

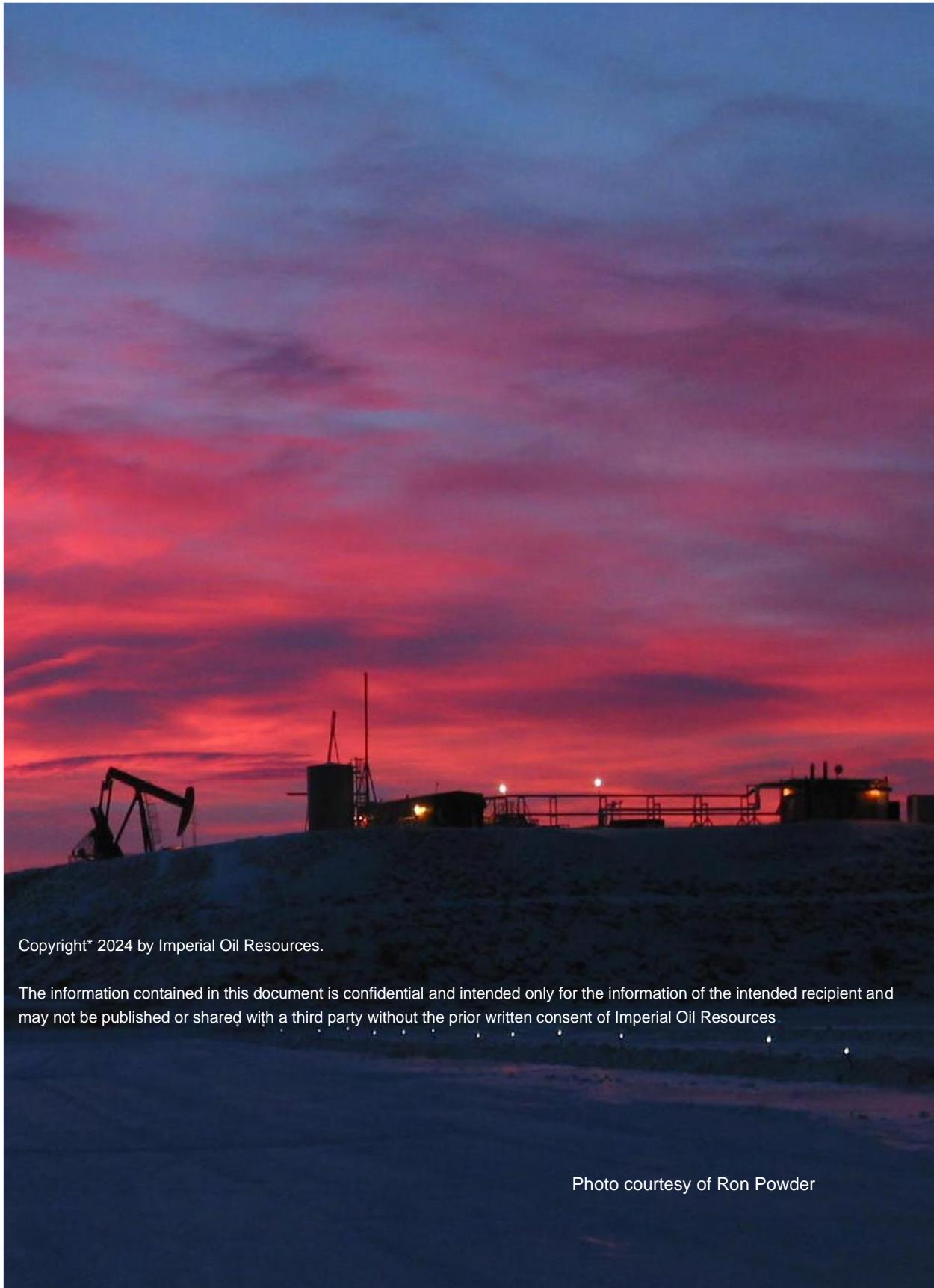


Norman Wells Operations 2023 Annual Water Use Report

Type A Water License - S13L1-007
Report No. 38

March 2024

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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**.

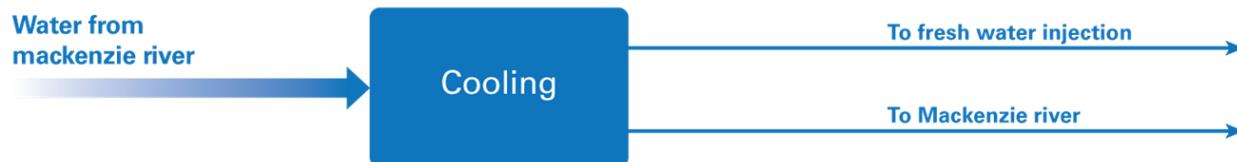
3.0 SNP – Freshwater

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 2023, Imperial withdrew approximately 2.1 million cubic metres (m^3) of water from the Mackenzie River (the maximum licence allowable limit is 3.5 million m^3). 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

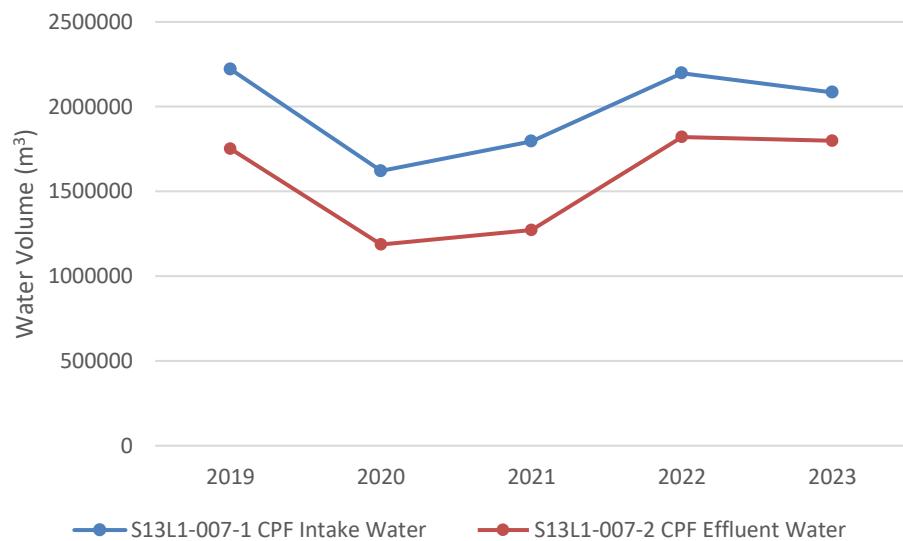


Details on the monthly quantities of freshwater withdrawn and discharged to the Mackenzie River can be found below in **Table 3-1**. All injection volumes can be found in **Table 4-1**. **Figure 3-2** shows the volume of water withdrawn from and returned to the Mackenzie River each year over a five year period.

