔	30-Oct-2023	40 days	3 days	✔	✔
Hydrocarbons : Silica Gel Treated CCME PHCs - F2-F4sg by GC-FID											
Amber glass/Teflon lined cap (sodium bisulfate) [ON MECP] GW-12575802-102523-EH-003	E601.SG	25-Oct-2023	27-Oct-2023	40 days	2 days	✔	30-Oct-2023	40 days	3 days	✔	✔

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 Work Order : WT2334782
 Client : GHD Limited
 Project : 12575802-20Y23-01



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec Actual		Eval	Analysis Date	Holding Times Rec Actual		Eval
Hydrocarbons : Silica Gel Treated CCME PHCs - F2-F4sg by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) [ON MECP] GW-12575802-102523-EH-005	E601.SG	25-Oct-2023	27-Oct-2023	40 days	2 days	✔	30-Oct-2023	40 days	3 days	✔

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).



Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: * = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation	
			QC	Regular	Actual	Expected		
Laboratory Duplicates (DUP)								
CCME PHC - F1 by Headspace GC-FID (Low Level)	E581.F1-L	1214510	1	6	16.6	5.0	✓	
Chloride in Water by IC	E235.Cl	1209905	1	13	7.6	5.0	✓	
Dissolved Metals in Water by CRC ICPMS	E421	1206460	1	20	5.0	5.0	✓	
Nitrate in Water by IC	E235.NO3	1209903	1	11	9.0	5.0	✓	
Nitrite in Water by IC	E235.NO2	1209904	1	11	9.0	5.0	✓	
Sulfate in Water by IC	E235.SO4	1209907	1	11	9.0	5.0	✓	
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1211615	2	40	5.0	5.0	✓	
Laboratory Control Samples (LCS)								
CCME PHC - F1 by Headspace GC-FID (Low Level)	E581.F1-L	1214510	1	6	16.6	5.0	✓	
Chloride in Water by IC	E235.Cl	1209905	1	13	7.6	5.0	✓	
Dissolved Metals in Water by CRC ICPMS	E421	1206460	1	20	5.0	5.0	✓	
Nitrate in Water by IC	E235.NO3	1209903	1	11	9.0	5.0	✓	
Nitrite in Water by IC	E235.NO2	1209904	1	11	9.0	5.0	✓	
Silica Gel Treated CCME PHCs - F2-F4sg by GC-FID	E601.SG	1214246	2	18	11.1	5.0	✓	
Sulfate in Water by IC	E235.SO4	1209907	1	11	9.0	5.0	✓	
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1211615	2	40	5.0	5.0	✓	
Method Blanks (MB)								
CCME PHC - F1 by Headspace GC-FID (Low Level)	E581.F1-L	1214510	1	6	16.6	5.0	✓	
Chloride in Water by IC	E235.Cl	1209905	1	13	7.6	5.0	✓	
Dissolved Metals in Water by CRC ICPMS	E421	1206460	1	20	5.0	5.0	✓	
Nitrate in Water by IC	E235.NO3	1209903	1	11	9.0	5.0	✓	
Nitrite in Water by IC	E235.NO2	1209904	1	11	9.0	5.0	✓	
Silica Gel Treated CCME PHCs - F2-F4sg by GC-FID	E601.SG	1214246	2	18	11.1	5.0	✓	
Sulfate in Water by IC	E235.SO4	1209907	1	11	9.0	5.0	✓	
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1211615	2	40	5.0	5.0	✓	
Matrix Spikes (MS)								
CCME PHC - F1 by Headspace GC-FID (Low Level)	E581.F1-L	1214510	1	6	16.6	5.0	✓	
Chloride in Water by IC	E235.Cl	1209905	1	13	7.6	5.0	✓	
Dissolved Metals in Water by CRC ICPMS	E421	1206460	1	20	5.0	5.0	✓	
Nitrate in Water by IC	E235.NO3	1209903	1	11	9.0	5.0	✓	
Nitrite in Water by IC	E235.NO2	1209904	1	11	9.0	5.0	✓	
Sulfate in Water by IC	E235.SO4	1209907	1	11	9.0	5.0	✓	
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1211615	2	40	5.0	5.0	✓	



Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Chloride in Water by IC	E235.Cl ALS Environmental - Waterloo	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC	E235.NO2 ALS Environmental - Waterloo	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC	E235.NO3 ALS Environmental - Waterloo	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 ALS Environmental - Waterloo	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U ALS Environmental - Waterloo	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Metals in Water by CRC ICPMS	E421 ALS Environmental - Waterloo	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
CCME PHC - F1 by Headspace GC-FID (Low Level)	E581.F1-L ALS Environmental - Waterloo	Water	CCME PHC in Soil - Tier 1 (mod)	CCME Fraction 1 (F1) is analyzed by static headspace GC-FID. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law. Analytical methods for CCME Petroleum Hydrocarbons (PHCs) are validated to comply fully with the Reference Method for the Canada-Wide Standard for PHC. Unless qualified, all required quality control criteria of the CCME PHC method have been met, including response factor and linearity requirements.
Silica Gel Treated CCME PHCs - F2-F4sg by GC-FID	E601.SG ALS Environmental - Waterloo	Water	CCME PHC in Soil - Tier 1 (mod)	Sample extracts are subjected to in-situ silica gel treatment prior to analysis by GC-FID for CCME hydrocarbon fractions (F2-F4). Analytical methods for CCME Petroleum Hydrocarbons (PHCs) are validated to comply fully with the Reference Method for the Canada-Wide Standard for PHC. Unless qualified, all required quality control criteria of the CCME PHC method have been met, including response factor and linearity requirements.

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 Client : GHD Limited
 Project : 12575802-20Y23-01



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
SUM F1 to F4 where F2-F4 is SG treated	EC581SG ALS Environmental - Waterloo	Water	CCME PHC in Soil - Tier 1	Hydrocarbons, total (C6-C50) is the sum of CCME Fraction F1(C6-C10), F2(C10-C16), F3(C16-C34), and F4(C34-C50), where F2-F4 have been treated with silica gel. F4G-sg is not used within this calculation due to overlap with other fractions.
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for Total Phosphorus in water	EP372 ALS Environmental - Waterloo	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 ALS Environmental - Waterloo	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
VOCs Preparation for Headspace Analysis	EP581 ALS Environmental - Waterloo	Water	EPA 5021A (mod)	Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler. An aliquot of the headspace is then injected into the GC/MS-FID system.
PHCs and PAHs Hexane Extraction	EP601 ALS Environmental - Waterloo	Water	EPA 3511 (mod)	Petroleum Hydrocarbons (PHCs) and Polycyclic Aromatic Hydrocarbons (PAHs) are extracted using a hexane liquid-liquid extraction.



QUALITY CONTROL REPORT

Work Order	: WT2334782	Page	: 1 of 6
Client	: GHD Limited	Laboratory	: ALS Environmental - Waterloo
Contact	: Kory Ozgun	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: +1 519 886 6910
Project	: 12575802-20Y23-01	Date Samples Received	: 25-Oct-2023 17:50
PO	: 735-004153-1	Date Analysis Commenced	: 26-Oct-2023
C-O-C number	: ---	Issue Date	: 01-Nov-2023 13:05
Sampler	: Ethan Haight___		
Site	: ---		
Quote number	: 12575802-20Y22-01 -SSOW-735-004153-1		
No. of samples received	: 6		
No. of samples analysed	: 6		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Greg Pokocky	Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario
Greg Pokocky	Manager - Inorganics	Waterloo Metals, Waterloo, Ontario
Jeremy Gingras	Supervisor - Semi-Volatile Instrumentation	Waterloo Organics, Waterloo, Ontario
Jocelyn Kennedy	Department Manager - Semi-Volatile Organics	Waterloo Organics, Waterloo, Ontario
Sarah Birch	VOC Section Supervisor	Waterloo VOC, Waterloo, Ontario

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Client : GHD Limited
Project : 12575802-20Y23-01



