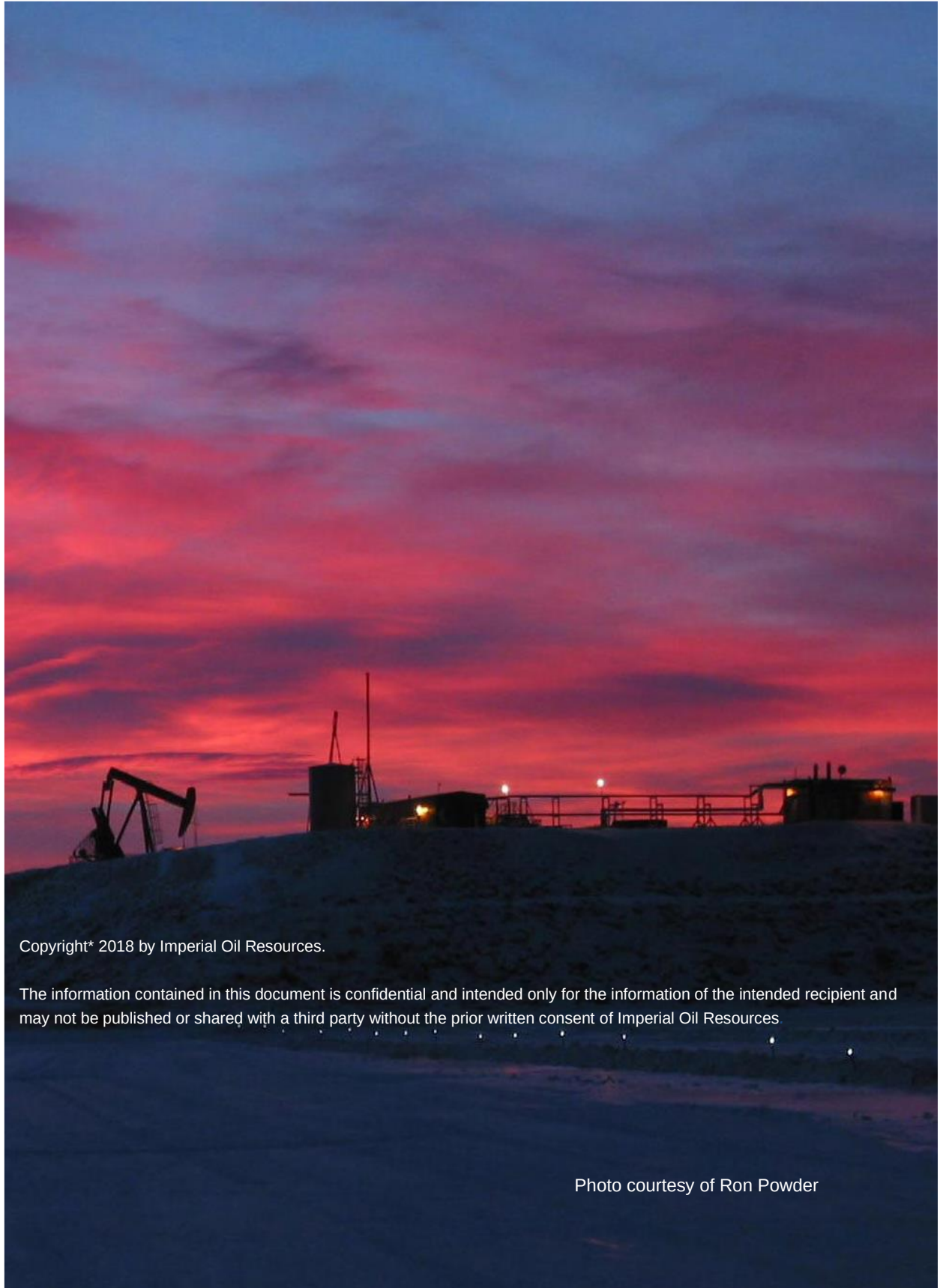


Norman Wells Operations 2022 Annual Water Use Report

Operations Authorization 1210-001
Report No. 37

March 2023

Imperial Oil Resources NWT Limited
Bag 5000, 745 Mackenzie Drive
Norman Wells, NT X0E 0V0
Switch Board: (867) 587-3100



Copyright* 2018 by Imperial Oil Resources.

The information contained in this document is confidential and intended only for the information of the intended recipient and may not be published or shared with a third party without the prior written consent of Imperial Oil Resources.

Photo courtesy of Ron Powder

Table of Contents

Table of Contents	ii
1.0 Introduction.....	4
2.0 Site Summary.....	5
3.0 SNP – Freshwater	5
3.1 Mackenzie River Withdrawal and Return Volumes	5
3.2 Volumes of Water Withdrawn from Other Sources	7
3.3 Freshwater Cooling Loop Explained	7
3.4 SNP – Freshwater Data Summary.....	8
4.0 Freshwater and Produced Water Injection.....	8
5.0 SNP – Surface Water	10
5.1 Surface Water Runoff Facilities (SWROF) Release Volumes	10
5.2 SNP – Surface Water Data Summary.....	10
6.0 SNP - Groundwater	13
7.0 Reportable Releases.....	14
7.1 Incident Prevention and Reduction	14
7.2 Spill Summary	14
8.0 Drilling Activity Summary	17
9.0 Waste	17
10.0 Emergency Response.....	17
11.0 Work Summary.....	19
Acronyms	20
12.0 Glossary	21
Appendix A CPF Inlet and Outlet Water Data	22
Appendix B Surface Water Runoff Data	41
Appendix C 2022 SNP Groundwater Quality Monitoring Report (TRSA)	44

List of Figures

Figure 3-1: Mackenzie River Water Uses.....	5
Figure 3-2: Mackenzie River Withdrawal and Return Volumes (2018-2022)	6
Figure 3-3: Freshwater Cooling Loop Flow Diagram.....	7
Figure 3-4: Simple Heat Exchanger	7
Figure 4-1: Freshwater and Produced Water Injection Volumes (2018-2022)	9
Figure 5-1: Refinery Impound Basin Elevated Volumes Event Before Discharge	11
Figure 5-2: Refinery Impound Basin Elevated Volumes Event After Discharge	11

List of Tables

Table 1-1:	Concordance Table	4
Table 3-1:	2022 CPF Inlet and Outlet Volumes.....	6
Table 4-1:	2022 Freshwater and Produced Water Injection Volumes	8
Table 5-1:	2022 SWROF Release Volumes.....	10
Table 6-1:	2022 SNP Monitoring Locations.....	13
Table 7-1:	Details on 2022 NT-NU Reportable Releases	16
Table 10-1:	2022 Emergency Response Exercises	18
Table 10-2:	2023 Planned Emergency Response Exercises.....	18
Table A-1:	2022 Total Petroleum Hydrocarbons and Phenols	22
Table A-2:	2022 Total Suspended Solids (TSS), pH and Specific Conductivity (EC)	24
Table A-3:	2022 Average Daily Chlorine and Temperature.....	28
Table A-4:	2022 Four Week Rolling Average (S13L1-007-02).....	38
Table A-5:	2022 Quarterly Acute Lethality Data	38
Table A-6:	2022 Quarterly Inlet Data	39
Table A-7:	2022 Quarterly Outlet Data	40
Table B-1:	2022 Surface Water Discharge Analytical Results for Category A Locations	41
Table B-2:	2022 Surface Water Discharge Analytical Results for Category B Locations.....	42

1.0 Introduction

As required by Type A Water Licence S13L1-007 (Part B: Item 13), the Licensee shall file an Annual Report with the Board no later than March 31st of the year following the calendar year reported. Details on the licence requirements and corresponding applicable section(s) within the report can be found below.

Table 1-1: Concordance Table

Licence Requirement		Section of Report
a)	The monthly and annual quantities in cubic meters of freshwater obtained from all sources	3.0
b)	The monthly and annual quantities in cubic meters of each and all Waste discharged	3.0– 5.0
c)	The monthly and annual quantity in cubic meters of Waste discharged to the Mackenzie River at SNP station S13L1-007-2	3.0
d)	The monthly and annual quantities in cubic meters of freshwater and produced water injected to the Waterflood	4.0
e)	The monthly and annual quantities in cubic meters of Waters contained and discharged from the Surface Water Run-off Facilities	5.0
f)	The monthly and annual quantity in cubic meters of Produced Water recovered from the oilfield reservoir	4.0
g)	Tabular summaries of all data generated under the Surveillance Network Program (SNP)	Appendix A & B & C
h)	A list of unauthorized discharges, identification of waterbodies affected and the current status of mitigation measures	7.0
i)	An annual drilling schedule for the upcoming year to the Board	8.0
j)	The annual amounts in cubic meters of water and Waste generated from all drilling activities	8.0
k)	A summary of measures taken to minimize net water withdrawals from the hydrological cycle as required in Part D, Item 4 of the licence	3.0– 5.0
l)	Details on the handling, storage, treatment and disposal of Waste from the Norman Wells Proven Area	9.0
m)	A review of spill training and communication exercises of the previous year, including the success and failure, as well as recommendations for improvement	10.0
n)	A general schedule for any planned oil spill exercises for the following year	10.0
o)	A summary of any Modification(s) and / or major maintenance work carried out as per Part G of the licence	11.0
p)	Any other details on Water(s) use or Waste(s) disposal requested by the Board no later than March 31st of the following calendar year reported	n/a
q)	A summary of all spills and Unauthorized Discharges and follow up actions taken that occurred during the previous calendar year	7.0

2.0 Site Summary

Imperial Oil Resources Northwest Territories (N.W.T.) Limited (Imperial) is an upstream oil and gas facility located approximately 700 km northwest of Yellowknife, N.W.T. Operations include a central processing facility (CPF), which receives production from the mainland (along the north-eastern shore of the Mackenzie River), natural islands (Bear and Goose Island), and six artificial islands.

Imperial holds a Type A Water Licence S13L1-007 which was issued by the Sahtu Land and Water Board (SLWB) on March 5th, 2015 and is valid for 10 years. The licence serves to regulate the use of water and the deposits of waste as it relates to Imperial's site. Imperial also holds a Canada Energy Regulator (CER) Operations Authorization (OA) 1210-001 issued December 31st, 2014, also valid for 10 years. This authorization serves to regulate the oil and gas activity on Imperial's federally regulated site.

A key piece of Imperial's Norman Wells Operation (NWO) and the Type A licence is the Surveillance Network Program (SNP). The SNP is detailed in Annex A of the licence and sets out the requirements for the three branches of the SNP program including but not limited to sampling expectations, water quality release limits, and reporting. The three branches of the SNP are listed below.

- Freshwater – Mackenzie River water
- Surface Water – snow and rainwater
- Groundwater – below surface water

More information on the SNP can be found within the Water Licence S13L1-007, Annex A. All other conditions are described above in **Section 1.0**.

3.0 SNP – Freshwater

The *SNP - Freshwater* covers the testing and analysis of the river water entering and leaving the central processing facility (CPF). There are two sampling locations, referred to as SNP Stations included in the SNP program. The stations are S13L1-007-1 (CPF inlet) and S13L1-007-2 (CPF outlet). The CPF inlet is the point at which the freshwater from the Mackenzie River enters the facility and the CPF outlet (or effluent) is the last point before it returns back to the Mackenzie River. This sampling is described in more detail in **Section 3.3**.

3.1 Mackenzie River Withdrawal and Return Volumes

In 2022, Imperial withdrew approximately 2.2 million cubic metres (m³) of water from the Mackenzie River (the maximum licence allowable limit is 3.5 million m³). All of this water was used for cooling in the CPF (**Figure 3-1**). Once the water was used for cooling, water was either returned to the Mackenzie River or injected to the reservoir via the freshwater injection system.

Figure 3-1: Mackenzie River Water Uses

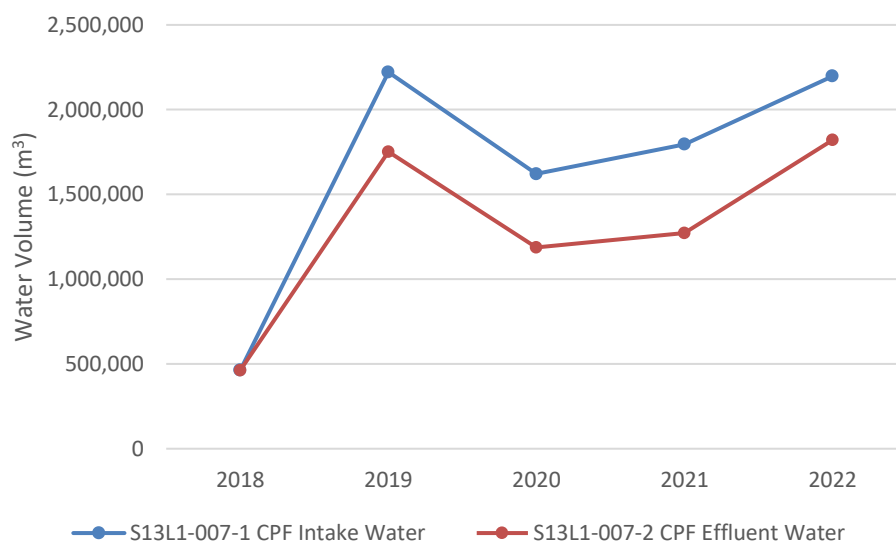


Details on the monthly quantities of freshwater withdrawn and discharged to the Mackenzie River can be found below in **Table 3-1**. All injection volumes can be found in **Table 4-1**. **Figure 3-2** shows the volume of water withdrawn from and returned to the Mackenzie River each year over a five year period.

Table 3-1: 2022 CPF Inlet and Outlet Volumes

Month	CPF Inlet (S13L1-007-1) (m ³)	CPF Outlet (S13L1-007-2) (m ³)
Jan	155,015	106,495
Feb	140,013	108,089
Mar	159,336	124,137
Apr	165,088	134,953
May	174,348	133,050
Jun	202,364	176,200
Jul	244,338	220,313
Aug	235,474	213,655
Sep	215,292	189,383
Oct	186,526	159,325
Nov	162,178	129,066
Dec	158,130	126,185
Total	2,198,103	1,820,850

Figure 3-2: Mackenzie River Withdrawal and Return Volumes (2018-2022)



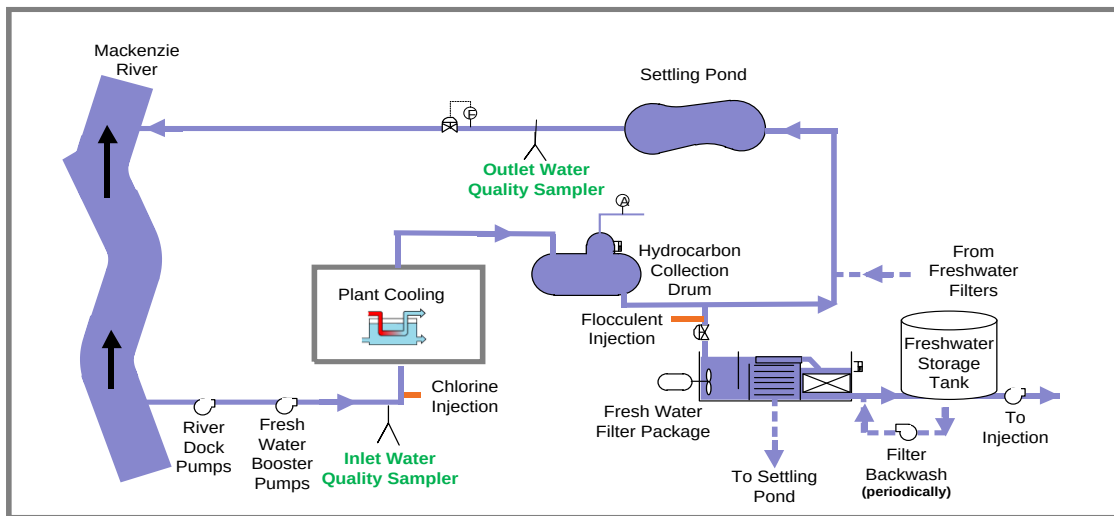
3.2 Volumes of Water Withdrawn from Other Sources

In 2022, Imperial did not withdraw any water from other sources.

3.3 Freshwater Cooling Loop Explained

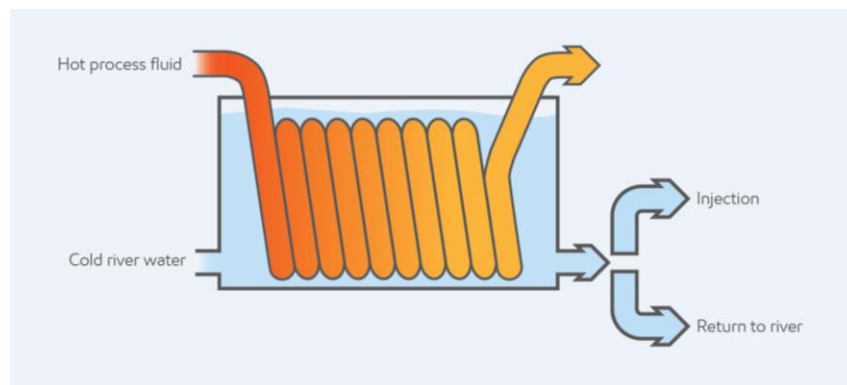
As water enters the CPF facility it is tested as per licence conditions at the CPF inlet (**Figure 3-3**). After testing, chlorine is added to kill bacteria in the piping and prevent damage to the equipment. This is the same type of chlorine used to disinfect drinking water systems. In 2020, the chlorine injection was in operation periodically throughout the year (**Table A-3**). As outlined in **Section 3.1** of the *Norman Wells Quality Assurance & Quality Control Manual* (January 2018), two chemicals are added to the freshwater to reduce the amount of silt and sediment in the freshwater.

Figure 3-3: Freshwater Cooling Loop Flow Diagram



Once a water sample has been taken and chlorine is added, the water then flows through heat exchangers within the plant for the sole purposes of cooling. The Mackenzie River water does not come into contact with any process fluids during cooling. There is no chance for the water to become contaminated because the water and oil are separated by a steel barrier (**Figure 3-4**). After cooling, the water passes through the hydrocarbon collection drum. This hydrocarbon collection drum is engineer designed with sensors that can detect light hydrocarbons. It is also equipped with automatic shut in valves as a preventative measure in the unlikely event that light hydrocarbons were to be detected in the freshwater (e.g., exchanger failure).

Figure 3-4: Simple Heat Exchanger



Once the water has passed through the hydrocarbon collection drum it either goes to the field for injection into the reservoir or to the settling pond where it is returned to the Mackenzie River. As the water is released from the settling pond it is tested as per licence conditions at a testing location referred to as the CPF outlet (**Figure 3-3**).

3.4 SNP – Freshwater Data Summary

All water results are reported to the SLWB as per licence conditions in the Monthly Water Use Report and are provided annually in this report (**Appendix A**).

4.0 Freshwater and Produced Water Injection

To maintain a constant pressure in the reservoir, all volumes removed from the producing reservoir must be replaced. Pressure is maintained by injecting fluid (such as produced water or freshwater) into the reservoir through injection wells. This is referred to as a waterflood. Without water injection, the reservoir pressure would fall and production would quickly decline.

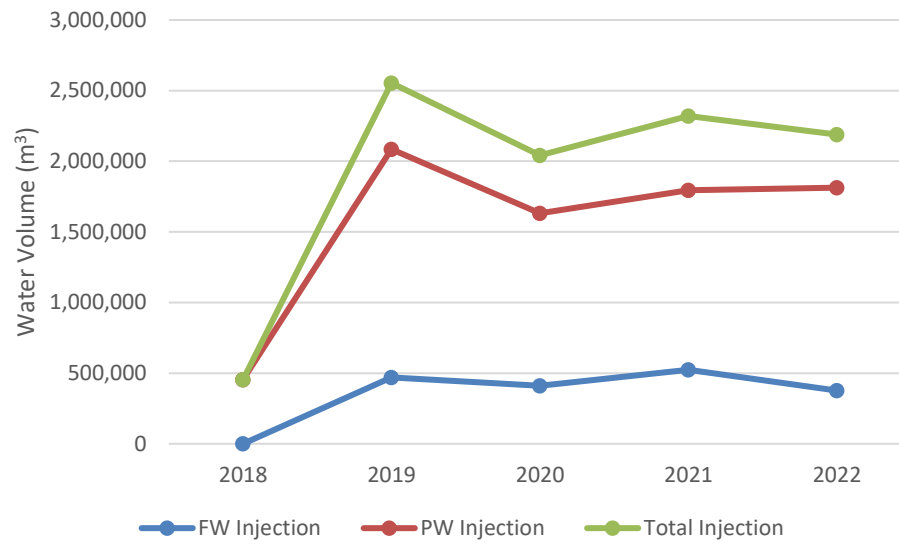
Water that is generated with the production of oil is called produced water and is re-injected into the reservoir. The volume of produced water is not enough to replace the amount of oil recovered; therefore, freshwater is used to supplement injection volumes required. The total volume of water injected in 2022 was approximately 2.2 million m³ and was made up of freshwater and produced water (**Table 4-1**)

Table 4-1: 2022 Freshwater and Produced Water Injection Volumes

Month	Freshwater Injection (m ³)	Produced Water Injection (m ³)	Total Water Injection (m ³)
Jan	48,520	180,533	229,052
Feb	31,924	163,060	194,985
Mar	35,200	161,750	196,949
Apr	30,135	153,609	183,744
May	41,298	166,197	207,495
Jun	26,164	156,931	183,095
Jul	24,026	150,220	174,246
Aug	21,819	145,550	167,369
Sep	25,909	131,189	157,098
Oct	27,201	139,212	166,413
Nov	33,113	130,476	163,589
Dec	31,945	133,510	165,456
Total	377,253	1,812,238	2,189,491

As waterfloods mature, the produced water to oil ratio from the wells typically increase resulting in increased produced water volumes with time. As a result, an increasing trend of produced water injection is observed. This is shown in **Figure 4-1**.

Figure 4-1: Freshwater and Produced Water Injection Volumes (2018-2022)



5.0 SNP – Surface Water

The *SNP - Surface Water* covers the testing and analysis of surface water run-off facilities. The major elements of the program include:

- collecting representative samples from surface water runoff facilities for field testing and/or laboratory analysis; and,
- performing controlled releases of surface water from runoff facilities that meets the guidelines in the Water Licence.

5.1 Surface Water Runoff Facilities (SWROF) Release Volumes

In 2022, 40,474 m³ of surface water was released back to the environment in total. This includes 1,752 m³ of Category A surface water and 38,722 m³ of Category B surface water. Category A surface water as defined within the Type A Water Licence S13L1-007 includes surface water collected from excavations in areas where there are no known historical impacts, bunkers, bermed areas and ditches where contamination is not suspected. These areas are shown below under the columns Mainland/Bear/Goose and D-42 Impound Basin (**Table 5-1**). Category B surface water includes sources where contamination may be suspected and therefore additional testing is completed prior to discharging as discussed below in Section 5.2. Category B surface water locations are shown below under the columns CPF Impound Basin, LT 11 Impound Basin, Refinery Impound Basin and Refinery Waterflood Basin (**Table 5-1**).

Table 5-1: 2022 SWROF Release Volumes

Month	CPF Impound Basin (m ³)	Mainland / Bear / Goose Impound Areas (m ³)	LT 11 Impound Basin (m ³)	D-42 Impound Basin (m ³)	Refinery Impound Basin (m ³)	Refinery Waterflood Basin (m ³)
Jan	0	0	0	0	0	0
Feb	0	0	0	0	0	0
Mar	0	0	0	0	0	0
Apr	0	0	0	0	0	0
May	11,712	1,733	455	0	14,259	0
Jun	3,981	0	852	0	3,423	0
Jul	3,487	0	0	0	0	0
Aug	0	19	0	0	0	0
Sep	0	0	0	0	553	0
Oct	0	0	0	0	0	0
Nov	0	0	0	0	0	0
Dec	0	0	0	0	0	0
Total	19,180	1,752	1,307	0	18,235	0

5.2 SNP – Surface Water Data Summary

All analytical water results (Cat A and Cat B surface water) are reported to the SLWB as per licence conditions in the Monthly Water Use Report and are provided annually in this report (**Appendix B**). In 2022 there was one occurrence where a controlled release was required from a Category B location prior to

completing analytical testing per license requirements. During the last weekend of April (April 30- May 1, 2022), a rapid increase of water levels in the Refinery Impound Basin were observed during spring thaw. Due to flight constraints over the weekend, Imperial was unable to send samples to the lab for analysis until Monday. Recognizing that the increasing levels could cause an uncontrolled release, Imperial proactively reached out to the CIRNAC inspector to obtain approval to begin a controlled discharge in an effort to maintain the integrity of berms surrounding the impound basin. Category A field screening (sheen, pH, Cl) were completed prior to discharging. On May 2 2022, samples were collected and sent to the lab on rush turnaround and full results were received on May 4, 2022. There were no observed Category B exceedances. Photos of the Refinery Impound Basin pre and post discharge can be found below in **Figures 5-1 and 5-2**.

Figure 5-1: Refinery Impound Basin Elevated Volumes Event Before Discharge



Figure 5-2: Refinery Impound Basin Elevated Volumes Event After Discharge



The total volume of surface water discharged from the Refinery Impound Basin during the event was 3990 m³. To avoid a similar issue in the spring of 2023, Imperial drained the impound basin to a reasonable low level in September 2022 prior to freeze up to increase the basin's capacity. During April 2023, Imperial plans to assess sampling options through the ice safely from the pump catwalk to proactively begin Category B sampling and analysis in advance to spring melt in the event that levels rapidly rise again, and a sudden discharge is required to maintain berm integrity.

There were no exceedances of water quality criteria or uncontrolled releases in 2022 for both Category A and B locations.

6.0 SNP - Groundwater

The 2022 SNP Groundwater Quality Monitoring results can be found in **Appendix C**. A summary of the results is included below.

The SNP network at Norman Wells consists of 15 groundwater monitoring wells including 2 contingency wells. There are also 3 inactive wells well that have been damaged historically and are replaced however historical data continues to be reported. A summary of the existing SNP network is shown below in **Table 6-1**.

Table 6-1: 2022 SNP Monitoring Locations

Monitoring Well	Location	Rationale for Selection
CPF 97-7-5	Mainland West	Situated between CPF and Bosworth Creek
CPF 98-8-3	Mainland West	Situated between CPF and Mackenzie River
WSY 97-1-5	Mainland East	Situated between Well Services Yard and Bosworth Creek
ARB-12-3-3	Mainland East	Adjacent Biocell 1
C38 08-1-4	Mainland East	Situated between known historical well issues (C-36x) and Mackenzie River
TF 03-12-3	Mainland East	Situated between Tank Farm and Mackenzie River; downgradient of known hydrocarbon source
MTF 97-1-5	Mainland East	Situated between Tank Farm and Town of Norman Wells
BIS 97-1-3	Bear Island	Situated between Bear Island Sump #5 and the Mackenzie River
BI-13-3-4.5	Bear Island	Situated near Bear Island Sump #6 and the Mackenzie River
BIBG-20-01-4	Bear Island	Situated at western edge of development on Bear Island, near Mackenzie River
GIBG-10-2-3	Goose Island	Situated between well pads and Mackenzie River
GIQ8-10-2-4	Goose Island	Situated between fuel storage/handling area and the Mackenzie River
GIP11 09-1-4-R	Goose Island	Situated between a sump and the Mackenzie River
Contingency Wells*		
MEBG-10-1-3	Mainland East	Situated between Mainland Sumps and Mackenzie River
BI-13-1-4	Bear Island	Situated near Bear Island Sump #6 and the Mackenzie River
Inactive Wells**		
GIP11 09-1-4	Goose Island	Situated between a sump and the Mackenzie River – well was abandoned in 2018 and reinstalled as GIP11 09-1-4-R
BIBG-10-1-4	Bear Island	Situated at western edge of Bear Island, south of the Mackenzie River – meant to replace damaged SNP well BIBG-12-1-7 – noted damaged in 2020 replaced by BIBG-20-01-4
BIBG-12-1-7	Bear Island	Situated at western edge of development on Bear Island, near Mackenzie River – well was replaced by BIBG-20-1-4 in fall 2020

*Wells serve as contingency monitoring locations in the event that a sample cannot be collected from all primary SNP locations.

** Wells that have been damaged and are replaced but historical data are reported

Two wells within the existing SNP network were observed to be damaged in 2021 by ice (BIBG-20-01-4 and GIBG-10-2-3) and could not be sampled in 2022. Imperial is planning a drilling program during the summer of 2023 to replace these two wells within the SNP network.

Groundwater quality monitoring for the SNP was completed in August and September 2022. Activities included measurement of hydraulic head and collection of groundwater samples for laboratory analyses per Norman Wells Operations Groundwater Management Plan (GMP). Full detailed analysis of the results

in addition to identified trends through Mann-Kendall statistical analyses are discussed in **Appendix C**. Imperial will continue to execute the *SNP Groundwater Monitoring Program* and analyze the data annually.

7.0 Reportable Releases

Imperial reported all 2022 government reportable releases to the CER Online Event Reporting System and the Northwest Territories – Nunavut (NT - NU) Spill Report Line.

7.1 Incident Prevention and Reduction

Imperial's integrity and reliability processes utilize a structured approach of prevention, detection, response and recovery. A variety of activities related to release prevention, reduction, mitigation, response and training is undertaken annually. These activities are designed to eliminate potential releases, detect releases should they occur and if they do occur, ensure an effective and timely clean up. Key elements for achieving this strategy include:

- awareness training for employees and contractors
- pre-job preparation and hazard recognition
- surveillance and monitoring
- flowline leak detection
- routine integrity testing and maintenance
- regularly scheduled emergency response training and exercises and;
- incident reporting processes; management support for a strong incident reporting culture
- analysis of incident trending to evaluate and understand learnings to improve future performance

For any new workers to site (both employees and contractors) a safety and environmental training package is reviewed covering environmental topics such as release prevention, reporting, waste management, and wildlife. Other tools such as Environmental Alerts, a one page bulletin intended as a high level overview of key topics, may be used to communicate to workers specific environmental information on an as needed basis. Environmental incidents and associated learnings are reviewed real-time with the general workforce in daily operations and stewardship meetings.

7.2 Spill Summary

In 2022, Imperial reported six government reportable release events to the CER's Online Event Reporting System (OERS) and the Northwest Territories – Nunavut (NT-NU) Spill Report Line. Each event was reported on and responded to immediately. Incident investigation details and clean up statuses were provided to the CER through the Monthly Release Report and the OERS, and to the SLWB via a Supplemental Release Report (30 Day Report). High level summaries of each release can be found below in **Table 7-1**. Further details can be found within the final incident reports submitted to the GNWT and SLWB.

On July 27, 2022, NWO experienced a flowline failure on Line #490 (6" Produced water line), along the cross-river portion between Goose Island Terminal 4 (GIT 4) and Bear Island Terminal 4 (BIT 4), releasing 55 m³ of a comingled product (77% produced water, 23% freshwater) into the Mackenzie River. Full details on the incident, the subsequent response and investigation, root cause and corrective actions can be found in the final incident report submitted to the CER and GNWT on November 15, 2022 (Spill # 2022-382). During the initial investigation, bathymetric surveys and side scan sonars were completed along the flowline corridor between GIT 4 and BIT 4. The preliminary results identified an exposed suspended pipeline span,

along the riverbed where the failure location was identified, caused by riverbed scouring. As a cautionary measure based on these findings, the three other pipelines (Line 111 – 10” oil emulsion line, Line 491 – 6” oil emulsion line and Line 263 – 4” natural gas line) within the cross river corridor were safely shut-in by August 18, 2022 and were cleaned using freshwater and scraper pigs. To complete a safe shutdown and isolation of the three additional flowlines, all production was shut-in and winterized on Islands 5, 6 and Bear Island. The production shut-ins remain in effect at the time of this report submission as NWO continues to evaluate production re-instatement options.

Norman Wells Operations 2022 Annual Water Use Report

Table 7-1: Details on 2022 NT-NU Reportable Releases

Date Occurred	CER INC Number	NT/NU Spill Number	Location of Incident	Product Released	Volume Released	Volume Contained	Volume Reaching the Environment	Executive Summary	Direct Cause	Status of Clean Up
01/27/2022	INC20 22-014	2022022	Central Processing Facility	Produced Water	294 L (frozen)	0 L	294 L (ice fully recovered)	Operator completing daily surveillance noticed smell of produced water (PW) near the SE corner of the CPF. Investigation discovered a produced water leak (~1 drip/min) from the flanged connection b/w a 4" isolation valve and spec blind on a suspended freshwater Line 418 tee. Leak was stopped by tightening 3 bottom studs on the flange connection and the isolation valve. 2 300L drip trays were placed underneath the release location as clean-up activities were completed. All the produced water ice was recovered and disposed in approved container onsite. Intact snow layer was identified underneath the produced water ice indicating ground infiltration did not occur.	Equipment – Other Mechanical Integrity / External Factor	Complete
03/03/2022	INC20 22-042	2022062	C-34x Mainland	Methanol	150L	0L	150L	Methanol tanker truck operator completing routine delivery of Methanol to 1000 bbl above ground storage tank. Operator inadvertently connected the hoses backwards to the pump on tanker truck causing methanol product to free flow from the holding tank to the bulker once the tank valve was opened, causing an overflow and methanol to release from the tank vents onto the ground. Upon discovery, tank valve was immediately shut stopping the release. Vac truck used to recover all of the free fluids and melted snow, while a loader with bucket completed surficial scrape to remove any residual methanol. Impacted materials were placed in approved containment on-site for future disposal.	People – Understood but did not follow acceptable procedure	Complete
07/22/22	INC20 22-116	2022-376	Mainland IOL Dock – Marine Shack	Grey Water	25L	5L (after initial 25L released)	25L	Contractor noticed sewage odour from marine shack building during morning activities at the dock. Initial investigation identified leaking effluent from the grey water storage tank due to an overflow, dripping outside of the building to the ground below (shale rock material). Drip tray placed under leak to recover an additional 5L while investigation took place. Vac truck was used to empty tank contents, absorbent pads deployed to recover released fluids on the shale dock material. Corrective action from investigation findings – holding tank level indicator with audible alarm to be installed to prevent a future incident.	Systems – Work Management Issue – Inadequate tools or equipment	Complete
07/27/22	INC202 2-122	2022-382	Line 490 between GIT4 and BIT	Produced Water (23% FW / 77% PW)	55 m ³	0 m ³	55 m ³	See summary outlined above in Section 7.2 and final incident report (INC2022-122 / 2022-382)	Circumferential crack of girth weld due to riverbed scouring exposing Line	Complete
11/09/2022	INC 2022-200	2022-524	Mainland Heli-shack	Grey water	2 L	0 L	2 L	A sewage odour was discovered by on-site staff late in the afternoon on November 9, 2022 coming from the Heli-shack washroom. After initial investigation, leaking effluent from the grey water storage tank in the shack was observed to be slowly dripping through the floor of the building reaching the frozen ground below. The tank itself was observed to be overfilled causing the slow release. Approximately 2L of grey water was released upon discovery. A vacuum truck on-site was utilized to remove the storage tank contents and the washroom was returned to service. Released fluids to the frozen ground were removed via shovel and placed in approved containment on-site for disposal. Level indicator alarm to be installed on tank to eliminate future overflow events.	Systems – Workplace Layout / Workplace Design Issue	Complete
12/31/22	INC202 3-001	2022564	Mainland – Office Trailer	Grey water	4L	0L	4L	During an inspection underneath a contractor office trailer located on the mainland of Norman Wells Operations, a failed mechanical joint coupling from the trailer's sewage line was observed. Upon initial investigation, it appears the leak occurred slowly over time from the failed MJ coupling due to gradual shifts in the trailer's position. It was estimated that approximately 4 L of grey water was released upon discovery. Impacted soil was collected and disposed in approved containment on-site for off-site disposal. MJ coupling was repaired, and a swing joint was installed to the line to alleviate any stress that may occur in the future due to settlement of the office trailer.	Equipment – Other Mechanical Integrity	Complete

8.0 Drilling Activity Summary

There was no drilling activity in 2022 nor are there plans to drill in 2023. All drilling sumps have been capped and are in the remediation process. There were no drilling fluid releases in 2022.

9.0 Waste

Waste generated on site is collected and disposed of at appropriate waste facilities both on and off site in accordance with the operating approval conditions for Imperial's Onsite Hazardous Waste Storage Yard, Generator Number NTG339, Receiver Number NTR019. In 2022, approximately 10 tonnes of hazardous waste and 764 tonnes of non-hazardous waste were transported to approved facilities outside of Norman Wells including Yellowknife and Northern Alberta (High Level and Ryley).

Two Imperial owned soil treatment facilities (bio cells) continue to accept impacted material for short term storage and treatment for reuse on site. In 2022, no bio-remediation treatment activities were completed within the bio cells.

An active *Waste Management Plan* serves as a resource document and field guide for waste management on-site, and includes additional details about the bio cell and other waste facilities at the NWO. As updates to this plan are made, the plan is filed with the SLWB.

10.0 Emergency Response

Imperial's Emergency Response Plan (ERP) includes set objectives for responding to emergencies in an effective and timely manner. These objectives include the following:

- manage risks, inherent in all operations to minimize releases;
- ensure that all employees understand their responsibility as it relates to emergencies and preventing them from occurring;
- develop and maintain emergency response capabilities locally and have the ability to quickly expand and leverage other resources; and,
- initiate appropriate response measures immediately and take all reasonable measures to ensure the safety of our workforce and the public and for the protection of the community and the environment.

In addition to the ERP mentioned above, a Spill Contingency and Response Plan (SCARP) also exists as a supplement the ERP. The SCARP is a more detailed field level strategy guide. Copies of both the ERP and SCARP are filed with the SLWB and CER and other agencies as appropriate.

The local Norman Wells workforce, in the event of an emergency, would be known as the emergency response team (ERT). The ERT completes regular training on roles and responsibilities, the structure and organization of the incident command system, emergency response equipment, as well as various response techniques (e.g., boom deployment and oil recovery on water). Within the scope of any training, the objectives of the exercise, learnings and any improvement areas are discussed throughout and followed up on as required.

A summary of the exercises completed in 2022 is included in **Table 10-1**.

Table 10-1: 2022 Emergency Response Exercises

Date	Description
14-Feb-22	Propane release – E2 Scenario
18-Feb-22	TG Building Fire – CO ₂ fire suppression system activated
10-Mar-22	Brittle fracture
19-Apr-22	BCP exercise
5-May-22	Old Compressor Building – VCE Evacuation Drill
19-May-22	Security Threat – Workplace Violence
26-May-22	Helicopter Incident - Overdue
30-Jun-22	Man Down – Confined Space Rescue
July/August 2022	Marine Response Drills – Man overboard, fire on ship
July/August 2022	Spill Response Drills – Boom deployment, skimmer operation
24-Aug-22	Full Scale Exercise – E2 Petroleum crude oil release (IMT and ERT support)
12-Sep-22	Old Compressor Building – VCE Evacuation drill
9-Oct-22	Old Compressor Building – VCE Evacuation drill
28-Oct-22	Marine Transport Incident
2-Nov-22	Well Blowout
7-Nov-22	Chlorine Release
15-Nov-22	Old Compressor Building – VCE Evacuation drill

A summary of the exercises planned for 2023 is included in **Table 10-2**.

Table 10-2: 2023 Planned Emergency Response Exercises

Date	Description
Jan	BCP – Cybersecurity exercise
Mar	Blocked Flare and Brittle Fracture exercise
May	Propane Release exercise
June	Old Compressor Building VCE exercise
June	TG Building fire – CO ₂ fire suppression system activated
June	Old Compressor Building VCE exercise
July	Man Down – working in remote area exercise
July	Marine Response Drills – Man overboard, fire on ship
July	Spill Response Drills – Boom deployment, skimmer operation
August	Old Compressor Building VCE exercise
August	Old Compressor Building VCE exercise
October	Petroleum Crude Oil release full scale exercise
October	Well Blowout exercise
Nov	Helicopter incident exercise

11.0 Work Summary

Below is a list of modification(s) and maintenance work carried out as per Part G of the licence in 2022:

- Norman Wells Storage Tank Vapour Recovery (STVR) project began construction in August 2022, to install two enclosed ground flares (EGF's) tied into storage tank infrastructure onsite within the Norman Wells Operations, both in the Central Processing Facility (CPF) and Refinery Tank Farm (RTF). These upgrades are expected to reduce the Operation's total annual venting volume of hydrocarbon gas to comply with the venting limit in Section 26(1) of the Regulations Respecting Reduction in the Release of methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector) SOR-2018-66. Construction of these upgrades is still ongoing currently. Details of this scope of work was discussed with the SLWB during quarterly meetings in 2022 on March 1 and June 7.

Acronyms

Acronym	Definition
AEMP	Aquatic Effects Monitoring Program
B.I.T. 4	Bear Island Terminal 4
BPT	Bear Island Pipeline Terminal
BLEVE	Boiling Liquid Expanding Vapor Explosion
CCME	Canadian Council of Ministers of the Environment
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CER	Canada Energy Regulator
CPF	central processing facility
EC	specific conductivity
EGF	Enclosed ground flare
ERP	Emergency Response Plan
ERS	Event Reporting System
ERT	emergency response team
FW	Freshwater
FWAL	Freshwater Aquatic Life
G.I.T. 4	Goose Island Terminal 4
Imperial	Imperial Oil Resources N.W.T. Limited
L	litres
m ³	cubic metres
mg/l	milligrams per litre
n/a	Not applicable
NWO	Norman Wells Operations
N.W.T.	Northwest Territories
NT-NU	Northwest Territories – Nunavut
OA	Operations Authorization
OERS	Online Event Reporting System
PW	Produced water
SCARP	Spill Contingency and Response Plan
SLWB	Sahtu Land and Water Board
SNP	Surveillance Network Program
STVR	Storage Tank Vapour Recovery
SWROF	Surface water runoff facilities
TPH	Total Petroleum Hydrocarbons
TSS	total suspended solids
uS/cm	micro Siemens per centimetre
VCE	Vapour cloud explosion

12.0 Glossary

Term	Description
Acute lethality	An effluent is deemed acutely lethal if the undiluted (100%) effluent kills 50% or more of the fish or <i>Daphnia magna</i> in the test. Biological test method: Acute Lethality Test Using Rainbow Trout Report EPS 1/RM/9 July 1990 (with May 1996 and May 2007 amendments) and Acute Lethality of Effluents to <i>Daphnia magna</i> EPS 1/RM/14 Second Edition December 2000, or as may be amended from time to time.
Average concentration	The running average of any four consecutive analytical results submitted to the Board in accordance with the sampling and analysis requirements specified in the "Surveillance Network Program".
Bathymetric survey	A survey used to measure the topography on the bottom of a waterbody. Imperial conducts these surveys on the Mackenzie River to help identify and understand what changes have occurred on the river bottom.
Central processing facility (CPF)	The plant where oil, gas, and produced water, are collected from the oilfield and separated.
Exceedance	Results are above the maximum concentrations listed in Water Licence S13L1-007
Flowline	A line that is used to transport fluids from a well to a production facility or vice versa, and includes intrafield export and all gathering lines
Phenols	Any of a family of organic compounds characterized by a hydroxyl (-OH) group attached to a carbon atom that is part of an aromatic ring. Phenols are widely used in household products such as cleaners and mouthwash. They are commonly found in nature and can be obtained from essential oils of plants. Phenols can also be obtained from the distillation of coal tar or crude petroleum. (Source: www.britannica.com).
Produced water	Water extracted from the reservoir as a mixture with oil and gas
SNP Station S13L1-007-1	The Surveillance Network Station for the CPF intake water.
SNP Station S13L1-007-2	The Surveillance Network Station for the CPF cooling flow return.
Surface water run-off facilities	The Refinery Impounding basin, Battery 3 impounding basin (also known as LT 11), Refinery waterflood Basin, CPF impounding area (also known as LT 2), miscellaneous Mainland impounding areas, miscellaneous Bear Island impounding areas, miscellaneous Goose Island impounding areas, and associated ditches provided for the collection, storage, and discharge of surface run-off waters from the NWO.
Surveillance network program	A network of devices or sampling points designed to test environmental conditions for comparison against baseline data obtained from a point or area designated as a control. This is a method of tracking and identifying the spread of deleterious substances in the environment.
Waste	Waste as defined by Section 2 of the <i>Northwest Territories Waters Act</i>
Waterflood	The injections of water into the Norman Wells oilfield reservoir for pressure maintenance and enhanced oil production
Water intake	The wetwell pump and associated facilities installed in the Mackenzie River and the water line to the CPF

Appendix A CPF Inlet and Outlet Water Data

Table A-1: 2022 Total Petroleum Hydrocarbons and Phenols

	CPF Inlet Total Petroleum Hydrocarbons (mg/L)	CPF Inlet Phenols (mg/L)	CPF Outlet Total Petroleum Hydrocarbons (mg/L)	CPF Outlet Phenols (mg/L)
SNP Station	S13L1-007-1	S13L1-007-1	S13L1-007-2	S13L1-007-2
Water Licence Criteria	n/a	n/a	5.0 mg/L	0.14mg/L
4-Jan	<2.0	<0.0015	<2.0	<0.0015
10-Jan	<2.0	<0.0015	<2.0	<0.0015
17-Jan	<2.0	<0.0015	<2.0	<0.0015
24-Jan	<2.0	<0.0015	<2.0	<0.0015
31-Jan	<2.0	<0.0015	<2.0	<0.0015
7-Feb	<2.0	<0.0015	<2.0	<0.0015
14-Feb	<2.0	<0.0015	<2.0	<0.0015
21-Feb	<2.0	<0.0015	<2.0	<0.0015
28-Feb	<2.0	0.0018	<2.0	0.0024
7-Mar	<2.0	0.0034	<2.0	0.0077
14-Mar	<2.0	<0.0015	<2.0	<0.0015
21-Mar	<2.0	<0.0015	<2.0	<0.0015
28-Mar	<2.0	<0.0015	<2.0	<0.0015
4-Apr	<2.0	0.0015	<2.0	<0.0015
11-Apr	<2.0	<0.0015	<2.0	<0.0015
18-Apr	<2.0	<0.0015	<2.0	<0.0015
25-Apr	<2.0	<0.0015	<2.0	<0.0015
9-May	<2.0	<0.0015	<2.0	<0.0015
16-May	<2.0	<0.0015	<2.0	<0.0015
19-May	<2.0	<0.0015	<2.0	<0.0015
24-May	<2.0	<0.0015	<2.0	<0.0015
30-May	<2.0	<0.0015	<2.0	<0.0015
6-Jun	<2.0	<0.0015	<2.0	<0.0015
13-Jun	<2.0	<0.0015	<2.0	0.0019
20-Jun	<2.0	<0.0015	<2.0	<0.0015
27-Jun	<2.0	<0.0015	<2.0	<0.0015
4-Jul	<2.0	<0.0015	<2.0	<0.0015
11-Jul	<2.0	<0.0015	<2.0	<0.0015
18-Jul	<2.0	0.0019	<2.0	<0.0015
25-Jul	<2.0	<0.0015	<2.0	<0.0015

	CPF Inlet Total Petroleum Hydrocarbons (mg/L)	CPF Inlet Phenols (mg/L)	CPF Outlet Total Petroleum Hydrocarbons (mg/L)	CPF Outlet Phenols (mg/L)
SNP Station	S13L1-007-1	S13L1-007-1	S13L1-007-2	S13L1-007-2
Water Licence Criteria	n/a	n/a	5.0 mg/L	0.14mg/L
2-Aug	<2.0	<0.0015	<2.0	<0.0015
4-Aug	<2.0	<0.0015	<2.0	<0.0015
8-Aug	<2.0	<0.0015	<2.0	<0.0015
11-Aug	<2.0	<0.0015	<2.0	<0.0015
15-Aug	<2.0	<0.0015	<2.0	<0.0015
22-Aug	<2.0	<0.0015	<2.0	<0.0015
29-Aug	3.8*	<0.0015	<2.0	<0.0015
2-Sep	<2.0	<0.0015	<2.0	<0.0015
6-Sep	<2.0	<0.0015	<2.0	<0.0015
12-Sep	<2.0	<0.0015	<2.0	<0.0015
19-Sep	<2.0	<0.0015	<2.0	<0.0015
26-Sep	<2.0	<0.0015	<2.0	<0.0015
3-Oct	<2.0	<0.0015	<2.0	<0.0015
11-Oct	<2.0	<0.0015	<2.0	0.0024
17-Oct	<2.0	<0.0015	<2.0	<0.0015
24-Oct	<2.0	<0.0015	<2.0	<0.0015
31-Oct	<2.0	<0.0015	<2.0	<0.0015
7-Nov	<2.0	<0.0015	<2.0	<0.0015
14-Nov	<2.0	<0.0015	<2.0	<0.0015
21-Nov	<2.0	<0.0015	<2.0	<0.0015
28-Nov	<2.0	<0.0015	<2.0	<0.0015
5-Dec	<2.0	<0.0015	<2.0	<0.0015
12-Dec	<2.0	<0.0015	<2.0	<0.0015
19-Dec	<2.0	<0.0015	<2.0	<0.0015
27-Dec	<2.0	<0.0015	<2.0	<0.0015

* Elevated TPH due to natural seep observed on the Mackenzie River near Intake location. Additional Samples collected on September 2nd, with results showing concentration back to <2.0 mg/L.

Table A-2: 2022 Total Suspended Solids (TSS), pH and Specific Conductivity (EC)

	CPF Inlet Total TSS (mg/L)	CPF Inlet Total pH (mg/L)	CPF Inlet Total EC (mg/L)	CPF Outlet Total TSS (mg/L)	CPF Outlet Total pH (mg/L)	CPF Outlet Total EC (mg/L)
SNP Station	S13L1-007-1	S13L1-007-1	S13L1-007-1	S13L1-007-2	S13L1-007-2	S13L1-007-2
Water Licence Criteria	n/a	n/a	n/a	n/a	Between	n/a
					6 – 9	
4-Jan	1.4	7.89	270	<1.0	7.85	250
6-Jan	48.0	8.29	270	<1.0	7.87	250
10-Jan	6.7	7.99	250	1.1	7.97	250
13-Jan	5.3	7.92	260	1.6	7.99	250
17-Jan	3.0	7.87	240	<1.0	7.69	240
20-Jan	7.0	7.44	240	1.4	7.88	240
24-Jan	2.3	7.28	240	<1.0	7.80	240
27-Jan	1.0	8.04	240	1.5	8.05	240
31-Jan	3.3	8.03	240	<1.0	8.01	240
4-Feb	2.1	7.79	240	1.6	7.51	240
7-Feb	<1.0	7.72	240	<1.0	7.28	240
10-Feb	4.9	7.68	240	1.6	7.36	240
14-Feb	<1.0	8.03	240	<1.0	8.1	240
17-Feb	1.2	8.04	240	<1.0	8.1	230
21-Feb	1.0	8.02	240	<1.0	8.05	240
24-Feb	1.6	8.04	240	<1.0	8.06	240
28-Feb	<1.0	7.98	240	<1.0	8.02	240
3-Mar	<1.0	7.94	240	<1.0	7.83	240
7-Mar	<1.0	8.02	240	<1.0	8.06	240
10-Mar	2.9	8.02	310	1.1	7.99	240
14-Mar	1.2	8.01	240	<1.0	7.85	240
17-Mar	<1.0	7.80	240	<1.0	8.05	230
21-Mar	<1.0	8.09	250	<1.0	8.05	250
24-Mar	<1.0	8.00	250	<1.0	8.06	250
28-Mar	2.0	7.90	240	<1.0	7.72	240
31-Mar	<1.0	8.11	240	<1.0	8.13	240
4-Apr	<1.0	7.95	240	<1.0	7.64	240
7-Apr	<1.0	7.98	250	<1.0	8.04	250
11-Apr	1.8	7.89	250	<1.0	7.55	250
14-Apr	<1.0	7.86	240	<1.0	7.87	240
18-Apr	<1.0	7.94	250	<1.0	7.91	250

Norman Wells Operations 2022 Annual Water Use Report

	CPF Inlet Total TSS (mg/L)	CPF Inlet Total pH (mg/L)	CPF Inlet Total EC (mg/L)	CPF Outlet Total TSS (mg/L)	CPF Outlet Total pH (mg/L)	CPF Outlet Total EC (mg/L)
SNP Station	S13L1-007-1	S13L1-007-1	S13L1-007- 1	S13L1-007-2	S13L1-007-2	S13L1- 007-2
Water Licence Criteria	n/a	n/a	n/a	n/a	Between 6 – 9	n/a
21-Apr	<1.0	7.89	250	<1.0	7.65	250
25-Apr	<1.0	8.01	260	<1.0	7.96	260
28-Apr	1.1	8.03	250	<1.0	8.01	240
2-May	1.5	7.98	250	1.1	8.04	250
5-May	5.3	7.90	240	5.3	7.91	260
9-May	9.6	7.75	250	4.9	7.84	250
12-May	7.0	7.64	240	32.0	7.78	270
16-May	23.0	7.89	240	21.0	7.7	250
19-May	3.6	7.99	310	6.6	7.9	260
24-May	62.0	8.05	300	24.0	7.94	260
26-May	74.0	7.97	280	58.0	7.87	240
30-May	6.4	7.94	280	12.0	7.48	240
2-Jun	6.3	8.06	290	21.0	8.03	240
6-Jun	4.7	8.00	280	16.0	8.02	250
9-Jun	8.9	8.01	280	84.0	7.80	250
13-Jun	1.8	8.08	290	15.0	8.05	260
16-Jun	3.2	8.05	270	9.1	7.88	260
20-Jun	3.3	8.02	280	19.0	8.04	240
23-Jun	170.0	7.93	260	44.0	7.95	250
27-Jun	5.4	7.99	280	11.0	8.07	260
4-Jul	53.0	7.87	260	15.0	7.96	260
7-Jul	95.0	8.02	260	36.0	7.83	250
11-Jul	1.9	8.11	280	2.4	8.17	270
14-Jul	130.0	7.98	260	8.9	7.96	260
18-Jul	100.0	7.98	270	3.1	7.86	270
21-Jul	34.0	7.66	260	9.9	8.10	260
25-Jul	11.0	8.13	270	4.7	8.09	270
28-Jul	27.0	8.10	270	30.0	8.10	270
2-Aug	1.9	8.11	270	7.7	8.11	270
4-Aug	110.0	8.03	330	3.5	7.4	250
8-Aug	12.0	7.96	270	1.2	8.05	270
11-Aug	130.0	8.06	280	6.3	7.9	270
15-Aug	19.0	7.69	280	2.3	7.98	280
18-Aug	26.0	8.18	270	74.0	8.17	280
22-Aug	23.0	7.97	270	34.0	7.91	260

Norman Wells Operations 2022 Annual Water Use Report

	CPF Inlet Total TSS (mg/L)	CPF Inlet Total pH (mg/L)	CPF Inlet Total EC (mg/L)	CPF Outlet Total TSS (mg/L)	CPF Outlet Total pH (mg/L)	CPF Outlet Total EC (mg/L)
SNP Station	S13L1-007-1	S13L1-007-1	S13L1-007- 1	S13L1-007-2	S13L1-007-2	S13L1- 007-2
Water Licence Criteria	n/a	n/a	n/a	n/a	Between 6 – 9	n/a
26-Aug	10.0	7.94	280	18.0	7.77	280
29-Aug	65.0	8.22	330	18.0	8.16	280
2-Sep	7.2	7.99	280	9.4	7.99	280
6-Sep	21.0	8.02	270	14.0	8.07	270
8-Sep	11.0	7.85	290	50.0	8.03	280
12-Sep	23.0	8.09	280	7.6	7.99	270
15-Sep	4.0	8	280	6.7	7.96	280
19-Sep	4.9	7.61	270	6.2	7.85	270
22-Sep	6.3	7.45	260	5.2	8.01	270
26-Sep	5.3	7.77	270	12.0	8.07	270
3-Oct	75.0	7.30	270	7.2	7.94	270
6-Oct	12.0	7.85	270	20.0	7.31	270
11-Oct	3.6	7.93	270	5.7	7.83	270
13-Oct	97.0	7.99	280	54.0	7.99	270
17-Oct	13.0	7.72	310	33.0	7.23	270
20-Oct	9.8	7.87	310	29.0	7.88	270
24-Oct	8.8	8.09	300	9.2	8.06	270
27-Oct	86.0	8.12	310	3.8	8.09	270
31-Oct	<1.0	7.92	270	7.4	8.01	270
4-Nov	7.5	7.64	280	4.4	8.05	280
7-Nov	7.1	7.87	300	3.7	8.00	290
10-Nov	33.0	8.04	320	6.5	7.97	310
14-Nov	<1.0	8.05	300	4.5	8.07	310
17-Nov	8.4	7.50	280	16.0	8.01	280
21-Nov	6.0	8.06	270	<1.0	8.06	270
24-Nov	1.7	7.86	270	29.0	8.09	270
28-Nov	44.0	7.97	270	<1.0	7.59	260
30-Nov	<1.0	7.86	260	2.7	8.04	260
5-Dec	6.3	8.02	280	1.3	7.97	270
8-Dec	9.2	8.00	270	1.0	7.92	270
12-Dec	74.0	8.04	280	1.0	8.03	260
15-Dec	18.0	8.25	260	1.0	8.29	260
19-Dec	7.1	8.00	250	1.0	8.07	250
22-Dec	1.0	8.03	250	1.0	8.04	250

	CPF Inlet Total TSS (mg/L)	CPF Inlet Total pH (mg/L)	CPF Inlet Total EC (mg/L)	CPF Outlet Total TSS (mg/L)	CPF Outlet Total pH (mg/L)	CPF Outlet Total EC (mg/L)
SNP Station	S13L1-007-1	S13L1-007-1	S13L1-007- 1	S13L1-007-2	S13L1-007-2	S13L1- 007-2
Water Licence Criteria	n/a	n/a	n/a	n/a	Between 6 – 9	n/a
27-Dec	27.0	8.10	250	1.0	8.04	250

*June 30 sample unable to be analyzed due to Canada Day laboratory closure

Table A-3: 2022 Average Daily Chlorine and Temperature

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
1-Jan	0.06	4.5
2-Jan	0.00	4.7
3-Jan	0.00	4.9
4-Jan	0.01	5.3
5-Jan	0.02	6.0
6-Jan	0.02	5.3
7-Jan	0.02	4.3
8-Jan	0.02	4.1
9-Jan	0.02	5.4
10-Jan	0.02	5.6
11-Jan	0.02	6.0
12-Jan	0.02	6.7
13-Jan	0.00	7.2
14-Jan	0.02	7.7
15-Jan	0.02	7.8
16-Jan	0.02	7.0
17-Jan	0.01	6.6
18-Jan	0.01	7.5
19-Jan	0.01	7.3
20-Jan	0.01	5.9
21-Jan	0.01	6.1
22-Jan	0.01	7.5
23-Jan	0.01	8.7
24-Jan	0.01	9.7
25-Jan	0.01	10.0
26-Jan	0.01	10.2
27-Jan	0.01	9.2
28-Jan	0.01	7.3
29-Jan	0.01	7.2
30-Jan	0.01	7.8
31-Jan	0.01	7.6
1-Feb	0.01	8.0
2-Feb	0.01	6.2
3-Feb	0.03	6.5
4-Feb	0.02	6.1
5-Feb	0.02	7.7

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
6-Feb	0.03	6.6
7-Feb	0.01	5.4
8-Feb	0.02	7.0
9-Feb	0.01	7.7
10-Feb	0.00	7.8
11-Feb	0.00	8.0
12-Feb	0.00	8.0
13-Feb	0.02	8.7
14-Feb	0.01	6.5
15-Feb	0.03	7.1
16-Feb	0.04	7.2
17-Feb	0.01	6.9
18-Feb	0.00	8.2
19-Feb	0.06	7.4
20-Feb	0.05	6.6
21-Feb	0.05	7.0
22-Feb	0.06	8.7
23-Feb	0.01	10.0
24-Feb	0.01	9.8
25-Feb	0.04	7.9
26-Feb	0.04	7.8
27-Feb	0.03	8.0
28-Feb	0.04	9.0
1-Mar	0.03	7.1
2-Mar	0.00	9.8
3-Mar	0.01	9.8
4-Mar	0.03	10.4
5-Mar	0.04	10.5
6-Mar	0.00	9.6
7-Mar	0.00	9.2
8-Mar	0.00	9.4
9-Mar	0.00	8.8
10-Mar	0.00	8.2
11-Mar	0.00	7.5
12-Mar	0.00	6.6
13-Mar	0.00	8.6
14-Mar	0.00	9.6

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
15-Mar	0.00	9.7
16-Mar	0.00	10.5
17-Mar	0.00	10.6
18-Mar	0.00	10.5
19-Mar	0.00	8.9
20-Mar	0.00	8.7
21-Mar	0.00	8.7
22-Mar	0.00	8.7
23-Mar	0.00	9.1
24-Mar	0.00	9.8
25-Mar	0.00	9.5
26-Mar	0.00	10.4
27-Mar	0.00	10.3
28-Mar	0.00	11.0
29-Mar	0.00	11.0
30-Mar	0.00	8.3
31-Mar	0.00	7.6
1-Apr	0.01	10.0
2-Apr	0.02	10.2
3-Apr	0.02	10.5
4-Apr	0.01	10.1
5-Apr	0.00	11.1
6-Apr	0.01	11.0
7-Apr	0.02	11.8
8-Apr	0.01	12.2
9-Apr	0.00	8.5
10-Apr	0.00	9.5
11-Apr	0.00	9.3
12-Apr	0.00	10.6
13-Apr	0.00	11.1
14-Apr	0.00	10.5
15-Apr	0.00	10.1
16-Apr	0.00	12.0
17-Apr	0.00	11.3
18-Apr	0.01	11.7
19-Apr	0.00	11.6
20-Apr	0.00	12.1

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
21-Apr	0.01	11.4
22-Apr	0.01	11.3
23-Apr	0.01	12.3
24-Apr	0.00	13.1
25-Apr	0.00	13.2
26-Apr	0.00	12.6
27-Apr	0.00	12.1
28-Apr	0.01	12.2
29-Apr	0.00	13.0
30-Apr	0.00	15.1
1-May	0.00	14.2
2-May	0.00	13.6
3-May	0.00	13.6
4-May	0.00	12.7
5-May	0.00	12.4
6-May	0.00	12.6
7-May	0.00	12.7
8-May	0.00	12.3
9-May	0.00	12.1
10-May	0.00	13.0
11-May	0.00	15.7
12-May	0.00	14.9
13-May	0.00	15.6
14-May	0.00	13.0
15-May	0.00	13.0
16-May	0.00	13.0
17-May	0.00	13.7
18-May	0.00	12.2
19-May	0.00	14.5
20-May	0.00	15.5
21-May	0.00	15.0
22-May	0.00	16.6
23-May	0.00	16.6
24-May	0.00	15.7
25-May	0.03	15.6
26-May	0.03	15.8
27-May	0.03	14.3

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
28-May	0.02	15.3
29-May	0.01	16.4
30-May	0.00	17.6
31-May	0.00	17.2
1-Jun	0.00	19.5
2-Jun	0.00	20.7
3-Jun	0.00	19.3
4-Jun	0.00	19.3
5-Jun	0.00	19.4
6-Jun	0.01	19.7
7-Jun	0.00	20.0
8-Jun	0.02	19.3
9-Jun	0.02	19.4
10-Jun	0.01	20.0
11-Jun	0.01	19.1
12-Jun	0.01	17.4
13-Jun	0.00	18.8
14-Jun	0.01	19.3
15-Jun	0.00	20.6
16-Jun	0.00	21.3
17-Jun	0.00	21.7
18-Jun	0.00	22.6
19-Jun	0.00	23.7
20-Jun	0.00	22.2
21-Jun	0.00	22.1
22-Jun	0.00	23.4
23-Jun	0.00	23.8
24-Jun	0.00	23.0
25-Jun	0.00	23.0
26-Jun	0.00	23.6
27-Jun	0.00	24.9
28-Jun	0.00	24.1
29-Jun	0.00	23.9
30-Jun	0.00	24.4
1-Jul	0.00	24.5
2-Jul	0.00	24.7
3-Jul	0.00	24.7

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
4-Jul	0.00	25.2
5-Jul	0.00	25.5
6-Jul	0.00	26.4
7-Jul	0.00	25.9
8-Jul	0.00	26.3
9-Jul	0.00	26.5
10-Jul	0.00	23.7
11-Jul	0.00	25.3
12-Jul	0.00	24.8
13-Jul	0.00	23.1
14-Jul	0.00	22.7
15-Jul	0.00	21.5
16-Jul	0.00	23.7
17-Jul	0.00	25.2
18-Jul	0.00	25.0
19-Jul	0.00	25.1
20-Jul	0.00	25.9
21-Jul	0.00	26.2
22-Jul	0.00	25.9
23-Jul	0.00	25.2
24-Jul	0.00	25.6
25-Jul	0.00	26.1
26-Jul	0.00	25.3
27-Jul	0.00	25.7
28-Jul	0.00	25.3
29-Jul	0.00	24.9
30-Jul	0.00	24.9
31-Jul	0.00	26.0
1-Aug	0.00	26.1
2-Aug	0.00	26.1
3-Aug	0.00	25.1
4-Aug	0.00	22.6
5-Aug	0.00	25.2
6-Aug	0.00	25.2
7-Aug	0.00	25.0
8-Aug	0.00	25.1
9-Aug	0.00	22.4

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
10-Aug	0.00	24.0
11-Aug	0.00	24.0
12-Aug	0.00	25.1
13-Aug	0.03	26.3
14-Aug	0.00	26.2
15-Aug	0.00	26.9
16-Aug	0.00	26.6
17-Aug	0.00	26.6
18-Aug	0.00	25.6
19-Aug	0.00	25.5
20-Aug	0.00	24.8
21-Aug	0.00	25.2
22-Aug	0.00	23.7
23-Aug	0.01	25.0
24-Aug	0.01	25.6
25-Aug	0.00	26.6
26-Aug	0.00	25.9
27-Aug	0.00	25.7
28-Aug	0.00	25.7
29-Aug	0.00	24.8
30-Aug	0.00	24.2
31-Aug	0.04	24.7
1-Sep	0.05	24.3
2-Sep	0.04	24.0
3-Sep	0.01	24.2
4-Sep	0.01	23.3
5-Sep	0.01	20.8
6-Sep	0.00	20.8
7-Sep	0.01	21.2
8-Sep	0.00	21.9
9-Sep	0.00	21.8
10-Sep	0.00	20.5
11-Sep	0.00	21.2
12-Sep	0.01	21.8
13-Sep	0.01	21.9
14-Sep	0.00	21.3
15-Sep	0.00	21.5

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
16-Sep	0.00	21.6
17-Sep	0.00	20.5
18-Sep	0.01	19.6
19-Sep	0.00	19.9
20-Sep	0.00	19.5
21-Sep	0.00	19.5
22-Sep	0.00	18.3
23-Sep	0.00	16.6
24-Sep	0.00	16.8
25-Sep	0.00	16.9
26-Sep	0.00	17.2
27-Sep	0.02	16.9
28-Sep	0.02	16.2
29-Sep	0.02	16.7
30-Sep	0.00	17.8
1-Oct	0.00	17.1
2-Oct	0.00	16.8
3-Oct	0.02	17.3
4-Oct	0.00	16.2
5-Oct	0.00	16.9
6-Oct	0.01	17.3
7-Oct	0.00	18.1
8-Oct	0.00	18.4
9-Oct	0.00	18.2
10-Oct	0.02	13.4
11-Oct	0.01	13.9
12-Oct	0.01	13.5
13-Oct	0.01	11.5
14-Oct	0.02	11.6
15-Oct	0.01	10.6
16-Oct	0.00	11.8
17-Oct	0.01	12.9
18-Oct	0.01	13.7
19-Oct	0.01	12.6
20-Oct	0.01	12.1
21-Oct	0.01	12.2
22-Oct	0.01	12.4

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
23-Oct	0.02	12.2
24-Oct	0.00	11.5
25-Oct	0.01	10.6
26-Oct	0.00	9.1
27-Oct	0.01	9.6
28-Oct	0.00	9.9
29-Oct	0.02	10.2
30-Oct	0.00	10.5
31-Oct	0.01	9.1
1-Nov	0.01	10.4
2-Nov	0.00	9.2
3-Nov	0.02	10.3
4-Nov	0.02	10.6
5-Nov	0.00	11.6
6-Nov	0.02	*
7-Nov	0.00	*
8-Nov	0.01	*
9-Nov	0.00	*
10-Nov	0.03	*
11-Nov	0.00	*
12-Nov	0.00	*
13-Nov	0.00	*
14-Nov	0.02	*
15-Nov	0.00	*
16-Nov	0.00	*
17-Nov	0.01	*
18-Nov	0.00	*
19-Nov	0.00	11.9
20-Nov	0.00	11.4
21-Nov	0.00	11.6
22-Nov	0.00	12.7
23-Nov	0.00	15.7
24-Nov	0.00	*
25-Nov	0.00	*
26-Nov	0.02	*
27-Nov	0.02	*
28-Nov	0.02	*

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
29-Nov	0.00	*
30-Nov	0.01	*
1-Dec	0.00	*
2-Dec	0.01	10.9
3-Dec	0.01	*
4-Dec	0.00	*
5-Dec	0.03	*
6-Dec	0.07	*
7-Dec	0.07	*
8-Dec	0.03	*
9-Dec	0.04	*
10-Dec	0.02	*
11-Dec	0.02	*
12-Dec	0.03	*
13-Dec	0.01	*
14-Dec	0.01	*
15-Dec	0.00	*
16-Dec	0.01	*
17-Dec	0.01	*
18-Dec	0.00	*
19-Dec	0.00	*
20-Dec	0.00	*
21-Dec	0.00	*
22-Dec	0.01	*
23-Dec	0.02	*
24-Dec	0.00	*
25-Dec	0.00	*
26-Dec	0.00	*
27-Dec	0.00	*
28-Dec	0.00	*
29-Dec	0.00	*
30-Dec	0.00	*
31-Dec	0.00	*

* S13L1-0072 temperature sensor malfunctioning

Table A-4: 2022 Four Week Rolling Average (S13L1-007-02)

	TPH (mg/L)	Phenols (mg/L)	TSS (mg/L)	pH	Specific Conductivity (uS/cm)	Daily Chlorine (mg/L)	Temperature (C)
Max. Average Limit	3 mg/L	0.07 mg/L	n/a	6.0-9.0	n/a	n/a	n/a
Jan 1 - 31	<2.0	<0.0015	1.18	7.90	244.44	0.01	6.82
Feb 1 - 28	<2.0	0.0017	1.15	7.81	238.75	0.02	7.57
Mar 1 - 31	<2.0	0.0031	1.01	7.97	241.11	0.00	9.30
April 1-30	<2.0	<0.0015	<1.0	7.83	247.50	0.01	11.39
May 1-31	<2.0	<0.0015	18.32	7.83	253.33	0.00	14.39
June 1-30	<2.0	<0.0015	27.39	7.98	251.25	0.00	21.32
July 1 - 31	<2.0	<0.0015	13.75	8.01	263.75	0.00	25.06
Aug 1 - 31	<2.0	<0.0015	18.33	7.94	271.11	0.00	25.21
Sept 1 - 30	<2.0	<0.0015	13.89	8.00	273.75	0.01	20.15
Oct 1 - 31	<2.0	0.0017	18.81	7.82	270.00	0.01	13.27
Nov 1 - 30	<2.0	<0.0015	7.64	7.99	281.11	0.01	11.53*
Dec 1 - 31	<2.0	<0.0015	1.04	8.05	258.57	0.01	10.94*

*Average only includes days when temperature sensor was functioning properly

Table A-5: 2022 Quarterly Acute Lethality Data

CPF Outlet (S13L1-007-2)		
Date	Rainbow Trout (% Survival)	Daphnia Magna (% Survival)
Licence Criteria	>50% survival	>50% survival
Q1	100%	100%
Q2	100%	100%
Q3	100%	100%
Q4	100%	100%

Table A-6: 2022 Quarterly Inlet Data

SNP S13L1-007-1 (Inlet)					
	Q1 (mg/L)	Q2 (mg/L)	Q3 (mg/L)	Q4 (mg/L)	YTD Average (mg/L)
pH	6.32	7.5	7.13	7.92	7.22
Phenols	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Dissolved Sodium	8.6	6.2	8.8	8.5	8.0
Total Sodium	8.2	6.5	8.8	7.9	7.9
Dissolved Potassium	1.1	0.91	0.96	0.88	0.96
Total Potassium	0.85	1.2	2.2	1.4	1.41
Dissolved Sulphate	28	39	38	32	34
Dissolved Chloride	10	4.6	9.8	9.4	8.5
Dissolved Calcium	27	35	33	28	31
Total Calcium	24	39	60	34	39
Dissolved Magnesium	9.8	8.9	9.4	9.4	9.4
Total Magnesium	8.5	9.2	18	11	11.7
Total Alkalinity	44	93	85	78	75
Specific Conductivity	240	270	280	240	258
Total Suspended Solids	<1.0	14	6.3	<1.0	5.6
Total Dissolved Solids	160	160	170	160	163
Total Petroleum Hydrocarbons	<2.0	<2.0	<2.0	<2.0	<2.0
Total Phosphorus	<0.1	<0.1	0.33	<0.1	0.16
Total Hardness	110	120	120	110	115

Table A-7: 2022 Quarterly Outlet Data

SNP S13L1-007-2 (Outlet)					
	Q1 (mg/L)	Q2 (mg/L)	Q3 (mg/L)	Q4 (mg/L)	YTD Average (mg/L)
pH	7.61	7.53	7.11	7.9	7.54
Phenols	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Dissolved Sodium	8.6	6.8	9.1	8.7	8.3
Total Sodium	8.5	6.6	9.1	7.8	8.0
Dissolved Potassium	0.95	0.93	0.92	0.88	0.92
Total Potassium	0.9	1.1	1.4	0.8	1.1
Dissolved Sulphate	28	36	38	33	34
Dissolved Chloride	9.9	7.2	11	9.7	9.5
Dissolved Calcium	27	33	33	29	31
Total Calcium	25	33	41	26	31
Dissolved Magnesium	10	8.9	9.3	9.7	9.5
Total Magnesium	8.8	9	11	9.5	9.6
Total Alkalinity	75	86	91	78	83
Specific Conductivity	240	260	270	240	253
Total Suspended Solids	<1.0	8	6	<1.0	4.0
Total Dissolved Solids	140	160	180	140	155
Total Petroleum Hydrocarbons	<2.0	<2.0	<2.0	<2.0	<2.0
Total Phosphorus	<0.1	<0.1	<0.1	<0.1	<0.10
Total Hardness	110	120	120	110	115

Appendix B Surface Water Runoff Data

Table B-1: 2022 Surface Water Discharge Analytical Results for Category A Locations

	Date	Total Discharge Volume (m ³)	Chlorides (mg/L)	pH	Sheen (Y/N)
Sample Limits			< 500 mg/L	6.0-9.0	N
Mainland - May 2022					
F-31 Culvert	1-May	9	<250	7	N
E-30 Culvert	1-May	8	<250	7	N
F-31 Culvert	2-May	5	<250	7	N
E-30 Culvert	2-May	9.5	<250	7	N
D-42 Area	2-May	234	<250	7	N
E-33 Area	3-May	174	<250	7	N
F-31 Culvert	3-May	8	<250	7	N
F-31 Culvert	4-May	8.5	<250	7	N
D-42 Area	5-May	735	<250	7	N
D-28 Area	6-May	248	<250	7	N
D-42 Area	7-May	294	<250	7	N
Goose Island – August 2022					
N-21x Area	2-Aug	6	32	7	N
N-18x Area	3-Aug	5	30	7	N
N-15x Area	3-Aug	8	35	7	N

Table B-2: 2022 Surface Water Discharge Analytical Results for Category B Locations

	Date	Start/ Middle/ End	Total Discharge Volume (m³)	Total Petroleum Hydrocarbons (mg/L)	Phenols (mg/L)	Chlorides (mg/L)	pH	Total Suspended Solids (mg/L)	Total Dissolved Solids (mg/L)	Specific Conductivity (uS/cm)
Max Grab Sample Limit				5	0.14	<500	6.0-9.0			
Mainland Areas - May 2022										
CPF Impound Basin	3-May	Start	11712	<2.0	<0.0015	1.5	7.53	4.3	160	260
	9-May	Mid 1		<2.0	<0.0015	1.7	7.10	<1.0	180	260
	17-May	Mid 2		<2.0	0.0022	17.0	7.97	33	200	340
	24-May	Mid 3		<2.0	<0.0015	10.0	7.56	3.5	500	750
	30-May	Mid 4		<2.0	<0.0015	8.2	8.10	1.4	730	1000
Refinery Impound Basin	2-May	Start	14259	<2.0	<0.0015	3.3	7.77	2.0	190	310
	9-May	Mid 1		<2.0	<0.0015	3.2	7.55	1.3	190	310
	17-May	Mid 2		<2.0	0.0031	6.9	8.09	2.5	290	470
	24-May	Mid 3		<2.0	<0.0015	9.8	7.99	1.1	360	580
	30-May	Mid 4		<2.0	<0.0015	12.0	8.29	<1.0	390	650
LT-11 Impound Basin	3-May	Start	455	<2.0	<0.0015	<1.0	7.38	2.2	88	120
	9-May	Mid 1		<2.0	0.0026	2.5	7.02	1.4	110	170
Mainland Areas - June 2022										
CPF Impound Basin	6-Jun	Mid 5	3981	<2.0	<0.0015	9.5	7.81	1.5	860	1200
	14-Jun	Mid 7		<2.0	0.0018	7.6	7.87	<1.0	830	1100
	20-Jun	Mid 8		<2.0	0.0016	9.3	7.61	11	*	630
	27-Jun	Mid 9		<2.0	<0.0015	13	7.59	1.5	1000	1300
LT-11 Impound Basin	6-Jun	Start	852	<2.0	<0.0015	3.9	7.91	1.0	390	550
	14-Jun	Mid 1		<2.0	<0.0015	2.8	7.90	<1.0	360	510
	20-Jun	Mid 2		<2.0	0.0022	4.2	8.10	3.9	*	600
	6-Jun	Mid 5	3423	<2.0	<0.0015	16	8.22	1.8	470	720

Norman Wells Operations 2022 Annual Water Use Report

Refinery Impound Basin	14-Jun	Mid 6		<2.0	0.0033	21	8.21	3.7	550	810
	20-Jun	Mid 7		<2.0	<0.0015	19	8.18	<1.0	*	760
	27-Jun	Mid 8		<2.0	<0.0015	19	8.21	1.6	530	770
Mainland Areas - July 2022										
CPF Impound Basin	4-Jul	Mid 10	3487	<2.0	0.0037	19	7.52	1.0	1100	1400
	11-Jul	Mid 11		<2.0	0.0044	20	7.47	19	1300	1500
	18-Jul	Mid 12		<2.0	0.0015	8.1	7.78	1.7	220	370
	25-Jul	Mid 13		<2.0	<0.0015	11	7.64	1.0	520	760
Mainland Areas – September 2022										
Refinery Impound Basin	6-Sep	Start	553	<2.0	<0.0015	30	8.19	<1.0	480	770
	12-Sep	Mid 1		<2.0	<0.0015	31	8.39	<1.0	500	750
	19-Sep	End		<2.0	<0.0015	31	8.42	<1.0	490	760

* Laboratory unable to complete total dissolved solids analysis on June 20th, 2022.

**Appendix C 2022 SNP Groundwater Quality Monitoring Report
(TRSA)**



2022 SNP Groundwater Quality Monitoring

Norman Wells, NT

Imperial Oil Ltd.

28 March 2023

417085-42051-22100





THIS REPORT CONTAINS PROVISIONS LIMITING LIABILITY, THE SCOPE OF THE REPORT AND THIRD-PARTY RELIANCE

These documents and the information contained therein are confidential, property of Imperial Oil and any disclosure of same is governed by the provisions of each of the applicable provincial and territorial freedom of information legislation, the Privacy Act (Canada) 1980-81-82-83, c.111, Sch.II"1", and the Access to Information Act (Canada) 1980-81-82-83, c.111, Sch.I"1", as such legislation may be amended from time to time.

Company details

Tłegóhł Reclamation Services Advisian (TRSA)

Suite 150, 205 Quarry Park Blvd SE
Calgary, AB T2C 3E7
CANADA

Tel: 403-258-6411

PROJECT: 417085-42051-22100-CA-REP-0001: 2022 SNP Groundwater Quality Monitoring – Norman Wells, NT

Rev	Description	Author	Review	TRSA approval	Revision date
0	Issued as Final	 O. Akinyosoye	 A. Haigh	 A. Haigh	28-Mar-23

\\Worley.com\CA\Data\CAL\GBS\417085-42051 - 2022 NW Ops\22100 - SNP GW Sampling\02_Rpts\11_TechRpts&Studies\02_Final\417085-42051-22100-CA-REP-0001-2022 Surveillance Network Program-Rev0.docx



Table of Contents

1	Introduction.....	1
	1.1 Background	1
2	Scope of Work.....	2
3	Environmental Assessment Guidelines.....	3
4	Groundwater Monitoring Network	4
5	Methodology	6
	5.1 Groundwater Sampling.....	6
	5.1.1 Deviations from Sampling Program.....	6
	5.2 Statistical Analyses.....	6
	5.2.1 Shewhart-Cumulative Sum Trend Analyses	6
	5.2.2 Mann-Kendall Statistical Analyses	7
6	Results and Interpretation	8
	6.1 Site Hydrogeology.....	8
	6.1.1 Mainland	8
	6.1.2 Bear Island and Goose Island.....	8
	6.2 Groundwater Analytical Results	9
	6.2.1 Routine Potability Parameters and Major Ions	9
	6.2.2 Dissolved Metals	9
	6.2.3 Petroleum Hydrocarbon Parameters	10
	6.3 Mann-Kendall Statistical Analyses.....	10
7	Field and Laboratory Quality Assurance/Quality Control.....	12
8	Summary	13
9	Closure	14
10	References	15



Tables within Text

Table 4-1	SNP Monitoring Locations	4
Table 6-1	Statistically-Notable Groundwater Hydrochemical Trends.....	11

Figures

Figure 1	Site Plan
Figure 2A	Groundwater Surface Elevations – Mainland (August 2022)
Figure 2B	Groundwater Surface Elevations – Mainland (September 2022)
Figure 3A	Groundwater Surface Elevations – Goose Island and Bear Island (August 2022)
Figure 3B	Groundwater Surface Elevations – Goose Island and Bear Island (September 2022)
Figure 4A	Groundwater Analytical Results: Dissolved Chloride (August 2022)
Figure 4B	Groundwater Analytical Results: Dissolved Chloride (September 2022)
Figure 5A	Groundwater Analytical Results: Petroleum Hydrocarbon Parameters (August 2022)
Figure 5B	Groundwater Analytical Results: Petroleum Hydrocarbon Parameters (September 2022)

Tables

Table 1	Monitoring Well Installation Details: Datum/Groundwater Surface Elevations and Hydraulic Conductivities
Table 2	Groundwater Analytical Results: Field Parameters
Table 3	Groundwater Analytical Results: Indicator Analysis Parameters
Table 4	Groundwater Analytical Results: Dissolved Metals and Trace Elements
Table 5	Groundwater Analytical Results: Petroleum Hydrocarbons



Appendices

Appendix A Limitation of Liability, Scope of Report, and Third-Party Reliance

Appendix B Background Geochemical Statistical Summary

Appendix C Field Methodologies

C.1 Groundwater Sampling Methods

C.1.1 Field Measurements, Sampling and Handling

Appendix D Laboratory Analytical Reports

Appendix E Quality Assurance/Quality Control

E.1 Quality Assurance/Quality Control (QA/QC)

E.1.1 Field QA/QC Program

E.1.2 Laboratory QA/QC Program

Appendix F Mann–Kendall Statistical Analyses



1 Introduction

Tłegóhłı Reclamation Services Advisian (TRSA) was retained to complete groundwater sampling activities in support of Imperial Oil Resources N.W.T. Limited's (Imperial) Norman Wells Operation (NWO). The NWO is an upstream oil and gas field located 700 km northwest of Yellowknife, Northwest Territories (NT; Latitude 65° 17' N, Longitude 126°51' W; the "Site"). Operations include a Central Processing Facility (CPF) on the northeastern shore of the Mackenzie River which receives production from wells on the mainland, three natural islands (Goose Island, Bear Island and Frenchy's Island), and six artificial islands (Figure 1).

The following report provides the 2022 groundwater monitoring results as per Imperial's Water Licence S13L1-007.

Limitations of Liability, Scope of Report and Third-Party Reliance for this report are provided in Appendix A.

1.1 Background

The Norman Wells Operations Groundwater Management Plan (GMP) was created in September 2014 (and updated in September 2015) as part of Imperial's Water Licence Renewal Application submitted to the Sahtu Land and Water Board (Imperial 2014 and 2015). A key component of the GMP is the sampling of a select subset of existing groundwater monitoring wells installed at strategic locations between operating facilities and potential receptors across the Site, referred to as the Groundwater Surveillance Network Program (SNP). These wells are sampled twice annually in accordance with the GMP, in order to provide ongoing monitoring of groundwater conditions adjacent to Site activities. The goal of the SNP is to identify existing groundwater quality issues and to provide early detection of groundwater changes across the Site.



2 Scope of Work

TRSA was retained by Imperial to conduct groundwater monitoring and sampling activities for the established surveillance network. The scope of work for the 2022 groundwater monitoring program at the Site included the following:

- Check monitoring well integrity and measure static groundwater levels of 15 groundwater monitoring wells.
- Collect groundwater samples for laboratory analysis of dissolved chloride and benzene, toluene, ethylbenzene and total xylenes (BTEX), as well as petroleum hydrocarbon (PHC) fractions F1 and F2, and select metals and major ions as per the GMP.
- Provide a summary report presenting the results of the 2022 groundwater sampling program.

The GMP has identified chloride and BTEX as primary indicator parameters of concern for the Site. As such, data analysis herein is focussed on those parameters.

In addition, a number of other parameters have been identified as primary indicators that may be indicative of site-influenced groundwater chemistry. Results for these parameters are included in the data tables; trend analysis remains focussed on the parameters identified in the GMP. These parameters include:

- major ions
 - sulphate, calcium, total dissolved solids (TDS).
- dissolved metals
 - aluminium, arsenic, cadmium, chromium (+3), molybdenum, nickel, selenium, uranium, zinc.



3 Environmental Assessment Guidelines

Groundwater quality assessment parameters in this report are compared to the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines for the Protection of Freshwater Aquatic Life (FWAL; CCME 2019), as surface water bodies, specifically Bosworth Creek and the Mackenzie River, are potential receptors of groundwater in most areas of interest for this program.

Background concentrations of key geochemical parameters were calculated in 2019 for different geographical areas and geological units using data collected primarily between 1998 and 2019 (Appendix B). Background groundwater geochemical parameters were characterized throughout the Site based on the hydrogeological zone where the monitoring well is completed, as well as evidence for the presence or absence of natural crude oil and saline water seepage in the vicinity. Relevant background concentrations are also provided in the analytical tables for comparison to the collected data.

It should be emphasized that the aforementioned guidelines are used for comparative purposes only in the context of this report.



4 Groundwater Monitoring Network

12 monitoring wells and three contingency wells make up the SNP per Imperial's Water Licence S13L1-007. These wells were selected based on proximity to operating facilities and potential receptors, historical groundwater quality, well completion information, and overall Site coverage. The contingency wells serve as replacement sampling locations in the event that a primary SNP monitoring well is dry, damaged, frozen, or otherwise cannot be sampled during a scheduled sampling event.

The main receptors identified during the development of the SNP were the Mackenzie River, Bosworth Creek, and the Town of Norman Wells. A summary of the selected monitoring wells is provided below as Table 4-1.

Table 4-1 SNP Monitoring Locations

Monitoring Well	Location	Rationale for Selection
CPF 97-7-5	Mainland West	Situated between CPF and Bosworth Creek
CPF 98-8-3	Mainland West	Situated between CPF and Mackenzie River
WSY 97-1-5	Mainland East	Situated between Well Services Yard and Bosworth Creek
ARB-12-3-3	Mainland East	Adjacent Biocell 1
C38 08-1-4	Mainland East	Situated between known historical well issues (C-36X) and Mackenzie River
TF 03-12-3	Mainland East	Situated between Tank Farm and Mackenzie River; downgradient of known hydrocarbon source
MTF 97-1-5	Mainland East	Situated between Tank Farm and Town of Norman Wells
BIS 97-1-3	Bear Island	Situated between Bear Island Sump #5 and the Mackenzie River
BI-13-3-4.5	Bear Island	Situated near Bear Island Sump #6 and the Mackenzie River
BIBG-20-01-4	Bear Island	Situated at western edge of development on Bear Island, near Mackenzie River
GIBG-10-2-3	Goose Island	Situated between well pads and Mackenzie River
GIQ8-10-2-4	Goose Island	Situated between fuel storage/handling area and the Mackenzie River
GIP11 09-1-4-R	Goose Island	Situated between a sump and the Mackenzie River - reinstalled as GIP11 09-1-4-R in 2018
Contingency Wells*		
MEBG-10-1-3	Mainland East	Situated between Mainland Sumps and Mackenzie River
BI-13-1-4	Bear Island	Situated near Bear Island Sump #6 and the Mackenzie River
Inactive Wells**		
GIP11 09-1-4	Goose Island	Situated between a sump and the Mackenzie River – well was abandoned in 2018 and reinstalled as GIP11 09-1-4-R



Monitoring Well	Location	Rationale for Selection
BIBG-10-1-4	Bear Island	Situated at western edge of Bear Island, south of the Mackenzie River – meant to replace damaged SNP well BIBG-12-1-7 – noted damaged in 2020 and replaced by BIBG-20-01-4
BIBG-12-1-7	Bear Island	Situated at western edge of development on Bear Island, near Mackenzie River – well was replaced by BIBG-20-1-4 in fall 2020

Notes:

* Wells serve as contingency monitoring locations in the event that a sample cannot be collected from all primary SNP locations.