Table 3-1: 2023 CPF Inlet and Outlet Volumes

Month	CPF Inlet (S13L1-007-1) (m ³)	CPF Outlet (S13L1-007-2) (m ³)
Jan	158,116	133,780
Feb	142,822	122,221
Mar	150,739	127,572
Apr	149,647	125,094
May	163,001	138,185
Jun	186,603	164,880
Jul	228,830	204,121
Aug	218,934	194,081
Sep	194,830	170,555
Oct	165,996	141,350
Nov	160,495	136,505
Dec	164,817	140,224
Total	2,084,830	1,798,568

Figure 3-2: Mackenzie River Withdrawal and Return Volumes (2019-2023)



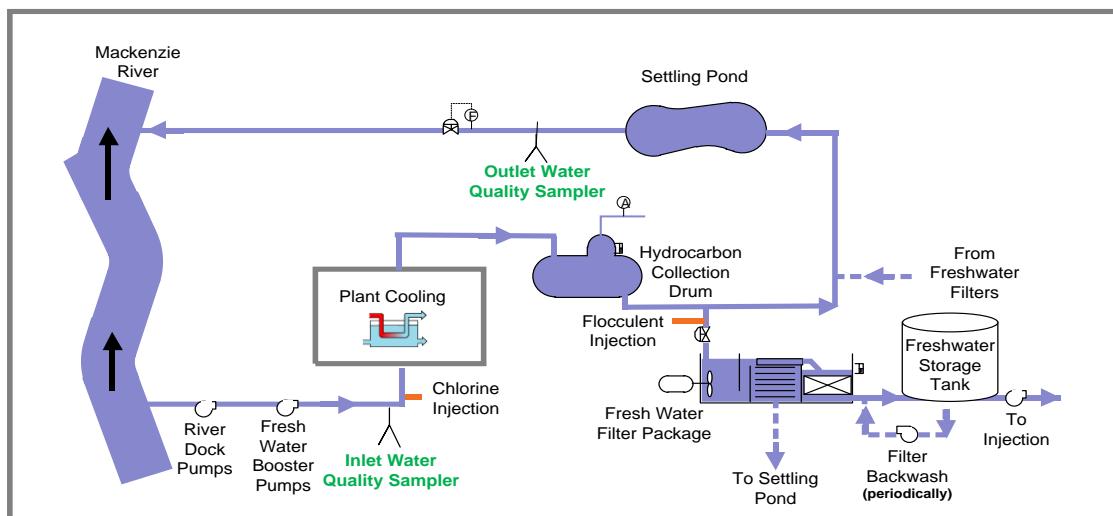
3.2 Volumes of Water Withdrawn from Other Sources

In 2023, Imperial did not withdraw any water from other sources.

3.3 Freshwater Cooling Loop Explained

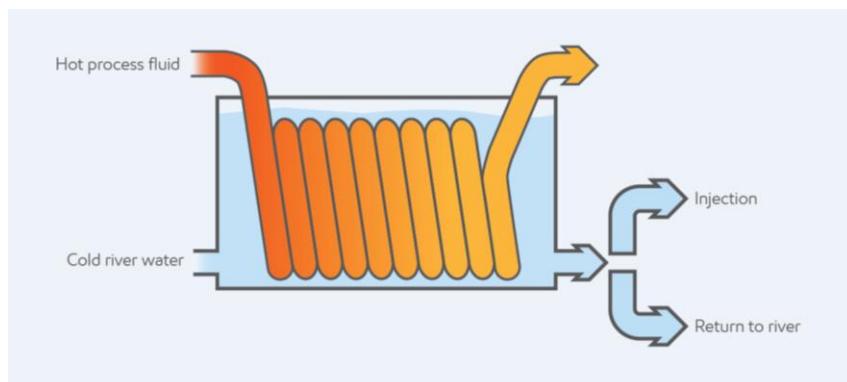
As water enters the CPF facility it is tested as per licence conditions at the CPF inlet (**Figure 3-3**). After testing, chlorine is added to kill bacteria in the piping and prevent damage to the equipment. This is the same type of chlorine used to disinfect drinking water systems. In 2023, the chlorine 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* (June 2021), 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.

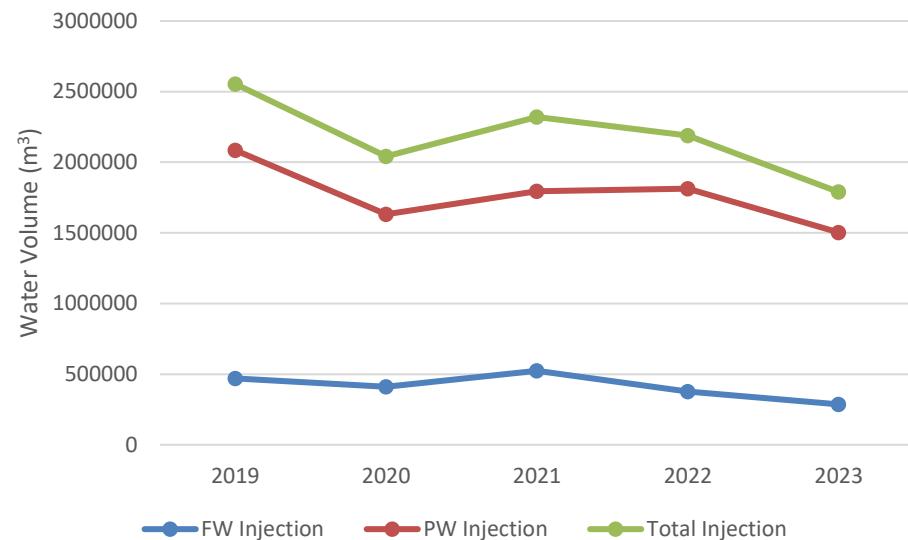
Water that is generated with the production of oil is called produced water and is re-injected into the reservoir. The volume of produced water is not enough to replace the amount of oil recovered; therefore, freshwater is used to supplement injection volumes required. The total volume of water injected in 2023 was approximately 1.8 million m³ and was made up of freshwater and produced water (**Table 4-1**)