General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
= Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Anions and Nutrients (QC Lot: 1207775)											
WT2334402-001	Anonymous	Phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0116	0.0132	0.0016	Diff <2x LOR	—
Anions and Nutrients (QC Lot: 1209903)											
WT2334782-001	GW-12575802-102523-EH-001	Nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	—
Anions and Nutrients (QC Lot: 1209904)											
WT2334782-001	GW-12575802-102523-EH-001	Nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	—
Anions and Nutrients (QC Lot: 1209905)											
WT2334782-001	GW-12575802-102523-EH-001	Chloride	16887-00-6	E235.Cl	0.50	mg/L	47.1	46.9	0.456%	20%	—
Anions and Nutrients (QC Lot: 1209907)											
WT2334782-001	GW-12575802-102523-EH-001	Sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	24.3	24.1	0.630%	20%	—
Anions and Nutrients (QC Lot: 1211615)											
WT2334782-004	GW-12575802-102523-EH-004	Phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0301	0.0300	0.432%	20%	—
Dissolved Metals (QC Lot: 1206460)											
WT2334654-001	Anonymous	Calcium, dissolved	7440-70-2	E421	0.500	mg/L	67.6	68.5	1.44%	20%	—
		Iron, dissolved	7439-89-6	E421	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	—
		Magnesium, dissolved	7439-95-4	E421	0.0500	mg/L	15.8	16.1	1.93%	20%	—
		Potassium, dissolved	7440-09-7	E421	0.500	mg/L	14.7	15.0	2.04%	20%	—
		Sodium, dissolved	7440-23-5	E421	0.500	mg/L	77800 µg/L	78.9	1.40%	20%	—
Hydrocarbons (QC Lot: 1214510)											
WT2334782-001	GW-12575802-102523-EH-001	F1 (C6-C10)	—	E581.F1-L	25	µg/L	<25	<25	0	Diff <2x LOR	—



Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 1207775)						
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	--
Anions and Nutrients (QCLot: 1209903)						
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	--
Anions and Nutrients (QCLot: 1209904)						
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	--
Anions and Nutrients (QCLot: 1209905)						
Chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	--
Anions and Nutrients (QCLot: 1209907)						
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	--
Anions and Nutrients (QCLot: 1211615)						
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	--
Dissolved Metals (QCLot: 1206460)						
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	--
Iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	--
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	--
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	--
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	--
Hydrocarbons (QCLot: 1210017)						
F2 (C10-C16)	--	E601.SG	100	µg/L	<100	--
F3 (C16-C34)	--	E601.SG	250	µg/L	<250	--
F4 (C34-C50)	--	E601.SG	250	µg/L	<250	--
Hydrocarbons (QCLot: 1214246)						
F2 (C10-C16)	--	E601.SG	100	µg/L	<100	--
F3 (C16-C34)	--	E601.SG	250	µg/L	<250	--
F4 (C34-C50)	--	E601.SG	250	µg/L	<250	--
Hydrocarbons (QCLot: 1214510)						
F1 (C6-C10)	--	E581.F1-L	25	µg/L	<25	--



Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 1207775)									
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.393 mg/L	96.6	80.0	120	--
Anions and Nutrients (QCLot: 1209903)									
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	97.2	90.0	110	--
Anions and Nutrients (QCLot: 1209904)									
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	95.4	90.0	110	--
Anions and Nutrients (QCLot: 1209905)									
Chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	100	90.0	110	--
Anions and Nutrients (QCLot: 1209907)									
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	100	90.0	110	--
Anions and Nutrients (QCLot: 1211615)									
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.393 mg/L	95.6	80.0	120	--
Dissolved Metals (QCLot: 1206460)									
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	2.5 mg/L	98.2	80.0	120	--
Iron, dissolved	7439-89-6	E421	0.01	mg/L	0.05 mg/L	98.4	80.0	120	--
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	2.5 mg/L	116	80.0	120	--
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	2.5 mg/L	100	80.0	120	--
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	2.5 mg/L	108	80.0	120	--
Hydrocarbons (QCLot: 1210017)									
F2 (C10-C16)	--	E601.SG	100	µg/L	3685.12 µg/L	107	70.0	130	--
F3 (C16-C34)	--	E601.SG	250	µg/L	7481.33 µg/L	108	70.0	130	--
F4 (C34-C50)	--	E601.SG	250	µg/L	4274.88 µg/L	101	70.0	130	--
Hydrocarbons (QCLot: 1214246)									
F2 (C10-C16)	--	E601.SG	100	µg/L	3685.12 µg/L	102	70.0	130	--
F3 (C16-C34)	--	E601.SG	250	µg/L	7481.33 µg/L	108	70.0	130	--
F4 (C34-C50)	--	E601.SG	250	µg/L	4274.88 µg/L	97.0	70.0	130	--
Hydrocarbons (QCLot: 1214510)									
F1 (C6-C10)	--	E581.F1-L	25	µg/L	2000 µg/L	97.6	80.0	120	--



Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

Matrix Spike (MS) Report										
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Spike		Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	Target	MS	Low	High	
Anions and Nutrients (QCLot: 1207775)										
WT2334402-001	Anonymous	Phosphorus, total	7723-14-0	E372-U	0,0976 mg/L	0,1 mg/L	97,6	70,0	130	---
Anions and Nutrients (QCLot: 1209903)										
WT2334782-001	GW-12575802-102523-EH-001	Nitrate (as N)	14797-55-8	E235.NO3	2,40 mg/L	2,5 mg/L	96,2	75,0	125	---
Anions and Nutrients (QCLot: 1209904)										
WT2334782-001	GW-12575802-102523-EH-001	Nitrite (as N)	14797-65-0	E235.NO2	0,492 mg/L	0,5 mg/L	98,3	75,0	125	---
Anions and Nutrients (QCLot: 1209905)										
WT2334782-001	GW-12575802-102523-EH-001	Chloride	16887-00-6	E235.Cl	97,4 mg/L	100 mg/L	97,4	75,0	125	---
Anions and Nutrients (QCLot: 1209907)										
WT2334782-001	GW-12575802-102523-EH-001	Sulfate (as SO4)	14808-79-8	E235.SO4	95,5 mg/L	100 mg/L	95,5	75,0	125	---
Anions and Nutrients (QCLot: 1211615)										
WT2334782-004	GW-12575802-102523-EH-004	Phosphorus, total	7723-14-0	E372-U	0,0974 mg/L	0,1 mg/L	97,4	70,0	130	---
Dissolved Metals (QCLot: 1206460)										
WT2334654-002	Anonymous	Calcium, dissolved	7440-70-2	E421	ND mg/L	25 mg/L	ND	70,0	130	---
		Iron, dissolved	7439-89-6	E421	0,538 mg/L	0,5 mg/L	108	70,0	130	---
		Magnesium, dissolved	7439-95-4	E421	31,6 mg/L	25 mg/L	126	70,0	130	---
		Potassium, dissolved	7440-09-7	E421	28,4 mg/L	25 mg/L	114	70,0	130	---
		Sodium, dissolved	7440-23-5	E421	ND mg/L	25 mg/L	ND	70,0	130	---
Hydrocarbons (QCLot: 1214510)										
WT2334782-001	GW-12575802-102523-EH-001	F1 (C6-C10)	---	E581,F1-L	1770 µg/L	2000 µg/L	88,6	60,0	140	---



CERTIFICATE OF ANALYSIS

<p>Work Order : WT2334786</p> <p>Client : GHD Limited</p> <p>Contact : Kory Ozgun</p> <p>Address : 455 Phillip Street Waterloo ON Canada N2L 3X2</p> <p>Telephone : ----</p> <p>Project : 12575802-20Y23-01</p> <p>PO : 735-004153-1</p> <p>C-O-C number : ----</p> <p>Sampler : Ethan Haight</p> <p>Site : ----</p> <p>Quote number : 12575802-20Y22-01 -SSOW-735-004153-1</p> <p>No. of samples received : 1</p> <p>No. of samples analysed : 1</p>	<p>Page : 1 of 2</p> <p>Laboratory : ALS Environmental - Waterloo</p> <p>Account Manager : Rick Hawthorne</p> <p>Address : 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8</p> <p>Telephone : +1 519 886 6910</p> <p>Date Samples Received : 25-Oct-2023 17:50</p> <p>Date Analysis : 29-Oct-2023</p> <p>Commenced : 30-Oct-2023 17:09</p>
---	---

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Greg Pokocky	Manager - Inorganics	Inorganics, Waterloo, Ontario



General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key :
 CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
 LOR: Limit of Reporting (detection limit).
 Measurement Uncertainty: The reported uncertainties in this report are expanded uncertainties calculated using a coverage factor of 2, which gives a level of confidence of approximately 95%.
 Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Unit	Description
mg/L	milligrams per litre

>: greater than.
 <: less than.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Qualifiers

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

Analytical Results

WT2334786-001

Sub-Matrix: **Water**

(Matrix: **Water**)