**Wells that have been damaged and are replaced but historical data are reported.

In 2018, GIP11 09-1-4 was abandoned and reinstalled as GIP11 09-1-4-R in the same location at the same depth, as the original well was damaged and could not be sampled.

In 2019, BIBG-10-1-4 was sampled instead of the primary SNP well BIBG-12-1-7, which was badly damaged. During 2020, well BIBG-10-1-4 was also observed to be damaged and could not be sampled in the fall. A new well (BIBG-20-01-4) was installed to replace both BIBG-12-1-7 and BIBG-10-1-4. Installation details for the new well are provided in Table 1.

Historical data for GIP11 09-1-4, BIBG-12-1-7, and BIBG-10-1-4 are included in this report for comparison purposes.



5 Methodology

5.1 Groundwater Sampling

The SNP groundwater monitoring was conducted by TRSA personnel in August and September 2022. The field sampling schedule targets middle and late summer when groundwater is most active (i.e. not frozen).

Groundwater samples were collected using dedicated/disposable bailers following no-purge methodology. A total of 24 groundwater samples and three field duplicate samples, one field blank sample, and one trip blank sample were collected in pre-cleaned laboratory-provided bottles as part of the SNP. Results were compared to the CCME FWAL guidelines, background chemistry, and historical records, as applicable.

All groundwater samples were submitted for laboratory analysis at an accredited third-party laboratory in Edmonton (Bureau Veritas Laboratories) in accordance with standard packaging, preservation, and chain-of-custody procedures.

The methodology for collecting groundwater samples is detailed in Appendix C and laboratory analytical reports are provided in Appendix D.

5.1.1 Deviations from Sampling Program

Water samples were collected in the summer and fall of 2022 from most planned sampling locations except for WSY 97-1-5 (September), BIBG-13-1-4 (August), BIBG-12-1-7, and GIBG-10-2-3.

- Well WSY 97-1-5 could not be sampled in September 2022 because of insufficient water.
- Well BIBG-13-1-4 could not be sampled in August 2022 due to fill in reason.
- Well BIBG-12-1-7 was first observed to be damaged in 2015 and could not be located in 2020, and so is now presumed destroyed. A sample was collected in the spring of 2020 from nearby monitoring well BIBG-10-1-4 for the purposes of maintaining adequate spatial coverage, but this well was also recently observed to be damaged and has not been sampled since. Monitoring well BIBG-20-1-4 was installed in 2020 to serve as a replacement sampling location for BIBG-12-1-7 but was not sampled when visited in 2022 as it was damaged.
- Location GIBG-10-2-3 was also observed to have been damaged by ice in 2021, and as such could not be sampled during the 2022 program.

5.2 Statistical Analyses

5.2.1 Shewhart-Cumulative Sum Trend Analyses

Combined Shewhart–Cumulative Sum (CUSUM) control charts provide a common means of statistical trend evaluation in many environmental monitoring programs and are in fact the only statistical procedure that is directly recommended for use in intra-well monitoring by the United States Environmental



Protection Agency (1989 and 1992). The Shewhart control chart is designed to detect an immediate increase over the background distribution for a particular monitoring parameter, whereas the CUSUM control chart is designed to detect more gradual increases over background (Gibbons 1999).

5.2.2 Mann-Kendall Statistical Analyses

The non-parametric Mann–Kendall test for trend can be used in combination with a modified version of Sen’s non-parametric slope estimator (Gibbons 1994). In both tests, four or more points of data are placed in chronological order, and the sign of the differences between all forward combinations of data pairs are used to compute the Mann–Kendall statistic (S). The Mann–Kendall statistic (S), along with the number of data points (n), is used for the normal approximation test, and the results yield a probability from 0 to 1.

Sen’s slope is used to provide an approximate magnitude of change on trend lines. Sen’s slope is calculated by evaluating the slope between all forward combinations of data pairs. The slopes are then ranked, and the median slope value is selected. Unlike least squares regression, the Sen’s slope is not greatly affected by gross outliers, which are occasionally encountered in groundwater chemistry data. Slopes are presented in absolute terms (milligrams per litre [mg/L] per year] and/or normalized relative to the median concentration (% change per year).

In each case, trend analyses are conducted using the available data series collected following installation of the monitoring wells. The Mann–Kendall statistics are evaluated only on datasets where at least four data points exist. It is important to note that some parameters returned “below detection” results for part or all of the location’s sampling history.

To indicate potentially significant temporal trends, results are screened according to three criteria:

- the probability of a trend;
- slope (in mg/L per year); and
- normalized slope (in % per year).

Location-specific discussions of statistical trend details and results are provided in Section 6.3.



6 Results and Interpretation

6.1 Site Hydrogeology

Monitoring well datum and groundwater surface elevations are presented in Table 1 and Figures 2A/B and 3A/B. Elevations are provided in metres above sea level (masl).

6.1.1 Mainland

Groundwater surface elevations do not indicate a consistent groundwater flow direction for the Mainland area. This is due, in part, to the wide spatial distribution of the SNP monitoring wells, and to the presence of discontinuous permafrost beneath the Site. Ice lenses in the subsurface act as barriers to groundwater movement, due to the comparatively low hydraulic conductivity associated with frozen soil. As a result, groundwater flow conditions beneath the Site are complex, and small-scale local variations are inferred to be present in many areas.

Generally speaking, groundwater is inferred to flow predominantly towards the Mackenzie River, with localized flow towards Bosworth Creek. More extensive historical monitoring events at the Site confirm this interpretation (Advisian 2019).

Groundwater surface elevations ranged from 54.28 to 63.6 masl in August (Figure 2A) and from 55.65 to 63.52 masl in September (Figure 2B). In general, hydraulic head is higher towards the north end of the Site and decreases with proximity to the Mackenzie River, following local topography.

6.1.2 Bear Island and Goose Island

Generally, groundwater surface elevations on Bear Island and Goose Island mimic the surface topography, with local flow directions inferred to be from high ground towards the closest surface water body. In most cases, the closest water body is the Mackenzie River; however, a number of unnamed surface water bodies also exist on both Islands (Figure 1).

Groundwater surface elevations on Bear Island were only collected from one location during the August 2022 program (BIS 97-1-3), having an elevation of 46.68 (Figure 3A). In September 2022 groundwater elevations varied from and from 47.89 to 49.14 masl (Figure 3B).

The groundwater surface elevation on Goose Island was not available in August 2022 (Figure 3A) and had a value of 44.98 masl in September 2022 (Figure 3B) at GIQ8-10-2-4. Groundwater surface elevation ranges could not be calculated in 2022 due to GIBG-10-2-3 being damaged by ice and GIP11 09-1-4-R missing survey data.



6.2 Groundwater Analytical Results

Current groundwater chemistry data are presented in Tables 2 through 6. Analytical exceedances for primary indicators, as compared to the CCME FWAL guidelines and background chemistry, are presented in Figures 4A/B and 5A/B.

The 2022 laboratory analytical reports, including primary indicator parameters and other associated chemistry data, are compiled in Appendix D. A description and summary of the quality assurance and quality control (QA/QC) program is provided in Appendix E.

The background geochemistry for the Norman Wells field was revised in 2019 (Appendix B). Estimated natural background geochemistry for shallow groundwater has been included for comparison purposes in Tables 3 through 6. These background values are referred to periodically in the discussion below.

6.2.1 Routine Potability Parameters and Major Ions

Two monitoring wells (ARB-12-3-3 and TF 03-12-3) had dissolved chloride concentrations below the CCME FWAL guideline but above the calculated background concentration for Mainland surficial sediments during one or both monitoring events in 2022 (Table 3). All monitoring wells were within calculated background concentration for sulphate, with the exception of MTF 97-1-5 and MEBG-10-1-3. Calcium values from summer and fall samples exceeded applied background concentrations at CPF 97-7-5 and MEBG-10-1-3. A calcium background exceedance was also noted at MTF 97-1-5 during the summer sampling event only. Iron concentration across all wells on the mainland location had values greater than the applied guideline except for ARB-12-3-3, CPF 98-8-3, and MTF 97-1-5. TDS values across all wells were generally within background concentrations apart from values recorded at MEBG-10-1-3.

At the Bear Island and Goose Island locations, BIS 97-1-3 and GIQ8-10-2-4 had dissolved chloride concentrations below the CCME FWAL guideline but above the calculated background concentration during both monitoring events in 2022. Sulphate concentrations were all within calculated background concentration and guideline values. Calcium concentration was also within guideline and background values at all monitoring well locations on Bear and Goose Island aside GIQ8-10-2-4, which had calcium concentrations above calculated background values. Iron concentration was above guideline values in all monitoring wells in this location. All wells across the Bear Island and Gosse Island locations were below calculated background concentrations.

All remaining 2022 analytical results were below both the CCME FWAL guidelines and the calculated background concentrations for Mainland and Island surficial sediments (Figures 4A/B and Table 2).

6.2.2 Dissolved Metals

Aluminum concentration generally exceeded guideline and background values across all wells on the Mainland location. Arsenic and nickel concentrations were also below guideline and background values at all monitoring wells in this location aside TF 03-12-3. Similarly, cadmium concentration was generally below guideline and background values with the exception of CPF 97-7-5, MEBG-10-3, and MTF 97-1-5. Molybdenum values were above background concentration at ARB-12-3-3, MEBG-10-1-3, MTF 97-1-5,



and TF 03-12-3. Selenium exceedances were noted at ARB-12-3-3, C38 08-1-4, MTF 97-1-5, and TF 03-12-3. Chromium and zinc showed no background or guideline exceedances across all wells sampled on the mainland location.

Monitoring wells in the Bear and Goose Island location showed aluminum exceedances with the exception of GIQ8-10-2-4. Arsenic exceedances were recorded at BI-13-14, BI-13-3-4.5, and GIQ8-10-2-4. Cadmium was generally within guideline and background values at all monitoring well locations aside BI-13-3-4.5. Chromium values across all monitoring well locations on Bear and Goose island were below guideline and background concentrations. A molybdenum exceedance was only noted at one monitoring well across all locations, BI-13-3-4.5. Nickel exceedances were noted at BI-13-3-4.5 and GIQ8-10-2-4. Selenium concentrations were recorded above guideline and background concentrations at BI-13-3-4.5, GIP11 09-1-4-R, and GIQ8-10-2-4. Uranium concentrations were at guideline in GIQ8-10-2-4 and above guideline in BI-13-3-4.5. Zinc exceeded guideline and background concentrations at GIQ8-10-2-4, this was the only recorded exceedance for this parameter across all locations.

Dissolved metals results are included in Table 4.

6.2.3 Petroleum Hydrocarbon Parameters

Generally, PHC parameter concentrations were below the applied guidelines and reported detection limits (RDLs), with the exception of below-guideline detections of benzene at C38 08-1-4 (summer and fall) and toluene at GIQ8-10-2-4 (fall only; Figures 5A/B and Table 5). Both benzene results were less than five times the RDL. Benzene was first detected at C38 08-1-4 in 2019, and the toluene detection was a first-time detection at GIQ8-10-2-4.

6.3 Mann-Kendall Statistical Analyses

Mann-Kendall statistical analyses have been performed for primary indicator parameters having four or more historical data points.

Locations were identified as exhibiting statistically-notable trends if the following criteria were met:

- >95% probability of occurrence (two-sided p-value <0.05); and
- significant rate of change (normalized slope > $\pm 10\%$ per year).

A decreasing trend indicates that concentrations are decreasing over time, while an increasing trend indicates that concentrations are increasing over time. Statistical analyses, trend charts, and a summary table are presented in Appendix F, and relevant trends are summarized in Table 6-1.



Table 6-1 Statistically-Notable Groundwater Hydrochemical Trends

Monitoring Location	Parameter	Trend	N*	Discussion
C38 08-1-4	Chloride	↓	23	Decreasing trend in dissolved chloride concentrations supported by 23 data points.
CPF 98-8-3	Chloride	↓	18	Decreasing trend in dissolved chloride concentrations supported by 18 data points.
TF 03-12-3	Chloride	↓	28	Decreasing trend in dissolved chloride concentrations supported by 28 data points.
BIBG-10-1-4	Chloride	↑	13	Increasing trend in dissolved chloride concentrations supported by 13 data points. Field observations indicate that this well may be damaged below grade and results may not be representative of aquifer conditions. Concentrations remain well below the CCME FWAL guideline. No samples have been collected from BIBG-10-1-4 since 2020, this trend was previously identified in 2020.
GIQ8-10-2-4	Chloride	↑	18	Increasing trend in dissolved chloride concentrations supported by 18 data points. Results remain well below the applied guideline and, at this time, do not suggest an active source.

Note:

N* = Number of supporting data points in historical dataset.



7 Field and Laboratory Quality Assurance/Quality Control

A QA/QC program was followed to manage and quantify the quality of the investigation results. The program included field procedures, laboratory procedures, and the use of QC samples to quantify the results of the program.

Field QC sampling included three duplicate samples, one field blank sample, and one groundwater trip blank sample.

The laboratory QA/QC analyses are provided in the laboratory certificates of analysis, presented in Appendix D. The laboratory QA/QC program included calibration checks, surrogate matrix spikes, blanks and laboratory duplicates during analyses. Any data quality issues are discussed in the laboratory data checklists provided in Appendix D.

The results of the field QA/QC sample analyses are presented in Appendix E.

All field and trip blank results were below the laboratory RDLs (Table E-1).

Based on the QA/QC analyses, the data are considered fit for the purpose of this report.



8 Summary

Groundwater quality monitoring for the SNP was completed in August and September 2022. Activities included measurement of groundwater surface elevations and collection of groundwater samples for laboratory analyses including primary indicator parameters (dissolved chloride and BTEX), dissolved metals, and major ions. A summary of the general conclusions from the 2022 sampling program is as follows:

- Due to the areal variability of permafrost presence across the Site and the wide spatial distribution of SNP wells, groundwater surface elevations from the SNP well network alone are insufficient to interpret a consistent flow direction. Based on more extensive monitoring programs at the Site, groundwater on the Mainland is generally inferred to flow predominantly towards the Mackenzie River, with localized flow towards Bosworth Creek. However, in some areas, groundwater flow is effectively static due to presence of permafrost. Groundwater surface elevations on Bear and Goose Island reflect the surface topography, with local flow directions inferred to be from high ground towards the closest surface water body;
- Dissolved chloride concentrations were below the applied CCME FWAL guideline at all monitoring locations, and exceeded the expected background concentration at four locations (ARB-12-3-3, TF 03-12-3, BIS 97-1-3, and GIQ8-10-2-4);
- Most analyzed PHC parameters results were below the applied guidelines and background concentrations, with the exception of C38-08-1-4 and GIQ8-10-2-4. Most were also below reportable detection limits, with the exception of benzene detected at C38 08-1-4 and xylenes at GIQ8-10-2-4 in 2022.
- Mann-Kendall trend analyses indicated three statistically significant decreasing trends (dissolved chloride at C38 08-1-4, CPF 98-8-3, and TF 03-12-3) and two statistically significant increasing trends (dissolved chloride at BIBG-10-1-4, and GIQ8-10-2-4).
- No new wells were reported to be damaged during the 2022 sampling event. BIBG-20-01-4 and GIBG-10-2-3 are primary SNP monitoring locations that were damaged in 2021 and, thus, were not sampled during the 2022 sampling program.



9 Closure

We trust that this report satisfies your current requirements and provides suitable documentation for your records. If you have any questions or require further details, please contact the undersigned at any time.

Report Prepared by:

A handwritten signature in black ink, appearing to read "Ola Akinyosoye".

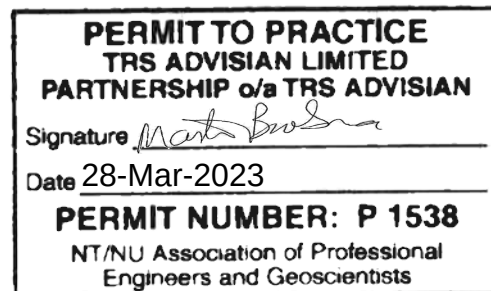
Ola Akinyosoye, B.Sc.
Environmental Scientist

Senior Review by:



28-Mar-2023

Alex Haigh, P. Eng (NT/NU, AB)
Environmental Engineer



Tłegóhłı Reclamation Services Advisian

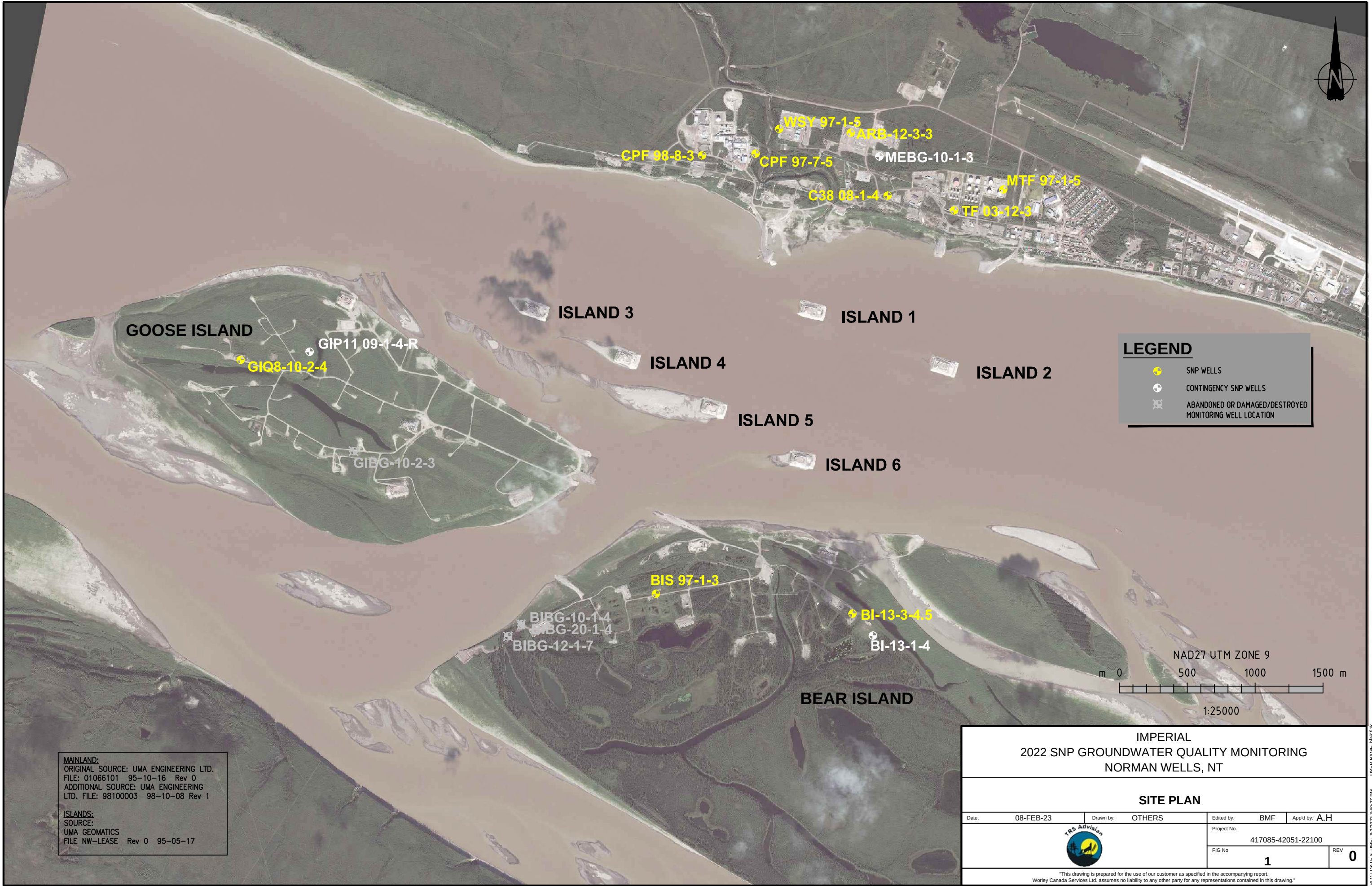


10 References

- Advisian 2019. 2019 Groundwater and Surface Water Quality Monitoring Report – E&PS Areas – Norman Wells, NT. Prepared for Imperial. December 2019.
- CCME (Canadian Council of Ministers of the Environment) 2019. Canadian Environmental Quality Guidelines – Water Quality Guidelines for the Protection of Freshwater Aquatic Life. Canadian Council of Ministers of the Environment. 2019.
- Gibbons, R.D. 1994. Statistical Methods for Groundwater Monitoring. Wiley Interscience. pp. 286.
- Gibbons, R.D. 1999. Use of Combined Shewhart-CUSUM Control Charts for Ground Water Monitoring Applications. Ground Water Journal, Vol. 37, No. 5, pp. 682-691. September-October 1999.
- Imperial (Imperial Oil Resources NWT Limited) 2014. Norman Wells Operations Groundwater Management Plan. Report prepared for the Sahtu Land and Water Board. September 2014.
- Imperial (Imperial Oil Resources NWT Limited) 2015. Norman Wells Operations Groundwater Management Plan. Report prepared for the Sahtu Land and Water Board. September 2015.
- USEPA (United States Environmental Protection Agency) 1989. Interim Final Guidance Document: Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities. April 1989.
- USEPA (United States Environmental Protection Agency) 1992. Addendum to Interim Final Guidance Document: Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities. July 1992.



Figures



MAINLAND:
ORIGINAL SOURCE: UMA ENGINEERING LTD.
FILE: 01066101 95-10-16 Rev 0
ADDITIONAL SOURCE: UMA ENGINEERING LTD.
FILE: 98100003 98-10-08 Rev 1

ISLANDS:
SOURCE:
UMA GEOMATICS
FILE NW-LEASE Rev 0 95-05-17

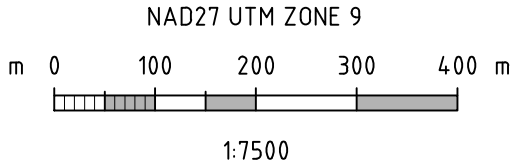
IMPERIAL 2022 SNP GROUNDWATER QUALITY MONITORING NORMAN WELLS, NT			
SITE PLAN			
Date: 08-FEB-23	Drawn by: OTHERS	Edited by: BMF	App'd by: A.H
		Project No. 417085-42051-22100	REV 0
		FIG No 1	
"This drawing is prepared for the use of our customer as specified in the accompanying report. Worley Canada Services Ltd. assumes no liability to any other party for any representations contained in this drawing."			



LEGEND

- INJECTION WELL LOCATION
- PRODUCTION WELL LOCATION
- ESSO LEASE BOUNDARY
- PIPELINES
- UTILIDOR LOCATION
- MONITORING WELL LOCATION
- GROUNDWATER SURFACE ELEVATION (m.a.s.l.) (AUGUST 2022)

SOURCES:
1. SITE PLAN AS PER UMA ENGINEERING LTD. FILES 010166101 (REV 0 DATED 95-10-16) AND 98100003 (REV 1 DATED 98-10-08).
2. 2017 AERIAL PHOTOGRAPH FROM PLANT LABS GEOMATICS CORP. IMAGE DATE AUGUST 6 AND 30, 2017.



IMPERIAL
2022 SNP GROUNDWATER QUALITY MONITORING
NORMAN WELLS, NT

GROUNDWATER SURFACE ELEVATIONS -
MAINLAND (AUGUST 2022)

Date:	08-FEB-23	Drawn by:	OTHERS	Edited by:	BMF	App'd by:	A.H
				Project No.	417085-42051-22100		
				FIG No	2A		REV 0



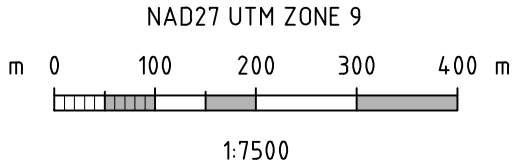
This drawing is prepared for the use of our customer as specified in the accompanying report.
Worley Canada Services Ltd. assumes no liability to any other party for any representations contained in this drawing.



LEGEND

- INJECTION WELL LOCATION
- PRODUCTION WELL LOCATION
- ESSO LEASE BOUNDARY
- PIPELINES
- UTILIDOR LOCATION
- MONITORING WELL LOCATION
- GROUNDWATER SURFACE ELEVATION (m.a.s.l.) (SEPTEMBER 2022)
- NOT MEASURED

SOURCES:
1. SITE PLAN AS PER UMA ENGINEERING LTD. FILES 010166101 (REV 0 DATED 95-10-16) AND 98100003 (REV 1 DATED 98-10-08).
2. 2017 AERIAL PHOTOGRAPH FROM PLANT LABS GEOMATICS CORP. IMAGE DATE AUGUST 6 AND 30, 2017.



IMPERIAL
2022 SNP GROUNDWATER QUALITY MONITORING
NORMAN WELLS, NT

GROUNDWATER SURFACE ELEVATIONS -
MAINLAND (SEPTEMBER 2022)

Date:	08-FEB-23	Drawn by:	OTHERS	Edited by:	BMF	App'd by:	A.H
		Project No.		417085-42051-22100			
		FIG No		2B		REV 0	



This drawing is prepared for the use of our customer as specified in the accompanying report.
Worley Canada Services Ltd. assumes no liability to any other party for any representations contained in this drawing.



LEGEND

- 

INJECTION WELL LOCATION
- 

PRODUCTION WELL LOCATION
- 

ESSO LEASE BOUNDARY
- 

PIPELINES
- 

UTILIDOR LOCATION
- 

MONITORING WELL LOCATION
- 

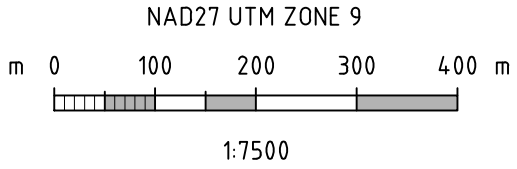
ABANDONED OR DAMAGED/DESTROYED MONITORING WELL LOCATION
- 

GROUNDWATER SURFACE ELEVATION (m.a.s.l.) (AUGUST 2022)
- 

NOT MEASURED (WELL ABANDONED OR DAMAGED/DESTROYED)
- 

SURVEY DATA OR WATER LEVEL MEASUREMENT NOT AVAILABLE

SOURCES:
1. SITE PLAN AS PER UMA ENGINEERING LTD. FILES 010166101 (REV 0 DATED 95-10-16) AND 98100003 (REV 1 DATED 98-10-08).
2. 2017 AERIAL PHOTOGRAPH FROM PLANT LABS GEOMATICS CORP. IMAGE DATE AUGUST 6 AND 30, 2017.



IMPERIAL
2022 SNP GROUNDWATER QUALITY MONITORING
NORMAN WELLS, NT

GROUNDWATER SURFACE ELEVATIONS -
GOOSE ISLAND AND BEAR ISLAND (AUGUST 2022)

Date:	08-FEB-23	Drawn by:	OTHERS	Edited by:	BMF	App'd by:	A.H
		Project No.		417085-42051-22100			
		FIG No		3A		REV 0	



This drawing is prepared for the use of our customer as specified in the accompanying report.
Worley Canada Services Ltd. assumes no liability to any other party for any representations contained in this drawing.



LEGEND

- 

INJECTION WELL LOCATION
- 

PRODUCTION WELL LOCATION
- 

ESSO LEASE BOUNDARY
- 

PIPELINES
- 

UTILIDOR LOCATION
- 

MONITORING WELL LOCATION
- 

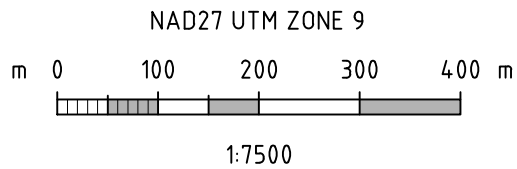
ABANDONED OR DAMAGED/DESTROYED MONITORING WELL LOCATION
- 

GROUNDWATER SURFACE ELEVATION (m.a.s.l.) (SEPTEMBER 2022)
- 

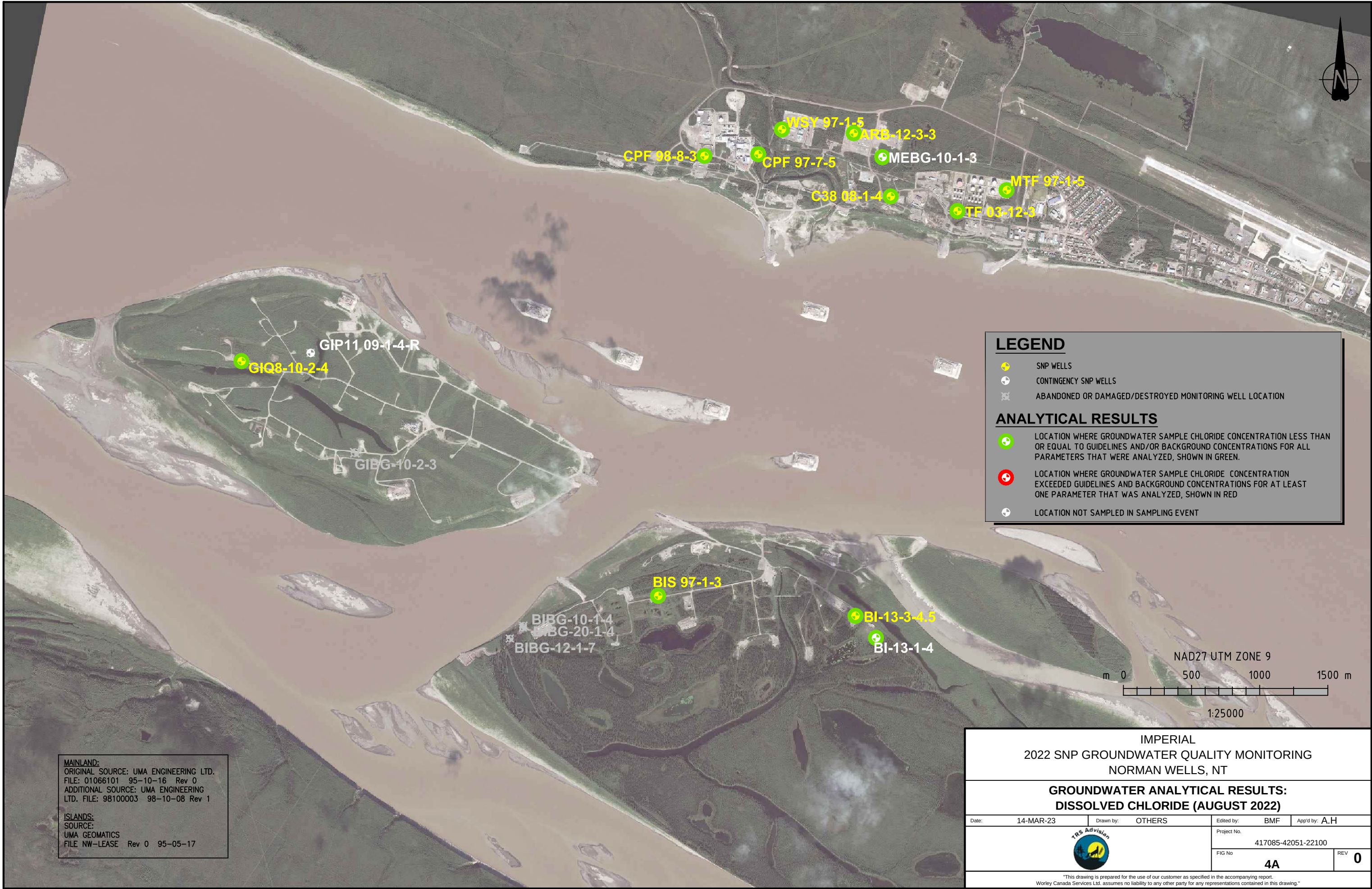
NOT MEASURED (WELL ABANDONED OR DAMAGED/DESTROYED)
- 

SURVEY DATA NOT AVAILABLE

SOURCES:
1. SITE PLAN AS PER UMA ENGINEERING LTD. FILES 010166101 (REV 0 DATED 95-10-16) AND 98100003 (REV 1 DATED 98-10-08).
2. 2017 AERIAL PHOTOGRAPH FROM PLANT LABS GEOMATICS CORP. IMAGE DATE AUGUST 6 AND 30, 2017.



IMPERIAL							
2022 SNP GROUNDWATER QUALITY MONITORING							
NORMAN WELLS, NT							
GROUNDWATER SURFACE ELEVATIONS -							
GOOSE ISLAND AND BEAR ISLAND (SEPTEMBER 2022)							
Date:	08-FEB-23	Drawn by:	OTHERS	Edited by:	BMF	App'd by:	A.H
		Project No.				417085-42051-22100	
		FIG No				3B	
		REV				0	
*This drawing is prepared for the use of our customer as specified in the accompanying report.							
Worley Canada Services Ltd. assumes no liability to any other party for any representations contained in this drawing.*							



MAINLAND:
ORIGINAL SOURCE: UMA ENGINEERING LTD.
FILE: 01066101 95-10-16 Rev 0
ADDITIONAL SOURCE: UMA ENGINEERING LTD.
FILE: 98100003 98-10-08 Rev 1

ISLANDS:
SOURCE:
UMA GEOMATICS
FILE NW-LEASE Rev 0 95-05-17

LEGEND

●

 SNP WELLS

⊕

 CONTINGENCY SNP WELLS

⊗

 ABANDONED OR DAMAGED/DESTROYED MONITORING WELL LOCATION

ANALYTICAL RESULTS

●

 LOCATION WHERE GROUNDWATER SAMPLE CHLORIDE CONCENTRATION LESS THAN OR EQUAL TO GUIDELINES AND/OR BACKGROUND CONCENTRATIONS FOR ALL PARAMETERS THAT WERE ANALYZED, SHOWN IN GREEN.

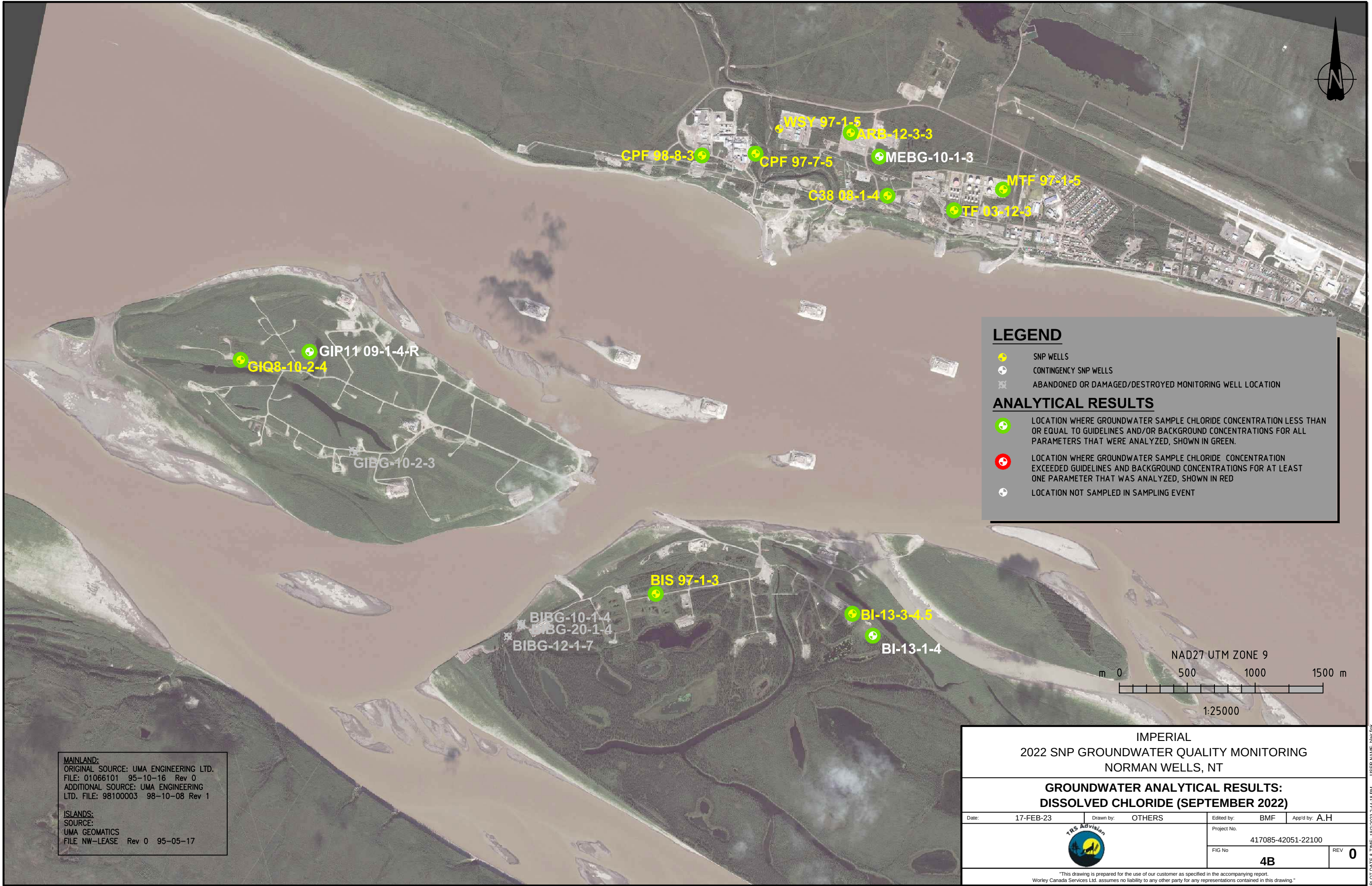
⊕

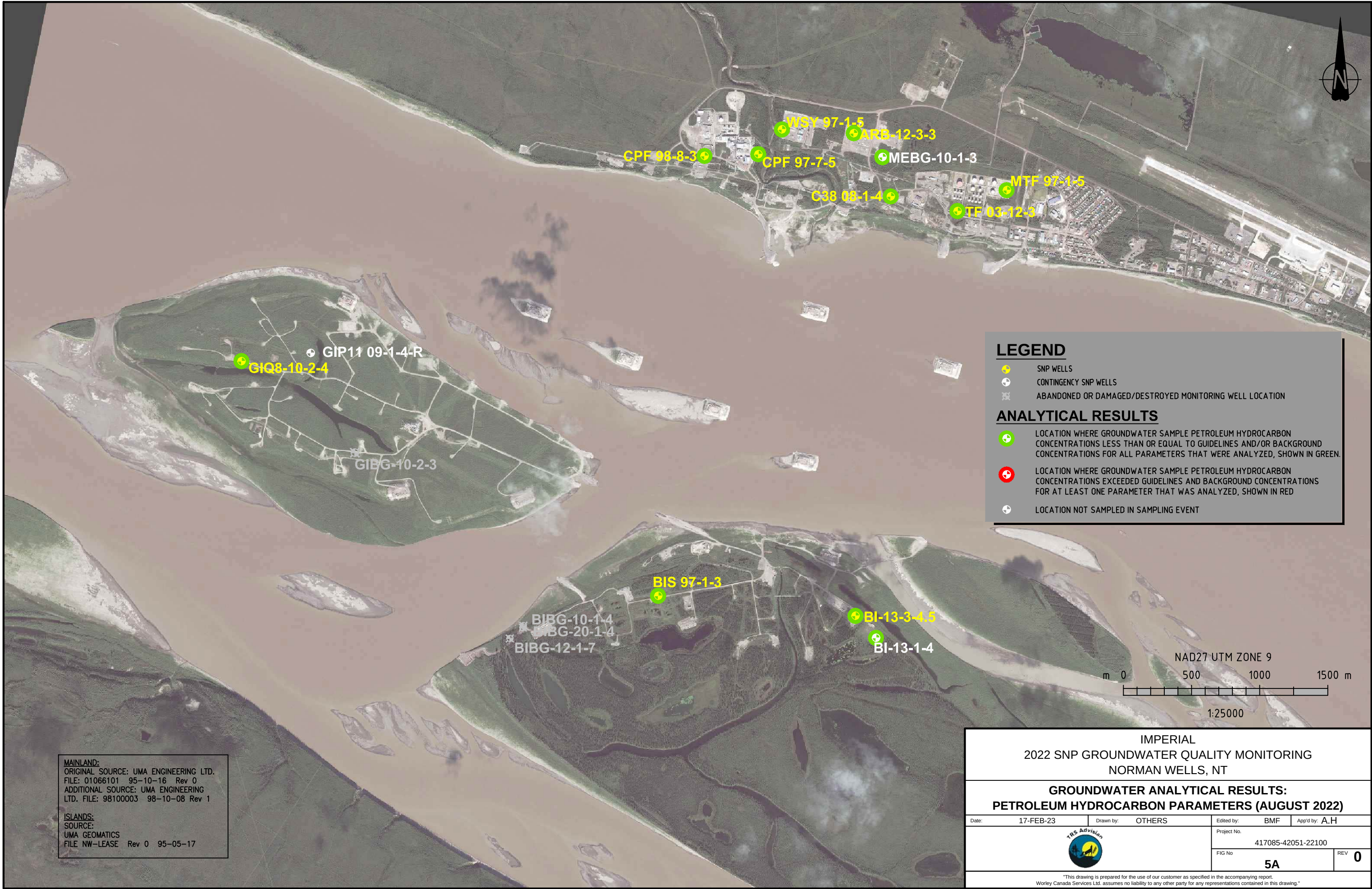
 LOCATION WHERE GROUNDWATER SAMPLE CHLORIDE CONCENTRATION EXCEEDED GUIDELINES AND BACKGROUND CONCENTRATIONS FOR AT LEAST ONE PARAMETER THAT WAS ANALYZED, SHOWN IN RED

⊗

 LOCATION NOT SAMPLED IN SAMPLING EVENT

IMPERIAL 2022 SNP GROUNDWATER QUALITY MONITORING NORMAN WELLS, NT				
GROUNDWATER ANALYTICAL RESULTS: DISSOLVED CHLORIDE (AUGUST 2022)				
Date:	14-MAR-23	Drawn by:	OTHERS	Edited by: BMF App'd by: A.H
		Project No.		417085-42051-22100
		FIG No	4A	REV 0
"This drawing is prepared for the use of our customer as specified in the accompanying report. Worley Canada Services Ltd. assumes no liability to any other party for any representations contained in this drawing."				





MAINLAND:
ORIGINAL SOURCE: UMA ENGINEERING LTD.
FILE: 01066101 95-10-16 Rev 0
ADDITIONAL SOURCE: UMA ENGINEERING LTD.
FILE: 98100003 98-10-08 Rev 1

ISLANDS:
SOURCE:
UMA GEOMATICS
FILE NW-LEASE Rev 0 95-05-17

LEGEND

- SNP WELLS
- CONTINGENCY SNP WELLS
- ABANDONED OR DAMAGED/DESTROYED MONITORING WELL LOCATION

ANALYTICAL RESULTS

- LOCATION WHERE GROUNDWATER SAMPLE PETROLEUM HYDROCARBON CONCENTRATIONS LESS THAN OR EQUAL TO GUIDELINES AND/OR BACKGROUND CONCENTRATIONS FOR ALL PARAMETERS THAT WERE ANALYZED, SHOWN IN GREEN.
- LOCATION WHERE GROUNDWATER SAMPLE PETROLEUM HYDROCARBON CONCENTRATIONS EXCEEDED GUIDELINES AND BACKGROUND CONCENTRATIONS FOR AT LEAST ONE PARAMETER THAT WAS ANALYZED, SHOWN IN RED
- LOCATION NOT SAMPLED IN SAMPLING EVENT

IMPERIAL

2022 SNP GROUNDWATER QUALITY MONITORING

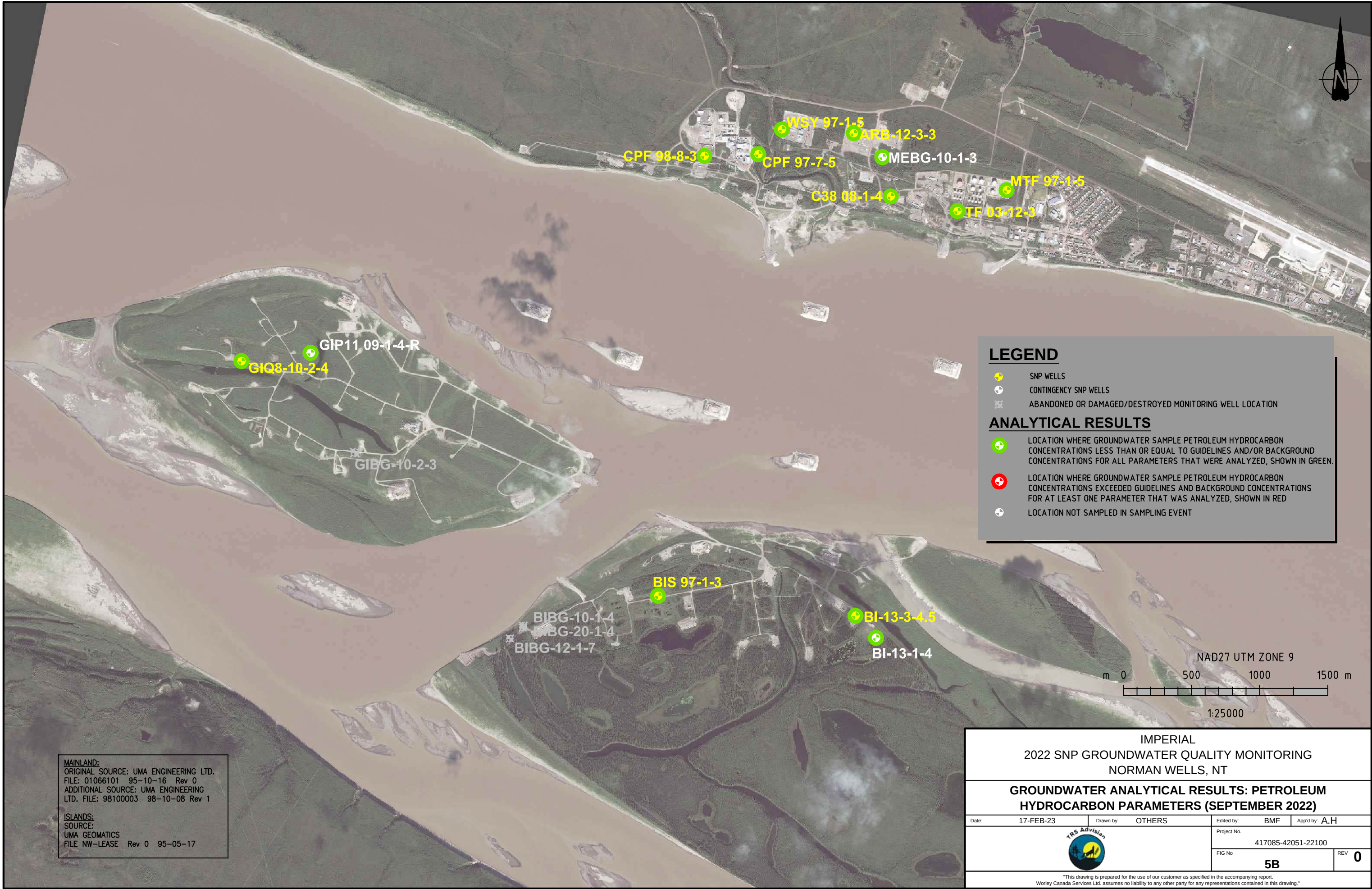
NORMAN WELLS, NT

GROUNDWATER ANALYTICAL RESULTS:

PETROLEUM HYDROCARBON PARAMETERS (AUGUST 2022)

Date:	17-FEB-23	Drawn by:	OTHERS	Edited by:	BMF	App'd by:	A.H
				Project No.		417085-42051-22100	
				FIG No		5A	REV

"This drawing is prepared for the use of our customer as specified in the accompanying report.
Worley Canada Services Ltd. assumes no liability to any other party for any representations contained in this drawing."



LEGEND

- SNP WELLS
 - CONTINGENCY SNP WELLS
 - ABANDONED OR DAMAGED/DESTROYED MONITORING WELL LOCATION
- ### ANALYTICAL RESULTS
- LOCATION WHERE GROUNDWATER SAMPLE PETROLEUM HYDROCARBON CONCENTRATIONS LESS THAN OR EQUAL TO GUIDELINES AND/OR BACKGROUND CONCENTRATIONS FOR ALL PARAMETERS THAT WERE ANALYZED, SHOWN IN GREEN.
 - LOCATION WHERE GROUNDWATER SAMPLE PETROLEUM HYDROCARBON CONCENTRATIONS EXCEEDED GUIDELINES AND BACKGROUND CONCENTRATIONS FOR AT LEAST ONE PARAMETER THAT WAS ANALYZED, SHOWN IN RED
 - LOCATION NOT SAMPLED IN SAMPLING EVENT

IMPERIAL 2022 SNP GROUNDWATER QUALITY MONITORING NORMAN WELLS, NT

GROUNDWATER ANALYTICAL RESULTS: PETROLEUM HYDROCARBON PARAMETERS (SEPTEMBER 2022)

Date:	17-FEB-23	Drawn by:	OTHERS	Edited by:	BMF	App'd by:	A.H
Project No.				417085-42051-22100			
FIG No.				5B		REV 0	



"This drawing is prepared for the use of our customer as specified in the accompanying report.
Worley Canada Services Ltd. assumes no liability to any other party for any representations contained in this drawing."

MAINLAND:
ORIGINAL SOURCE: UMA ENGINEERING LTD.
FILE: 01066101 95-10-16 Rev 0
ADDITIONAL SOURCE: UMA ENGINEERING LTD.
FILE: 98100003 98-10-08 Rev 1

ISLANDS:
SOURCE:
UMA GEOMATICS
FILE NW-LEASE Rev 0 95-05-17



Tables

Table 1



Monitoring Well Installation Details: Datum/Groundwater Surface Elevations and Hydraulic Conductivities

PROJECT No.: 417085-42051-22100

Monitoring Station	Status	Background Category	Easting (m)	Northing (m)	Ground Elevation (masl)	Datum Elevation (masl)	Surveyed Stickup (m)	Total Depth of Piezometer (mbgs)	Bottom of Piezometer Elevation (masl)	Depth Interval of Screen (mbgs)	Depth Interval of and (mbgs)	Date (dd-mm-yyyy)	Depth to Groundwater (mbloc)	Depth to Groundwater (mbgs)	Groundwater Surface Elevation (masl)	Measured Stick up (m)	Hydraulic Conductivity (m/s)	Lithology	Completion Interval	Comments
Surveillance Network Program- Mainland Locations																				
ARB-12-3-3	Active	W-CAT-1	599801.144	7242007.048	65.330	66.020	0.690	2.700	62.630	1.20 - 2.70	0.80 - 2.70	07-Aug-2015	2.79	2.10	63.23	N/M		Gravel fill/Sand/Peat		
												14-Sep-2015	2.57	1.88	63.45	N/M				
												05-Aug-2016	2.71	2.02	63.31	N/M			Replaced waterra with dedicated bailer	
												02-Oct-2016	2.54	1.85	63.48	N/M				
												04-Nov-2016	2.79	2.10	63.23	N/M				
												12-Aug-2017	2.62	1.93	63.40	N/M				
												12-Sep-2017	2.45	1.76	63.57	N/M				
												11-Jul-2018	2.44	1.75	63.58	0.71				
												15-Sep-2018	2.48	1.79	63.54	N/M				
												11-Jul-2019	2.42	1.73	63.60	0.72				
												28-Sep-2019	2.53	1.84	63.49	N/M				
												23-Jul-2020	2.44	1.75	63.58	0.72				
												17-Sep-2020	2.40	1.71	63.62	N/M				
												20-Aug-2021	2.36	1.67	63.66	0.65				
												15-Sep-2021	2.47	1.78	63.55	N/M				
												09-Aug-2022	2.42	1.73	63.60	N/M				
												23-Sep-2022	2.50	1.81	63.52	0.89				
C38 08-1-4	Active	W-CAT-1	600072.804	7241542.767	60.48	61.23	0.75	3.8	56.68	1.80 - 3.80	1.50 - 3.80	06-Aug-2015	1.82	1.07	59.41	N/M	5.90E-06	Sandy silt/peat/silty clay		
												14-Sep-2015	1.65	0.90	59.58	N/M				
												05-Aug-2016	1.92	1.17	59.31	N/M				
												02-Oct-2016	1.83	1.08	59.40	N/M				
												04-Nov-2016	2.17	1.42	59.06	N/M				
												12-Aug-2017	1.97	1.22	59.26	N/M				Frost jacked
												12-Sep-2017	1.74	0.99	59.49	N/M				
												13-Jul-2018	1.90	1.15	59.33	0.95				
												15-Sep-2018	1.97	1.22	59.26	N/M				
												15-Jul-2019	2.07	1.32	59.16	0.99				
												28-Sep-2019	2.09	1.34	59.14	N/M				
												23-Jul-2020	2.02	1.27	59.21	1.04				
												17-Sep-2020	2.01	1.26	59.22	N/M				
												20-Aug-2021	2.11	1.36	59.12	1				
												15-Sep-2021	2.25	1.50	58.98	N/M				Well is frost-jacked
												08-Aug-2022	2.36	1.61	58.87	1.1				
												23-Sep-2022	2.47	1.72	58.76	1.09				
CPF 97-7-5	Active	W-CAT-1	599100.347	7241852.827	58.64	59.49	0.84	4.9	53.87	N/A	1.20 - 4.90	07-Aug-2015	1.37	0.53	58.12	N/M	1.10E-08	Silt/siltstone		
												14-Sep-2015	1.42	0.58	58.07	N/M				
												06-Aug-2016	1.35	0.51	58.14	N/M				Replaced lock
												02-Oct-2016	1.76	0.92	57.73	N/M				
												04-Nov-2016	4.71	3.87	54.78	N/M				
												17-Aug-2017	1.25	0.41	58.24	N/M				
												12-Sep-2017	1.39	0.55	58.10	N/M				
												20-Jul-2018	1.43	0.59	58.06	0.97				
												15-Sep-2018	1.56	0.72	57.93	N/M				
												11-Jul-2019	> 5.98	> 5.04	< 53.61	N/M				dry
												26-Jul-2019	1.54	0.70	57.95	N/M				
												28-Sep-2019	2.04	1.20	57.45	N/M				
												23-Jul-2020	5.45	4.61	54.04	0.81				
												17-Sep-2020	1.90	1.06	57.59	N/M				
												20-Aug-2021	1.36	0.52	58.13	0.86				
												15-Sep-2021	1.94	1.10	57.55	N/M				
												08-Aug-2022	5.21	4.37	54.28	0.78				
												24-Sep-2022	3.84	3.00	55.65	0.8				
CPF 98-8-3	Active	W-CAT-1	598705.553	7241839.552	58.79	59.54	0.75	2.7	55.95	1.40 - 2.90	0.80 - 2.90	07-Aug-2015	1.39	0.64	58.15	N/M	1.70E-06	Clay silt		
												14-Sep-2015	1.27	0.52	58.27	N/M				
												06-Aug-2016	1.72	0.97	57.82	N/M				
												02-Oct-2016	1.35	0.60	58.19	N/M				
												04-Nov-2016	1.89	1.14	57.65	N/M				
												17-Aug-2017	1.66	0.91	57.88	N/M				
												12-Sep-2017	1.31	0.56	58.23	N/M				
												22-Jul-2018	1.53	0.78	58.01	1.09				
												16-Sep-2018	1.31	0.56	58.23	N/M				
												11-Jul-2019	1.49	0.74	58.05	N/M				limited sample
												28-Sep-2019	1.31	0.56	58.23	N/M				
												23-Jul-2020	1.31	0.56	58.23	1.01				
												17-Sep-2020	1.37	0.62	58.17	N/M				
												20-Aug-2021	1.47	0.72	58.07	1.04				
												15-Sep-2021	1.18	0.43	58.36	N/M				
												08-Aug-2022	1.32	0.57	58.22	1.02				
												24-Sep-2022	1.73	0.98	57.81	1.01				



Table 1

Monitoring Well Installation Details: Datum/Groundwater Surface Elevations and Hydraulic Conductivities

PROJECT No.: 417085-42051-22100

Monitoring Station	Status	Background Category	Easting (m)	Northing (m)	Ground Elevation (masl)	Datum Elevation (masl)	Surveyed Stickup (m)	Total Depth of Piezometer (mbgs)	Bottom of Piezometer Elevation (masl)	Depth Interval of Screen (mbgs)	Depth Interval of Sand (mbgs)	Date (dd-mmm-yyyy)	Depth to Groundwater (mbloc)	Depth to Groundwater (mbgs)	Groundwater Surface Elevation (masl)	Measured Stick up (m)	Hydraulic conductivity (m/s)	Lithology	Completion Interval	Comments
MEBG-10-1-3	Active	W-CAT-1	600011.383	7241831.078	63.73	64.47	0.75	3.0	60.73	1.50 - 3.00	1.00 - 3.00	06-Aug-2015	0.89	0.14	63.58	N/M	9.01E-07	Silty Sand / Clayey Silt		Clear
												14-Sep-2015	0.88	0.13	63.59	N/M				
												03-Aug-2016	1	0.25	63.47	N/M				
												02-Oct-2016	0.96	0.21	63.51	N/M				
												04-Nov-2016	1.1	0.35	63.37	N/M				
												12-Aug-2017	1.02	0.27	63.45	N/M				
												12-Sep-2017	0.92	0.17	63.55	N/M				
												16-Jul-2018	0.96	0.21	63.51	0.82				
												15-Sep-2018	0.93	0.18	63.54	N/M				
												15-Jul-2019	1	0.25	63.47	0.8				
												04-Oct-2019	0.99	0.24	63.48	N/M				
												23-Jul-2020	0.98	0.23	63.49	0.78				
												17-Sep-2020	1.01	0.26	63.46	N/M				
												20-Aug-2021	1.08	0.33	63.39	0.88				
												15-Sep-2021	1.14	0.39	63.33	N/M				
												09-Aug-2022	1.22	0.47	63.25	0.98				
												23-Sep-2022	1.36	0.61	63.11	0.96				
MTF 97-1-5	Active	W-CAT-1	600924.768	7241588.497	63.49	64.39	0.91	4.7	58.76	1.70 - 4.70	1.10 - 4.70	08-Aug-2015	4.21	3.3	60.18	N/M	>1.0E-05	Silt		Dry
												15-Sep-2015	4.04	3.13	60.35	N/M				
												02-Oct-2016	4.36	3.45	60.03	N/M				
												04-Nov-2016	> 5.61	> 4.70	< 58.79	N/M				
												17-Aug-2017	4.3	3.39	60.09	N/M				
												14-Sep-2017	4.13	3.22	60.26	N/M				
												16-Jul-2018	4.25	3.34	60.14	1.05				
												16-Sep-2018	4.14	3.24	60.25	N/M				
												18-Jun-2019	4.63	3.72	59.76	N/M				
												28-Sep-2019	4.28	3.37	60.11	N/M				
												23-Jul-2020	4.13	3.22	60.26	1.08				
												17-Sep-2020	4.24	3.33	60.15	N/M				
												20-Aug-2021	4.25	3.34	60.14	1.04				
												15-Sep-2021	4.38	3.47	60.01	N/M				
												07-Aug-2022	4.27	3.36	60.12	1.03				
												24-Sep-2022	4.51	3.6	59.88	1.02				
TF 03-12-3	Active	W-CAT-1	600562.552	7241435.321	57.08	58.63	1.55	2.8	54.28	1.00 - 2.80	0.90 - 2.90	08-Aug-2015	1.74	0.19	56.89	N/M	>1.0E-05	Silty clay and shale fill		Frost jacked 15cm
												15-Sep-2015	1.74	0.19	56.89	N/M				Frost jacked
												06-Aug-2016	1.78	0.23	56.85	N/M				
												02-Oct-2016	1.78	0.23	56.85	N/M				
												04-Nov-2016	1.87	0.32	56.76	N/M				
												17-Aug-2017	1.72	0.17	56.91	N/M				
												13-Sep-2017	1.73	0.18	56.9	N/M				
												16-Jul-2018	1.82	0.27	56.81	1.01				
												16-Sep-2018	1.77	0.22	56.86	N/M				
												18-Jun-2019	1.75	0.2	56.88	N/M				
												28-Sep-2019	1.84	0.29	56.79	N/M				
												23-Jul-2020	1.85	0.3	56.78	1				Frost jacked, cannot lock piezo
												17-Sep-2020	1.88	0.33	56.75	N/M				Frost jacked, cannot lock piezo
												20-Aug-2021	1.84	0.29	56.79	1.04				
												15-Sep-2021	1.97	0.42	56.66	N/M				
												07-Aug-2022	1.96	0.41	56.67	1.08				
												23-Sep-2022	2.13	0.58	56.5	1.08				
WSY 97-1-5	Active	W-CAT-1	599274.168	7242034.279	62.61	63.4	0.79	4.7	57.96	1.70 - 4.70	1.10 - 4.70	06-Aug-2015	4.26	3.47	59.14	N/M	1.70E-07	Silt		Frost jacked, cannot clean red casing
												14-Sep-2015	4.12	3.33	59.28	N/M				Well bent downhole, hard to get bailer down
												05-Aug-2016	5.24	4.45	58.16	N/M				
												02-Oct-2016	4.15	3.36	59.25	N/M				
												04-Nov-2016	5.48	4.69	57.92	N/M				
												18-Aug-2017	2.69	1.9	60.71	N/M				
												12-Sep-2017	2.86	2.07	60.54	N/M				
												11-Jul-2018	5.15	4.36	58.25	N/M				
												18-Sep-2018	4.32	3.53	59.08	N/M				
												15-Jul-2019	5.2	4.41	58.2	0.75				clear
												28-Sep-2019	4.97	4.18	58.43	N/M				
												23-Jul-2020	5.15	4.36	58.25	0.8				
												20-Aug-2021	2.84	2.05	60.56	0.74				Well is frost-jacked
												15-Sep-2021	5.51	4.72	57.89	N/M				
												09-Aug-2022	5.43	4.64	57.97	0.79				
												24-Sep-2022	> 5.72	> 4.93	< 57.68	0.86				Dry



Table 1

Monitoring Well Installation Details: Datum/Groundwater Surface Elevations and Hydraulic Conductivities

PROJECT No.: 417085-42051-22100

Monitoring Station	Status	Background Category	Easting (m)	Northing (m)	Ground Elevation (masl)	Datum Elevation (masl)	Surveyed Stickup (m)	Total Depth of Piezometer (mbgs)	Bottom of Piezometer Elevation (masl)	Depth Interval of Screen (mbgs)	Depth Interval of sand (mbgs)	Date (dd-mm-yyyy)	Depth to Groundwater (mbloc)	Depth to Groundwater (mbgs)	Groundwater Surface Elevation (masl)	Measured Stick up (m)	Hydraulic Conductivity (m/s)	Lithology	Completion Interval	Comments
Surveillance Network Program - Bear Island Locations																				
BI-13-1-4	Active	W-CAT-2	599964.584	7238301.752	49.7	49.7	0	N/A	N/A	1.30 - 4.30	1.00 - 4.60	07-Aug-2015	1.02	1.02	48.68	N/M	2.60E-06			
												07-Aug-2016	1.13	1.13	48.57	N/M				
												15-Aug-2017	1.30	1.30	48.4	N/M				
												22-Nov-2017	1.89	1.89	47.81	N/M				
												18-Jul-2018	1.08	1.08	48.62	1.09				casing loose
												20-Sep-2018	1.00	1.00	48.7	N/M				
												12-Jul-2019	1.15	1.15	48.55	1.21				
												29-Sep-2019	1.05	1.05	48.65	N/M				potential blockage or bailer at bottom. limited sample no fp
												26-Jul-2020	1.03	1.03	48.67	1.02				
												16-Sep-2020	1.07	1.07	48.63	N/M				
												18-Sep-2021	1.36	1.36	48.34	N/M				
												25-Sep-2022	1.81	1.81	47.89	1.1				
BI-13-3-4.5	Active	W-CAT-2	599813.864	7238463.124	50.62	51.57	0.95	N/A	N/A	1.50 - 4.50	1.20 - 4.80	07-Aug-2015	1.65	0.70	49.92	N/M	1.40E-06			
												08-Aug-2016	1.74	0.79	49.83	N/M				
												15-Aug-2017	1.81	0.86	49.76	N/M				
												22-Nov-2017	N/M	N/M	N/A	N/M				Froze @ 0.99m
												18-Jul-2018	1.67	0.72	49.90	0.97				
												20-Sep-2018	1.69	0.74	49.88	N/M				Damaged - no sample
												29-Sep-2019	N/M	N/M	N/A	N/M				
												26-Jul-2020	1.66	0.71	49.91	1.00				
												16-Sep-2020	1.75	0.80	49.82	N/M				
												22-Aug-2021	1.81	0.86	49.76	1.00				
												18-Sep-2021	1.84	0.89	49.73	N/M				
												25-Sep-2022	2.44	1.49	49.13	1.03				
BIBG-10-1-4	Damaged	W-CAT-2	597436.110	7238366.063	50.11	50.89	0.78	4.1	46.01	1.10 - 4.10	0.78 - 4.10	09-Aug-2015	1.22	0.44	49.67	N/M	1.90E-06	Silty Clay / Sand		
												08-Aug-2016	1.87	1.09	49.02	N/M				
												11-Aug-2017	3.57	2.79	47.32	N/M				
												17-Jul-2018	3.39	2.61	47.5	0.76				
												20-Sep-2018	1.63	0.85	49.26	N/M				
												17-Jul-2019	2.94	2.16	47.95	0.78				
												29-Sep-2019	1.96	1.18	48.93	N/M				
												25-Jul-2020	3.3	2.52	47.59	0.73				
												16-Sep-2020	N/M	N/M	N/A	N/M				Damaged
BIBG-12-1-7	Active	W-CAT-2	597275.824	7238297.135	49.4	50.2	0.8	7.5	41.9	4.20 - 7.20	3.80 - 7.50	09-Aug-2015	1.2	0.4	49	N/M		Silty Sand/Sandy Silt		
												17-Sep-2015	N/M	N/M	N/A	N/M				
												07-Aug-2016	1.35	0.55	48.85	N/M				
												02-Oct-2016	N/M	N/M	N/A	N/M				Blocked at approximately 1.5 mbtloc. Bentonite on water level probe.
												04-Nov-2016	1.83	1.03	48.37	N/M				Bentonite on WL tape and bailer when sampling. Well appears broken downhole.
												15-Aug-2017	> 1.31	> 0.51	< 48.89	N/M				WELL NOT ACCESSIBLE. Well previously noted as damaged
												29-Sep-2019	1.29	0.49	48.91	N/M				Dry, Compromised, bentonite on water level tape
												26-Jul-2020	N/M	N/M	N/A	N/M				No sample
												16-Sep-2020	N/M	N/M	N/A	N/M				Cannot Lock
BIBG-20-01-4		W-CAT-2	597396.323	728374.471	47.88	48.92	1.04	4.4	43.48	2.90 - 4.40	2.50 - 4.40	29-Sep-2020	> 5.33	> 4.29	< 43.59	0.93	N/M	Sand		
												22-Aug-2021	> 5.35	> 4.31	< 43.57	N/M				Dry
												18-Sep-2021	> 5.34	> 4.30	< 43.58	N/M				Dry, well damaged
BIS 97-1-3	Active	W-CAT-2	598365.067	7238610.352	51	51.93	0.93	2.6	48.47	N/A	0.60 - 2.60	22-Nov-2017	1.82	0.89	50.11	N/M	6.50E-05	Silty peat/silt		
												20-Jul-2018	1.79	0.86	50.14	1.01				
												20-Sep-2018	1.69	0.76	50.24	N/M				
												17-Jul-2019	1.69	0.76	50.24	1.08				
												29-Sep-2019	1.71	0.78	50.22	N/M				orange
												26-Jul-2020	1.74	0.81	50.19	1.09				
												16-Sep-2020	1.93	1	50	N/M				
												22-Aug-2021	2.2	1.27	49.73	1.17				
												18-Sep-2021	2.37	1.44	49.56	N/M				
												07-Aug-2022	2.25	1.32	49.68	1.19				
												25-Sep-2022	2.79	1.86	49.14	1.2				



Table 1

Monitoring Well Installation Details: Datum/Groundwater Surface Elevations and Hydraulic Conductivities

PROJECT No.: 417085-42051-22100

Monitoring Station	Status	Background Category	Easting (m)	Northing (m)	Ground Elevation (masl)	Datum Elevation (masl)	Surveyed Stickup (m)	Total Depth of Piezometer (mbgs)	Bottom of Piezometer Elevation (masl)	Depth Interval of Screen (mbgs)	Depth Interval of Sand (mbgs)	Date (dd-mm-yyyy)	Depth to Groundwater (mbioc)	Depth to Groundwater (mbgs)	Groundwater Surface Elevation (masl)	Measured Stick up (m)	Hydraulic Conductivity (m/s)	Lithology	Completion Interval	Comments
Surveillance Network Program - Goose Island Locations																				
GIBG-10-2-3	Active	W-CAT-2	596138.596	7239661.038	43.66	44.2	0.54	3.0	40.66	1.43 - 3.00	1.30 - 3.00	10-Aug-2015	2.05	1.52	42.15	N/M	1.70E-05	Sand		Frost jacked
												16-Sep-2015	2.13	1.59	42.07	N/M				
												06-Aug-2016	1.99	1.45	42.21	N/M				
												02-Oct-2016	2.24	1.7	41.96	N/M				
												04-Nov-2016	2.38	1.84	41.82	N/M				
												20-Aug-2017	1.84	1.3	42.36	N/M				Fished out bailer
												12-Sep-2017	1.65	1.11	42.55	N/M				
												14-Jul-2018	2.16	1.62	42.04	0.29				
												20-Sep-2018	2.14	1.6	42.06	N/M				
												16-Jul-2019	2.36	1.82	41.84	0.36				limited sample, silty
												30-Sep-2019	2.46	1.92	41.74	N/M				
												25-Jul-2020	1.53	0.99	42.67	0.44				
												16-Sep-2020	1.78	1.24	42.42	N/M				
												25-Sep-2022	N/M	N/M	N/A	0.6				Blocked at 0.6mbioc.
GIP11 09-1-4	Replaced	W-CAT-2	595813.546	7240393.423	45.55	45.9	0.35	4.0	41.55	1.00 - 4.00	0.72 - 4.00	10-Aug-2015	3.17	2.82	42.73	N/M	1.60E-05	Silty sand/sandy silt and clay/sand		
												16-Sep-2015	3.29	2.94	42.61	N/M				
												02-Oct-2016	> 1.32	> 0.97	< 44.58	N/M				Dry
GIP11 09-1-4-R	Active	W-CAT-2	N/M	N/M	N/M	N/M	N/A	4.0	N/A	1.00 - 4.00	0.72 - 4.00	14-Jul-2018	3.39	3.27 ^Y	N/A	0.12		Silty Sand		
												20-Sep-2018	3.51	3.39 ^Y	N/A	N/M				
												16-Jul-2019	3.58	3.48 ^Y	N/A	0.1				
												16-Jul-2019	3.58	3.48 ^Y	N/A	0.1				
												04-Oct-2019	3.8	3.70 ^Y	N/A	N/M				
												25-Jul-2020	2.94	2.84 ^Y	N/A	0.1				
												16-Sep-2020	3.09	2.99 ^Y	N/A	N/M				
												17-Sep-2021	3.08	2.98 ^Y	N/A	N/M				
												08-Aug-2022	3.06	2.86 ^Y	N/A	0.2				
												25-Sep-2022	3.44	3.34 ^Y	N/A	0.1				
GIQ8-10-2-4	Active	W-CAT-2	595306.125	7240333.425	47.5	47.72	0.22	3.95	43.55	0.95 - 3.95	0.75 - 3.70	10-Aug-2015	> 5.67	> 5.45	< 42.05	N/M	3.30E-06	Sandy Silt		Dry
												16-Sep-2015	2.11	1.89	45.61	N/M				
												07-Aug-2016	1.72	1.5	46	N/M				
												02-Oct-2016	2.48	2.26	45.24	N/M				
												04-Nov-2016	2.66	2.44	45.06	N/M				
												20-Aug-2017	2.43	2.21	45.29	N/M				
												12-Sep-2017	2.25	2.03	45.47	N/M				
												14-Jul-2018	2.53	2.31	45.19	0.1				
												20-Sep-2018	2.21	1.99	45.51	N/M				
												16-Jul-2019	2.63	2.41	45.09	0.1				
												30-Sep-2019	2.6	2.38	45.12	N/M				
												25-Jul-2020	2.44	2.22	45.28	0.1				
												16-Sep-2020	2.31	2.09	45.41	N/M				
												21-Aug-2021	2.31	2.09	45.41	0.11				
												17-Sep-2021	2.39	2.17	45.33	N/M				
												09-Aug-2022	2.18	1.96	45.54	0.1				
												25-Sep-2022	2.74	2.52	44.98	0.11				

- NOTES:**
1. Data may be entered to the nearest mm, but are reported above to the nearest cm.
 2. Apparent rounding errors may occasionally occur in calculated fields (e.g. Groundwater Surface Elevation).
 3. All coordinates are provided in the UTM Zone 9N referenced to North American Datum of 1927 coordinate system.
 3. N/M - Denotes not measured.
 4. N/A - Denotes not available.
 5. masl - Denotes metres above sea level.
 6. mbgs - Denotes metres below ground surface.
 7. mbtoc - Denotes metres below top of PVC casing.
 8. Y - depth to groundwater (mbgs) calculated using field-measured stick up, not used to calculate groundwater surface elevation
 9. Where a measurement is not available due to the source being dry, depths are displayed as greater than the measured depth of well, where available, and where not the installed depth is used.



Table 2

Groundwater Results: Field Measurements

PROJECT No.: 417085-42051-22100

Monitoring Station	Date (dd-mm-yyyy)	Status	Dissolved Oxygen (mg/L)	Electrical Conductivity (uS/cm)	Eh (mV)	pH (pH Units)	Temperature (°C)	Sample Comment
CCME CEQG Freshwater Aquatic Life			5.5	---	---	(6.5 - 9)	---	
Surveillance Network Program - Mainland Locations								
ARB-12-3-3	07-Aug-2015	Active	---	881	---	7.53	4	Clear, excellent recharge
	14-Sep-2015		---	1078	---	7.06	4	
	05-Aug-2016		---	917	---	6.73	4.6	Silty, brown
	02-Oct-2016		---	1250	---	6.12	3.5	
	12-Aug-2017		---	841	---	7.51	18.7	
			---	1046	---	6.76	6.5	
	12-Sep-2017		---	1055	---	7.05	5.3	
	11-Jul-2018		---	942	---	7.2	5.4	clear
	15-Sep-2018		---	1073	---	6.8	5	Light brown hue
	11-Jul-2019		---	1001	---	7.91	4.6	slightly turbid brown
	28-Sep-2019		---	567	---	6.81	-1.2	Yellowish, clear
	23-Jul-2020		---	691	---	7	7.5	Light brown, slightly turbid
	17-Sep-2020		---	546	---	6.8	7.2	Light brown, slightly turbid
	20-Aug-2021		---	975	---	7.3	8.2	Light brown
	15-Sep-2021		---	883	---	7.05	6.7	Light brown
	09-Aug-2022		3.94	574	-20.6	6.6	6.3	
	23-Sep-2022		0.25	879	-47.5	6.98	4.5	Clear
C38 08-1-4	06-Aug-2015	Active	---	1790	---	6.54	9.4	Brown water, frost jacking, can't close red casing, organic odour
	14-Sep-2015		---	1752	---	6.72	6.1	
	05-Aug-2016		---	1326	---	7.02	8.5	Dark brown, silty
	02-Oct-2016		---	1316	---	6.34	8.6	
	12-Aug-2017		---	1027	---	6.26	9.5	Dark brown, sour odor
	12-Sep-2017		---	1324	---	6.59	8.2	
	13-Jul-2018		---	1369	---	6.01	8	HCO, TURBID, GREY
	15-Sep-2018		---	1317	---	6.58	6.5	Brown, frost sacked
	15-Jul-2019		---	1159	---	7.01	9.2	very silty brown, sulfurous odour
	28-Sep-2019		---	7.62	---	6.31	0.1	Mostly clear, swampy odour
	23-Jul-2020		---	992	---	7	9	Light brown, slightly turbid, sulfurous odour
	17-Sep-2020		---	1144	---	6.35	8.6	Brown, slightly turbid, organic debris
	20-Aug-2021		---	1233	---	6.44	9.1	Brown, turbid
	15-Sep-2021		---	1205	---	6.35	8.4	Grey, organic debris
	08-Aug-2022		1.79	1038	-0.9	6.28	8.2	
	23-Sep-2022		0.16	1610	-9.5	6.51	2.9	Silty, brown, frost jacked, swampy odour
CPF 97-7-5	07-Aug-2015	Active	---	1540	---	6.79	8.4	Clear, no odour
	14-Sep-2015		---	1785	---	6.68	7	
	06-Aug-2016		---	1579	---	6.81	10.4	Clear
	02-Oct-2016		---	2350	---	6.83	7.2	
	17-Aug-2017		---	1655	---	6.43	11.1	
	12-Sep-2017		---	1786	---	6.67	9.3	
	20-Jul-2018		---	1827	---	6.27	12.2	
	15-Sep-2018		---	1663	---	6.31	7.5	Clear
	11-Jul-2019		---	0	---	0	0	dry, no fp
	28-Sep-2019		---	1090	---	6.14	1.5	Clear
	23-Jul-2020		---	---	---	---	---	Light brown, slightly turbid, limited sample, no field parameter
	17-Sep-2020		---	1979	---	5.98	7	Light brown, very slightly turbid
	20-Aug-2021		---	2170	---	6.6	6.6	Clear
	15-Sep-2021		---	1942	---	6.14	8.7	Clear
	08-Aug-2022		5.43	1310	7.4	6.11	6.8	
	24-Sep-2022		1.93	2056	156.6	6.36	2.6	Clear
CPF 98-8-3	07-Aug-2015	Active	---	1020	---	6.69	9	
	14-Sep-2015		---	1120	---	6.79	4.4	
	06-Aug-2016		---	---	---	---	---	Insufficient water for field parameters.
	02-Oct-2016		---	1032	---	6.59	3.2	
	17-Aug-2017		---	---	---	---	---	Limited sample, no field parameters



Table 2

Groundwater Results: Field Measurements

PROJECT No.: 417085-42051-22100

Monitoring Station	Date (dd-mm-yyyy)	Status	Dissolved Oxygen (mg/L)	Electrical Conductivity (uS/cm)	Eh (mV)	pH (pH Units)	Temperature (°C)	Sample Comment
CCME CEQG Freshwater Aquatic Life			5.5	---	---	(6.5 - 9)	---	
MEBG-10-1-3	12-Sep-2017	Active	---	1101	---	6.56	5	
	22-Jul-2018		---	921	---	6.4	6.7	
	16-Sep-2018		---	965	---	6.35	4.9	Clear
	11-Jul-2019		---	0	---	0	0	limited sample, no fp
	28-Sep-2019		---	613	---	6.22	-1.9	Clear
	23-Jul-2020		---	903	---	6.5	6.5	Light brown, slightly turbid
	17-Sep-2020		---	1074	---	6.41	5.2	Light brown, very slightly turbid
	20-Aug-2021		---	1042	---	6.5	8.9	Clear
	15-Sep-2021		---	1110	---	6.36	6.4	Clear
	08-Aug-2022		3.38	776	6.4	6.18	11.2	
	24-Sep-2022		0.62	1101	38	6.49	1.8	Possible hydrocarbon odour
	06-Aug-2015		---	964	---	6.73	10.4	Clear, standing water around piezo
	14-Sep-2015		---	1238	---	7.13	7.8	
	03-Aug-2016		---	890	---	6.79	7.7	Clear
	02-Oct-2016		---	1466	---	6.17	3.9	
	12-Aug-2017		---	1075	---	6.82	7.1	Clear. Minor sediment in PAH bottle. Didn't go dry, try purging next year
	13-Aug-2017		---	2110	---	6.82	7.5	
	12-Sep-2017		---	1415	---	7.03	6.5	
	16-Jul-2018		---	1066	---	6.05	10.6	
	15-Sep-2018		---	1175	---	6.75	5.1	Brown, silty
MTF 97-1-5	15-Jul-2019	Active	---	1169	---	5.27	3.4	
	04-Oct-2019		7.26	1541	78.3	3.75	1.1	
	23-Jul-2020		---	931	---	7.5	9.5	Light brown, slightly turbid
	17-Sep-2020		---	1565	---	6.75	7.4	Brown, turbid
	20-Aug-2021		---	1856	---	6.93	9.7	Silty, brown
	15-Sep-2021		---	2040	---	6.73	8.7	Clear
	09-Aug-2022		3.83	1212	-10.8	6.44	7.1	Frost Jacked
	23-Sep-2022		0.37	1786	23.4	6.6	3.5	Clear, frost jacked
	07-Aug-2015		---	1527	---	6.22	6.3	Yellow H2O, no odour
	15-Sep-2015		---	1492	---	7.31	5.6	
TF 03-12-3	02-Oct-2016	Active	---	1760	---	6.77	---	
	17-Aug-2017		---	877	---	7.26	9	Clear
	14-Sep-2017		---	1685	---	7.12	3.6	
	16-Jul-2018		---	1265	---	7	7.6	
	16-Sep-2018		---	1478	---	7.12	6.5	Brown, silty
	18-Jun-2019		---	1597	---	7.12	3.4	
	28-Sep-2019		---	854	---	6.56	-2.6	Slightly silty
	23-Jul-2020		---	1254	---	6.5	4	Light brown, turbid
	19-Sep-2020		---	1379	---	7.18	8.8	Light brown, turbid
	20-Aug-2021		---	1006	---	7.27	5.3	Clear
	15-Sep-2021		---	1497	---	6.91	5.3	Brown
	07-Aug-2022		10.59	1166	-14.9	6.5	9.7	
	24-Sep-2022		2.5	1508	135.9	6.96	2.5	Brown, silty
	08-Aug-2015		---	1410	---	6.64	10.2	Light brown
	15-Sep-2015		---	1585	---	7.36	7.7	
	06-Aug-2016		---	1426	---	7.65	10.1	Brown, slightly silty, slightly rotten egg odour
	02-Oct-2016		---	1730	---	6.59	6.3	
	17-Aug-2017		---	1418	---	6.87	15	
	13-Sep-2017		---	1593	---	6.91	8.2	
	17-Jul-2018		---	1760	---	7.02	10.7	TURBID BROWN
	16-Sep-2018		---	1485	---	6.73	5.9	Brown, silty, frost sacked
	18-Jun-2019		---	1368	---	6.99	6.6	
	28-Sep-2019		---	952	---	6.65	-0.3	Brown, silty
	23-Jul-2020		---	1440	---	7	9	Orange brown, turbid
	19-Sep-2020		---	1739	---	6.87	9.5	Orange brown, turbid



Table 2

Groundwater Results: Field Measurements

PROJECT No.: 417085-42051-22100

PROJECT No.: 417085-42051-22100										
Monitoring Station	Date	Status	Dissolved Oxygen	Electrical Conductivity	Eh	pH	Temperature	Sample Comment		
(dd-mmm-yyyy)			(mg/L)	(uS/cm)	(mV)	(pH Units)	(°C)			
CCME CEQG Freshwater Aquatic Life			5.5	---	---	(6.5 - 9)	---			
WSY 97-1-5	20-Aug-2021	Active	---	1670	---	6.84	8.9	Light brown, silty		
	15-Sep-2021		---	1742	---	6.84	9.5	Frost-jacked, clear, sour odour		
	07-Aug-2022		3.14	1193	-20.9	6.65	9.7	Frost Jacked		
	23-Sep-2022		1.8	1920	-34.3	6.76	6.8	Grey, brown, silty, frost jacked.		
	06-Aug-2015		---	---	---	---	---	Limited sample recovery, no field parameters		
	14-Sep-2015		---	2390	---	6.94	4.7	Frost-jacked. Limited sample available.		
	05-Aug-2016		---	---	---	---	---	Insufficient water for field parameters. Half routine, no metals.		
	02-Oct-2016		---	2270	---	6.72	---			
	18-Aug-2017		---	1598	---	6.6	8.2			
	12-Sep-2017		---	1873	---	6.69	6.3			
	11-Jul-2018		---	---	---	---	---	ltd h2o, well pinched below ground, frost jacked 30cm		
	18-Sep-2018		---	---	---	---	---	Well kinked @ 4.6 mcbtoc		
	15-Jul-2019		---	---	---	---	---	Insufficient water for field parameters		
	28-Sep-2019		---	737	---	6.65	-1.7	Clear, bailer stuck at bottom, used peripump to sample		
	23-Jul-2020		---	---	---	---	---	Clear, limited sample, no field parameter		
	17-Sep-2020		---	---	---	---	---	Clear, limited sample, no field parameter		
	20-Aug-2021		---	1585	---	6.37	7.9			
	15-Sep-2021		---	---	---	---	---	Muddy well bottom, no sample		
Surveillance Netwrok Program - Bear Island Locations										
BI-13-1-4	07-Aug-2015	Active	---	1746	---	6.86	6.9	Grey, silty		
	15-Aug-2017		---	1148	---	6.8	10.9			
	22-Nov-2017		---	1585	---	7.45	1	Semi-turbid, yellow hue		
	18-Jul-2018		---	737	---	7.1	10.5	slightly turbid		
	20-Sep-2018		---	1612	---	6.93	5.6	Clear		
	12-Jul-2019		---	---	---	---	---	limited sample, no fp		
	29-Sep-2019		---	1969	---	6.91	-2	Yellowish		
	26-Jul-2020		---	576	---	7	12.5			
	16-Sep-2020		---	1748	---	6.92	4.9	Brown, slightly turbid		
	18-Sep-2021		---	1442	---	7.08	3.4	Brown, turbid		
	25-Sep-2022		1.95	899	79.1	6.94	4.3	Silty, grey, frost jacked, loose		
	BI-13-3-4.5		07-Aug-2015	Active	---	1984	---	7.05	8.6	Clear
			15-Aug-2017		---	2150	---	6.85	13.5	
			18-Jul-2018		---	1744	---	7.27	7.7	clear
20-Sep-2018		---	1755		---	7.13	6.9	Clear		
26-Jul-2020		---	1357		---	7	14.5	Light brown		
16-Sep-2020		---	2035		---	7.08	8	Brown, slightly turbid		
22-Aug-2021		---	1920		---	6.33	4.6			
18-Sep-2021		---	1667		---	7.08	9.1	Brown		
25-Sep-2022		0.84	1249		24.2	6.89	2.7	Silty, brown		
BIBG-10-1-4	09-Aug-2015	Active	---	1280	---	6.73	8.8	Silty brown		
	09-Aug-2016		---	1656	---	6.32	7.4	Cloudy		
	11-Aug-2017		---	1087	---	6.42	10.7	Silty, brown		
	17-Jul-2018		---	1332	---	6.87	3.2	TURBID, BROWN		
	20-Sep-2018		---	1250	---	6.45	3.9	Semi-turbid, brown		
	17-Jul-2019		---	1303	---	6.69	6.7	Turbid		
	29-Sep-2019		---	1544	---	6.57	-1.9	Slightly silty, grey/brown		
	26-Jul-2020		---	1020	---	7	5.5	Dark brown, silty, well compromised at screen.		
	BIBG-12-1-7		09-Aug-2015	Active	---	2360	---	7.01	10.5	
17-Sep-2015		---	---		---	---	Blocked at approximately 1.5 mbtoc. Bentonite on water level probe.			
07-Aug-2016		---	2440		---	6.75	11.2	Cloudy, grey		
15-Aug-2017		---	---		---	---	DRY - no sample			
BIS 97-1-3	22-Nov-2017	Active	---	1465	---	7.28	1.9	Turbid, Red/Brn hue		
	20-Jul-2018		---	1280	---	7.09	5.2			
	20-Sep-2018		---	1214	---	6.74	3.1	Brown, silty		