Table 4-1: 2023 Freshwater and Produced Water Injection Volumes

Month	Freshwater Injection (m ³)	Produced Water Injection (m ³)	Total Water Injection (m ³)
Jan	24,336	128,767	153,102
Feb	20,602	114,539	135,141
Mar	23,167	129,617	152,784
Apr	24,553	128,345	152,898
May	24,816	118,466	143,282
Jun	21,723	123,817	145,540
Jul	24,710	133,297	158,006
Aug	24,853	127,366	152,219
Sep	24,275	125,320	149,595
Oct	24,646	129,163	153,810
Nov	23,989	118,968	142,958
Dec	24,593	125,805	150,398
Total	286,262	1,503,470	1,789,732

A decrease in water injection volumes has been observed over the past couple years due to a decline in production volumes. This decline can be attributed to the production shut-in of Island 5, 6, Bear and Frenchy's as a result of the Line 490 failure in July 2022. This is shown in **Figure 4-1**.

Figure 4-1: Freshwater and Produced Water Injection Volumes (2019-2023)



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 2023, 88,666 m³ of surface water was released back to the environment in total. This includes 4,792 m³ of Category A surface water and 83,874 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: 2023 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	11,979	4,241	1,422	0	9,156	0
Jun	0	552	0	0	593	0
Jul	60,171	0	0	0	0	0
Aug	0	0	0	0	553	0
Sep	0	0	0	0	0	0
Oct	0	0	0	0	0	0
Nov	0	0	0	0	0	0
Dec	0	0	0	0	0	0
Total	72,150	4,793	1,422	0	10,302	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**). There were no exceedances of water quality criteria or uncontrolled releases in 2023 for both Category A and B locations.

6.0 SNP - Groundwater

The 2023 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. In 2023, CPF 98-8-3, WSY 97-1-5, and TF 03-12-3 were abandoned and reinstalled as CPF 23-1-3, WSY 23-1-5, and TF 23-1-3. The wells were previously observed to be damaged (frost jacked). Replacement wells were redrilled in the same locations and depths. 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: 2023 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 – well was abandoned in 2023 and reinstalled as CPF 23-1-3.
WSY 97-1-5	Mainland East	Situated between Well Services Yard and Bosworth Creek – well was abandoned in 2023 and reinstalled as WSY 23-1-5.
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 – well was abandoned in 2023 and reinstalled as TF 23-1-3.
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-10-01-4	Bear Island	Situated at western edge of development on Bear Island, near Mackenzie River – meant to replace damaged SNP well BIBG-12-1-7 – noted damaged in 2020 and replaced by BIBG-20-01-4. BIBG-20-01-4 was observed to be damaged in 2021 and BIBG-10-01-4 has since been reinstated.
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
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-20-01-4	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. Which has since been damaged and replaced by the reinstated BIBG-10-01-4.
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 that have been damaged and are replaced but historical data are reported for comparison purposes

Groundwater quality monitoring for the SNP was completed in August and September 2023. 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 any identified trends through Mann-Kendall statistical analyses and Shewhart-Cumulative sum trend analyses are discussed in **Appendix C**. Imperial will continue to execute the *SNP Groundwater Monitoring Program* and analyze the data annually. Per direction received from the SLWB in 2023, Imperial will be submitting an updated GMP for Board review in 2024 which includes a number of additional groundwater monitoring well installations to increase the monitoring network coverage. Installation

of the new wells will begin in 2024 and be completed by the summer of 2025. The updated GMP (2024) will be followed for the 2024 groundwater quality monitoring program.

7.0 Reportable Releases

Imperial reported all 2023 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 2023, Imperial reported three 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 Supplemental OERS report, 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.

Table 7-1: Details on 2023 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
07-25-23	INC 2023-118	2023313	Mackenzie River – Norman Wells	Boat hydraulic fluid	0.12 L	0 L	0.12 L	During routine operation of Imperial Boat #2 in the Mackenzie River near the Imperial Norman Wells Operation, boat crew identified a mechanical issue when attempting to raise the outboard motor. Inspection found that the seal on the ram system leaked resulting in hydraulic fluid weeping to the river (120 mL in total). Repair completed later in the afternoon to resolve issue and boat resumed normal operation.	Equipment Integrity	N/A
8-16-2023	INC 2023-140	2023350	Mainland East Utilidor	Crude Oil / Produced Water emulsion	1.5 m3	1.5 m3	0.5 L	Contractor working in area noticed what sounded like a release from inside of an above ground utilidor located in Mainland East. Upon investigation, panels were removed from the utilidor wall to expose the flowlines within. Small pinhole was identified on Line 40, an 8" emulsion line. Released product was observed contained within the utilidor near the release point on the line. Flowline was promptly shut-in and blinked at both ends. Contained product was recovered via vac-truck within the utilidor. Approx 0.5L of product was released to environment while removing utilidor panels to gain access, which was cleaned up via surficial scrape. A 1 m section of line where external corrosion pinhole was located has since been replaced with the line fully reinstated.	Equipment - External Corrosion	Complete
11-27-2023	INC 2023-199	2023505	CPF – Freshwater Building	Corrosion inhibitor CORR18 171W	120 L	90 L	30 L	At 2300 hrs on November 26, 2023, Operator completed draw down on corrosion inhibitor tank in Fresh Water Bldg. to confirm volume being pumped and noticed volume to be inadequate. Operator lined out valves allowing fresh water to flush system to regain pump chemical capacity and left system in this configuration. During final surveillance round at 0430 hrs on November 27, 2023, Operator noticed corrosion inhibitor tote had expanded and ruptured, releasing 120 L of fluid to secondary containment tray with 90 L fully contained. The released volume overwhelmed the containment with 30 liters breaching the secondary containment tray escaping under the building wall reaching the ground outside of the building. Vac truck was utilized to promptly clean-up the impacted soil which was placed in secure containment on-site for disposal	People – Understood but did not follow acceptable practices or procedure	Complete

8.0 Drilling Activity Summary

There was no drilling activity in 2023 nor are there plans to drill in 2024. All drilling sumps have been capped and are in the remediation process. There were no drilling fluid releases in 2023.