Client sample ID: SW-12575802-102523-EH-001

Client sampling date / time: 25-Oct-2023 15:34

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Anions and Nutrients								
Phosphorus, total	7723-14-0	1.48 ^{DLM}	0.200	mg/L	E372-U/WT	29-Oct-2023	30-Oct-2023	1211605

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

QUALITY CONTROL INTERPRETIVE REPORT

<p>Work Order : WT2334786</p> <p>Client : GHD Limited</p> <p>Contact : Kory Ozgun</p> <p>Address : 455 Phillip Street Waterloo ON Canada N2L 3X2</p> <p>Telephone : ----</p> <p>Project : 12575802-20Y23-01</p> <p>PO : 735-004153-1</p> <p>C-O-C number : ----</p> <p>Sampler : Ethan Haight</p> <p>Site : ----</p> <p>Quote number : 12575802-20Y22-01 -SSOW-735-004153-1</p> <p>No. of samples received : 1</p> <p>No. of samples analysed : 1</p>	<p>Page : 1 of 5</p> <p>Laboratory : ALS Environmental - Waterloo</p> <p>Account Manager : Rick Hawthorne</p> <p>Address : 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8</p> <p>Telephone : +1 519 886 6910</p> <p>Date Samples Received : 25-Oct-2023 17:50</p> <p>Issue Date : 30-Oct-2023 17:09</p>
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This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

- Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
- CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
- DQO: Data Quality Objective.
- LOR: Limit of Reporting (detection limit).
- RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "----" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.



Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) [ON MECP] SW-12575802-102523-EH-001	E372-U	25-Oct-2023	29-Oct-2023	28 days	4 days	✔	30-Oct-2023	28 days	5 days	✔

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).



Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water** Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation	
			QC	Regular	Actual	Expected		
Laboratory Duplicates (DUP)								
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1211605	1	20	5.0	5.0	✔	
Laboratory Control Samples (LCS)								
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1211605	1	20	5.0	5.0	✔	
Method Blanks (MB)								
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1211605	1	20	5.0	5.0	✔	
Matrix Spikes (MS)								
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1211605	1	20	5.0	5.0	✔	



Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U ALS Environmental - Waterloo	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for Total Phosphorus in water	EP372 ALS Environmental - Waterloo	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.



QUALITY CONTROL REPORT

Work Order	: WT2334786	Page	: 1 of 3
Client	: GHD Limited	Laboratory	: ALS Environmental - Waterloo
Contact	: Kory Ozgun	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: +1 519 886 6910
Project	: 12575802-20Y23-01	Date Samples Received	: 25-Oct-2023 17:50
PO	: 735-004153-1	Date Analysis Commenced	: 29-Oct-2023
C-O-C number	: ---	Issue Date	: 30-Oct-2023 17:09
Sampler	: Ethan Haight___		
Site	: ---		
Quote number	: 12575802-20Y22-01 -SSOW-735-004153-1		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Greg Pokocky	Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario

Page : 2 of 3
 Work Order : WT2334786
 Client : GHD Limited
 Project : 12575802-20Y23-01



General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

- Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
- CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
- DQO = Data Quality Objective.
- LOR = Limit of Reporting (detection limit).
- RPD = Relative Percent Difference
- # = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "--" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: Water					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Anions and Nutrients (QC Lot: 1211605)											
WT2334710-001	Anonymous	Phosphorus, total	7723-14-0	E372-U	0,0020	mg/L	0,109	0,108	0,628%	20%	—

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: Water						
Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QC Lot: 1211605)						
Phosphorus, total	7723-14-0	E372-U	0,002	mg/L	<0,0020	---



Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: Water

Laboratory Control Sample (LCS) Report										
					Spike	Recovery (%)	Recovery Limits (%)			
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier	
Anions and Nutrients (QCLot: 1211605)										
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.393 mg/L	100	80.0	120	---	

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias, ND – Recovery not determined, background level $\geq 1 \times$ spike level.

Sub-Matrix: Water

Matrix Spike (MS) Report										
					Spike	Recovery (%)	Recovery Limits (%)			
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 1211605)										
WT2334710-001	Anonymous	Phosphorus, total	7723-14-0	E372-U	ND mg/L	0.1 mg/L	ND	70.0	130	---



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