Table 2

Groundwater Results: Field Measurements

PROJECT No.: 417085-42051-22100

Monitoring Station (dd-mm-yyyy)	Date	Status	Dissolved Oxygen (mg/L)	Electrical Conductivity (uS/cm)	Eh (mV)	pH (pH Units)	Temperature (°C)	Sample Comment
CCME CEQG Freshwater Aquatic Life			5.5	---	---	(6.5 - 9)	---	
	17-Jul-2019		---	1550	---	7.04	11.7	Orange
	29-Sep-2019		---	1802	---	6.96	-0.3	Yellow, clear
	26-Jul-2020		---	1175	---	7	9.5	
	16-Sep-2020		---	1772	---	7.02	6	Brown, turbid
	22-Aug-2021		---	1434	---	6.72	4.8	
	18-Sep-2021		---	1577	---	7.11	5.8	Brown
	07-Aug-2022		3.03	1143	-32.5	6.8	6.5	
	25-Sep-2022		3.9	1232	-15.3	6.8	3.5	Brown, silty, frost jacked, casing loose
Surveillance Network Program - Goose Island Locations								
GIBG-10-2-3	10-Aug-2015	Active	---	477	---	6.01	12.7	Silty brown
	16-Sep-2015		---	1039	---	7.22	6.8	Frost-jacked; can't lock well casing.
	02-Oct-2016		---	738	---	6.91	5.9	
	20-Aug-2017		---	890	---	7.04	7.1	Silty
	12-Sep-2017		---	1267	---	6.85	6.6	
	14-Jul-2018		---	---	---	---	---	ltd sample, no fp
	20-Sep-2018		---	832	---	6.38	4.01	Clear, brown bottom silty
	16-Jul-2019		---	580	---	6.91	10.6	Silty
	30-Sep-2019		---	752	---	6.53	-0.6	Very silty, grey
	25-Jul-2020		---	511	---	7	13	Light brown, silty
	16-Sep-2020		---	732	---	7.1	8.3	Brown, turbid
GIP11 09-1-4	10-Aug-2015	Active	---	682	---	5.85	9.3	Silty brown
	16-Sep-2015		---	1043	---	7.22	6	
	14-Jul-2018		---	1591	---	6.82	8	
	16-Jul-2019		---	---	---	---	---	Very turbid, brown
GIP11 09-1-4-R	20-Sep-2018		---	1095	---	6.32	8.4	Clear
	04-Oct-2019		---	---	---	---	---	Limited sample
	25-Jul-2020		---	473	---	6	8.5	Dark brown, silty
	16-Sep-2020		---	606	---	7.34	6.1	Dark brown, very turbid
	17-Sep-2021		---	503	---	7.2	8	Brown, turbid
	08-Aug-2022		4.6	814	-13.9	6.54	8	
	25-Sep-2022		0.59	808	-10.2	6.7	4.5	Silty, ice damage, cant close
GIQ8-10-2-4	10-Aug-2015	Active	---	---	---	---	---	Dry
	16-Sep-2015		---	1820	---	7.19	4.4	
	07-Aug-2016		---	1518	---	6.7	6.5	Silty
	02-Oct-2016		---	1846	---	7.2	4.7	
	20-Aug-2017		---	817	---	6.62	5.7	
	12-Sep-2017		---	1060	---	6.85	4.9	
	14-Jul-2018		---	2160	---	6.64	4.4	
	20-Sep-2018		---	1613	---	6.38	4.2	Clear
	16-Jul-2019		---	2030	---	5.68	4	brown, turbid
	30-Sep-2019		---	2194	---	6.39	-2.7	Very silty, grey
	25-Jul-2020		---	613	---	6	8.5	Light brown, silty
	16-Sep-2020		---	1263	---	6.91	3.9	Brown, silty
	21-Aug-2021		---	1734	---	6.26	5.1	
	17-Sep-2021		---	1627	---	6.42	4.4	Brown, turbid
	09-Aug-2022		3.05	1503	-2.1	6.29	6	
	25-Sep-2022		0.23	1383	6.1	6.41	2	Silty, grey



Table 2

Groundwater Results: Field Measurements

PROJECT No.: 417085-42051-22100

Monitoring Station Date (dd-mmm-yyyy)	Status						Sample Comment
		Dissolved Oxygen (mg/L)	Electrical Conductivity (uS/cm)	Eh (mV)	pH (pH Units)	Temperature (°C)	
CCME CEQG Freshwater Aquatic Life		5.5	---	---	(6.5 - 9)	---	

NOTES:



1. --- in guideline row(s) denotes no criteria for that parameter.
2. --- in detail data row(s) denotes parameter not analyzed.
3. Highlighting indicates parameters above applied guideline/criteria.
4. Highlighting indicates non-detect parameters above applied guideline/criteria.
5. Highlighting indicates parameters at applied guideline/criteria.
6. Superscript ^{#1} denotes values exceeding
(CCME Canadian Environmental Quality Guidelines for Industrial, Fine-grained Surface soils, 1999 and updates)



Table 3

Groundwater Analytical Results: Indicator Analysis Parameters

PROJECT No.: 417085-42051-22100				Anions						Cations						General						Inorganic Nitrogen Compounds						Miscellaneous						
Sampling Location	Date (dd-mmm-yyyy)	Status	Background Category	Bicarbonate	Carbonate	Chloride	Fluoride	Sulphate	Hydroxide	Calcium	Iron	Magnesium	Manganese	Potassium	Sodium	Fluoride	Alkalinity (Total; as CaCO ₃)	Alkalinity (PP; as CaCO ₃)	Electrical Conductivity	Hardness (Total; as CaCO ₃)	pH	Total Dissolved Solids	Total Dissolved Solids (Calculated)	Ammonia (Total; as N)	Nitrate	Nitrate (as N)	Nitrite	Nitrite (as N)	Nitrite-plus-Nitrate (as N)	Ion Balance	Ion Balance % Difference			
				(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(µS/cm)	(mg/L)	(pH Units)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(Balance)	(%)	
				---	---	120	0.12	---	---	---	0.3	---	---	---	---	---	---	---	0.12	---	---	---	---	(6.5 - 9)	---	---	8.5	---	2.9	---	0.06	---	---	---
CCME CEQG Freshwater Aquatic Life				1000	1.0	17	---	700	1.0	312	---	---	---	5.2	161	---	---	1.0	2300	1241	8.1	1620	---	---	---	0.4	---	0.03	---	---	---			
W-CAT-1				1100	5.0	26	---	980	5.0	400	---	---	---	12	180	---	---	5.0	2800	1600	8.1	2200	---	---	---	36	---	0.11	---	---	---			
Surveillance Network Program - Mainland Locations																																		
ARB-12-8/ARB-12-3-3	07-Aug-2015	Active	W-CAT-1	590	< 0.50	16	---	53	< 0.50	130	< 0.060	43	< 0.0040	1.3	12	---	480	< 0.50	950	510	7.55	600	---	---	4.8	1.1	0.053	0.016	1.1	0.96	---			
	14-Sep-2015			670	< 0.50	8.7	0.093	33	< 0.50	160	0.25	48	0.26	1.5	11	0.093	550	< 0.50	1000	600	7.52	610	---	---	2.9	0.66	< 0.033	< 0.010	0.66	1	---			
	05-Aug-2016			620	< 0.50	19	---	79	< 0.50	150	0.084	47	0.12	2.1	24	---	510	< 0.50	1100	580	7.6	690	---	---	4.5	1	0.042	0.013	1	1	---			
	02-Oct-2016			860	< 0.50	12	---	87	< 0.50	180	4.7	60	0.46	2.2	25	---	690	< 0.50	1300	700	7.49	770	---	---	2.4	0.54	< 0.033	< 0.010	0.54	0.94	---			
	12-Aug-2017			650	< 0.50	12	---	60	< 0.50	160	< 0.060	44	0.057	1.9	12	---	530	< 0.50	1100	580	---	640	---	---	4.8	1.1	< 0.033	< 0.010	1.1	---	0.41			
	12-Sep-2017			560	< 0.50	22	---	160	< 0.50	160	< 0.060	46	0.025	2.3	46	---	460	< 0.50	1100	590	---	810	---	---	1.5	0.34	< 0.033	< 0.010	0.34	---	2.5			
	11-Jul-2018			460	< 1.0	27	---	180 ^{#1}	< 1.0	150	0.49	49	0.064	2.5	31	---	380	< 1.0	1100	580	---	760	---	---	4.7	1.1	0.043	0.013	1.1	---	3.3			
	15-Sep-2018			790	< 1.0	16	---	140	< 1.0	170	< 0.060	52	0.15	2.5	29	---	650	< 1.0	1300	640	---	800	---	---	1.1	0.25	< 0.033	< 0.010	0.25	---	7.1			
	11-Jul-2019			450	< 1.0	26	---	190 ^{#1}	< 1.0	150	< 0.060	50	0.033	2.9	25	---	370	< 1.0	1000	580	---	740	---	---	1.8	0.41	< 0.033	< 0.010	0.41	---	2.2			
	28-Sep-2019			500	< 1.0	17	0.088	180	< 1.0	140	0.36	43	0.26	2.5	27	0.088	410	< 1.0	1000	530	---	780	---	---	0.51	0.12	0.048	0.015	0.13	---	2.3			
	23-Jul-2020			330	< 1.0	11	0.09	150	< 1.0	110	< 0.060	35	< 0.0040	2.1	17	0.09	270	< 1.0	820	410	---	550	---	---	5.2	1.2	< 0.033	< 0.010	1.2	---	1.7			
	17-Sep-2020			680	< 1.0	7	0.072	100	< 1.0	160	0.11	46	0.35	2.5	19	0.072	550	< 1.0	1200	600	---	780	---	---	2	0.44	0.07	0.021	0.47	---	2.2			
	20-Aug-2021			400	< 1.0	7.1	0.11	140	< 1.0	120	0.086	36	0.048	1.8	12	0.11	330	< 1.0	840	440	---	470	---	---	1.5	0.33	< 0.033	< 0.010	0.33	---	1.4			
	15-Sep-2021			480	< 1.0	7.2	0.092	110	< 1.0	130	0.2	42	0.52	2.5	14	0.092	410	< 1.0	940	510	---	580	---	---	0.65	0.15	0.066	0.02	0.17	---	0.16			
	09-Aug-2022			490	< 1.0	14	0.1	120	< 1.0	130	< 0.060	42	0.057	2.4	13	0.1	400	< 1.0	930	500	---	630	---	---	1.4	0.32	< 0.033	< 0.010	0.32	---	1.3			
	09-Aug-2022			480	< 1.0	14	0.1	120	< 1.0	130	< 0.060	42	0.066	2.4	12	0.1	400	< 1.0	930	510	---	620	---	---	1.5	0.33	< 0.033	< 0.010	0.33	---	0.92			
	23-Sep-2022			460	< 1.0	19	0.11	140	< 1.0	140	0.29	47	1.9	2.7	13	0.11	380	< 1.0	970	550	---	670	---	---	0.38	0.085	0.095	0.029	0.11	---	3.1			
C38 08-1-4	06-Aug-2015	Active	W-CAT-1	840	< 0.50	19	---	200 ^{#3}	< 0.50	220	18	70	2.9	4.3	65	---	690	< 0.50	1600	840	6.95	1100	---	---	0.053	0.012	< 0.033	< 0.010	< 0.020	1.1	---			
	14-Sep-2015			950	< 0.50	20	0.098	130	< 0.50	230	22	70	3	4.3	53	0.098	780	< 0.50	1600	850	6.91	1100 ^{#2}	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.020	1.1	---			
	05-Aug-2016			980	< 0.50	23	---	58	< 0.50	190	19	63	2.5	3.9	55	---	800	< 0.50	1600	740	7.17	1000 ^{#2}	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.020	1	---			
	02-Oct-2016			990	< 0.50	21	---	24	< 0.50	180	22	60	2.2	3.9	53	---	810	< 0.50	1400	700	7.02	980 ^{#2}	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.020	1	---			
	12-Aug-2017			820	< 0.50	19	---	18	< 0.50	160	27	50	1.8	3.3	39	---	670	< 0.50	1300	590	---	780 ^{#2}	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	1			
	12-Sep-2017			900	< 0.50	14 ^{#4}	---	51 ^{#3}	< 0.50	190	20	64	2	3.7	53	---	740	< 0.50	1400	730	---	960 ^{#2}	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	4.5			
	13-Jul-2018			920	< 1.0	21	---	39 ^{#1}	< 1.0	150	24	46	1.7	3	56	---	750	< 1.0	1400	560	---	900 ^{#2}	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	5.7			
	16-Sep-2018			930	< 1.0	18	---	3.4	< 1.0	170	23	53	1.8	3.7	45	---	760	< 1.0	1400	640	---	840 ^{#2}	---	---	< 0.44	< 0.10 ^{#1}	< 0.33	< 0.10 ^{#1}	< 0.14	---	0.32			
	15-Jul-2019			760	< 1.0	18	---	4.5	< 1.0	140	16	54	0.85	2.9	28	---	620	< 1.0	1200	580	---	760 ^{#5}	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	1.7			
	15-Jul-2019			760	< 1.0	18	---	5.6	< 1.0	140	15	52	0.81	2.8	27	---	630	< 1.0	1200	560	---	760 ^{#5}	---	---	< 0.22	< 0.050 ^{#1}	< 0.16	< 0.050 ^{#1}	< 0.071	---	0.64			
	28-Sep-2019			830	< 1.0	19	0.096	73	< 1.0	160	12	53	1	3.3	41	0.096	680	< 1.0	1300	610	---	890 ^{#5}	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	3.5			
	23-Jul-2020			720	< 1.0	20 ^{#5}	0.082	< 10 ^{#5}	< 1.0	140	14	50	0.64	2.9	30	0.082	590	< 1.0	1200	550	---	730 ^{#2}	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	2			
	17-Sep-2020			760	< 1.0	17	0.094	< 2.0 ^{#3}	< 1.0	140	12	48	0.6	3.3	32	0.094	630	< 1.0	1200	550	---	810 ^{#2}	---	---	0.079	0.018	< 0.033	< 0.010	0.018	---	0.39			
	20-Aug-2021			780	< 1.0	16	0.086	< 1.0	< 1.0	140	14	50	0.55	2.8	25	0.086	640	< 1.0	1200	560	---	800 ^{#2}	---	---	< 0.22	< 0.050	< 0.16	< 0.050 ^{#1}	< 0.010	---	1.1			
	15-Sep-2021			800	< 1.0	16	0.088	< 1.0	< 1.0	150	12	50	0.58	3.3	32	0.088	660	< 1.0	1200	570	---	520 ^{#2}	---	---	< 0.22	< 0.050	< 0.033	< 0.010	< 0.050 ^{#1}	---	0.88			
	08-Aug-2022			770	< 1.0	12	0.11	390	< 1.0	170	11	62	0.56	2.7	33	0.11	630	< 1.0	1800	680	---	1100 ^{#2}	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.010	---	15			
	23-Sep-2022			800	< 1.0	16	0.2	59	< 1.0	180	9.2	65	0.45	3.4	30	0.2	660	< 1.0	1300	700	---	790 ^{#2}	---	---	< 0.22	< 0.050	< 0.033	< 0.010	< 0.050 ^{#1}	---	3.1			
CPF 97-7-5 (Duplicate)	07-Aug-2015	Active	W-CAT-1	350	< 0.50	11	---	750 ^{#13}	< 0.50	320	0.78	75	1.5	4.9	9	---	290	< 0.50	1800	1100	6.99	1500	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.020	1.1	---			
	07-Aug-2015			---	---	---	---	---	---	320	0.76	73	1.5	4.8	9	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		
	14-Sep-2015			400	< 0.50	11	0.11	730 ^{#13}	< 0.50	300	0.46	67	0.87	4.2	7.9	0.11	330	< 0.50	1800	1000	6.84	1500	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.020	0.95	---			
(Duplicate)	06-Aug-2016	340	< 0.50	22	---	730 ^{#13}	< 0.50	310	0.42	68	1.3	4.5	8.5	---	280	< 0.50	1700	1000	7.13	1400	---	---	0.13	0.028	< 0.033	< 0.010	< 0.010	0.028	1	---				
	06-Aug-2016	350	< 0.50	22	---	720 ^{#13}	< 0.50	310	0.43	68	1.3	4.5	8.5	---	280	< 0.50	1700	1000	7.14	1400	---	---	0.078	0.018	< 0.033	< 0.010	< 0.020	1	---					
	02-Oct-2016	420	< 0.50	23	---	660 ^{#13}	< 0.50	320	1.6	74																								



Table 3

Groundwater Analytical Results: Indicator Analysis Parameters

PROJECT No.: 417085-42051-22100				Anions										Cations										General							Inorganic Nitrogen Compounds							Miscellaneous	
Sampling Location		Date (dd-mm-yyyy)	Status	Background Category	Bicarbonate	Carbonate	Chloride	Fluoride	Sulphate	Hydroxide	Calcium	Iron	Magnesium	Manganese	Potassium	Sodium	Fluoride	Alkalinity (Total; as CaCO ₃)	Alkalinity (PP; as CaCO ₃)	Electrical Conductivity	Hardness (Total; as CaCO ₃)	pH	Total Dissolved Solids	Total Dissolved Solids (Calculated)	Ammonia (Total; as N)	Nitrate	Nitrate (as N)	Nitrite	Nitrite (as N)	Nitrite-plus-Nitrate (as N)	Ion Balance	Ion Balance % Difference							
					(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(µS/cm)	(mg/L)	(pH Units)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(Balance)	(%)						
CCME CEQG Freshwater Aquatic Life					---	---	120	0.12	---	---	---	0.3	---	---	---	---	0.12	---	---	---	---	---	(6.5 - 9)	---	---	8.5	---	2.9	---	0.06	---	---	---	---					
W-CAT-1					1000	1.0	17	700	1.0	---	312	---	---	---	5.2	161	---	---	1.0	2300	1241	8.1	1620	---	---	---	0.4	---	0.03	---	---	---	---	---					
W-CAT-2					1100	5.0	26	980	5.0	---	400	---	---	---	12	180	---	---	5.0	2800	1600	8.1	2200	---	---	---	36	---	0.11	---	---	---	---	---					
CPF 97-7-5 (cont'd) (Duplicate)		17-Sep-2020	Active	W-CAT-1	360	<1.0	11	0.083	970 ⁷³	<1.0	400	0.54	85	1.9	4.8	9.7	0.083	290	<1.0	2100	1300	---	1800	---	---	<0.044	<0.010	<0.033	<0.010	<0.010	---	2	---						
		17-Sep-2020			360	<1.0	10	0.08	1000 ⁷³	<1.0	400	0.51	85	2	4.9	9.8	0.08	290	<1.0	2100	1400	---	1800	---	---	<0.044	<0.010	<0.033	<0.010	<0.010	---	0.27	---						
		20-Aug-2021			270	<1.0	8.4	0.076	1100	<1.0	430	0.087	90	1.5	5.2	9.9	0.076	220	<1.0	2100	1400	---	1800	---	---	0.88	0.2	<0.033	<0.010	0.2	---	4.8	---						
		15-Sep-2021			380	<1.0	9.9	0.083	1100	<1.0	400	0.85	83	2.1	4.9	9.5	0.083	310	<1.0	2200	1300	---	1900	---	---	<0.22	<0.050	<0.033	<0.010	<0.050 ⁷¹	---	1.9	---						
		08-Aug-2022			460	<1.0	9.5	0.093	990	<1.0	400	<0.060	81	0.38	4.1	9.9	0.093	370	<1.0	2100	1300	---	1800	---	---	0.96	0.22	<0.033	<0.010	0.22	---	2.4	---						
		24-Sep-2022			480	<1.0	8.6	0.096	1000	<1.0	420	<0.060	85	0.58	4.7	9.9	0.096	400	<1.0	2200	1400	---	1900	---	---	0.51	0.11	<0.033	<0.010	0.11	---	2.2	---						
CPF 98-8-3		07-Aug-2015					330	<0.50	7.1	---	200 ⁷¹	<0.50	160	0.47	32	1.5	2.6	13	---	270	<0.50	900	540	6.91	740 ⁷²	---	---	0.098	0.022	0.033	0.01	0.032	1.2	---					
		14-Sep-2015					490	<0.50	8.7	0.086	190 ⁷³	<0.50	180	3.2	37	1.6	2.6	18	0.086	410	<0.50	1100	610	6.84	770	---	---	0.072	0.016	0.051	0.016	0.032	1.1	---					
		06-Aug-2016					490	<0.50	13	---	160	<0.50	170	0.45	36	2.2	2.7	11	---	400	<0.50	1000	580	7.28	720	---	---	0.12	0.026	0.05	0.015	0.042	1	---					
		02-Oct-2016					570	<0.50	12	---	130	<0.50	170	3	39	2	2.7	20	---	470	<0.50	1100	570	7.07	740 ⁷²	---	---	0.16	0.037	<0.033	<0.010	0.037	1	---					
		17-Aug-2017					370	<0.50	9.4	---	180	<0.50	150	0.081	30	0.14	2.5	10	---	310	<0.50	890	490	---	640	---	---	0.36	0.081	<0.033	<0.010	0.081	---	1.3	---				
		12-Sep-2017					410	<0.50	9.1	---	170	<0.50	160	0.76	34	0.63	2.6	12	---	330	<0.50	920	530	---	660 ⁷²	---	---	0.18	0.04	0.062	0.019	0.059	---	4	---				
		22-Jul-2018					330	<1.0	6.8	---	240 ⁷³	<1.0	150	0.21	28	0.87	2.2	9.6	---	270	<1.0	920	490	---	680 ⁷²	---	---	<0.044	<0.010	<0.033	<0.010	<0.014	---	1.9	---				
		16-Sep-2018					490	<1.0	8.5	---	200	<1.0	160	2.4	34	1.2	2.4	17	---	400	<1.0	1000	540	---	740	---	---	0.1	0.023	0.045	0.014	0.036	---	2.5	---				
		11-Jul-2019					360	<1.0	6.8	---	320 ⁷³	<1.0	190	0.069	34	0.63	2.5	12	---	300	<1.0	1100	610	---	820	---	---	0.072	0.016	<0.033	<0.010	0.016	---	0.84	---				
		28-Sep-2020					520	<1.0	9.7	0.064	250 ⁷³	<1.0	190	2.6	40	1.3	2.7	23	0.064	430	<1.0	1200	630	---	880	---	---	0.071	0.016	<0.033	<0.010	0.016	---	1.4	---				
		23-Jul-2020					440	<1.0	7.4	0.074	230 ⁷³	<1.0	180	0.53	37	0.83	2.4	14	0.074	360	<1.0	1100	600	---	850	---	---	<0.044	<0.010	0.04	0.012	<0.014	---	2.1	---				
		17-Sep-2020					600	<1.0	9	0.063	140	<1.0	180	4.8	38	1.1	2.8	32	0.063	490	<1.0	1100	590	---	800	---	---	0.24	0.055	0.051	0.015	0.07	---	2.1	---				
		20-Aug-2021					500	<1.0	6.6	0.058	190	<1.0	170	0.14	33	0.65	2.3	13	0.058	410	<1.0	1100	550	---	690 ⁷²	---	---	<0.044	<0.010	<0.033	<0.010	<0.010	---	3.2	---				
		15-Sep-2021					540	<1.0	8.3	0.057	200	<1.0	190	0.44	38	1	2.4	14	0.057	440	<1.0	1100	620	---	770	---	---	<0.044	<0.010	0.037	0.011	<0.010	---	0.82	---				
		15-Sep-2021					540	<1.0	8.1	0.057	220	<1.0	200	0.47	40	1.1	2.4	14	0.057	440	<1.0	1200	660	---	780	---	---	0.065	0.015	<0.033	<0.010	0.015	---	0.59	---				
		08-Aug-2022					530	<1.0	7.7	0.058	220	<1.0	190	0.61	41	1	2.3	14	0.058	430	<1.0	1200	640	---	830	---	---	<0.044	<0.010	0.04	0.012	<0.010	---	0.49	---				
		24-Sep-2022					650	<1.0	9.3	0.072	140	<1.0	170	3.3	38	1.1	3.9	27	0.072	530	<1.0	1200	570	---	820	---	---	0.068	0.015	<0.033	<0.010	0.015	---	3.1	---				
MEBG-10-2/ MEBG-10-1-3		06-Aug-2015	Active	W-CAT-1	610	<0.50	3	---	190 ⁷¹	<0.50	200	1.5	42	1.1	1.6	22	---	500	<0.50	1200	680	7.32	810	---	---	0.11	0.026	0.048	0.015	0.041	1.1	---	---						
		14-Sep-2015			670	<0.50	2.4	0.12	170	<0.50	200	4.2	44	1.7	1.9	23	0.12	550	<0.50	1200	680	7.2	780	---	---	0.057	0.013	<0.033	<0.010	<0.020	1	---	---						
		03-Aug-2016			520	<0.50	2.2	---	140	<0.50	170	5.8	37	2.1	1.3	12	---	420	<0.50	980	570	7.45	460	---	---	0.091	0.021	<0.033	<0.010	0.021	1.1	---	---						
		02-Oct-2016			530	<0.50	2.3	---	130	<0.50	190	9.9	46	2.6	1.8	15	---	450	<0.50	970	660	7.67	560	---	---	0.068	0.015	<0.033	<0.010	<0.020	1.2	---	---						
		12-Aug-2017			770	<0.50	2.4	---	180	<0.50	230	2.8	48	0.67	1.5	40	---	630	<0.50	1400	760	---	890	---	---	0.048	0.011	<0.033	<0.010	<0.014	---	1.7	---						
		12-Sep-2017			750	<0.50	2.4	---	180	<0.50	220	3.6	51	1.2	1.7	33	---	620	<0.50	1300	770	---	910	---	---	0.41	0.091	<0.033	<0.010	0.091	---	2.4	---						
		16-Jul-2018			610	<1.0	1.9	---	250 ⁷²	<1.0	230	0.57	44	0.45	1.3	22	---	500	<1.0	1300	750	---	900	---	---	0.38	0.087	<0.033	<0.010	0.087	---	1.8	---						
		15-Sep-2018			630	<1.0	2.3	---	240 ⁷³	<1.0	210	3.2	45	1.4	1.6	18	---	510	<1.0	1300	710	---	880	---	---	0.26	0.058	<0.033	<0.010	0.058	---	0.58	---						
		15-Jul-2019			290	<1.0	2	---	110	<1.0	97	0.27	22	0.97	0.66	7.1	---	230	<1.0	630	330	---	310	---	---	0.11	0.024	<0.033	<0.010	0.024	---	0.69	---						
		04-Oct-2019			830	<1.0	1.9	0.11	260 ⁷³	<1.0	240	4.5	51	2.3	1.3	25	0.11	680	<1.0	1500	810	---	980	---	---	<0.044	<0.010	<0.033	<0.010	<0.014	---	4.1	---						
		23-Jul-2020			350	<1.0	1.7	0.072	200 ⁷³	<1.0	210	1.1	40	0.84	0.67	9.9	0.072	290	<1.0	940	680	---	1100	---	---	0.2	0.046	<0.033	<0.010	0.046	---	17	---						
		17-Sep-2020			590	<1.0	2.2	0.099	500 ⁷³	<1.0	300	2.2	59	1.7	1	14	0.099	480	<1.0	1600	990	---	1200	---	---	0.092	0.021	<0.033	<0.010	0.021	---	1.1	---						
		17-Sep-2020			570	<1.0	1.9	0.099	500 ⁷³	<1.0	300	2.2	58	1.7	0.95	14	0.099	470	<1.0	1600	980	---	1200	---	---	0.12													



Table 3

Groundwater Analytical Results: Indicator Analysis Parameters

PROJECT No.: 417085-42051-22100				Anions						Cations						General						Inorganic Nitrogen Compounds						Miscellaneous				
Sampling Location	Date (dd-mm-yyyy)	Status	Background Category	Bicarbonate	Carbonate	Chloride	Fluoride	Sulphate	Hydroxide	Calcium	Iron	Magnesium	Manganese	Potassium	Sodium	Fluoride	Alkalinity (Total; as CaCO ₃)	Alkalinity (PP; as CaCO ₃)	Electrical Conductivity	Hardness (Total; as CaCO ₃)	pH	Total Dissolved Solids	Total Dissolved Solids (Calculated)	Ammonia (Total; as N)	Nitrate	Nitrate (as N)	Nitrite	Nitrite (as N)	Nitrite-plus-Nitrate (as N)	Ion Balance	Ion Balance % Difference	
				(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(µS/cm)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(%)
CCME CEQG Freshwater Aquatic Life				---	---	120	0.12	---	---	---	0.3	---	---	---	---	0.12	---	---	---	---	(6.5 - 9)	---	---	8.5	---	2.9	---	0.06	---	---	---	---
W-CAT-1				1000	1.0	17	700	1.0	---	312	---	---	---	5.2	161	---	---	1.0	2300	1241	8.1	1620	---	---	---	0.4	---	0.03	---	---	---	
W-CAT-2				1100	5.0	26	980	5.0	---	400	---	---	---	12	180	---	---	5.0	2800	1600	8.1	2200	---	---	---	36	---	0.11	---	---	---	
MTF 97-1-5 (cont'd)	24-Sep-2022			340	< 1.0	1.4	0.17	710	< 1.0	280	< 0.060	72	< 0.0040	1.7	3.4	0.17	280	< 1.0	1600	1000	---	1300	---	---	16	3.6	< 0.033	< 0.010	3.6	---	0.67	
TF 03-12-3	08-Aug-2015	Active	W-CAT-1	710	< 0.50	140	---	150	< 0.50	220	3.5	90	0.27	6.2	55	---	580	< 0.50	1700	930	7.29	1200 ⁹²	---	---	0.092	0.021	< 0.033	< 0.010	0.021	1.1	---	
	15-Sep-2015			740	< 0.50	140	0.44	170	< 0.50	180	4.8	70	0.4	5.3	68 ⁹⁸	0.44	600	< 0.50	1700	750	7.87	1100	---	---	0.21	0.047	< 0.033	< 0.010	0.047	0.92	---	
	06-Aug-2016			830	< 0.50	130	---	140	< 0.50	220	3.1	86	0.27	5.5	53	---	680	< 0.50	1700	900	7.5	1200 ⁹²	---	---	0.062	0.014	< 0.033	< 0.010	< 0.020	1	---	
	02-Oct-2016			830	< 0.50	120	---	160	< 0.50	220	8.4	88	0.43	5.4	59	---	680	< 0.50	1700	900	7.22	1200 ⁹²	---	---	0.095	0.021	< 0.033	< 0.010	0.021	1	---	
	17-Aug-2017			700	< 0.50	160	---	170	< 0.50	190	1.8	77	0.25	5	60	---	570	< 0.50	1700	800	---	1200 ⁹²	---	---	0.15	0.034	< 0.033	< 0.010	0.034	---	1.9	
	13-Sep-2017			820	< 0.50	190	---	110	< 0.50	190	2.8	79	0.31	5.1	54	---	670	< 0.50	1900	800	---	1100 ⁹²	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	7	
	13-Sep-2017			690	< 0.50	160	---	150	< 0.50	200	3.7	81	0.38	5	56	---	570	< 0.50	1700	820	---	990 ⁹²	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	0.28	
(Duplicate)	16-Jul-2018			740	< 1.0	170	---	130	< 1.0	220	2.8	84	0.33	4.6	50	---	610	< 1.0	1800	900	---	1100 ⁹²	---	---	0.36	0.082	< 0.033	< 0.010	0.082	---	1.7	
(Duplicate)	16-Jul-2018			730	< 1.0	170	---	130	< 1.0	220	2.6	83	0.31	4.6	50	---	600	< 1.0	1800	900	---	1200 ⁹²	---	---	0.51	0.12	0.035	0.011	0.13	---	2.1	
	16-Sep-2018			810	< 1.0	110	---	180 ⁹¹	< 1.0	200	3.3	76	0.39	4.7	50	---	670	< 1.0	1700	810	---	1100	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	3.8	
	19-Jun-2019			590	< 1.0	110	---	140	< 1.0	180	0.78	67	0.22	3.7	29	---	480	< 1.0	1400	730	---	970	---	---	0.12	0.026	< 0.033	< 0.010	0.026	---	1.6	
	28-Sep-2019			840	< 1.0	80	0.35	280 ⁹³	< 1.0	230	4.5	87	0.5	4.8	41	0.35	690	< 1.0	1700	940	---	1300 ⁹⁵	---	---	0.057	0.013	< 0.033	< 0.010	< 0.014	---	2.1	
	28-Sep-2019			820	< 1.0	78	0.35	280 ⁹³	< 1.0	240	4.5	86	0.5	4.8	41	0.35	680	< 1.0	1700	940	---	1300 ⁹⁵	---	---	0.13	0.028	< 0.033	< 0.010	0.028	---	1.4	
(Duplicate)	23-Jul-2020			750	< 1.0	99	0.32	210 ⁹³	< 1.0	240	11	92	0.63	4.8	43	0.32	610	< 1.0	1800	970	---	1300	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	5.7	
	23-Jul-2020			760	< 1.0	100	0.33	210 ⁹³	< 1.0	230	9.4	90	0.55	4.7	44	0.33	620	< 1.0	1800	950	---	1300 ⁹²	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	3.9	
	19-Sep-2020			1100	< 1.0	100	0.48	200 ⁹³	< 1.0	280	13	100	0.73	5.5	48	0.48	870	< 1.0	2100	1100	---	1600 ⁹²	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	1.7	
	20-Aug-2021			880	< 1.0	84	0.44	180	< 1.0	240	15	86	0.68	5.1	41	0.44	720	< 1.0	1700	950	---	990 ⁹²	---	---	< 0.22	< 0.050	0.067	0.02	< 0.050 ⁹³	---	1.8	
	15-Sep-2021			800	< 1.0	72	0.47	230	< 1.0	240	11	86	0.51	5.2	46	0.47	650	< 1.0	1600	950	---	1000 ⁹²	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.010	---	3.7	
(Duplicate)	15-Sep-2021			910	< 1.0	76	0.42	210	< 1.0	250	13	91	0.57	5.5	43	0.42	750	< 1.0	1800	1000	---	1200 ⁹²	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.010	---	2.6	
	07-Aug-2022			890	< 1.0	95	0.47	190	< 1.0	250	18	91	0.66	5.4	36	0.47	730	< 1.0	1800	1000	---	1300 ⁹²	---	---	< 0.044	< 0.010	0.06	0.018	0.026	---	2.4	
	23-Sep-2022			1100	< 1.0	76	0.49	140	< 1.0	280	16	100	0.92	7.1	38	0.49	920	< 1.0	1900	1100	---	1300 ⁹²	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.010	---	2.6	
WSY 97-1-5	06-Aug-2015	Active	W-CAT-1	510	< 0.50	14	---	970 ⁹³	< 0.50	440	0.063	100	0.075	4.4	34	---	420	< 0.50	2200	1500	6.96	2000	---	---	0.36	0.081	0.046	0.014	0.095	1.1	---	
	14-Sep-2015			560	< 0.50	13	0.09	960 ⁹³	< 0.50	390	0.11	110 ⁹⁸	0.064 ⁹⁸	5.0 ⁹⁸	35 ⁹⁸	0.09	460	< 0.50	2200	1400	7.15	2000	---	---	0.54	0.12	< 0.033	< 0.010	0.12	1	---	
	05-Aug-2016			570	< 0.50	11	---	950 ⁹³	< 0.50	380	2	90	0.31	3.8	26	---	470	< 0.50	2100	1300	7.51	1800 ⁹²	---	---	1.2	0.27	< 0.033	< 0.010	0.27	0.95	---	
	03-Oct-2016			480	< 0.50	6.5	---	980 ⁹³	< 0.50	430	< 0.060	85	0.16	3.8	22	---	400	< 0.50	2200	1400	7.48	1900	---	---	1.7	0.39	0.058	0.018	0.41	1	---	
	18-Aug-2017			360	< 0.50	15	---	750 ⁹³	< 0.50	350	0.22	69	0.11	2.1	13	---	290	< 0.50	1700	1100	---	1600	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	3.8	
	12-Sep-2017			440	< 0.50	26	---	660 ⁹³	< 0.50	300	2.3	82	1.4	3.2	18	---	360	< 0.50	1800	1100	---	1400	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	2.6	
	11-Jul-2018			540	< 1.0	24	---	570 ⁹³	< 1.0	310	0.44	70	0.51	2.4	13	---	440	< 1.0	1700	1100	---	1400	---	---	0.27	0.06	0.061	0.018	0.078	---	1.6	
	15-Jul-2019			420	< 1.0	23	---	480 ⁹³	< 1.0	260	0.18	47	0.37	2	14	---	340	< 1.0	1400	850	---	1100	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	0.21	
	28-Sep-2019			490	< 1.0	24	0.097	480 ⁹³	< 1.0	250	1.3	59	1	2.8	15	0.097	400	< 1.0	1500	880	---	1400	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	1.3	
	23-Jul-2020			410	< 1.0	40	0.1	430 ⁹³	< 1.0	240	0.78	47	0.27	1.8	12	0.1	340	< 1.0	1500	800	---	1100	---	---	0.47	0.11	< 0.033	< 0.010	0.11	---	0.45	
	17-Sep-2020			380	< 1.0	26	0.1	480 ⁹³	< 1.0	260	< 0.060	39	0.051	2.1	14	0.1	310	< 1.0	1400	820	---	1100	---	---	6.1	1.4	< 0.033	< 0.010	1.4 ⁹³	---	0.038	
	20-Aug-2021			460	< 1.0	33	0.096	550	< 1.0	300	0.074	52	0.051	1.4	12	0.096	370	< 1.0	1600	970	---</											



Table 3

Groundwater Analytical Results: Indicator Analysis Parameters

PROJECT No.: 417085-42051-22100			Anions										Cations										General										Inorganic Nitrogen Compounds						Miscellaneous	
Sampling Location	Date (dd-mmm-yyyy)	Status	Background Category	Bicarbonate	Carbonate	Chloride	Fluoride	Sulphate	Hydroxide	Calcium	Iron	Magnesium	Manganese	Potassium	Sodium	Fluoride	Alkalinity (Total; as CaCO ₃)	Alkalinity (PP; as CaCO ₃)	Electrical Conductivity	Hardness (Total; as CaCO ₃)	pH Units	Total Dissolved Solids	Total Dissolved Solids (Calculated)	Ammonia (Total; as N)	Nitrate	Nitrate (as N)	Nitrite	Nitrite (as N)	Nitrite-plus-Nitrate (as N)	Ion Balance	Ion Balance % Difference									
				(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(μS/cm)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(Balance)	(%)							
CCME CEQG Freshwater Aquatic Life				---	---	120	0.12	---	---	---	0.3	---	---	---	---	0.12	---	---	---	---	(6.5 - 9)	---	---	8.5	---	2.9	---	0.06	---	---	---	---								
W-CAT-1				1000	1.0	17	700	1.0	---	312	---	---	---	5.2	161	---	---	---	2300	1241	8.1	1620	---	---	---	0.4	---	0.03	---	---	---	---								
W-CAT-2				1100	5.0	26	980	5.0	---	400	---	---	---	12	180	---	---	5.0	2800	1600	8.1	2200	---	---	---	36	---	0.11	---	---	---	---								
BI-13-3-4.5 (cont'd)	20-Sep-2018	Damaged	W-CAT-2	550	<1.0	10	---	710 ^{#3}	<1.0	250	0.28	130	0.55	3.1	14	---	450	<1.0	1900	1200	---	1600	---	---	0.6	0.14	<0.033	<0.010	0.14	---	---	0.33								
	12-Jul-2019			420	<1.0	8.4	---	870 ^{#3}	<1.0	280	0.27	140	0.28	3.7	14	---	340	<1.0	1900	1300	---	1700	---	---	0.082	0.019	<0.033	<0.010	0.019	---	---	2.1								
	26-Jul-2020			340	<1.0	6	0.23	840 ^{#3}	<1.0	310	0.58	150	0.47	3	14	0.23	280	<1.0	1900	1400	---	1600	---	---	1.7	0.38	<0.033	<0.010	0.38	---	---	9.7								
	16-Sep-2020			560	<1.0	7.1	---	860 ^{#3}	<1.0	290	1.9	140	0.51	3	13	0.27	460	<1.0	2100	1300	---	1700	---	---	0.15	0.035	<0.033	<0.010	0.035	---	---	1.6								
	21-Aug-2021			470	<1.0	6	---	860	<1.0	270	0.85	110	0.47	2.7	11	---	390	<1.0	2000	1100	---	1700	---	---	<0.44	<0.10	<0.033	<0.010	<0.10 ^{#4}	---	---	5.1								
	18-Sep-2021			480	<1.0	5.5	0.3	800	<1.0	310	1.2	130	0.53	2.9	12	0.3	390	<1.0	2000	1300	---	1700	---	---	<0.044	<0.010	<0.033	<0.010	<0.010	---	---	4.1								
	07-Aug-2022			850	<1.0	11	0.23	34	<1.0	170	31	67	0.8	1.5	13	0.23	690	<1.0	1300	700	---	680	---	---	<0.044	<0.010	<0.033	<0.010	<0.010	---	---	2.5								
	25-Sep-2022			530	<1.0	6.9	0.3	920	<1.0	330	1.1	140	0.39	3.1	12	0.3	430	<1.0	2100	1400	---	1800	---	---	<0.044	<0.010	<0.033	<0.010	<0.010	---	---	1.2								
	09-Aug-2015			---	---	12	---	380 ^{#3}	---	250	0.24	59	5.5	2.2	6.6	---	---	---	1400	---	---	---	---	---	---	0.14	0.032	<0.033	<0.010	0.032	---	---	---							
	10-Aug-2016			630	<0.50	25	---	520 ^{#3}	<0.50	320	0.23	65	3.3	2.1	7.4	---	510	<0.50	1800	1100	7.34	1300	---	---	0.049	0.011	<0.033	<0.010	<0.020	1	---	---								
11-Aug-2017	540	<0.50	18	---	350 ^{#3}	<0.50	230	0.072	54	0.14	1.9	7.5	---	440	<0.50	1400	800	---	1000	---	---	0.82	0.18	<0.033	<0.010	0.18	---	---	0.69											
BIBG-10-3/BIBG-10-1-4	17-Jul-2018	Active	W-CAT-2	560	<1.0	16	---	320 ^{#3}	<1.0	220	0.12	46	0.31	1.7	6.5	---	460	<1.0	1400	730	---	1000	---	---	0.15	0.034	<0.033	<0.010	0.034	---	---	4.2								
	20-Sep-2018			550	<1.0	23	---	300 ^{#3}	<1.0	220	0.3	55	2	1.8	7.5	---	450	<1.0	1300	780	---	1000	---	---	<0.044	<0.010	<0.033	<0.010	<0.014	---	---	0.18								
	17-Jul-2019			480	<1.0	23	---	320 ^{#3}	<1.0	220	0.13	50	0.73	1.7	6.7	---	390	<1.0	1300	750	---	950	---	---	<0.044	<0.010 ^{#9}	<0.033	<0.010 ^{#9}	<0.014	---	---	0.93								
	29-Sep-2019			610	<1.0	20	0.21	320 ^{#3}	<1.0	260	3	55	1.3	1.8	6.4	0.21	500	<1.0	1500	870	---	1100	---	---	<0.044	<0.010	<0.033	<0.010	<0.014	---	---	1.6								
	26-Jul-2020			440	<1.0	22	0.23	390 ^{#3}	<1.0	240	0.13	56	0.44	1.4	6.7	0.23	360	<1.0	1400	830	---	980 ^{#2}	---	---	0.17	0.038	<0.033	<0.010	0.038	---	---	2.2								
	09-Aug-2015			960	<0.50	8.1	---	670 ^{#3}	<0.50	110	<0.060	42	0.09	2	520 ^{#3}	---	780	<0.50	2600	450	7.4	2100	---	---	11	2.6	0.56	0.17	2.8	1.1	---	---								
	07-Aug-2016			910	<0.50	7.5	---	620 ^{#3}	<0.50	180	<0.060	76	0.11	1.5	300	---	740	<0.50	2400	770	7.42	1700 ^{#2}	---	---	1.8	0.4	0.14	0.043	0.44	1	---	---								
	22-Nov-2017			1000	<1.0	20	---	110	<1.0	240	0.22	91	0.86	3.8	19	---	840	<1.0	1700	980	---	940 ^{#2}	---	---	0.22	0.05	0.062	0.019	0.068	---	---	4.2								
	20-Jul-2018			720	<1.0	16	---	160	<1.0	170	1.8	77	0.46	3.1	16	---	590	<1.0	1300	750	---	900	---	---	3.7	0.83	<0.033	<0.010	0.83	---	---	0.29								
	20-Sep-2018			950	<1.0	22	---	160	<1.0	230	27	87	0.92	3.5	18	---	780	<1.0	1500	940	---	1100	---	---	0.051	0.011	<0.033	<0.010	<0.014	---	---	3								
(Duplicate)	17-Jul-2019	820	<1.0	19	---	180	<1.0	210	5.7	93	0.65	3.5	20	---	670	<1.0	1500	910	---	1000	---	---	2.4	0.53	0.037	0.011	0.55	---	---	4.6										
	17-Jul-2019	840	<1.0	19	---	180	<1.0	210	5.7	93	0.65	3.5	20	---	690	<1.0	1500	910	---	1000	---	---	2.4	0.54	0.043	0.013	0.56	---	---	3.2										
	29-Sep-2019	1000	<1.0	22	0.21	200	<1.0	270	21	100	1.2	3.7	19	0.21	830	<1.0	1700	1100	---	1100	---	---	0.26	0.059	0.045	0.014	0.072	---	---	5.6										
	26-Jul-2020	840	<1.0	18	0.17	190	<1.0	230	3.7	97	0.82	3.1	19	0.17	690	<1.0	1600	980	---	980 ^{#2}	---	---	0.87	0.2	0.04	0.012	0.21	---	---	6.1										
	26-Jul-2020	850	<1.0	20	0.17	190	<1.0	210	3.8	93	0.84	3.3	19	0.17	700	<1.0	1600	920	---	1000	---	---	0.64	0.15	0.034	0.01	0.16	---	---	2.4										
	16-Sep-2020	970	<1.0	19	0.21	210 ^{#3}	<1.0	250	15	100	1.2	3.9	19	0.21	800	<1.0	1700	1000	---	1100	---	---	0.35	0.078 ^{#4}	<0.16	<0.050 ^{#4}	0.078	---	---	3.1										
	21-Aug-2021	940	<1.0	20	---	180	<1.0	220	0.11	82	0.51	3	16	---	770	<1.0	1600	880	---	1000	---	---	1.7	0.39	<0.033	<0.010	0.39	---	---	3.9										
	18-Sep-2021	1100	<1.0	23	0.25	180	<1.0	250	3.2	92	1	3.3	17	0.25	870	<1.0	1800	1000	---	1200	---	---	0.054	0.012	<0.033	<0.010	0.012	---	---	2.2										
	07-Aug-2022	880	<1.0	24	0.17	340	<1.0	300	0.13	97	0.73	3.2	19	0.17	730	<1.0	1800	1200	---	1400	---	---	1.5	0.35	0.045	0.014	0.36	---	---	3.8										
	25-Sep-2022	1100	<1.0	26	0.23	300	<1.0	320	0.69	110	1.3	3.5	20	0.23	910	<1.0	2000	1300	---	1500	---	---	0.16	0.035	0.046	0.014	0.049	---	---	1.6										
	Surveillance Network Program - Goose Island Locations																																							
GIBG-10-2/10-2-3 (Duplicate)	10-Aug-2015	Active	W-CAT-2	270	<0.50	1.9	---	58	<0.50	71	0.23	12	1.6	2.5	18	---	220	<0.50	510	230	7.71	330 ^{#2}	---	---	0.25	0.057	0.035	0.011	0.067	0.96	---	---								
	10-Aug-2015			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---							
16-Sep-2015	440			<0.50	3.1	0.086	330 ^{#3}	<0.50	170	0.82	28	1.5 ^{#11}	3.9	57	0.086	360	<0.50	1200	530	7.9	690	---	---	0.79	0.18	<0.033	<0.010	0.18	0.95	---	---									
07-Aug-2016	290			<0.50	<1.0	---	77	<0.50	87	0.15	13	1.7	2.6	30	---	240	<0.50	610	270	7.85	430 ^{#2}	---	---	0.47	0.11	<0.033	<0.010	0.11	1.1	---	---									
07-Aug-2016	310			<0.50	<1.0	---	84	<0.50	87	0.15	13	1.7	2.6	30	---	250	<0.50	640	270	7.86	360 ^{#2}	---	---	0.52	0.12	<0.033	<0.010	0.12	1	---	---									
(Duplicate)	03-Oct-2016	Active	W-CAT-2	470	<0.50	2.3	---	98	<0.50	120	1.5	20	2.1	3	34	---	390	<0.50	840	390	7.76	570 ^{#2}	---	---	0.069	0.016	<0.033	<0.010	<0.020	0.95	---	---								
	20-Aug-2017			370	<0.50	2.4	---	140	<0.50	130	0.43	24	1.7	2.9	30	---	310	<0.50	810	430	---	560 ^{#2}	---	---	0.58	0.13	<0.033	<0.010	0.13	---	---	4.3								
	20-Aug-2017			410	<0.50	2.3	---	130	<0.50	130	0.44	24	1.7	2.9	29	---	340	<0.50	840	430	---	560 ^{#2}	---	---	0.5	0.11	<0.033	<0.010	0.11	---	---	1.8								
	12-Sep-2017			630	<0.50	2.9	---	180	<0.50	190	<0.060	35	0.83	3.7	43	---	520	<0.50	1200	630	---	740 ^{#2}	---	---	0.44	0.1	<0.033	<0.010	0.1	---	---	1.5								
	14-Jul-2018			400	<1.0	6.9	---	130	<1.0	120	0.16	22	0.66	2.3	30	---	330	<1.0	830	390	---	570 ^{#2}	---	---																



Table 3

Groundwater Analytical Results: Indicator Analysis Parameters

PROJECT No.: 417085-42051-22100				Anions						Cations						General						Inorganic Nitrogen Compounds						Miscellaneous				
Sampling Location	Date (dd-mm-yyyy)	Status	Background Category	Bicarbonate (mg/L)	Carbonate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulphate (mg/L)	Hydroxide (mg/L)	Calcium (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Manganese (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Fluoride (mg/L)	Alkalinity (Total; as CaCO ₃) (mg/L)	Alkalinity (PP; as CaCO ₃) (mg/L)	Electrical Conductivity (uS/cm)	Hardness (Total; as CaCO ₃) (mg/L)	pH Units	Total Dissolved Solids (mg/L)	Total Dissolved Solids (Calculated) (mg/L)	Ammonia (Total; as N) (mg/L)	Nitrate (mg/L)	Nitrate (as N) (mg/L)	Nitrite (mg/L)	Nitrite (as N) (mg/L)	Nitrite-plus-Nitrate (as N) (mg/L)	Ion Balance (Balance)	Ion Balance % Difference (%)	
CCME CEQG Freshwater Aquatic Life				---	---	120	0.12	---	---	---	0.3	---	---	---	---	0.12	---	---	---	---	(6.5 - 9)	---	---	---	8.5	---	2.9	---	0.06	---	---	---
W-CAT-1				1000	1.0	17	700	1.0	---	312	---	---	---	5.2	161	---	---	1.0	2300	1241	8.1	1620	---	---	---	0.4	---	0.03	---	---	---	
W-CAT-2				1100	5.0	26	980	5.0	---	400	---	---	---	12	180	---	---	5.0	2800	1600	8.1	2200	---	---	---	36	---	0.11	---	---	---	
GIP11 09-1-4	10-Aug-2015 16-Sep-2015	Replaced	W-CAT-2	520	< 0.50	4.5	---	290 ^{#3}	< 0.50	220	0.57	45	1.1	2.9	21	---	430	< 0.50	1200	730	7.14	930	---	---	1.5	0.33	< 0.033	< 0.010	0.33	1.1	---	
GIP11 09-1-4-R	14-Jul-2018 20-Sep-2018 16-Jul-2019 04-Oct-2019 25-Jul-2020 16-Sep-2020 17-Sep-2021 08-Aug-2022 25-Sep-2022	Active	W-CAT-2	530	< 0.50	6.3	0.062	260 ^{#3}	< 0.50	190	3.2	38	1.6 ^{#11}	2.9	24 ^{#8}	0.062	430	< 0.50	1200	630	7.76	780	---	---	0.14	0.032	< 0.033	< 0.010	0.032	0.98	---	
				800	< 1.0	50	---	200 ^{#1}	< 1.0	270	< 0.060	51	1.6	4	8.8	---	660	< 1.0	1600	890	---	1100	---	---	0.6	0.13	< 0.033	< 0.010	0.13	---	0.94	
				800	< 1.0	14	---	200	< 1.0	250	< 0.060	47	0.37	3.7	6.2	---	650	< 1.0	1400	810	---	970	---	---	1.2	0.27	< 0.033	< 0.010	0.27	---	3.2	
				580	< 1.0	14	---	110	< 1.0	170	< 0.060	29	0.42	6	8.8	---	470	< 1.0	1000	550	---	690	---	---	0.54	0.12	< 0.033	< 0.010	0.12	---	2.2	
				---	---	17	0.061	---	---	---	---	---	---	---	---	0.061	---	---	1100	---	---	---	---	---	---	---	---	---	---	---	---	
				300	< 1.0	5.9	0.053	49	< 1.0	93	0.068	18	1.5	2.2	7.1	0.053	250	< 1.0	610	300	---	290 ^{#2}	---	---	1.5	0.34	< 0.033	< 0.010	0.34	---	2.2	
				330	< 1.0	5	0.077	58	< 1.0	97	0.5	21	1.4	2.3	7.9	0.077	270	< 1.0	610	330	---	390 ^{#2}	---	---	0.78	0.18	< 0.033	< 0.010	0.18	---	1.5	
				280	< 1.0	5.4	0.078	42	< 1.0	80	0.28	16	0.65	2.5	6.6	0.078	230	< 1.0	510	260	---	320	---	---	0.71	0.16	< 0.033	< 0.010	0.16	---	0.05	
				760	< 1.0	7.1	< 0.050	120	< 1.0	220	1.1	43	0.66	4	7	< 0.050	630	< 1.0	1300	740	---	830	---	---	4.7	1.1	< 0.033	< 0.010	1.1	---	0.47	
				780	< 1.0	9.1	0.057	120	< 1.0	230	0.12	46	1.4	4	6.7	0.057	640	< 1.0	1300	750	---	760 ^{#2}	---	---	0.47	0.11	< 0.033	< 0.010	0.11	---	0.55	
GIQ8-10-3/8-10-2-4	16-Sep-2015 07-Aug-2016 03-Oct-2016 03-Oct-2016 20-Aug-2017 12-Sep-2017 14-Jul-2018 20-Sep-2018 20-Sep-2018 16-Jul-2019 30-Sep-2019 30-Sep-2019 25-Jul-2020 16-Sep-2020 21-Aug-2021 17-Sep-2021 09-Aug-2022 25-Sep-2022	Active	W-CAT-2	640	< 0.50	20	< 0.050	690 ^{#3}	< 0.50	330	1	81	4.1	3.1	26	< 0.050	530	< 0.50	2000	1200	7.77	1700	---	---	0.062	0.014	< 0.033	< 0.010	< 0.020	0.97	---	
(Duplicate)				630	< 0.50	14	---	580 ^{#3}	< 0.50	300	3.5	86	5.1	3.3	22	---	520	< 0.50	1900	1100	7.49	1500	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.020	1	---	
				740	< 0.50	18	---	640 ^{#3}	< 0.50	340	5.4	94	5.7	3.7	25	---	610	< 0.50	2000	1200	7.45	1700 ^{#2}	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.020	1	---	
				740	< 0.50	19	---	660 ^{#3}	< 0.50	340	5.5	94	5.6	3.6	25	---	590	< 0.50	2000	1200	7.48	1700	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.020	1	---	
				450	< 0.50	5.8	---	91	< 0.50	140	2.7	28	1.5	2.8	8.5	---	370	< 0.50	820	460	---	560 ^{#2}	---	---	0.089	0.02	< 0.033	< 0.010	0.02	---	2.5	
				390	< 0.50	9.4	---	220 ^{#3}	< 0.50	150	0.31	36	1.5	2.3	11	---	320	< 0.50	990	520	---	740 ^{#2}	---	---	0.09	0.02	< 0.033	< 0.010	0.02	---	1.3	
(Duplicate)				800	< 1.0	21	---	680 ^{#3}	< 1.0	340	2.2	83	3.5	3.1	21	---	660	< 1.0	2200	1200	---	1700	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	5.5	
				780	< 1.0	21	---	700 ^{#3}	< 1.0	370	3.6	95	5.8	3.6	25	---	640	< 1.0	2100	1300	---	1800 ^{#2}	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	0.12	
				860	< 1.0	21	---	690 ^{#3}	< 1.0	380	4	98	6	3.7	25	---	710	< 1.0	2100	1300	---	1800 ^{#2}	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	0.94	
				780	< 1.0	20	---	710 ^{#3}	< 1.0	370	5.5	92	4.7	3.5	43	---	640	< 1.0	2100	1300	---	1800 ^{#5}	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	0.11	
(Duplicate)				750	< 1.0	20	< 0.050	740 ^{#3}	< 1.0	380	8.3	100	6.7	3.5	29	< 0.050	610	< 1.0	2200	1400	---	1800	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	1.5	
				730	< 1.0	20	< 0.050	740 ^{#3}	< 1.0	380	8.5	100	6.7	3.5	30	< 0.050	600	< 1.0	2200	1400	---	1800	---	---	0.18	0.040 ^{#9}	< 0.033	< 0.010	0.04	---	2.3	
				380	< 1.0	6.9	< 0.050	55	< 1.0	130	0.071	24	1.8	2	8.5	< 0.050	310	< 1.0	740	420	---	400	---	---	0.11	0.025	< 0.033	< 0.010	0.025	---	8.4	
				650	< 1.0	19	< 0.050	570 ^{#3}	< 1.0	250	0.84	64	4	2.9	17	< 0.050	530	< 1.0	1800	890	---	1300 ^{#2}	---	---	0.057	0.013	< 0.033	< 0.010	< 0.014	---	10	
				710	< 1.0	21	---	480	< 1.0	310	3.8	63	2.5	3.8	58	---	580	< 1.0	1900	1000	---	1500 ^{#2}	---	---	< 0.44	< 0.10	< 0.033	< 0.010	< 0.10 ^{#1}	---	2.7	
				670	< 1.0	21	0.092	540	< 1.0	290	5.4	68	4	3	27	0.092	550	< 1.0	1900	1000	---	1500	---	---	< 0.22	< 0.050	< 0.033	< 0.010	< 0.050 ^{#1}	---	2.8	
				920	< 1.0	38	< 0.050	760	< 1.0	440	17	99	4.5	3.2	47	< 0.050	750	< 1.0	2400	1500	---	1900 ^{#2}	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.010	---	1.4	
				900	< 1.0	33	< 0.050	780	< 1.0	440	21	110	6.2	3.5	34	< 0.050	740	< 1.0	2400	1500	---	2000 ^{#2}	---	---	< 0.044	< 0.010	< 0.033	< 0.010	< 0.010	---	2.1	
Surveillance Network Program - Duplicate RPDs																																
ARB-12-8/ARB-12-3-3	09-Aug-2022 09-Aug-2022	Active	W-CAT-1	490	< 1.0	14	0.1	120	< 1.0	130	< 0.060	42	0.057	2.4	13	0.1	400	< 1.0	930	500	---	630	---	---	1.4	0.32	< 0.033	< 0.010	0.32	---	1.3	
RPD (%)				480	< 1.0	14	0.11	120	< 1.0	130	< 0.060	42	0.066	2.4	12	0.1	400	< 1.0	930	510	---	620	---	---	1.5	0.33	< 0.033	< 0.010	0.33	---	0.92	
				2.06	---	---	9.5	---	---	---	---	---	14.63	---	8.0	---	---	---	---	1.98	---	1.60	---	---	6.89	3.07	---	---	3.07	---	34.23	



Table 3

Groundwater Analytical Results: Indicator Analysis Parameters

PROJECT No.: 417085-42051-22100				Anions							Cations							General							Inorganic Nitrogen Compounds						Miscellaneous	
Sampling Location	Date (dd-mmm-yyyy)	Status	Background Category	Bicarbonate	Carbonate	Chloride	Fluoride	Sulphate	Hydroxide	Calcium	Iron	Magnesium	Manganese	Potassium	Sodium	Fluoride	Alkalinity (Total; as CaCO ₃)	Alkalinity (PP; as CaCO ₃)	Electrical Conductivity	Hardness (Total; as CaCO ₃)	pH	Total Dissolved Solids	Total Dissolved Solids (Calculated)	Ammonia (Total; as N)	Nitrate	Nitrate (as N)	Nitrite	Nitrite (as N)	Nitrite-plus-Nitrate (as N)	Ion Balance	Ion Balance % Difference	
				(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(µS/cm)	(mg/L)	(pH Units)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(Balance)
CCME CEQG Freshwater Aquatic Life				---	---	120	0.12	---	---	---	0.3	---	---	---	---	0.12	---	---	---	---	(6.5 - 9)	---	---	8.5	---	2.9	---	0.06	---	---	---	
W-CAT-1				1000	1.0	17	---	700	1.0	312	---	---	---	5.2	161	---	---	1.0	2300	1241	8.1	1620	---	---	---	0.4	---	0.03	---	---	---	
W-CAT-2				1100	5.0	26	---	980	5.0	400	---	---	---	12	180	---	---	5.0	2800	1600	8.1	2200	---	---	---	36	---	0.11	---	---	---	

NOTES:

Chloride
910

1. --- in guideline row(s) denotes no criteria for that parameter.
2. --- in detail data row(s) denotes parameter not analyzed.
3. Indicates Primary Indicator Parameters
4. Indicates values above calculated background concentration.
5. Highlighting indicates parameters above applied guideline/criteria.
6. Highlighting indicates non-detect parameters above applied guideline/criteria.
7. Highlighting indicates parameters at applied guideline/criteria.
8. Denotes values exceeding
(CCME, 2014. Canadian Environmental Quality Guidelines Summary Table. Water Quality Guidelines for the Protection of Freshwater Aquatic Life. <http://st-ts.ccme.ca/?chems=all&chapters=1> accessed Aug 22, 2014.)
Chloride:
Guideline based on chronic exposure
Nitrate (as N):
Guideline based on long term exposure
Nitrite (as N):
Standard is for NO₂ as N, equivalent standard for NO₂ is 0.197 mg/L.
9. Superscript ^{†1} - Detection limits raised due to matrix interference.
10. Superscript ^{†2} - Detection limit raised based on sample volume used for analysis.
11. Superscript ^{†3} - Detection limits raised due to dilution to bring analyte within the calibrated range.
12. Superscript ^{†4} - Detection limits raised due to sample matrix.
13. Superscript ^{†5} - Detection limit raised based on sample volume used and sample matrix.
14. Superscript ^{†6} - Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.
15. Superscript ^{†7} - Matrix Spike exceeds acceptance limits for dissolved Mg. due to matrix interference. Reanalysis yields similar results. (Recovery:76%, limits 80-120%)
16. Superscript ^{†8} - Dissolved greater than total. Results within acceptable limits of precision.
17. Superscript ^{†9} - Sample was originally processed within hold time. Data quality required investigation. Re-analysis was completed past recommended hold time.
18. Superscript ^{†10} - Detection limit raised based on sample volume used for analysis
19. Superscript ^{†11} - Dissolved greater than total. Reanalysis yields similar results.



Table 4

Groundwater Analytical Results: Dissolved Metals and Trace Elements

PROJECT No.: 417085-42051-22100

PROJECT No.: 417085-4201-22100																																	
Sampling Location	Date (dd-mm-yyyy)	Status	Background Category																														
				Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (Total) (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Lithium (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Phosphorus (mg/L)	Selenium (mg/L)	Silicon (mg/L)	Silver (mg/L)	Strontium (mg/L)	Thallium (mg/L)	Tin (mg/L)	Titanium (mg/L)	Uranium (mg/L)	Vanadium (mg/L)	Zinc (mg/L)		
CMCE CEQG Freshwater Aquatic Life				0.005	---	0.005	---	---	---	1.5	0.00009	0.0089	---	---	---	---	0.00026	0.073	0.025	---	0.001	---	0.00025	---	0.0008	---	---	---	0.015	---	---	0.03	
W-CAT-1				0.13	---	0.01	0.53	---	---	0.27	0.002	0.007	---	---	---	---	0.01	6.11	0.023	---	0.005	0.03	---	0.002	---	---	---	---	0.009	---	---	0.03	
W-CAT-2				0.03	---	0.00239	0.22	---	---	0.09	0.00073	0.01	---	---	---	---	0.01	64	0.002	---	---	---	0.000003	0.041	0.04	---	0.002	---	---	0.082	---	---	0.03
Surveillance Network Program - Mainland Locations																																	
ARB-12-8/ARB-12-3-3				0.014	< 0.00060	0.00042	0.11	< 0.0010	0.045	0.000041	< 0.0010	< 0.00030	0.0038	< 0.060	< 0.00020	< 0.020	< 0.0040	---	0.00096	0.0025	< 0.10	0.00044	4.1	< 0.00010	0.57	< 0.00020	< 0.0010	< 0.0010	0.0096	< 0.0010	0.0069		
	07-Aug-2015	Active	W-CAT-1	0.0067	< 0.00060	0.00045	0.13	< 0.0010	0.069	0.00011	< 0.0010	0.0023	0.0031	0.25	< 0.00020	< 0.020	0.26	---	0.00067	0.0072	< 0.10	0.00024	4.8	< 0.00010	0.73 ⁴¹	< 0.00020	< 0.0010	< 0.0010	0.013	< 0.0010	0.0045		
	14-Sep-2015			0.012	< 0.00060	0.00077	0.099	< 0.0010	0.043	0.00012	< 0.0010	0.0017	0.0093	0.084	< 0.00020	< 0.020	0.12	---	0.0015	0.0087	< 0.10	0.001	4.7	< 0.00010	0.48	< 0.00020	< 0.0010	< 0.0010	0.012	< 0.0010	0.0093		
	05-Aug-2016			0.035	< 0.00060	0.0016	0.12	< 0.0010	0.066	0.00011	< 0.0010	0.0005	0.0043	4.7	< 0.00020	< 0.020	0.46	0.0000055	0.0011	0.011	< 0.10	0.00058	5.6	< 0.00010	0.74	< 0.00020	< 0.0010	< 0.0010	0.012	< 0.0010	0.011		
	02-Oct-2016			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
	04-Nov-2016			0.015	< 0.00060	0.00076	0.11	< 0.0010	0.049	0.000077	< 0.0010	< 0.00030	0.0063	< 0.060	< 0.00020	< 0.020	0.057	< 0.0000020	0.0015	0.0057	< 0.10	0.00058	5	< 0.00010	0.62	< 0.00020	< 0.0010	< 0.0010	0.011	< 0.0010	0.011		
	12-Aug-2017			0.013	< 0.00060	0.00077	0.11	< 0.0010	0.039	0.00007	< 0.0010	< 0.00030	0.004	< 0.060	< 0.00020	< 0.020	0.025	< 0.0000020	0.0031	0.0033	0.14	0.003	5.7	< 0.00010	0.49	< 0.00020	< 0.0010	< 0.0010	0.0081	< 0.0010	0.0047		
	12-Sep-2017			0.2	< 0.00060	0.0011	0.11	< 0.0010	< 0.020	0.000065	< 0.0010	0.00073	0.0046	0.49	< 0.00020	< 0.020	0.064	0.0000065	0.0018	0.0039	0.38	0.00039	5.5	< 0.00010	0.45	< 0.00020	< 0.0010	0.0049	0.007	0.014	0.1		
	11-Jul-2018			0.0078	< 0.00060	0.00078	0.11	< 0.0010	0.055	0.000065	< 0.0010	0.00064	0.0042	< 0.060	< 0.00020	< 0.020	0.15	0.0000025	0.0028	0.0041	0.13	0.00085	5.4	< 0.00010	0.47	< 0.00020	< 0.0010	< 0.0010	0.01	< 0.0010	0.0065		
	15-Sep-2018			0.018	< 0.00060	0.00099	0.1	< 0.0010	< 0.020	0.000024	< 0.0010	< 0.00030	0.0018	< 0.060	< 0.00020	< 0.020	0.033	0.0000025	0.0025	0.0025	0.38	0.00068	5.5	< 0.00010	0.46	< 0.00020	< 0.0010	< 0.0010	0.0061	< 0.0010	0.0054		
	28-Sep-2019			0.012	< 0.00060	0.0011	0.11	< 0.0010	0.022	0.000085	< 0.0010	0.00059	0.0026	0.36	< 0.00020	< 0.020	0.26	< 0.0000020	0.005	0.0037	0.2	0.00079	4.9	< 0.00010	0.44	< 0.00020	< 0.0010	< 0.0010	0.0077	< 0.0010	0.0064		
	23-Jul-2020			0.011	< 0.00060	0.00085	0.083	< 0.0010	0.024	< 0.000020	< 0.0010	< 0.00030	0.0025	< 0.060	< 0.00020	< 0.020	0.040	< 0.0000019 ⁴²	0.0045	0.0016	0.26	0.0019	4.7	< 0.00010	0.38	< 0.00020	< 0.0010	< 0.0010	0.0036	< 0.0010	0.0056		
	17-Sep-2020			0.014	< 0.00060	0.00098	0.12	< 0.0010	0.074	0.000089	< 0.0010	0.0014	0.0054	0.11	< 0.00020	< 0.020	0.35	< 0.0000019	0.0025	0.005	0.19	0.00082	5.2	< 0.00010	0.57	< 0.00020	< 0.0010	< 0.0010	0.009	< 0.0010	0.0076		
	20-Aug-2021			0.015	< 0.00060	0.001	0.1	< 0.0010	0.03	0.000028	< 0.0010	< 0.00030	0.0025	0.086	< 0.00020	< 0.020	0.048	0.0000022	0.005	0.003	0.26	0.00058	5.4	< 0.00010	0.4	< 0.00020	< 0.0010	< 0.0010	0.0048	< 0.0010	0.0047		
	15-Sep-2021			0.021	< 0.00060	0.0012	0.11	< 0.0010	0.039	0.00012	< 0.0010	0.00083	0.0044	0.2	< 0.00020	< 0.020	0.52	0.0000048	0.0043	0.0049	0.24	0.00071	4.5	< 0.00010	0.49	< 0.00020	< 0.0010	< 0.0010	0.0069	< 0.0010	0.011		
	09-Aug-2022			0.016	< 0.00060	0.001	0.099	< 0.0010	< 0.020	0.000030	< 0.0010	< 0.00030	0.0024	< 0.060	< 0.00020	< 0.020	0.057	0.0000031	0.0045	0.003	0.34	0.0013	5.8	< 0.00010	0.43	< 0.00020	< 0.0010	< 0.0010	0.006	< 0.0010	0.0054		
	09-Aug-2022			0.017	< 0.00060	0.00097	0.1	< 0.0010	< 0.020	0.000044	< 0.0010	< 0.00030	0.0025	< 0.060	< 0.00020	< 0.020	0.066	0.0000037	0.0048	0.0033	0.34	0.0013	5.8	< 0.00010	0.43	< 0.00020	< 0.0010	< 0.0010	0.0061	< 0.0010	0.0053		
	23-Sep-2022			0.019	< 0.00060	0.0016	0.12	< 0.0010	0.028	0.000036	< 0.0010	0.00023	0.0023	0.29	< 0.00020	< 0.020	0.19	0.0000035	0.0074	0.0063	0.27	0.00044	5.4	< 0.00010	0.49	< 0.00020	< 0.0010	< 0.0010	0.0073	< 0.0010	0.0096		
C38 08-1-4	06-Aug-2015	Active	W-CAT-1	0.038	< 0.00060	0.00097	0.55	< 0.0010	0.05	< 0.000020	< 0.0010	0.0047	< 0.00020	18	< 0.00020	0.029	2.9	---	0.00026	0.0076	0.19	0.0031	8.9	< 0.00010	0.73	< 0.00020	< 0.0010	0.0015	0.0087	0.001	0.0066		
	14-Sep-2015			0.043	< 0.00060	0.011	0.52	< 0.0010	0.053	< 0.000020	< 0.0010	0.0044	0.0039	22	< 0.00020	0.026	3	---	< 0.00020	0.0084	0.33	0.00069	9	< 0.00010	0.84 ⁴⁴	< 0.00020	< 0.0010	< 0.0010	0.0014	0.0012	0.0034		
	05-Aug-2016			0.045	< 0.00060	0.0097	0.52	< 0.0010	0.027	< 0.000020	< 0.0010	0.0037	0.0028	19	< 0.00020	0.028	2.5	---	0.00096	0.0059	0.1	0.00032	11	< 0.00010	0.65	< 0.00020	< 0.0010	0.0017	0.0065	0.0011	0.0048		
	02-Oct-2016			0.054	< 0.00060	0.0079	0.54	< 0.0010	0.031	< 0.000020	< 0.0010	0.0033	0.0039	22	< 0.00020	0.028	2.2	0.0000028	0.00034	0.054	0.4	0.00018	11	< 0.00010	0.61	< 0.00020	< 0.0010	0.0017	0.0035	0.0013	0.0044		
	04-Nov-2016			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
	12-Aug-2017			0.067	< 0.00060	0.023	0.55	< 0.0010	0.061	< 0.000020	< 0.0010	0.0052	0.00034	27	< 0.00020	0.024	1.8	0.0000021	0.00033	0.0068	0.13	0.0028	11	< 0.00010	0.53	< 0.00020	< 0.0010	0.0013	0.0013	0.0015	0.0047		
	12-Sep-2017			0.11	< 0.00060	0.015	0.48	< 0.0010	0.047	< 0.000020	< 0.0010	0.0053	< 0.00020	20	< 0.00020	0.029	2	< 0.00000020	0.00031	0.0076	0.16	0.00058	12	< 0.00010	0.62	< 0.00020	< 0.0010	0.0065	0.0019	0.0018	< 0.0030		
	13-Jul-2018			0.055	< 0.00060	0.0074	0.49	< 0.0010	0.026	0.00002	< 0.0010	0.0034	0.0003	24	< 0.00020	0.023	1.7	< 0.00000020	< 0.00020	0.0058	0.36	0.00083	9.1	< 0.00010	0.58	< 0.00020	< 0.0010	0.0012	0.0009	0.0011	0.0009		
	16-Sep-2018			0.93	< 0.00060	0.01	0.56	< 0.0010	0.032	0.00013	0.0017	0.0042	0.0023	23	0.0034	0.025	1.8	0.0000042 ⁴⁵	0.00037	0.01	0.7	0.00087	13	< 0.00010	0.5	< 0.00020	< 0.0010	0.0098	0.0052	0.0042	0.0039		
	15-Jul-2019			0.068	< 0.00060	0.0061	0.39	< 0.0010	< 0.020	< 0.000020	< 0.0010	0.0029	0.00028	16	< 0.00020	< 0.020	0.81	< 0.00000020	0.0004	0.0049	0.67	0.00077	10	< 0.00010	0.42	< 0.00020	< 0.0010	0.002	0.0005	0.0011	0.001		
	15-Jul-2019			0.065	< 0.00060	0.0054	0.37	< 0.0010	< 0.020	< 0.000020	< 0.0010	0.0028	0.00039	15	< 0.00020	< 0.020	0.81	< 0.00000020	0.00022	0.0049	0.64	0.00054	10	< 0.00010	0.41	< 0.00020	< 0.0010	0.0016	0.0008	0.0009	0.001	0.0037	
	28-Sep-2019			0.065	< 0.00060	0.005	0.32	< 0.0010	< 0.020	< 0.000020	< 0.0010	0.0027	0.00031	12	< 0.00020	0.024	1	< 0.00000020	0.00099	0.0044	0.54	0.00051	9.5	< 0.00010	0.44	< 0.00020	< 0.0010	0.0017	0.0009	< 0.0010	0.0033		
	23-Jul-2020			0.058	< 0.0012	0.0034	0.32	< 0.0020	< 0.020	< 0.000040	< 0.0020	0.0017	0.00046	14	< 0.00040	< 0.020	0.64	< 0.0000019 ⁴²	< 0.00														



Table 4

Groundwater Analytical Results: Dissolved Metals and Trace Elements

PROJECT No.: 417085-42051-22100				Date (dd-mm-yyyy)	Status	Background Category																											
Sampling Location			Aluminum (mg/L)				Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (Total) (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Lithium (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Phosphorus (mg/L)	Selenium (mg/L)	Silicon (mg/L)	Silver (mg/L)	Strontium (mg/L)	Thallium (mg/L)	Tin (mg/L)	Titanium (mg/L)	Uranium (mg/L)	Vanadium (mg/L)	Zinc (mg/L)
CMCE CEQG Freshwater Aquatic Life			0.005	--	0.005	--	--	1.5	0.00009	0.0089	--	0.002	0.3	0.001	--	--	--	0.000026	0.073	0.025	--	0.001	--	0.00025	--	0.0008	--	--	0.015	--	0.03		
W-CAT-1			0.13	--	0.01	0.53	--	0.27	0.002	0.007	--	0.01	6.11	0.023	--	3.01	0.000288	0.005	0.03	--	0.002	--	0.01	--	0.01	--	0.02	--	--	0.039	--	0.03	
W-CAT-2			0.03	--	0.00239	0.22	--	0.09	0.00073	0.01	--	0.01	64	0.002	--	10	0.000003	0.041	0.04	--	0.002	--	0.001	--	0.001	--	0.002	--	--	0.082	--	0.03	
CPF 98-8-3		07-Aug-2015	Active	W-CAT-1	0.026	< 0.00060	0.00055	0.16	< 0.0010	0.024	0.000024	< 0.0010	0.0015	0.0027	0.47	< 0.00020	< 0.020	1.5	--	0.0019	0.0035	0.12	0.0015	3.8	< 0.00010	0.62	< 0.00020	< 0.0010	< 0.0010	0.00084	< 0.0010	0.012	
		14-Sep-2015			0.034	< 0.00060	0.0011	0.17	< 0.0010	0.031	< 0.000020	< 0.0010	0.0028	0.00078	3.2	< 0.00020	< 0.020	1.6	--	0.0006	0.0058	< 0.10	0.00040	4.6	< 0.00010	0.74	< 0.00020	< 0.0010	< 0.0010	0.00097	< 0.0010	0.0096	
		06-Aug-2016			0.047	< 0.00060	0.0009	0.18	< 0.0010	< 0.020	0.000055	< 0.0010	0.0023	0.00013	0.45	< 0.00020	< 0.020	2.2	--	0.0016	0.005	< 0.10	0.00028	4.4	< 0.00010	0.62	< 0.00020	< 0.0010	< 0.0010	0.0015	< 0.0010	0.015	
		02-Oct-2016			0.053	< 0.00060	0.0019	0.19	< 0.0010	0.023	0.00003	< 0.0010	0.0042	0.00017	3	< 0.00031	< 0.020	2	0.0000025	0.0011	0.0062	< 0.10	0.0006	5.3	< 0.00010	0.68	< 0.00020	< 0.0010	0.0013	0.0012	0.0012	0.029	
		04-Nov-2016			---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.0000068	---	---	---	---	---	---	---	---	---	---	---	---	---	---
		17-Aug-2017			0.045	< 0.00060	0.00032	0.16	< 0.0010	0.03	0.000084	< 0.0010	0.00032	0.0025	0.081	< 0.00021	< 0.020	0.14	< 0.0000020	0.0012	0.0023	< 0.10	0.00024	3.8	< 0.00010	0.55	< 0.00020	< 0.0010	< 0.0010	0.00042	0.0015	0.012	
		12-Sep-2017			0.049	< 0.00060	0.00063	0.16	< 0.0010	0.021	0.000032	< 0.0010	0.00098	0.0016	0.76	< 0.00020	< 0.020	0.63	< 0.0000020	0.00081	0.0032	< 0.10	0.00022	4.6	< 0.00010	0.56	< 0.00020	< 0.0010	< 0.0010	0.00059	< 0.0010	0.015	
		23-Jul-2018			0.032	< 0.00060	0.0004	0.15	< 0.0010	0.022	0.000022	< 0.0010	0.0011	0.00086	0.21	< 0.00024	< 0.020	0.87	< 0.0000020	0.0012	0.0026	< 0.10	0.00046	3.3	< 0.00010	0.53	< 0.00020	< 0.0010	< 0.0010	0.00033	< 0.0010	0.013	
		16-Sep-2018			0.029	< 0.00060	0.00083	0.15	< 0.0010	0.029	< 0.000020	< 0.0010	0.0022	0.00078	2.4	< 0.00020	< 0.020	1.2	< 0.0000020	0.00043	0.0039	< 0.10	0.00078	4.5	< 0.00010	0.6	< 0.00020	< 0.0010	< 0.0010	0.00057	< 0.0010	0.0093	
		11-Jul-2019			0.034	< 0.00060	0.00038	0.16	< 0.0010	0.022	< 0.000061	< 0.0010	0.00067	0.0017	0.069	< 0.00022	< 0.020	0.63	< 0.0000020	0.00083	0.0044	< 0.10	< 0.00020	3.6	< 0.00010	0.63	< 0.00020	< 0.0010	< 0.0010	0.00098	< 0.0010	0.036	
		28-Sep-2019			0.029	< 0.00060	0.00015	0.18	< 0.0010	< 0.020	< 0.000020	< 0.0010	0.0026	0.0005	2.6	< 0.00020	< 0.020	1.3	< 0.0000020	0.0004	0.0042	< 0.10	0.00037	5.1	< 0.00010	0.77	< 0.00020	< 0.0010	< 0.0010	0.00088	< 0.0010	0.0071	
		23-Jul-2020			0.034	< 0.00060	0.001	0.19	< 0.0010	0.026	< 0.000020	< 0.0010	0.0012	0.00069	0.53	< 0.00020	< 0.020	0.83	< 0.0000019	0.00071	0.0026	< 0.10	0.00024	4	< 0.00010	0.7	< 0.00020	< 0.0010	< 0.0010	0.00083	< 0.0010	< 0.0030	
		17-Sep-2020			0.029	< 0.00060	0.0029	0.18	< 0.0010	0.043	< 0.000020	< 0.0010	0.0034	0.00045	4.8	< 0.00020	< 0.020	1.1	---	0.00036	0.0054	< 0.10	0.00047	5.5	< 0.00010	0.81	< 0.00020	< 0.0010	0.0012	0.00082	< 0.0010	0.0064	
		20-Aug-2021			0.044	< 0.00060	0.00025	0.18	< 0.0010	0.025	0.000034	< 0.0010	0.0009	0.00099	0.14	< 0.00020	< 0.020	0.65	0.0000019	0.00062	0.0028	< 0.10	< 0.00020	4.7	< 0.00010	0.63	< 0.00020	< 0.0010	< 0.0010	0.0009	< 0.0010	0.0088	
		15-Sep-2021			0.036	< 0.00060	0.00051	0.2	< 0.0010	0.025	< 0.000020	< 0.0010	0.0015	0.0009	0.44	< 0.00020	< 0.020	1	0.0000036	0.00037	0.003	< 0.10	< 0.00020	4.1	< 0.00010	0.74	< 0.00020	< 0.0010	0.0012	0.00081	< 0.0010	0.008	
		15-Sep-2021			0.044	< 0.00060	0.00058	0.21	< 0.0010	0.023	< 0.000020	< 0.0010	0.0017	0.00041	---	< 0.00020	< 0.020	1.1	0.0000037	0.00047	0.0031	< 0.10	< 0.00020	4.2	< 0.00010	0.77	< 0.00020	< 0.0010	0.0015	0.00085	< 0.0010	0.0065	
		08-Aug-2022			0.042	< 0.00060	0.00069	0.23	< 0.0010	0.029	< 0.000020	< 0.0010	0.0017	< 0.0010	0.61	< 0.00020	< 0.020	1	< 0.0000019	0.00037	0.0034	< 0.10	0.00065	4.7	< 0.00010	0.78	< 0.00020	< 0.0010	0.0010	0.00086	< 0.0010	0.016	
		24-Sep-2022			< 0.0030	< 0.00060	< 0.00020	0.23	< 0.0010	0.064	< 0.000020	< 0.0010	< 0.00030	< 0.0010	3.3	< 0.00020	0.031	1.1	0.000003	0.00069	< 0.00050	0.22	0.00045	5.1	< 0.00010	0.81	< 0.00020	< 0.0010	0.0012	0.00062	< 0.0010	< 0.0030	
MEBG-10-2/ MEBG-10-1-3		06-Aug-2015	Active	W-CAT-1	0.013	< 0.00060	0.00062	0.44	< 0.0010	0.03	0.000085	< 0.0010	0.0021	0.0017	1.5	< 0.00020	< 0.020	1.1	---	0.0012	0.0039	< 0.10	0.00084	4.6	< 0.00010	0.68	< 0.00020	< 0.0010	< 0.0010	0.00062	< 0.0010	0.015	
		14-Sep-2015			0.003	< 0.00060	0.0012	0.43	< 0.0010	0.039	0.000035	< 0.0010	0.0031	0.00074	4.2	< 0.00020	< 0.020	1.7	---	0.0011	0.0067	< 0.10	< 0.00020	5.4	< 0.00010	0.73	< 0.00020	< 0.0010	0.00052	< 0.0010	0.0076	0.7	
		03-Aug-2016			0.041	< 0.00060	0.00019	0.35	< 0.0010	0.025	< 0.000020	< 0.0010	0.0044	0.00062	1.8	< 0.00020	< 0.020	2.1	< 0.0000019	0.00011	0.0049	< 0.10	< 0.00020	4.7	< 0.00010	0.56	< 0.00020	< 0.0010	< 0.0010	0.0009	< 0.0010	0.009	
		02-Oct-2016			0.0051	< 0.00060	0.00031	0.44	< 0.0010	0.038	< 0.000020	< 0.0010	0.0052	0.00053	9.9	< 0.00020	< 0.020	2.6	0.0000021	0.00015	0.0059	< 0.10	0.00023	6	< 0.00010	0.79	< 0.00020	< 0.0010	< 0.0010	0.00046	< 0.0010	0.0067	
		04-Nov-2016			---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.0000031	---	---	---	---	---	---	---	---	---	---	---	---	---	---
		12-Aug-2017			0.0044	< 0.00060	0.00096	0.39	< 0.0010	0.022	0.000032	< 0.0010	0.0014	0.00078	2.8	< 0.00020	< 0.020	0.67	< 0.0000020	0.00027	0.0052	< 0.10	0.00039	4.3	< 0.00010	0.72	< 0.00020	< 0.0010	< 0.0010	0.0011	< 0.0010	0.004	
		12-Sep-2017			0.0067	< 0.00060	0.0014	0.4	< 0.0010	0.025	0.000034	< 0.0010	0.0023	0.00057	3.6	< 0.00020	< 0.020	1.2	< 0.0000020	0.00022	0.0057	< 0.10	0.00026	5.4	< 0.00010	0.7	< 0.00020	< 0.0010	< 0.0010	0.0009	< 0.0010	0.0038	
		16-Jul-2018			< 0.0030	< 0.00060	0.00045	0.26	< 0.0010	0.024	0.000067	< 0.0010	0.00052	0.00021	0.57	< 0.00020	< 0.020	0.45	< 0.0000020	0.00015	0.0047	< 0.10	0.00036	4.1	< 0.00010	0.7	< 0.00020	< 0.0010	0.0013	0.00068	< 0.0010	0.0069	
		15-Sep-2018			< 0.0030	< 0.00060	0.00085	0.31	< 0.0010	0.029	0.00005	< 0.0010	0.0024	0.00069	3.2	< 0.00020	< 0.020	1.4	< 0.0000020	0.0003	0.0053	< 0.10	0.00022										