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 2023, approximately 21 tonnes of hazardous waste and 280 tonnes of non-hazardous waste were transported to approved facilities outside of Norman Wells including Yellowknife and Northern Alberta (High Level and Edmonton).

Two Imperial owned soil treatment facilities (bio cells) continue to accept impacted material for short term storage and treatment for reuse on site. In 2023, 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 to 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 2023 is included in **Table 10-1**.

Table 10-1: 2023 Emergency Response Exercises

Date	Description
24-Jan-23	Tabletop – Cyber outage / Cyber Security
27-Apr-23	Drill – Old Compressor Building VCE Exercise
25-May-23	Functional – ECCC E2 Regs – Propane release – Explosion of V-118 Propane bullet – BLEVE Exercise
18-Jun-23	Drill – Old Compressor Building VCE Exercise
26-Jun-23	Drill – TG Building Fire – CO2 fire suppression system activated – Man down drill
July / Aug	Drill – Transport Canada Reg – Marine Response Drills (Man Overboard, Fire on Ship) – Once per rotation during boat season
July / Aug	Training – Spill response training (boom deployment, skimmer operation, etc) – weekly training completed with on-site rotation during open water season
10-Sept-23	Drill – Old Compressor Building VCE Exercise
14-Sept-23	Drill – Old Compressor Building VCE Exercise
20-Sept-23	Drill – Spill Response Drill for a well blowout (boom deployment, skimmer operation, etc)
17-Oct-23	Full Scale – ECCC E2 Regs – Petroleum Crude Oil Release from TK-114

A summary of the exercises planned for 2024 is included in **Table 10-2**.

Table 10-2: 2024 Planned Emergency Response Exercises

Date	Description
Apr	Training exercise – BCP – Cybersecurity
May	Tabletop – Firefighting exercise (wildfires)
May	Tabletop – Helicopter incident – Transport Canada
May	Drill – Old Compressor Building VCE Exercise
May	Tabletop – ECCC E2 Regs – Propane release – Explosion of V-117 Propane reflux drum – BLEVE exercise
May	Drill – TG Building Fire – CO2 fire suppression system activated – Man down drill
June	Drill – Old Compressor Building VCE Exercise
July / Aug	Drill – Transport Canada Reg – Marine Response Drills (Man Overboard, Fire on Ship) – Once per rotation during boat season
Aug	Drill – Old Compressor Building VCE Exercise
Aug	Drill – Man down exercise – working in remote areas – medical emergency
Aug	Drill – Well blowout – spill response drill (boom deployment, skimmer operation, etc)
Sept	Tabletop – Blocked flare and brittle fracture - critical operating parameter exercise
Sept	Drill – Old Compressor Building VCE Exercise
Sept	Tabletop – ECCC E2 Regs – Crude oil release – Release of TK-119 exercise

11.0 Work Summary

Below is a list of modification(s) and maintenance work carried out as per Part G of the license in 2023:

- Artificial Islands 3 & 4 Armouring Repair Program – Results from the Artificial Island inspection program completed in August 2022 revealed movement and slippage of the lower concrete blocks along the upstream facing toes of Island's 3 & 4 due to localized scouring in the area. Sustained high summer flow rates on the Mackenzie River in 2022 combined with local flow patterns around both islands were believed to be the primary causes of the scour events leading to armour block slippage. A modification notification was submitted to the SLWB per Part G (1a) of Water License S13L1-007 on January 9, 2023, in preparation to execute an armouring repair program in March 2023. The repair program was successfully completed between March into early April utilizing ice pads constructed around the toes of both islands. The existing slipping concrete armour blocks were repositioned before approximately 1300 m³ of Class E riprap armour rock was placed around the toe of Island 3 while approximately 100 m³ of Class E riprap armour rock was placed around the toe of Island 4. Further details on the work is summarized in the 2023 Flowline Integrity and Break-up report that was submitted to the SLWB on January 31, 2024.
- Bosworth Creek Erosion Repair - A geotechnical assessment of Bosworth Creek completed in November 2022 identified a 21m long section of unstable creek bank showing evidence of recent sloughing and soil and vegetation loss due to active slope degradation during the 2022 spring freshet when Bosworth Creek water levels were high. An aboveground utilidor providing a right of way for electrical cables and conveyance flowlines carrying multiphase fluids, fuel and natural gas parallels the Bosworth Creek bank, in the area offset between 2.5 m to 6 m from the crest of the actively eroding creek bank. Based on the assessment, future instability was deemed likely to occur if no mitigative actions were taken. A modification notification was submitted to the SLWB per Part G (1a) of Water License S13L1-007 on February 22, 2023, to complete the bank stabilization efforts in advance of spring freshet. The bank stabilization scope of work began on March 15, 2023, and was completed by March 27, 2023. The scope of work included:
 - Tree and vegetation removal and site grading to facilitate access to the area requiring work along the 21m section of the Bosworth Creek bank.
 - Use of equipment for clearing, grading and excavation
 - Preparation of two staging areas for armour rock- D-28X well site and across the creek from the failed bank
 - Construction of two ice bridge / snowfills crossings of Bosworth Creek to facilitate access.
 - Placement of non-woven geotextile filter fabric and 65 m³ of Class 1M riprap, 75 m³ of Class 2 riprap armour rock long a 240 m² footprint of the bank to mitigate from future erosion. The riprap armour rock was sourced from the local Norman Wells quarry.
 - No water use was required for the completion of the erosion mitigation program.
 - Upon completion of the bank stabilization, any remaining rock sediment fines on the working ice were collected via surficial scrape using a loader and safely disposed within Imperials waste management yard within the mainland operations footprint to prevent the introduction of any new sediment into Bosworth Creek during spring freshet in 2023.

- No issues were encountered during execution. A DFO inspector completed a satisfactory site inspection on April 3, 2023, once the activities were completed.
- Norman Wells Operations will continue to monitor the Bosworth Creek bank in the vicinity of any flowline corridors on an annual basis as part of the Operation's Long Term Erosion Plan to ensure any advancing slope erosion is detected early so mitigative actions can be implemented as required in accordance with Part F (3) of Water License S13L1-007.
- Below are photos of the Bosworth Creek bank during the initial geotechnical assessment in November 2022 and during execution of the bank stabilization scope for reference.

Figure 11-1: Unstable Bosworth Creek Bank during Geotechnical assessment, November 2022

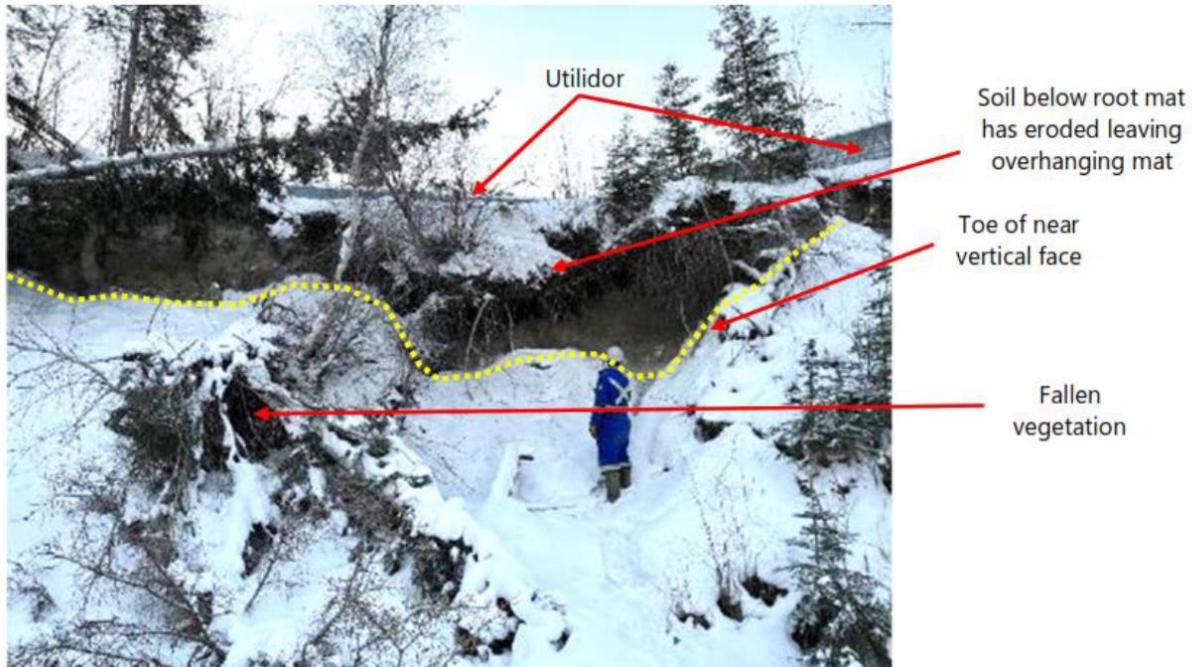


Figure 11-2: Bosworth Creek Bank Stabilized during execution, March 2023



12.0 Acronyms

Acronym	Definition
AEMP	Aquatic Effects Monitoring Program
B.I.T. 4	Bear Island Terminal 4
BCP	Business Continuity Plan
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
ECCC	Environment and Climate Change Canada
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

13.0 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: 2023 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
3-Jan	<2.0	<0.0015	<2.0	<0.0015
9-Jan	<2.0	<0.0015	<2.0	<0.0015
16-Jan	<2.0	<0.0015	<2.0	<0.0015
23-Jan	<2.0	<0.0015	<2.0	<0.0015
30-Jan	<2.0	<0.0015	<2.0	<0.0015
6-Feb	<2.0	<0.0015	<2.0	<0.0015
13-Feb	<2.0	<0.0015	<2.0	<0.0015
21-Feb	<2.0	<0.0015	<2.0	<0.0015
27-Feb	<2.0	<0.0015	<2.0	<0.0015
6-Mar	<2.0	<0.0015	<2.0	<0.0015
13-Mar	<2.0	<0.0015	<2.0	<0.0015
20-Mar	<2.0	<0.0015	<2.0	<0.0015
27-Mar	<2.0	<0.0015	<2.0	<0.0015
4-Apr	<2.0	<0.0015	<2.0	<0.0015
9-Apr	<2.0	<0.0015	<2.0	<0.0015
17-Apr	<2.0	<0.0015	<2.0	<0.0015
24-Apr	<2.0	<0.0015	<2.0	<0.0015
1-May	<2.0	<0.0015	<2.0	<0.0015
8-May	<2.0	<0.0015	<2.0	0.0019
15-May	<2.0	<0.0015	<2.0	<0.0015
22-May	<2.0	<0.0015	<2.0	<0.0015
29-May	<2.0	<0.0015	<2.0	<0.0015
5-Jun	<2.0	<0.0015	<2.0	<0.0015
12-Jun	<2.0	<0.0015	<2.0	0.0019
19-Jun	<2.0	<0.0015	<2.0	<0.0015
26-Jun	<2.0	<0.0015	<2.0	<0.0015
3-Jul	<2.0	<0.0015	<2.0	<0.0015
10-Jul	<2.0	<0.0015	3	<0.0015
17-Jul	<2.0	<0.0015	<2.0	<0.0015
24-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
31-Jul	<2.0	<0.0015	<2.0	<0.0015
9-Aug	<2.0	0.0018	<2.0	<0.0015
14-Aug	<2.0	<0.0015	<2.0	<0.0015
21-Aug	<2.0	<0.0015	<2.0	<0.0015
28-Aug	<2.0	<0.0015	<2.0	<0.0015
5-Sep	<2.0	<0.0015	<2.0	<0.0015
11-Sep	<2.0	<0.0015	<2.0	<0.0015
18-Sep	<2.0	<0.0015	<2.0	<0.0015
25-Sep	<2.0	<0.0015	<2.0	<0.0015
2-Oct	<2.0	<0.0015	<2.0	<0.0015
9-Oct	<2.0	<0.0015	<2.0	<0.0015
16-Oct	<2.0	<0.0015	<2.0	<0.0015
23-Oct	<2.0	<0.0015	<2.0	<0.0015
30-Oct	<2.0	<0.0015	<2.0	<0.0015
6-Nov	<2.0	<0.0015	<2.0	<0.0015
17-Nov	<2.0	<0.0015	<2.0	<0.0015
20-Nov	<2.0	<0.0015	<2.0	<0.0015
27-Nov	<2.0	<0.0015	<2.0	<0.0015
4-Dec	<2.0	<0.0015	<2.0	<0.0015
11-Dec	<2.0	<0.0015	<2.0	<0.0015
18-Dec	<2.0	<0.0015	<2.0	<0.0015
27-Dec	<2.0	<0.0015	<2.0	<0.0015