Table 4



Groundwater Analytical Results: Dissolved Metals and Trace Elements

PROJECT No.: 417085-42051-22100

Sampling Location		Date (dd-mm-yyyy)	Status	Background Category	Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (Total) (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Lithium (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Phosphorus (mg/L)	Selenium (mg/L)	Silicon (mg/L)	Silver (mg/L)	Strontium (mg/L)	Thallium (mg/L)	Tin (mg/L)	Titanium (mg/L)	Uranium (mg/L)	Vanadium (mg/L)	Zinc (mg/L)	
CCME CEQG Freshwater Aquatic Life					0.005	---	0.005	---	1.5	0.00099	0.0089	---	0.002	0.3	0.001	---	---	---	0.00026	0.073	0.025	---	0.001	---	0.00025	---	0.0008	---	---	---	0.015	---	0.03
W-CAT-1					0.13	---	0.01	0.53	---	0.27	0.002	0.007	---	0.01	6.11	0.023	---	3.01	0.000288	0.005	0.03	---	0.002	---	0.001	---	0.02	---	---	---	0.039	---	0.03
W-CAT-2					0.03	---	0.00239	0.22	---	0.09	0.00073	0.01	---	0.01	64	0.002	---	10	0.000003	0.041	0.04	---	0.002	---	0.001	---	0.002	---	---	---	0.002	---	0.03
(Duplicate)	16-Sep-2018				0.013	< 0.00060	0.0082	0.073	< 0.0010	0.04	0.000075	< 0.0010	0.0036	0.0011	3.3	< 0.00020	< 0.020	0.39	< 0.0000020	0.19	0.026	< 0.10	0.0019	13	< 0.00010	0.65	0.0013	< 0.0010	< 0.0010	0.025	0.0037	0.012	
	0.006				0.00098	0.0018	0.053	< 0.0010	0.035	0.000096	< 0.0010	0.0025	0.0012	0.78	< 0.00020	< 0.020	0.22	< 0.0000020	0.18	0.02	< 0.10	0.0033	9.8	< 0.00010	0.53	0.0011	< 0.0010	< 0.0010	0.024	0.0027	0.0047		
	0.014				< 0.00060	0.0066	0.081	< 0.0010	0.023	0.000076	< 0.0010	0.0043	0.0022	4.5	< 0.00020	< 0.020	0.5	< 0.0000020	0.17	0.03	< 0.10	0.0012	13	< 0.00010	0.8	0.0015	< 0.0010	0.001	0.018	0.0039	0.0083		
	0.014				< 0.00060	0.0007	0.081	< 0.0010	0.023	0.000076	< 0.0010	0.0043	0.00033	4.5	< 0.00020	< 0.020	0.5	< 0.0000020	0.17	0.03	< 0.10	0.0013	12	< 0.00010	0.79	0.0015	< 0.0010	0.0015	0.019	0.0041	0.0068		
(Duplicate)	23-Jul-2020				0.0099	< 0.00060	0.00051	0.08	< 0.0010	0.031	0.000076	< 0.0010	0.0057	0.0009	11	< 0.00020	< 0.020	0.63	< 0.0000019	0.17	0.033	< 0.10	0.00092	11	< 0.00010	0.87	0.00099	< 0.0010	< 0.0010	0.017	0.0034	0.0062	
	0.0086				< 0.00060	0.00053	0.074	< 0.0010	0.033	0.00003	< 0.0010	0.0052	0.00046	9.4	< 0.00020	< 0.020	0.55	< 0.0000019	0.17	0.032	< 0.10	0.001	11	< 0.00010	0.84	0.001	< 0.0010	0.011	0.016	0.004	< 0.0030		
	0.015				< 0.00060	0.0006	0.087	< 0.0010	0.036	0.000044	< 0.0010	0.0061	< 0.00020	13	< 0.00020	< 0.020	0.73	< 0.0000019	0.21	0.044	< 0.10	0.0014	13	< 0.00010	0.98	0.00092	< 0.0010	< 0.0010	0.016	0.0029	< 0.0030		
	0.016				< 0.00060	0.00059	0.098	< 0.0010	0.057	0.000045	< 0.0010	0.0047	0.0017	15	< 0.00020	< 0.020	0.68	< 0.0000019	0.19	0.034	< 0.10	0.0019	12	< 0.00010	0.91	< 0.00020	< 0.0010	0.0021	0.015	0.0036	0.0075		
(Duplicate)	15-Sep-2021				0.019	< 0.00060	0.0063	0.077	< 0.0010	0.036	0.000073	< 0.0010	0.0044	0.00032	11	< 0.00020	< 0.020	0.51	< 0.0000032	0.18	0.031	< 0.10	0.0014	11	< 0.00010	0.89	< 0.00020	< 0.0010	0.002	0.015	0.0035	0.0042	
	0.013				0.0006	0.0069	0.083	< 0.0010	0.038	0.000054	< 0.0010	0.0048	0.0028	13	< 0.00020	< 0.020	0.57	0.0000033	0.21	0.036	< 0.10	0.0014	12	< 0.00010	0.95	< 0.00020	< 0.0010	0.0019	0.014	0.0039	0.0084		
	0.015				< 0.00060	0.00075	0.096	< 0.0010	0.031	0.000043	< 0.0010	0.0039	< 0.0010	18	< 0.00020	< 0.020	0.66	0.0000061	0.19	0.032	< 0.10	0.0018	13	< 0.00010	0.89	< 0.00020	< 0.0010	0.001	0.012	0.0036	0.0092		
	0.014				0.00063	0.00073	0.12	< 0.0010	0.037	< 0.00020	< 0.0010	0.0039	0.0017	16	< 0.00023	< 0.020	0.92	0.0000024	0.18	0.032	< 0.10	0.0011	14	< 0.00010	0.99	0.00041	< 0.0010	< 0.0010	0.0069	0.0031	0.0061		
WSY 97-1-5	06-Aug-2015	Active	W-CAT-1	0.0083	< 0.00060	0.00045	0.093	< 0.0010	0.31	0.00013	< 0.0010	< 0.00030	0.0045	0.063	< 0.00020	< 0.020	0.75	---	0.0048	0.004	< 0.10	0.0077	4.8	< 0.00010	1.3	< 0.00020	< 0.0010	< 0.0010	0.008	< 0.0010	0.017		
	0.013			< 0.00060	0.00039	0.096	< 0.0010	0.35	0.0001	< 0.0010	< 0.00030	0.0028	0.11	< 0.00020	0.023	0.064	---	0.0033	0.0057	< 0.10	0.0016	4.7	< 0.00010	1.3	< 0.00020	< 0.0010	< 0.0010	0.0047	< 0.0010	0.022			
	0.012			0.0011	0.0042	0.081	< 0.0010	0.14	0.000042	< 0.0010	0.00097	0.002	---	0.00034	< 0.020	0.31	---	0.0074	0.008	< 0.10	0.014	5.3	< 0.00010	1.1	< 0.00020	< 0.0010	< 0.0010	0.011	0.002	0.011			
	---			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	0.0086			< 0.00060	0.00049	0.053	< 0.0010	0.11	0.000069	< 0.0010	0.00035	0.002	0.22	< 0.00020	< 0.020	0.11	< 0.0000020	0.012	0.0033	< 0.10	0.0033	5.3	< 0.00010	0.92	< 0.00020	< 0.0010	< 0.0010	0.0065	< 0.0010	0.019			
	0.016			< 0.00060	0.0016	0.06	< 0.0010	0.2	< 0.00020	< 0.0010	0.0012	0.0019	2.3	< 0.00020	< 0.020	1.4	< 0.0000025	0.0096	0.0039	< 0.10	0.0014	5.2	< 0.00010	0.86	< 0.00020	< 0.0010	< 0.0010	0.0039	0.001	0.0057			
	0.021			< 0.00060	0.00059	0.07	< 0.0010	0.13	0.000066	< 0.0010	0.0012	0.0015	0.44	< 0.00020	< 0.020	0.51	< 0.0000020	0.0029	0.0033	< 0.10	0.00087	4.7	< 0.00010	0.84	< 0.00020	< 0.0010	< 0.0010	0.0044	< 0.0010	0.019			
	0.012			0.0006	0.00035	0.054	< 0.0010	0.067	0.000058	< 0.0010	0.0009	0.0025	0.18	< 0.00020	< 0.020	0.37	< 0.0000020	0.014	0.0039	< 0.10	0.0063	5.3	< 0.00010	0.63	< 0.00020	< 0.0010	< 0.0010	0.0008	< 0.0010	0.02			
	0.015			< 0.00060	0.0013	0.049	< 0.0010	0.16	0.000059	< 0.0010	0.0018	0.0027	1.3	< 0.00020	< 0.020	0.1	0.0000021	0.0098	0.0037	< 0.10	0.00071	4.4	< 0.00010	0.67	< 0.00020	< 0.0010	< 0.0010	0.0053	< 0.0010	0.01			
	0.0094			< 0.00060	0.00043	0.097	< 0.0010	0.073	< 0.00020	< 0.0010	0.0069	0.0019	0.78	< 0.00020	< 0.020	0.27	< 0.0000019	0.0052	0.0032	< 0.10	0.0018	4.1	< 0.00010	0.89	< 0.00020	< 0.0010	< 0.0010	0.0071	< 0.0010	0.012			
0.0097	0.00072	0.00021	0.1	< 0.0010	0.083	0.00012	< 0.0010	< 0.00030	0.005	< 0.060	< 0.00020	< 0.020	0.051	< 0.0000019	0.013	0.0036	< 0.10	0.018	5.7	< 0.00010	0.66	< 0.00020	< 0.0010	< 0.0010	0.0078	< 0.0010	0.013						
0.019	< 0.00060	0.0005	0.094	< 0.0010	0.11	0.00013	< 0.0010	< 0.00030	0.0014	0.074	< 0.00020	< 0.020	0.051	< 0.0000019	0.0057	0.0029	< 0.10	0.0074	4.9	< 0.00010	0.82	< 0.00020	< 0.0010	< 0.0010	0.0047	< 0.0010	0.012						
Surveillance Network Program - Bear Island Locations																																	
BI-13-1-4	07-Aug-2015	Active	W-CAT-2	0.018	< 0.00060	0.011	0.032	< 0.0010	0.025	0.000026	< 0.0010	0.0095	0.00034	49	< 0.00020	0.023	2.5	---	0.0025	0.014	< 0.10	0.00066	6.1	< 0.00010	1.5	< 0.00020	< 0.0010	< 0.0010	0.0048	0.0015	0.0042		
	0.026			< 0.00060	0.012	0.041	< 0.0010	0.023	< 0.00020	< 0.0010	0.0095	< 0.00020	47	< 0.00020	0.020	3.4	---	0.0013	0.011	< 0.10	0.00069	7.8	< 0.00010	1.5	< 0.00020	< 0.0010	< 0.0010	0.0034	0.0019	0.0057			
	0.0069			< 0.00060	0.0014	0.037	< 0.0010	0.021	0.0001	< 0.0010	0.0093	0.0015	9.1	< 0.00020	0.024	2.4	---	0.0031	0.015	< 0.10	0.0008	4.1	< 0.00010	1.1	< 0.00020	< 0.0010	< 0.0010	0.011	< 0.0010	0.021			
	0.0093			< 0.00060	0.0035	0.048	< 0.0010	< 0.020	0.000033	< 0.0010	0.01	0.0014	27	< 0.00020	< 0.020	0.28	< 0.0000020	0.0022	0.016	< 0.10	0.0004	4.9	< 0.00010	1.3	< 0.00020	< 0.0010	< 0.0010	0.0062	0.001	0.011			
	0.0068			< 0.00060	0.00032	0.015	< 0.0010	< 0.020	0.000020	< 0.0010	0.0015	0.0012	1.6	< 0.00020	< 0.020	0.43	< 0.0000020	0.00074	0.0037	< 0.10	< 0.00020	1.3	< 0.00010	0.49	< 0.00020	< 0.0010	< 0.0010	0.0015	< 0.0010	0.0042			
	0.011																																



Table 4

Groundwater Analytical Results: Dissolved Metals and Trace Elements

PROJECT No.: 417085-42051-22100																																		
Sampling Location		Date (dd-mm-yyyy)	Status	Background Category	Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (Total) (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Lithium (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Phosphorus (mg/L)	Selenium (mg/L)	Silicon (mg/L)	Silver (mg/L)	Strontium (mg/L)	Thallium (mg/L)	Tin (mg/L)	Titanium (mg/L)	Uranium (mg/L)	Vanadium (mg/L)	Zinc (mg/L)		
CME CEQG Freshwater Aquatic Life					0.005	--	0.005	--	--	1.5	0.00099	0.0089	--	--	0.002	0.3	0.001	--	--	0.000026	0.073	0.025	--	0.001	--	0.000025	--	--	0.0008	--	--	0.015	--	0.03
W-CAT-1					0.13	0.027	0.01	0.53	--	0.27	0.002	0.007	--	--	0.01	6.11	0.023	--	3.01	0.000038	0.005	0.03	--	0.002	--	0.001	--	0.02	--	--	0.039	--	0.03	
W-CAT-2					0.03	--	0.00239	0.22	--	0.09	0.00073	0.01	--	0.01	64	0.002	--	--	10	0.000003	0.041	0.04	--	0.002	--	0.001	--	0.002	--	--	0.082	--	0.03	
BIS 97-1-3					0.0032	0.0027	0.0015	0.013	< 0.0010	0.074	0.00018	< 0.0010	< 0.00030	0.0036	0.060	0.00088	0.098	0.11	--	0.021	0.0074	< 0.10	0.00042	6.7	< 0.00010	1.2	< 0.00020	< 0.0010	< 0.0010	0.055	< 0.0010	0.011		
22-Nov-2017					0.0094	< 0.00060	0.0021	0.03	< 0.0010	< 0.020	0.00003	< 0.0010	0.00028	0.00099	22	< 0.00020	< 0.020	0.86	< 0.0000020	0.0051	0.0092	< 0.10	0.0012	6.7	< 0.00010	0.7	< 0.00020	< 0.0010	< 0.0010	0.019	0.013	0.041		
20-Jul-2018					0.0039	< 0.00060	0.001	0.028	< 0.0010	< 0.020	< 0.000020	< 0.0010	0.0012	0.0017	1.8	< 0.00020	< 0.020	0.46	< 0.0000020	0.0045	0.0063	< 0.10	0.00045	5.4	< 0.00010	0.57	< 0.00020	< 0.0010	< 0.0010	0.016	< 0.0010	0.0053		
20-Sep-2018					0.012	< 0.00060	0.0016	0.047	< 0.0010	< 0.020	0.000046	< 0.0010	0.0025	0.0019	27	< 0.00020	< 0.020	0.92	0.0000028	0.0041	0.0072	< 0.10	0.00056	6.9	< 0.00010	0.81	< 0.00020	< 0.0010	< 0.0010	0.0017	0.0058			
17-Jul-2019					0.0064	< 0.00060	0.001	0.045	< 0.0010	< 0.020	< 0.000020	< 0.0010	0.0016	0.0025	5.7	< 0.00020	< 0.020	0.65	0.0000027	0.0046	0.0065	< 0.10	0.00046	5.6	< 0.00010	0.76	< 0.00020	< 0.0010	< 0.0010	0.0014	< 0.0010	0.0042		
(Duplicate)					0.0066	< 0.00060	0.00095	0.046	< 0.0010	< 0.020	< 0.000020	< 0.0010	0.0016	0.0041	5.7	< 0.00020	< 0.020	0.65	0.0000031	0.0046	0.0067	< 0.10	0.00049	5.6	< 0.00010	0.76	< 0.00020	< 0.0010	< 0.0010	0.014	< 0.0010	0.0063		
29-Sep-2019					0.0085	< 0.00060	0.0017	0.055	< 0.0010	< 0.020	0.000046	< 0.0010	0.0031	0.0021	21	< 0.00020	< 0.020	1.2	< 0.0000020	0.0039	0.0085	< 0.10	0.0006	7.1	< 0.00010	0.92	< 0.00020	< 0.0010	< 0.0010	0.011	0.012	0.037		
26-Jul-2020					< 0.0030	< 0.00060	0.00095	0.051	< 0.0010	< 0.020	< 0.000020	< 0.0010	0.0022	0.0019	3.7	< 0.00020	< 0.020	0.82	< 0.0000019	0.0045	0.0073	< 0.10	0.00063	5.9	< 0.00010	0.79	< 0.00020	< 0.0010	< 0.0010	0.015	< 0.0010	< 0.0030		
(Duplicate)					0.0038	< 0.00060	0.00097	0.051	< 0.0010	< 0.020	< 0.000020	< 0.0010	0.0025	0.0021	3.8	< 0.00020	< 0.020	0.84	< 0.0000019	0.004	0.0077	< 0.10	0.00037	5.4	< 0.00010	0.76	< 0.00020	< 0.0010	0.005	0.014	< 0.0010	< 0.0030		
16-Sep-2020					0.0055	< 0.00060	0.002	0.063	< 0.0010	< 0.020	0.000035	< 0.0010	0.0041	0.0013	15	< 0.00020	< 0.020	1.2	0.0000021	0.0054	0.011	< 0.10	0.00057	6.6	< 0.00010	0.88	< 0.00020	< 0.0010	< 0.0010	0.0043	< 0.0010	0.0048		
21-Aug-2021					0.0052	< 0.00060	0.00067	0.053	< 0.0010	< 0.020	0.00003	< 0.0010	0.0021	0.0077	0.11	< 0.00020	< 0.020	0.51	< 0.0000019	0.0053	0.011	< 0.10	0.00055	4.4	< 0.00010	0.82	< 0.00020	< 0.0010	< 0.0010	0.0036	< 0.0010	0.0079		
18-Sep-2021					0.011	< 0.00060	0.001	0.062	< 0.0010	< 0.020	0.00004	< 0.0010	0.004	0.0048	3.2	< 0.00020	< 0.020	0.2	< 0.0000019	0.0046	0.013	< 0.10	0.00041	4.9	< 0.00010	0.91	< 0.00020	< 0.0010	< 0.0010	0.0029	< 0.0010	0.01		
07-Aug-2022					0.0046	< 0.00060	0.00067	0.066	< 0.0010	< 0.020	0.000067	< 0.0010	0.0028	0.0064	0.13	< 0.00020	< 0.020	0.73	0.0000031	0.0044	0.011	< 0.10	0.00058	4.8	< 0.00010	1.1	< 0.00020	< 0.0010	< 0.0010	0.0028	< 0.0010	0.014		
25-Sep-2022					0.0056	< 0.00068	0.00086	0.076	< 0.0010	< 0.020	0.000089	< 0.0010	0.0051	0.0033	0.69	< 0.00020	< 0.020	1.3	< 0.0000027	0.0043	0.017	< 0.10	0.00072	5.5	< 0.00010	1.3	< 0.00020	< 0.0010	< 0.0010	0.0025	< 0.0010	0.012		
Surveillance Network Program - Goose Island Locations																																		
GIBG-10-210-2-3					0.0053	< 0.00060	0.00082	0.11	< 0.0010	< 0.020	0.000089	< 0.0010	0.0026	0.00086	0.23	< 0.00020	< 0.020	1.6	---	0.0033	0.0053	< 0.10	< 0.00020	3.4	< 0.00010	0.35	< 0.00020	< 0.0010	< 0.0010	0.002	< 0.0010	0.0048		
(Duplicate)					0.0053	< 0.00060	0.0011	0.11	< 0.0010	< 0.020	0.000078	< 0.0010	0.0026	0.00077	0.23	< 0.00020	< 0.020	1.6	---	0.0034	0.0055	< 0.10	< 0.00020	3.6	< 0.00010	0.35	< 0.00020	< 0.0010	< 0.0010	0.002	< 0.0010	< 0.0030		
					0.0057	< 0.00060	0.0016	0.23	< 0.0010	< 0.020	0.000014	< 0.0010	0.0026	0.00077	0.23	< 0.00020	< 0.020	1.6	---	0.0035	0.007	< 0.10	0.00032	4.6	< 0.00010	0.82	< 0.00020	< 0.0010	< 0.0010	0.008	< 0.0010	0.011		
07-Aug-2016					0.005	< 0.00060	0.0012	0.16	< 0.0010	< 0.020	0.000014	< 0.0010	0.0024	0.0011	0.15	< 0.00020	< 0.020	0.67	---	0.0023	0.0046	< 0.10	< 0.00020	3.5	< 0.00010	0.41	< 0.00020	< 0.0010	< 0.0010	0.0028	0.014	0.006		
(Duplicate)					0.0065	< 0.00060	0.0011	0.17	< 0.0010	< 0.020	0.000012	< 0.0010	0.0022	0.00094	0.15	< 0.00020	< 0.020	0.66	---	0.0023	0.0044	< 0.10	< 0.00020	3.5	< 0.00010	0.41	< 0.00020	< 0.0010	< 0.0010	0.0027	0.002	0.051		
03-Oct-2016					0.0052	< 0.00060	0.0019	0.23	< 0.0010	< 0.020	0.000014	< 0.0010	0.0014	1.5	< 0.00020	< 0.020	2.1	< 0.0000020	0.0026	0.0079	< 0.10	< 0.00020	5.7	< 0.00010	0.6	< 0.00020	< 0.0010	< 0.0010	0.0036	< 0.0010	0.011			
04-Nov-2016					---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		
(Duplicate)					0.0059	< 0.00060	0.00065	0.2	< 0.0010	0.036	0.00017	< 0.0010	0.0036	0.0014	0.43	< 0.00020	< 0.020	1.7	< 0.0000020	0.0014	0.0066	< 0.10	0.00033	4.4	< 0.00010	0.71	< 0.00020	< 0.0010	< 0.0010	0.0056	< 0.0010	0.0094		
20-Aug-2017					0.0055	< 0.00060	0.0006	0.2	< 0.0010	0.03	0.00016	< 0.0010	0.0036	0.0014	0.44	< 0.00020	< 0.020	1.7	< 0.0000020	0.0013	0.0066	< 0.10	< 0.00020	4.4	< 0.00010	0.71	< 0.00020	< 0.0010	< 0.0010	0.0054	< 0.0010	0.0097		
					0.0042	< 0.00060	0.00026	0.2	< 0.0010	0.036	0.00073	< 0.0010	< 0.00030	0.0032	< 0.060	< 0.00020	< 0.020	0.83	< 0.0000020	0.0014	0.011	< 0.10	< 0.00020	6.3	< 0.00010	0.95	< 0.00020	< 0.0010	< 0.0010	0.0093	< 0.0010	0.024		
14-Jul-2018					0.0053	< 0.00060	0.00038	0.16	< 0.0010	0.024	0.00018	< 0.0010	0.0025	0.0016	0.16	< 0.00020	< 0.020	0.66	< 0.0000020	0.00063	0.0053	< 0.10	< 0.00020	3.7	< 0.00010	0.63	< 0.00020	< 0.0010	< 0.0010	0.003	< 0.0010	0.008		
14-Jul-2018					0.0052	< 0.00060	0.00032	0.16	< 0.0010	0.022	0.00017	< 0.0010	0.0025	0.0016	0.15	< 0.00020	< 0.020	0.65	< 0.0000020	0.0007	0.0055	< 0.10	< 0.00020	3.7	< 0.00010	0.63	< 0.00020	< 0.0010	< 0.0010	0.003	< 0.0010	0.0082		
20-Sep-2018					0.0049	< 0.00060	< 0.00020	0.16	< 0.0010	0.031	0.00053	< 0.0010	< 0.00030	0.0025	< 0.060	< 0.00020	< 0.020	0.62	< 0.0000020	0.00065	0.0024	< 0.10	< 0.00020	4.8	< 0.00010	0.71	< 0.00020	< 0.0010	< 0.0010	0.0028	< 0.0010	0.0081		
(Duplicate)					0.0058	< 0.00060	0.00042	0.11	< 0.0010	< 0.020	0.000018	< 0.0010	0.0014	0.0029	< 0.060	< 0.00020	< 0.020	0.46	< 0.0000020	0.0011	0.004	< 0.10	< 0.00020	3.3	< 0.00010	0.48	< 0.00020	< 0.0010	< 0.0010	0.0016	< 0.0010	0.0083		
16-Jul-2019					0.0054	< 0.00060	0.00034	0.11	< 0.0010	< 0.020	0.000017	< 0.0010	0.0014	0.0011	< 0.060	< 0.00020	< 0.020	0.47	< 0.0000020	0.001	0.0039	< 0.10	< 0.00020	3.4	< 0.00010	0.48	< 0.00020	< 0.0010	< 0.0010	0.0016	< 0.0010	0.0088		
30-Sep-2019					0.0055	< 0.00060	0.00085	0.13	< 0.0010	0.026	0.00019	< 0.0010	0.0035	0.0015	0.29	< 0.00020	< 0.020	1.4	< 0.0000020	0.00088	0.													

Table 4



Groundwater Analytical Results: Dissolved Metals and Trace Elements

PROJECT No.: 417085-42051-22100																																			
Sampling Location	Date (dd-mm-yyyy)	Status	Background Category																																
				Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (Total) (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Lithium (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Phosphorus (mg/L)	Selenium (mg/L)	Silicon (mg/L)	Silver (mg/L)	Strontium (mg/L)	Thallium (mg/L)	Tin (mg/L)	Titanium (mg/L)	Uranium (mg/L)	Vanadium (mg/L)	Zinc (mg/L)				
CCME CEQG Freshwater Aquatic Life W-CAT-1 W-CAT-2				0.005	---	0.005	---	---	1.5	0.00009	0.0089	---	0.002	0.3	0.001	---	---	0.000026	0.073	0.025	---	0.001	---	0.00025	---	0.0008	---	---	---	0.015	---	0.03			
				0.13	---	0.01	0.53	---	0.27	0.002	0.007	---	0.01	6.11	0.023	---	3.01	0.000288	0.005	0.03	---	0.002	---	0.01	---	0.02	---	---	0.039	---	0.03				
				0.03	---	0.00239	0.22	---	0.09	0.00073	0.01	---	0.01	64	0.002	---	10	0.000003	0.041	0.04	---	0.002	---	0.001	---	0.002	---	---	0.082	---	0.03				

NOTES:

Aluminum
910
< X
X

1. --- in guideline row(s) denotes no criteria for that parameter.
2. --- in detail data row(s) denotes parameter not analyzed.
3. Indicates Primary Indicator Parameters
4. Indicates values above calculated background concentration.
5. Highlighting indicates parameters above applied guideline/criteria.
6. Highlighting indicates non-detected parameters above applied guideline/criteria.
7. Highlighting indicates parameters at applied guideline/criteria.
8. Denotes values exceeding
- (CCME, 2014. Canadian Environmental Quality Guidelines Summary Table. Water Quality Guidelines for the Protection of Freshwater Aquatic Life. <http://rst-ts.ccm.ca/?chems=all&chapters=1> accessed Aug 22, 2014.)
- Aluminum:
Standard varies with pH.
pH < 6.5 = 0.005 mg/L
pH >= 6.5 = 0.1 mg/L
- Boron:
Guideline based on long term exposure
- Cadmium:
Guideline based on long term exposure
- Chromium (Total):
Limit is for Chromium(III).
- Copper:
Guideline is hardness dependent. Presented guideline set to lower limit.
- Lead:
Guideline is hardness dependent. Presented guideline set to lower limit.
- Mercury:
Guideline for Inorganic mercury
- Nickel:
Guideline is hardness dependent. Presented guideline set to lower limit.
- Silver:
Guideline based on long term exposure
- Uranium:
Guideline based on long term exposure
9. Superscript ⁴⁵ - Dissolved greater than total. Results within acceptable limits of precision.
10. Superscript ⁴² - Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.
11. Superscript ⁴³ - Client supplied DHg bottle contained particulate.
12. Superscript ⁴⁴ - Detection limits raised due to sample matrix.
13. Superscript ⁴⁶ - Dissolved greater than total. Reanalysis yields similar results.
14. Superscript ⁴⁸ - Matrix Spike exceeds acceptance limits due to matrix interference. Reanalysis yields similar results.
15. Superscript ⁴⁷ - Dissolved greater than total. Results are within limits of uncertainty(MU).



PROJECT No.: 417085-42051-22100

U:\CALIGBS\417085-42051 - 2022 NW Ops\22100 - SNP GW Sampling\02_Rpts\11_TechRpts&Studies\03_Backend\Tables\417085-42051-22100-EN-TAB-05-GW-PHC-FEB032023-A



PROJECT No.: 417085-42051-22100

U:\ICAL\IGBS\417085-42051 - 2022 NW Ops\22100 - SNP GW Sampling\02_Rpts\11_TechRpts&Studies\03_Backend\Tables\417085-42051-22100-EN-TAB-05-GW-PHC-FEB032023-A



Groundwater Analytical Results: Petroleum Hydrocarbons (PHCs)

PROJECT No.: 417085-42051-22100																	
Location	Date (dd-mm-yyyy)	Status	Background Category	Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene	Xylenes (Total)	PHC F1 (C ₉ -C ₁₀)	PHC F1 (C ₉ -C ₁₀) - BTEX	PHC F2 (C ₁₀ -C ₁₁)	PHC F3 (C ₁₀ -C ₁₂)	PHC F4 (C ₁₂ -C ₁₃)			
				(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	
CCME CEQG Freshwater Aquatic Life				0.37	0.002	0.09	---	---	---	---	---	---	---	---			
W-CAT-1				0.0005	0.0005	0.0005	---	---	0.000923	---	---	---	---	---			
W-CAT-2				0.0004	0.0004	0.0004	---	---	0.00089	---	---	---	---	---			
Surveillance Network Program - Bear Island Locations																	
BI-13-1-4	07-Aug-2015	Active	W-CAT-2	< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00080	< 0.1	< 0.1	< 0.10	---	---			
	07-Aug-2016			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00080	< 0.1	< 0.1	< 0.10	---	---			
	15-Aug-2017			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00080	< 0.10	< 0.10	< 0.10	---	---			
	20-Sep-2018			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
	12-Jul-2019			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
	29-Sep-2019			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
	26-Jul-2020			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
	16-Sep-2020			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
	22-Aug-2021			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
	18-Sep-2021			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
	25-Sep-2022			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
	BI-13-3-4.5			07-Aug-2015	Active	W-CAT-2	< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00080	< 0.1	< 0.1	< 0.10	---	---
				08-Aug-2016			0.00042	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00080	< 0.1	< 0.1	< 0.10	---	---
15-Aug-2017		< 0.00040	< 0.00040	< 0.00040			< 0.00080	< 0.00040	< 0.00080	< 0.10	< 0.10	< 0.10	---	---			
22-Nov-2017		< 0.00040	< 0.00040	< 0.00040			< 0.00080	< 0.00040	< 0.00080	< 0.10	< 0.10	< 0.10	---	---			
18-Jul-2018		< 0.00040	< 0.00040	< 0.00040			< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
20-Sep-2018		< 0.00040	< 0.00040	< 0.00040			< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
12-Jul-2019		< 0.00040	< 0.00040	< 0.00040			< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
26-Jul-2020		< 0.00040	< 0.00040	< 0.00040			< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
16-Sep-2020		< 0.00040	< 0.00040	< 0.00040			< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
21-Aug-2021		< 0.00040	< 0.00040	< 0.00040			< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
18-Sep-2021		< 0.00040	< 0.00040	< 0.00040			< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10						



Table 5

Groundwater Analytical Results: Petroleum Hydrocarbons (PHCs)

PROJECT No.: 417085-42051-22100

PROJECT No.: 417085-42051-22100																
Location	Date (dd-mm-yyyy)	Status	Background Category	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	m&p-Xylene (mg/L)	o-Xylene (mg/L)	Xylenes (Total) (mg/L)	PHC F1 (C ₇ -C ₉) (mg/L)	PHC F1 (C ₇ -C ₉) - BTEX (mg/L)	PHC F2 (C ₁₀ -C ₁₄) (mg/L)	PHC F3 (C ₁₅ -C ₂₀) (mg/L)	PHC F4 (C ₂₁ -C ₃₀) (mg/L)		
CCME CEQG Freshwater Aquatic Life				0.37	0.002	0.09	--	--	--	--	--	--	--	--		
W-CAT-1				0.0005	0.0005	0.0005	--	--	0.000923	--	--	--	--	--		
W-CAT-2				0.0004	0.0004	0.0004	---	---	0.00089	---	---	---	---	---		
GIP11 09-1-4-R	14-Jul-2018	Active	W-CAT-2	< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---		
	20-Sep-2018			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---		
	16-Jul-2019			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---		
	04-Oct-2019			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---		
	25-Jul-2020			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---		
	16-Sep-2020			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---		
	17-Sep-2021			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---		
	08-Aug-2022			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---		
GIQ8-10-3/8-10-2-4 (Duplicate)	25-Sep-2022	Active	W-CAT-2	< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---		
	16-Sep-2015			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00080	< 0.1	< 0.1	< 0.10	---	---		
07-Aug-2016	< 0.00040			< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00080	< 0.1	< 0.1	< 0.10	---	---			
03-Oct-2016	< 0.00040			< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00080	< 0.10	< 0.10	< 0.10	---	---			
03-Oct-2016	< 0.00040			< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00080	< 0.10	< 0.10	< 0.10	---	---			
20-Aug-2017	< 0.00040			< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00080	< 0.10	< 0.10	< 0.10	---	---			
12-Sep-2017	< 0.00040			< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00080	< 0.10	< 0.10	< 0.10	---	---			
14-Jul-2018	< 0.00040			< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
20-Sep-2018	< 0.00040			< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
(Duplicate)	20-Sep-2018			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---		
	16-Jul-2019			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	2.7	---	---		
30-Sep-2019	< 0.00040			< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	0.14	---	---			
(Duplicate)	30-Sep-2019			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	0.12	---	---		
	25-Jul-2020			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---		
16-Sep-2020	< 0.00040			< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---			
21-Aug-2021	< 0.00040			< 0.00040	< 0.00040	0.001	0.00056	0.0016	0.44	0.44	14	---	---			
17-Sep-2021	< 0.00040			< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	0.26 ^{#3}	---	---			
09-Aug-2022	< 0.00040			< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	0.23	0.23	10	---	---			
25-Sep-2022	< 0.00040			0.00041	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	0.99	---	---			
Surveillance Network Program - Duplicate RPDs																
ARB-12-3-3 (Duplicate)	09-Aug-2022			RPD (%)		< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---
	09-Aug-2022	< 0.00040	< 0.00040			< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---		
C38 08-1-4 (Duplicate)	23-Sep-2022	RPD (%)		0.00052	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---		
	23-Sep-2022			0.0005	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---		
BI-13-3-4.5 (Duplicate)	25-Sep-2022	RPD (%)		NC	---	---	---	---	---	---	---	---	---	---		
	25-Sep-2022			< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---		
(Duplicate)	25-Sep-2022	RPD (%)		< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10	---	---		
	25-Sep-2022			---	---	---	---	---	---	---	---	---	---	---		

NOTES:

Benzene
< X
X

1. --- in guideline row(s) denotes no criteria for that parameter.
2. --- in detail data row(s) denotes parameter not analyzed.
3. Indicates Primary Indicator Parameters
4. Highlighting indicates non-detect parameters above applied guideline/criteria.
5. Highlighting indicates parameters at applied guideline/criteria.
6. Denotes values exceeding

(CCME, 2014. Canadian Environmental Quality Guidelines Summary Table. Water Quality Guidelines for the Protection of Freshwater Aquatic Life. <http://st-ts.ccme.ca/?chems=all&chapters=1> accessed Aug 22, 2014.)

7. Superscript ^{#1} - Matrix Spike below acceptance limits due to matrix interference. Reanalysis yields similar results.
8. Superscript ^{#2} - Detection limit raised based on sample volume used for analysis.
9. Superscript ^{#3} - Duplicate exceeds acceptance criteria due to sample non homogeneity. Unable to reanalyze due to insufficient sample.



Appendix A

Limitation of Liability, Scope of Report, and Third-Party Reliance



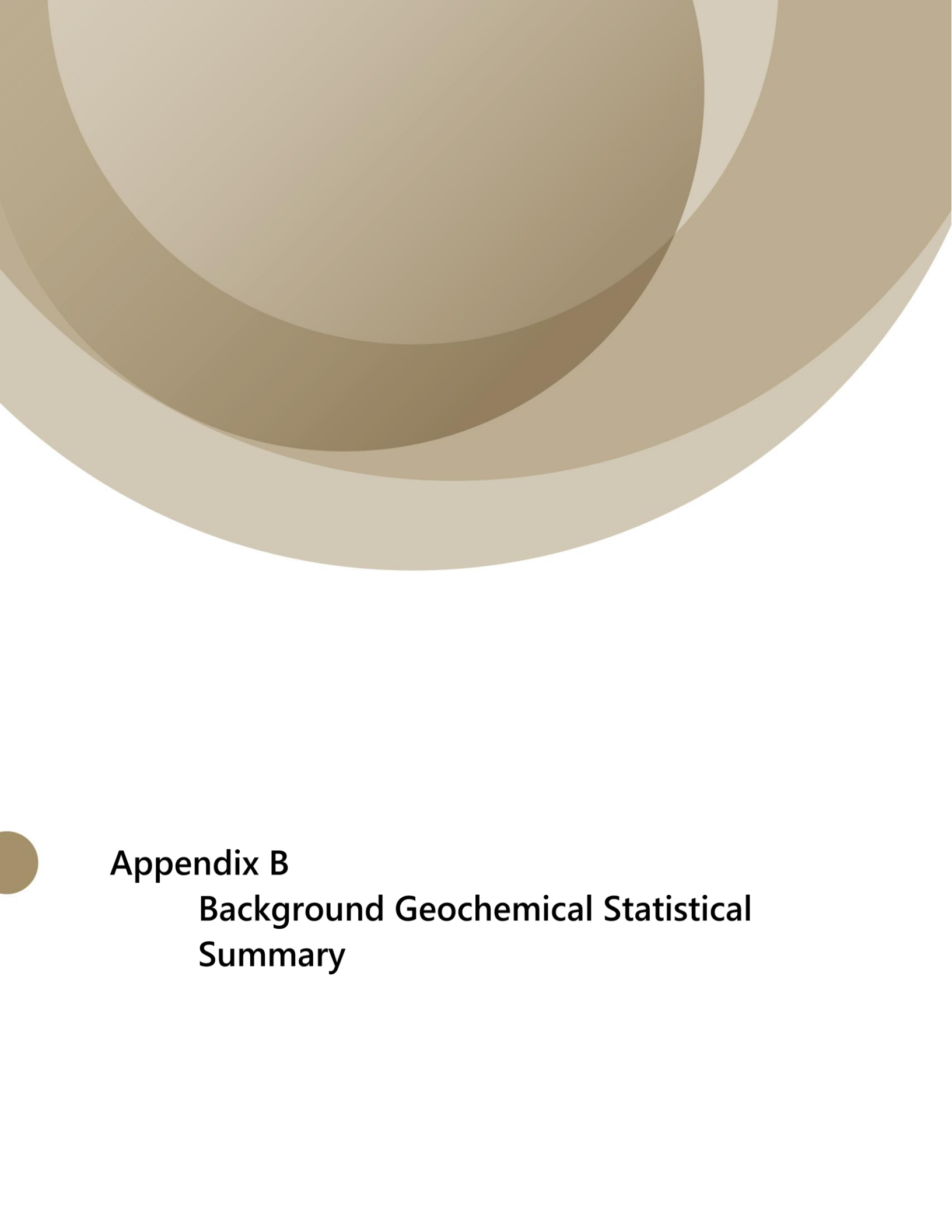
Limitation of Liability, Scope of Report, and Third-Party Reliance

This report has been prepared and the work referred to in this report has been undertaken by Tłęgōhł Reclamation Services Advisian (TRSA) for Imperial Oil Limited. It is intended for the sole and exclusive use of Imperial Oil Limited, its affiliated companies and partners and their respective insurers, agents, employees, and advisors (collectively, "Imperial Oil"). Any use, reliance on or decision made by any person other than Imperial Oil based on this report is the sole responsibility of such other person. Imperial Oil and TRSA make no representation or warranty to any other person with regard to this report and the work referred to in this report and they accept no duty of care to any other person or any liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties or other harm that may be suffered or incurred by any other person as a result of the use of, reliance on, any decision made or any action taken based on this report or the work referred to in this report.

The investigation undertaken by TRSA with respect to this report and any conclusions or recommendations made in this report reflect TRSA's judgment based on the site conditions observed at the time of the site inspection on the date(s) set out in this report and on information available at the time of preparation of this report. This report has been prepared for the specific application to this site and it is based, in part, upon visual observation of the site, subsurface investigation at discrete locations and depths, and specific analysis of specific chemical parameters and materials during a specific time interval, all as described in this report. Unless otherwise stated, the findings cannot be extended to previous or future site conditions, portions of the site which were unavailable for direct investigation, subsurface locations which were not investigated directly, or chemical parameters, materials or analysis which were not addressed. Substances other than those addressed by the investigation described in this report may exist within the site, substances addressed by the investigation may exist in areas of the site not investigated and concentrations of substances addressed which are different than those reported may exist in areas other than the locations from which samples were taken.

If site conditions or applicable standards change or if any additional information becomes available at a future date, modifications to the findings, conclusions, and recommendations in this report may be necessary.

Other than by Imperial Oil, copying or distribution of this report or use of or reliance on the information contained herein, in whole or in part, is not permitted without the express written permission of TRSA. Nothing in this report is intended to constitute or provide a legal opinion.



Appendix B

Background Geochemical Statistical Summary

Table B-1

Groundwater Indicator Parameters - Background Geochemical Statistical Summary (1997-2019)

PROJECT No.: 417085-31872

Monitoring Station		Bicarbonate (mg/L)	Calcium (mg/L)	Carbonate (CO3) (mg/L)	Chloride (mg/L)	Electrical Conductivity (uS/cm)	Hardness (as CaCO3) (mg/L)	Hydroxide (mg/L)	Nitrate (as N) (mg/L)	Nitrite (as N) (mg/L)	pH (pH units)	Phenols (mg/L)	Potassium (mg/L)	PP Alkalinity (as CaCO3) (mg/L)	Sodium (mg/L)	Sulphate (mg/L)	Total Dissolved Solids (mg/L)
CCME 2015, CEQG Freshwater Aquatic Life		---	---	---	120	---	---	---	3	0.06	(6.5 - 9)	0.004	---	---	---	---	---
Background - Surficial Sediments																	
W-CAT-1	Mainland Locations - Surficial Sediments - 95th Percentile Background	1000	312	1	17	2300	1241	1	0.4	0.03	8.1	0.013	5.2	1.0	161	700	1620
	Mainland Locations - Surficial Sediments - Maximum Background	1100	400	5	26	2800	1600	5	36.0	0.11	8.1	0.021	12.0	5.0	180	980	2200
W-CAT-2	Bear, Goose, and Frenchy's Islands - Surficial Sediments - 95th Percentile Background	975	477	1	23	2600	1600	1	2.4	0.03	8.0	0.014	4.5	1.0	100	930	2255
	Bear, Goose, and Frenchy's Islands - Surficial Sediments - Maximum Background	1200	540	1	25	3000	1800	1	23.0	0.17	8.1	0.048	5.3	1.0	520	1200	2700
Background - Shallow Bedrock - Inferred to Represent Natural Saline Water & Hydrocarbon Seepage																	
W-CAT-3	Shallow Bedrock - Natural Saline Water & Oil Seepage - 95th Percentile Background	1570	198	25	715	3397	788	0.5	1.0	0.06	8.5	0.020	7.6	20.5	747	117	2402
	Shallow Bedrock - Natural Saline Water & Oil Seepage - Maximum Background	1680	474	40	1500	5880	1580	1	4.0	0.26	8.6	0.025	16.8	33.0	848	185	3130
Background - Surficial Sediments - Inferred to Represent Natural Saline Water & Hydrocarbon Seepage																	
W-CAT-4	Surficial Sediments - Natural Saline Water & Oil Seepage - 95th Percentile Background	1220	350	62	280	2780	1200	1	0.2	0.06	8.7	0.020	7.5	51.0	440	990	2015
	Surficial Sediments - Natural Saline Water & Oil Seepage - Maximum Background	1300	390	200	291	2800	1300	1	0.4	0.06	10.1	0.023	8.6	160	680	1000	2300
Background - Surficial Sediments - Inferred to Represent Natural Gas Seepage without Saline Water																	
W-CAT-5	Surficial Sediments - Natural Gas & Non-Saline Water Seepage - 95th Percentile Background	876	266	1	12	1384	740	1	0.2	0.06	7.7	0.062	6.9	1.0	47	201	920
	Surficial Sediments - Natural Gas & Non-Saline Water Seepage - Maximum Background	950	330	1	13	1600	750	1	0.2	0.10	7.9	0.072	10.0	1.0	72	330	1200

NA Denotes guideline not available

NC Denotes parameters not measured / not calculated

Shading indicates parameters above most restrictive guidelines selected

Table B-2

Groundwater Dissolved Metals - Background Geochemical Statistical Summary (1997-2019)

PROJECT No.: 417085-31872

Monitoring Station		Aluminum (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Thallium (mg/L)	Uranium (mg/L)	Zinc (mg/L)
CCME 2015, CEQG Freshwater Aquatic Life		0.1	0.005	—	1.5	0.00009	0.0089	0.004	0.3	0.007	—	0.000026	0.073	0.15	0.001	0.00025	0.0008	0.015	0.007
Background - Surficial Sediments																			
W-CAT-1	Mainland Locations - Surficial Sediments - 95th Percentile Background	0.13	0.01	0.53	0.27	0.00200	0.0070	0.01	6.11	0.023	3.01	0.000288	0.005	0.03	0.002	0.01000	0.0200	0.039	0.03
	Mainland Locations - Surficial Sediments - Maximum Background	3.70	0.07	0.88	0.34	0.00200	0.0100	0.02	11.00	0.100	3.66	0.000940	0.005	0.05	0.030	0.01000	0.0300	1.000	0.15
W-CAT-2	Bear, Goose, and Frenchy's Islands - Surficial Sediments - 95th Percentile Background	0.03	0.00239	0.22	0.04	0.00045	0.0010	0.01	7.50	0.001	5.44	0.000003	0.026	0.02	0.001	0.00010	0.0002	0.024	0.03
	Bear, Goose, and Frenchy's Islands - Surficial Sediments - Maximum Background	0.05	0.00380	0.23	0.09	0.00073	0.0100	0.01	64.00	0.002	10.00	0.000003	0.041	0.04	0.002	0.00100	0.0020	0.082	0.03
Background - Shallow Bedrock - Inferred to Represent Natural Saline Water & Hydrocarbon Seepage																			
W-CAT-3	Shallow Bedrock - Natural Saline Water & Oil Seepage - 95th Percentile Background	0.34	0.05	8.40	1.33	0.00200	0.0070	0.01	4.08	0.030	0.64	0.000170	0.008	0.02	0.005	0.00021	0.0300	0.079	0.03
	Shallow Bedrock - Natural Saline water & Oil Seepage - Maximum Background	5.35	0.07	23.69	1.37	0.00200	0.0070	0.02	12.40	0.100	1.30	0.000580	0.031	0.04	0.030	0.01000	0.0300	1.000	0.21
Background - Surficial Sediments - Inferred to Represent Natural Saline Water & Hydrocarbon Seepage																			
W-CAT-4	Surficial Sediments - Natural Saline Water & Oil Seepage - 95th Percentile Background	0.07	0.03	1.39	1.13	0.00140	0.0070	0.01	25.00	0.042	2.80	0.000050	0.020	0.02	0.001	0.00015	0.0012	0.411	1.40
	Surficial Sediments - Natural Saline Water & Oil Seepage - Maximum Background	0.12	0.04	2.01	1.40	0.00200	0.0070	0.01	28.00	0.100	2.80	0.000050	0.020	0.02	0.002	0.00020	0.0016	1.000	1.70
Background - Surficial Sediments - Inferred to Represent Natural Gas Seepage without Saline Water																			
W-CAT-5	Surficial Sediments - Natural Gas & Non-Saline Water Seepage - 95th Percentile Background	0.07	0.02	1.53	0.16	0.00102	0.0070	0.01	29.50	0.032	5.99	0.000050	0.006	0.02	0.002	0.00010	0.0008	0.308	0.02
	Surficial Sediments - Natural Gas & Non-Saline Water Seepage - Maximum Background	0.16	0.02	2.70	0.28	0.00200	0.0070	0.01	64.00	0.100	6.40	0.000050	0.006	0.03	0.003	0.00021	0.0008	1.000	0.04

NA Denotes guideline not available
 NC Denotes parameters not measured / not calculated
 Shading indicates parameters above most restrictive guidelines selected

Table B-3

Groundwater PHCs - Background Geochemical Statistical Summary (1997-2019)

PROJECT No.: 417085-31872

Monitoring Station		Benzene (mg/L)	Ethylbenzene (mg/L)	PHC F1 (C6-C10) -BTEX (mg/L)	PHC F2 (C10-C16) (mg/L)	Toluene (mg/L)	Xylenes-Total (mg/L)
CCME 2015. CEQG Freshwater Aquatic Life		0.37	0.09	--	--	0.002	--
Background - Surficial Sediments							
W-CAT-1	Mainland Locations - Surficial Sediments - 95th Percentile Background	0.0005	0.0005	0.10	0.10	0.0005	0.000923
	Mainland Locations - Surficial Sediments - Maximum Background	0.0050	0.0050	0.19	0.20	0.0050	0.01
W-CAT-2	Bear, Goose, and Frenchy's Islands - Surficial Sediments - 95th Percentile Background	0.0004	0.0004	0.10	0.10	0.0004	0.00089
	Bear, Goose, and Frenchy's Islands - Surficial Sediments - Maximum Background	0.0004	0.0004	0.10	0.10	0.0004	0.0009
Background - Shallow Bedrock - Inferred to Represent Natural Saline Water & Hydrocarbon Seepage							
W-CAT-3	Shallow Bedrock - Natural Saline Water & Oil Seepage - 95th Percentile Background	0.0630	0.0025	0.88	28.8	0.0033	0.0100
	Shallow Bedrock - Natural Saline water & Oil Seepage - Maximum Background	0.1700	0.0500	3.90	130	0.0500	0.1000
Background - Surficial Sediments - Inferred to Represent Natural Saline Water & Hydrocarbon Seepage							
W-CAT-4	Surficial Sediments - Natural Saline Water & Oil Seepage - 95th Percentile Background	0.0911	0.0022	0.24	1.60	0.0009	0.0144
	Surficial Sediments - Natural Saline Water & Oil Seepage - Maximum Background	0.1000	0.0032	0.60	3.00	0.0014	0.080
Background - Surficial Sediments - Inferred to Represent Natural Gas Seepage without Saline Water							
W-CAT-5	Surficial Sediments - Natural Gas & Non-Saline Water Seepage - 95th Percentile Background	0.9630	0.0757	1.58	1.90	0.0131	0.3875
	Surficial Sediments - Natural Gas & Non-Saline Water Seepage - Maximum Background	1.2500	0.3100	2.20	2.80	0.0250	0.450

NA Denotes guideline not available
 NC Denotes parameters not measured / not calculated
 Shading indicates parameters above most restrictive guidelines selected



Table 8
Groundwater PAHs - Background Geochemical Statistical Summary (1997-2019)

PROJECT No.: 417085-31872

Monitoring Station	Acenaphthene (mg/L)	Acridine (mg/L)	Anthracene (mg/L)	Benzo[a]anthracene (mg/L)	Benzo[a]pyrene (mg/L)	Fluoranthene (mg/L)	Fluorene (mg/L)	Naphthalene (mg/L)	Phenanthrene (mg/L)	Pyrene (mg/L)	Quinoline (mg/L)
CCME 2015. CEQG Freshwater Aquatic Life	0.0058	0.0044	0.000012	0.000018	0.000015	0.00004	0.003	0.0011	0.0004	0.000025	0.0034
Background - Surficial Sediments											
Mainland Locations - Surficial Sediments - 95th Percentile Background	0.00010	0.00005	0.000010	0.000009	0.000008	0.00003	0.00005	0.0001	0.0001	0.000030	0.0002
Mainland Locations - Surficial Sediments - Maximum Background	0.00010	0.00005	0.000032	0.000068	0.000008	0.00039	0.00005	0.0001	0.0004	0.000280	0.0002
Bear, Goose, and Frenchy's Islands - Surficial Sediments - 95th Percentile Background	0.00010	0.00005	0.000010	0.000009	0.000008	0.00001	0.00005	0.0001	0.0001	0.000020	0.0002
Bear, Goose, and Frenchy's Islands - Surficial Sediments - Maximum Background	0.00010	0.00005	0.000010	0.000009	0.000008	0.00001	0.00005	0.0001	0.0001	0.000020	0.0002
Background - Shallow Bedrock - Inferred to Represent Natural Saline Water & Hydrocarbon Seepage											
Shallow Bedrock - Natural Saline Water & Oil Seepage - 95th Percentile Background	0.00044	0.00005	0.000011	0.000082	0.000032	0.00006	0.00140	0.0049	0.0035	0.000228	0.0002
Shallow Bedrock - Natural Saline water & Oil Seepage - Maximum Background	0.00096	0.00005	0.000034	0.000110	0.000077	0.00009	0.00220	0.0066	0.0047	0.000490	0.0002
Background - Surficial Sediments - Inferred to Represent Natural Saline Water & Hydrocarbon Seepage											
Surficial Sediments - Natural Saline Water & Oil Seepage - 95th Percentile Background	0.00042	NC	0.000024	0.000009	0.000008	0.00006	0.00182	0.0031	0.0017	0.000201	NC
Surficial Sediments - Natural Saline Water & Oil Seepage - Maximum Background	0.00062	NC	0.000076	0.000016	0.000008	0.00006	0.00200	0.0038	0.0037	0.000210	NC
Background - Surficial Sediments - Inferred to Represent Natural Gas Seepage without Saline Water											
Surficial Sediments - Natural Gas & Non-Saline Water Seepage - 95th Percentile Background	0.00015	0.00005	0.000045	0.000035	0.000012	0.00027	0.00014	0.0157	0.0004	0.000199	0.0002
Surficial Sediments - Natural Gas & Non-Saline Water Seepage - Maximum Background	0.00016	0.00005	0.000051	0.000040	0.000013	0.00032	0.00016	0.0160	0.0004	0.000230	0.0002

NA

Denotes guideline not available

NC

Denotes parameters not measured / not calculated

Shading indicates parameters above most restrictive guidelines selected



Appendix C
Field Methodologies



C.1 Groundwater Sampling Methods

C.1.1 Field Measurements, Sampling and Handling

Prior to collection of groundwater samples, the static water and/or hydrocarbon level was measured from the top of the piezometer casing using a commercially available two-phase water level meter.

Groundwater from each monitoring well was collected for field measurements and laboratory analyses, using either dedicated or disposable bailers with no-purge methodology for the following primary indicator analyses per the GMP:

Dissolved Chloride: 1 x 500 mL aliquot (unfiltered and chemically unpreserved) for analysis of major ions.

BTEX: 3 x 44 mL aliquots (placed in glass vials containing NaHSO₄ preservative, no headspace) for analysis of BTEX compounds (benzene, toluene, ethylbenzene and xylenes).

Additional samples were collected for analysis of secondary indicator parameters as per the GMP. Upon completion of sampling at each location, all equipment was thoroughly rinsed with deionized water. New bailing rope (as required) and clean disposable nitrile gloves were used at each piezometer to reduce the potential for cross-contamination. Samples were stored in iced coolers to maintain approximate in situ temperatures, and were promptly shipped to Bureau Veritas Laboratories in Edmonton, Alberta. Standard chain-of-custody procedures were followed.



Appendix D

Laboratory Analytical Reports



Attention: Alex Haigh

Advisian
Suite 500, 151 Canada Olympic
Calgary, AB
Canada T3B 6B7

Task Order#: 417085-42051.22200
Site#: N/A
Site Location: Norman Wells, NT
Project #: 417085-42051.22200
Your C.O.C. #: 299419

Report Date: 2022/08/22
Report #: R3219357
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C259968

Received: 2022/08/13, 09:52

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH (1)	1	AB SOP-00005	SM 23 2320 B m
BTEX/F1 in Water by HS GC/MS/FID (1)	1	AB SOP-00039	CCME CWS/EPA 8260d m
F1-BTEX (1)	1		Auto Calc
Cadmium - low level CCME - Dissolved (1)	1		Auto Calc
Chloride/Sulphate by Auto Colourimetry (1)	1	AB SOP-00020	SM23-4500-Cl/SO ₄ -E m
Conductivity @25C (1)	1	AB SOP-00005	SM 23 2510 B m
Fluoride (1)	1	AB SOP-00005	SM 23 4500-F C m
CCME Hydrocarbons in Water (F2; C10-C16) (1, 2)	1	AB SOP-00037 AB SOP-00040	CCME PHC-CWS m
Hardness (1)	1		Auto Calc
Mercury (Dissolved) by CV (1, 3)	1	AB SOP-00084	BCMOE BCLM Oct2013 m
Elements by ICP - Dissolved (1, 3)	1	AB SOP-00042	EPA 6010d R5 m
Elements by ICPMS - Dissolved (1, 3)	1	AB SOP-00043	EPA 6020b R2 m
Ion Balance (1)	1		Auto Calc
Nitrate and Nitrite (1)	1		Auto Calc
NO ₂ (N); NO ₂ (N) + NO ₃ (N) in Water (1)	1	AB SOP-00091	SM 23 4500 NO3m
Nitrate (as N) (1)	1		Auto Calc
Phenols (4-AAP) (1)	1	AB SOP-00088	EPA 9066 R0 m
Total Dissolved Solids (Filt. Residue) (1)	1	AB SOP-00065	SM 23 2540 C m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard. All samples were analyzed within hold time unless otherwise flagged.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless



Attention: Alex Haigh

Advisian
Suite 500, 151 Canada Olympic
Calgary, AB
Canada T3B 6B7

Task Order#: 417085-42051.22200
Site#: N/A
Site Location: Norman Wells, NT
Project #: 417085-42051.22200
Your C.O.C. #: 299419

Report Date: 2022/08/22
Report #: R3219357
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C259968

Received: 2022/08/13, 09:52

otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

- (1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8
- (2) Silica gel clean up employed.
- (3) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Namita Sahni, Customer Solutions Representative
Email: Namita.Sahni@bureauveritas.com
Phone# (604)639-2614

=====

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.



BUREAU
VERITAS

Bureau Veritas Job #: C259968

Report Date: 2022/08/22

Advisian

Task Order#: 417085-42051.22200

Site#: N/A

Site Location: Norman Wells, NT

Project #: 417085-42051.22200

AT1 BTEX AND F1-F2 IN WATER (WATER)

Bureau Veritas ID		AZL885		
Sampling Date		2022/08/09 11:00		
COC Number		299419		
	UNITS	GIQ8-10-2-4	RDL	QC Batch
Ext. Pet. Hydrocarbon				
F2 (C10-C16 Hydrocarbons)	mg/L	10	0.10	A680377
Volatiles				
Benzene	mg/L	<0.00040	0.00040	A680889
Toluene	mg/L	<0.00040	0.00040	A680889
Ethylbenzene	mg/L	<0.00040	0.00040	A680889
m & p-Xylene	mg/L	<0.00080	0.00080	A680889
o-Xylene	mg/L	<0.00040	0.00040	A680889
Xylenes (Total)	mg/L	<0.00089	0.00089	A680177
F1 (C6-C10) - BTEX	mg/L	0.23	0.10	A680177
F1 (C6-C10)	mg/L	0.23	0.10	A680889
Extraction				
Surrogate Recovery (%)				
O-TERPHENYL (sur.)	%	101		A680377
Instrument				
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	100		A680889
4-Bromofluorobenzene (sur.)	%	126		A680889
D4-1,2-Dichloroethane (sur.)	%	98		A680889
RDL = Reportable Detection Limit				



RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		AZL885		
Sampling Date		2022/08/09 11:00		
COC Number		299419		
	UNITS	GIQ8-10-2-4	RDL	QC Batch
Calculated Parameters				
Hardness (CaCO ₃)	mg/L	1500	0.50	A680208
Ion Balance (% Difference)	%	1.4	N/A	A680209
Nitrate (N)	mg/L	<0.010	0.010	A680187
Nitrate (NO ₃)	mg/L	<0.044	0.044	A680173
Nitrite (NO ₂)	mg/L	<0.033	0.033	A680173
Elements				
Dissolved Cadmium (Cd)	mg/L	0.00041	0.000020	A680137
Misc. Inorganics				
Conductivity	uS/cm	2400	2.0	A681363
Total Dissolved Solids	mg/L	1900 (1)	50	A681818
Anions				
Alkalinity (PP as CaCO ₃)	mg/L	<1.0	1.0	A681360
Alkalinity (Total as CaCO ₃)	mg/L	750	1.0	A681360
Bicarbonate (HCO ₃)	mg/L	920	1.0	A681360
Carbonate (CO ₃)	mg/L	<1.0	1.0	A681360
Dissolved Fluoride (F)	mg/L	<0.050	0.050	A681365
Hydroxide (OH)	mg/L	<1.0	1.0	A681360
Chloride (Cl)	mg/L	38	1.0	A680538
Sulphate (SO ₄)	mg/L	760	25	A680538
Nutrients				
Nitrite (N)	mg/L	<0.010	0.010	A681009
Nitrate plus Nitrite (N)	mg/L	<0.010	0.010	A681009
Misc. Organics				
Phenols	mg/L	0.014	0.0015	A680539
RDL = Reportable Detection Limit				
N/A = Not Applicable				
(1) Detection limit raised based on sample volume used for analysis.				



BUREAU
VERITAS

Bureau Veritas Job #: C259968

Report Date: 2022/08/22

Advisian

Task Order#: 417085-42051.22200

Site#: N/A

Site Location: Norman Wells, NT

Project #: 417085-42051.22200

MERCURY BY COLD VAPOR (WATER)

Bureau Veritas ID		AZL885		
Sampling Date		2022/08/09 11:00		
COC Number		299419		
	UNITS	GIQ8-10-2-4	RDL	QC Batch
Elements				
Dissolved Mercury (Hg)	ug/L	0.0074	0.0019	A680849
RDL = Reportable Detection Limit				



ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		AZL885		
Sampling Date		2022/08/09 11:00		
COC Number		299419		
	UNITS	GIQ8-10-2-4	RDL	QC Batch
Elements				
Dissolved Aluminum (Al)	mg/L	0.019	0.0030	A680857
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	A680857
Dissolved Arsenic (As)	mg/L	0.0086	0.00020	A680857
Dissolved Barium (Ba)	mg/L	0.13	0.010	A681035
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	A680857
Dissolved Boron (B)	mg/L	0.031	0.020	A681035
Dissolved Calcium (Ca)	mg/L	440	0.30	A681035
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	A680857
Dissolved Cobalt (Co)	mg/L	0.019	0.00030	A680857
Dissolved Copper (Cu)	mg/L	0.0061	0.0010	A680857
Dissolved Iron (Fe)	mg/L	17	0.060	A681035
Dissolved Lead (Pb)	mg/L	0.00026	0.00020	A680857
Dissolved Lithium (Li)	mg/L	0.021	0.020	A681035
Dissolved Magnesium (Mg)	mg/L	99	0.20	A681035
Dissolved Manganese (Mn)	mg/L	4.5	0.0040	A681035
Dissolved Molybdenum (Mo)	mg/L	0.00095	0.00020	A680857
Dissolved Nickel (Ni)	mg/L	0.039	0.00050	A680857
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	A681035
Dissolved Potassium (K)	mg/L	3.2	0.30	A681035
Dissolved Selenium (Se)	mg/L	0.0018	0.00020	A680857
Dissolved Silicon (Si)	mg/L	6.1	0.10	A681035
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	A680857
Dissolved Sodium (Na)	mg/L	47	0.50	A681035
Dissolved Strontium (Sr)	mg/L	1.8	0.020	A681035
Dissolved Sulphur (S)	mg/L	230	0.20	A681035
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	A680857
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	A680857
Dissolved Titanium (Ti)	mg/L	0.0019	0.0010	A680857
Dissolved Uranium (U)	mg/L	0.015	0.00010	A680857
Dissolved Vanadium (V)	mg/L	0.0011	0.0010	A680857
Dissolved Zinc (Zn)	mg/L	0.032	0.0030	A680857
RDL = Reportable Detection Limit				



BUREAU
VERITAS

Bureau Veritas Job #: C259968

Report Date: 2022/08/22

Advisian

Task Order#: 417085-42051.22200

Site#: N/A

Site Location: Norman Wells, NT

Project #: 417085-42051.22200

TEST SUMMARY

Bureau Veritas ID: AZL885
Sample ID: GIQ8-10-2-4
Matrix: Water

Collected: 2022/08/09
Relinquished: 2022/08/10
Received: 2022/08/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH	AT/ALK	A681360	N/A	2022/08/15	Tracy (Jing) Ling
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A680889	N/A	2022/08/16	Darrus Ong
F1-BTEX	CALC/MS	A680177	N/A	2022/08/17	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	A680137	N/A	2022/08/18	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	A680538	N/A	2022/08/15	Tyler Orr
Conductivity @25C	COND	A681363	N/A	2022/08/15	Tracy (Jing) Ling
Fluoride	AT	A681365	N/A	2022/08/15	Tracy (Jing) Ling
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A680377	2022/08/15	2022/08/15	Elizabeth Chacko
Hardness	CALC	A680208	N/A	2022/08/16	Automated Statchk
Mercury (Dissolved) by CV	CV	A680849	2022/08/15	2022/08/15	Kiran Kumari
Elements by ICP - Dissolved	ICPA	A681035	N/A	2022/08/15	Mohammad Pousti
Elements by ICPMS - Dissolved	ICPM	A680857	N/A	2022/08/18	Serena Tian
Ion Balance	CALC	A680209	N/A	2022/08/16	Automated Statchk
Nitrate and Nitrite	CALC	A680173	N/A	2022/08/16	Automated Statchk
NO ₂ (N); NO ₂ (N) + NO ₃ (N) in Water	AC/COL	A681009	N/A	2022/08/15	Shanna McKort
Nitrate (as N)	CALC	A680187	2022/08/16	2022/08/16	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	A680539	N/A	2022/08/15	Tracy (Jing) Ling
Total Dissolved Solids (Filt. Residue)	BAL	A681818	2022/08/16	2022/08/16	Haydee Estilong



GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.0°C
-----------	-------

Temperatures upon receipt at Bureau Veritas Labs Calgary.

Package 1: [2.6] degrees C

Each temperature is the average of up to three cooler temperatures taken at receipt.

Sample AZL885 [GIQ8-10-2-4] : Sample was analyzed past method specified hold time for NO₂ (N); NO₂ (N) + NO₃ (N) in Water. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Results relate only to the items tested.



BUREAU
VERITAS

Bureau Veritas Job #: C259968

Report Date: 2022/08/22

Advisian

Task Order#: 417085-42051.22200

Site#: N/A

Site Location: Norman Wells, NT

Project #: 417085-42051.22200

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A680377	ECO	Method Blank	O-TERPHENYL (sur.)	2022/08/15		92	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2022/08/15	<0.10		mg/L	
A680538	TOR	Method Blank	Chloride (Cl)	2022/08/15	<1.0		mg/L	
			Sulphate (SO4)	2022/08/15	<1.0		mg/L	
A680539	JLD	Method Blank	Phenols	2022/08/15	<0.0015		mg/L	
A680849	KKM	Method Blank	Dissolved Mercury (Hg)	2022/08/15	<0.0019		ug/L	
A680857	STI	Method Blank	Dissolved Aluminum (Al)	2022/08/15	<0.0030		mg/L	
			Dissolved Chromium (Cr)	2022/08/15	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2022/08/15	<0.00030		mg/L	
			Dissolved Copper (Cu)	2022/08/15	<0.0010		mg/L	
			Dissolved Lead (Pb)	2022/08/15	<0.00020		mg/L	
			Dissolved Antimony (Sb)	2022/08/15	<0.00060		mg/L	
			Dissolved Molybdenum (Mo)	2022/08/15	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2022/08/15	<0.00050		mg/L	
			Dissolved Selenium (Se)	2022/08/15	<0.00020		mg/L	
			Dissolved Silver (Ag)	2022/08/15	<0.00010		mg/L	
			Dissolved Arsenic (As)	2022/08/15	<0.00020		mg/L	
			Dissolved Thallium (Tl)	2022/08/15	<0.00020		mg/L	
			Dissolved Tin (Sn)	2022/08/15	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2022/08/15	<0.0010		mg/L	
			Dissolved Uranium (U)	2022/08/15	<0.00010		mg/L	
			Dissolved Vanadium (V)	2022/08/15	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2022/08/15	<0.0030		mg/L	
			Dissolved Beryllium (Be)	2022/08/15	<0.0010		mg/L	
A680889	DO1	Method Blank	1,4-Difluorobenzene (sur.)	2022/08/16		98	%	50 - 140
			4-Bromofluorobenzene (sur.)	2022/08/16		100	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2022/08/16		95	%	50 - 140
			Benzene	2022/08/16	<0.00040		mg/L	
			Toluene	2022/08/16	<0.00040		mg/L	
			Ethylbenzene	2022/08/16	<0.00040		mg/L	
			m & p-Xylene	2022/08/16	<0.00080		mg/L	
			o-Xylene	2022/08/16	<0.00040		mg/L	
			F1 (C6-C10)	2022/08/16	<0.10		mg/L	
A681009	SKM	Method Blank	Nitrite (N)	2022/08/15	<0.010		mg/L	
			Nitrate plus Nitrite (N)	2022/08/15	<0.010		mg/L	
A681035	MPU	Method Blank	Dissolved Iron (Fe)	2022/08/15	<0.060		mg/L	
			Dissolved Lithium (Li)	2022/08/15	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2022/08/15	<0.20		mg/L	
			Dissolved Manganese (Mn)	2022/08/15	<0.0040		mg/L	
			Dissolved Potassium (K)	2022/08/15	<0.30		mg/L	
			Dissolved Sodium (Na)	2022/08/15	<0.50		mg/L	
			Dissolved Strontium (Sr)	2022/08/15	<0.020		mg/L	
			Dissolved Sulphur (S)	2022/08/15	<0.20		mg/L	
			Dissolved Phosphorus (P)	2022/08/15	<0.10		mg/L	
			Dissolved Barium (Ba)	2022/08/15	<0.010		mg/L	
			Dissolved Silicon (Si)	2022/08/15	<0.10		mg/L	
			Dissolved Boron (B)	2022/08/15	<0.020		mg/L	
			Dissolved Calcium (Ca)	2022/08/15	<0.30		mg/L	
A681360	JLD	Method Blank	Alkalinity (Total as CaCO3)	2022/08/15	<1.0		mg/L	
			Alkalinity (PP as CaCO3)	2022/08/15	<1.0		mg/L	
			Bicarbonate (HCO3)	2022/08/15	<1.0		mg/L	
			Carbonate (CO3)	2022/08/15	<1.0		mg/L	



**BUREAU
VERITAS**

Bureau Veritas Job #: C259968

Report Date: 2022/08/22

Advisian

Task Order#: 417085-42051.22200

Site#: N/A

Site Location: Norman Wells, NT

Project #: 417085-42051.22200

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Hydroxide (OH)	2022/08/15	<1.0		mg/L	
A681363	JLD	Method Blank	Conductivity	2022/08/15	<2.0		uS/cm	
A681365	JLD	Method Blank	Dissolved Fluoride (F)	2022/08/15	<0.050		mg/L	
A681818	HE1	Method Blank	Total Dissolved Solids	2022/08/16	<10		mg/L	
A680377	ECO	LCS	O-TERPHENYL (sur.)	2022/08/15		96	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2022/08/15		95	%	60 - 140
A680538	TOR	LCS	Chloride (Cl)	2022/08/15		103	%	80 - 120
			Sulphate (SO4)	2022/08/15		99	%	80 - 120
A680539	JLD	LCS	Phenols	2022/08/15		93	%	80 - 120
A680849	KKM	LCS	Dissolved Mercury (Hg)	2022/08/15		114	%	80 - 120
A680857	STI	LCS	Dissolved Aluminum (Al)	2022/08/18		100	%	80 - 120
			Dissolved Chromium (Cr)	2022/08/18		96	%	80 - 120
			Dissolved Cobalt (Co)	2022/08/18		95	%	80 - 120
			Dissolved Copper (Cu)	2022/08/18		93	%	80 - 120
			Dissolved Lead (Pb)	2022/08/18		100	%	80 - 120
			Dissolved Antimony (Sb)	2022/08/18		100	%	80 - 120
			Dissolved Molybdenum (Mo)	2022/08/18		101	%	80 - 120
			Dissolved Nickel (Ni)	2022/08/18		94	%	80 - 120
			Dissolved Selenium (Se)	2022/08/18		98	%	80 - 120
			Dissolved Silver (Ag)	2022/08/18		96	%	80 - 120
			Dissolved Arsenic (As)	2022/08/18		95	%	80 - 120
			Dissolved Thallium (Tl)	2022/08/18		101	%	80 - 120
			Dissolved Tin (Sn)	2022/08/18		105	%	80 - 120
			Dissolved Titanium (Ti)	2022/08/18		103	%	80 - 120
			Dissolved Uranium (U)	2022/08/18		101	%	80 - 120
			Dissolved Vanadium (V)	2022/08/18		99	%	80 - 120
			Dissolved Zinc (Zn)	2022/08/18		99	%	80 - 120
			Dissolved Beryllium (Be)	2022/08/18		101	%	80 - 120
A680889	DO1	LCS	1,4-Difluorobenzene (sur.)	2022/08/16		97	%	50 - 140
			4-Bromofluorobenzene (sur.)	2022/08/16		100	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2022/08/16		97	%	50 - 140
			Benzene	2022/08/16		113	%	60 - 130
			Toluene	2022/08/16		112	%	60 - 130
			Ethylbenzene	2022/08/16		112	%	60 - 130
			m & p-Xylene	2022/08/16		112	%	60 - 130
			o-Xylene	2022/08/16		111	%	60 - 130
			F1 (C6-C10)	2022/08/16		99	%	60 - 140
A681009	SKM	LCS	Nitrite (N)	2022/08/15		98	%	80 - 120
			Nitrate plus Nitrite (N)	2022/08/15		99	%	80 - 120
A681035	MPU	LCS	Dissolved Iron (Fe)	2022/08/15		99	%	80 - 120
			Dissolved Lithium (Li)	2022/08/15		100	%	80 - 120
			Dissolved Magnesium (Mg)	2022/08/15		99	%	80 - 120
			Dissolved Manganese (Mn)	2022/08/15		96	%	80 - 120
			Dissolved Potassium (K)	2022/08/15		104	%	80 - 120
			Dissolved Sodium (Na)	2022/08/15		100	%	80 - 120
			Dissolved Strontium (Sr)	2022/08/15		100	%	80 - 120
			Dissolved Sulphur (S)	2022/08/15		93	%	80 - 120
			Dissolved Phosphorus (P)	2022/08/15		94	%	80 - 120
			Dissolved Barium (Ba)	2022/08/15		104	%	80 - 120
			Dissolved Silicon (Si)	2022/08/15		93	%	80 - 120
			Dissolved Boron (B)	2022/08/15		98	%	80 - 120
			Dissolved Calcium (Ca)	2022/08/15		101	%	80 - 120



BUREAU
VERITAS

Bureau Veritas Job #: C259968

Report Date: 2022/08/22

Advisian

Task Order#: 417085-42051.22200

Site#: N/A

Site Location: Norman Wells, NT

Project #: 417085-42051.22200

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A681360	JLD	LCS	Alkalinity (Total as CaCO ₃)	2022/08/15		102	%	80 - 120
A681363	JLD	LCS	Conductivity	2022/08/15		101	%	90 - 110
A681365	JLD	LCS	Dissolved Fluoride (F)	2022/08/15		93	%	80 - 120
A681818	HE1	LCS	Total Dissolved Solids	2022/08/16		97	%	80 - 120

LCS: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.



BUREAU
VERITAS

Bureau Veritas Job #: C259968

Report Date: 2022/08/22

Advisian

Task Order#: 417085-42051.22200

Site#: N/A

Site Location: Norman Wells, NT

Project #: 417085-42051.22200

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

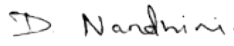
Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

Veronica Falk, B.Sc., P.Chem., QP, Scientific Specialist, Organics

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

COC-1010 (06/2016) IOL-AB

DATA QUALITY REVIEW CHECKLIST - IMPERIAL OIL PROJECTS

Consultant: <u>Advisian</u>		Sampling Date: <u>24-Sep-22, 23-Sep-22</u>		
Location: <u>Norman Wells</u>		Laboratory : <u>Bureau Veritas</u>		
Consultant Project Number: <u>417085-42051-22100</u>		Sample Submission Number: <u>C274421</u>		
Are All Laboratory QC Within Acceptance Criteria (Yes, No, Not Applicable)?				
	Yes	No	NA	Comments
Instrument Surrogate Recovery	x			All laboratory QC met acceptance criteria.
Extraction Surrogate Recovery	x			
Method Blank Concentration	x			
Matrix Duplicate RPD	x			
Matrix Spike Recovery	x			
Lab Control Sample Recovery	x			
Are All Field QC Samples Within Alert Limits (Yes, No, Not Applicable)?				
	Yes	No	NA	Comments
Field Blank Concentration			x	All field QC samples met alert limits.
Trip Blank Concentration			x	
Equipment Blank Concentration			x	
Field Duplicate RPD	x			
Has CoA been signed off (Yes/No)?: <u>Yes</u>				
Has lab warranted all tests were analyzed following SOP's in CoA (Yes/No)?: <u>Yes</u>				
Were all samples analyzed within hold times (Yes/No)?: <u>No</u>				
All volatiles samples methanol extracted (if required) within 48 hours (Yes/No)?: <u>n/a</u>				
Is Chain of Custody completed and signed (Yes/No)?: <u>Yes</u>				
Were sample temperatures acceptable when they reached lab (Yes/No)?: <u>Yes</u>				
Was a Data Quality Overview (DQO) issued (Yes/No)?: <u>Yes</u>				
Date DQO was received: <u>05-Oct-22</u>				
Is data considered to be reliable (Yes/No)?: <u>Yes</u>				
If answer is "No", describe and provide rationale: _____				
 Data Reviewed by (Print): <u>Nandhini Durairaj</u> Data Reviewed by (Signature): <u></u>				
Date: <u>30-Nov-22</u>				



Attention: Alex Haigh

Advisian
Suite 500, 151 Canada Olympic
Calgary, AB
Canada T3B 6B7

Task Order#: PENDING
Line Item: 10
Site#: N/A
Site Location: NORMAN WELLS, NT
Project #: 417085-42051-22100
Your C.O.C. #: 1of1

Report Date: 2022/10/05
Report #: R3243975
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C274421

Received: 2022/09/27, 07:00

Sample Matrix: Water
Samples Received: 8

Analyses	Quantity	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH (1)	7	AB SOP-00005	SM 23 2320 B m
BTEX/F1 in Water by HS GC/MS/FID (1)	8	AB SOP-00039	CCME CWS/EPA 8260d m
F1-BTEX (1)	8		Auto Calc
Cadmium - low level CCME - Dissolved (1)	7		Auto Calc
Chloride/Sulphate by Auto Colourimetry (1)	7	AB SOP-00020	SM23-4500-Cl/SO ₄ -E m
Container Supply & Nonhazardous Disposal (1)	1		
Conductivity @25C (1)	7	AB SOP-00005	SM 23 2510 B m
Fluoride (1)	7	AB SOP-00005	SM 23 4500-F C m
CCME Hydrocarbons in Water (F2; C10-C16) (1, 2)	8	AB SOP-00037 AB SOP-00040	CCME PHC-CWS m
Hardness (1)	7		Auto Calc
Mercury (Dissolved) by CV (1, 3)	7	AB SOP-00084	BCMOE BCLM Oct2013 m
Elements by ICP - Dissolved (1, 3)	7	AB SOP-00042	EPA 6010d R5 m
Elements by ICPMS - Dissolved (1, 3)	7	AB SOP-00043	EPA 6020b R2 m
Ion Balance (1)	7		Auto Calc
Nitrate and Nitrite (1)	7		Auto Calc
NO ₂ (N); NO ₂ (N) + NO ₃ (N) in Water (1)	7	AB SOP-00091	SM 23 4500 NO3m
Nitrate (as N) (1)	7		Auto Calc
Phenols (4-AAP) (1)	7	AB SOP-00088	EPA 9066 R0 m
Total Dissolved Solids (Filt. Residue) (1)	7	AB SOP-00065	SM 23 2540 C m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard. All samples were analyzed within hold time unless otherwise flagged.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or



Attention: Alex Haigh

Advisian
Suite 500, 151 Canada Olympic
Calgary, AB
Canada T3B 6B7

Task Order#: PENDING
Line Item: 10
Site#: N/A
Site Location: NORMAN WELLS, NT
Project #: 417085-42051-22100
Your C.O.C. #: 1of1

Report Date: 2022/10/05
Report #: R3243975
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C274421

Received: 2022/09/27, 07:00

implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8

(2) Silica gel clean up employed.

(3) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Namita Sahni, Customer Solutions Representative

Email: Namita.Sahni@bureauveritas.com

Phone# (604)639-2614

=====

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



BUREAU
VERITAS

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

AT1 BTEX AND F1-F2 IN WATER (WATER)

Bureau Veritas ID		BCU570			BCU570			BCU571		
Sampling Date		2022/09/24 09:30			2022/09/24 09:30			2022/09/24 09:45		
COC Number		1of1			1of1			1of1		
	UNITS	CPF 97-7-5	RDL	QC Batch	CPF 97-7-5 Lab-Dup	RDL	QC Batch	CPF 98-8-3	RDL	QC Batch
Ext. Pet. Hydrocarbon										
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	0.10	A734263				<0.10	0.10	A734263
Volatiles										
Benzene	mg/L	<0.00040	0.00040	A733498	<0.00040	0.00040	A733498	<0.00040	0.00040	A733498
Toluene	mg/L	<0.00040	0.00040	A733498	<0.00040	0.00040	A733498	<0.00040	0.00040	A733498
Ethylbenzene	mg/L	<0.00040	0.00040	A733498	<0.00040	0.00040	A733498	<0.00040	0.00040	A733498
m & p-Xylene	mg/L	<0.00080	0.00080	A733498	<0.00080	0.00080	A733498	<0.00080	0.00080	A733498
o-Xylene	mg/L	<0.00040	0.00040	A733498	<0.00040	0.00040	A733498	<0.00040	0.00040	A733498
Xylenes (Total)	mg/L	<0.00089	0.00089	A731388				<0.00089	0.00089	A731388
F1 (C6-C10) - BTEX	mg/L	<0.10	0.10	A731388				<0.10	0.10	A731388
F1 (C6-C10)	mg/L	<0.10	0.10	A733498	<0.10	0.10	A733498	<0.10	0.10	A733498
Extraction										
Surrogate Recovery (%)										
O-TERPHENYL (sur.)	%	115		A734263				108		A734263
Instrument										
Surrogate Recovery (%)										
1,4-Difluorobenzene (sur.)	%	100		A733498	100		A733498	101		A733498
4-Bromofluorobenzene (sur.)	%	100		A733498	100		A733498	101		A733498
D4-1,2-Dichloroethane (sur.)	%	93		A733498	94		A733498	97		A733498
RDL = Reportable Detection Limit										
Lab-Dup = Laboratory Initiated Duplicate										



BUREAU
VERITAS

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

AT1 BTEX AND F1-F2 IN WATER (WATER)

Bureau Veritas ID		BCU572	BCU573	BCU574	BCU575	BCU576		
Sampling Date		2022/09/23 15:30	2022/09/23 14:00	2022/09/24 08:45	2022/09/23 16:30	2022/09/23 14:45		
COC Number		1of1	1of1	1of1	1of1	1of1		
	UNITS	MEBG-10-1-3	TF 03-12-3	MTF 97-1-5	C38 08-1-4	ARB-12-3-3	RDL	QC Batch
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	A734263
Volatiles								
Benzene	mg/L	<0.00040	<0.00040	<0.00040	0.00052	<0.00040	0.00040	A733498
Toluene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	A733498
Ethylbenzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	A733498
m & p-Xylene	mg/L	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080	0.00080	A733498
o-Xylene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	A733498
Xylenes (Total)	mg/L	<0.00089	<0.00089	<0.00089	<0.00089	<0.00089	0.00089	A731388
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	A731388
F1 (C6-C10)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	A733498
Extraction Surrogate Recovery (%)								
O-TERPHENYL (sur.)	%	118	108	109	121	107		A734263
Instrument Surrogate Recovery (%)								
1,4-Difluorobenzene (sur.)	%	103	101	107	102	102		A733498
4-Bromofluorobenzene (sur.)	%	100	103	99	96	97		A733498
D4-1,2-Dichloroethane (sur.)	%	100	100	98	101	99		A733498
RDL = Reportable Detection Limit								



BUREAU
VERITAS

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

AT1 BTEX AND F1-F2 IN WATER (WATER)

Bureau Veritas ID		BCU577		
Sampling Date		2022/09/23 16:40		
COC Number		1of1		
	UNITS	FIELD DUPLICATE 1	RDL	QC Batch
Ext. Pet. Hydrocarbon				
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	0.10	A734263
Volatiles				
Benzene	mg/L	0.00050	0.00040	A733498
Toluene	mg/L	<0.00040	0.00040	A733498
Ethylbenzene	mg/L	<0.00040	0.00040	A733498
m & p-Xylene	mg/L	<0.00080	0.00080	A733498
o-Xylene	mg/L	<0.00040	0.00040	A733498
Xylenes (Total)	mg/L	<0.00089	0.00089	A731388
F1 (C6-C10) - BTEX	mg/L	<0.10	0.10	A731388
F1 (C6-C10)	mg/L	<0.10	0.10	A733498
Extraction Surrogate Recovery (%)				
O-TERPHENYL (sur.)	%	104		A734263
Instrument Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	101		A733498
4-Bromofluorobenzene (sur.)	%	100		A733498
D4-1,2-Dichloroethane (sur.)	%	101		A733498
RDL = Reportable Detection Limit				



BUREAU
VERITAS

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		BCU570			BCU571			BCU572		
Sampling Date		2022/09/24 09:30			2022/09/24 09:45			2022/09/23 15:30		
COC Number		1of1			1of1			1of1		
	UNITS	CPF 97-7-5	RDL	QC Batch	CPF 98-8-3	RDL	QC Batch	MEBG-10-1-3	RDL	QC Batch
Calculated Parameters										
Hardness (CaCO ₃)	mg/L	1400	0.50	A731599	570	0.50	A731599	1400	0.50	A731599
Ion Balance (% Difference)	%	2.2	N/A	A731601	3.1	N/A	A731601	0.069	N/A	A731601
Nitrate (N)	mg/L	0.11	0.010	A731391	0.015	0.010	A731391	0.013	0.010	A731391
Nitrate (NO ₃)	mg/L	0.51	0.044	A731390	0.068	0.044	A731390	0.055	0.044	A731390
Nitrite (NO ₂)	mg/L	<0.033	0.033	A731390	<0.033	0.033	A731390	<0.033	0.033	A731390
Elements										
Dissolved Cadmium (Cd)	mg/L	0.00061	0.000020	A731657	<0.000020	0.000020	A731657	0.00019	0.000020	A731657
Misc. Inorganics										
Conductivity	uS/cm	2200	2.0	A733591	1200	2.0	A733591	2100	2.0	A733591
Total Dissolved Solids	mg/L	1900	10	A736210	820	10	A736210	1800	10	A734717
Anions										
Alkalinity (PP as CaCO ₃)	mg/L	<1.0	1.0	A733588	<1.0	1.0	A733588	<1.0	1.0	A733588
Alkalinity (Total as CaCO ₃)	mg/L	400	1.0	A733588	530	1.0	A733588	450	1.0	A733588
Bicarbonate (HCO ₃)	mg/L	480	1.0	A733588	650	1.0	A733588	550	1.0	A733588
Carbonate (CO ₃)	mg/L	<1.0	1.0	A733588	<1.0	1.0	A733588	<1.0	1.0	A733588
Dissolved Fluoride (F)	mg/L	0.096	0.050	A733593	0.072	0.050	A733593	0.17	0.050	A733593
Hydroxide (OH)	mg/L	<1.0	1.0	A733588	<1.0	1.0	A733588	<1.0	1.0	A733588
Chloride (Cl)	mg/L	8.6	1.0	A733144	9.3	1.0	A733144	4.2	1.0	A733144
Sulphate (SO ₄)	mg/L	1000	25	A733144	140	5.0	A733144	980	25	A733144
Nutrients										
Nitrite (N)	mg/L	<0.010	0.010	A732799	<0.010	0.010	A732799	<0.010	0.010	A732802
Nitrate plus Nitrite (N)	mg/L	0.11	0.010	A732799	0.015	0.010	A732799	0.013	0.010	A732802
Misc. Organics										
Phenols	mg/L	<0.0015	0.0015	A736242	<0.0015	0.0015	A733444	<0.0015	0.0015	A733444
RDL = Reportable Detection Limit										
N/A = Not Applicable										



BUREAU
VERITAS

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		BCU573			BCU574			BCU575		
Sampling Date		2022/09/23 14:00			2022/09/24 08:45			2022/09/23 16:30		
COC Number		1of1			1of1			1of1		
	UNITS	TF 03-12-3	RDL	QC Batch	MTF 97-1-5	RDL	QC Batch	C38 08-1-4	RDL	QC Batch
Calculated Parameters										
Hardness (CaCO ₃)	mg/L	1100	0.50	A731599	1000	0.50	A731599	700	0.50	A731599
Ion Balance (% Difference)	%	2.6	N/A	A731601	0.67	N/A	A731601	3.1	N/A	A731601
Nitrate (N)	mg/L	<0.010	0.010	A731391	3.6	0.050	A731391	<0.050	0.050	A731391
Nitrate (NO ₃)	mg/L	<0.044	0.044	A731390	16	0.22	A731390	<0.22	0.22	A731390
Nitrite (NO ₂)	mg/L	<0.033	0.033	A731390	<0.033	0.033	A731390	<0.033	0.033	A731390
Elements										
Dissolved Cadmium (Cd)	mg/L	<0.000020	0.000020	A731657	0.00016	0.000020	A731657	0.000021	0.000020	A731657
Misc. Inorganics										
Conductivity	uS/cm	1900	2.0	A733591	1600	2.0	A733591	1300	2.0	A733591
Total Dissolved Solids	mg/L	1300 (1)	25	A734717	1300	10	A736210	790 (1)	17	A734717
Anions										
Alkalinity (PP as CaCO ₃)	mg/L	<1.0	1.0	A733588	<1.0	1.0	A733588	<1.0	1.0	A733588
Alkalinity (Total as CaCO ₃)	mg/L	920	1.0	A733588	280	1.0	A733588	660	1.0	A733588
Bicarbonate (HCO ₃)	mg/L	1100	1.0	A733588	340	1.0	A733588	800	1.0	A733588
Carbonate (CO ₃)	mg/L	<1.0	1.0	A733588	<1.0	1.0	A733588	<1.0	1.0	A733588
Dissolved Fluoride (F)	mg/L	0.49	0.050	A733593	0.17	0.050	A733593	0.20	0.050	A733593
Hydroxide (OH)	mg/L	<1.0	1.0	A733588	<1.0	1.0	A733588	<1.0	1.0	A733588
Chloride (Cl)	mg/L	76	1.0	A733144	1.4	1.0	A733144	16	1.0	A733144
Sulphate (SO ₄)	mg/L	140	5.0	A733144	710	25	A733144	59	1.0	A733144
Nutrients										
Nitrite (N)	mg/L	<0.010	0.010	A732802	<0.010	0.010	A732799	<0.010	0.010	A732802
Nitrate plus Nitrite (N)	mg/L	<0.010	0.010	A732802	3.6	0.050	A732799	<0.050 (2)	0.050	A732802
Misc. Organics										
Phenols	mg/L	<0.0015	0.0015	A733444	<0.0015	0.0015	A733444	<0.0015	0.0015	A733293

RDL = Reportable Detection Limit

N/A = Not Applicable

(1) Detection limit raised based on sample volume used for analysis.

(2) Detection limits raised due to matrix interference.