Table A-2: 2023 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	
3-Jan	1	8.13	250	1	8.13	240
5-Jan	7	8	240	1	8.08	240
9-Jan	4	8.07	250	1	8.12	240
12-Jan	1	8.14	260	1	8.03	250
16-Jan	1	7.66	250	1	8.09	250
19-Jan	1	7.37	240	1	8.19	250
23-Jan	42	8.09	240	1	8.08	240
26-Jan	1	8.02	250	1	7.87	240
30-Jan	8.7	8	240	1.7	8	240
2-Feb	2.4	8.12	240	<1.0	7.93	240
6-Feb	8.2	8.14	250	<1.0	8.12	250
9-Feb	1.4	8.13	250	<1.0	8.15	250
13-Feb	1.5	7.95	270	<1.0	8.01	250
16-Feb	<1.0	8.01	250	<1.0	8.02	250
21-Feb	<1.0	7.82	250	<1.0	8.11	250
23-Feb	1	8.07	250	<1.0	8.11	250
27-Feb	1.6	8.05	260	1	7.81	260
2-Mar	<1.0	7.63	260	<1.0	7.87	260
6-Mar	<1.0	7.78	280	<1.0	8.04	260
9-Mar	<1.0	7.99	260	<1.0	8.08	260
13-Mar	<1.0	7.99	260	<1.0	7.98	260
16-Mar	<1.0	7.57	260	<1.0	7.98	260
20-Mar	<1.0	7.95	260	4.5	8	270
23-Mar	1.1	7.96	260	<1.0	7.4	260
27-Mar	<1.0	7.73	260	<1.0	7.62	260
30-Mar	<1.0	7.43	260	<1.0	7.95	260
4-Apr	1.1	7.93	280	1.1	8	280
6-Apr	1.9	7.86	270	<1.0	8.01	270
9-Apr	<1.0	7.88	270	1.3	8.04	280
13-Apr	1.2	8.12	280	<1.0	8.14	280
17-Apr	<1.0	7.63	270	<1.0	7.97	270

	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
20-Apr	<1.0	8.03	240	1.6	8.05	270
24-Apr	<1.0	7.6	270	<1.0	8	270
27-Apr	<1.0	7.62	270	<1.0	8.04	270
1-May	<1.0	8.25	270	<1.0	8.25	280
4-May	2	7.95	260	<1.0	7.99	250
8-May	2.1	7.2	270	4.1	7.28	270
11-May	8.8	7.84	240	13	7.7	260
15-May	23	8.09	380	11	8.04	250
18-May	210	8.06	330	24	7.97	250
22-May	3.7	8.19	260	12	8.16	260
25-May	32	7.49	270	7.9	7.97	260
29-May	10	8.1	310	6.8	8.07	260
1-Jun	44	7.92	200	6.9	7.78	260
5-Jun	43	8.08	250	12	8.14	250
8-Jun	180	8.04	260	7.1	8.08	250
12-Jun	390	8.14	260	13	8.06	260
15-Jun	320	8.12	270	13	7.94	270
19-Jun	49	8.09	260	18	8.12	250
22-Jun	1.9	7.5	250	17	7.86	250
26-Jun	18	7.89	510	7.7	7.9	260
29-Jun	120	8.18	460	5.2	7.55	270
3-Jul	16	8	290	17	8	280
6-Jul	150	8	280	330	8	280
10-Jul	21	8	280	120	8	280
13-Jul	87	8	300	10	8	290
17-Jul	8	7	280	<1.0	8	280
20-Jul	15	8	290	<1.0	8	290
24-Jul	28	8	290	19	8	290
27-Jul	28	8	300	2	8	300
31-Jul	31	8	290	<1.0	8	300
3-Aug	55	7.57	290	3.4	7.23	290
9-Aug	5.9	7.4	290	3.7	8	280
10-Aug	85	8.17	290	85	8.18	290
14-Aug	21	8.05	290	2.7	8.15	290