BUREAU
VERITAS

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		BCU576		
Sampling Date		2022/09/23 14:45		
COC Number		1of1		
	UNITS	ARB-12-3-3	RDL	QC Batch
Calculated Parameters				
Hardness (CaCO ₃)	mg/L	550	0.50	A731599
Ion Balance (% Difference)	%	3.1	N/A	A731601
Nitrate (N)	mg/L	0.085	0.010	A731391
Nitrate (NO ₃)	mg/L	0.38	0.044	A731390
Nitrite (NO ₂)	mg/L	0.095	0.033	A731390
Elements				
Dissolved Cadmium (Cd)	mg/L	0.000036	0.000020	A731657
Misc. Inorganics				
Conductivity	uS/cm	970	2.0	A733591
Total Dissolved Solids	mg/L	670	10	A734717
Anions				
Alkalinity (PP as CaCO ₃)	mg/L	<1.0	1.0	A733588
Alkalinity (Total as CaCO ₃)	mg/L	380	1.0	A733588
Bicarbonate (HCO ₃)	mg/L	460	1.0	A733588
Carbonate (CO ₃)	mg/L	<1.0	1.0	A733588
Dissolved Fluoride (F)	mg/L	0.11	0.050	A733593
Hydroxide (OH)	mg/L	<1.0	1.0	A733588
Chloride (Cl)	mg/L	19	1.0	A733144
Sulphate (SO ₄)	mg/L	140	5.0	A733144
Nutrients				
Nitrite (N)	mg/L	0.029	0.010	A732802
Nitrate plus Nitrite (N)	mg/L	0.11	0.010	A732802
Misc. Organics				
Phenols	mg/L	<0.0015	0.0015	A733444
RDL = Reportable Detection Limit				
N/A = Not Applicable				



BUREAU
VERITAS

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

MERCURY BY COLD VAPOR (WATER)

Bureau Veritas ID		BCU570	BCU571	BCU572		BCU573	BCU574	BCU575		
Sampling Date		2022/09/24 09:30	2022/09/24 09:45	2022/09/23 15:30		2022/09/23 14:00	2022/09/24 08:45	2022/09/23 16:30		
COC Number		1of1	1of1	1of1		1of1	1of1	1of1		
	UNITS	CPF 97-7-5	CPF 98-8-3	MEBG-10-1-3	QC Batch	TF 03-12-3	MTF 97-1-5	C38 08-1-4	RDL	QC Batch
Elements										
Dissolved Mercury (Hg)	ug/L	0.0035	0.0030	0.0039	A733324	0.0024	0.0026	0.0028	0.0019	A733338
RDL = Reportable Detection Limit										

Bureau Veritas ID		BCU576		
Sampling Date		2022/09/23 14:45		
COC Number		1of1		
	UNITS	ARB-12-3-3	RDL	QC Batch
Elements				
Dissolved Mercury (Hg)	ug/L	0.0035	0.0019	A733338
RDL = Reportable Detection Limit				



BUREAU
VERITAS

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		BCU570	BCU571	BCU572	BCU573	BCU574	BCU575		
Sampling Date		2022/09/24 09:30	2022/09/24 09:45	2022/09/23 15:30	2022/09/23 14:00	2022/09/24 08:45	2022/09/23 16:30		
COC Number		1of1	1of1	1of1	1of1	1of1	1of1		
	UNITS	CPF 97-7-5	CPF 98-8-3	MEBG-10-1-3	TF 03-12-3	MTF 97-1-5	C38 08-1-4	RDL	QC Batch
Elements									
Dissolved Aluminum (Al)	mg/L	0.026	<0.0030	0.0059	0.014	0.0053	0.052	0.0030	A733804
Dissolved Antimony (Sb)	mg/L	0.00091	<0.00060	<0.00060	0.00063	0.00069	<0.00060	0.00060	A733804
Dissolved Arsenic (As)	mg/L	0.00042	<0.00020	0.00072	0.0073	0.00022	0.0036	0.00020	A733804
Dissolved Barium (Ba)	mg/L	0.052	0.23	0.061	0.12	0.029	0.27	0.010	A733784
Dissolved Beryllium (Be)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	A733804
Dissolved Boron (B)	mg/L	0.092	0.064	<0.020	0.037	0.032	<0.020	0.020	A733784
Dissolved Calcium (Ca)	mg/L	420	170	440	280	280	180	0.30	A733784
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	A733804
Dissolved Cobalt (Co)	mg/L	0.00067	<0.00030	0.0072	0.0039	<0.00030	0.0018	0.00030	A733804
Dissolved Copper (Cu)	mg/L	0.0041	<0.0010	0.0013	0.0017	0.0016	<0.0010	0.0010	A733804
Dissolved Iron (Fe)	mg/L	<0.060	3.3	1.8	16	<0.060	9.2	0.060	A733784
Dissolved Lead (Pb)	mg/L	0.00025	<0.00020	<0.00020	0.00023	<0.00020	<0.00020	0.00020	A733804
Dissolved Lithium (Li)	mg/L	<0.020	0.031	<0.020	<0.020	<0.020	<0.020	0.020	A733784
Dissolved Magnesium (Mg)	mg/L	85	38	86	100	72	65	0.20	A733784
Dissolved Manganese (Mn)	mg/L	0.58	1.1	2.1	0.92	<0.0040	0.45	0.0040	A733784
Dissolved Molybdenum (Mo)	mg/L	0.0012	0.00069	0.0059	0.18	0.017	<0.00020	0.00020	A733804
Dissolved Nickel (Ni)	mg/L	0.0098	<0.00050	0.024	0.032	0.0068	0.0058	0.00050	A733804
Dissolved Phosphorus (P)	mg/L	<0.10	0.22	<0.10	<0.10	<0.10	0.29	0.10	A733784
Dissolved Potassium (K)	mg/L	4.7	3.9	3.5	7.1	1.7	3.4	0.30	A733784
Dissolved Selenium (Se)	mg/L	0.00026	0.00045	0.00035	0.0011	0.16	0.00032	0.00020	A733804
Dissolved Silicon (Si)	mg/L	3.8	5.1	5.9	14	4.6	9.0	0.50	A733784
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	A733804
Dissolved Sodium (Na)	mg/L	9.9	27	14	38	3.4	30	0.50	A733784
Dissolved Strontium (Sr)	mg/L	2.0	0.81	0.90	0.99	0.52	0.49	0.020	A733784
Dissolved Sulphur (S)	mg/L	320	39	310	47	220	15	0.20	A733784
Dissolved Thallium (Tl)	mg/L	<0.00020	<0.00020	0.00030	0.00041	<0.00020	<0.00020	0.00020	A733804
Dissolved Tin (Sn)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	A733804
Dissolved Titanium (Ti)	mg/L	0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	A733804
Dissolved Uranium (U)	mg/L	0.0038	0.00052	0.027	0.0069	0.033	0.00046	0.00010	A733804
Dissolved Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	0.0031	<0.0010	<0.0010	0.0010	A733804
Dissolved Zinc (Zn)	mg/L	0.021	<0.0030	0.0087	0.0061	0.0055	0.0074	0.0030	A733804
RDL = Reportable Detection Limit									



ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		BCU576		
Sampling Date		2022/09/23 14:45		
COC Number		1of1		
	UNITS	ARB-12-3-3	RDL	QC Batch
Elements				
Dissolved Aluminum (Al)	mg/L	0.019	0.0030	A733804
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	A733804
Dissolved Arsenic (As)	mg/L	0.0016	0.00020	A733804
Dissolved Barium (Ba)	mg/L	0.12	0.010	A733784
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	A733804
Dissolved Boron (B)	mg/L	0.028	0.020	A733784
Dissolved Calcium (Ca)	mg/L	140	0.30	A733784
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	A733804
Dissolved Cobalt (Co)	mg/L	0.0023	0.00030	A733804
Dissolved Copper (Cu)	mg/L	0.0023	0.0010	A733804
Dissolved Iron (Fe)	mg/L	0.29	0.060	A733784
Dissolved Lead (Pb)	mg/L	<0.00020	0.00020	A733804
Dissolved Lithium (Li)	mg/L	<0.020	0.020	A733784
Dissolved Magnesium (Mg)	mg/L	47	0.20	A733784
Dissolved Manganese (Mn)	mg/L	1.9	0.0040	A733784
Dissolved Molybdenum (Mo)	mg/L	0.0074	0.00020	A733804
Dissolved Nickel (Ni)	mg/L	0.0063	0.00050	A733804
Dissolved Phosphorus (P)	mg/L	0.27	0.10	A733784
Dissolved Potassium (K)	mg/L	2.7	0.30	A733784
Dissolved Selenium (Se)	mg/L	0.00044	0.00020	A733804
Dissolved Silicon (Si)	mg/L	5.4	0.50	A733784
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	A733804
Dissolved Sodium (Na)	mg/L	13	0.50	A733784
Dissolved Strontium (Sr)	mg/L	0.49	0.020	A733784
Dissolved Sulphur (S)	mg/L	43	0.20	A733784
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	A733804
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	A733804
Dissolved Titanium (Ti)	mg/L	<0.0010	0.0010	A733804
Dissolved Uranium (U)	mg/L	0.0073	0.00010	A733804
Dissolved Vanadium (V)	mg/L	0.0013	0.0010	A733804
Dissolved Zinc (Zn)	mg/L	0.0096	0.0030	A733804
RDL = Reportable Detection Limit				



**BUREAU
VERITAS**

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

TEST SUMMARY

Bureau Veritas ID: BCU570
Sample ID: CPF 97-7-5
Matrix: Water

Collected: 2022/09/24
Relinquished: 2022/09/24
Received: 2022/09/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH	AT/ALK	A733588	N/A	2022/09/29	Tracy (Jing) Ling
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A733498	N/A	2022/09/28	Ancheol Jeong
F1-BTEX	CALC/MS	A731388	N/A	2022/10/02	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	A731657	N/A	2022/10/05	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	A733144	N/A	2022/09/28	Carlo Truong
Conductivity @25C	COND	A733591	N/A	2022/09/29	Tracy (Jing) Ling
Fluoride	AT	A733593	N/A	2022/09/29	Tracy (Jing) Ling
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A734263	2022/09/29	2022/09/30	Grace (Quan) Guo
Hardness	CALC	A731599	N/A	2022/10/01	Automated Statchk
Mercury (Dissolved) by CV	CV	A733324	2022/09/28	2022/09/28	Jason Bao
Elements by ICP - Dissolved	ICPA	A733784	N/A	2022/09/30	Jason Bao
Elements by ICPMS - Dissolved	ICPM	A733804	N/A	2022/10/05	Rikuto Yamazaki
Ion Balance	CALC	A731601	N/A	2022/10/01	Automated Statchk
Nitrate and Nitrite	CALC	A731390	N/A	2022/09/30	Automated Statchk
NO ₂ (N); NO ₂ (N) + NO ₃ (N) in Water	AC/COL	A732799	N/A	2022/09/27	Shanna McKort
Nitrate (as N)	CALC	A731391	2022/09/30	2022/09/30	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	A736242	N/A	2022/09/30	Zoe Wu
Total Dissolved Solids (Filt. Residue)	BAL	A736210	2022/09/30	2022/09/30	Grace O'Connor

Bureau Veritas ID: BCU570 Dup
Sample ID: CPF 97-7-5
Matrix: Water

Collected: 2022/09/24
Relinquished: 2022/09/24
Received: 2022/09/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A733498	N/A	2022/09/28	Ancheol Jeong

Bureau Veritas ID: BCU571
Sample ID: CPF 98-8-3
Matrix: Water

Collected: 2022/09/24
Relinquished: 2022/09/24
Received: 2022/09/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH	AT/ALK	A733588	N/A	2022/09/29	Tracy (Jing) Ling
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A733498	N/A	2022/09/28	Ancheol Jeong
F1-BTEX	CALC/MS	A731388	N/A	2022/10/02	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	A731657	N/A	2022/10/05	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	A733144	N/A	2022/09/28	Carlo Truong
Conductivity @25C	COND	A733591	N/A	2022/09/29	Tracy (Jing) Ling
Fluoride	AT	A733593	N/A	2022/09/29	Tracy (Jing) Ling
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A734263	2022/09/29	2022/09/30	Grace (Quan) Guo
Hardness	CALC	A731599	N/A	2022/10/01	Automated Statchk
Mercury (Dissolved) by CV	CV	A733324	2022/09/28	2022/09/28	Jason Bao
Elements by ICP - Dissolved	ICPA	A733784	N/A	2022/09/30	Jason Bao
Elements by ICPMS - Dissolved	ICPM	A733804	N/A	2022/10/05	Rikuto Yamazaki
Ion Balance	CALC	A731601	N/A	2022/10/01	Automated Statchk



BUREAU
VERITAS

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

TEST SUMMARY

Bureau Veritas ID: BCU571
Sample ID: CPF 98-8-3
Matrix: Water

Collected: 2022/09/24
Relinquished: 2022/09/24
Received: 2022/09/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate and Nitrite	CALC	A731390	N/A	2022/09/30	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	A732799	N/A	2022/09/27	Shanna McKort
Nitrate (as N)	CALC	A731391	2022/09/30	2022/09/30	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	A733444	N/A	2022/09/28	Zoe Wu
Total Dissolved Solids (Filt. Residue)	BAL	A736210	2022/09/30	2022/09/30	Grace O'Connor

Bureau Veritas ID: BCU572
Sample ID: MEBG-10-1-3
Matrix: Water

Collected: 2022/09/23
Relinquished: 2022/09/24
Received: 2022/09/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	A733588	N/A	2022/09/29	Tracy (Jing) Ling
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A733498	N/A	2022/09/29	Ancheol Jeong
F1-BTEX	CALC/MS	A731388	N/A	2022/10/02	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	A731657	N/A	2022/10/05	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	A733144	N/A	2022/09/28	Carlo Truong
Conductivity @25C	COND	A733591	N/A	2022/09/29	Tracy (Jing) Ling
Fluoride	AT	A733593	N/A	2022/09/29	Tracy (Jing) Ling
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A734263	2022/09/29	2022/09/30	Grace (Quan) Guo
Hardness	CALC	A731599	N/A	2022/10/01	Automated Statchk
Mercury (Dissolved) by CV	CV	A733324	2022/09/28	2022/09/28	Jason Bao
Elements by ICP - Dissolved	ICPA	A733784	N/A	2022/09/30	Jason Bao
Elements by ICPMS - Dissolved	ICPM	A733804	N/A	2022/10/05	Rikuto Yamazaki
Ion Balance	CALC	A731601	N/A	2022/10/01	Automated Statchk
Nitrate and Nitrite	CALC	A731390	N/A	2022/10/01	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	A732802	N/A	2022/09/27	Shanna McKort
Nitrate (as N)	CALC	A731391	2022/10/01	2022/10/01	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	A733444	N/A	2022/09/28	Zoe Wu
Total Dissolved Solids (Filt. Residue)	BAL	A734717	2022/09/29	2022/09/29	Grace O'Connor

Bureau Veritas ID: BCU573
Sample ID: TF 03-12-3
Matrix: Water

Collected: 2022/09/23
Relinquished: 2022/09/24
Received: 2022/09/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	A733588	N/A	2022/09/29	Tracy (Jing) Ling
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A733498	N/A	2022/09/28	Ancheol Jeong
F1-BTEX	CALC/MS	A731388	N/A	2022/10/02	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	A731657	N/A	2022/10/05	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	A733144	N/A	2022/09/28	Carlo Truong
Conductivity @25C	COND	A733591	N/A	2022/09/29	Tracy (Jing) Ling
Fluoride	AT	A733593	N/A	2022/09/29	Tracy (Jing) Ling
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A734263	2022/09/29	2022/09/30	Grace (Quan) Guo
Hardness	CALC	A731599	N/A	2022/10/01	Automated Statchk



BUREAU
VERITAS

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

TEST SUMMARY

Bureau Veritas ID: BCU573
Sample ID: TF 03-12-3
Matrix: Water

Collected: 2022/09/23
Relinquished: 2022/09/24
Received: 2022/09/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury (Dissolved) by CV	CV	A733338	2022/09/28	2022/09/29	Jason Bao
Elements by ICP - Dissolved	ICPA	A733784	N/A	2022/09/30	Jason Bao
Elements by ICPMS - Dissolved	ICPM	A733804	N/A	2022/10/05	Rikuto Yamazaki
Ion Balance	CALC	A731601	N/A	2022/10/01	Automated Statchk
Nitrate and Nitrite	CALC	A731390	N/A	2022/10/01	Automated Statchk
NO ₂ (N); NO ₂ (N) + NO ₃ (N) in Water	AC/COL	A732802	N/A	2022/09/27	Shanna McKort
Nitrate (as N)	CALC	A731391	2022/10/01	2022/10/01	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	A733444	N/A	2022/09/28	Zoe Wu
Total Dissolved Solids (Filt. Residue)	BAL	A734717	2022/09/29	2022/09/29	Grace O'Connor

Bureau Veritas ID: BCU574
Sample ID: MTF 97-1-5
Matrix: Water

Collected: 2022/09/24
Relinquished: 2022/09/24
Received: 2022/09/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH	AT/ALK	A733588	N/A	2022/09/29	Tracy (Jing) Ling
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A733498	N/A	2022/09/30	Ancheol Jeong
F1-BTEX	CALC/MS	A731388	N/A	2022/10/02	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	A731657	N/A	2022/10/05	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	A733144	N/A	2022/09/28	Carlo Truong
Conductivity @25C	COND	A733591	N/A	2022/09/29	Tracy (Jing) Ling
Fluoride	AT	A733593	N/A	2022/09/29	Tracy (Jing) Ling
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A734263	2022/09/29	2022/09/30	Grace (Quan) Guo
Hardness	CALC	A731599	N/A	2022/10/01	Automated Statchk
Mercury (Dissolved) by CV	CV	A733338	2022/09/28	2022/09/29	Jason Bao
Elements by ICP - Dissolved	ICPA	A733784	N/A	2022/09/30	Jason Bao
Elements by ICPMS - Dissolved	ICPM	A733804	N/A	2022/10/05	Rikuto Yamazaki
Ion Balance	CALC	A731601	N/A	2022/10/01	Automated Statchk
Nitrate and Nitrite	CALC	A731390	N/A	2022/09/30	Automated Statchk
NO ₂ (N); NO ₂ (N) + NO ₃ (N) in Water	AC/COL	A732799	N/A	2022/09/27	Shanna McKort
Nitrate (as N)	CALC	A731391	2022/09/30	2022/09/30	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	A733444	N/A	2022/09/28	Zoe Wu
Total Dissolved Solids (Filt. Residue)	BAL	A736210	2022/09/30	2022/09/30	Grace O'Connor

Bureau Veritas ID: BCU575
Sample ID: C38 08-1-4
Matrix: Water

Collected: 2022/09/23
Relinquished: 2022/09/24
Received: 2022/09/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH	AT/ALK	A733588	N/A	2022/09/29	Tracy (Jing) Ling
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A733498	N/A	2022/09/28	Ancheol Jeong
F1-BTEX	CALC/MS	A731388	N/A	2022/10/02	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	A731657	N/A	2022/10/05	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	A733144	N/A	2022/09/28	Carlo Truong

BUREAU
VERITAS

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

TEST SUMMARY

Bureau Veritas ID: BCU575
Sample ID: C38 08-1-4
Matrix: Water

Collected: 2022/09/23
Relinquished: 2022/09/24
Received: 2022/09/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Conductivity @25C	COND	A733591	N/A	2022/09/29	Tracy (Jing) Ling
Fluoride	AT	A733593	N/A	2022/09/29	Tracy (Jing) Ling
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A734263	2022/09/29	2022/09/30	Grace (Quan) Guo
Hardness	CALC	A731599	N/A	2022/10/01	Automated Statchk
Mercury (Dissolved) by CV	CV	A733338	2022/09/28	2022/09/29	Jason Bao
Elements by ICP - Dissolved	ICPA	A733784	N/A	2022/09/30	Jason Bao
Elements by ICPMS - Dissolved	ICPM	A733804	N/A	2022/10/05	Rikuto Yamazaki
Ion Balance	CALC	A731601	N/A	2022/10/01	Automated Statchk
Nitrate and Nitrite	CALC	A731390	N/A	2022/10/01	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	A732802	N/A	2022/09/28	Shanna McKort
Nitrate (as N)	CALC	A731391	2022/10/01	2022/10/01	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	A733293	N/A	2022/09/29	Zoe Wu
Total Dissolved Solids (Filt. Residue)	BAL	A734717	2022/09/29	2022/09/29	Grace O'Connor

Bureau Veritas ID: BCU576
Sample ID: ARB-12-3-3
Matrix: Water

Collected: 2022/09/23
Relinquished: 2022/09/24
Received: 2022/09/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	A733588	N/A	2022/09/29	Tracy (Jing) Ling
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A733498	N/A	2022/09/28	Ancheol Jeong
F1-BTEX	CALC/MS	A731388	N/A	2022/10/02	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	A731657	N/A	2022/10/05	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	A733144	N/A	2022/09/28	Carlo Truong
Conductivity @25C	COND	A733591	N/A	2022/09/29	Tracy (Jing) Ling
Fluoride	AT	A733593	N/A	2022/09/29	Tracy (Jing) Ling
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A734263	2022/09/29	2022/09/30	Grace (Quan) Guo
Hardness	CALC	A731599	N/A	2022/10/01	Automated Statchk
Mercury (Dissolved) by CV	CV	A733338	2022/09/28	2022/09/29	Jason Bao
Elements by ICP - Dissolved	ICPA	A733784	N/A	2022/09/30	Jason Bao
Elements by ICPMS - Dissolved	ICPM	A733804	N/A	2022/10/05	Rikuto Yamazaki
Ion Balance	CALC	A731601	N/A	2022/10/01	Automated Statchk
Nitrate and Nitrite	CALC	A731390	N/A	2022/10/01	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	A732802	N/A	2022/09/27	Shanna McKort
Nitrate (as N)	CALC	A731391	2022/10/01	2022/10/01	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	A733444	N/A	2022/09/28	Zoe Wu
Total Dissolved Solids (Filt. Residue)	BAL	A734717	2022/09/29	2022/09/29	Grace O'Connor

Bureau Veritas ID: BCU577
Sample ID: FIELD DUPLICATE 1
Matrix: Water

Collected: 2022/09/23
Relinquished: 2022/09/24
Received: 2022/09/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A733498	N/A	2022/09/28	Ancheol Jeong



BUREAU
VERITAS

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

TEST SUMMARY

Bureau Veritas ID: BCU577
Sample ID: FIELD DUPLICATE 1
Matrix: Water

Collected: 2022/09/23
Relinquished: 2022/09/24
Received: 2022/09/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
F1-BTEX	CALC/MS	A731388	N/A	2022/10/02	Automated Statchk
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A734263	2022/09/29	2022/09/30	Grace (Quan) Guo

**GENERAL COMMENTS**

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	6.0°C
-----------	-------

Temperatures upon receipt at Bureau Veritas Labs Calgary

Package 1: 9.4 degrees C

Each temperature is the average of up to three cooler temperatures taken at receipt.

Sample BCU572 [MEBG-10-1-3] : Sample was analyzed past method specified hold time for NO2 (N); NO2 (N) + NO3 (N) in Water. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample BCU573 [TF 03-12-3] : Sample was analyzed past method specified hold time for NO2 (N); NO2 (N) + NO3 (N) in Water. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample BCU575 [C38 08-1-4] : Sample was analyzed past method specified hold time for NO2 (N); NO2 (N) + NO3 (N) in Water. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample BCU576 [ARB-12-3-3] : Sample was analyzed past method specified hold time for NO2 (N); NO2 (N) + NO3 (N) in Water. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

RESULTS OF CHEMICAL ANALYSES OF WATER Comments

Sample BCU575 [C38 08-1-4] NO2 (N); NO2 (N) + NO3 (N) in Water: Sample was originally processed within hold time. Data quality required investigation. Re-analysis was completed past recommended hold time.

Results relate only to the items tested.

DATA QUALITY OVERVIEW

Lab ID	Client Sample ID	Matrix	Test Code	Analysis Type	Parameters	Deviation	Root Cause	Potential Impact
BCU572	MEBG-10-1-3	Water	NO23AC-W	NUTS	Sample	#11 Past Hold Time	#10 Lab Error	This may increase the uncertainty associated with these results.
BCU573	TF 03-12-3	Water	NO23AC-W	NUTS	Sample	#11 Past Hold Time	#10 Lab Error	This may increase the uncertainty associated with these results.
BCU575	C38 08-1-4	Water	NO23AC-W	NUTS	Sample	#11 Past Hold Time	#4 Re-Analysis Required	This may increase the uncertainty associated with these results.
BCU576	ARB-12-3-3	Water	NO23AC-W	NUTS	Sample	#11 Past Hold Time	#10 Lab Error	This may increase the uncertainty associated with these results.



BUREAU
VERITAS

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A732799	SKM	Method Blank	Nitrite (N)	2022/09/27	<0.010		mg/L	
			Nitrate plus Nitrite (N)	2022/09/27	<0.010		mg/L	
A732802	SKM	Method Blank	Nitrite (N)	2022/09/27	<0.010		mg/L	
			Nitrate plus Nitrite (N)	2022/09/27	<0.010		mg/L	
A733144	CTU	Method Blank	Chloride (Cl)	2022/09/28	<1.0		mg/L	
			Sulphate (SO4)	2022/09/28	<1.0		mg/L	
A733293	ZWU	Method Blank	Phenols	2022/09/29	<0.0015		mg/L	
A733324	JAB	Method Blank	Dissolved Mercury (Hg)	2022/09/28	<0.0019		ug/L	
A733338	JAB	Method Blank	Dissolved Mercury (Hg)	2022/09/29	<0.0019		ug/L	
A733444	ZWU	Method Blank	Phenols	2022/09/28	<0.0015		mg/L	
A733498	AJG	Method Blank	1,4-Difluorobenzene (sur.)	2022/09/30		108	%	50 - 140
			4-Bromofluorobenzene (sur.)	2022/09/30		98	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2022/09/30		101	%	50 - 140
			Benzene	2022/09/30	<0.00040		mg/L	
			Toluene	2022/09/30	<0.00040		mg/L	
			Ethylbenzene	2022/09/30	<0.00040		mg/L	
			m & p-Xylene	2022/09/30	<0.00080		mg/L	
			o-Xylene	2022/09/30	<0.00040		mg/L	
			F1 (C6-C10)	2022/09/30	<0.10		mg/L	
A733588	JLD	Method Blank	Alkalinity (Total as CaCO3)	2022/09/29	<1.0		mg/L	
			Alkalinity (PP as CaCO3)	2022/09/29	<1.0		mg/L	
			Bicarbonate (HCO3)	2022/09/29	<1.0		mg/L	
			Carbonate (CO3)	2022/09/29	<1.0		mg/L	
			Hydroxide (OH)	2022/09/29	<1.0		mg/L	
A733591	JLD	Method Blank	Conductivity	2022/09/29	<2.0		uS/cm	
A733593	JLD	Method Blank	Dissolved Fluoride (F)	2022/09/29	<0.050		mg/L	
A733784	JAB	Method Blank	Dissolved Iron (Fe)	2022/09/30	<0.060		mg/L	
			Dissolved Lithium (Li)	2022/09/30	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2022/09/30	<0.20		mg/L	
			Dissolved Manganese (Mn)	2022/09/30	<0.0040		mg/L	
			Dissolved Potassium (K)	2022/09/30	<0.30		mg/L	
			Dissolved Sodium (Na)	2022/09/30	<0.50		mg/L	
			Dissolved Strontium (Sr)	2022/09/30	<0.020		mg/L	
			Dissolved Sulphur (S)	2022/09/30	<0.20		mg/L	
			Dissolved Phosphorus (P)	2022/09/30	<0.10		mg/L	
			Dissolved Barium (Ba)	2022/09/30	<0.010		mg/L	
			Dissolved Silicon (Si)	2022/09/30	<0.50		mg/L	
			Dissolved Boron (B)	2022/09/30	<0.020		mg/L	
			Dissolved Calcium (Ca)	2022/09/30	<0.30		mg/L	
A733804	RY3	Method Blank	Dissolved Aluminum (Al)	2022/10/05	<0.0030		mg/L	
			Dissolved Chromium (Cr)	2022/10/05	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2022/10/05	<0.00030		mg/L	
			Dissolved Copper (Cu)	2022/10/05	<0.0010		mg/L	
			Dissolved Lead (Pb)	2022/10/05	<0.00020		mg/L	
			Dissolved Antimony (Sb)	2022/10/05	<0.00060		mg/L	
			Dissolved Molybdenum (Mo)	2022/10/05	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2022/10/05	<0.00050		mg/L	
			Dissolved Selenium (Se)	2022/10/05	<0.00020		mg/L	
			Dissolved Silver (Ag)	2022/10/05	<0.00010		mg/L	
			Dissolved Arsenic (As)	2022/10/05	<0.00020		mg/L	
			Dissolved Thallium (Tl)	2022/10/05	<0.00020		mg/L	
			Dissolved Tin (Sn)	2022/10/05	<0.0010		mg/L	



BUREAU
VERITAS

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A734263	GG3	Method Blank	Dissolved Titanium (Ti)	2022/10/05	<0.0010		mg/L	
			Dissolved Uranium (U)	2022/10/05	<0.00010		mg/L	
			Dissolved Vanadium (V)	2022/10/05	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2022/10/05	<0.0030		mg/L	
			Dissolved Beryllium (Be)	2022/10/05	<0.0010		mg/L	
A734263	GG3	Method Blank	O-TERPHENYL (sur.)	2022/09/30		111	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2022/09/30	<0.10		mg/L	
A734717	GOC	Method Blank	Total Dissolved Solids	2022/09/29	<10		mg/L	
A736210	GOC	Method Blank	Total Dissolved Solids	2022/09/30	<10		mg/L	
A736242	ZWU	Method Blank	Phenols	2022/09/30	<0.0015		mg/L	
A733498	AJG	RPD [BCU570-06]	Benzene	2022/09/28	NC		%	30
			Toluene	2022/09/28	NC		%	30
			Ethylbenzene	2022/09/28	NC		%	30
			m & p-Xylene	2022/09/28	NC		%	30
			o-Xylene	2022/09/28	NC		%	30
			F1 (C6-C10)	2022/09/28	NC		%	30
			1,4-Difluorobenzene (sur.)	2022/09/28		101	%	50 - 140
			4-Bromofluorobenzene (sur.)	2022/09/28		97	%	50 - 140
A733498	AJG	Matrix Spike [BCU571-05]	D4-1,2-Dichloroethane (sur.)	2022/09/28		100	%	50 - 140
			Benzene	2022/09/28		93	%	50 - 140
			Toluene	2022/09/28		87	%	50 - 140
			Ethylbenzene	2022/09/28		95	%	50 - 140
			m & p-Xylene	2022/09/28		90	%	50 - 140
			o-Xylene	2022/09/28		91	%	50 - 140
			F1 (C6-C10)	2022/09/28		84	%	60 - 140
A732799	SKM	LCS	Nitrite (N)	2022/09/27		102	%	80 - 120
			Nitrate plus Nitrite (N)	2022/09/27		100	%	80 - 120
A732802	SKM	LCS	Nitrite (N)	2022/09/28		102	%	80 - 120
			Nitrate plus Nitrite (N)	2022/09/28		102	%	80 - 120
A733144	CTU	LCS	Chloride (Cl)	2022/09/28		105	%	80 - 120
			Sulphate (SO4)	2022/09/28		108	%	80 - 120
A733293	ZWU	LCS	Phenols	2022/09/29		101	%	80 - 120
A733324	JAB	LCS	Dissolved Mercury (Hg)	2022/09/28		109	%	80 - 120
A733338	JAB	LCS	Dissolved Mercury (Hg)	2022/09/29		101	%	80 - 120
A733444	ZWU	LCS	Phenols	2022/09/28		102	%	80 - 120
A733498	AJG	LCS	1,4-Difluorobenzene (sur.)	2022/09/28		102	%	50 - 140
			4-Bromofluorobenzene (sur.)	2022/09/28		97	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2022/09/28		101	%	50 - 140
			Benzene	2022/09/28		97	%	60 - 130
			Toluene	2022/09/28		91	%	60 - 130
			Ethylbenzene	2022/09/28		99	%	60 - 130
			m & p-Xylene	2022/09/28		95	%	60 - 130
			o-Xylene	2022/09/28		95	%	60 - 130
			F1 (C6-C10)	2022/09/28		81	%	60 - 140
			Alkalinity (Total as CaCO3)	2022/09/29		98	%	80 - 120
A733588	JLD	LCS	Conductivity	2022/09/29		101	%	90 - 110
A733591	JLD	LCS	Dissolved Fluoride (F)	2022/09/29		111	%	80 - 120
A733593	JLD	LCS	Dissolved Iron (Fe)	2022/09/30		95	%	80 - 120
A733784	JAB	LCS	Dissolved Lithium (Li)	2022/09/30		101	%	80 - 120
			Dissolved Magnesium (Mg)	2022/09/30		104	%	80 - 120
			Dissolved Manganese (Mn)	2022/09/30		93	%	80 - 120
			Dissolved Potassium (K)	2022/09/30		105	%	80 - 120



**BUREAU
VERITAS**

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A733804	RY3	LCS	Dissolved Sodium (Na)	2022/09/30		101	%	80 - 120
			Dissolved Strontium (Sr)	2022/09/30		99	%	80 - 120
			Dissolved Sulphur (S)	2022/09/30		96	%	80 - 120
			Dissolved Phosphorus (P)	2022/09/30		100	%	80 - 120
			Dissolved Barium (Ba)	2022/09/30		101	%	80 - 120
			Dissolved Silicon (Si)	2022/09/30		95	%	80 - 120
			Dissolved Boron (B)	2022/09/30		100	%	80 - 120
			Dissolved Calcium (Ca)	2022/09/30		102	%	80 - 120
			Dissolved Aluminum (Al)	2022/10/04		98	%	80 - 120
			Dissolved Chromium (Cr)	2022/10/04		91	%	80 - 120
			Dissolved Cobalt (Co)	2022/10/04		89	%	80 - 120
			Dissolved Copper (Cu)	2022/10/04		88	%	80 - 120
			Dissolved Lead (Pb)	2022/10/04		102	%	80 - 120
			Dissolved Antimony (Sb)	2022/10/04		98	%	80 - 120
			Dissolved Molybdenum (Mo)	2022/10/04		92	%	80 - 120
			Dissolved Nickel (Ni)	2022/10/04		88	%	80 - 120
			Dissolved Selenium (Se)	2022/10/04		99	%	80 - 120
			Dissolved Silver (Ag)	2022/10/04		88	%	80 - 120
			Dissolved Arsenic (As)	2022/10/04		93	%	80 - 120
			Dissolved Thallium (Tl)	2022/10/04		101	%	80 - 120
			Dissolved Tin (Sn)	2022/10/04		101	%	80 - 120
			Dissolved Titanium (Ti)	2022/10/04		90	%	80 - 120
			Dissolved Uranium (U)	2022/10/04		96	%	80 - 120
			Dissolved Vanadium (V)	2022/10/04		93	%	80 - 120
			Dissolved Zinc (Zn)	2022/10/04		92	%	80 - 120
			Dissolved Beryllium (Be)	2022/10/04		111	%	80 - 120
A734263	GG3	LCS	O-TERPHENYL (sur.)	2022/09/30		107	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2022/09/30		111	%	60 - 140
A734717	GOC	LCS	Total Dissolved Solids	2022/09/29		96	%	80 - 120
A736210	GOC	LCS	Total Dissolved Solids	2022/09/30		102	%	80 - 120
A736242	ZWU	LCS	Phenols	2022/09/30		100	%	80 - 120

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

LCS: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).



BUREAU
VERITAS

Bureau Veritas Job #: C274421

Report Date: 2022/10/05

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Gita Pokhrel, Laboratory Supervisor

Sandy Yuan, M.Sc., QP, Scientific Specialist

Veronica Falk, B.Sc., P.Chem., QP, Scientific Specialist, Organics

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

805 MPN

**EXXON MOBIL/IMPERIAL OIL - MAXXAM
CHAIN-OF-CUSTODY RECORD**

Page 1 of 1
C of C # **299522**

INVOICE INFORMATION				REPORT INFORMATION				ANALYSIS REQUESTED																								
Company Name: ☒ Imperial Oil ☐ ExxonMobil				Company Name: WORLEY (ADVISIAN)				PHCs (FRACTIONS 1-2 PLUS BTEX) PHCs (FRACTIONS 1-4 PLUS BTEX) PHCs (FRACTIONS 2-4) PHCs (FRACTION 1 PLUS BTEX) GRAIN SIZE (75 MICRON) TEXTURE (% SAND, SILT, CLAY) PARTICLE SIZE DISTRIBUTION WITH GRAPH REGULATED METALS ☐ TOT ☐ DIS ☒ MERCURY TOTAL ☐ DISSOLVED ☒ SALINITY SOIL FERTILIZER SOIL FERTILIZER WATER NUTRIENTS SOIL ROUTINE POTABILITY pH ☐ EC ☐ ALKALINITY ☐ BASIC CLASS II LANDFILL PKG Total Phenols Fluoride Limited sample, no TDS bottle Limited sample, only 2.5 LEX vials Project reference on bottles "SNP"																								
Contact Name: ALEX HAIGH				Contact Name: ALEX HAIGH																												
Address: 150, 205 QUARRY PARK BLVD SE, CALGARY AB T2C 3E7				Address: 150, 205 QUARRY PARK BLVD SE, CALGARY AB T2C 3E7																												
Email: ALEX.HAIGH@ADVISIAN.COM				Email: ALEX.HAIGH@ADVISIAN.COM																												
Ph: 987-897-6249				Ph: 587-897-6249																												
Sampler Name (Print): MATTHEW EUBANK/JE				Consultant Project #: 417085-42051-22100																												
FIELD SAMPLE ID	MATRIX				# CONTAINERS	SAMPLING			VOC	PAH	PHCs (FRACTIONS 1-2 PLUS BTEX)	PHCs (FRACTIONS 1-4 PLUS BTEX)	PHCs (FRACTIONS 2-4)	PHCs (FRACTION 1 PLUS BTEX)	GRAIN SIZE (75 MICRON)	TEXTURE (% SAND, SILT, CLAY)	PARTICLE SIZE DISTRIBUTION WITH GRAPH	REGULATED METALS ☐ TOT ☐ DIS ☒	MERCURY TOTAL ☐ DISSOLVED ☒	SALINITY SOIL	FERTILIZER SOIL	FERTILIZER WATER	NUTRIENTS SOIL	ROUTINE POTABILITY	pH ☐ EC ☐ ALKALINITY ☐	BASIC CLASS II LANDFILL PKG	Total Phenols	Fluoride	Limited sample, no TDS bottle	Limited sample, only 2.5 LEX vials	Project reference on bottles "SNP"	
	GROUND WATER	SURFACE WATER	SOIL	OTHER		DATE (YYYY/MM/DD)	TIME (24 HR)	FIELD FILTERED & PRESERVED																								LAB FILTRATION REQUIRED
1 CPF 97-7-5	X				9	2022/09/24	9:30	X			X							X	X					X		X	X					
2 CPF 98-8-3	X				8	2022/09/24	9:45	X			X							X	X					X		X	X		X			
3 MEBG-10-1-3	X				8	2022/09/23	15:30	X			X							X	X					X		X	X		X			
4 TF 03-12-3	X				9	2022/09/23	14:00	X			X							X	X					X		X	X		X			
5 MTF 97-1-5	X				9	2022/09/24	8:45	X			X							X	X					X		X	X		X			
6 C38 08-1-4	X				9	2022/09/23	16:30	X			X							X	X					X		X	X		X			
7 ARB-12-3-3	X				9	2022/09/23	14:45	X			X							X	X					X		X	X		X			
8 Field Duplicate 1	X				4	2022/09/23	16:40				X																					
9																																
10																																

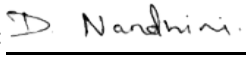
IOL SITE LOCATION NORMAN WELLS, NT				REGULATORY CRITERIA / DETECTION LIMITS:				SPECIAL INSTRUCTIONS SEND DATA TO: CANADA.CHEMISTRY@WORLEY.COM CACALOR.DATATRACK@WORLEY.COM IES A2601436				# JARS USED & NOT SUBMITTED Enter N/A for Water N/A				TURNAROUND TIME			
IOL PROJECT # (if applicable) N/A				☐ Alberta Tier 1 ☐ CDWG ☐ SEQG (SK) ☐ NoSC (SK) ☒ CCME (incl. level) FAL ☐ Other												Standard (5 days) ☒ Rush (3 days) ☐ (2 days) ☐ (1 day) ☐ (same day) ☐			
MAXXAM TASK ORDER # OR SERVICE ORDER # + LINE ITEM 417085-42051-22100																			

SEAL PRESENT	YES	NO	COOLER ID #	SEAL PRESENT	YES	NO	COOLER ID #	SEAL PRESENT	YES	NO	COOLER ID #
SEAL INTACT	☒		TEMP °C 7 6 5	SEAL INTACT	☒		TEMP °C 10.1 8.8 9.3	SEAL INTACT	☒		TEMP °C 10.1 8.8 9.3
COOLING MEDIA PRESENT	☒		1 2 3	COOLING MEDIA PRESENT	☒		1 2 3	COOLING MEDIA PRESENT	☒		1 2 3

RELINQUISHED BY:		DATE:	TIME (24 HR)	RECEIVED BY:		DATE:	TIME (24 HR)
1. M Eubank		Matthew Eubank	2022/09/24 12:10	1. Alana Morris		Alana Morris	2022/09/27 07:00
2. Mandree		Mandree Pandher	2022/09/27 09:37	2. Shaira Cura		Shaira Cura	2022/09/27 15:25
3.				3.			

LABORATORY		SAMPLES	
LABELLED BY:	VERIFIED BY:	LABELLED BY:	VERIFIED BY:
MPN	AMY	MPN	AMY

DATA QUALITY REVIEW CHECKLIST - IMPERIAL OIL PROJECTS

Consultant: <u>Advisian</u>		Sampling Date: <u>25-Sep-22</u>		
Location: <u>Norman Wells</u>		Laboratory : <u>Bureau Veritas</u>		
Consultant Project Number: <u>417085-42051-22100</u>		Sample Submission Number: <u>C275319</u>		
Are All Laboratory QC Within Acceptance Criteria (Yes, No, Not Applicable)?				
	Yes	No	NA	Comments
Instrument Surrogate Recovery	x			All laboratory QC met acceptance criteria.
Extraction Surrogate Recovery	x			
Method Blank Concentration	x			
Matrix Duplicate RPD			x	
Matrix Spike Recovery			x	
Lab Control Sample Recovery	x			
Are All Field QC Samples Within Alert Limits (Yes, No, Not Applicable)?				
	Yes	No	NA	Comments
Field Blank Concentration	x			All field QC samples met alert limits.
Trip Blank Concentration	x			
Equipment Blank Concentration			x	
Field Duplicate RPD	x			
Has CoA been signed off (Yes/No)?: <u>Yes</u>				
Has lab warranted all tests were analyzed following SOP's in CoA (Yes/No)?: <u>Yes</u>				
Were all samples analyzed within hold times (Yes/No)?: <u>No</u>				
All volatiles samples methanol extracted (if required) within 48 hours (Yes/No)?: <u>n/a</u>				
Is Chain of Custody completed and signed (Yes/No)?: <u>Yes</u>				
Were sample temperatures acceptable when they reached lab (Yes/No)?: <u>Yes</u>				
Was a Data Quality Overview (DQO) issued (Yes/No)?: <u>Yes</u>				
Date DQO was received: <u>06-Oct-22</u>				
Is data considered to be reliable (Yes/No)?: <u>Yes</u>				
If answer is "No", describe and provide rationale: _____				
 Data Reviewed by (Print): <u>Nandhini Durairaj</u> Data Reviewed by (Signature): <u></u>				
Date: <u>30-Nov-22</u>				



Attention: Alex Haigh

Advisian
Suite 500, 151 Canada Olympic
Calgary, AB
Canada T3B 6B7

Task Order#: PENDING
Line Item: 10
Site#: N/A
Site Location: NORMAN WELLS, NT
Project #: 417085-42051-22100
Your C.O.C. #: 299524

Report Date: 2022/10/06

Report #: R3244679

Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C275319

Received: 2022/09/28, 15:00

Sample Matrix: Water
Samples Received: 8

Analyses	Quantity	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH (1)	5	AB SOP-00005	SM 23 2320 B m
BTEX/F1 in Water by HS GC/MS/FID (1)	8	AB SOP-00039	CCME CWS/EPA 8260d m
F1-BTEX (1)	8		Auto Calc
Cadmium - low level CCME - Dissolved (1)	5		Auto Calc
Chloride/Sulphate by Auto Colourimetry (1)	5	AB SOP-00020	SM23-4500-Cl/SO ₄ -E m
Conductivity @25C (1)	5	AB SOP-00005	SM 23 2510 B m
Fluoride (1)	5	AB SOP-00005	SM 23 4500-F C m
CCME Hydrocarbons in Water (F2; C10-C16) (1, 2)	8	AB SOP-00037 AB SOP-00040	CCME PHC-CWS m
Hardness (1)	5		Auto Calc
Mercury (Dissolved) by CV (1, 3)	5	AB SOP-00084	BCMOE BCLM Oct2013 m
Elements by ICP - Dissolved (1, 3)	5	AB SOP-00042	EPA 6010d R5 m
Elements by ICPMS - Dissolved (1, 3)	5	AB SOP-00043	EPA 6020b R2 m
Ion Balance (1)	5		Auto Calc
Nitrate and Nitrite (1)	5		Auto Calc
NO ₂ (N); NO ₂ (N) + NO ₃ (N) in Water (1)	5	AB SOP-00091	SM 23 4500 NO3m
Nitrate (as N) (1)	5		Auto Calc
Phenols (4-AAP) (1)	5	AB SOP-00088	EPA 9066 R0 m
Total Dissolved Solids (Filt. Residue) (1)	5	AB SOP-00065	SM 23 2540 C m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard. All samples were analyzed within hold time unless otherwise flagged.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless



Attention: Alex Haigh

Advisian
Suite 500, 151 Canada Olympic
Calgary, AB
Canada T3B 6B7

Task Order#: PENDING
Line Item: 10
Site#: N/A
Site Location: NORMAN WELLS, NT
Project #: 417085-42051-22100
Your C.O.C. #: 299524

Report Date: 2022/10/06
Report #: R3244679
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C275319

Received: 2022/09/28, 15:00

otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

- (1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8
- (2) Silica gel clean up employed.
- (3) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Namita Sahni, Customer Solutions Representative
Email: Namita.Sahni@bureauveritas.com
Phone# (604)639-2614

=====

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.



BUREAU
VERITAS

Bureau Veritas Job #: C275319

Report Date: 2022/10/06

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

AT1 BTEX AND F1-F2 IN WATER (WATER)

Bureau Veritas ID		BDA173	BDA174	BDA175	BDA176	BDA177		
Sampling Date		2022/09/25 14:00	2022/09/25 10:30	2022/09/25 09:40	2022/09/25 13:15	2022/09/25 08:45		
COC Number		299524	299524	299524	299524	299524		
	UNITS	GIQ8-10-2-4	BI-13-1-4	BI-13-3-4.5	GIP11 09-1-4-R	BIS 97-1-3	RDL	QC Batch
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	mg/L	0.99	<0.10	<0.10	<0.10	<0.10	0.10	A737307
Volatiles								
Benzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	A735209
Toluene	mg/L	0.00041	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	A735209
Ethylbenzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	A735209
m & p-Xylene	mg/L	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080	0.00080	A735209
o-Xylene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	A735209
Xylenes (Total)	mg/L	<0.00089	<0.00089	<0.00089	<0.00089	<0.00089	0.00089	A735565
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	A735565
F1 (C6-C10)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	A735209
Extraction Surrogate Recovery (%)								
O-TERPHENYL (sur.)	%	100	98	95	97	98		A737307
Instrument Surrogate Recovery (%)								
1,4-Difluorobenzene (sur.)	%	100	100	101	99	101		A735209
4-Bromofluorobenzene (sur.)	%	108	101	99	100	100		A735209
D4-1,2-Dichloroethane (sur.)	%	99	98	98	98	100		A735209
RDL = Reportable Detection Limit								



BUREAU
VERITAS

Bureau Veritas Job #: C275319

Report Date: 2022/10/06

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

AT1 BTEX AND F1-F2 IN WATER (WATER)

Bureau Veritas ID		BDA178	BDA179	BDA180		
Sampling Date		2022/09/25 10:00	2022/09/25 11:00	2022/09/25 11:30		
COC Number		299524	299524	299524		
	UNITS	FIELD DUPLICATE 2	FIELD DUPLICATE 3	FIELD DUPLICATE 4	RDL	QC Batch
Ext. Pet. Hydrocarbon						
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	0.10	A737307
Volatiles						
Benzene	mg/L	<0.00040	<0.00040	<0.00040	0.00040	A735209
Toluene	mg/L	<0.00040	<0.00040	<0.00040	0.00040	A735209
Ethylbenzene	mg/L	<0.00040	<0.00040	<0.00040	0.00040	A735209
m & p-Xylene	mg/L	<0.00080	<0.00080	<0.00080	0.00080	A735209
o-Xylene	mg/L	<0.00040	<0.00040	<0.00040	0.00040	A735209
Xylenes (Total)	mg/L	<0.00089	<0.00089	<0.00089	0.00089	A735565
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	<0.10	0.10	A735565
F1 (C6-C10)	mg/L	<0.10	<0.10	<0.10	0.10	A735209
Extraction Surrogate Recovery (%)						
O-TERPHENYL (sur.)	%	94	96	94		A737307
Instrument Surrogate Recovery (%)						
1,4-Difluorobenzene (sur.)	%	100	102	102		A735209
4-Bromofluorobenzene (sur.)	%	99	98	97		A735209
D4-1,2-Dichloroethane (sur.)	%	98	100	99		A735209
RDL = Reportable Detection Limit						



BUREAU
VERITAS

Bureau Veritas Job #: C275319
Report Date: 2022/10/06

Advisian
Task Order#: PENDING, Line Item: 10
Site#: N/A
Site Location: NORMAN WELLS, NT
Project #: 417085-42051-22100

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		BDA173			BDA174			BDA175		
Sampling Date		2022/09/25 14:00			2022/09/25 10:30			2022/09/25 09:40		
COC Number		299524			299524			299524		
	UNITS	GIQ8-10-2-4	RDL	QC Batch	BI-13-1-4	RDL	QC Batch	BI-13-3-4.5	RDL	QC Batch
Calculated Parameters										
Hardness (CaCO ₃)	mg/L	1500	0.50	A735553	890	0.50	A735553	1400	0.50	A735553
Ion Balance (% Difference)	%	2.1	N/A	A735554	4.1	N/A	A735801	1.2	N/A	A735803
Nitrate (N)	mg/L	<0.010	0.010	A735584	<0.010	0.010	A735584	<0.010	0.010	A735584
Nitrate (NO ₃)	mg/L	<0.044	0.044	A735703	<0.044	0.044	A735703	<0.044	0.044	A735703
Nitrite (NO ₂)	mg/L	<0.033	0.033	A735703	<0.033	0.033	A735703	<0.033	0.033	A735703
Elements										
Dissolved Cadmium (Cd)	mg/L	0.00018	0.000040	A735347	<0.000020	0.000020	A735347	0.000099	0.000020	A735347
Misc. Inorganics										
Conductivity	uS/cm	2400	2.0	A740464	1400	2.0	A740464	2100	2.0	A740464
Total Dissolved Solids	mg/L	2000 (1)	13	A736215	930	10	A736224	1800	10	A736224
Anions										
Alkalinity (PP as CaCO ₃)	mg/L	<1.0	1.0	A740460	<1.0	1.0	A740460	<1.0	1.0	A740460
Alkalinity (Total as CaCO ₃)	mg/L	740	1.0	A740460	830	1.0	A740460	430	1.0	A740460
Bicarbonate (HCO ₃)	mg/L	900	1.0	A740460	1000	1.0	A740460	530	1.0	A740460
Carbonate (CO ₃)	mg/L	<1.0	1.0	A740460	<1.0	1.0	A740460	<1.0	1.0	A740460
Dissolved Fluoride (F)	mg/L	<0.050	0.050	A740466	0.26	0.050	A740466	0.30	0.050	A740466
Hydroxide (OH)	mg/L	<1.0	1.0	A740460	<1.0	1.0	A740460	<1.0	1.0	A740460
Chloride (Cl)	mg/L	33	1.0	A737132	12	1.0	A737132	6.9	1.0	A737132
Sulphate (SO ₄)	mg/L	780	25	A737132	30	1.0	A737132	920	25	A737132
Nutrients										
Nitrite (N)	mg/L	<0.010	0.010	A738456	<0.010	0.010	A738456	<0.010	0.010	A738458
Nitrate plus Nitrite (N)	mg/L	<0.010	0.010	A738456	<0.010	0.010	A738456	<0.010	0.010	A738458
Misc. Organics										
Phenols	mg/L	0.0048	0.0015	A737175	<0.0015	0.0015	A737175	<0.0015	0.0015	A737175

RDL = Reportable Detection Limit

N/A = Not Applicable

(1) Detection limit raised based on sample volume used for analysis.



RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		BDA176		BDA177		
Sampling Date		2022/09/25 13:15		2022/09/25 08:45		
COC Number		299524		299524		
	UNITS	GIP11 09-1-4-R	RDL	BIS 97-1-3	RDL	QC Batch
Calculated Parameters						
Hardness (CaCO ₃)	mg/L	750	0.50	1300	0.50	A735553
Ion Balance (% Difference)	%	0.55	N/A	1.6	N/A	A735803
Nitrate (N)	mg/L	0.11	0.010	0.035	0.010	A735584
Nitrate (NO ₃)	mg/L	0.47	0.044	0.16	0.044	A735703
Nitrite (NO ₂)	mg/L	<0.033	0.033	0.046	0.033	A735703
Elements						
Dissolved Cadmium (Cd)	mg/L	0.000036	0.000020	0.000089	0.000020	A735347
Misc. Inorganics						
Conductivity	uS/cm	1300	2.0	2000	2.0	A740464
Total Dissolved Solids	mg/L	760 (1)	25	1500	10	A736224
Anions						
Alkalinity (PP as CaCO ₃)	mg/L	<1.0	1.0	<1.0	1.0	A740460
Alkalinity (Total as CaCO ₃)	mg/L	640	1.0	910	1.0	A740460
Bicarbonate (HCO ₃)	mg/L	780	1.0	1100	1.0	A740460
Carbonate (CO ₃)	mg/L	<1.0	1.0	<1.0	1.0	A740460
Dissolved Fluoride (F)	mg/L	0.057	0.050	0.23	0.050	A740466
Hydroxide (OH)	mg/L	<1.0	1.0	<1.0	1.0	A740460
Chloride (Cl)	mg/L	9.1	1.0	26	1.0	A737132
Sulphate (SO ₄)	mg/L	120	1.0	300	5.0	A737132
Nutrients						
Nitrite (N)	mg/L	<0.010	0.010	0.014	0.010	A738456
Nitrate plus Nitrite (N)	mg/L	0.11	0.010	0.049	0.010	A738456
Misc. Organics						
Phenols	mg/L	<0.0015	0.0015	<0.0015	0.0015	A737175
RDL = Reportable Detection Limit						
N/A = Not Applicable						
(1) Detection limit raised based on sample volume used for analysis.						



BUREAU
VERITAS

Bureau Veritas Job #: C275319

Report Date: 2022/10/06

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

MERCURY BY COLD VAPOR (WATER)

Bureau Veritas ID		BDA173	BDA174	BDA175	BDA176	BDA177		
Sampling Date		2022/09/25 14:00	2022/09/25 10:30	2022/09/25 09:40	2022/09/25 13:15	2022/09/25 08:45		
COC Number		299524	299524	299524	299524	299524		
	UNITS	GIQ8-10-2-4	BI-13-1-4	BI-13-3-4.5	GIP11 09-1-4-R	BIS 97-1-3	RDL	QC Batch
Elements								
Dissolved Mercury (Hg)	ug/L	0.0049	<0.0019	<0.0019	<0.0019	0.0027	0.0019	A736253
RDL = Reportable Detection Limit								



BUREAU
VERITAS

Bureau Veritas Job #: C275319

Report Date: 2022/10/06

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		BDA173		BDA174	BDA175		BDA176		
Sampling Date		2022/09/25 14:00		2022/09/25 10:30	2022/09/25 09:40		2022/09/25 13:15		
COC Number		299524		299524	299524		299524		
	UNITS	GIQ8-10-2-4	RDL	BI-13-1-4	BI-13-3-4.5	QC Batch	GIP11 09-1-4-R	RDL	QC Batch
Elements									
Dissolved Aluminum (Al)	mg/L	0.016	0.0060	0.0097	0.0059	A739712	0.0082	0.0030	A740275
Dissolved Antimony (Sb)	mg/L	<0.0012	0.0012	<0.00060	0.00069	A739712	<0.00060	0.00060	A740275
Dissolved Arsenic (As)	mg/L	0.0068	0.00040	0.0066	0.00080	A739712	0.0019	0.00020	A740275
Dissolved Barium (Ba)	mg/L	0.16	0.010	0.19	0.058	A739349	0.30	0.010	A739351
Dissolved Beryllium (Be)	mg/L	<0.0020	0.0020	<0.0010	<0.0010	A739712	<0.0010	0.0010	A740275
Dissolved Boron (B)	mg/L	<0.020	0.020	<0.020	<0.020	A739349	0.033	0.020	A739351
Dissolved Calcium (Ca)	mg/L	440	0.30	210	330	A739349	230	0.30	A739351
Dissolved Chromium (Cr)	mg/L	<0.0020	0.0020	<0.0010	<0.0010	A739712	<0.0010	0.0010	A740275
Dissolved Cobalt (Co)	mg/L	0.024	0.00060	0.0053	0.0023	A739712	0.0028	0.00030	A740275
Dissolved Copper (Cu)	mg/L	<0.0020	0.0020	0.0014	0.0012	A739712	0.0018	0.0010	A740275
Dissolved Iron (Fe)	mg/L	21	0.060	18	1.1	A739349	0.12	0.060	A739351
Dissolved Lead (Pb)	mg/L	<0.00040	0.00040	<0.00020	<0.00020	A739712	<0.00020	0.00020	A740275
Dissolved Lithium (Li)	mg/L	<0.020	0.020	<0.020	<0.020	A739349	<0.020	0.020	A739351
Dissolved Magnesium (Mg)	mg/L	110	0.20	87	140	A739349	46	0.20	A739351
Dissolved Manganese (Mn)	mg/L	6.2	0.0040	1.2	0.39	A739349	1.4	0.0040	A739351
Dissolved Molybdenum (Mo)	mg/L	0.0017	0.00040	0.0026	0.019	A739712	0.0016	0.00020	A740275
Dissolved Nickel (Ni)	mg/L	0.039	0.0010	0.010	0.033	A739712	0.0094	0.00050	A740275
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	<0.10	<0.10	A739349	<0.10	0.10	A739351
Dissolved Potassium (K)	mg/L	3.5	0.30	1.5	3.1	A739349	4.0	0.30	A739351
Dissolved Selenium (Se)	mg/L	0.00085	0.00040	0.00054	0.0015	A739712	0.00021	0.00020	A740275
Dissolved Silicon (Si)	mg/L	6.3	0.50	6.8	5.1	A739349	5.1	0.50	A739351
Dissolved Silver (Ag)	mg/L	<0.00020	0.00020	<0.00010	<0.00010	A739712	<0.00010	0.00010	A740275
Dissolved Sodium (Na)	mg/L	34	0.50	16	12	A739349	6.7	0.50	A739351
Dissolved Strontium (Sr)	mg/L	1.9	0.020	1.6	1.0	A739349	1.1	0.020	A739351
Dissolved Sulphur (S)	mg/L	250	0.20	8.0	300	A739349	34	0.20	A739351
Dissolved Thallium (Tl)	mg/L	<0.00040	0.00040	<0.00020	<0.00020	A739712	<0.00020	0.00020	A740275
Dissolved Tin (Sn)	mg/L	<0.0020	0.0020	<0.0010	<0.0010	A739712	<0.0010	0.0010	A740275
Dissolved Titanium (Ti)	mg/L	<0.0020	0.0020	<0.0010	<0.0010	A739712	<0.0010	0.0010	A740275
Dissolved Uranium (U)	mg/L	0.011	0.00020	0.0018	0.018	A739712	0.0065	0.00010	A740275
Dissolved Vanadium (V)	mg/L	<0.0020	0.0020	<0.0010	<0.0010	A739712	<0.0010	0.0010	A740275
Dissolved Zinc (Zn)	mg/L	0.024	0.0060	0.0048	0.021	A739712	0.0079	0.0030	A740275
RDL = Reportable Detection Limit									



BUREAU
VERITAS

Bureau Veritas Job #: C275319

Report Date: 2022/10/06

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		BDA177		
Sampling Date		2022/09/25 08:45		
COC Number		299524		
	UNITS	BIS 97-1-3	RDL	QC Batch
Elements				
Dissolved Aluminum (Al)	mg/L	0.0056	0.0030	A740275
Dissolved Antimony (Sb)	mg/L	0.00068	0.00060	A740275
Dissolved Arsenic (As)	mg/L	0.00086	0.00020	A740275
Dissolved Barium (Ba)	mg/L	0.076	0.010	A739351
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	A740275
Dissolved Boron (B)	mg/L	<0.020	0.020	A739351
Dissolved Calcium (Ca)	mg/L	320	0.30	A739351
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	A740275
Dissolved Cobalt (Co)	mg/L	0.0051	0.00030	A740275
Dissolved Copper (Cu)	mg/L	0.0033	0.0010	A740275
Dissolved Iron (Fe)	mg/L	0.69	0.060	A739351
Dissolved Lead (Pb)	mg/L	<0.00020	0.00020	A740275
Dissolved Lithium (Li)	mg/L	<0.020	0.020	A739351
Dissolved Magnesium (Mg)	mg/L	110	0.20	A739351
Dissolved Manganese (Mn)	mg/L	1.3	0.0040	A739351
Dissolved Molybdenum (Mo)	mg/L	0.0043	0.00020	A740275
Dissolved Nickel (Ni)	mg/L	0.017	0.00050	A740275
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	A739351
Dissolved Potassium (K)	mg/L	3.5	0.30	A739351
Dissolved Selenium (Se)	mg/L	0.00072	0.00020	A740275
Dissolved Silicon (Si)	mg/L	5.5	0.50	A739351
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	A740275
Dissolved Sodium (Na)	mg/L	20	0.50	A739351
Dissolved Strontium (Sr)	mg/L	1.3	0.020	A739351
Dissolved Sulphur (S)	mg/L	100	0.20	A739351
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	A740275
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	A740275
Dissolved Titanium (Ti)	mg/L	<0.0010	0.0010	A740275
Dissolved Uranium (U)	mg/L	0.0025	0.00010	A740275
Dissolved Vanadium (V)	mg/L	<0.0010	0.0010	A740275
Dissolved Zinc (Zn)	mg/L	0.012	0.0030	A740275
RDL = Reportable Detection Limit				



**BUREAU
VERITAS**

Bureau Veritas Job #: C275319

Report Date: 2022/10/06

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

TEST SUMMARY

Bureau Veritas ID: BDA173
Sample ID: GIQ8-10-2-4
Matrix: Water

Collected: 2022/09/25
Relinquished: 2022/09/26
Received: 2022/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH	AT/ALK	A740460	N/A	2022/10/03	Madelyn Ellis
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A735209	N/A	2022/09/30	Liping Zong
F1-BTEX	CALC/MS	A735565	N/A	2022/09/30	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	A735347	N/A	2022/10/06	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	A737132	N/A	2022/09/30	Tyler Orr
Conductivity @25C	COND	A740464	N/A	2022/10/03	Madelyn Ellis
Fluoride	AT	A740466	N/A	2022/10/03	Madelyn Ellis
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A737307	2022/10/01	2022/10/02	Elizabeth Chacko
Hardness	CALC	A735553	N/A	2022/10/03	Automated Statchk
Mercury (Dissolved) by CV	CV	A736253	2022/09/30	2022/09/30	Jason Bao
Elements by ICP - Dissolved	ICPA	A739349	N/A	2022/10/03	Paula Calzada
Elements by ICPMS - Dissolved	ICPM	A739712	N/A	2022/10/05	Rikuto Yamazaki
Ion Balance	CALC	A735554	N/A	2022/10/04	Automated Statchk
Nitrate and Nitrite	CALC	A735703	N/A	2022/10/04	Automated Statchk
NO ₂ (N); NO ₂ (N) + NO ₃ (N) in Water	AC/COL	A738456	N/A	2022/10/01	Ana Katrina Cariaga
Nitrate (as N)	CALC	A735584	2022/10/04	2022/10/04	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	A737175	N/A	2022/09/30	Zoe Wu
Total Dissolved Solids (Filt. Residue)	BAL	A736215	2022/09/30	2022/09/30	Silkiben Patel

Bureau Veritas ID: BDA174
Sample ID: BI-13-1-4
Matrix: Water

Collected: 2022/09/25
Relinquished: 2022/09/26
Received: 2022/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH	AT/ALK	A740460	N/A	2022/10/03	Madelyn Ellis
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A735209	N/A	2022/09/30	Liping Zong
F1-BTEX	CALC/MS	A735565	N/A	2022/09/30	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	A735347	N/A	2022/10/06	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	A737132	N/A	2022/09/30	Tyler Orr
Conductivity @25C	COND	A740464	N/A	2022/10/03	Madelyn Ellis
Fluoride	AT	A740466	N/A	2022/10/03	Madelyn Ellis
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A737307	2022/10/01	2022/10/02	Elizabeth Chacko
Hardness	CALC	A735553	N/A	2022/10/03	Automated Statchk
Mercury (Dissolved) by CV	CV	A736253	2022/09/30	2022/09/30	Jason Bao
Elements by ICP - Dissolved	ICPA	A739349	N/A	2022/10/03	Paula Calzada
Elements by ICPMS - Dissolved	ICPM	A739712	N/A	2022/10/05	Rikuto Yamazaki
Ion Balance	CALC	A735801	N/A	2022/10/04	Automated Statchk
Nitrate and Nitrite	CALC	A735703	N/A	2022/10/04	Automated Statchk
NO ₂ (N); NO ₂ (N) + NO ₃ (N) in Water	AC/COL	A738456	N/A	2022/10/01	Ana Katrina Cariaga
Nitrate (as N)	CALC	A735584	2022/10/04	2022/10/04	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	A737175	N/A	2022/09/30	Zoe Wu
Total Dissolved Solids (Filt. Residue)	BAL	A736224	2022/09/30	2022/09/30	Kamalpreet Kaur (Calgary)



**BUREAU
VERITAS**

Bureau Veritas Job #: C275319

Report Date: 2022/10/06

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

TEST SUMMARY

Bureau Veritas ID: BDA175
Sample ID: BI-13-3-4.5
Matrix: Water

Collected: 2022/09/25
Relinquished: 2022/09/26
Received: 2022/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH	AT/ALK	A740460	N/A	2022/10/03	Madelyn Ellis
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A735209	N/A	2022/09/30	Liping Zong
F1-BTEX	CALC/MS	A735565	N/A	2022/09/30	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	A735347	N/A	2022/10/06	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	A737132	N/A	2022/09/30	Tyler Orr
Conductivity @25C	COND	A740464	N/A	2022/10/03	Madelyn Ellis
Fluoride	AT	A740466	N/A	2022/10/03	Madelyn Ellis
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A737307	2022/10/01	2022/10/02	Elizabeth Chacko
Hardness	CALC	A735553	N/A	2022/10/03	Automated Statchk
Mercury (Dissolved) by CV	CV	A736253	2022/09/30	2022/09/30	Jason Bao
Elements by ICP - Dissolved	ICPA	A739349	N/A	2022/10/03	Paula Calzada
Elements by ICPMS - Dissolved	ICPM	A739712	N/A	2022/10/05	Rikuto Yamazaki
Ion Balance	CALC	A735803	N/A	2022/10/04	Automated Statchk
Nitrate and Nitrite	CALC	A735703	N/A	2022/10/04	Automated Statchk
NO ₂ (N); NO ₂ (N) + NO ₃ (N) in Water	AC/COL	A738458	N/A	2022/10/01	Ana Katrina Cariaga
Nitrate (as N)	CALC	A735584	2022/10/04	2022/10/04	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	A737175	N/A	2022/09/30	Zoe Wu
Total Dissolved Solids (Filt. Residue)	BAL	A736224	2022/09/30	2022/09/30	Kamalpreet Kaur (Calgary)

Bureau Veritas ID: BDA176
Sample ID: GIP11 09-1-4-R
Matrix: Water

Collected: 2022/09/25
Relinquished: 2022/09/26
Received: 2022/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH	AT/ALK	A740460	N/A	2022/10/03	Madelyn Ellis
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A735209	N/A	2022/09/30	Liping Zong
F1-BTEX	CALC/MS	A735565	N/A	2022/09/30	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	A735347	N/A	2022/10/06	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	A737132	N/A	2022/09/30	Tyler Orr
Conductivity @25C	COND	A740464	N/A	2022/10/03	Madelyn Ellis
Fluoride	AT	A740466	N/A	2022/10/03	Madelyn Ellis
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A737307	2022/10/01	2022/10/02	Elizabeth Chacko
Hardness	CALC	A735553	N/A	2022/10/04	Automated Statchk
Mercury (Dissolved) by CV	CV	A736253	2022/09/30	2022/09/30	Jason Bao
Elements by ICP - Dissolved	ICPA	A739351	N/A	2022/10/04	Kathleen Dalton
Elements by ICPMS - Dissolved	ICPM	A740275	N/A	2022/10/06	Rikuto Yamazaki
Ion Balance	CALC	A735803	N/A	2022/10/04	Automated Statchk
Nitrate and Nitrite	CALC	A735703	N/A	2022/10/04	Automated Statchk
NO ₂ (N); NO ₂ (N) + NO ₃ (N) in Water	AC/COL	A738456	N/A	2022/10/01	Ana Katrina Cariaga
Nitrate (as N)	CALC	A735584	2022/10/04	2022/10/04	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	A737175	N/A	2022/09/30	Zoe Wu
Total Dissolved Solids (Filt. Residue)	BAL	A736224	2022/09/30	2022/09/30	Kamalpreet Kaur (Calgary)



BUREAU
VERITAS

Bureau Veritas Job #: C275319

Report Date: 2022/10/06

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

TEST SUMMARY

Bureau Veritas ID: BDA177
Sample ID: BIS 97-1-3
Matrix: Water

Collected: 2022/09/25
Relinquished: 2022/09/26
Received: 2022/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH	AT/ALK	A740460	N/A	2022/10/03	Madelyn Ellis
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A735209	N/A	2022/09/30	Liping Zong
F1-BTEX	CALC/MS	A735565	N/A	2022/09/30	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	A735347	N/A	2022/10/06	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	A737132	N/A	2022/09/30	Tyler Orr
Conductivity @25C	COND	A740464	N/A	2022/10/03	Madelyn Ellis
Fluoride	AT	A740466	N/A	2022/10/03	Madelyn Ellis
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A737307	2022/10/01	2022/10/02	Elizabeth Chacko
Hardness	CALC	A735553	N/A	2022/10/04	Automated Statchk
Mercury (Dissolved) by CV	CV	A736253	2022/09/30	2022/09/30	Jason Bao
Elements by ICP - Dissolved	ICPA	A739351	N/A	2022/10/04	Kathleen Dalton
Elements by ICPMS - Dissolved	ICPM	A740275	N/A	2022/10/06	Rikuto Yamazaki
Ion Balance	CALC	A735803	N/A	2022/10/04	Automated Statchk
Nitrate and Nitrite	CALC	A735703	N/A	2022/10/04	Automated Statchk
NO ₂ (N); NO ₂ (N) + NO ₃ (N) in Water	AC/COL	A738456	N/A	2022/10/01	Ana Katrina Cariaga
Nitrate (as N)	CALC	A735584	2022/10/04	2022/10/04	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	A737175	N/A	2022/09/30	Zoe Wu
Total Dissolved Solids (Filt. Residue)	BAL	A736224	2022/09/30	2022/09/30	Kamalpreet Kaur (Calgary)

Bureau Veritas ID: BDA178
Sample ID: FIELD DUPLICATE 2
Matrix: Water

Collected: 2022/09/25
Relinquished: 2022/09/26
Received: 2022/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A735209	N/A	2022/09/30	Liping Zong
F1-BTEX	CALC/MS	A735565	N/A	2022/09/30	Automated Statchk
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A737307	2022/10/01	2022/10/02	Elizabeth Chacko

Bureau Veritas ID: BDA179
Sample ID: FIELD DUPLICATE 3
Matrix: Water

Collected: 2022/09/25
Relinquished: 2022/09/26
Received: 2022/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A735209	N/A	2022/09/30	Liping Zong
F1-BTEX	CALC/MS	A735565	N/A	2022/09/30	Automated Statchk
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A737307	2022/10/01	2022/10/02	Elizabeth Chacko

Bureau Veritas ID: BDA180
Sample ID: FIELD DUPLICATE 4
Matrix: Water

Collected: 2022/09/25
Relinquished: 2022/09/26
Received: 2022/09/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	A735209	N/A	2022/09/30	Liping Zong
F1-BTEX	CALC/MS	A735565	N/A	2022/09/30	Automated Statchk
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	A737307	2022/10/01	2022/10/02	Elizabeth Chacko

**GENERAL COMMENTS**

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.0°C
-----------	-------

Temperatures upon receipt at Bureau Veritas Labs Calgary

Package 1: 2.7 degrees C

Package 2: 7.7 degrees C

Each temperature is the average of up to three cooler temperatures taken at receipt.

Sample BDA173 [GIQ8-10-2-4] : Sample was analyzed past method specified hold time for NO2 (N); NO2 (N) + NO3 (N) in Water. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample BDA174 [BI-13-1-4] : Sample was analyzed past method specified hold time for NO2 (N); NO2 (N) + NO3 (N) in Water. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample BDA175 [BI-13-3-4.5] : Sample was analyzed past method specified hold time for NO2 (N); NO2 (N) + NO3 (N) in Water. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample BDA176 [GIP11 09-1-4-R] : Sample was analyzed past method specified hold time for NO2 (N); NO2 (N) + NO3 (N) in Water. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample BDA177 [BIS 97-1-3] : Sample was analyzed past method specified hold time for NO2 (N); NO2 (N) + NO3 (N) in Water. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER) Comments

Sample BDA173 [GIQ8-10-2-4] Elements by ICPMS - Dissolved: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

Results relate only to the items tested.

DATA QUALITY OVERVIEW

Lab ID	Client Sample ID	Matrix	Test Code	Analysis Type	Parameters	Deviation	Root Cause	Potential Impact
BDA173	GIQ8-10-2-4	Water	NO23AC-W	NUTS	Sample	#11 Past Hold Time	#10 Lab Error	This may increase the uncertainty associated with these results.
BDA174	BI-13-1-4	Water	NO23AC-W	NUTS	Sample	#11 Past Hold Time	#10 Lab Error	This may increase the uncertainty associated with these results.
BDA175	BI-13-3-4.5	Water	NO23AC-W	NUTS	Sample	#11 Past Hold Time	#10 Lab Error	This may increase the uncertainty associated with these results.
BDA176	GIP11 09-1-4-R	Water	NO23AC-W	NUTS	Sample	#11 Past Hold Time	#10 Lab Error	This may increase the uncertainty associated with these results.
BDA177	BIS 97-1-3	Water	NO23AC-W	NUTS	Sample	#11 Past Hold Time	#10 Lab Error	This may increase the uncertainty associated with these results.



BUREAU
VERITAS

Bureau Veritas Job #: C275319

Report Date: 2022/10/06

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A735209	LZ3	Method Blank	1,4-Difluorobenzene (sur.)	2022/09/29		102	%	50 - 140
			4-Bromofluorobenzene (sur.)	2022/09/29		105	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2022/09/29		89	%	50 - 140
			Benzene	2022/09/29	<0.00040		mg/L	
			Toluene	2022/09/29	<0.00040		mg/L	
			Ethylbenzene	2022/09/29	<0.00040		mg/L	
			m & p-Xylene	2022/09/29	<0.00080		mg/L	
			o-Xylene	2022/09/29	<0.00040		mg/L	
			F1 (C6-C10)	2022/09/29	<0.10		mg/L	
A736215	SKP	Method Blank	Total Dissolved Solids	2022/09/30	<10		mg/L	
A736224	KK9	Method Blank	Total Dissolved Solids	2022/09/30	<10		mg/L	
A736253	JAB	Method Blank	Dissolved Mercury (Hg)	2022/09/30	<0.0019		ug/L	
A737132	TOR	Method Blank	Chloride (Cl)	2022/09/30	<1.0		mg/L	
			Sulphate (SO4)	2022/09/30	<1.0		mg/L	
A737175	ZWU	Method Blank	Phenols	2022/09/30	<0.0015		mg/L	
A737307	ECO	Method Blank	O-TERPHENYL (sur.)	2022/10/01		97	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2022/10/01	<0.10		mg/L	
A738456	ACR	Method Blank	Nitrite (N)	2022/10/01	<0.010		mg/L	
			Nitrate plus Nitrite (N)	2022/10/01	<0.010		mg/L	
A738458	ACR	Method Blank	Nitrite (N)	2022/10/01	<0.010		mg/L	
			Nitrate plus Nitrite (N)	2022/10/01	<0.010		mg/L	
A739349	PC5	Method Blank	Dissolved Iron (Fe)	2022/10/03	<0.060		mg/L	
			Dissolved Lithium (Li)	2022/10/03	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2022/10/03	<0.20		mg/L	
			Dissolved Manganese (Mn)	2022/10/03	<0.0040		mg/L	
			Dissolved Potassium (K)	2022/10/03	<0.30		mg/L	
			Dissolved Sodium (Na)	2022/10/03	<0.50		mg/L	
			Dissolved Strontium (Sr)	2022/10/03	<0.020		mg/L	
			Dissolved Sulphur (S)	2022/10/03	<0.20		mg/L	
			Dissolved Phosphorus (P)	2022/10/03	<0.10		mg/L	
			Dissolved Barium (Ba)	2022/10/03	<0.010		mg/L	
			Dissolved Silicon (Si)	2022/10/03	<0.50		mg/L	
			Dissolved Boron (B)	2022/10/03	<0.020		mg/L	
			Dissolved Calcium (Ca)	2022/10/03	<0.30		mg/L	
			Dissolved Iron (Fe)	2022/10/04	<0.060		mg/L	
			Dissolved Lithium (Li)	2022/10/04	<0.020		mg/L	
A739351	KD9	Method Blank	Dissolved Magnesium (Mg)	2022/10/04	<0.20		mg/L	
			Dissolved Manganese (Mn)	2022/10/04	<0.0040		mg/L	
			Dissolved Potassium (K)	2022/10/04	<0.30		mg/L	
			Dissolved Sodium (Na)	2022/10/04	<0.50		mg/L	
			Dissolved Strontium (Sr)	2022/10/04	<0.020		mg/L	
			Dissolved Sulphur (S)	2022/10/04	<0.20		mg/L	
			Dissolved Phosphorus (P)	2022/10/04	<0.10		mg/L	
			Dissolved Barium (Ba)	2022/10/04	<0.010		mg/L	
			Dissolved Silicon (Si)	2022/10/04	<0.50		mg/L	
			Dissolved Boron (B)	2022/10/04	<0.020		mg/L	
			Dissolved Calcium (Ca)	2022/10/04	<0.30		mg/L	
			Dissolved Aluminum (Al)	2022/10/05	<0.0030		mg/L	
			Dissolved Chromium (Cr)	2022/10/05	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2022/10/05	<0.00030		mg/L	
			Dissolved Copper (Cu)	2022/10/05	<0.0010		mg/L	
			Dissolved Lead (Pb)	2022/10/05	<0.00020		mg/L	
A739712	RY3	Method Blank	Dissolved Aluminum (Al)	2022/10/05	<0.0030		mg/L	
			Dissolved Chromium (Cr)	2022/10/05	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2022/10/05	<0.00030		mg/L	
			Dissolved Copper (Cu)	2022/10/05	<0.0010		mg/L	
			Dissolved Lead (Pb)	2022/10/05	<0.00020		mg/L	



BUREAU
VERITAS

Bureau Veritas Job #: C275319

Report Date: 2022/10/06

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A740275	RY3	Method Blank	Dissolved Antimony (Sb)	2022/10/05	<0.00060		mg/L	
			Dissolved Molybdenum (Mo)	2022/10/05	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2022/10/05	<0.00050		mg/L	
			Dissolved Selenium (Se)	2022/10/05	<0.00020		mg/L	
			Dissolved Silver (Ag)	2022/10/05	<0.00010		mg/L	
			Dissolved Arsenic (As)	2022/10/05	<0.00020		mg/L	
			Dissolved Thallium (Tl)	2022/10/05	<0.00020		mg/L	
			Dissolved Tin (Sn)	2022/10/05	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2022/10/05	<0.0010		mg/L	
			Dissolved Uranium (U)	2022/10/05	<0.00010		mg/L	
			Dissolved Vanadium (V)	2022/10/05	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2022/10/05	<0.0030		mg/L	
			Dissolved Beryllium (Be)	2022/10/05	<0.0010		mg/L	
			Dissolved Aluminum (Al)	2022/10/05	<0.0030		mg/L	
			Dissolved Chromium (Cr)	2022/10/05	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2022/10/05	<0.00030		mg/L	
			Dissolved Copper (Cu)	2022/10/05	<0.0010		mg/L	
			Dissolved Lead (Pb)	2022/10/05	<0.00020		mg/L	
			Dissolved Antimony (Sb)	2022/10/05	<0.00060		mg/L	
			Dissolved Molybdenum (Mo)	2022/10/05	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2022/10/05	<0.00050		mg/L	
			Dissolved Selenium (Se)	2022/10/05	<0.00020		mg/L	
			Dissolved Silver (Ag)	2022/10/05	<0.00010		mg/L	
			Dissolved Arsenic (As)	2022/10/05	<0.00020		mg/L	
			Dissolved Thallium (Tl)	2022/10/05	<0.00020		mg/L	
			Dissolved Tin (Sn)	2022/10/05	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2022/10/05	<0.0010		mg/L	
			Dissolved Uranium (U)	2022/10/05	<0.00010		mg/L	
			Dissolved Vanadium (V)	2022/10/05	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2022/10/05	<0.0030		mg/L	
			Dissolved Beryllium (Be)	2022/10/05	<0.0010		mg/L	
A740460	MEL	Method Blank	Alkalinity (Total as CaCO ₃)	2022/10/03	<1.0		mg/L	
			Alkalinity (PP as CaCO ₃)	2022/10/03	<1.0		mg/L	
			Bicarbonate (HCO ₃)	2022/10/03	<1.0		mg/L	
			Carbonate (CO ₃)	2022/10/03	<1.0		mg/L	
			Hydroxide (OH)	2022/10/03	<1.0		mg/L	
A740464	MEL	Method Blank	Conductivity	2022/10/03	<2.0		uS/cm	
A740466	MEL	Method Blank	Dissolved Fluoride (F)	2022/10/03	<0.050		mg/L	
A735209	LZ3	LCS	1,4-Difluorobenzene (sur.)	2022/09/29		99	%	50 - 140
			4-Bromofluorobenzene (sur.)	2022/09/29		103	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2022/09/29		95	%	50 - 140
			Benzene	2022/09/29		101	%	60 - 130
			Toluene	2022/09/29		91	%	60 - 130
			Ethylbenzene	2022/09/29		95	%	60 - 130
			m & p-Xylene	2022/09/29		92	%	60 - 130
			o-Xylene	2022/09/29		93	%	60 - 130
			F1 (C6-C10)	2022/09/29		106	%	60 - 140
A736215	SKP	LCS	Total Dissolved Solids	2022/09/30		102	%	80 - 120
A736224	KK9	LCS	Total Dissolved Solids	2022/09/30		104	%	80 - 120
A736253	JAB	LCS	Dissolved Mercury (Hg)	2022/09/30		92	%	80 - 120
A737132	TOR	LCS	Chloride (Cl)	2022/09/30		104	%	80 - 120
			Sulphate (SO ₄)	2022/09/30		103	%	80 - 120



BUREAU
VERITAS

Bureau Veritas Job #: C275319

Report Date: 2022/10/06

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A737175	ZWU	LCS	Phenols	2022/09/30		102	%	80 - 120
A737307	ECO	LCS	O-TERPHENYL (sur.)	2022/10/01		97	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2022/10/01		93	%	60 - 140
A738456	ACR	LCS	Nitrite (N)	2022/10/01		99	%	80 - 120
			Nitrate plus Nitrite (N)	2022/10/01		105	%	80 - 120
A738458	ACR	LCS	Nitrite (N)	2022/10/01		99	%	80 - 120
			Nitrate plus Nitrite (N)	2022/10/01		104	%	80 - 120
A739349	PC5	LCS	Dissolved Iron (Fe)	2022/10/03		105	%	80 - 120
			Dissolved Lithium (Li)	2022/10/03		97	%	80 - 120
			Dissolved Magnesium (Mg)	2022/10/03		103	%	80 - 120
			Dissolved Manganese (Mn)	2022/10/03		100	%	80 - 120
			Dissolved Potassium (K)	2022/10/03		100	%	80 - 120
			Dissolved Sodium (Na)	2022/10/03		96	%	80 - 120
			Dissolved Strontium (Sr)	2022/10/03		101	%	80 - 120
			Dissolved Sulphur (S)	2022/10/03		95	%	80 - 120
			Dissolved Phosphorus (P)	2022/10/03		98	%	80 - 120
			Dissolved Barium (Ba)	2022/10/03		104	%	80 - 120
			Dissolved Silicon (Si)	2022/10/03		92	%	80 - 120
			Dissolved Boron (B)	2022/10/03		102	%	80 - 120
			Dissolved Calcium (Ca)	2022/10/03		100	%	80 - 120
A739351	KD9	LCS	Dissolved Iron (Fe)	2022/10/04		104	%	80 - 120
			Dissolved Lithium (Li)	2022/10/04		99	%	80 - 120
			Dissolved Magnesium (Mg)	2022/10/04		104	%	80 - 120
			Dissolved Manganese (Mn)	2022/10/04		108	%	80 - 120
			Dissolved Potassium (K)	2022/10/04		99	%	80 - 120
			Dissolved Sodium (Na)	2022/10/04		98	%	80 - 120
			Dissolved Strontium (Sr)	2022/10/04		100	%	80 - 120
			Dissolved Sulphur (S)	2022/10/04		98	%	80 - 120
			Dissolved Phosphorus (P)	2022/10/04		103	%	80 - 120
			Dissolved Barium (Ba)	2022/10/04		105	%	80 - 120
			Dissolved Silicon (Si)	2022/10/04		97	%	80 - 120
			Dissolved Boron (B)	2022/10/04		99	%	80 - 120
			Dissolved Calcium (Ca)	2022/10/04		101	%	80 - 120
A739712	RY3	LCS	Dissolved Aluminum (Al)	2022/10/05		106	%	80 - 120
			Dissolved Chromium (Cr)	2022/10/05		98	%	80 - 120
			Dissolved Cobalt (Co)	2022/10/05		98	%	80 - 120
			Dissolved Copper (Cu)	2022/10/05		99	%	80 - 120
			Dissolved Lead (Pb)	2022/10/05		100	%	80 - 120
			Dissolved Antimony (Sb)	2022/10/05		103	%	80 - 120
			Dissolved Molybdenum (Mo)	2022/10/05		99	%	80 - 120
			Dissolved Nickel (Ni)	2022/10/05		98	%	80 - 120
			Dissolved Selenium (Se)	2022/10/05		108	%	80 - 120
			Dissolved Silver (Ag)	2022/10/05		98	%	80 - 120
			Dissolved Arsenic (As)	2022/10/05		98	%	80 - 120
			Dissolved Thallium (Tl)	2022/10/05		100	%	80 - 120
			Dissolved Tin (Sn)	2022/10/05		105	%	80 - 120
			Dissolved Titanium (Ti)	2022/10/05		100	%	80 - 120
			Dissolved Uranium (U)	2022/10/05		98	%	80 - 120
			Dissolved Vanadium (V)	2022/10/05		99	%	80 - 120
			Dissolved Zinc (Zn)	2022/10/05		101	%	80 - 120
			Dissolved Beryllium (Be)	2022/10/05		107	%	80 - 120
A740275	RY3	LCS	Dissolved Aluminum (Al)	2022/10/05		114	%	80 - 120



QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Chromium (Cr)	2022/10/05		101	%	80 - 120
			Dissolved Cobalt (Co)	2022/10/05		100	%	80 - 120
			Dissolved Copper (Cu)	2022/10/05		100	%	80 - 120
			Dissolved Lead (Pb)	2022/10/05		100	%	80 - 120
			Dissolved Antimony (Sb)	2022/10/05		106	%	80 - 120
			Dissolved Molybdenum (Mo)	2022/10/05		98	%	80 - 120
			Dissolved Nickel (Ni)	2022/10/05		100	%	80 - 120
			Dissolved Selenium (Se)	2022/10/05		108	%	80 - 120
			Dissolved Silver (Ag)	2022/10/05		96	%	80 - 120
			Dissolved Arsenic (As)	2022/10/05		102	%	80 - 120
			Dissolved Thallium (Tl)	2022/10/05		101	%	80 - 120
			Dissolved Tin (Sn)	2022/10/05		102	%	80 - 120
			Dissolved Titanium (Ti)	2022/10/05		103	%	80 - 120
			Dissolved Uranium (U)	2022/10/05		98	%	80 - 120
			Dissolved Vanadium (V)	2022/10/05		103	%	80 - 120
			Dissolved Zinc (Zn)	2022/10/05		106	%	80 - 120
			Dissolved Beryllium (Be)	2022/10/05		115	%	80 - 120
A740460	MEL	LCS	Alkalinity (Total as CaCO ₃)	2022/10/03		98	%	80 - 120
A740464	MEL	LCS	Conductivity	2022/10/03		100	%	90 - 110
A740466	MEL	LCS	Dissolved Fluoride (F)	2022/10/03		93	%	80 - 120
LCS: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy. Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination. Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.								



BUREAU
VERITAS

Bureau Veritas Job #: C275319

Report Date: 2022/10/06

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: NORMAN WELLS, NT

Project #: 417085-42051-22100

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Elizabeth Chacko, Senior Analyst, Organics

Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

Qiliang (Alex) Wu, Senior Analyst

Sandy Yuan, M.Sc., QP, Scientific Specialist

Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

INVOICE INFORMATION				REPORT INFORMATION				ANALYSIS REQUESTED																													
Company Name: ☒ Imperial Oil ☐ ExxonMobil				Company Name: <u>NOBLEY (ADVISIAN)</u>																																	
Contact Name: <u>ALEX. HAIGH</u>				Contact Name: <u>ALEX HAIGH</u>																																	
Address: <u>150, 205 QUARRY PARK BLVD, SE CALGARY AB T2C 3E7</u>				Address: <u>150, 205 QUARRY PARK BLVD, SE CALGARY AB T2C 3E7</u>																																	
Email: <u>ALEX.HAIGH@ADVISIAN.COM</u>				Email: <u>ALEX.HAIGH@ADVISIAN.COM</u>																																	
Ph: <u>587-897-6249</u>				Ph: <u>587-897-6249</u>																																	
Sampler Name (Print): <u>MATTHEW EUBANK / JE</u>				Consultant Project #: <u>417085-42051-22100</u>																																	
FIELD SAMPLE ID	MATRIX				# CONTAINERS	SAMPLING		FIELD FILTERED & PRESERVED	LAB FILTRATION REQUIRED	VOC	PAH	PHCs (FRACTIONS 1-2 PLUS BTEX)	PHCs (FRACTIONS 1-4 PLUS BTEX)	PHCs (FRACTIONS 2-4)	PHCs (FRACTION 1 PLUS BTEX)	GRAIN SIZE (75 MICRON)	TEXTURE (% SAND, SILT, CLAY)	PARTICLE SIZE DISTRIBUTION WITH GRAPH	REGULATED METALS	TOT	DIS	MERCURY	TOTAL	DISSOLVED	SALINITY SOIL	FERTILIZER SOIL	FERTILIZER WATER	NUTRIENTS SOIL	ROUTINE POTABILITY	pH	EC	ALKALINITY	BASIC CLASS II LANDFILL PKG	Total Phenols	Fluoride	Note: Project reference on bottles: "SNP"	
	GROUND WATER	SURFACE WATER	SOIL	OTHER		DATE (YYYY/MM/DD)	TIME (24 HR)																														
1 <u>GIQ8-10-2-4</u>	☒				9	2022/09/25	14:00	☒				☒							☒	☒														☒	☒	☒	
2 <u>BI-13-1-4</u>	☒				9	2022/09/25	10:30	☒				☒							☒	☒														☒	☒	☒	
3 <u>BI-13-3-4.5</u>	☒				9	2022/09/25	9:40	☒				☒							☒	☒													☒	☒	☒		
4 <u>GIP1109-1-4-R</u>	☒				9	2022/09/25	13:15	☒				☒							☒	☒													☒	☒	☒		
5 <u>BIS 97-1-3</u>	☒				9	2022/09/25	8:45	☒				☒							☒	☒													☒	☒	☒		
6 <u>Field Duplicate 2</u>	☒				4	2022/09/25	10:00					☒																						☒			
7 <u>Field Duplicate 3</u>	☒				4	2022/09/25	11:00					☒																						☒			
8 <u>~~Field Duplicate 3~~</u>	☒				~~4~~	~~2022/09/25~~	~~11:00~~					☒																									
9 <u>Field Duplicate 4</u>	☒				4	2022/09/25	11:30					☒																						☒			
10																																					

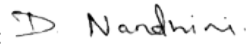
IOL SITE LOCATION <u>NORMAN WELLS, NT</u>				REGULATORY CRITERIA / DETECTION LIMITS:				SPECIAL INSTRUCTIONS <u>SEND DATA TO: CANADA.CHEMISTRY@NOBLEY.COM</u>				# JARS USED & NOT SUBMITTED <u>N/A</u>				TURNAROUND TIME			
IOL PROJECT # (if applicable) <u>N/A</u>				☐ Alberta Tier 1 ☐ SEQG (SK) ☒ CCME (incl. level) <u>FAL</u>				☐ CDWG ☐ NoSC (SK) ☐ Other				<u>CACAL.IORDATATRACK@NOBLEY.COM</u> <u>IES A2601436</u>				Standard (5 days) ☒ Rush (3 days) ☐ (2 days) ☐ (1 day) ☐ (same day) ☐			
MAXXAM TASK ORDER # OR SERVICE ORDER # + LINE ITEM <u>417085-42051-22100</u>																			

SEAL PRESENT	YES	NO	COOLER ID #	SEAL PRESENT	YES	NO	COOLER ID #	SEAL PRESENT	YES	NO	COOLER ID #
SEAL INTACT	☒		TEMP °C <u>3</u> <u>3</u> <u>3</u>	SEAL INTACT	☒		TEMP °C <u>5</u> <u>5</u> <u>4</u>	SEAL INTACT	☒		TEMP °C <u>5</u> <u>5</u> <u>4</u>
COOLING MEDIA PRESENT	☒		1 2 3	COOLING MEDIA PRESENT	☒		1 2 3	COOLING MEDIA PRESENT	☒		1 2 3

RELINQUISHED BY:		DATE:	TIME (24 HR)	RECEIVED BY:		DATE:	TIME (24 HR)
1. <u>Matthew Eubank</u>		2022/09/26	12:10	1. <u>Alana Morrison</u>		2022/09/28	15:00
2. <u>Mandee Maryjindee Kordner</u>		2022/09/28	17:15	2. <u>Nick Buty</u>		2022/09/29	07:00
3.				3.			

MAXXAM JOB # <u>C275319</u>	
LABELED BY: <u>MPN</u>	VERIFIED BY: <u>ISV</u>

DATA QUALITY REVIEW CHECKLIST - IMPERIAL OIL PROJECTS

Consultant: <u>Advisian</u>		Sampling Date: <u>26-Sep-22</u>		
Location: <u>Norman Wells</u>		Laboratory : <u>Bureau Veritas</u>		
Consultant Project Number: <u>417085-42051-22100</u>		Sample Submission Number: <u>C275982</u>		
Are All Laboratory QC Within Acceptance Criteria (Yes, No, Not Applicable)?				
	Yes	No	NA	Comments
Instrument Surrogate Recovery			x	All laboratory QC met acceptance criteria.
Extraction Surrogate Recovery			x	
Method Blank Concentration	x			
Matrix Duplicate RPD			x	
Matrix Spike Recovery			x	
Lab Control Sample Recovery	x			
Are All Field QC Samples Within Alert Limits (Yes, No, Not Applicable)?				
	Yes	No	NA	Comments
Field Blank Concentration			x	No field QC samples submitted.
Trip Blank Concentration			x	
Equipment Blank Concentration			x	
Field Duplicate RPD			x	
Has CoA been signed off (Yes/No)?: <u>Yes</u>				
Has lab warranted all tests were analyzed following SOP's in CoA (Yes/No)?: <u>Yes</u>				
Were all samples analyzed within hold times (Yes/No)?: <u>No</u>				
All volatiles samples methanol extracted (if required) within 48 hours (Yes/No)?: <u>n/a</u>				
Is Chain of Custody completed and signed (Yes/No)?: <u>Yes</u>				
Were sample temperatures acceptable when they reached lab (Yes/No)?: <u>Yes</u>				
Was a Data Quality Overview (DQO) issued (Yes/No)?: <u>No</u>				
Date DQO was received: <u>n/a</u>				
Is data considered to be reliable (Yes/No)?: <u>Yes</u>				
If answer is "No", describe and provide rationale:				
Data Reviewed by (Print): <u>Nandhini Durairaj</u>		Data Reviewed by (Signature): <u></u>		
Date: <u>30-Nov-22</u>				

**Attention: Alex Haigh**

Advisian
Suite 500, 151 Canada Olympic
Calgary, AB
Canada T3B 6B7

Task Order#: PENDING
Line Item: 10
Site#: N/A
Site Location: Norman Wells, NT
Project #: 417085-42051-22100
Your C.O.C. #: 637652-08-01

Report Date: 2022/10/07

Report #: R3245030

Version: 1 - Final

CERTIFICATE OF ANALYSIS**BUREAU VERITAS JOB #: C275982****Received: 2022/09/30, 07:00**

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH (1)	2	AB SOP-00005	SM 23 2320 B m
Chloride/Sulphate by Auto Colourimetry (1)	2	AB SOP-00020	SM23-4500-Cl/SO ₄ -E m
Conductivity @25C (1)	2	AB SOP-00005	SM 23 2510 B m
Filtration (Metals) (1)	1		
Hardness (1)	2		Auto Calc
Elements by ICP - Dissolved (1, 2)	1	AB SOP-00042	EPA 6010d R5 m
Elements by ICP-Dissolved-Lab Filtered (1, 2)	1	AB SOP-00042	EPA 6010d R5 m
Ion Balance (1)	2		Auto Calc
Nitrate and Nitrite (1)	2		Auto Calc
NO ₂ (N); NO ₂ (N) + NO ₃ (N) in Water (1)	2	AB SOP-00091	SM 23 4500 NO ₃ m
Nitrate (as N) (1)	2		Auto Calc
Total Dissolved Solids (Filt. Residue) (1)	2	AB SOP-00065	SM 23 2540 C m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard. All samples were analyzed within hold time unless otherwise flagged.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.



Attention: Alex Haigh

Advisian
Suite 500, 151 Canada Olympic
Calgary, AB
Canada T3B 6B7

Task Order#: PENDING
Line Item: 10
Site#: N/A
Site Location: Norman Wells, NT
Project #: 417085-42051-22100
Your C.O.C. #: 637652-08-01

Report Date: 2022/10/07
Report #: R3245030
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C275982

Received: 2022/09/30, 07:00

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8

(2) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Namita Sahni, Customer Solutions Representative

Email: Namita.Sahni@bureauveritas.com

Phone# (604)639-2614

=====

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.



BUREAU
VERITAS

Bureau Veritas Job #: C275982

Report Date: 2022/10/07

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: Norman Wells, NT

Project #: 417085-42051-22100

IOL ROUTINE WATER - LAB FILTRATION (WATER)

Bureau Veritas ID		BDE007		
Sampling Date		2022/09/26 16:30		
COC Number		637652-08-01		
	UNITS	CPF 21-1-4	RDL	QC Batch
Calculated Parameters				
Hardness (CaCO ₃)	mg/L	1200	0.50	A737039
Ion Balance (% Difference)	%	0.12	N/A	A737170
Nitrate (N)	mg/L	6.2	0.10	A737117
Nitrate (NO ₃)	mg/L	28	0.44	A737114
Nitrite (NO ₂)	mg/L	0.32	0.033	A737114
Misc. Inorganics				
Conductivity	uS/cm	1900	2.0	A738858
Total Dissolved Solids	mg/L	1700	10	A737707
Anions				
Alkalinity (PP as CaCO ₃)	mg/L	<1.0	1.0	A738861
Alkalinity (Total as CaCO ₃)	mg/L	260	1.0	A738861
Bicarbonate (HCO ₃)	mg/L	320	1.0	A738861
Carbonate (CO ₃)	mg/L	<1.0	1.0	A738861
Hydroxide (OH)	mg/L	<1.0	1.0	A738861
Chloride (Cl)	mg/L	5.4	1.0	A737731
Sulphate (SO ₄)	mg/L	920	25	A737731
Nutrients				
Nitrite (N)	mg/L	0.098	0.010	A738458
Nitrate plus Nitrite (N)	mg/L	6.3	0.10	A738458
Lab Filtered Elements				
Dissolved Calcium (Ca)	mg/L	340	0.30	A738557
Dissolved Iron (Fe)	mg/L	0.12	0.060	A738557
Dissolved Magnesium (Mg)	mg/L	83	0.20	A738557
Dissolved Manganese (Mn)	mg/L	0.72	0.0040	A738557
Dissolved Potassium (K)	mg/L	5.7	0.30	A738557
Dissolved Sodium (Na)	mg/L	24	0.50	A738557
RDL = Reportable Detection Limit				
N/A = Not Applicable				



BUREAU
VERITAS

Bureau Veritas Job #: C275982

Report Date: 2022/10/07

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: Norman Wells, NT

Project #: 417085-42051-22100

IOL ROUTINE WATER (WATER)

Bureau Veritas ID		BDE006		
Sampling Date		2022/09/26 16:40		
COC Number		637652-08-01		
	UNITS	CPF 21-2-4.5	RDL	QC Batch
Calculated Parameters				
Hardness (CaCO ₃)	mg/L	1300	0.50	A737039
Ion Balance (% Difference)	%	1.4	N/A	A737170
Nitrate (N)	mg/L	0.18	0.010	A737117
Nitrate (NO ₃)	mg/L	0.78	0.044	A737114
Nitrite (NO ₂)	mg/L	<0.033	0.033	A737114
Misc. Inorganics				
Conductivity	uS/cm	2000	2.0	A738858
Total Dissolved Solids	mg/L	1800	10	A737707
Anions				
Alkalinity (PP as CaCO ₃)	mg/L	<1.0	1.0	A738861
Alkalinity (Total as CaCO ₃)	mg/L	350	1.0	A738861
Bicarbonate (HCO ₃)	mg/L	430	1.0	A738861
Carbonate (CO ₃)	mg/L	<1.0	1.0	A738861
Hydroxide (OH)	mg/L	<1.0	1.0	A738861
Chloride (Cl)	mg/L	14	1.0	A738118
Sulphate (SO ₄)	mg/L	1000	25	A738118
Nutrients				
Nitrite (N)	mg/L	<0.010	0.010	A738456
Nitrate plus Nitrite (N)	mg/L	0.18	0.010	A738456
Elements				
Dissolved Calcium (Ca)	mg/L	370	0.30	A739348
Dissolved Iron (Fe)	mg/L	0.27	0.060	A739348
Dissolved Magnesium (Mg)	mg/L	100	0.20	A739348
Dissolved Manganese (Mn)	mg/L	0.77	0.0040	A739348
Dissolved Potassium (K)	mg/L	3.1	0.30	A739348
Dissolved Sodium (Na)	mg/L	13	0.50	A739348
RDL = Reportable Detection Limit				
N/A = Not Applicable				



**BUREAU
VERITAS**

Bureau Veritas Job #: C275982

Report Date: 2022/10/07

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: Norman Wells, NT

Project #: 417085-42051-22100

TEST SUMMARY

Bureau Veritas ID: BDE006
Sample ID: CPF 21-2-4.5
Matrix: Water

Collected: 2022/09/26
Relinquished: 2022/09/28
Received: 2022/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH	AT/ALK	A738861	N/A	2022/10/02	Madelyn Ellis
Chloride/Sulphate by Auto Colourimetry	KONE	A738118	N/A	2022/10/01	Carlo Truong
Conductivity @25C	COND	A738858	N/A	2022/10/02	Madelyn Ellis
Hardness	CALC	A737039	N/A	2022/10/03	Automated Statchk
Elements by ICP - Dissolved	ICPA	A739348	N/A	2022/10/03	Paula Calzada
Ion Balance	CALC	A737170	N/A	2022/10/03	Automated Statchk
Nitrate and Nitrite	CALC	A737114	N/A	2022/10/04	Automated Statchk
NO ₂ (N); NO ₂ (N) + NO ₃ (N) in Water	AC/COL	A738456	N/A	2022/10/01	Ana Katrina Cariaga
Nitrate (as N)	CALC	A737117	2022/10/04	2022/10/04	Automated Statchk
Total Dissolved Solids (Filt. Residue)	BAL	A737707	2022/09/30	2022/09/30	Kamalpreet Kaur (Calgary)

Bureau Veritas ID: BDE007
Sample ID: CPF 21-1-4
Matrix: Water

Collected: 2022/09/26
Relinquished: 2022/09/28
Received: 2022/09/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH	AT/ALK	A738861	N/A	2022/10/02	Madelyn Ellis
Chloride/Sulphate by Auto Colourimetry	KONE	A737731	N/A	2022/09/30	Carlo Truong
Conductivity @25C	COND	A738858	N/A	2022/10/02	Madelyn Ellis
Hardness	CALC	A737039	N/A	2022/10/03	Automated Statchk
Elements by ICP-Dissolved-Lab Filtered	ICPA	A738557	N/A	2022/10/02	Kristijan Kovac
Ion Balance	CALC	A737170	N/A	2022/10/03	Automated Statchk
Nitrate and Nitrite	CALC	A737114	N/A	2022/10/04	Automated Statchk
NO ₂ (N); NO ₂ (N) + NO ₃ (N) in Water	AC/COL	A738458	N/A	2022/10/01	Ana Katrina Cariaga
Nitrate (as N)	CALC	A737117	2022/10/04	2022/10/04	Automated Statchk
Total Dissolved Solids (Filt. Residue)	BAL	A737707	2022/09/30	2022/09/30	Kamalpreet Kaur (Calgary)



GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.3°C
-----------	-------

Temperatures upon receipt at Bureau Veritas Labs Calgary

Package 1: 8.3 degrees C

Each temperature is the average of up to three cooler temperatures taken at receipt.

Sample BDE006 [CPF 21-2-4.5] : Sample was analyzed past method specified hold time for NO₂ (N); NO₂ (N) + NO₃ (N) in Water. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample BDE007 [CPF 21-1-4] : Sample was analyzed past method specified hold time for NO₂ (N); NO₂ (N) + NO₃ (N) in Water. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Results relate only to the items tested.



BUREAU
VERITAS

Bureau Veritas Job #: C275982

Report Date: 2022/10/07

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: Norman Wells, NT

Project #: 417085-42051-22100

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A737707	KK9	Method Blank	Total Dissolved Solids	2022/09/30	<10		mg/L	
A737731	CTU	Method Blank	Chloride (Cl)	2022/10/01	<1.0		mg/L	
			Sulphate (SO4)	2022/10/01	<1.0		mg/L	
A738118	CTU	Method Blank	Chloride (Cl)	2022/10/01	<1.0		mg/L	
			Sulphate (SO4)	2022/10/01	<1.0		mg/L	
A738456	ACR	Method Blank	Nitrite (N)	2022/10/01	<0.010		mg/L	
			Nitrate plus Nitrite (N)	2022/10/01	<0.010		mg/L	
A738458	ACR	Method Blank	Nitrite (N)	2022/10/01	<0.010		mg/L	
			Nitrate plus Nitrite (N)	2022/10/01	<0.010		mg/L	
A738557	KKC	Method Blank	Dissolved Iron (Fe)	2022/10/02	<0.060		mg/L	
			Dissolved Magnesium (Mg)	2022/10/02	<0.20		mg/L	
			Dissolved Manganese (Mn)	2022/10/02	<0.0040		mg/L	
			Dissolved Potassium (K)	2022/10/02	<0.30		mg/L	
			Dissolved Sodium (Na)	2022/10/02	<0.50		mg/L	
			Dissolved Calcium (Ca)	2022/10/02	<0.30		mg/L	
A738858	MEL	Method Blank	Conductivity	2022/10/02	<2.0		uS/cm	
A738861	MEL	Method Blank	Alkalinity (Total as CaCO3)	2022/10/02	<1.0		mg/L	
			Alkalinity (PP as CaCO3)	2022/10/02	<1.0		mg/L	
			Bicarbonate (HCO3)	2022/10/02	<1.0		mg/L	
			Carbonate (CO3)	2022/10/02	<1.0		mg/L	
			Hydroxide (OH)	2022/10/02	<1.0		mg/L	
A739348	PC5	Method Blank	Dissolved Iron (Fe)	2022/10/03	<0.060		mg/L	
			Dissolved Magnesium (Mg)	2022/10/03	<0.20		mg/L	
			Dissolved Manganese (Mn)	2022/10/03	<0.0040		mg/L	
			Dissolved Potassium (K)	2022/10/03	<0.30		mg/L	
			Dissolved Sodium (Na)	2022/10/03	<0.50		mg/L	
			Dissolved Calcium (Ca)	2022/10/03	<0.30		mg/L	
A737707	KK9	LCS	Total Dissolved Solids	2022/09/30		99	%	80 - 120
A737731	CTU	LCS	Chloride (Cl)	2022/09/30		97	%	80 - 120
			Sulphate (SO4)	2022/09/30		105	%	80 - 120
A738118	CTU	LCS	Chloride (Cl)	2022/10/01		103	%	80 - 120
			Sulphate (SO4)	2022/10/01		97	%	80 - 120
A738456	ACR	LCS	Nitrite (N)	2022/10/01		99	%	80 - 120
			Nitrate plus Nitrite (N)	2022/10/01		105	%	80 - 120
A738458	ACR	LCS	Nitrite (N)	2022/10/01		99	%	80 - 120
			Nitrate plus Nitrite (N)	2022/10/01		104	%	80 - 120
A738557	KKC	LCS	Dissolved Iron (Fe)	2022/10/02		101	%	80 - 120
			Dissolved Magnesium (Mg)	2022/10/02		100	%	80 - 120
			Dissolved Manganese (Mn)	2022/10/02		96	%	80 - 120
			Dissolved Potassium (K)	2022/10/02		99	%	80 - 120
			Dissolved Sodium (Na)	2022/10/02		95	%	80 - 120
			Dissolved Calcium (Ca)	2022/10/02		96	%	80 - 120
A738858	MEL	LCS	Conductivity	2022/10/02		100	%	90 - 110
A738861	MEL	LCS	Alkalinity (Total as CaCO3)	2022/10/02		99	%	80 - 120
A739348	PC5	LCS	Dissolved Iron (Fe)	2022/10/03		108	%	80 - 120
			Dissolved Magnesium (Mg)	2022/10/03		103	%	80 - 120
			Dissolved Manganese (Mn)	2022/10/03		103	%	80 - 120
			Dissolved Potassium (K)	2022/10/03		102	%	80 - 120
			Dissolved Sodium (Na)	2022/10/03		98	%	80 - 120



BUREAU
VERITAS

Bureau Veritas Job #: C275982

Report Date: 2022/10/07

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: Norman Wells, NT

Project #: 417085-42051-22100

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC		QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
Batch	Init							
			Dissolved Calcium (Ca)	2022/10/03		102	%	80 - 120
LCS: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.								
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.								



BUREAU
VERITAS

Bureau Veritas Job #: C275982

Report Date: 2022/10/07

Advisian

Task Order#: PENDING, Line Item: 10

Site#: N/A

Site Location: Norman Wells, NT

Project #: 417085-42051-22100

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



4000 19st N.E
Calgary, Alberta T2E 6P8
www.bvlabs.com

Phone: (403) 291-3077
Fax: (403) 291-9468
Toll Free: 800-563-6266

959
MPN

EXXONMOBIL/IMPERIAL OIL - BV LABS
CHAIN-OF-CUSTODY RECORD
ANALYSIS REQUESTED

Page 1 of 1
C of C # 637652-08-01



637652

INVOICE INFORMATION				REPORT INFORMATION																														
Company Name: Imperial Oil Ltd - Worley Parsons				Company Name: Advisian																														
Contact Name: Alex Haigh				Contact Name: Alex Haigh																														
Address: 150, 205 Quarry Park Blvd, SE Suite 300, 51 Canada Olympic Centre, Calgary, AB T2C 3E7				Address: 150, 205 Quarry Park Blvd, SE Suite 300, 51 Canada Olympic Centre, Calgary, AB T2C 3E7																														
Email: alex.haigh@advisian.com				Email: alex.haigh@advisian.com																														
Phone: (587) 552-1895 587 897 6249				Phone: (403) 247-0290 587 897 6249																														
Sampler Name (Print): Matthew Eubank / Jefferson Encinien				Consultant Project #: 417085-42051-22100																														
FIELD SAMPLE ID	MATRIX				# CONTAINERS	SAMPLING		FIELD FILTERED & PRESERVED	LAB FILTRATION REQUIRED	KBr-Residue: Water plus Dissolved Metals and Sulphur	Regulated Metals including Mercury/Sulphur: Total	COO, TOC, TKN	Biochemical Oxygen Demand	True Colour, Nitrate, Nitrite	TSS, TDS, TURB	Ammonia-N (Total)	Carbon (DOC)	Total Sulphide	ATI BTEX and FI-FZ in Water	PAH - Water	Oil and Grease	Fluoride	Routine Potability	Limited sample, no dissolved metals bottle										
	GROUND WATER	SURFACE WATER	SOIL	OTHER		DATE (YYYYMMDD)	TIME (24 HR)																											
1	CPF 21-2-4.5	X			2	2022/09/26	16:40	X															X											
2	CPF 21-1-4	X			1	2022/09/26	16:30																X		X									
3																																		
4																																		
5																																		
6																																		
7																																		
8																																		
9																																		
10																																		
IOL SITE LOCATION: Norman Wells, NT				REGULATORY CRITERIA / DETECTION LIMITS:				SPECIAL INSTRUCTIONS: Send data to: canada.chemistry@worley.com cacal.iol.DATATRACKER@worley.com				# JARS USED AND NOT SUBMITTED: Enter N/A for Water				TURNAROUND TIME																		
IOL PROJECT # (if applicable): N/A				☒ Alberta Tier I ☐ CDWG												Standard (5 days) ☒																		
BV LABS TASK ORDER # OR SERVICE ORDER # + LINE ITEM: 417085-42051-22100				☐ SEQG (SK) ☐ NoSC (SK)												Rush (3 days) ☐																		
				☐ CCME ☐ Other																(1 day) ☐														
																				(same day) ☐														
																								Date Required										
SEAL PRESENT ☒				COOLER ID: mcal				SEAL PRESENT ☒				COOLER ID:				SEAL PRESENT ☒				COOLER ID:				LAB USE ONLY										
SEAL INTACT ☒				TEMP °C: 8 7 3				SEAL INTACT ☒				TEMP °C: 9 8 8				SEAL INTACT ☒				TEMP °C: 1 2 3				BV LABS JOB #										
COOLING MEDIA PRESENT ☒								COOLING MEDIA PRESENT ☒								COOLING MEDIA PRESENT ☒								C275982										
* RELINQUISHED BY:				DATE:				TIME (24 HR):				RECEIVED BY:				DATE:				TIME (24 HR):				SAMPLES										
1. M.B. AK				2022/09/26				9:00				1. Alana Morris				2022/09/30				07:00				Labeled BY: AMY										
2. Alana Morris				2022/09/30				08:37				2. Megan Foxan				2022/09/30				15:00				Verified BY: MPN										
3. Megan Foxan												3. Megan Foxan																						

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BV LABS' STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVLABS.COM/TERMS-AND-CONDITIONS.



Appendix E

Quality Assurance/Quality Control



E.1 Quality Assurance/Quality Control (QA/QC)

E.1.1 Field QA/QC Program

The groundwater field QA/QC program for the SNP consisted of three field duplicate samples for the analysis of dissolved chloride and BTEX parameters. One trip and one field blank sample were also submitted for analysis of PHCs as part of the 2022 field program.

For the field duplicate samples, the QA/QC results were evaluated by calculating the relative percent difference (RPD) between the parent and duplicate sample results and comparison of the RPD to designated alert limits.

The RPD is calculated using the following formula:

$$\text{RPD \%} = \left(\frac{|x_1 - x_2|}{(x_1 + x_2)/2} \right) * 100$$

Where x_1 = original field sample

x_2 = blind field duplicate sample

Consistent with laboratory practices and to permit reliable calculations, an RPD is only considered to be statistically relevant when the original and duplicate sample concentrations are at least five times the reportable detection limit. These limits vary parameter to parameter and sample to sample and are indicated by the laboratory alongside the analytical results in the Certificates of Analysis (Appendix D).

The designated field duplicate RPD alert limits are presented in the analytical tables. All samples results were below the laboratory detection limits so RPDs could not be calculated

The designated field and trip blank alert limits are >5X the reportable detection limit (RDL) for BTEX. The blanks submitted during the September SNP sampling program were compared to the alert limits and is presented in Table E-1. All of the results were below the RDLs.

E.1.2 Laboratory QA/QC Program

The laboratory QA/QC program consisted of one or more of the following analyses:

- Instrument and extraction surrogate recoveries for samples that were analyzed.
- The analysis of method blank, laboratory duplicate, matrix spike, and/or laboratory control samples for the sample analytical batches that were analyzed.



The laboratory QA/QC results are presented in the laboratory certificates of analysis and data quality checklists (Appendix D). There were no QA/QC laboratory issues identified that impact the primary SNP parameters (dissolved chloride and BTEX).

No field or laboratory QA/QC issues were identified that would affect the overall conclusions presented in this report. Overall, the results reported are considered to be reliable.



Table E-1

Field and Trip Blanks: Petroleum Hydrocarbons (PHCs)

PROJECT No.: 417085-42051

Sampling Location		Date (dd-mmm-yyyy)	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	m&p-Xylene (mg/L)	o-Xylene (mg/L)	Xylenes (Total) (mg/L)
Laboratory Reportable Detection Limit			0.00040	0.00040	0.00040	0.00080	0.00040	0.00089
Alert Limits			5 x RDL	5 x RDL	5 x RDL	5 x RDL	5 x RDL	5 x RDL
QA/QC Samples								
Groundwater Field Blank	25-Sep-2022		< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089
Groundwater Trip Blank	25-Sep-2022		< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089

NOTES:

1. Highlighting indicates parameters above alert limits



Appendix F

Mann–Kendall Statistical Analyses

Table F-1
Mann-Kendall Statistical Analysis (1997-2022) - Chloride

Filtered Trend Results, two-sided p-value < 0.05 And Normalized Slope > ± 10%/Year

Location	Count	Mann-Kendall S	Two-sided p-value (for MK test)	Slope (mg/L/year)	Normalized Slope (%/year)	Min (mg/L)	Median (mg/L)	Max (mg/L)
BIBG-10-1-4	13	37	0.02	2.0886	13	3.0	16.0	25

Full Mann-Kendall Analysis, Sorted by two-sided p-value

Location	Count	Mann-Kendall S	Two-sided p-value (for MK test)	Slope (mg/L/year)	Normalized Slope (%/year)	Min (mg/L)	Median (mg/L)	Max (mg/L)
TF 03-12-3	28	-261	0.00	-8.5035	-6	72	153.5	280
C38 08-1-4	23	-156	0.00	-0.6197	-3	12	19.0	25
CPF 98-8-3	32	-239	0.00	-0.3517	-3	6.6	10.6	22
GIQ8-10-2-4	18	75	0.00	1.6392	8	5.8	19.5	38
BI-13-3-4.5	15	-51	0.01	-0.5746	-7	5.5	8.4	13
BIBG-10-1-4	13	37	0.02	2.0886	13	3.0	16.0	25
MEBG-10-1-3	21	-65	0.05	-0.1428	-6	< 2.0	2.4	5
BIS 97-1-3	27	-91	0.05	-0.1986	-1	16	22.0	35
GIP11 09-1-4-R	9	-15	0.14	-3.1771	-35	5.0	9.1	50
ARB-12-3-3	19	-42	0.15	-0.8822	-6	7.0	16.0	32
GIP11 09-1-4	7	-9	0.23	-4.5933	-66	3.6	7.0	110
GIBG-10-2-3	17	29	0.24	0.2902	6	< 1.0	5.0	11
BIBG-12-1-7	4	-4	0.30	-0.5959	-7	7.5	8.65	11
WSY 97-1-5	29	55	0.31	0.2915	1	6.5	20.3	64
MTF 97-1-5	27	-38	0.43	-0.0091	-1	< 1.0	1.4	3.4
BI-13-1-4	14	7	0.74	0.1460	2	2.5	8.1	12
CPF 97-7-5	33	-12	0.86	0.0000	0	7.7	14.0	190

Table F-2
Mann-Kendall Statistical Analysis (1998-2022) - Benzene

Filtered Trend Results, two-sided p-value < 0.05 And Normalized Slope > ± 10%/Year

Location	Count	Mann-Kendall S	Two-sided p-value (for MK test)	Slope (mg/L/year)	Normalized Slope (%/year)	Min (mg/L)	Median (mg/L)	Max (mg/L)
----------	-------	-------------------	---------------------------------------	----------------------	---------------------------------	---------------	------------------	---------------

Full Mann-Kendall Analysis, Sorted by two-sided p-value

Location	Count	Mann-Kendall S	Two-sided p-value (for MK test)	Slope (mg/L/year)	Normalized Slope (%/year)	Min (mg/L)	Median (mg/L)	Max (mg/L)
CPF 98-8-3	32	-213	0.00	0.0000	0	< 0.0004	0.0002	< 0.0050
CPF 97-7-5	31	-192	0.00	0.0000	0	< 0.0004	0.0002	< 0.0050
WSY 97-1-5	28	-132	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
BIS 97-1-3	23	-102	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
TF 03-12-3	28	-111	0.00	0.0000	0	< 0.0004	0.0002	0.0017
C38 08-1-4	23	101	0.00	0.0000	0	< 0.0004	0.0002	0.00093
MTF 97-1-5	23	-60	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
BI-13-3-4.5	15	-8	0.41	0.0000	0	< 0.00040	0.0002	0.00042
MEBG-10-1-3	21	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
ARB-12-3-3	19	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
GIQ8-10-2-4	18	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
GIBG-10-2-3	17	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
BI-13-1-4	13	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
BIBG-10-1-4	13	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
GIP11 09-1-4-R	9	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
GIP11 09-1-4	7	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
BIBG-12-1-7	4	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040

Table F-3
Mann-Kendall Statistical Analysis (1998-2022) - Toluene

Filtered Trend Results, two-sided p-value < 0.05 And Normalized Slope > ± 10%/Year

Location	Count	Mann-Kendall S	Two-sided p-value (for MK test)	Slope (mg/L/year)	Normalized Slope (%/year)	Min (mg/L)	Median (mg/L)	Max (mg/L)
----------	-------	-------------------	---------------------------------------	----------------------	---------------------------------	---------------	------------------	---------------

Full Mann-Kendall Analysis, Sorted by two-sided p-value

Location	Count	Mann-Kendall S	Two-sided p-value (for MK test)	Slope (mg/L/year)	Normalized Slope (%/year)	Min (mg/L)	Median (mg/L)	Max (mg/L)
CPF 98-8-3	32	-219	0.00	0.0000	0	< 0.0004	0.0002	< 0.0050
CPF 97-7-5	31	-197	0.00	0.0000	0	< 0.0004	0.0002	< 0.0050
WSY 97-1-5	28	-132	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
BIS 97-1-3	23	-102	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
TF 03-12-3	28	-96	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
MTF 97-1-5	23	-60	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
GIQ8-10-2-4	18	17	0.12	0.0000	0	< 0.00040	0.0002	0.00041
C38 08-1-4	23	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
MEBG-10-1-3	21	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
ARB-12-3-3	19	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
GIBG-10-2-3	17	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
BI-13-3-4.5	15	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
BI-13-1-4	13	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
BIBG-10-1-4	13	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
GIP11 09-1-4-R	9	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
GIP11 09-1-4	7	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
BIBG-12-1-7	4	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040

Table F-4
Mann-Kendall Statistical Analysis (1998-2022) - Ethylbenzene

Filtered Trend Results, two-sided p-value < 0.05 And Normalized Slope > ± 10%/Year

Location	Count	Mann-Kendall S	Two-sided p-value (for MK test)	Slope (mg/L/year)	Normalized Slope (%/year)	Min (mg/L)	Median (mg/L)	Max (mg/L)
----------	-------	-------------------	---------------------------------------	----------------------	---------------------------------	---------------	------------------	---------------

Full Mann-Kendall Analysis, Sorted by two-sided p-value

Location	Count	Mann-Kendall S	Two-sided p-value (for MK test)	Slope (mg/L/year)	Normalized Slope (%/year)	Min (mg/L)	Median (mg/L)	Max (mg/L)
CPF 98-8-3	32	-213	0.00	0.0000	0	< 0.0004	0.0002	< 0.0050
CPF 97-7-5	31	-192	0.00	0.0000	0	< 0.0004	0.0002	< 0.0050
WSY 97-1-5	28	-132	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
BIS 97-1-3	23	-102	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
TF 03-12-3	28	-96	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
MTF 97-1-5	23	-60	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
C38 08-1-4	23	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
MEBG-10-1-3	21	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
ARB-12-3-3	19	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
GIQ8-10-2-4	18	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
GIBG-10-2-3	17	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
BI-13-3-4.5	15	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
BI-13-1-4	13	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
BIBG-10-1-4	13	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
GIP11 09-1-4-R	9	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
GIP11 09-1-4	7	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
BIBG-12-1-7	4	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040

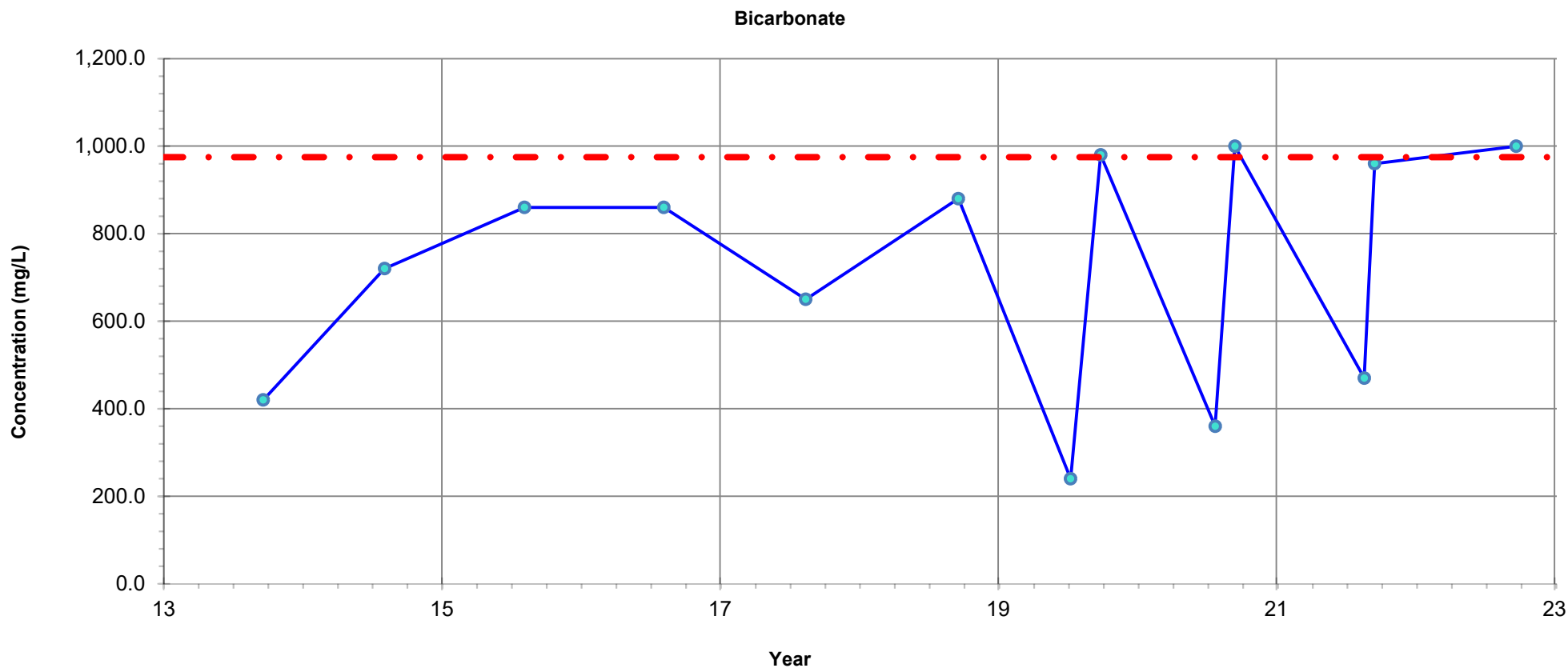
Table F-5
Mann-Kendall Statistical Analysis (1998-2022) - Xylenes-Total

Filtered Trend Results, two-sided p-value < 0.05 And Normalized Slope > ± 10%/Year

Location	Count	Mann-Kendall S	Two-sided p-value (for MK test)	Slope (mg/L/year)	Normalized Slope (%/year)	Min (mg/L)	Median (mg/L)	Max (mg/L)
----------	-------	-------------------	---------------------------------------	----------------------	---------------------------------	---------------	------------------	---------------

Full Mann-Kendall Analysis, Sorted by two-sided p-value

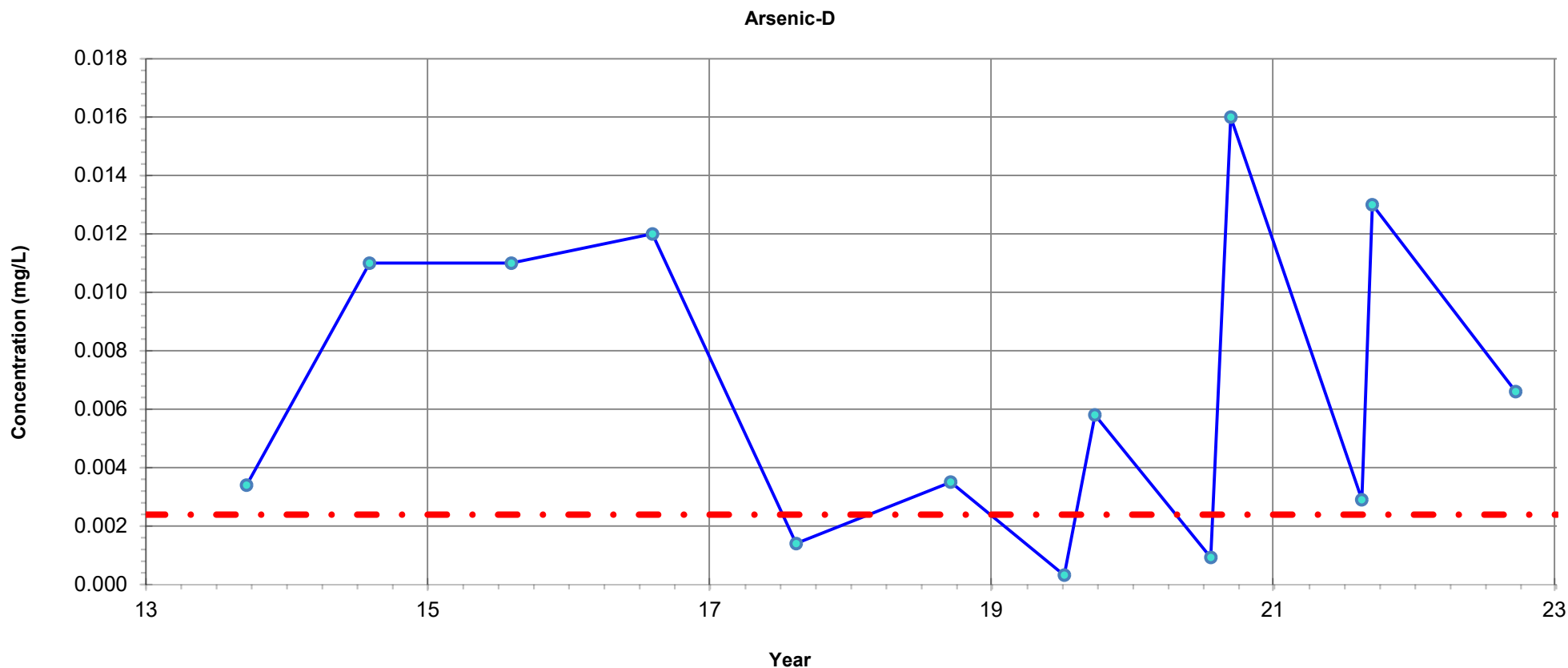
Location	Count	Mann-Kendall S	Two-sided p-value (for MK test)	Slope (mg/L/year)	Normalized Slope (%/year)	Min (mg/L)	Median (mg/L)	Max (mg/L)
C38 08-1-4	23	130	0.00	0.0000	1	< 0.0008	0.0004	< 0.00089
MEBG-10-1-3	21	110	0.00	0.0000	1	< 0.0008	0.0004	< 0.00089
GIQ8-10-2-4	18	83	0.00	0.0000	1	< 0.00080	0.000445	0.0016
ARB-12-3-3	19	90	0.00	0.0000	1	< 0.00080	0.000445	< 0.00089
GIBG-10-2-3	17	66	0.00	0.0000	0	< 0.0008	0.0004	< 0.00089
BIBG-10-1-4	13	40	0.00	0.0000	1	< 0.0008	0.0004	< 0.00089
BI-13-3-4.5	15	54	0.00	0.0000	1	< 0.00080	0.000445	< 0.00089
BI-13-1-4	13	40	0.01	0.0000	1	< 0.00080	0.000445	< 0.00089
MTF 97-1-5	23	82	0.01	0.0000	0	< 0.0005	0.000445	< 0.001
WSY 97-1-5	28	82	0.08	0.0000	0	< 0.0005	0.0004	< 0.0015
BIS 97-1-3	23	45	0.21	0.0000	0	< 0.0005	0.000445	< 0.0015
TF 03-12-3	28	45	0.33	0.0000	0	< 0.00080	0.0004225	< 0.0015
CPF 97-7-5	31	39	0.49	0.0000	0	< 0.0005	0.000445	< 0.0050
CPF 98-8-3	32	17	0.78	0.0000	0	< 0.0005	0.000445	< 0.0050
GIP11 09-1-4-R	9	0	1.00	0.0000	0	< 0.00089	0.000445	< 0.00089
GIP11 09-1-4	7	0	1.00	0.0000	0	< 0.0008	0.0004	< 0.0008
BIBG-12-1-7	4	0	1.00	0.0000	0	< 0.00080	0.0004	< 0.00080



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- - - GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

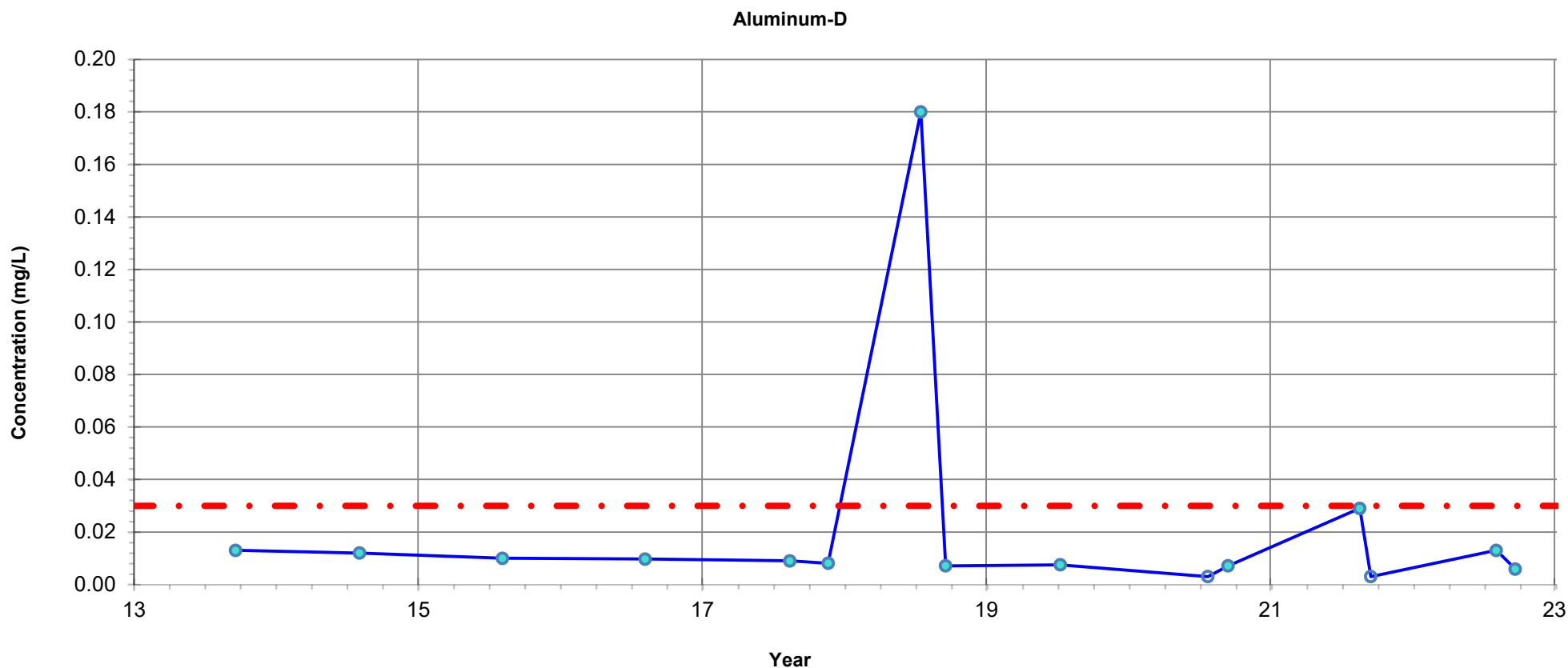
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BI-13-1-4									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER: 417085-42051-22100	Figure 1
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.									



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- - - GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

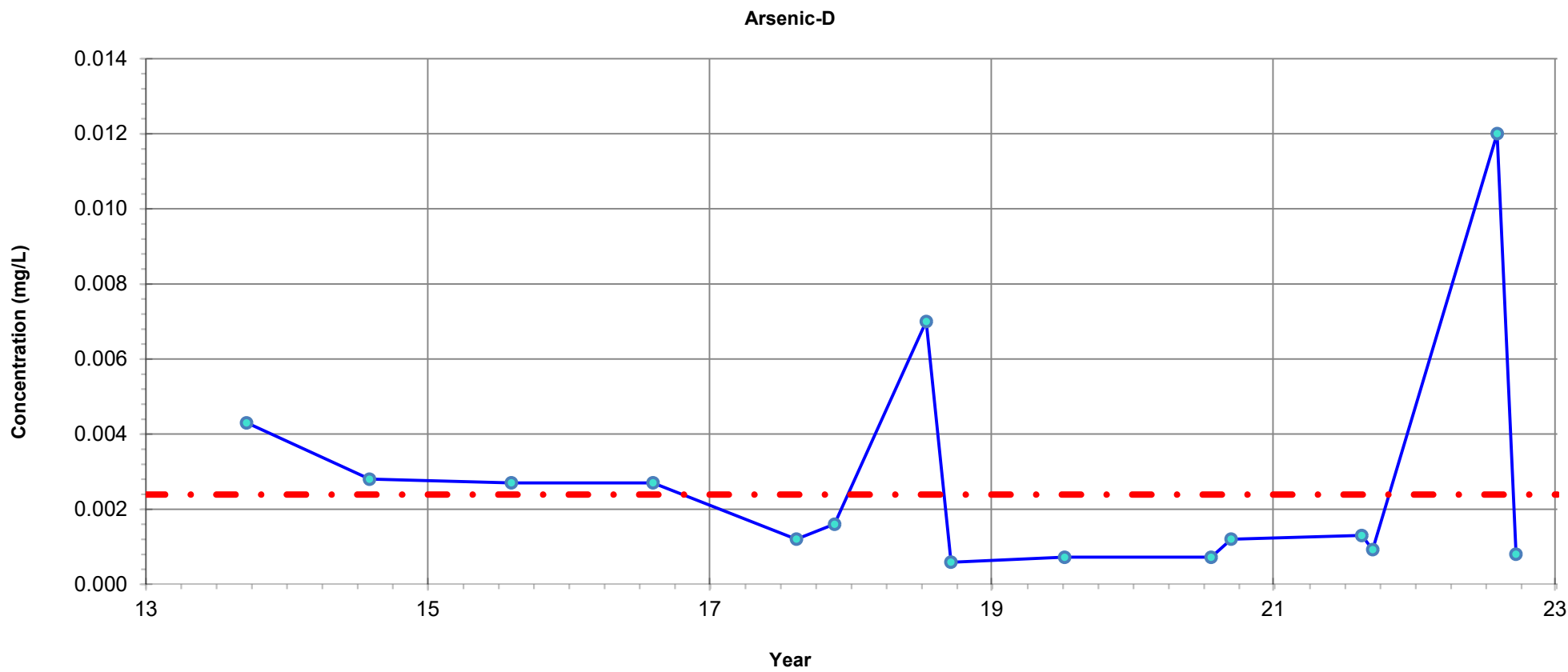
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BI-13-1-4				TRS Advisian 					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	2



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- - - GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

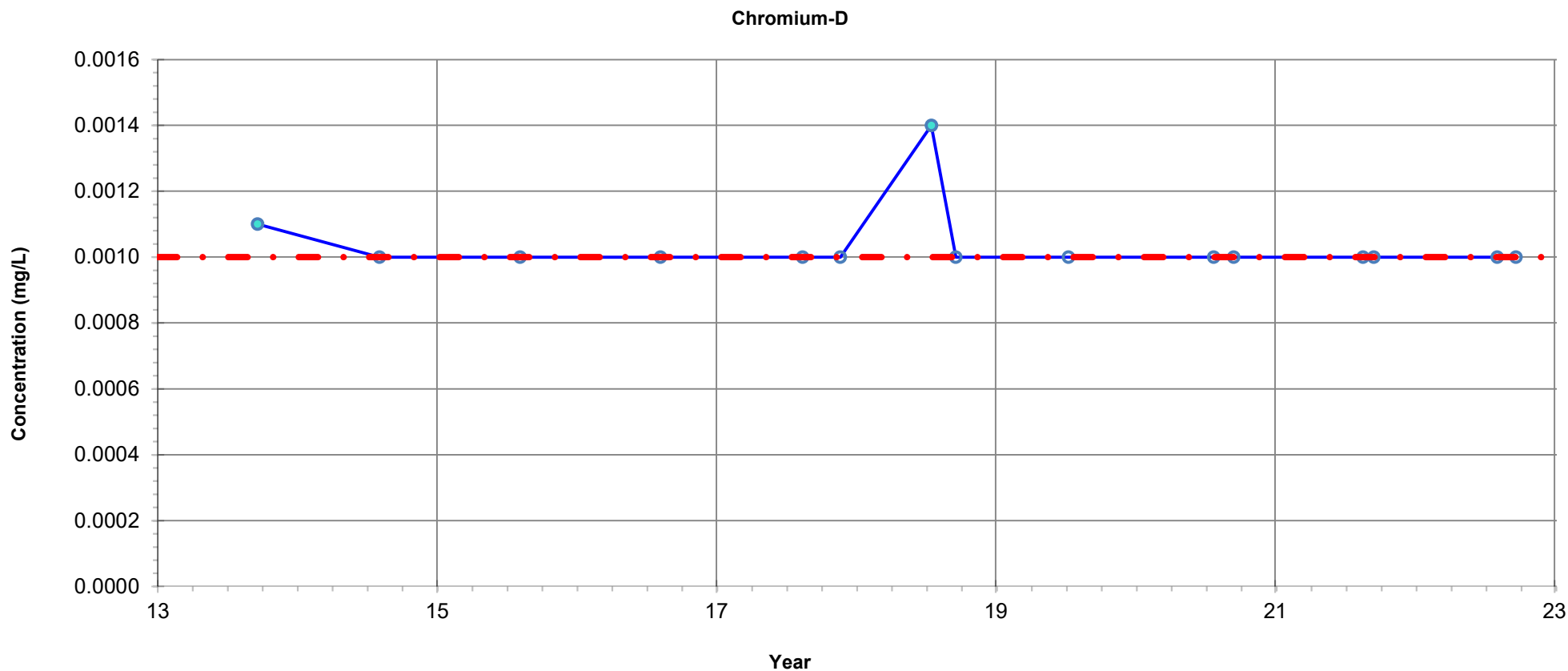
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BI-13-3-4.5									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	3



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- - - GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BI-13-3-4.5									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	4

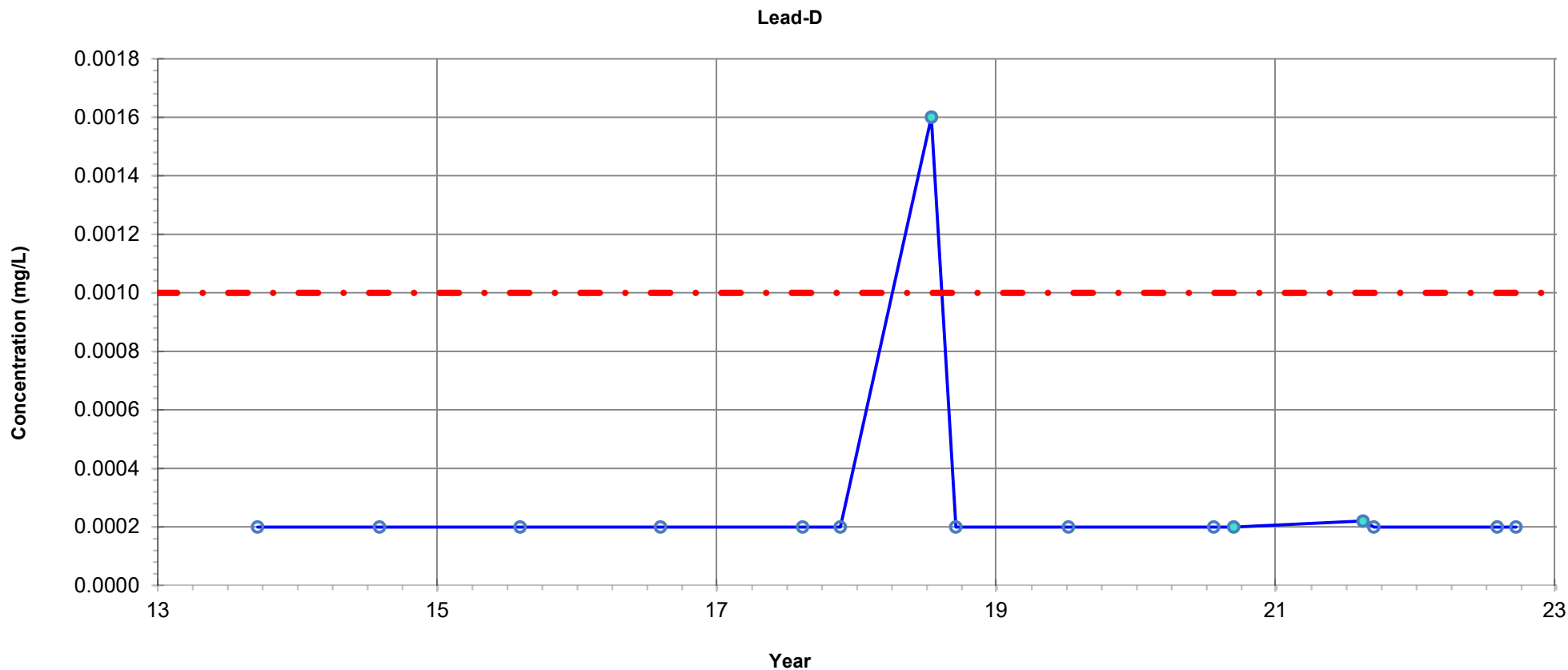


NOTES:

- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

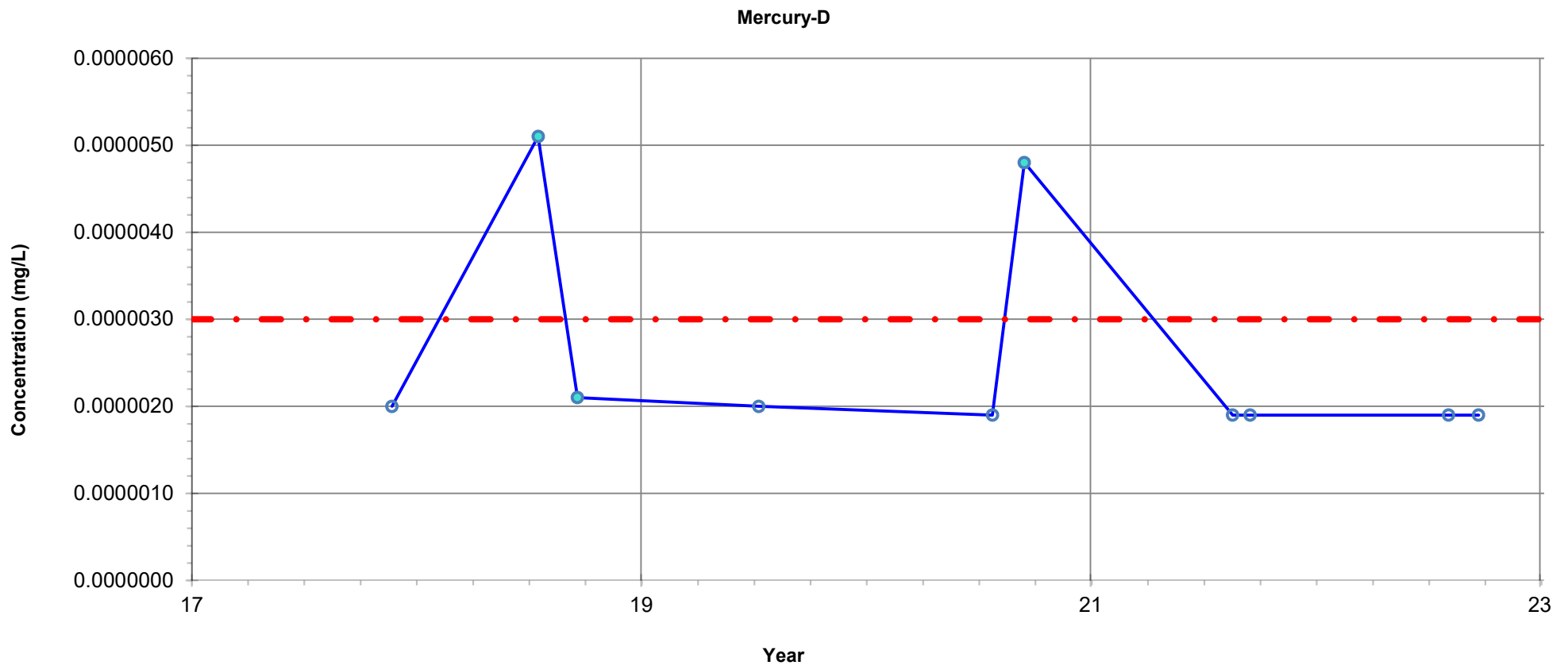
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BI-13-3-4.5				TRS Advisian 					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	5



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- **GUIDELINE:**
 Background - Island - Surficial
 Sediments - 95th Percentile

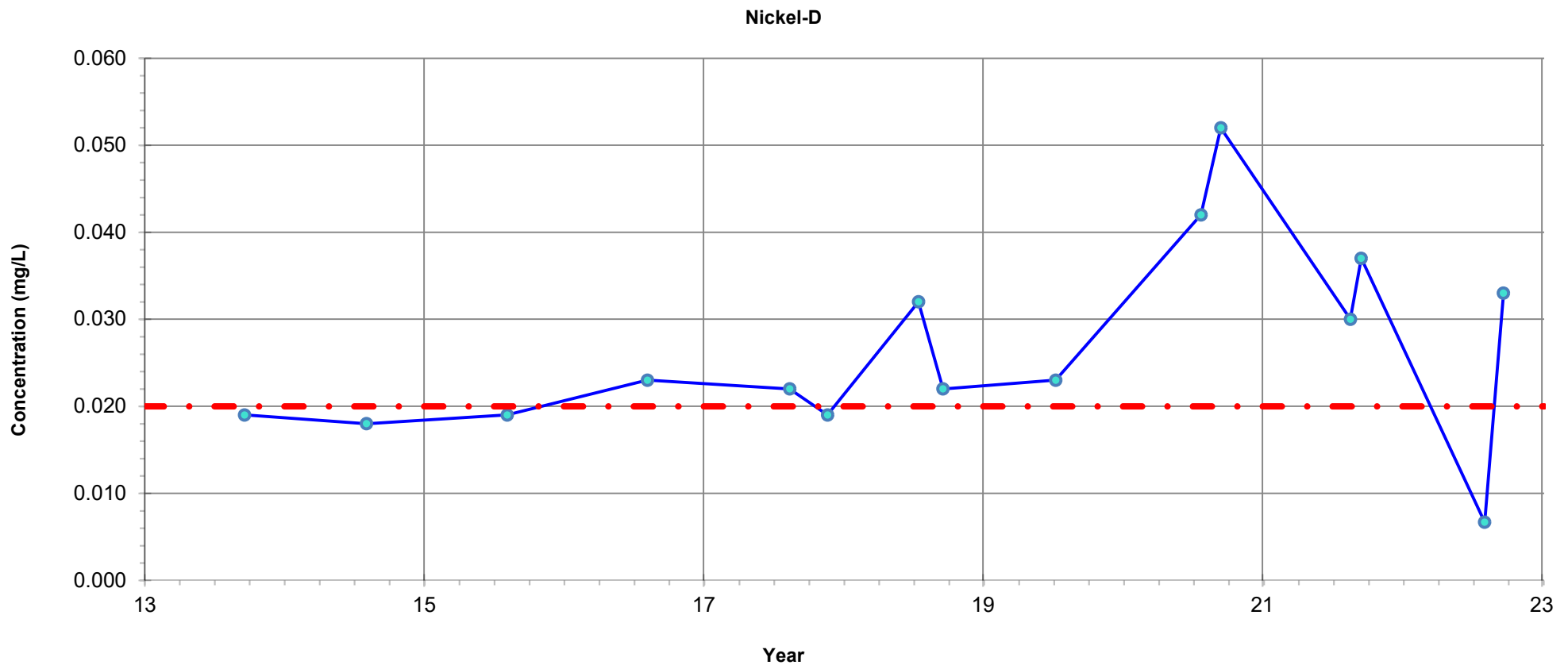
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BI-13-3-4.5				TPS Advisian 					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	6



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- **GUIDELINE:**
 Background - Island - Surficial
 Sediments - 95th Percentile

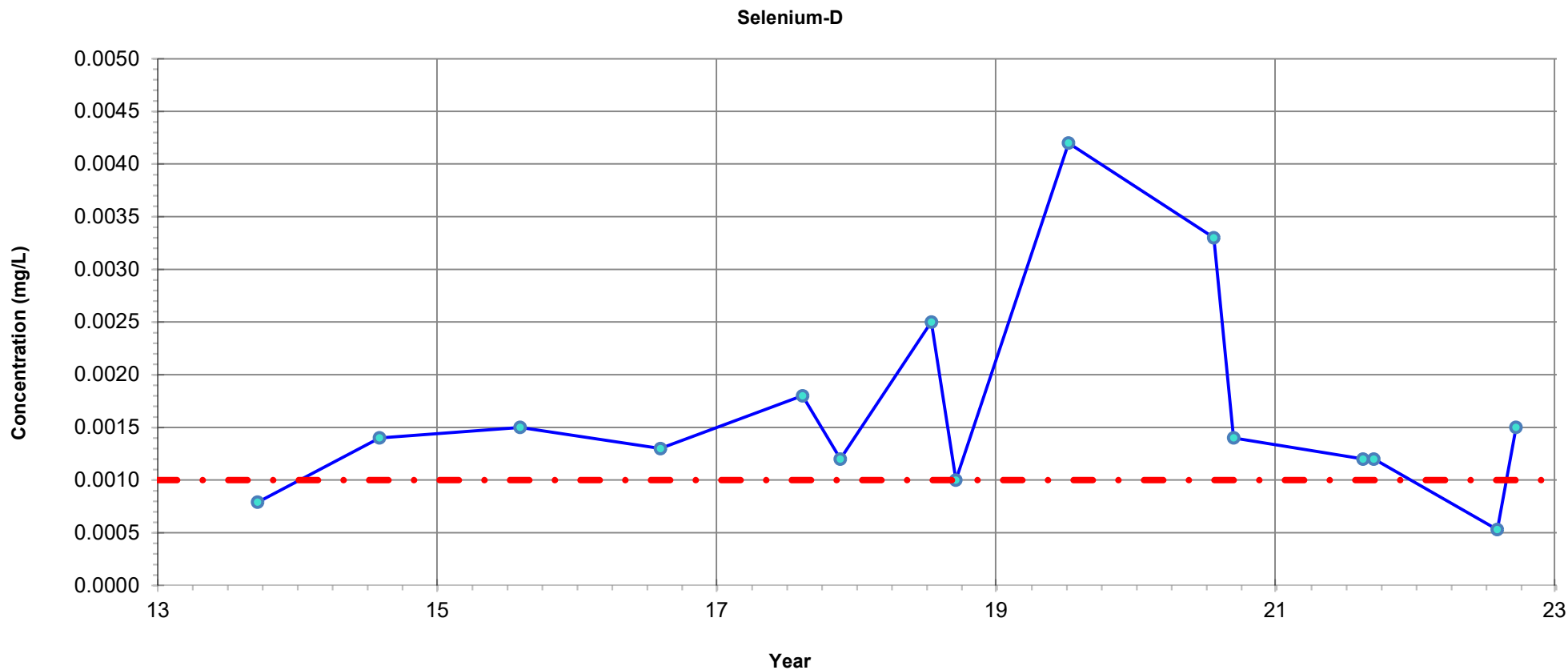
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BI-13-3-4.5				TRIS Advisian 					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	7



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

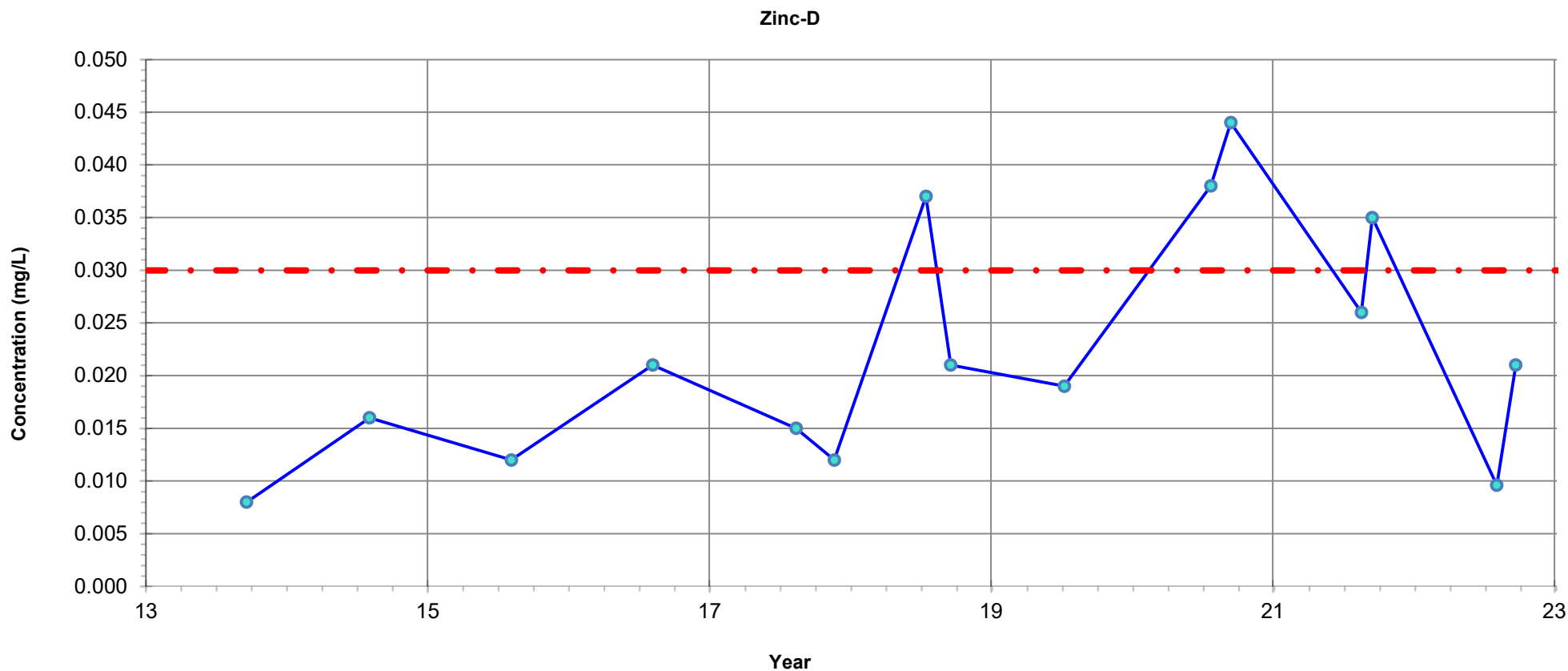
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BI-13-3-4.5									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	8



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

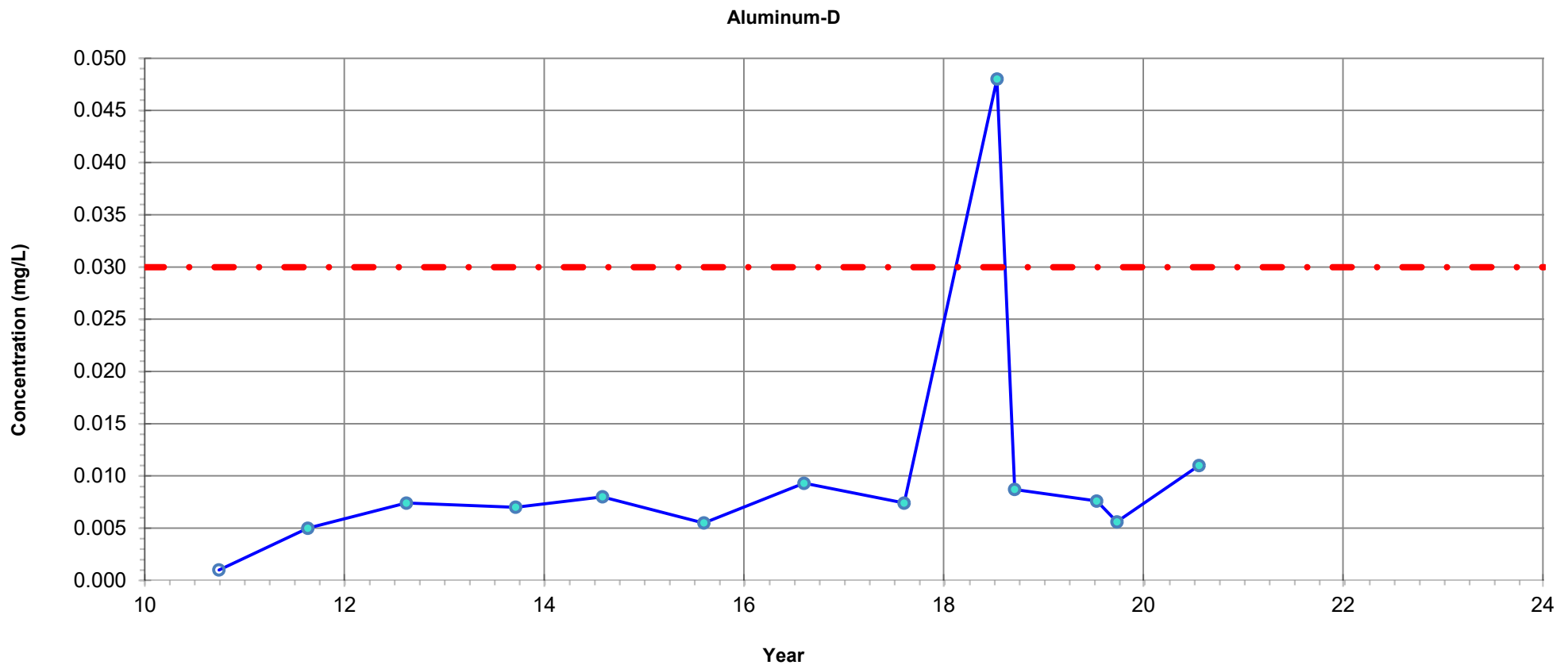
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BI-13-3-4.5					TRS Advisian 				
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	9



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BI-13-3-4.5				TRS Advisian 					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	10

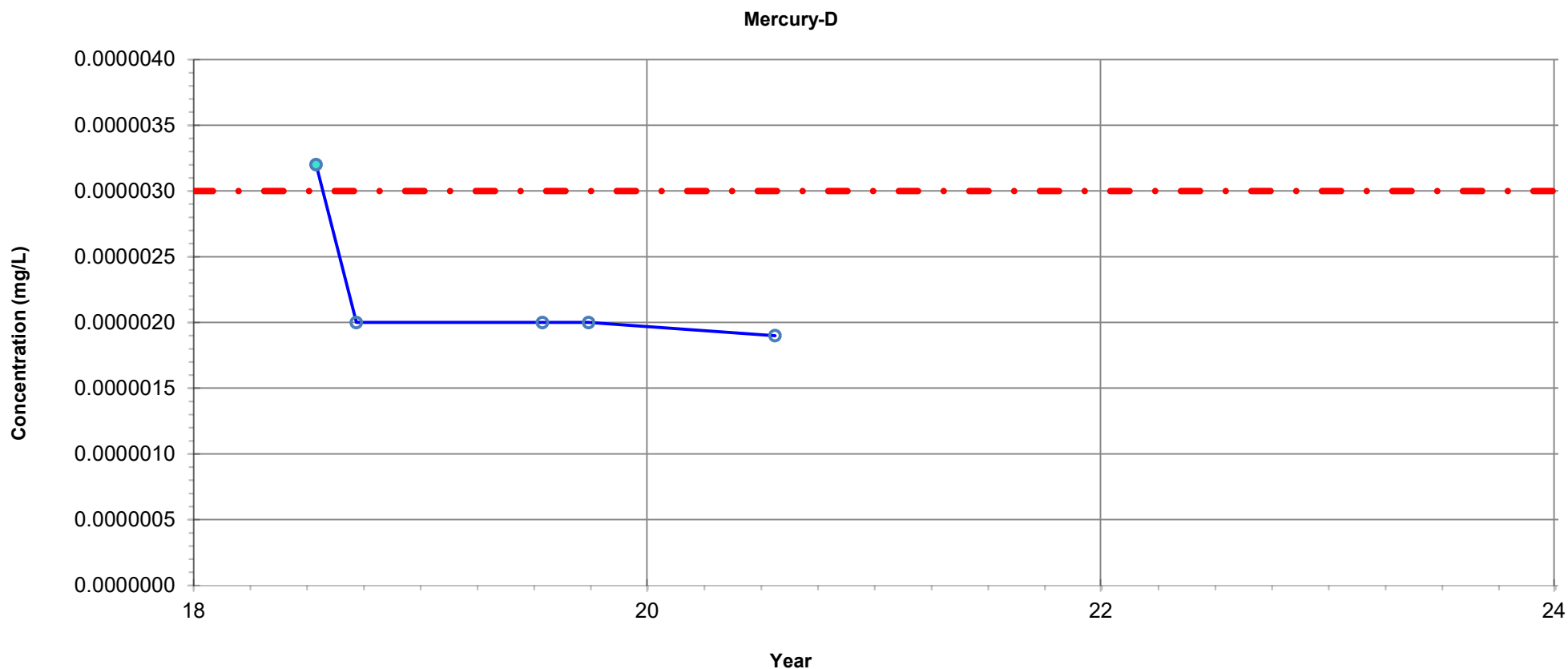


NOTES:

- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

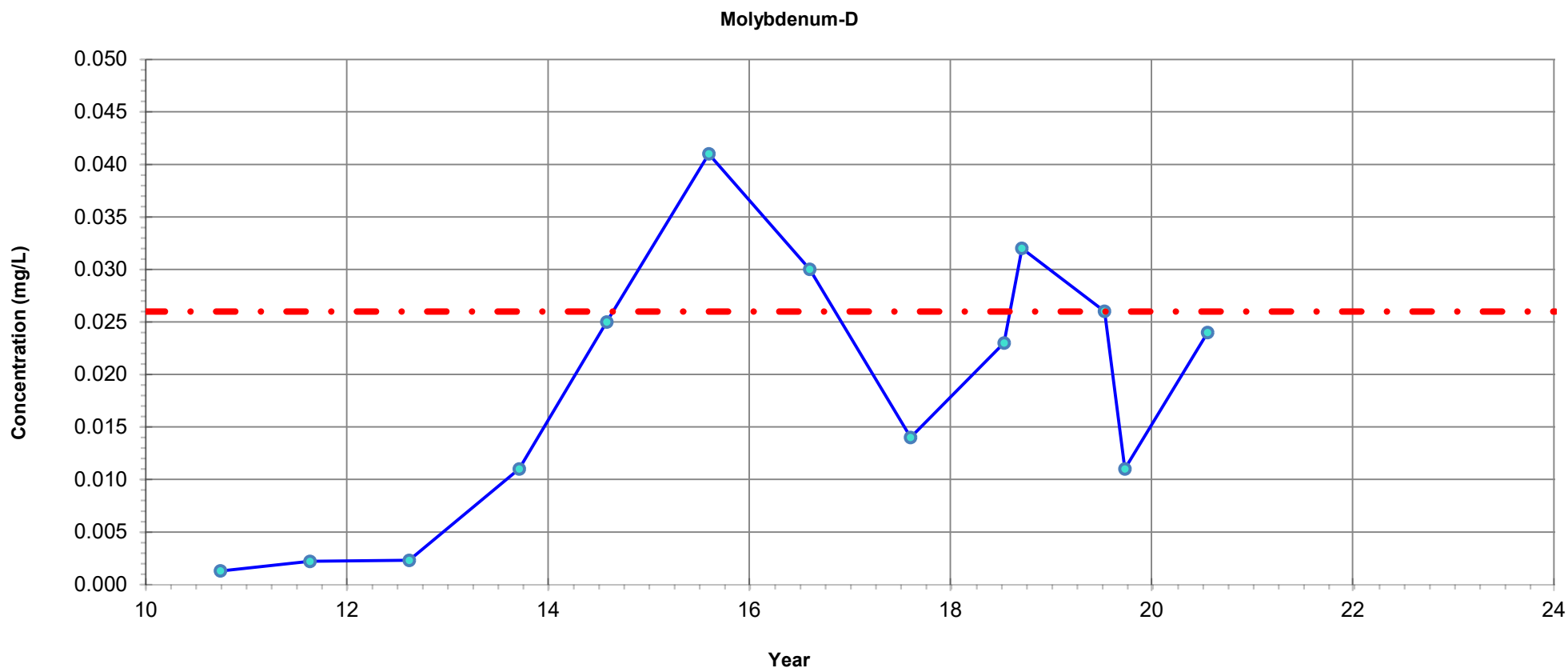
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BIBG-10-1-4									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	11



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- - - GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BIBG-10-1-4									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER: 417085-42051-22100	Figure 12
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.									