	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
17-Aug	23	8.2	290	5.1	8.26	310
21-Aug	11	7.79	290	4.4	7.05	290
24-Aug	41	8.11	270	3.6	8.22	270
28-Aug	3.9	6.95	290	2.3	7.22	290
31-Aug	15	7.14	300	5.7	7.87	300
5-Sep	7.6	6.93	300	4.1	7.09	300
7-Sep	14	7.95	310	4.4	7.52	300
11-Sep	2.1	7	300	2.6	7.32	300
14-Sep	81	8.06	300	3	8.17	300
18-Sep	51	6.98	320	1.6	6.96	290
21-Sep	100	6.93	300	2.1	6.93	290
25-Sep	17	6.93	290	2.3	7.53	290
2-Oct	45	7	290	1	7.22	300
9-Oct	28	7	290	<1.0	6.8	280
12-Oct	120	7	290	1.5	7.59	280
16-Oct	190	8	290	<1.0	8.07	280
23-Oct	10	8	280	2.9	8.16	290
26-Oct	60	8	370	3.3	7.89	310
30-Oct	2	8	330	1.9	8.11	280
2-Nov	40	8.32	290	3.4	7.98	290
6-Nov	8.5	8.24	300	1.8	8.11	290
9-Nov	<1.0	8.01	310	2.5	8.16	310
17-Nov	<1.0	7.77	310	1.7	7.94	310
20-Nov	2.6	8.1	310	<1.0	7.98	340
23-Nov	<1.0	8.11	300	<1.0	7.98	280
27-Nov	23	8.14	300	<1.0	8.06	290
30-Nov	16	8.06	300	<1.0	7.89	300
4-Dec	10	8.13	340	1.6	8.09	320
7-Dec	7.2	8.2	340	<1.0	7.9	330
11-Dec	2.1	7.74	350	<1.0	8.12	330
14-Dec	35	7.45	320	<1.0	7.21	310
18-Dec	1	7.87	300	<1.0	7.99	290
21-Dec	92	7.68	280	<1.0	7.8	280
27-Dec	<1.0	7.93	280	<1.0	7.93	280

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	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
28-Dec	10	7.22	260	<1.0	7.14	260

Table A-3: 2023 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	0.00	- *
2-Jan	0.00	- *
3-Jan	0.00	- *
4-Jan	0.01	- *
5-Jan	0.01	- *
6-Jan	0.00	- *
7-Jan	0.03	- *
8-Jan	0.00	- *
9-Jan	0.00	- *
10-Jan	0.00	- *
11-Jan	0.01	- *
12-Jan	0.03	- *
13-Jan	0.00	- *
14-Jan	0.00	- *
15-Jan	0.00	- *
16-Jan	0.00	- *
17-Jan	0.03	- *
18-Jan	0.00	- *
19-Jan	0.00	- *
20-Jan	0.00	- *
21-Jan	0.00	- *
22-Jan	0.01	- *
23-Jan	0.03	- *
24-Jan	0.02	- *
25-Jan	0.02	- *
26-Jan	0.02	- *
27-Jan	0.03	- *
28-Jan	0.00	- *
29-Jan	0.03	- *
30-Jan	0.01	- *
31-Jan	0.01	- *
1-Feb	0.01	- *
2-Feb	0.00	- *
3-Feb	0.00	- *
4-Feb	0.00	- *
5-Feb	0.01	- *

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

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
15-Mar	0.01	- *
16-Mar	0.01	- *
17-Mar	0.01	- *
18-Mar	0.00	- *
19-Mar	0.00	- *
20-Mar	0.00	- *
21-Mar	0.00	- *
22-Mar	0.00	- *
23-Mar	0.00	- *
24-Mar	0.00	- *
25-Mar	0.00	- *
26-Mar	0.00	9.5
27-Mar	0.01	10.0
28-Mar	0.00	10.6
29-Mar	0.01	10.4
30-Mar	0.00	9.7
31-Mar	0.03	9.5
1-Apr	0.01	9.6
2-Apr	0.01	9.5
3-Apr	0.01	10.4
4-Apr	0.00	11.3
5-Apr	0.01	12.2
6-Apr	0.01	11.7
7-Apr	0.00	10.6
8-Apr	0.01	11.9
9-Apr	0.01	12.3
10-Apr	0.01	10.8
11-Apr	0.00	11.4
12-Apr	0.00	10.8
13-Apr	0.01	9.0
14-Apr	0.00	8.7
15-Apr	0.00	11.1
16-Apr	0.01	10.6
17-Apr	0.00	8.5
18-Apr	0.02	8.4
19-Apr	0.01	9.6
20-Apr	0.00	10.1

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
21-Apr	0.00	10.4
22-Apr	0.01	9.0
23-Apr	0.00	8.4
24-Apr	0.01	9.5
25-Apr	0.01	9.5
26-Apr	0.00	10.1
27-Apr	0.01	11.3
28-Apr	0.00	12.1
29-Apr	0.00	12.3
30-Apr	0.00	11.9
1-May	0.01	12.3
2-May	0.00	12.4
3-May	0.00	11.9
4-May	0.01	13.5
5-May	0.00	14.7
6-May	0.00	14.7
7-May	0.00	12.3
8-May	0.00	11.6
9-May	0.00	13.4
10-May	0.01	14.8
11-May	0.00	16.6
12-May	0.00	15.9
13-May	0.00	16.0
14-May	0.00	16.5
15-May	0.00	17.2
16-May	0.00	17.2
17-May	0.00	14.7
18-May	0.00	14.6
19-May	0.00	15.2
20-May	0.00	17.4
21-May	0.01	17.4
22-May	0.01	18.7
23-May	0.01	18.6
24-May	0.00	19.9
25-May	0.00	20.1
26-May	0.00	18.8
27-May	0.01	18.1

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
28-May	0.01	19.3
29-May	0.00	19.8
30-May	0.00	20.4
31-May	0.00	18.9
1-Jun	0.01	21.3
2-Jun	0.01	20.9
3-Jun	0.01	22.2
4-Jun	0.01	21.8
5-Jun	0.01	19.7
6-Jun	0.01	17.8
7-Jun	0.03	19.7
8-Jun	0.02	21.2
9-Jun	0.00	23.2
10-Jun	0.02	20.7
11-Jun	0.00	20.7
12-Jun	0.01	21.3
13-Jun	0.00	22.6
14-Jun	0.03	22.5
15-Jun	0.01	22.0
16-Jun	0.02	23.0
17-Jun	0.01	22.8
18-Jun	0.01	23.7
19-Jun	0.00	23.0
20-Jun	0.00	22.5
21-Jun	0.01	22.9
22-Jun	0.00	23.0
23-Jun	0.00	20.8
24-Jun	0.00	22.2
25-Jun	0.00	23.6
26-Jun	0.00	25.2
27-Jun	0.00	25.0
28-Jun	0.00	26.2
29-Jun	0.00	27.0
30-Jun	0.00	27.2
1-Jul	0.00	21.6
2-Jul	0.00	18.7
3-Jul	0.00	17.9