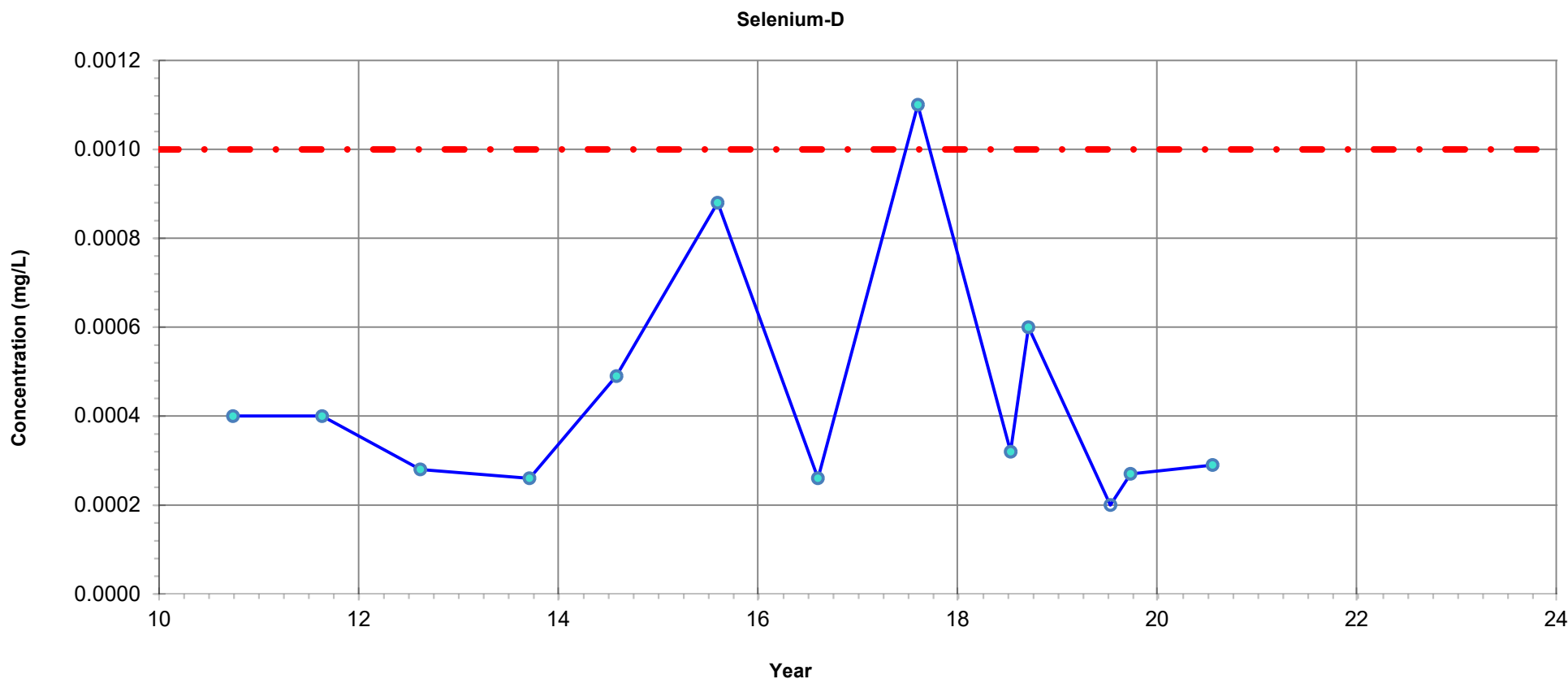


NOTES:

- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

- - - GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

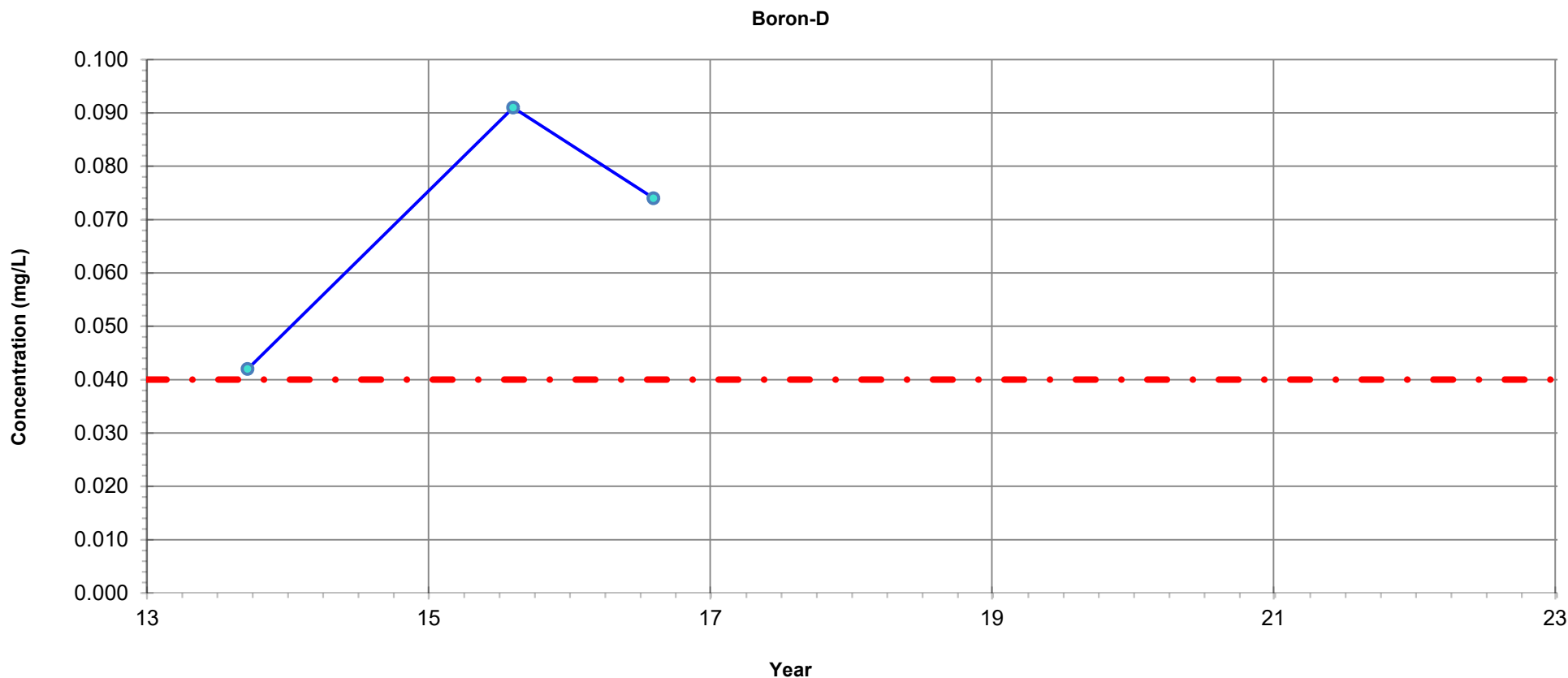
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BIBG-10-1-4									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	13



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- - - GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

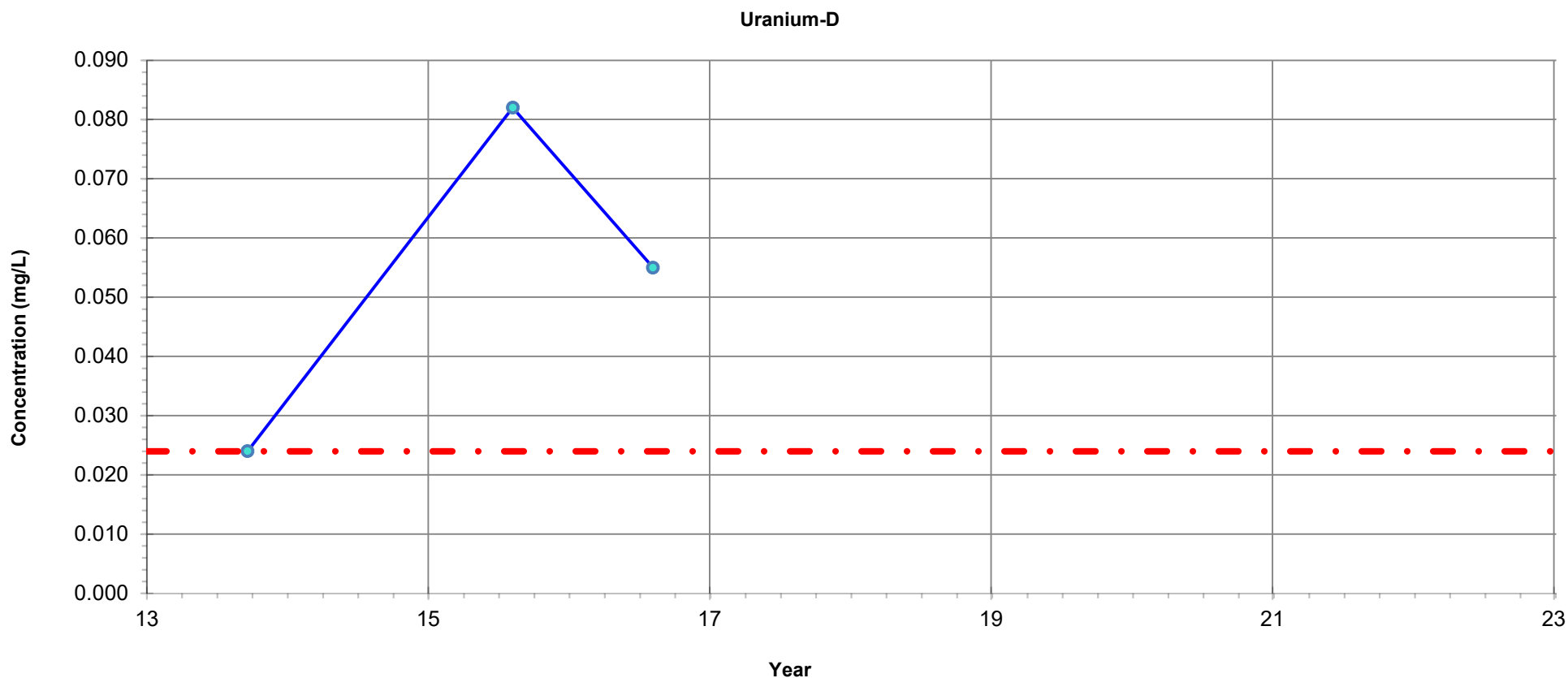
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BIBG-10-1-4				TRS Advisian 					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	14



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- - - GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BIBG-12-1-7				TRS Advisian 					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	15

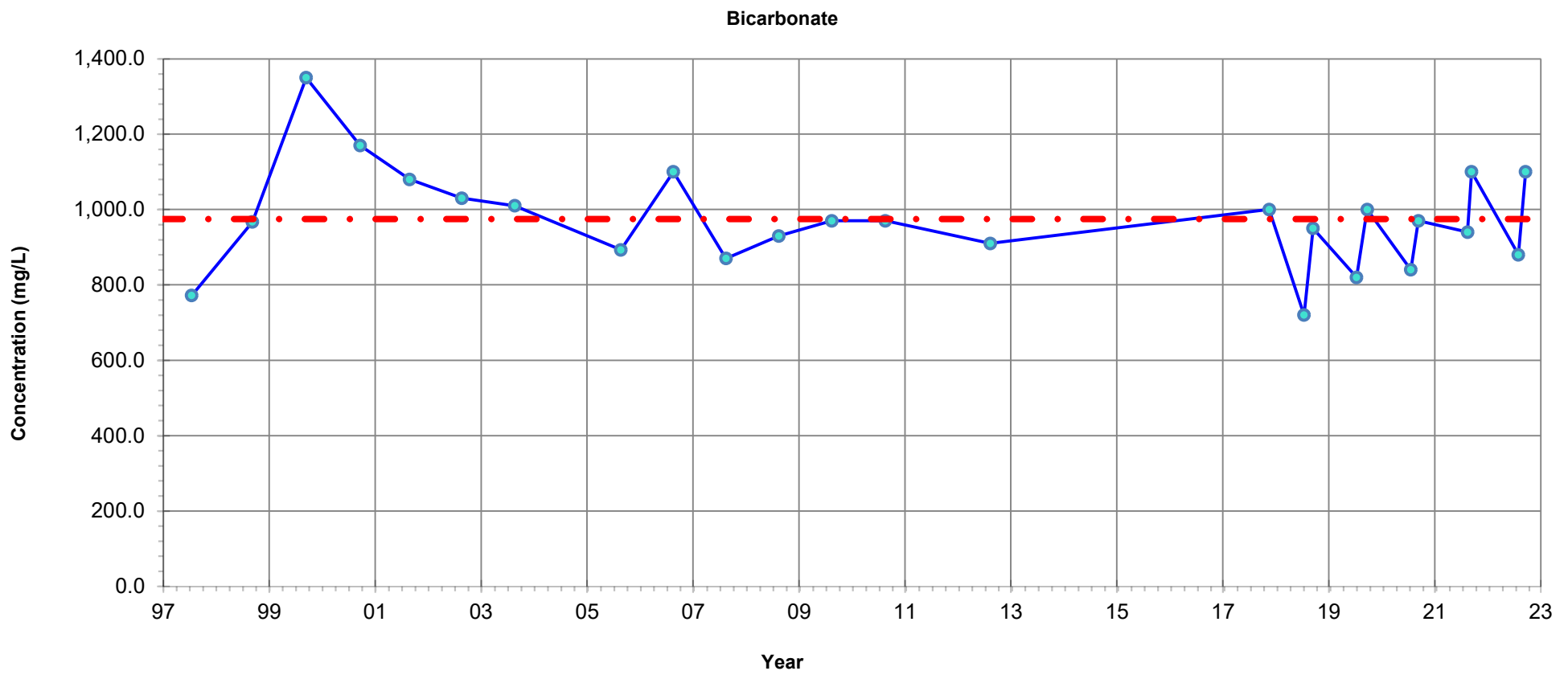


NOTES:

- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

- - - GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

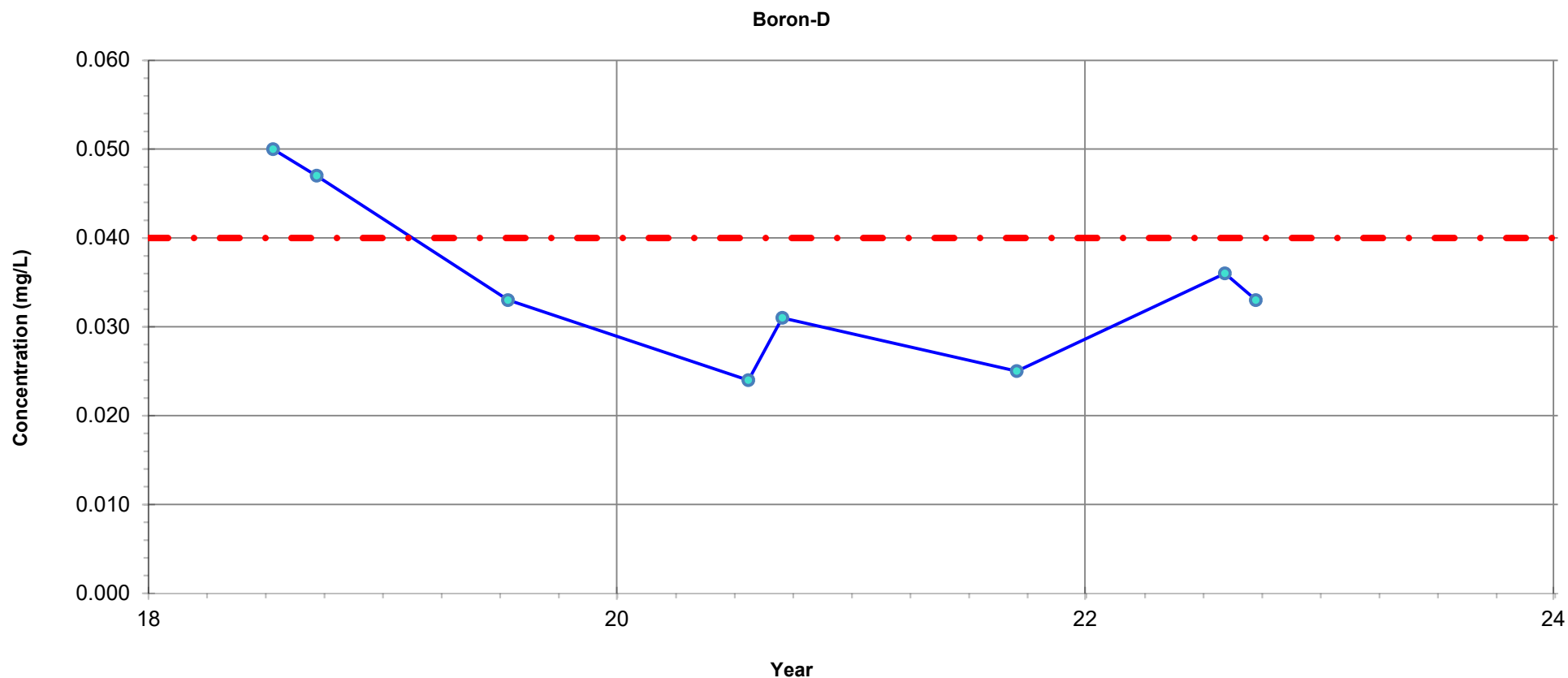
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BIBG-12-1-7									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER: 417085-42051-22100	Figure 16
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.									



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- - - GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

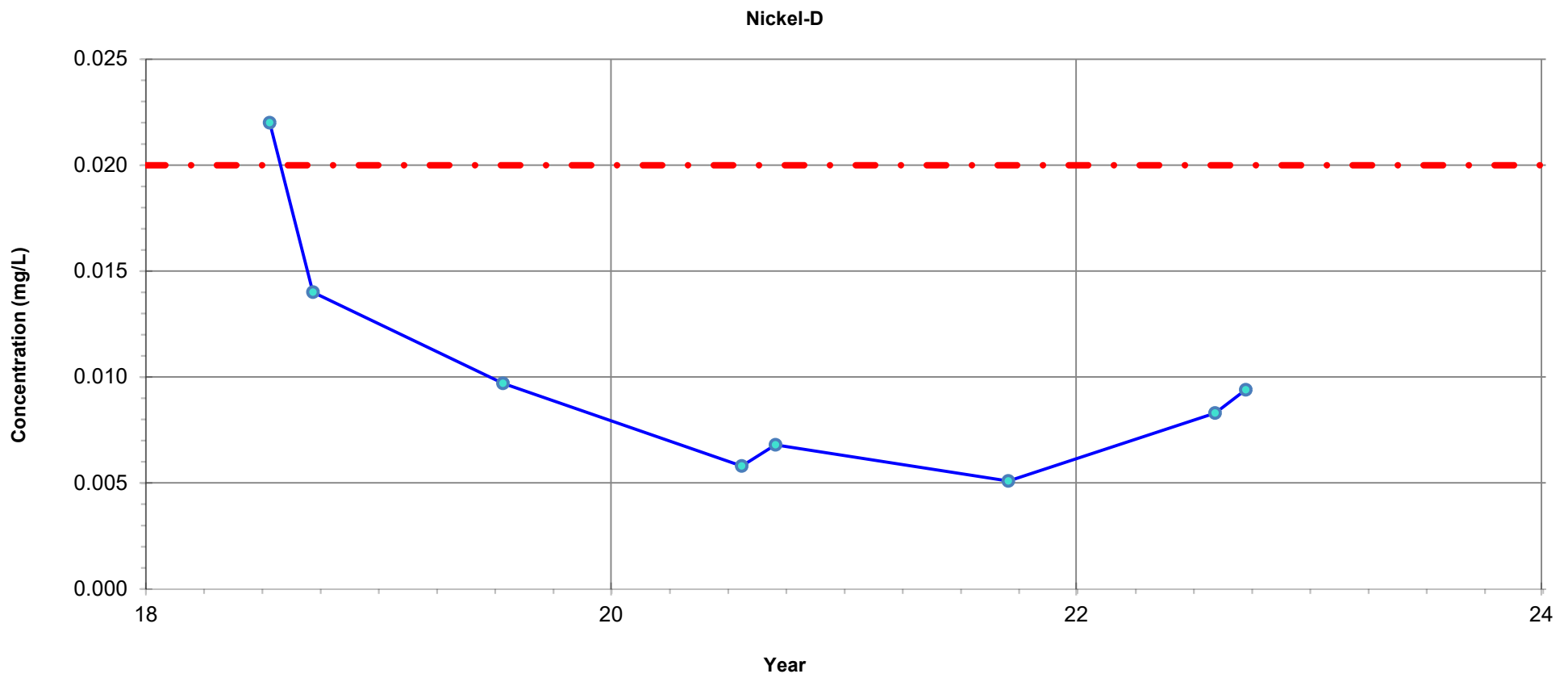
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: BIS 97-1-3					TRIS Advisian 				
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	17



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

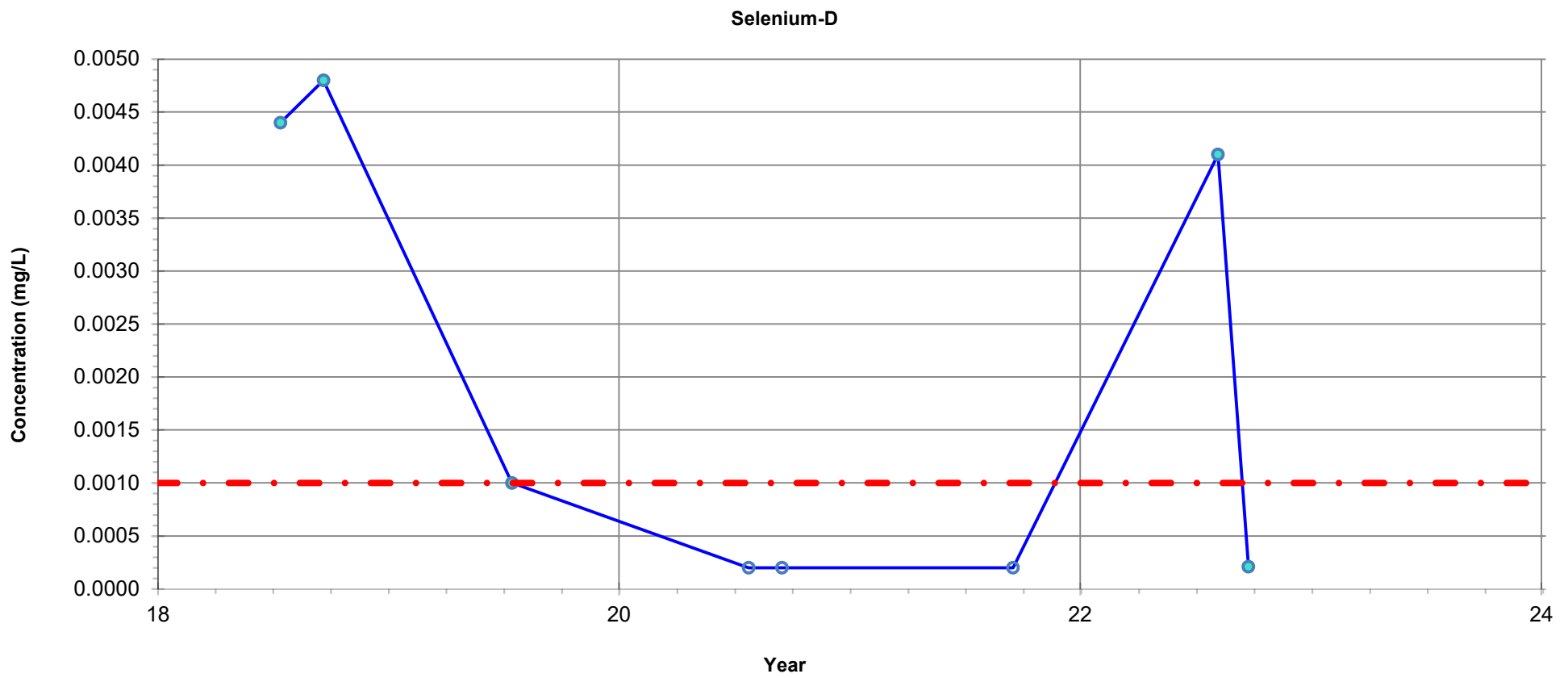
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: GIP11 09-1-4-R				TRS Advisian 					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	18



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

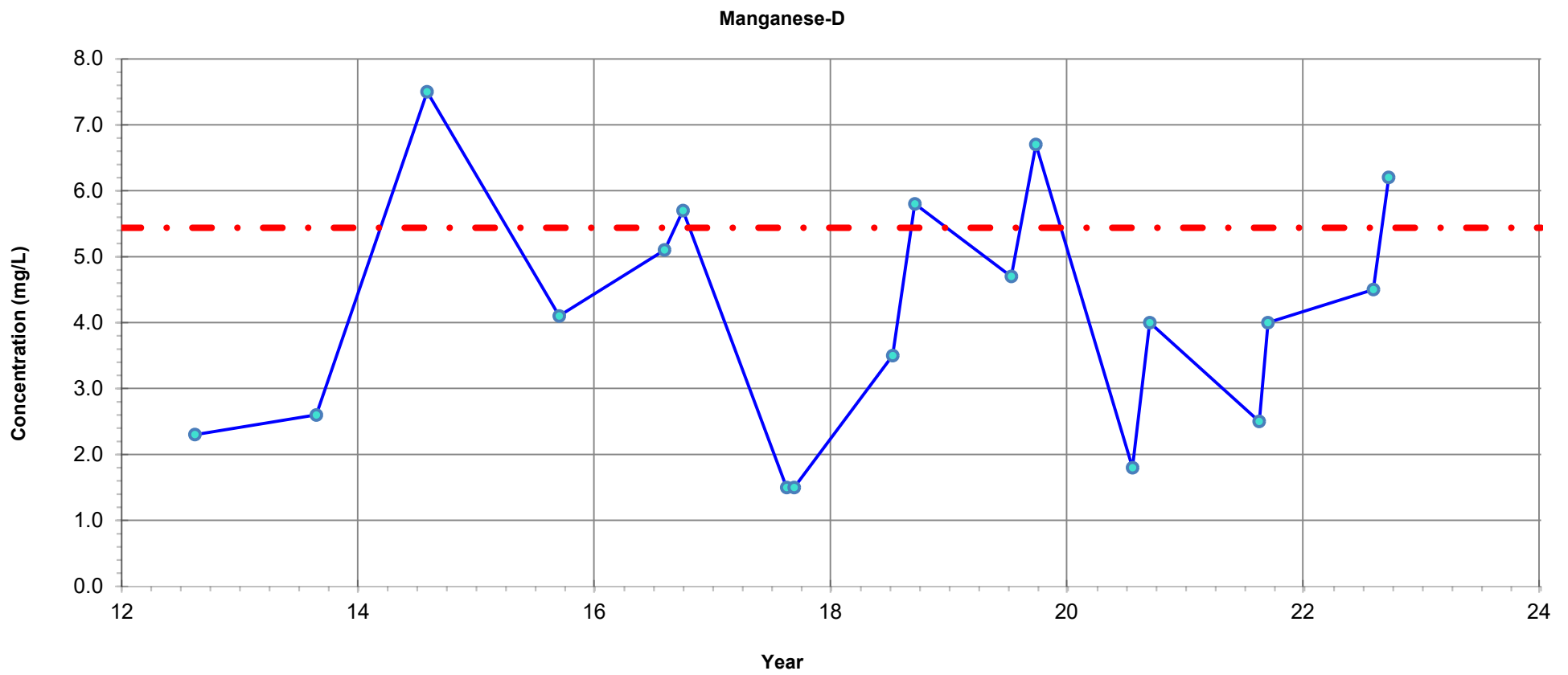
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: GIP11 09-1-4-R									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	19



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

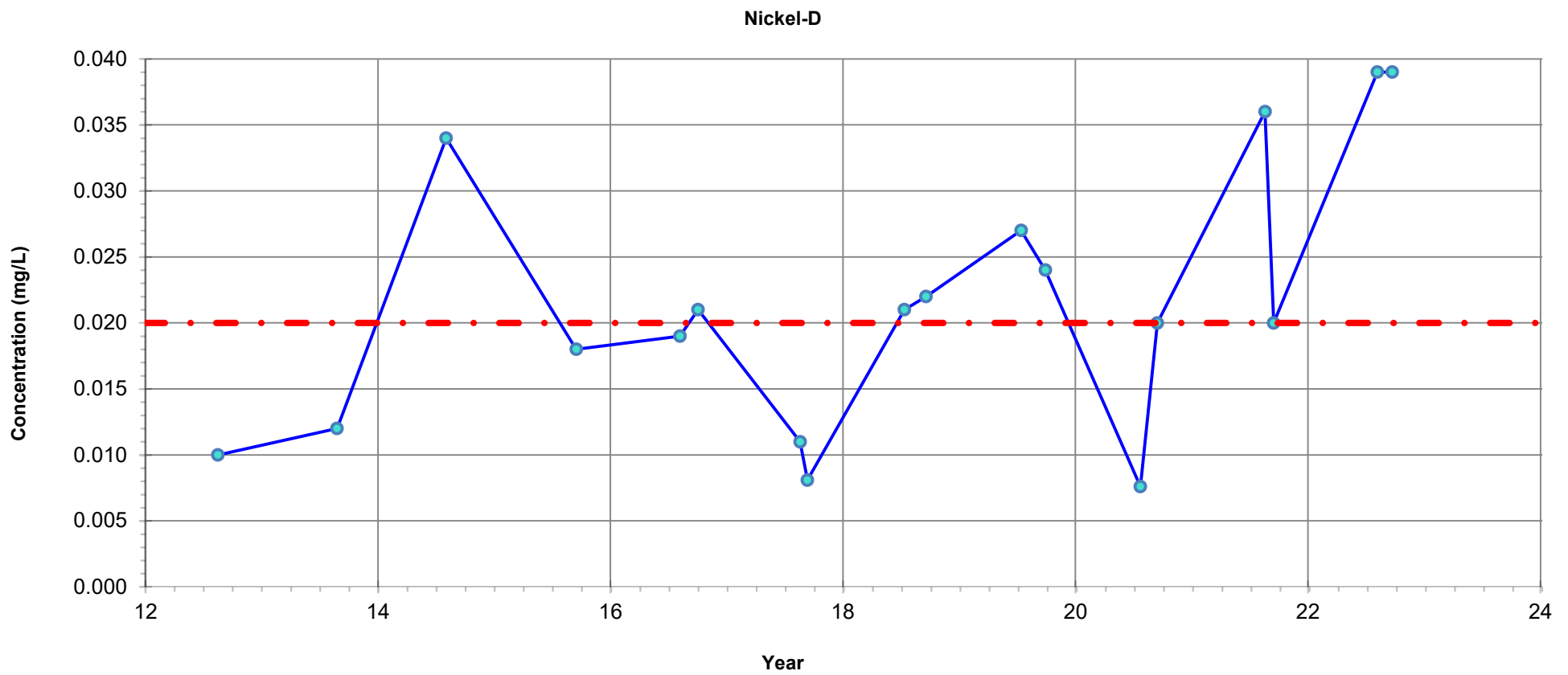
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: GIP11 09-1-4-R					TRIS Advisian 			
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.							PROJECT NUMBER: 417085-42051-22100	Figure 20



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- - - GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

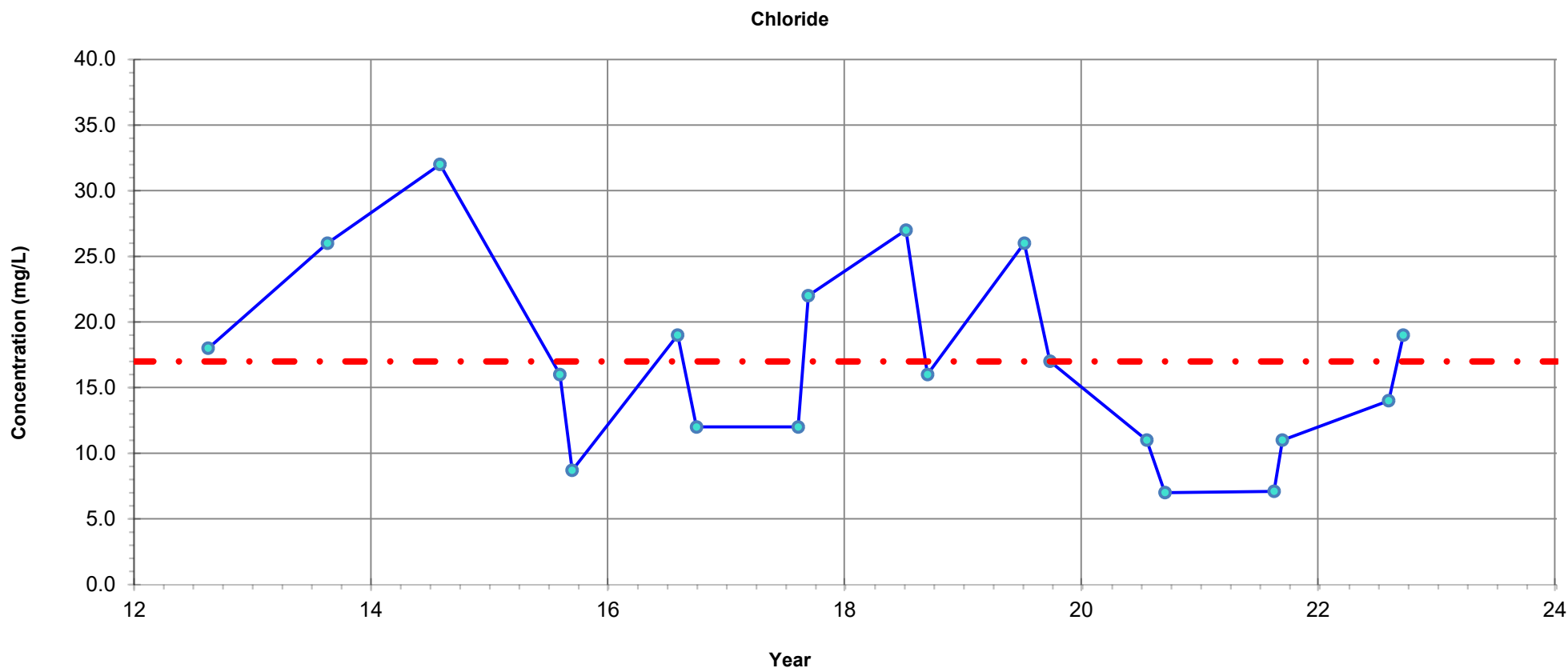
Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: GIQ8-10-2-4				TRIS Advisian 					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	21



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Island - Surficial
 Sediments - 95th Percentile

Imperial 2022 Background - Island Program Norman Wells, NT Trend Graphs Monitoring Well: GIQ8-10-2-4				TRIS Advisian 					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	22

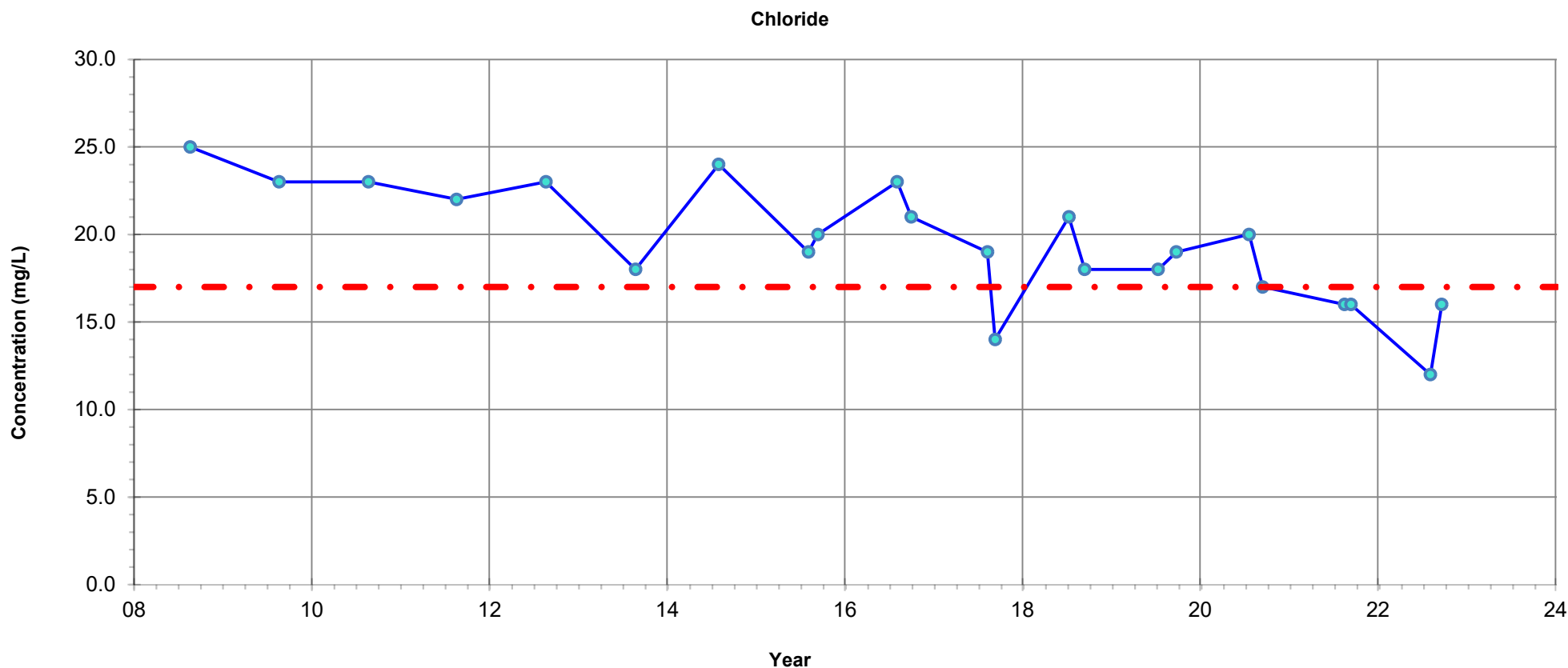


NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- . - **GUIDELINE:**
 Background - Mainland - Surficial
 Sediments - 95th Percentile

- - -
 - - -

Imperial							
2022 Background - Mainland Program							
Norman Wells, NT							
Trend Graphs							
Monitoring Well: ARB-12-3-3							
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.						PROJECT NUMBER: 417085-42051-22100	Figure 1

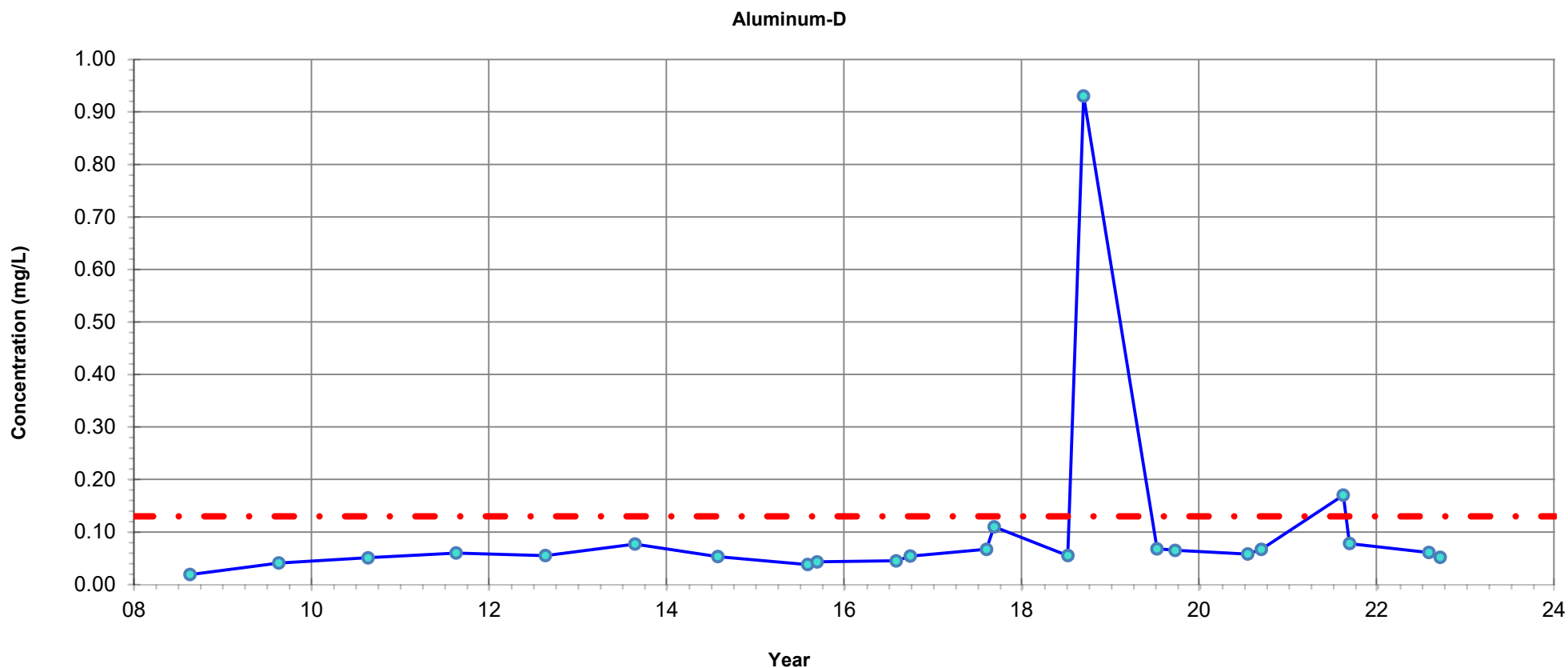


NOTES:

- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Mainland - Surficial
 Sediments - 95th Percentile

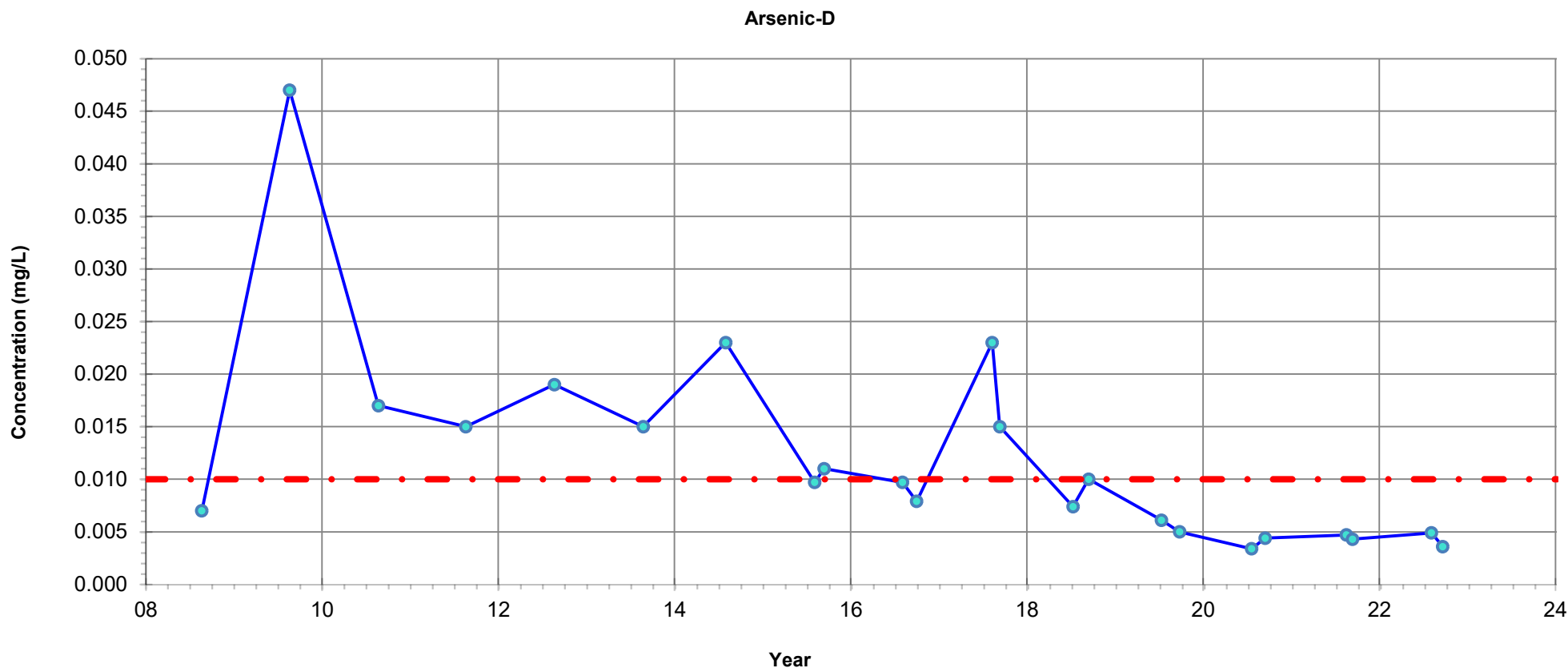
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: C38 08-1-4				TRS Advisian 							
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by				
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								PROJECT NUMBER: 417085-42051-22100		Figure 2	



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- . - **GUIDELINE:**
 Background - Mainland - Surficial
 Sediments - 95th Percentile

Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: C38 08-1-4					TRS Advisian				
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER: 417085-42051-22100	Figure 3
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.									

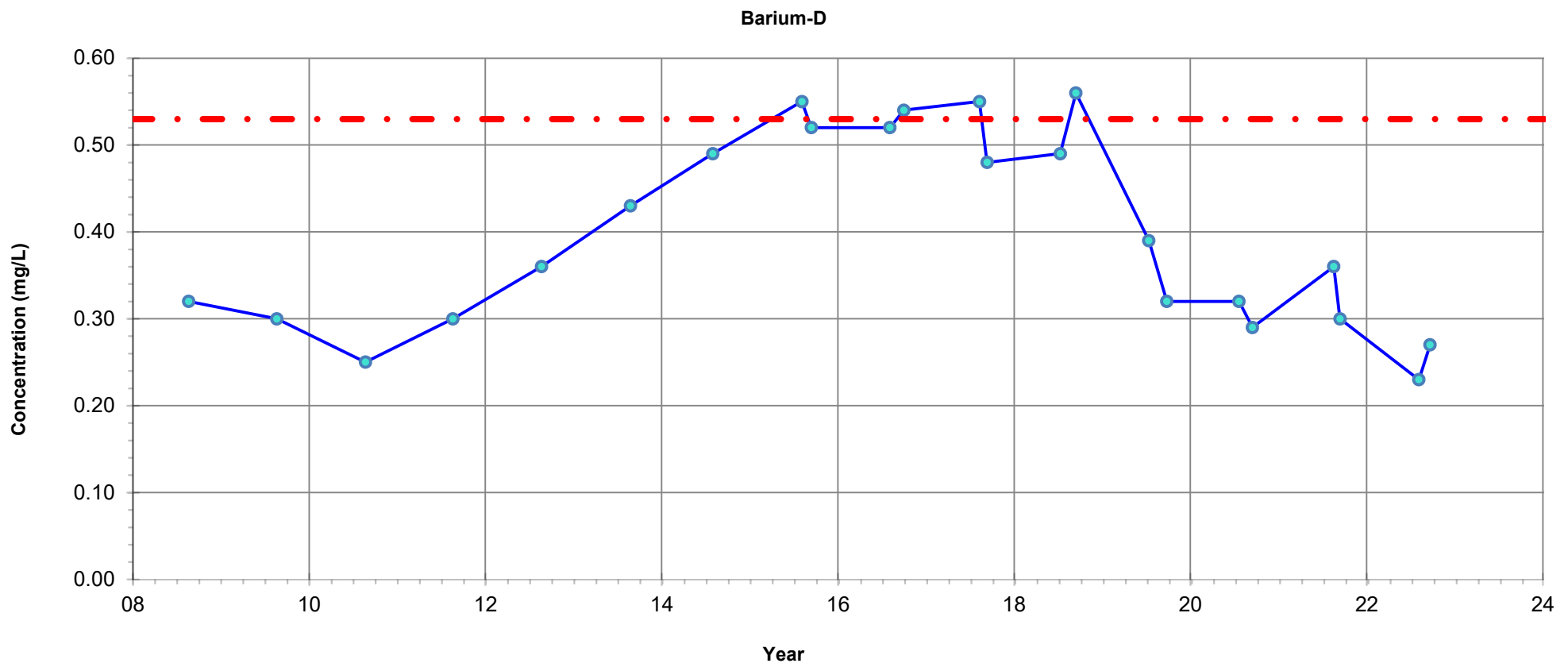


NOTES:

- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

- - - GUIDELINE:
 Background - Mainland - Surficial
 Sediments - 95th Percentile

Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: C38 08-1-4				TRIS Advisian 					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	4

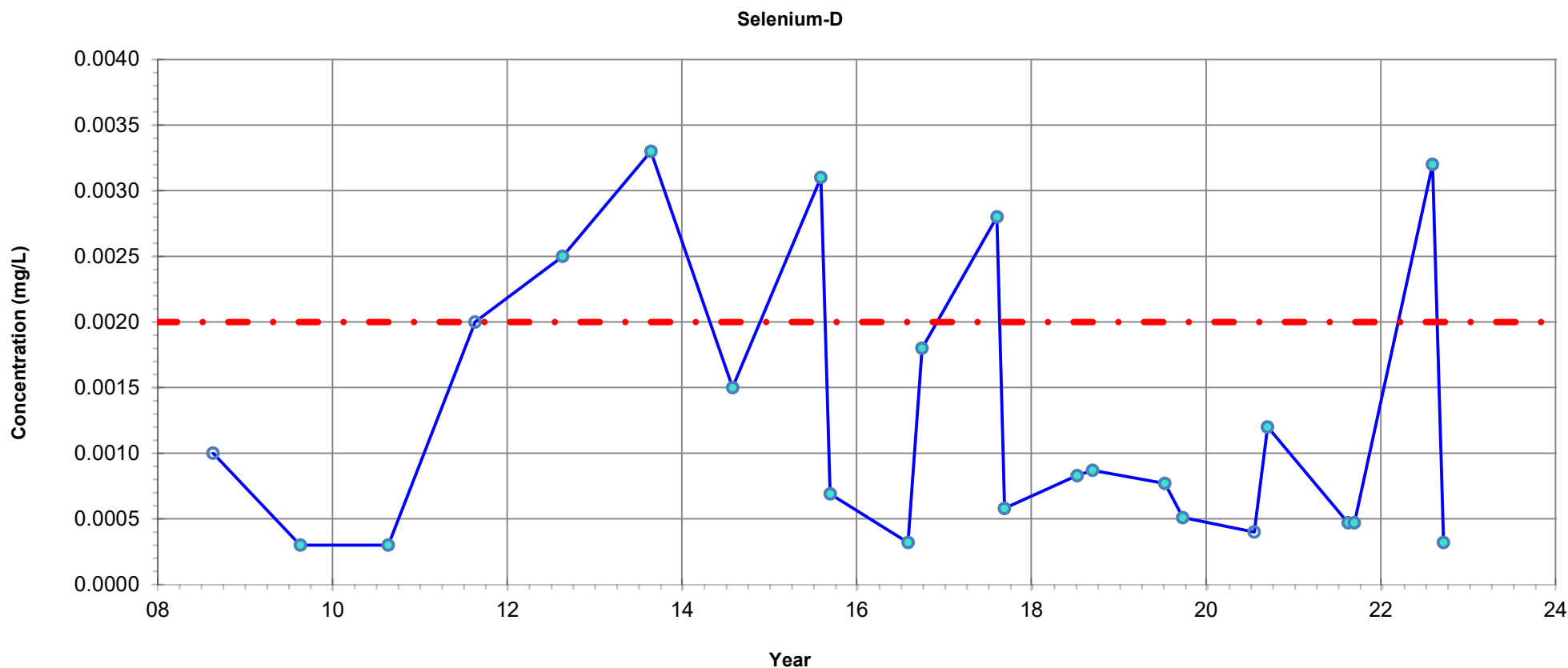


NOTES:

- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

- - - GUIDELINE:
 Background - Mainland - Surficial
 Sediments - 95th Percentile

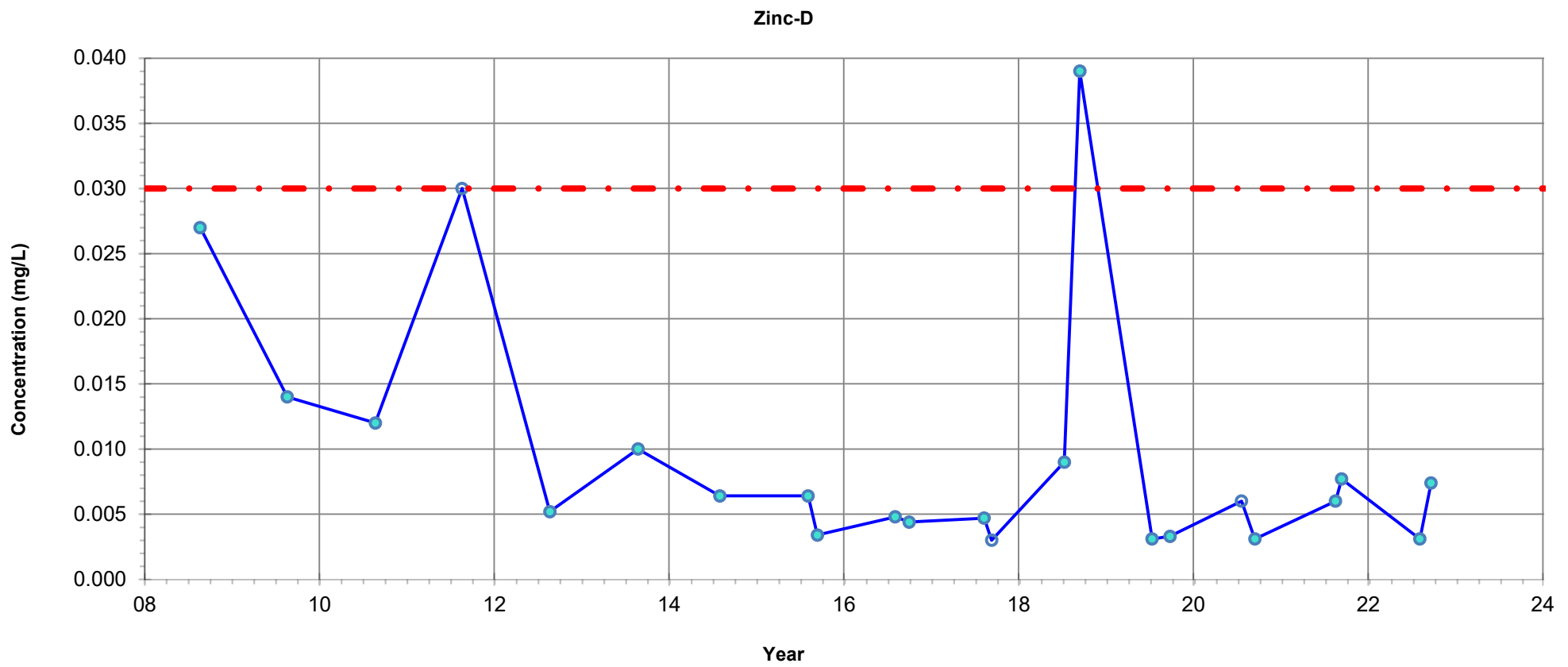
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: C38 08-1-4									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	5



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Mainland - Surficial
 Sediments - 95th Percentile

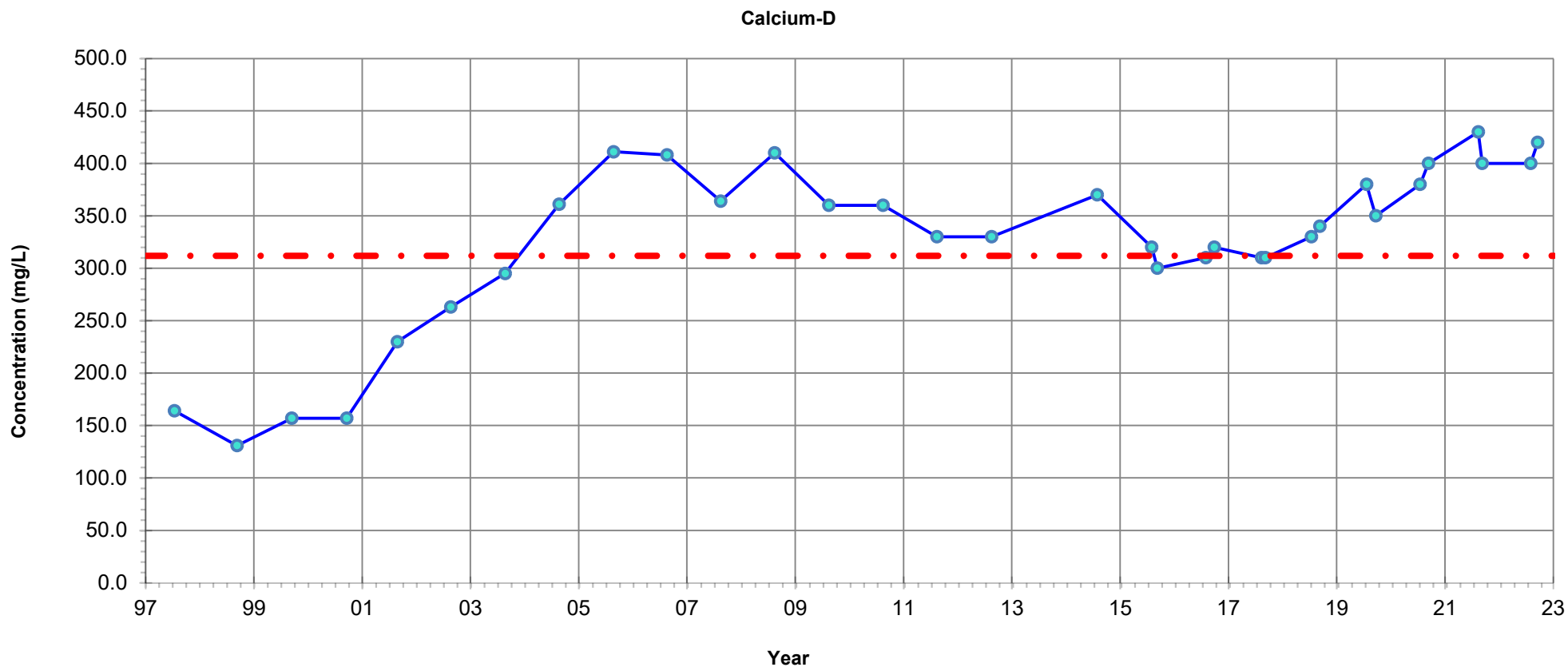
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: C38 08-1-4				TRS Advisian 					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	6



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Mainland - Surficial
 Sediments - 95th Percentile

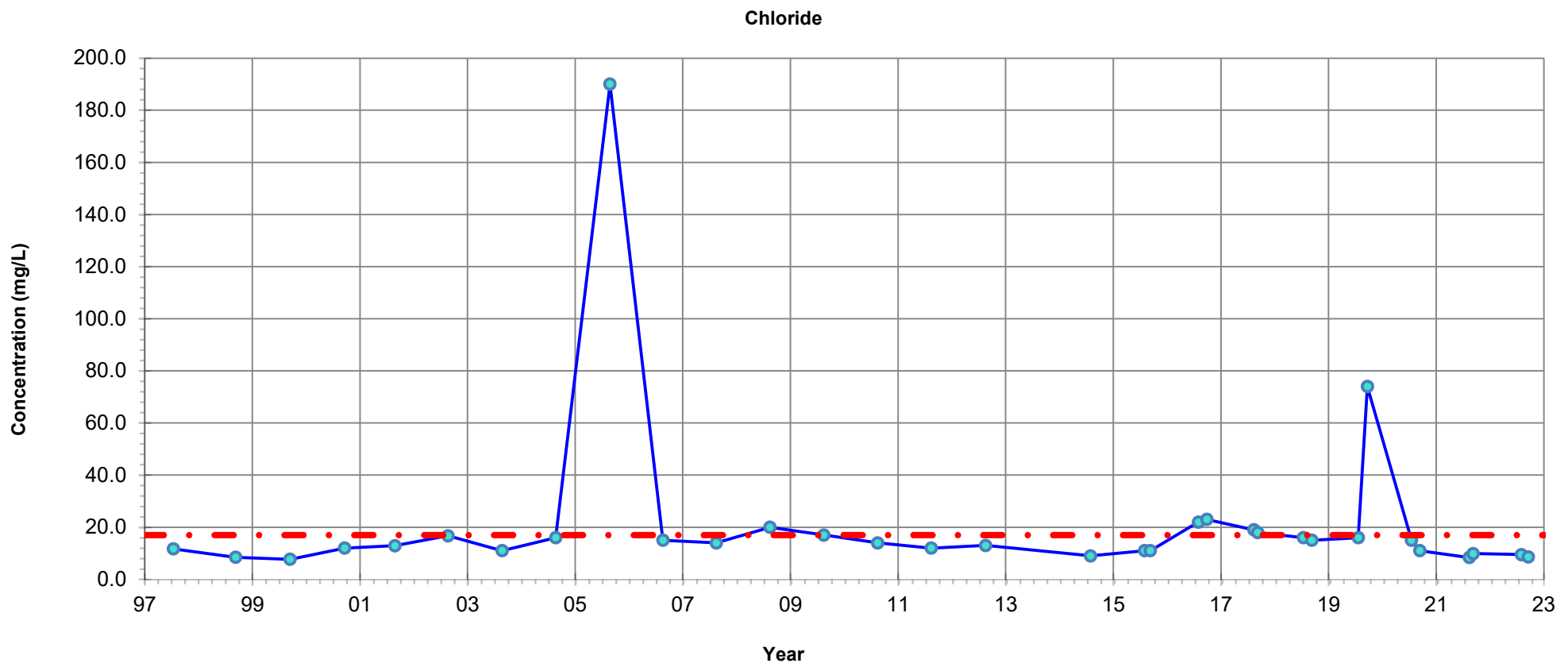
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: C38 08-1-4					TRS Advisian 				
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	7



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Mainland - Surficial
 Sediments - 95th Percentile

Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: CPF 97-7-5				TRIS Advisian 					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	8

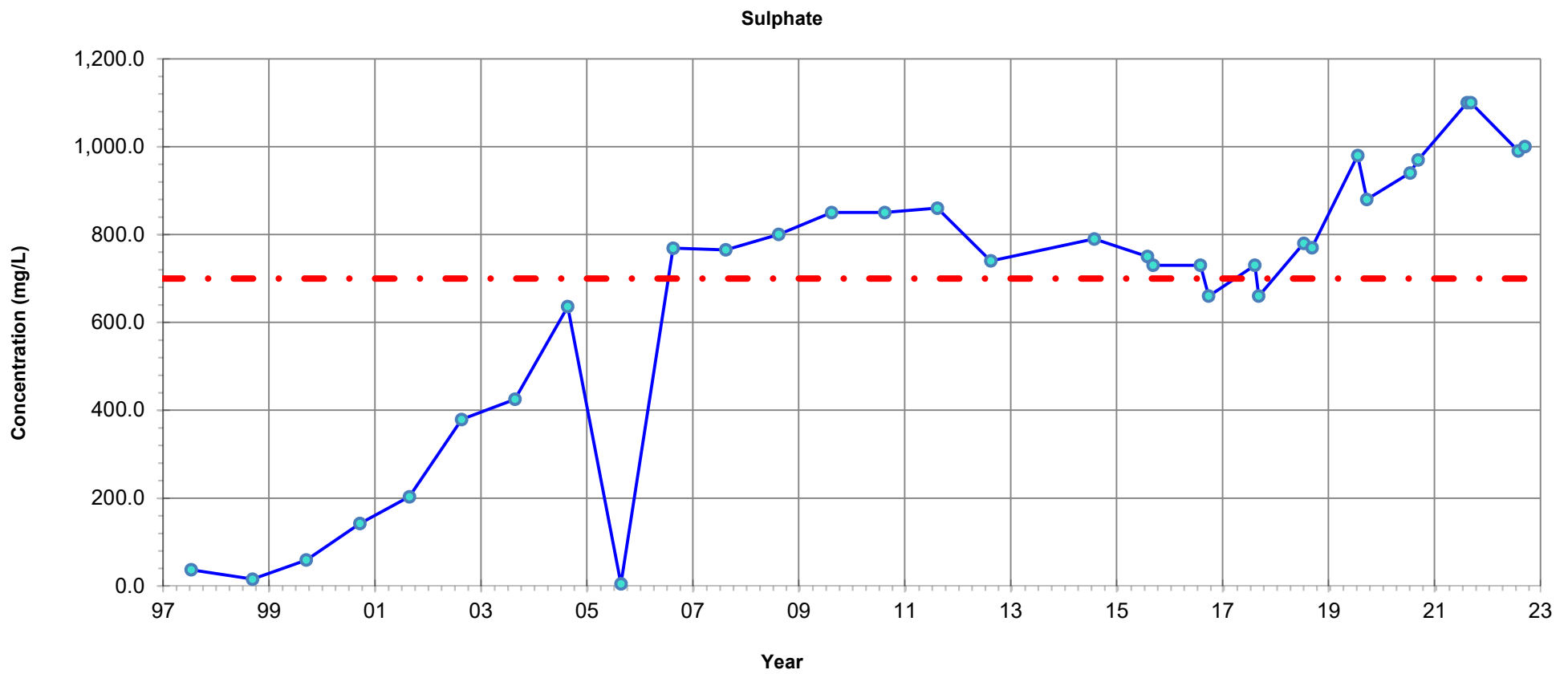


NOTES:

- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

- - - GUIDELINE:
 Background - Mainland - Surficial
 Sediments - 95th Percentile

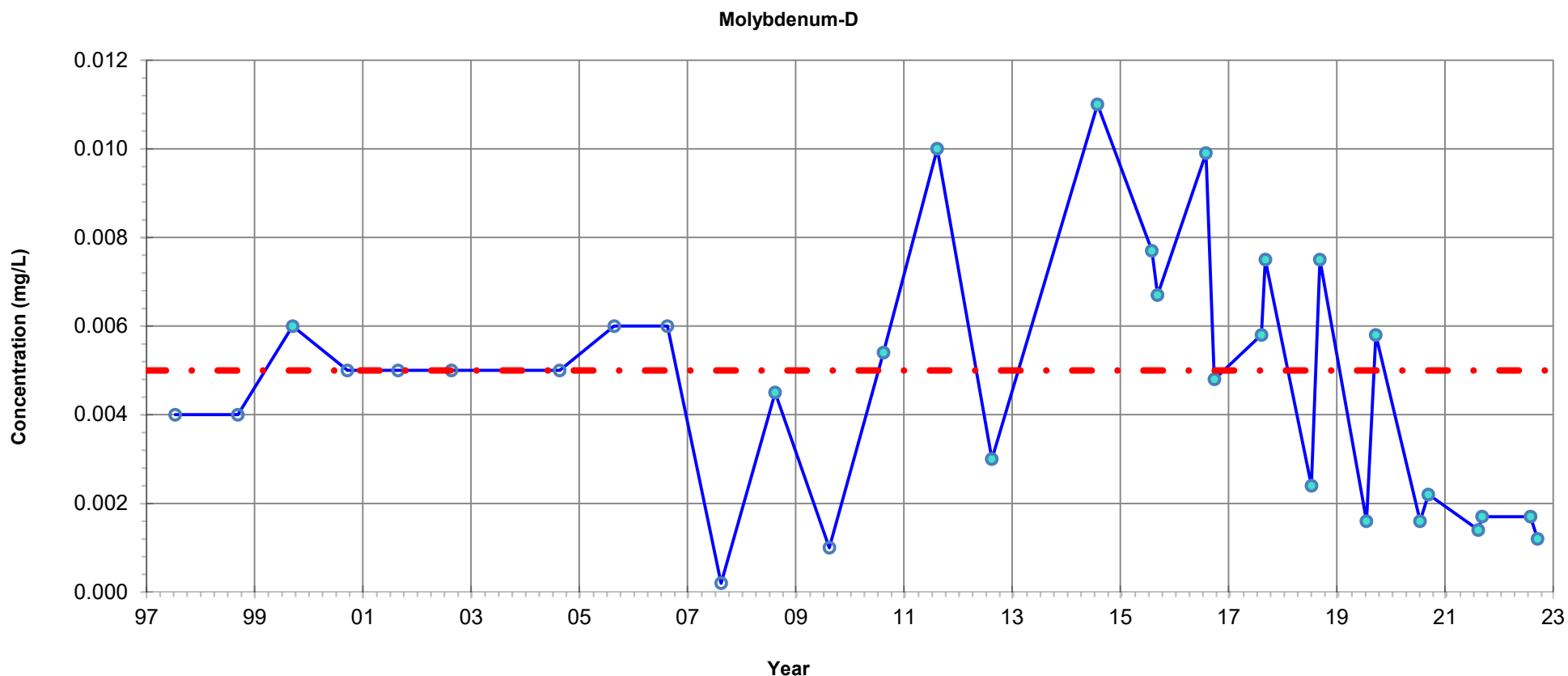
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: CPF 97-7-5									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	9



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Mainland - Surficial
 Sediments - 95th Percentile

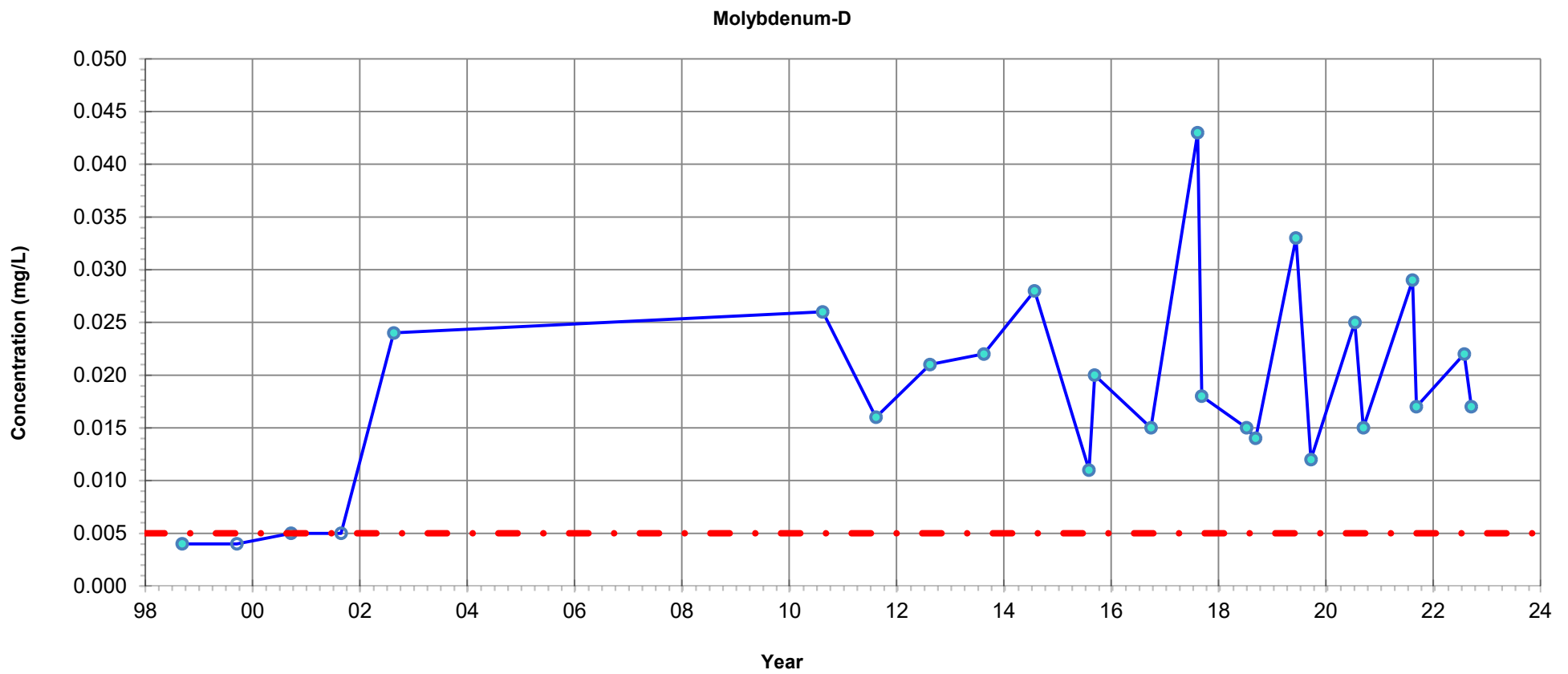
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: CPF 97-7-5				TRIS Advisian 					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	10



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- **GUIDELINE:**
 Background - Mainland - Surficial
 Sediments - 95th Percentile

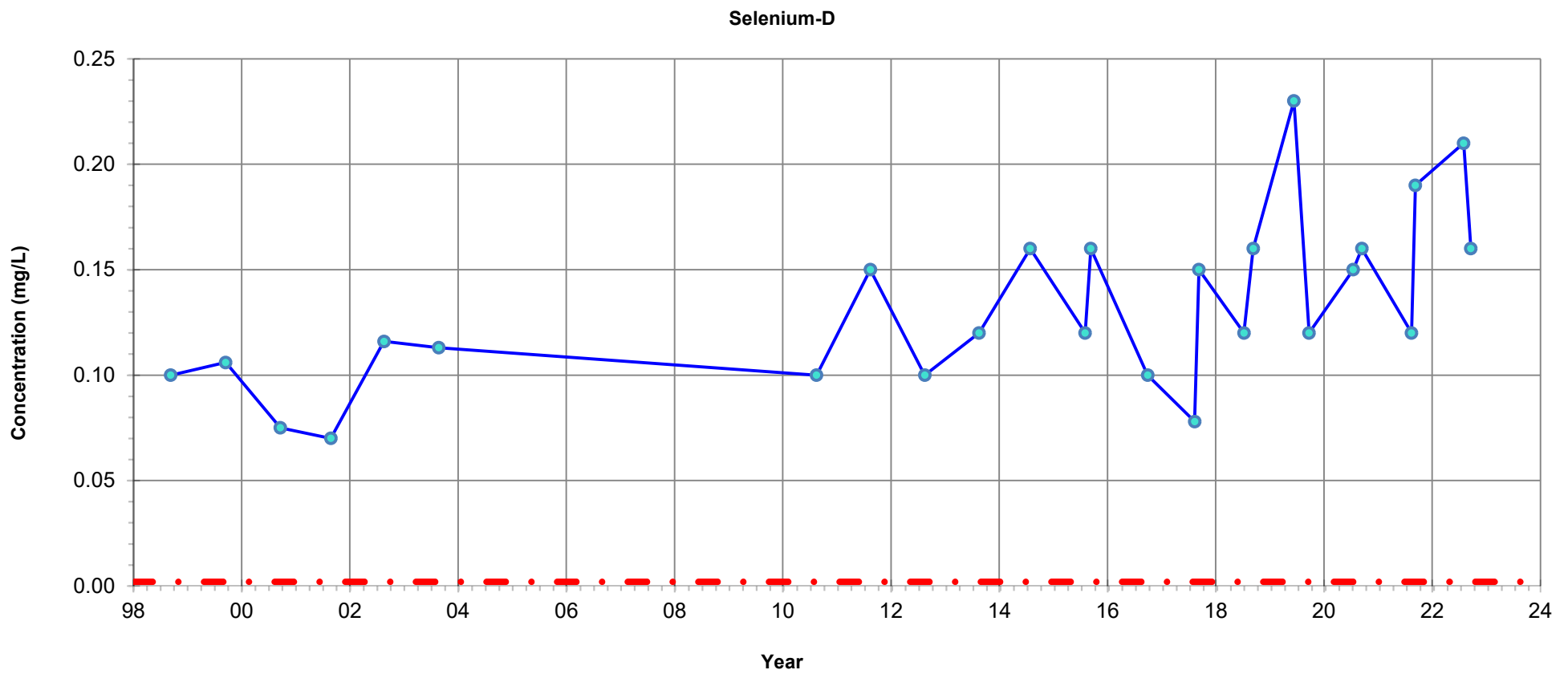
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: CPF 97-7-5					TRIS Advisian 				
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	11



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- **GUIDELINE:**
 Background - Mainland - Surficial
 Sediments - 95th Percentile

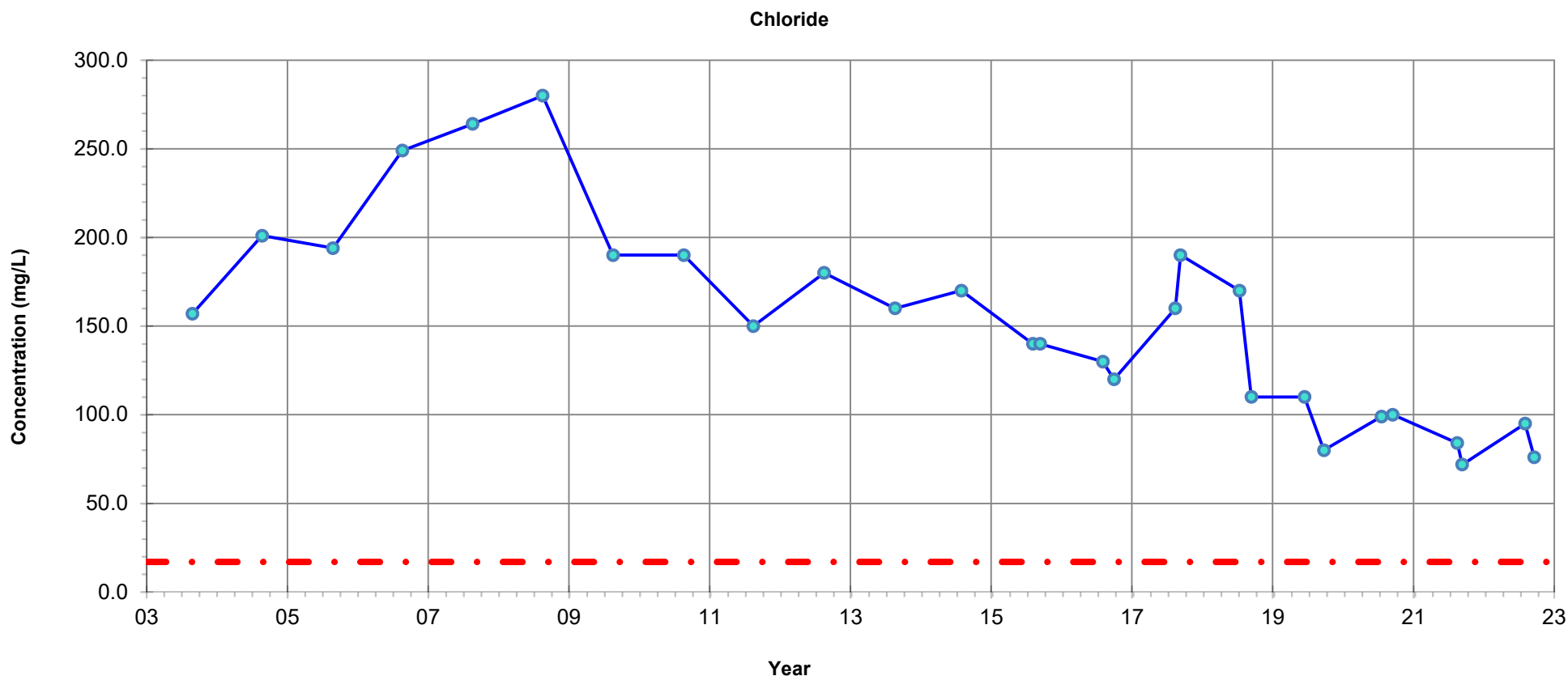
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: MTF 97-1-5									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER: 417085-42051-22100	Figure 12
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.									



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

-- -- **GUIDELINE:**
 Background - Mainland - Surficial
 Sediments - 95th Percentile

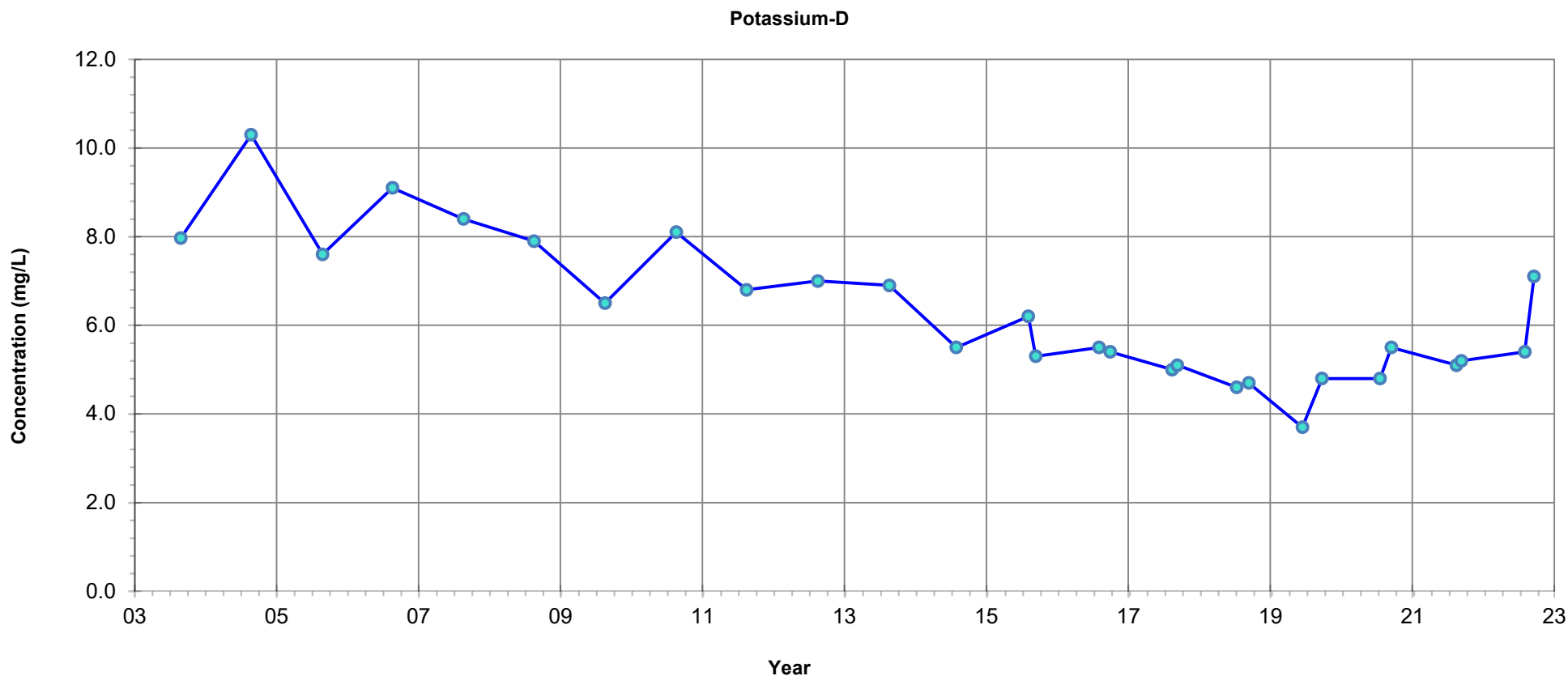
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: MTF 97-1-5									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	13



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- - - GUIDELINE:
 Background - Mainland - Surficial
 Sediments - 95th Percentile

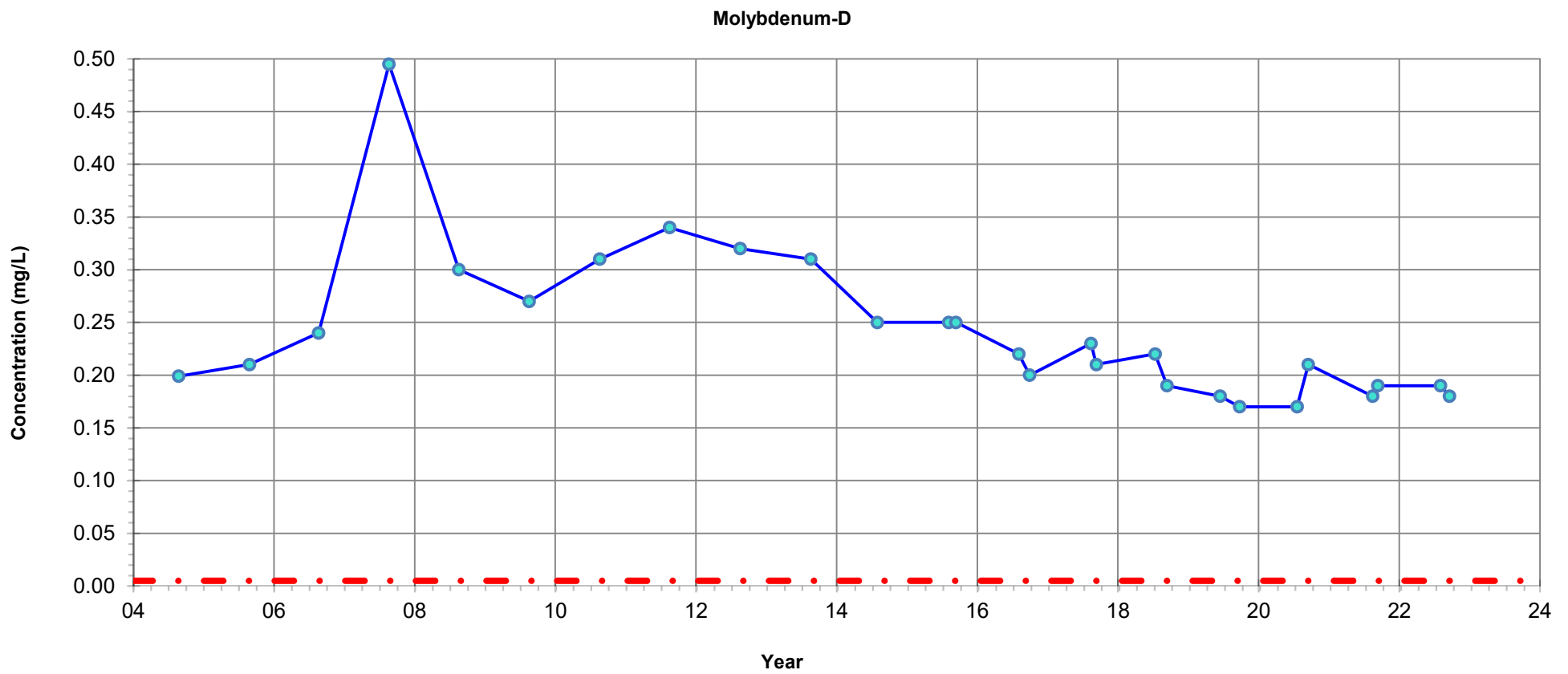
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: TF 03-12-3				TRS Advisian					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER: 417085-42051-22100	Figure 14
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.									



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Mainland - Surficial
 Sediments - 95th Percentile

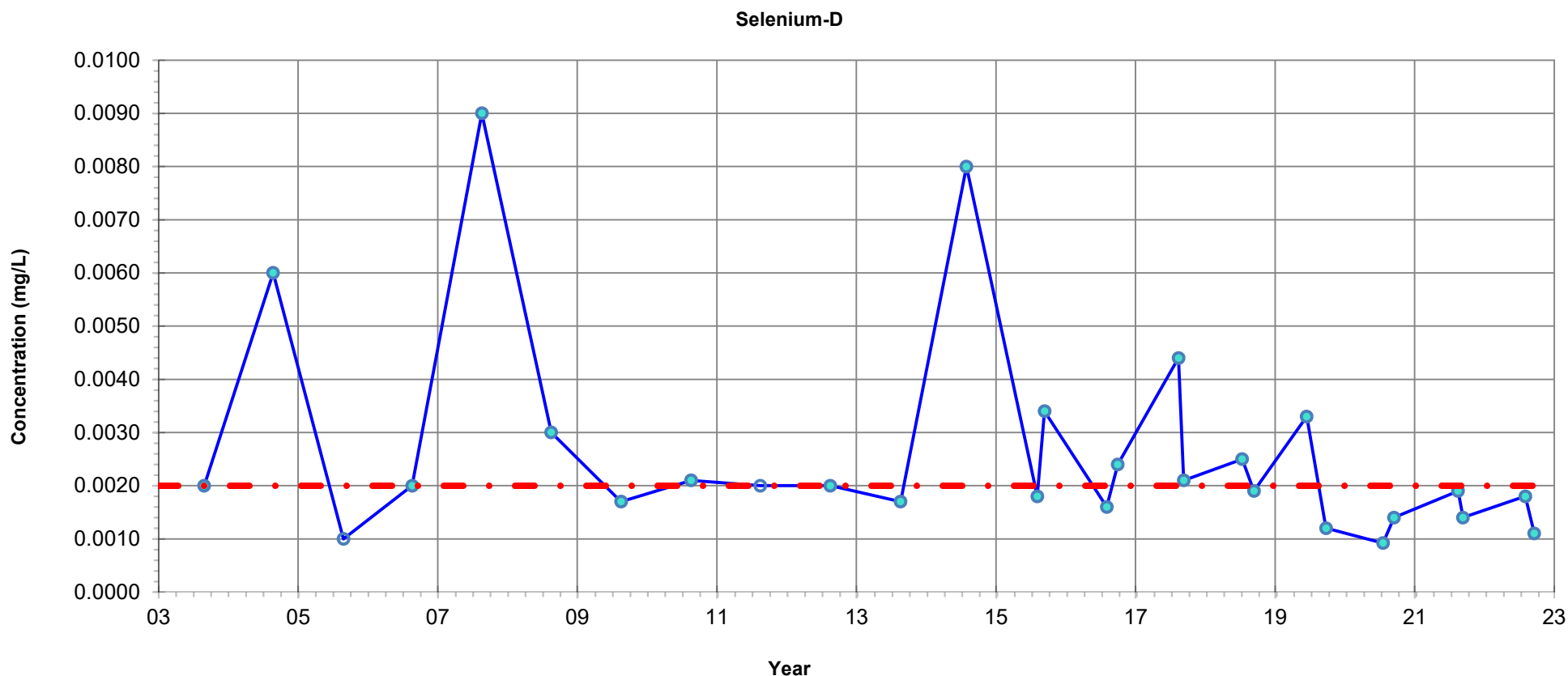
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: TF 03-12-3					TRIS Advisian				
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	15



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- **GUIDELINE:**
 Background - Mainland - Surficial
 Sediments - 95th Percentile

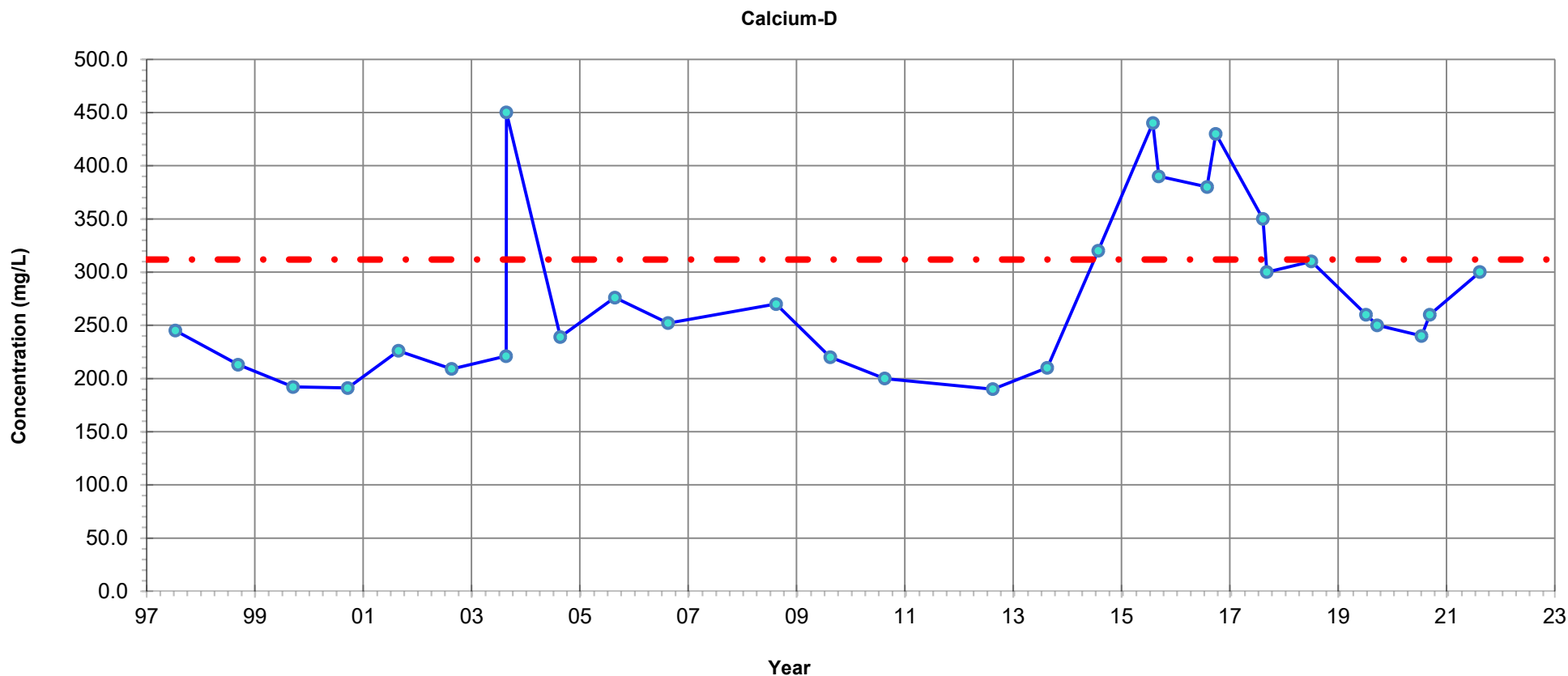
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: TF 03-12-3				TRIS Advisian 					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	16



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Mainland - Surficial
 Sediments - 95th Percentile

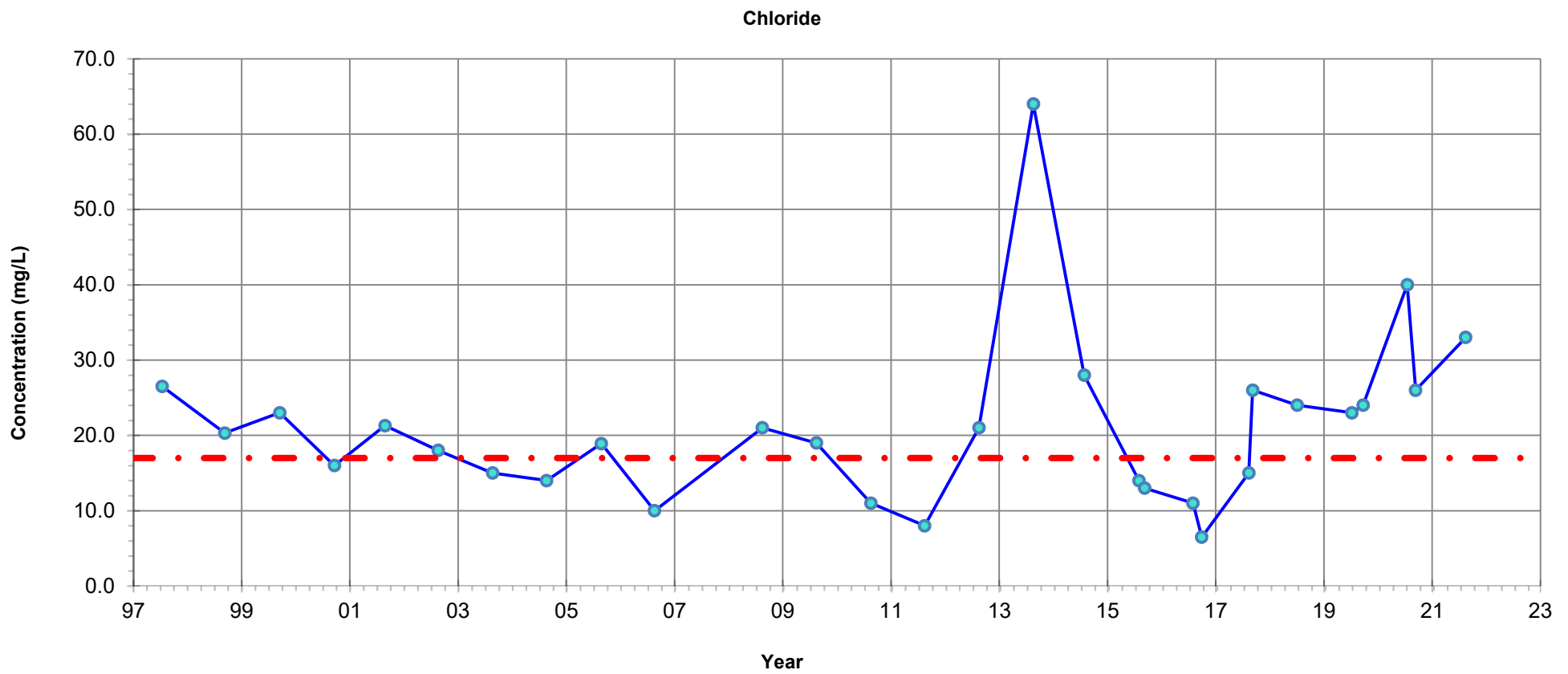
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: TF 03-12-3					TRS Advisian				
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER: 417085-42051-22100	Figure 17
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.									



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Mainland - Surficial
 Sediments - 95th Percentile

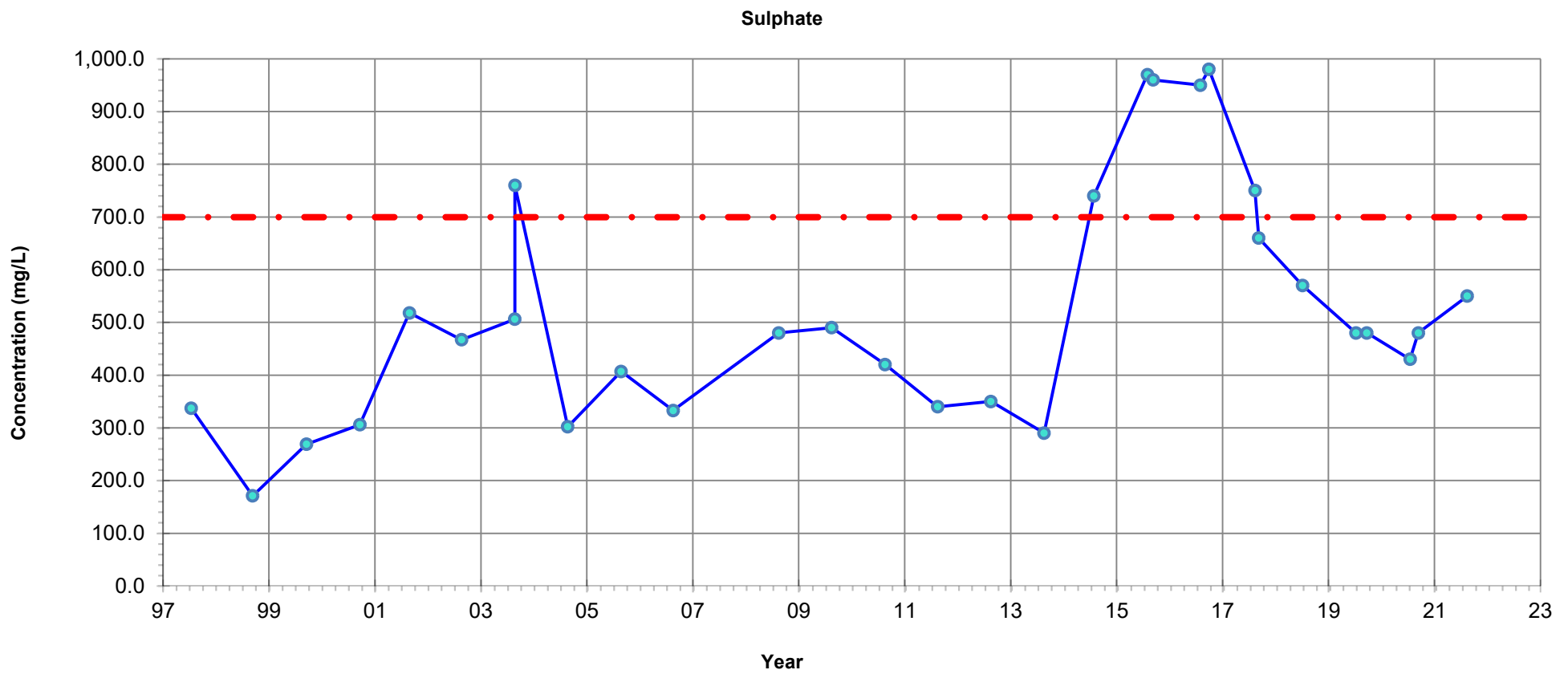
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: WSY 97-1-5					TRIS Advisian				
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER: 417085-42051-22100	Figure 18
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.									



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- - - GUIDELINE:
 Background - Mainland - Surficial
 Sediments - 95th Percentile

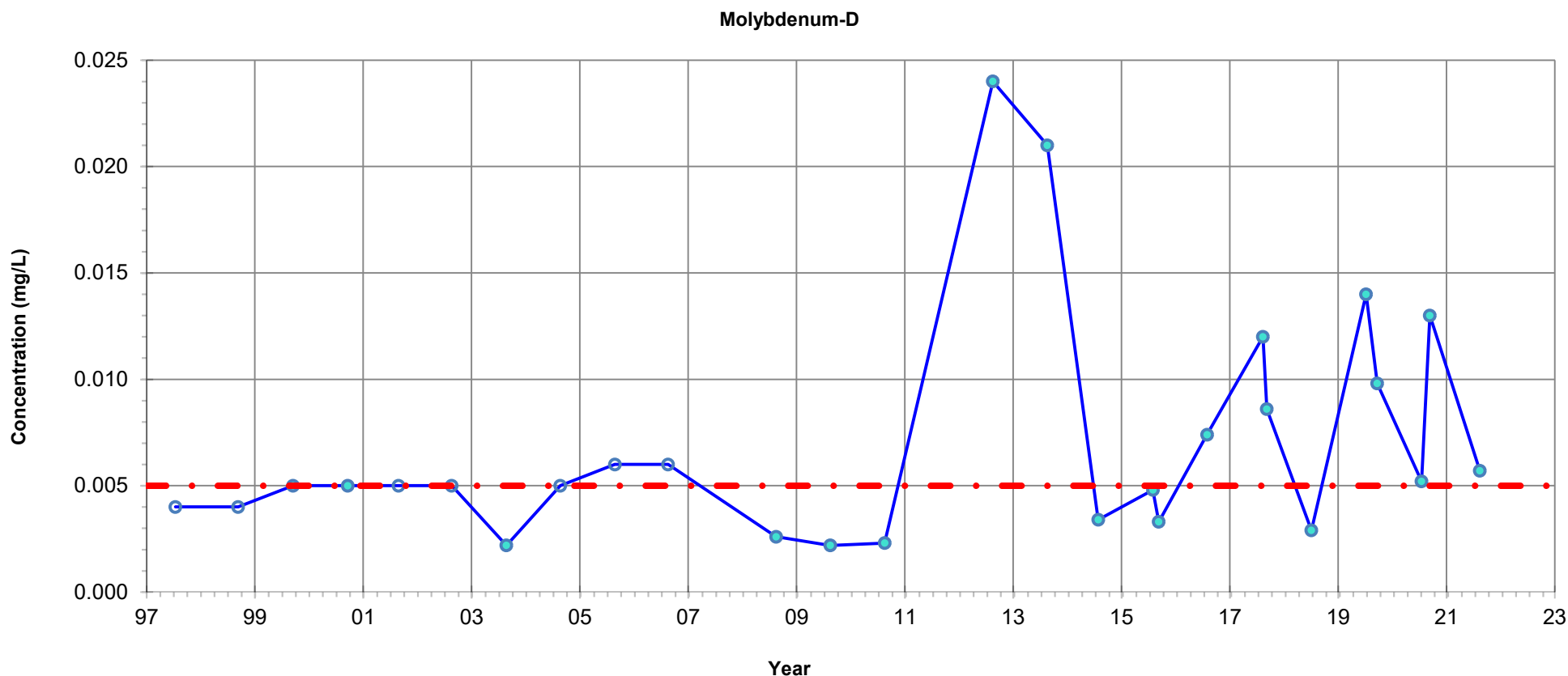
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: WSY 97-1-5					TRIS Advisian 				
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	19



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 Background - Mainland - Surficial
 Sediments - 95th Percentile

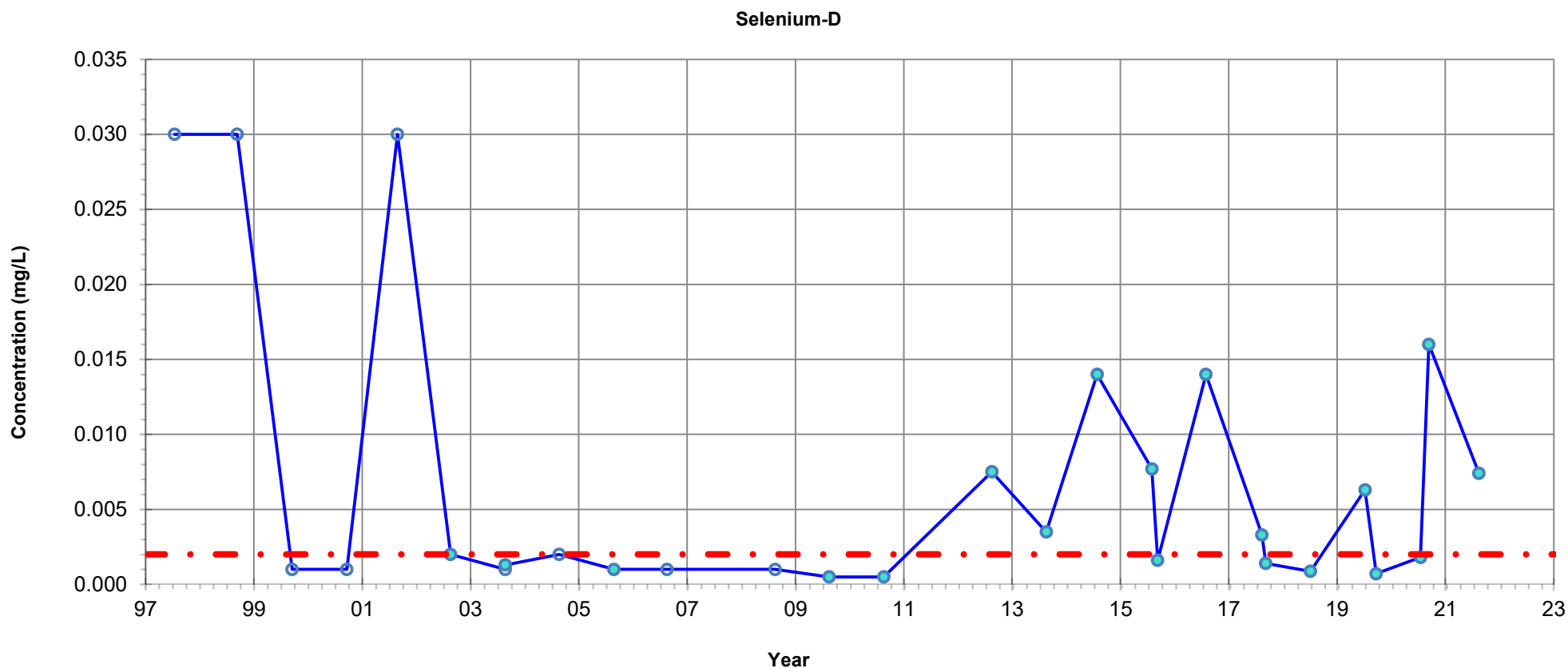
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: WSY 97-1-5									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	20



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- **GUIDELINE:**
 Background - Mainland - Surficial
 Sediments - 95th Percentile

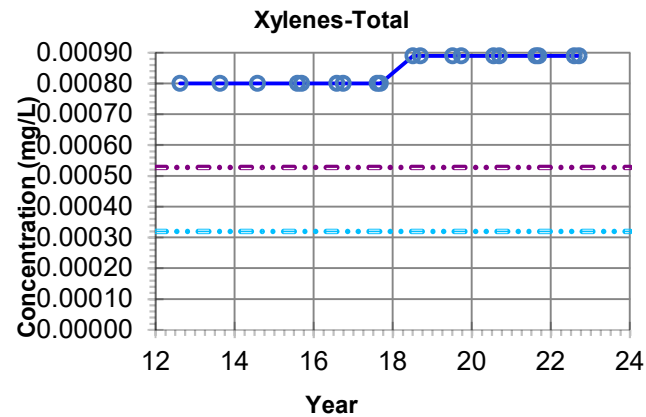
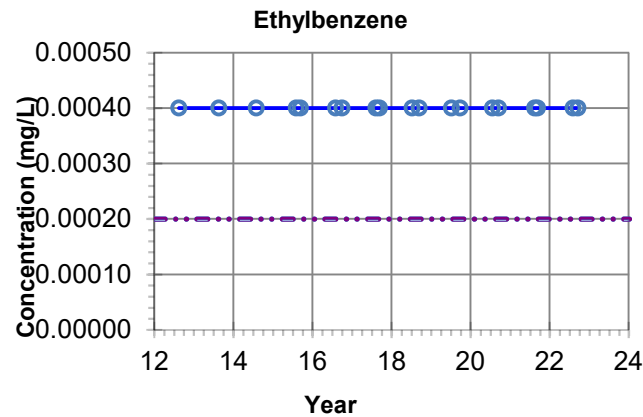
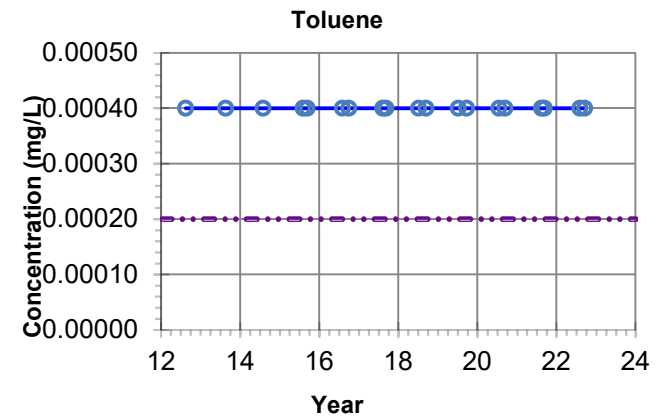
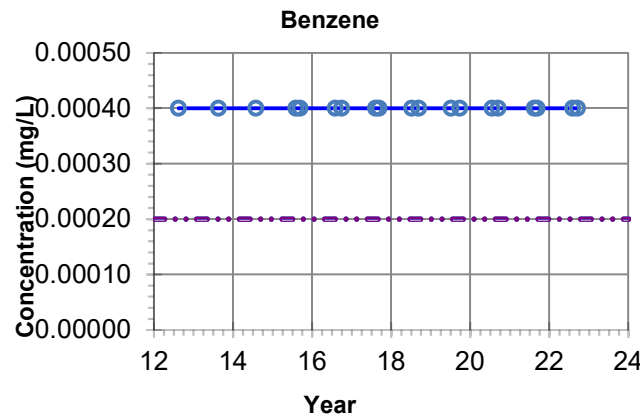
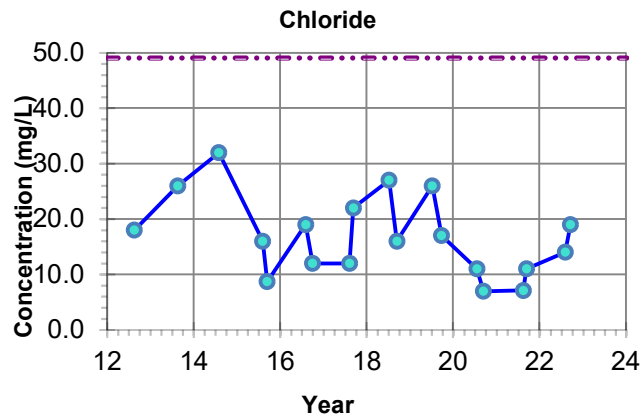
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: WSY 97-1-5					TRC Advisian 				
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	21



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

-- -- **GUIDELINE:**
 Background - Mainland - Surficial
 Sediments - 95th Percentile

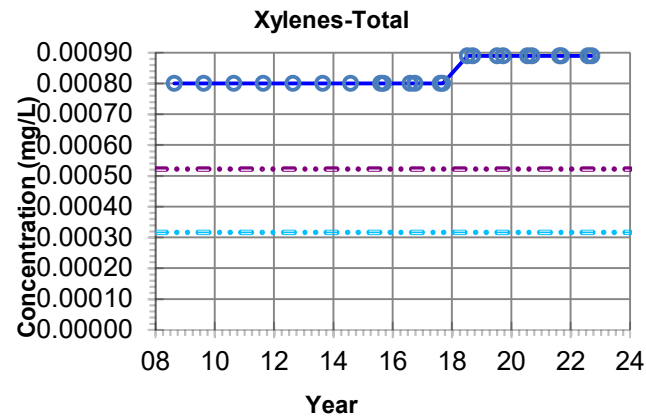
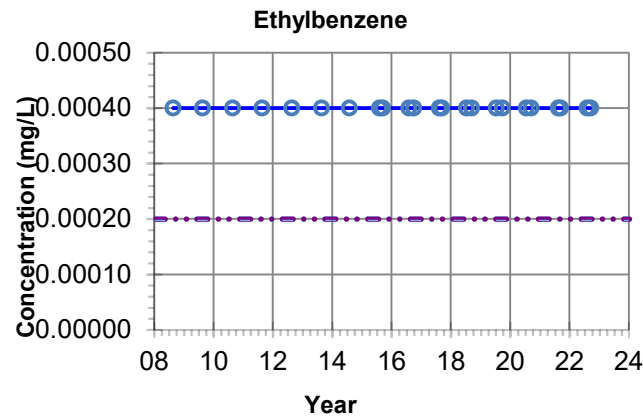
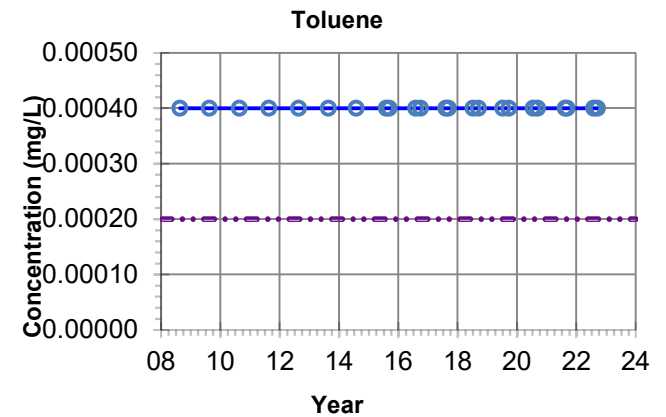
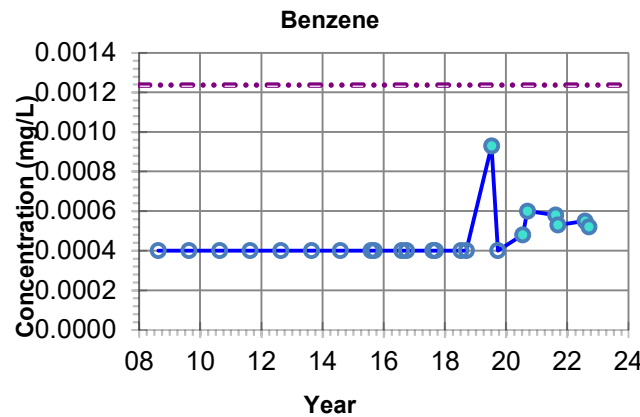
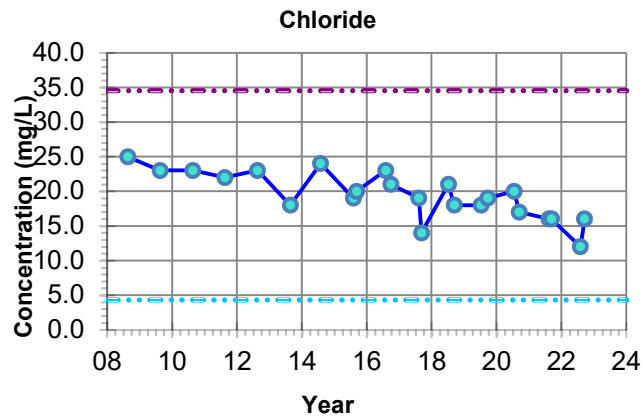
Imperial 2022 Background - Mainland Program Norman Wells, NT Trend Graphs Monitoring Well: WSY 97-1-5						TRIS Advisian 			
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	22



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- **GUIDELINE:**
 CCME CEQG Freshwater Aquatic Life
 -Chloride = 120 mg/L
 -Benzene = 0.37
 -Toluene = 0.002 mg/L
 -Ethylbenzene = 0.09 mg/L
- **Upper Control Limit**
 --- **Lower Control Limit**

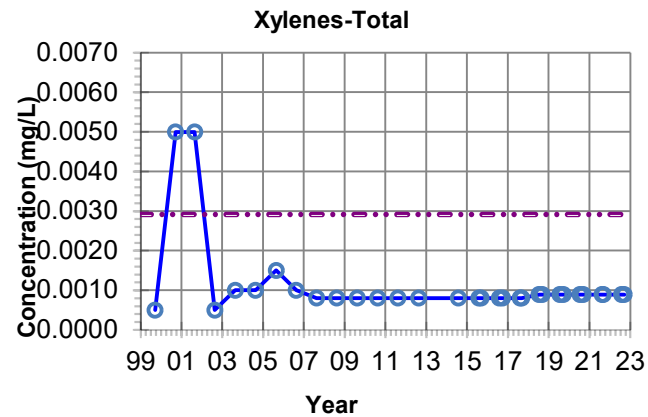
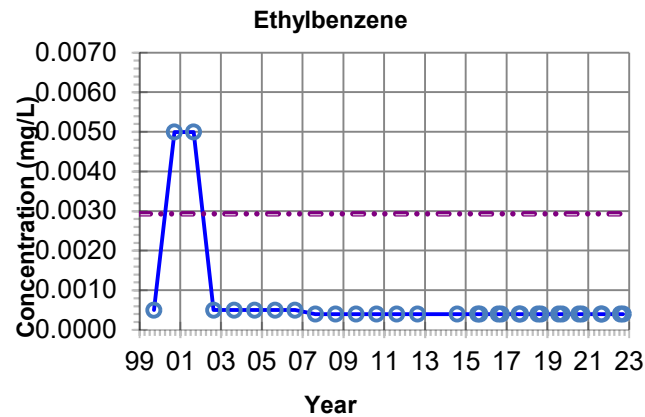
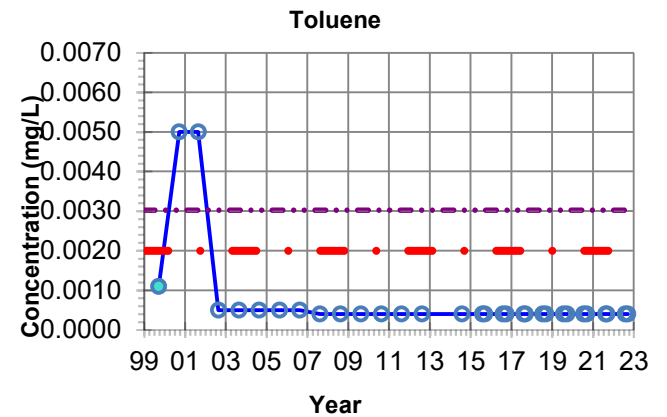
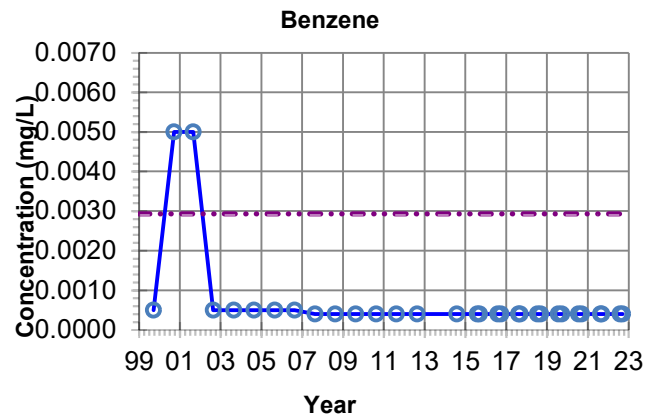
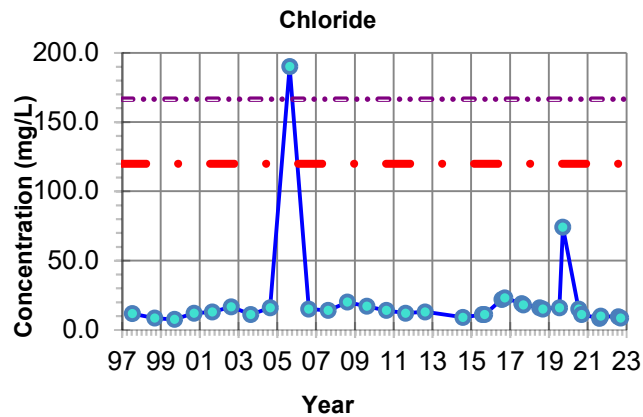
Imperial							
2022 Groundwater Surveillance Network Program							
Norman Wells, NT							
Trend Graphs							
Monitoring Well: ARB-12-3-3							
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.						PROJECT NUMBER: 417085-42051-22100	Figure 1



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- GUIDELINE:**
 CCME CEQG Freshwater Aquatic Life
 -Chloride = 120 mg/L
 -Benzene = 0.37
 -Toluene = 0.002 mg/L
 -Ethylbenzene = 0.09 mg/L
- Upper Control Limit**
--- Lower Control Limit

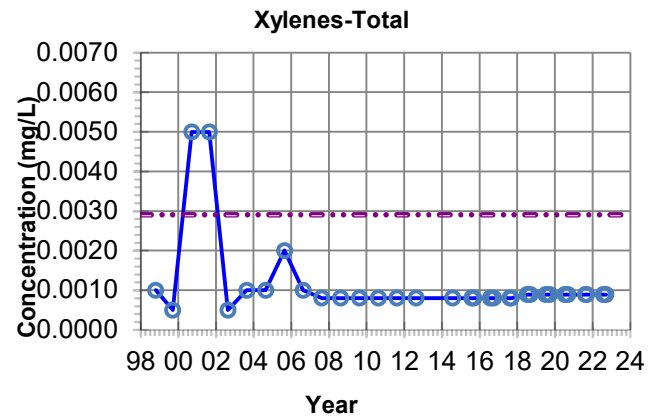
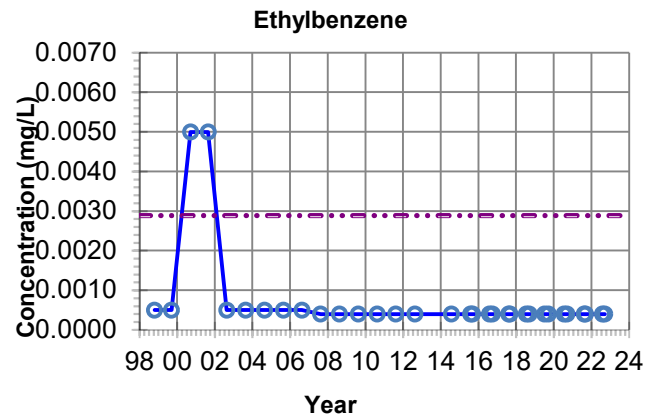
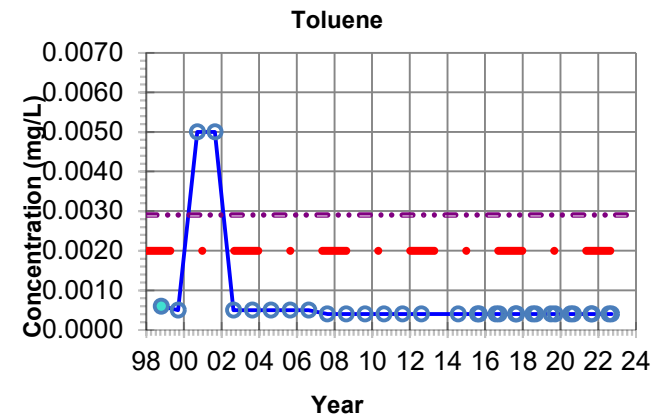
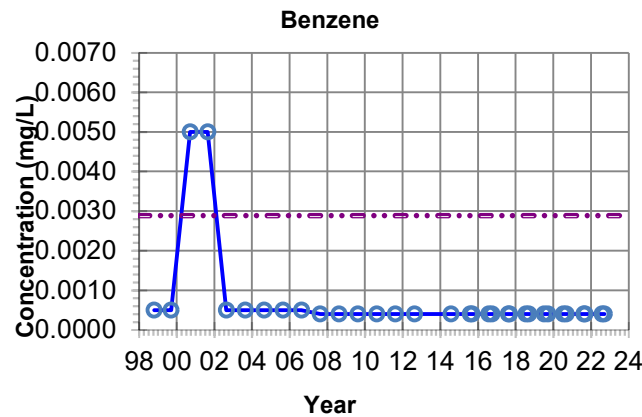
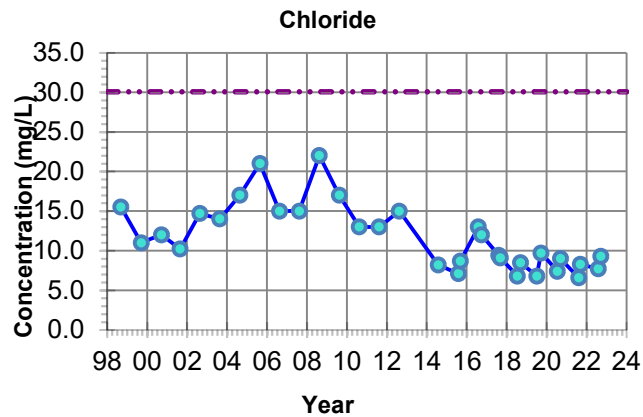
Imperial 2022 Groundwater Surveillance Network Program Norman Wells, NT Trend Graphs Monitoring Well: C38 08-1-4									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	2



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- **GUIDELINE:**
 CCME CEQG Freshwater Aquatic Life
 -Chloride = 120 mg/L
 -Benzene = 0.37
 -Toluene = 0.002 mg/L
 -Ethylbenzene = 0.09 mg/L
- **Upper Control Limit**
 --- **Lower Control Limit**

Imperial 2022 Groundwater Surveillance Network Program Norman Wells, NT Trend Graphs Monitoring Well: CPF 97-7-5				TRIS Advisian 					
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	3



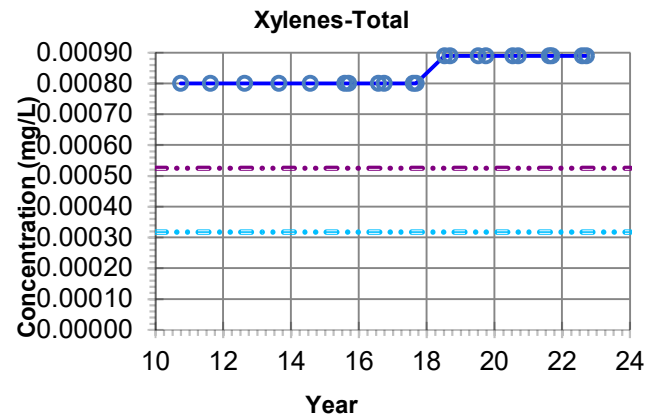
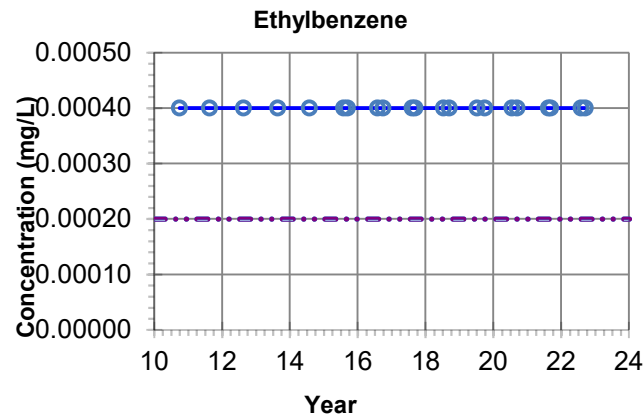
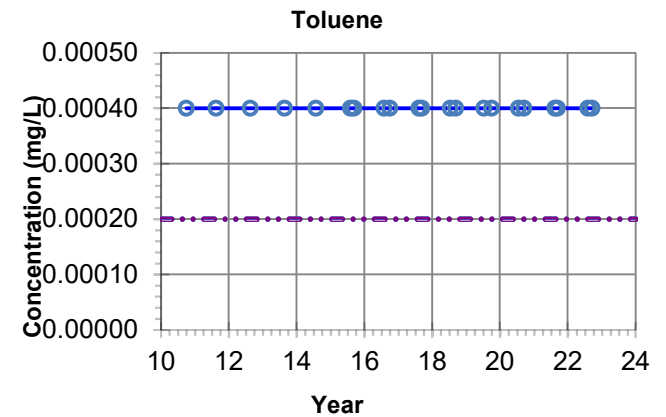
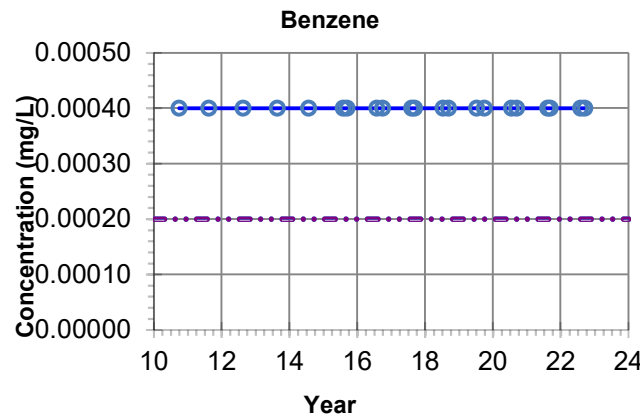
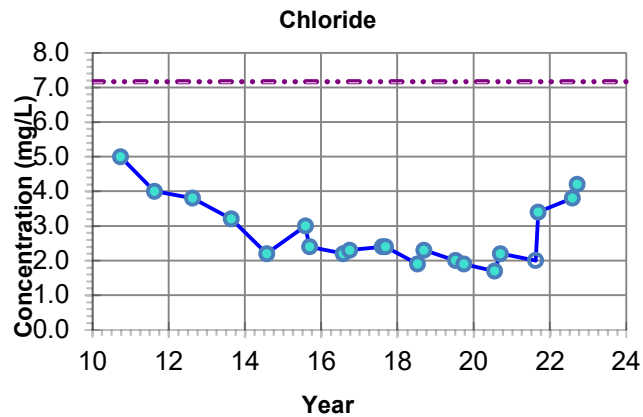
NOTES:

- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
CCME CEQG Freshwater Aquatic Life
 -Chloride = 120 mg/L
 -Benzene = 0.37
 -Toluene = 0.002 mg/L
 -Ethylbenzene = 0.09 mg/L

--- Upper Control Limit
--- Lower Control Limit

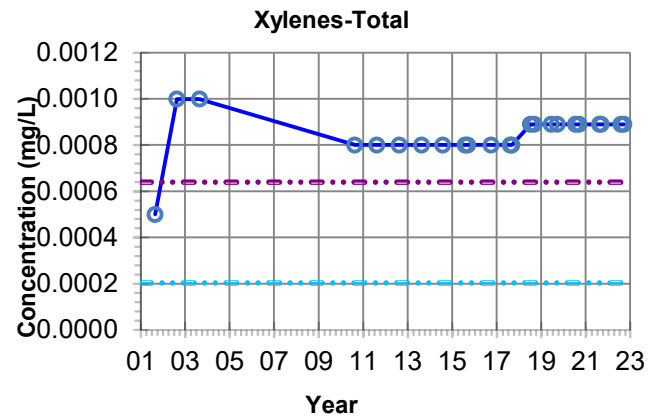
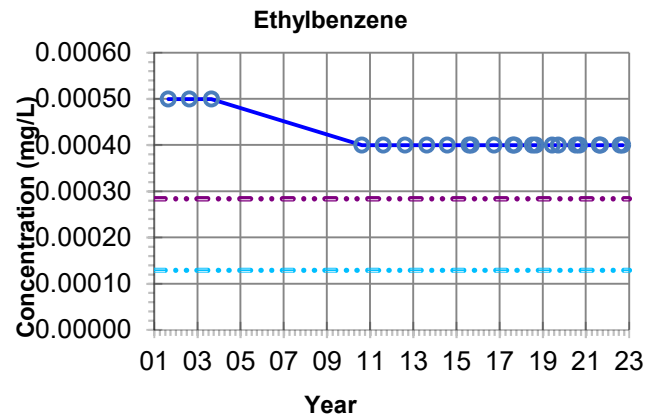
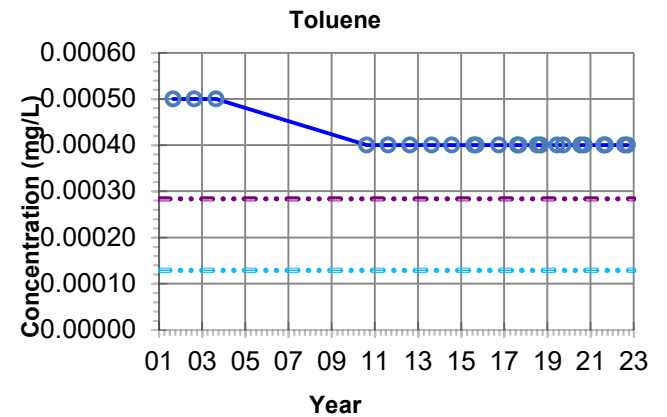
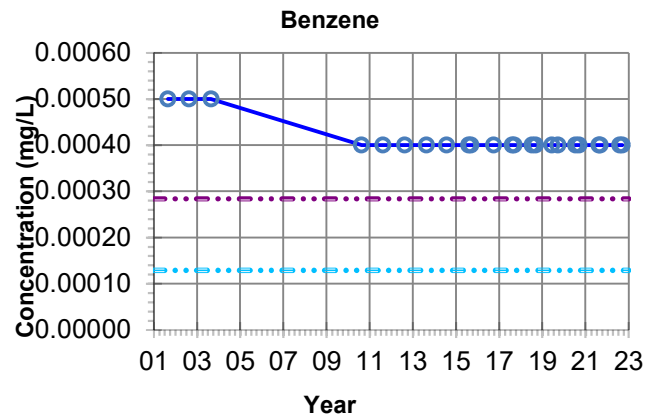
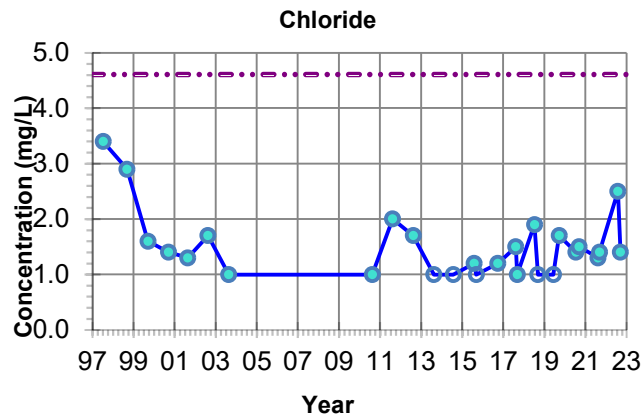
Imperial							
2022 Groundwater Surveillance Network Program							
Norman Wells, NT							
Trend Graphs							
Monitoring Well: CPF 98-8-3							
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.						PROJECT NUMBER:	Figure
						417085-42051-22100	4



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- GUIDELINE:**
 CCME CEQG Freshwater Aquatic Life
 -Chloride = 120 mg/L
 -Benzene = 0.37
 -Toluene = 0.002 mg/L
 -Ethylbenzene = 0.09 mg/L
- Upper Control Limit**
--- Lower Control Limit

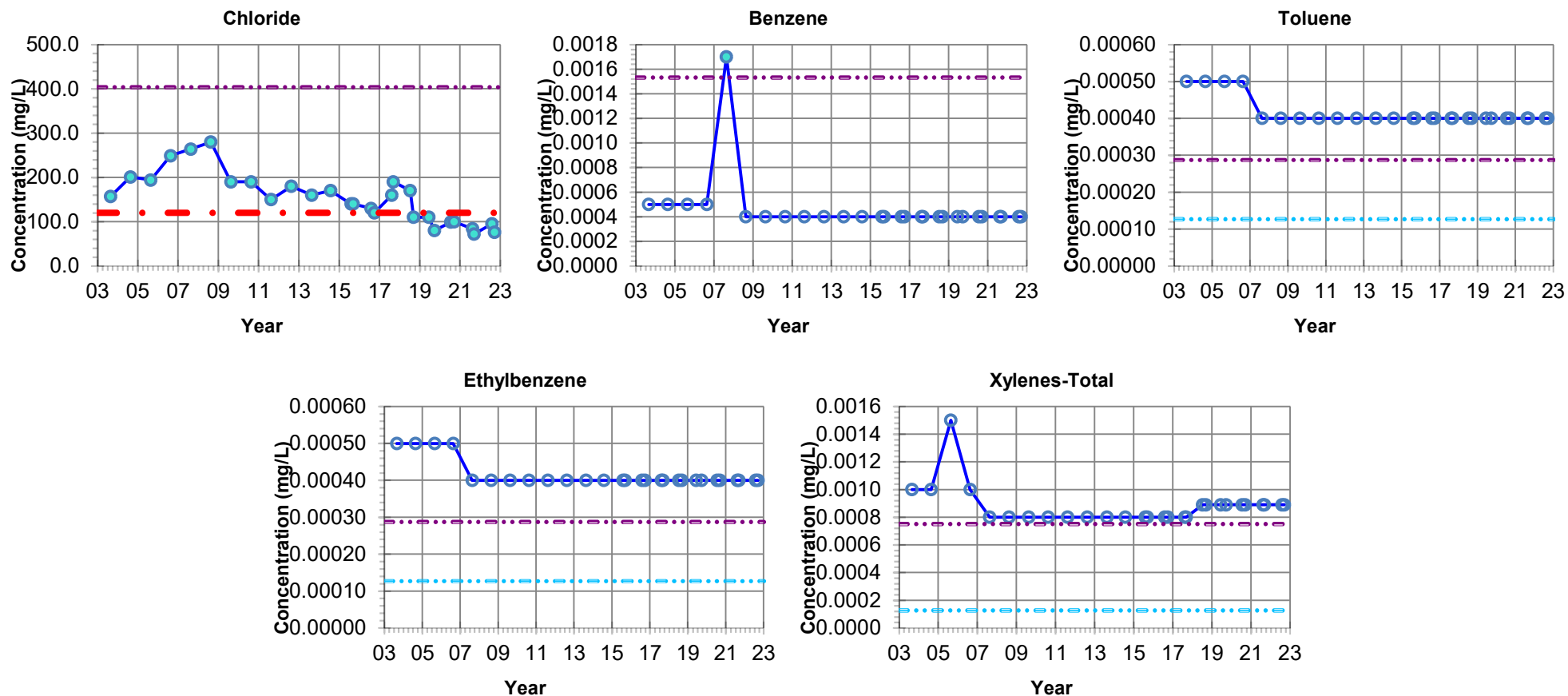
Imperial 2022 Groundwater Surveillance Network Program Norman Wells, NT Trend Graphs Monitoring Well: MEBG-10-1-3									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	5



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- **GUIDELINE:**
 CCME CEQG Freshwater Aquatic Life
 -Chloride = 120 mg/L
 -Benzene = 0.37
 -Toluene = 0.002 mg/L
 -Ethylbenzene = 0.09 mg/L
- **Upper Control Limit**
 --- **Lower Control Limit**

Imperial							
2022 Groundwater Surveillance Network Program							
Norman Wells, NT							
Trend Graphs							
Monitoring Well: MTF 97-1-5							
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.						PROJECT NUMBER:	Figure
						417085-42051-22100	6

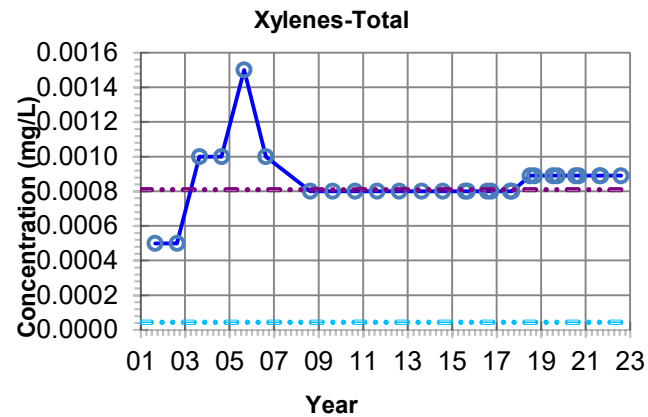
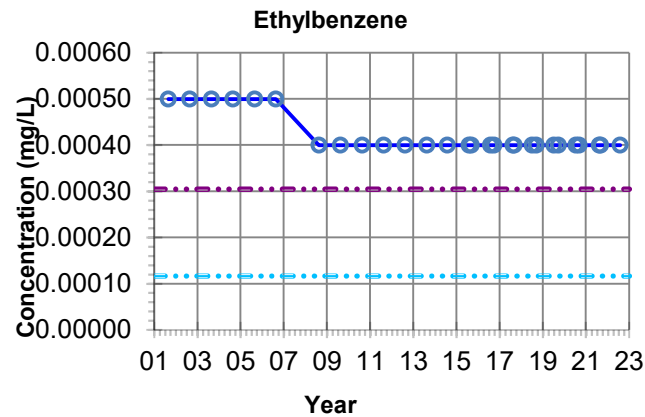
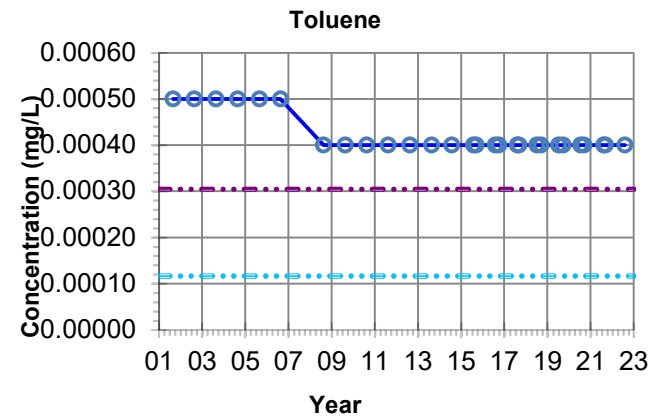
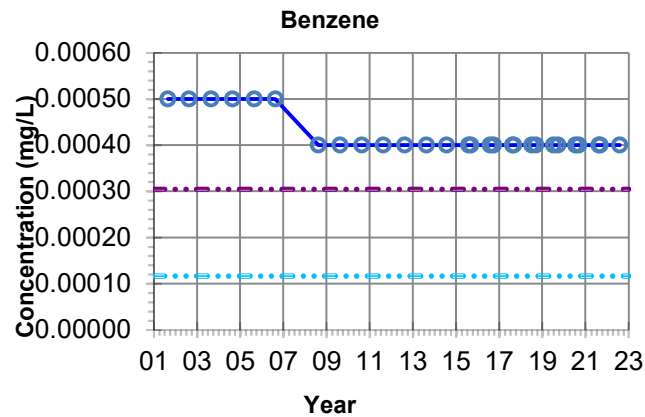
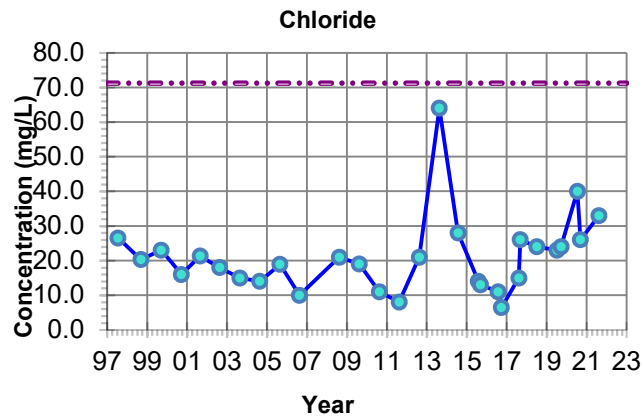


NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
 CCME CEQG Freshwater Aquatic Life
 -Chloride = 120 mg/L
 -Benzene = 0.37
 -Toluene = 0.002 mg/L
 -Ethylbenzene = 0.09 mg/L

--- Upper Control Limit
--- Lower Control Limit

Imperial							
2022 Groundwater Surveillance Network Program							
Norman Wells, NT							
Trend Graphs							
Monitoring Well: TF 03-12-3							
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.						PROJECT NUMBER:	Figure
						417085-42051-22100	7



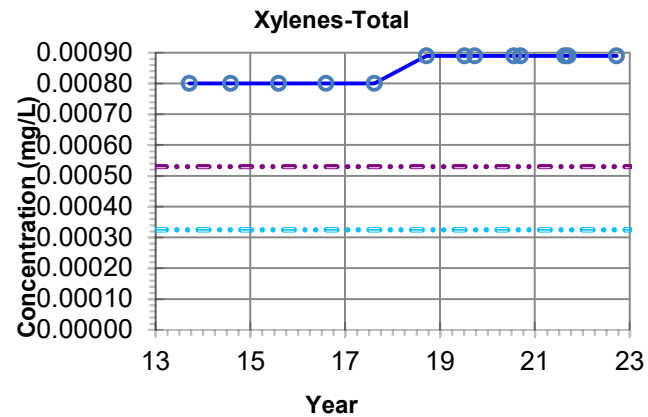
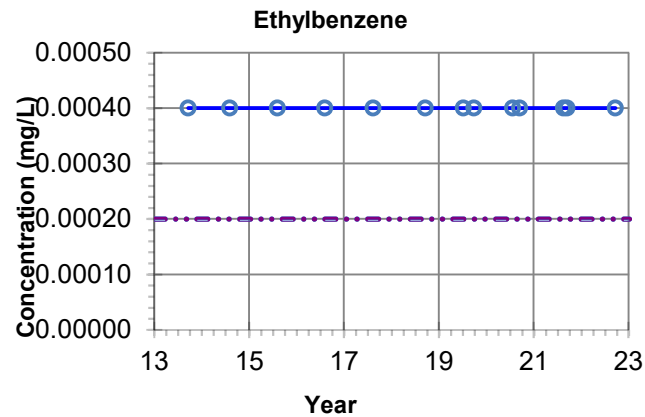
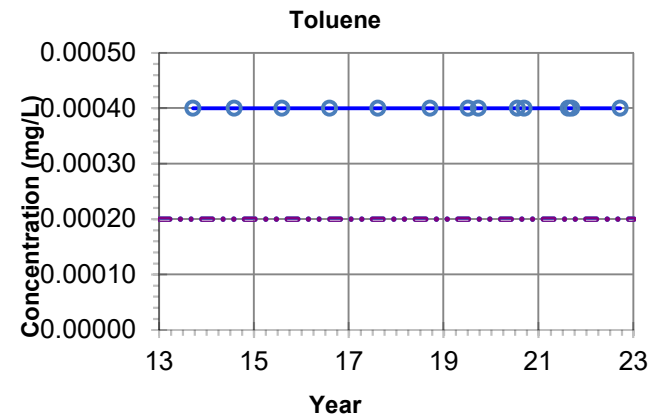
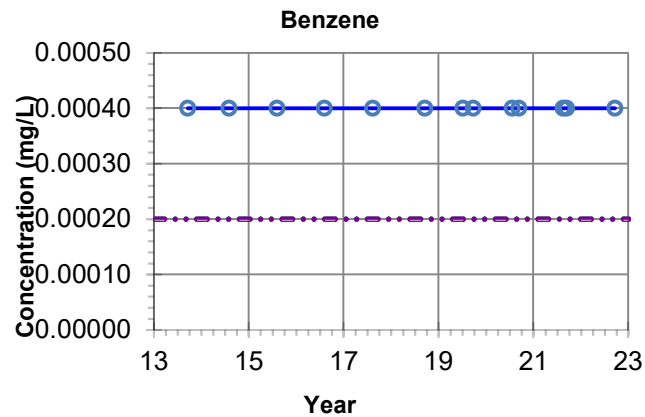
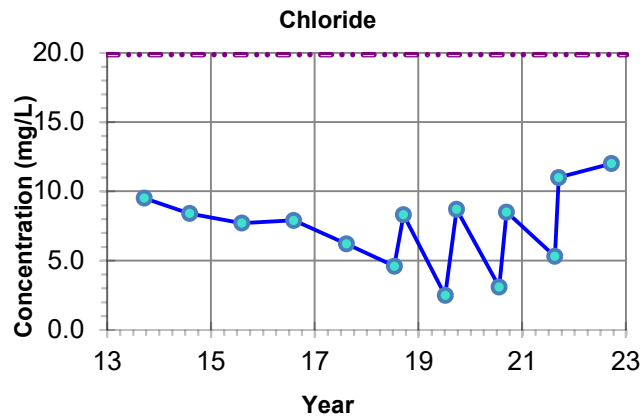
NOTES:

- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
CCME CEQG Freshwater Aquatic Life
 -Chloride = 120 mg/L
 -Benzene = 0.37
 -Toluene = 0.002 mg/L
 -Ethylbenzene = 0.09 mg/L

--- Upper Control Limit
--- Lower Control Limit

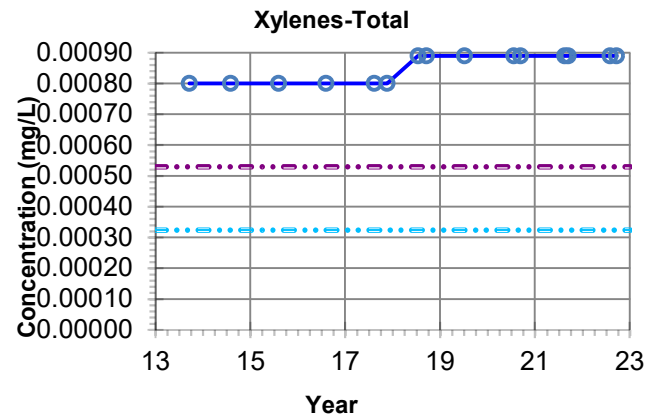
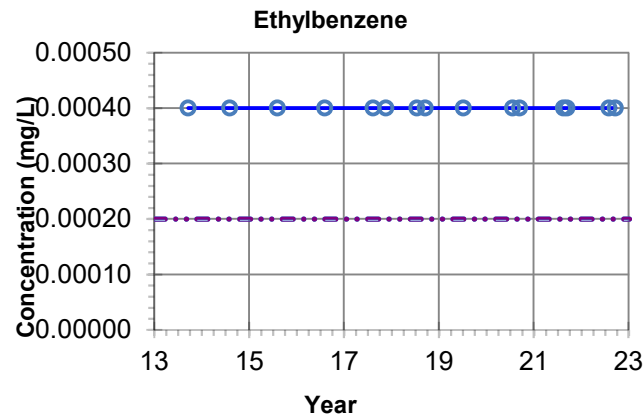
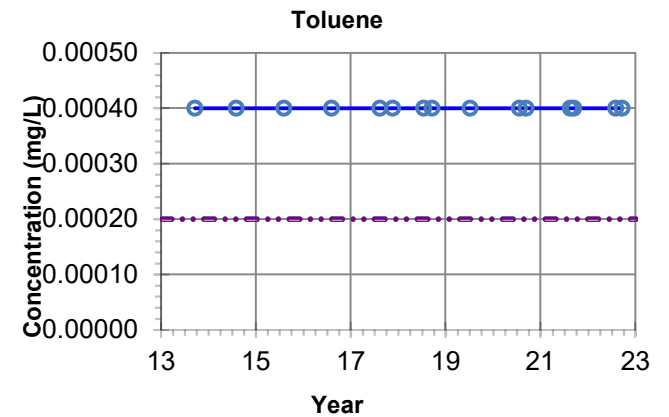
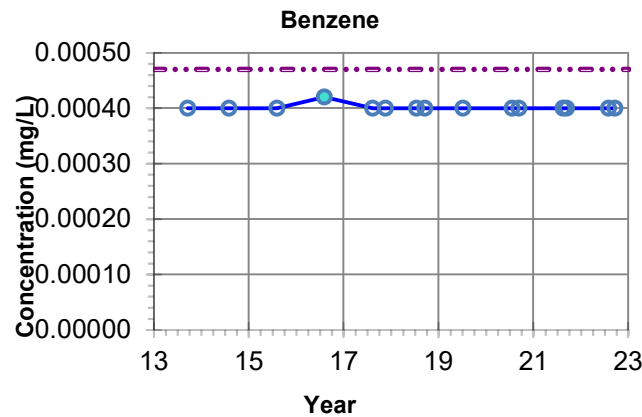
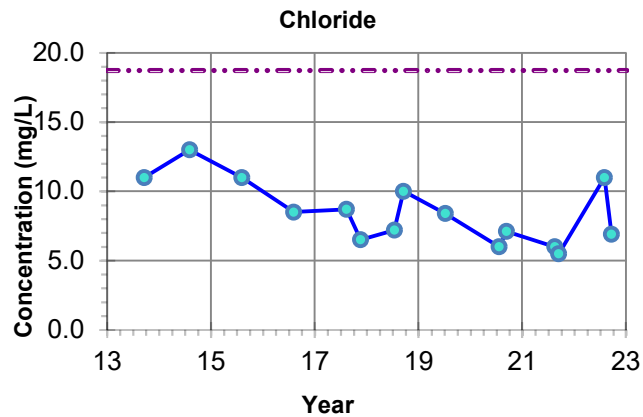
Imperial 2022 Groundwater Surveillance Network Program Norman Wells, NT Trend Graphs Monitoring Well: WSY 97-1-5									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	8



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- **GUIDELINE:**
 CCME CEQG Freshwater Aquatic Life
 -Chloride = 120 mg/L
 -Benzene = 0.37
 -Toluene = 0.002 mg/L
 -Ethylbenzene = 0.09 mg/L
- **Upper Control Limit**
 --- **Lower Control Limit**

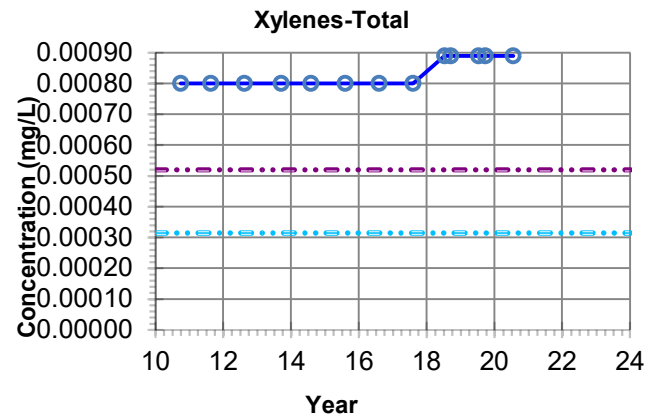
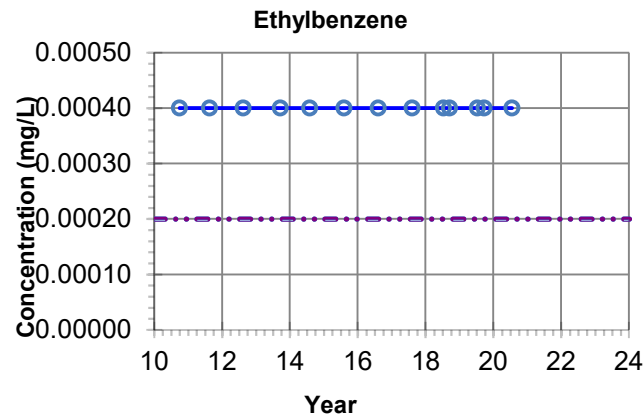
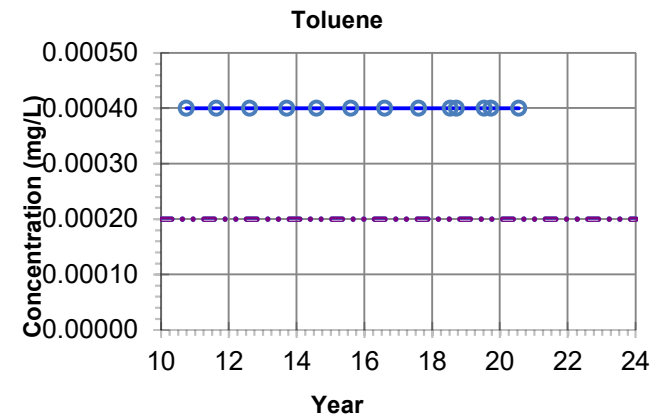
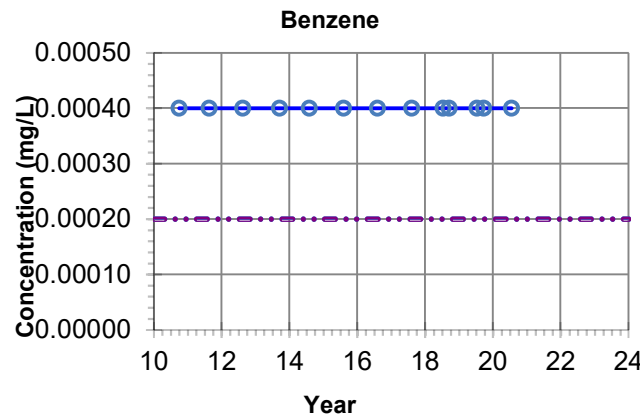
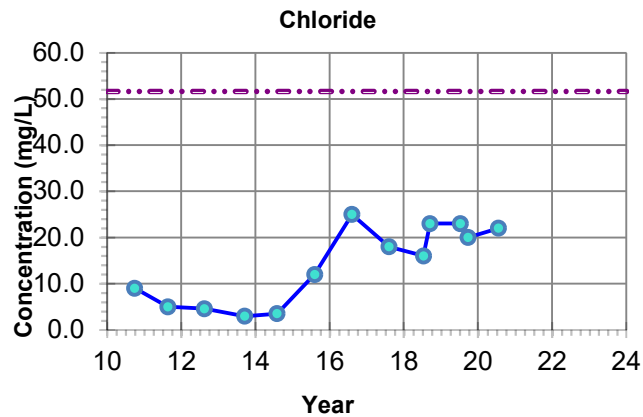
Imperial							
2022 Groundwater Surveillance Network Program							
Norman Wells, NT							
Trend Graphs							
Monitoring Well: BI-13-1-4							
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.						PROJECT NUMBER: 417085-42051-22100	Figure 9



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- GUIDELINE:**
 CCME CEQG Freshwater Aquatic Life
 -Chloride = 120 mg/L
 -Benzene = 0.37
 -Toluene = 0.002 mg/L
 -Ethylbenzene = 0.09 mg/L
- Upper Control Limit**
--- Lower Control Limit

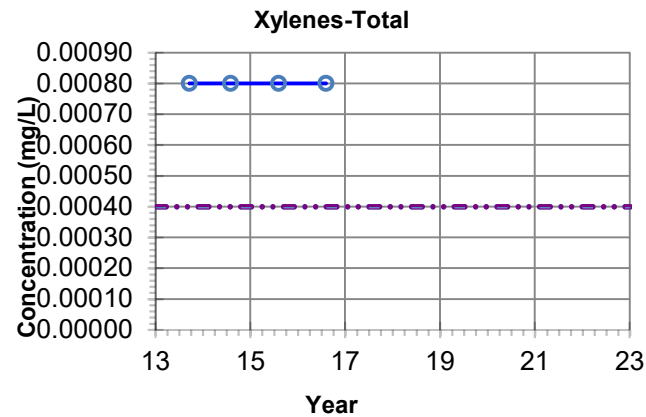
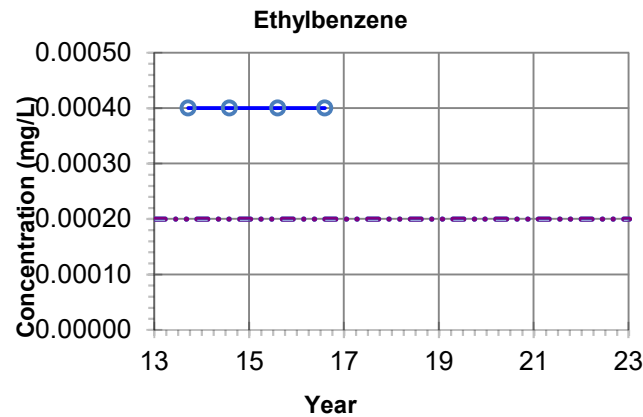
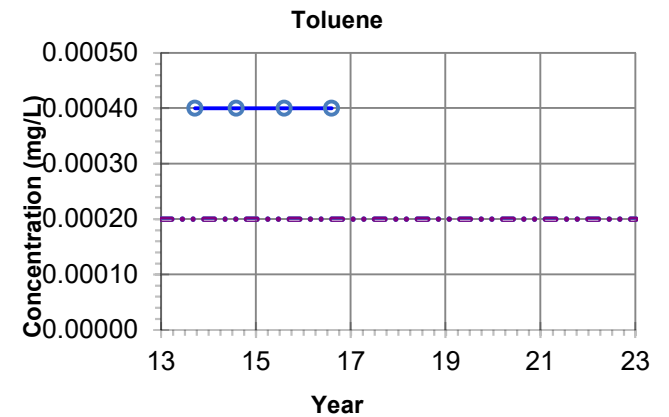
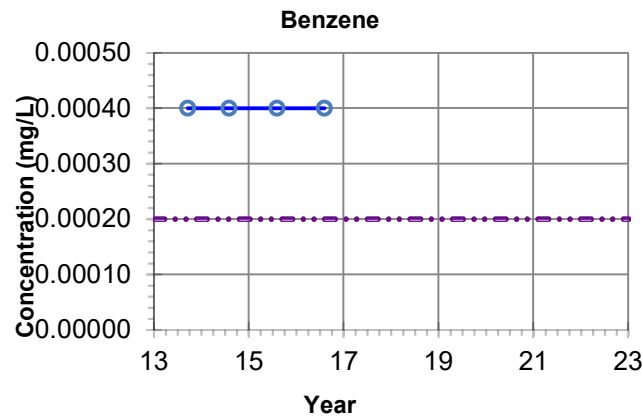
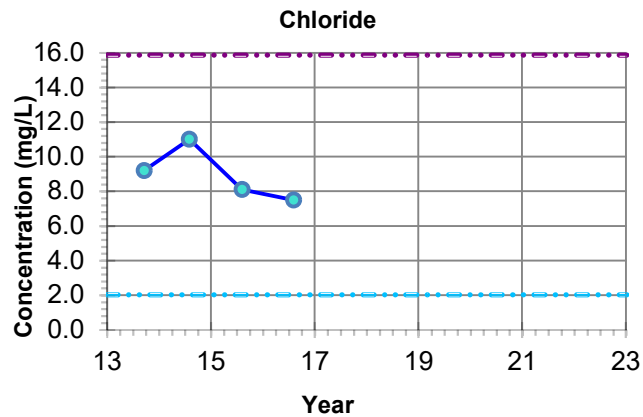
Imperial							
2022 Groundwater Surveillance Network Program							
Norman Wells, NT							
Trend Graphs							
Monitoring Well: BI-13-3-4.5							
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.						PROJECT NUMBER: 417085-42051-22100	Figure 10



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- **GUIDELINE:**
 CCME CEQG Freshwater Aquatic Life
 -Chloride = 120 mg/L
 -Benzene = 0.37
 -Toluene = 0.002 mg/L
 -Ethylbenzene = 0.09 mg/L
- **Upper Control Limit**
 --- **Lower Control Limit**

Imperial 2022 Groundwater Surveillance Network Program Norman Wells, NT Trend Graphs Monitoring Well: BIBG-10-1-4									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	11



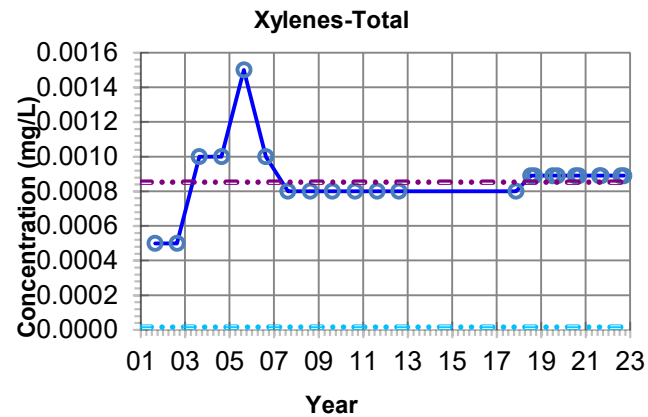
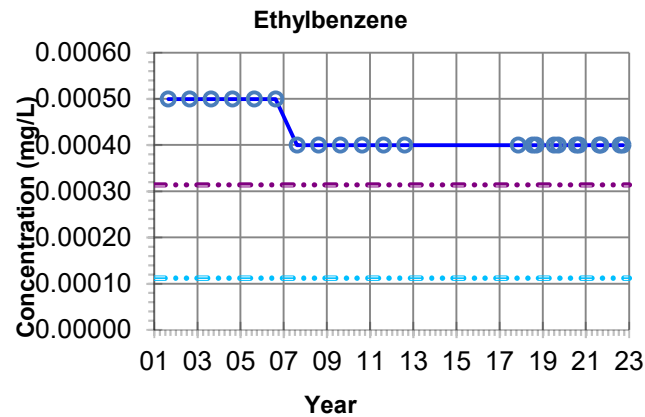
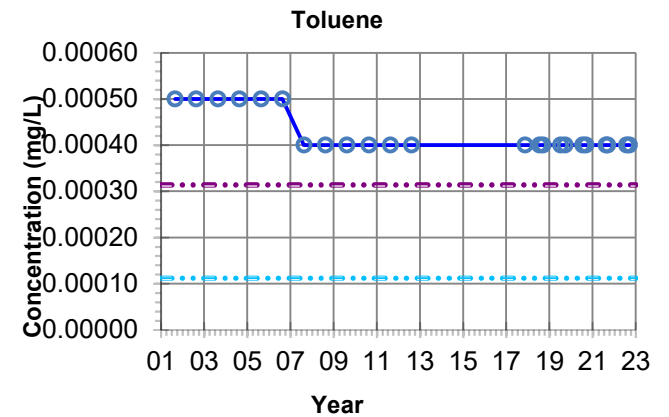
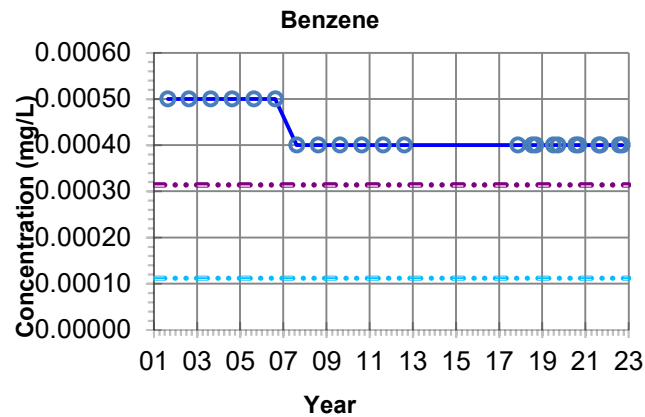
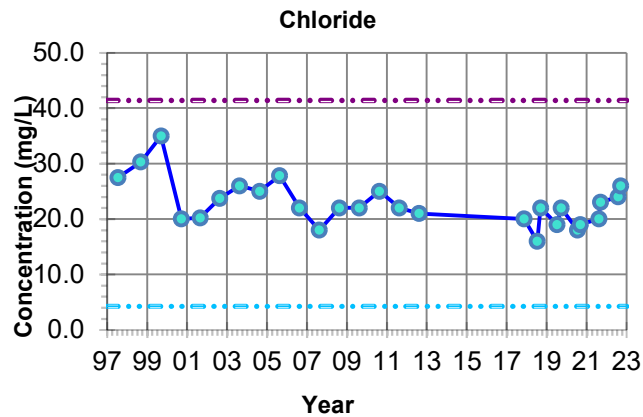
NOTES:

- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
CCME CEQG Freshwater Aquatic Life
 -Chloride = 120 mg/L
 -Benzene = 0.37
 -Toluene = 0.002 mg/L
 -Ethylbenzene = 0.09 mg/L

--- Upper Control Limit
--- Lower Control Limit

Imperial 2022 Groundwater Surveillance Network Program Norman Wells, NT Trend Graphs Monitoring Well: BIBG-12-1-7						TRIS Advisian 			
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	12



NOTES:

- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

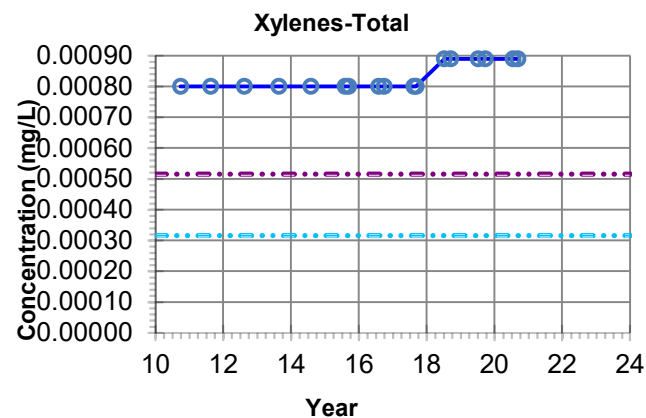
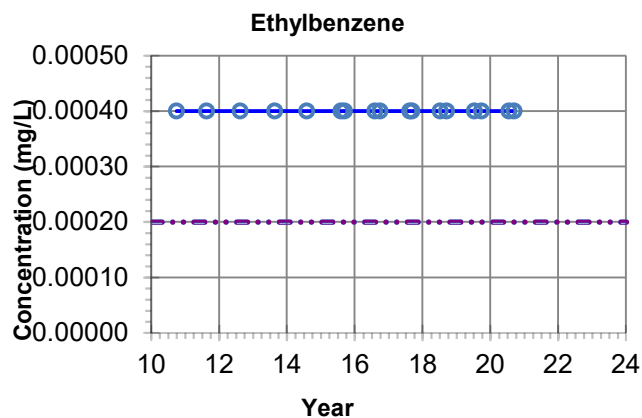
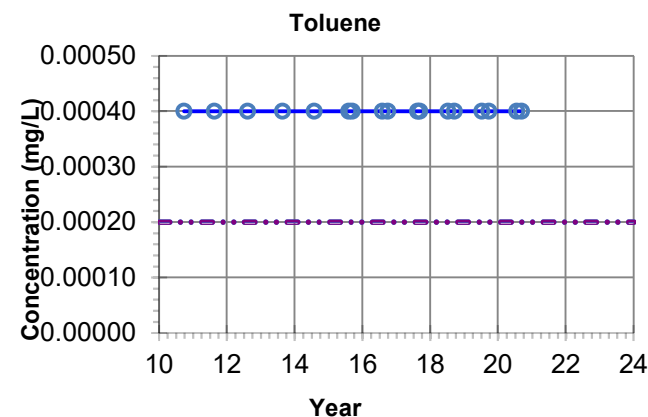
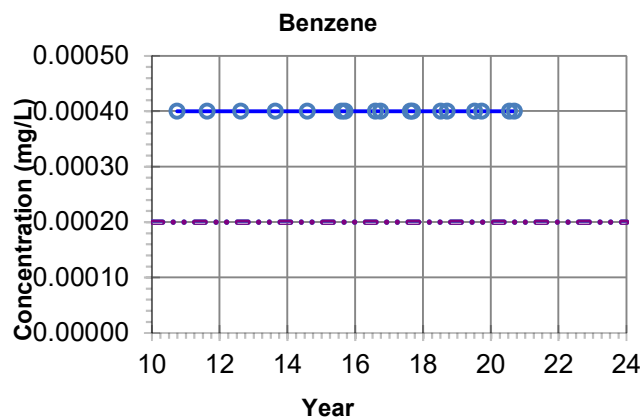
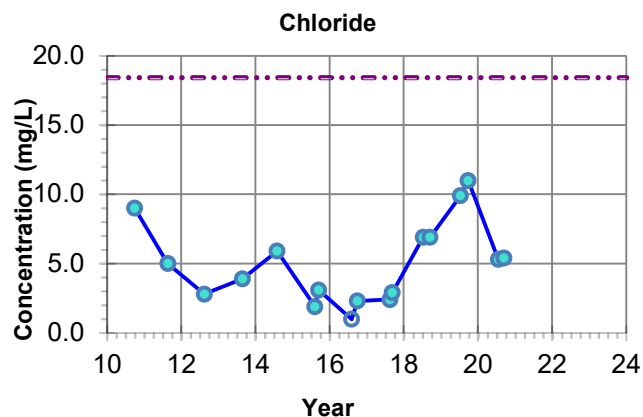
--- **GUIDELINE:**
CCME CEQG Freshwater Aquatic Life

- Chloride = 120 mg/L
- Benzene = 0.37
- Toluene = 0.002 mg/L
- Ethylbenzene = 0.09 mg/L

--- **Upper Control Limit**

--- **Lower Control Limit**

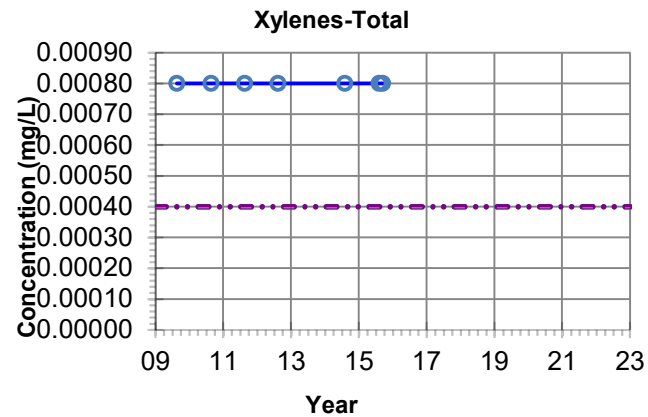
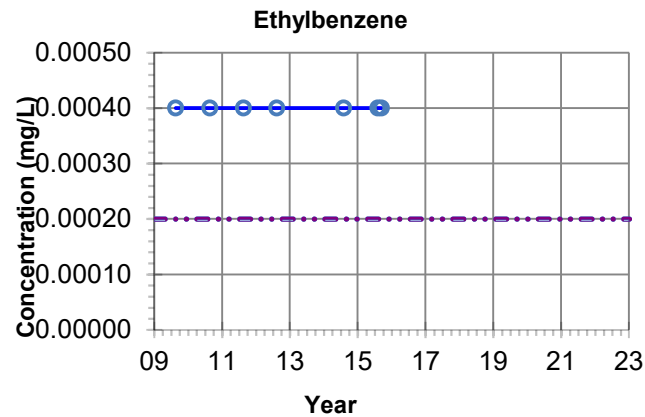
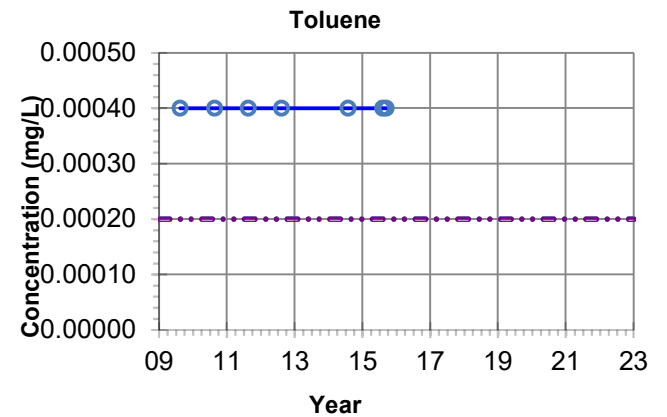
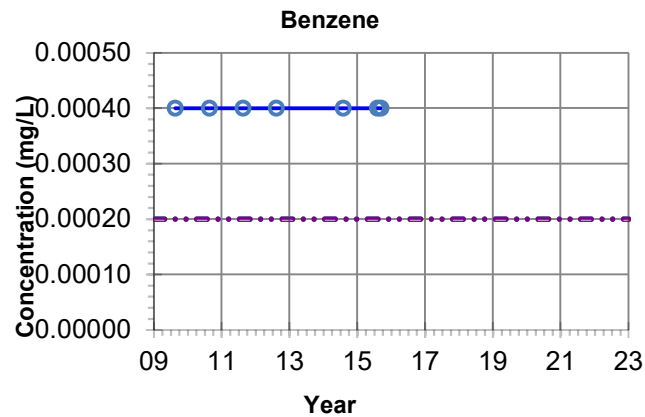
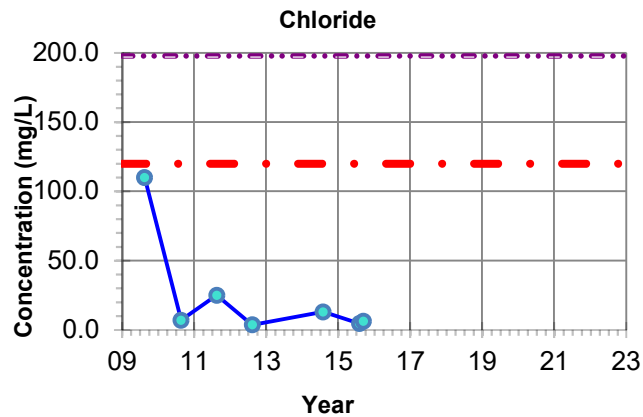
Imperial 2022 Groundwater Surveillance Network Program Norman Wells, NT Trend Graphs Monitoring Well: BIS 97-1-3									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	13



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- GUIDELINE:**
 CCME CEQG Freshwater Aquatic Life
 -Chloride = 120 mg/L
 -Benzene = 0.37
 -Toluene = 0.002 mg/L
 -Ethylbenzene = 0.09 mg/L
- Upper Control Limit**
--- Lower Control Limit

Imperial							
2022 Groundwater Surveillance Network Program							
Norman Wells, NT							
Trend Graphs							
Monitoring Well: GIBG-10-2-3							
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.						PROJECT NUMBER: 417085-42051-22100	Figure 14



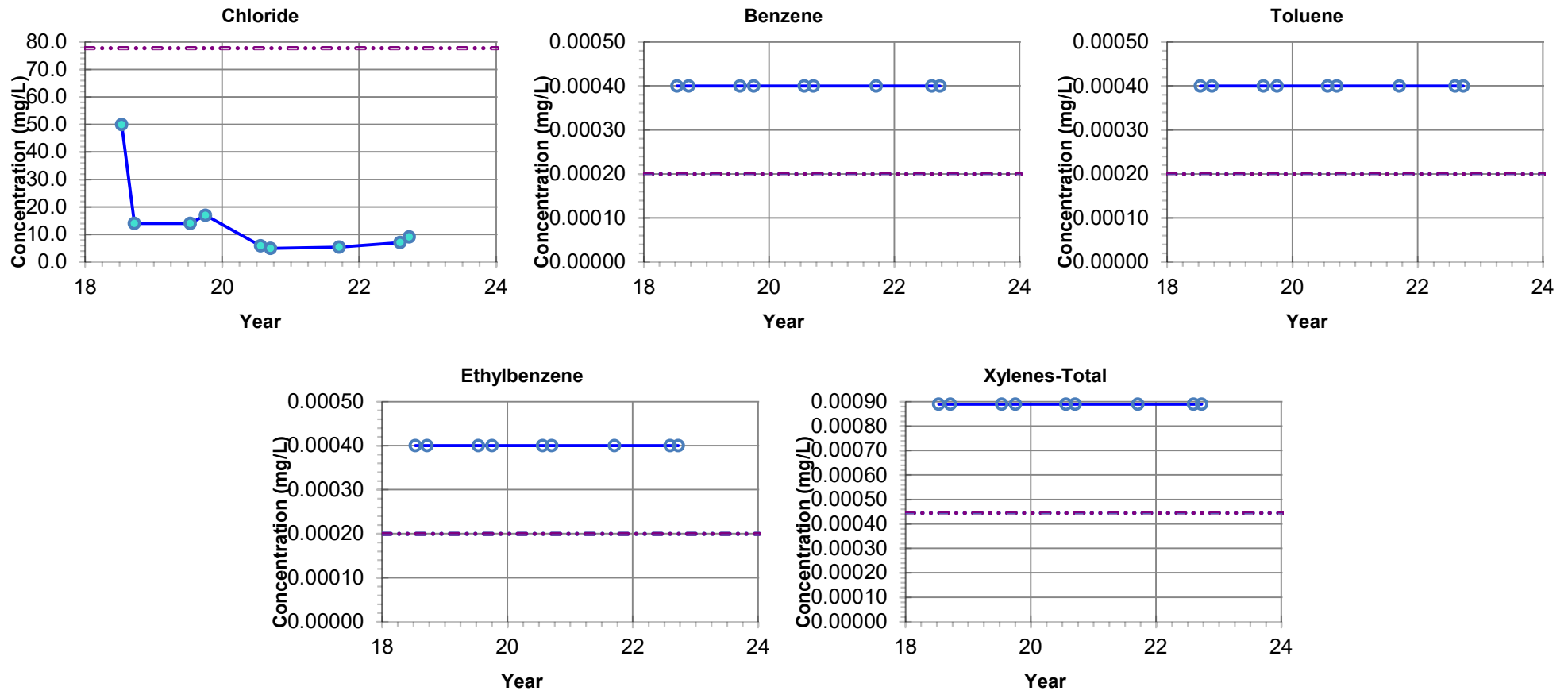
NOTES:

- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

--- GUIDELINE:
CCME CEQG Freshwater Aquatic Life
 -Chloride = 120 mg/L
 -Benzene = 0.37
 -Toluene = 0.002 mg/L
 -Ethylbenzene = 0.09 mg/L

--- Upper Control Limit
--- Lower Control Limit

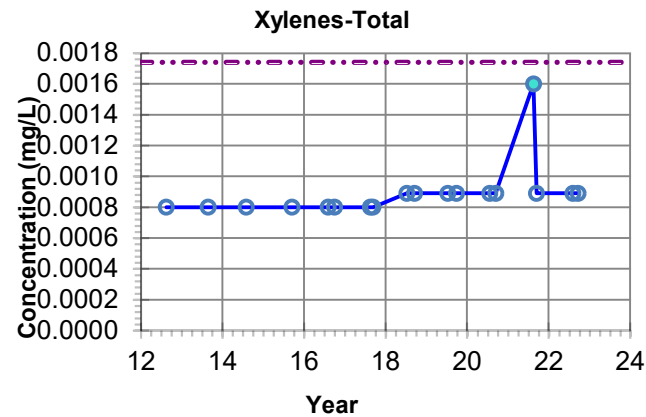
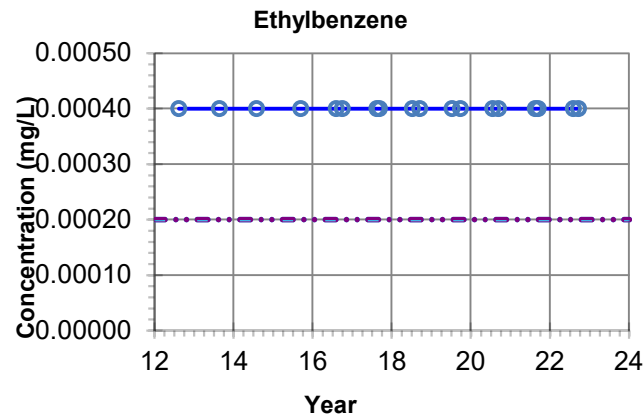
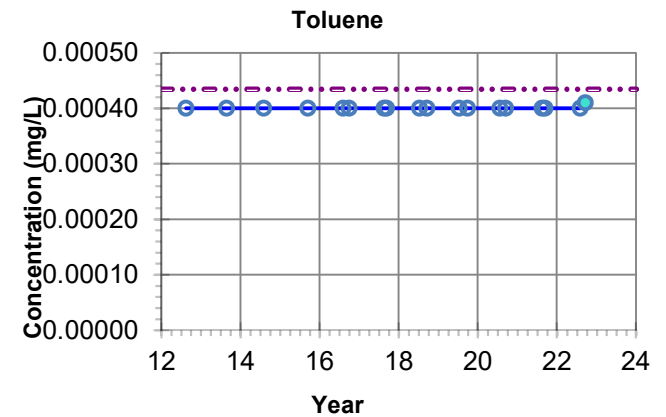
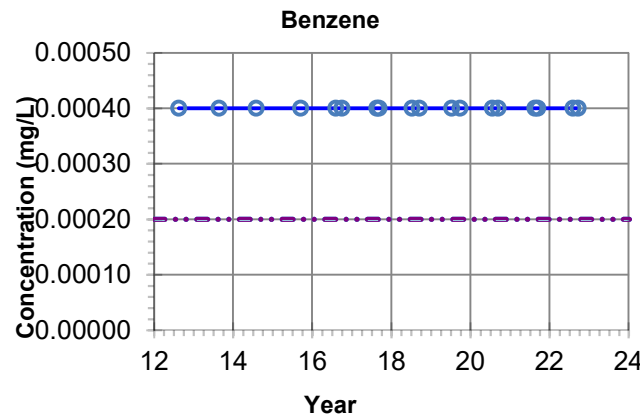
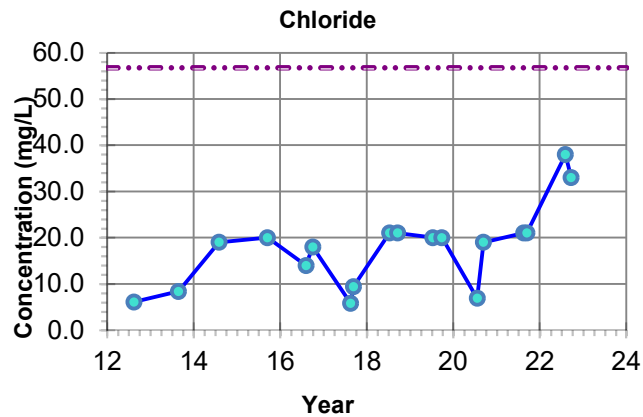
Imperial 2022 Groundwater Surveillance Network Program Norman Wells, NT Trend Graphs Monitoring Well: GIP11 09-1-4									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	15



NOTES: - Filled symbols denote Sample Values
 - Unfilled symbols denote Values < Detection Limit(s)

- **GUIDELINE:**
 CCME CEQG Freshwater Aquatic Life
 -Chloride = 120 mg/L
 -Benzene = 0.37
 -Toluene = 0.002 mg/L
 -Ethylbenzene = 0.09 mg/L
- **Upper Control Limit**
 --- **Lower Control Limit**

Imperial							
2022 Groundwater Surveillance Network Program							
Norman Wells, NT							
Trend Graphs							
Monitoring Well: GIP11 09-1-4-R							
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.						PROJECT NUMBER:	Figure
						417085-42051-22100	16



NOTES:

- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

--- **GUIDELINE:**
 CCME CEQG Freshwater Aquatic Life
 -Chloride = 120 mg/L
 -Benzene = 0.37
 -Toluene = 0.002 mg/L
 -Ethylbenzene = 0.09 mg/L

--- **Upper Control Limit**
 --- **Lower Control Limit**

Imperial 2022 Groundwater Surveillance Network Program Norman Wells, NT Trend Graphs Monitoring Well: GIQ8-10-2-4									
24-Jan-2023	date	NA	edited by	JC	drawn by	NA	app by	PROJECT NUMBER:	Figure
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.								417085-42051-22100	17