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
4-Jul	0.00	18.0
5-Jul	0.00	18.2
6-Jul	0.00	19.0
7-Jul	0.00	19.5
8-Jul	0.00	20.0
9-Jul	0.00	20.5
10-Jul	0.00	21.0
11-Jul	0.00	21.4
12-Jul	0.00	22.1
13-Jul	0.00	22.0
14-Jul	0.00	22.3
15-Jul	0.00	22.1
16-Jul	0.00	22.2
17-Jul	0.00	22.1
18-Jul	0.00	21.9
19-Jul	0.00	22.0
20-Jul	0.00	21.9
21-Jul	0.00	21.9
22-Jul	0.00	21.7
23-Jul	0.00	21.9
24-Jul	0.00	21.9
25-Jul	0.00	22.0
26-Jul	0.00	22.0
27-Jul	0.00	22.1
28-Jul	0.00	22.2
29-Jul	0.00	22.2
30-Jul	0.00	22.0
31-Jul	0.00	22.0
1-Aug	0.00	21.8
2-Aug	0.00	21.7
3-Aug	0.00	21.7
4-Aug	0.00	21.4
5-Aug	0.00	21.2
6-Aug	0.00	21.1
7-Aug	0.00	21.0
8-Aug	0.00	20.9
9-Aug	0.00	20.8

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
10-Aug	0.00	20.6
11-Aug	0.00	20.7
12-Aug	0.00	20.6
13-Aug	0.00	23.5
14-Aug	0.01	24.5
15-Aug	0.01	25.0
16-Aug	0.00	25.9
17-Aug	0.00	25.2
18-Aug	0.00	24.2
19-Aug	0.01	24.8
20-Aug	0.00	25.1
21-Aug	0.00	25.5
22-Aug	0.00	26.3
23-Aug	0.00	26.3
24-Aug	0.00	25.8
25-Aug	0.00	25.9
26-Aug	0.01	25.6
27-Aug	0.02	25.8
28-Aug	0.02	25.7
29-Aug	0.01	26.0
30-Aug	0.05	25.7
31-Aug	0.03	26.1
1-Sep	0.00	25.2
2-Sep	0.00	21.7
3-Sep	0.00	22.5
4-Sep	0.00	22.7
5-Sep	0.00	24.2
6-Sep	0.02	24.9
7-Sep	0.00	25.0
8-Sep	0.00	25.0
9-Sep	0.00	24.8
10-Sep	0.01	25.3
11-Sep	0.01	25.0
12-Sep	0.00	25.0
13-Sep	0.00	23.7
14-Sep	0.00	22.4
15-Sep	0.00	22.7

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
16-Sep	0.01	21.8
17-Sep	0.00	21.9
18-Sep	0.00	21.7
19-Sep	0.00	20.5
20-Sep	0.01	20.3
21-Sep	0.01	20.5
22-Sep	0.01	18.9
23-Sep	0.02	19.2
24-Sep	0.00	18.9
25-Sep	0.01	18.4
26-Sep	0.02	18.4
27-Sep	0.00	18.1
28-Sep	0.02	17.5
29-Sep	0.00	17.0
30-Sep	0.00	16.8
1-Oct	0.00	18.1
2-Oct	0.01	19.8
3-Oct	0.00	18.2
4-Oct	0.00	16.8
5-Oct	0.00	16.8
6-Oct	0.00	16.5
7-Oct	0.00	14.6
8-Oct	0.00	14.4
9-Oct	0.00	13.7
10-Oct	0.01	14.1
11-Oct	0.02	14.2
12-Oct	0.01	14.1
13-Oct	0.01	15.0
14-Oct	0.00	14.9
15-Oct	0.00	15.1
16-Oct	0.01	14.5
17-Oct	0.01	14.3
18-Oct	0.01	14.1
19-Oct	0.01	12.9
20-Oct	0.00	11.6
21-Oct	0.01	10.6
22-Oct	0.00	11.3

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
23-Oct	0.01	12.1
24-Oct	0.00	13.2
25-Oct	0.01	13.9
26-Oct	0.00	14.2
27-Oct	0.00	12.8
28-Oct	0.00	12.0
29-Oct	0.02	11.0
30-Oct	0.00	11.3
31-Oct	0.00	11.6
1-Nov	0.00	12.9
2-Nov	0.01	12.7
3-Nov	0.00	11.5
4-Nov	0.01	11.0
5-Nov	0.00	9.7
6-Nov	0.00	8.8
7-Nov	0.01	9.3
8-Nov	0.02	9.2
9-Nov	0.02	9.7
10-Nov	0.01	9.6
11-Nov	0.01	9.0
12-Nov	0.02	8.8
13-Nov	0.02	10.1
14-Nov	0.01	10.6
15-Nov	0.02	10.4
16-Nov	0.02	9.9
17-Nov	0.01	9.0
18-Nov	0.02	8.8
19-Nov	0.01	7.2
20-Nov	0.02	7.9
21-Nov	0.02	6.9
22-Nov	0.01	8.2
23-Nov	0.01	9.1
24-Nov	0.01	9.3
25-Nov	0.02	9.3
26-Nov	0.01	10.0
27-Nov	0.01	9.3
28-Nov	0.02	9.6

	Daily Chlorine (mg/L)	CPF Outlet Temperature (°C)
SNP Station	S13L1-007-2	
Water Licence Criteria	n/a	n/a
29-Nov	0.01	8.7
30-Nov	0.02	8.0
1-Dec	0.01	8.5
2-Dec	0.01	8.3
3-Dec	0.00	8.1
4-Dec	0.01	6.8
5-Dec	0.01	7.4
6-Dec	0.03	8.0
7-Dec	0.03	8.6
8-Dec	0.02	8.5
9-Dec	0.02	7.6
10-Dec	0.02	6.2
11-Dec	0.02	6.1
12-Dec	0.02	7.0
13-Dec	0.02	6.3
14-Dec	0.03	6.6
15-Dec	0.01	6.2
16-Dec	0.01	7.0
17-Dec	0.03	7.7
18-Dec	0.00	8.1
19-Dec	0.00	7.6
20-Dec	0.00	8.3
21-Dec	0.00	7.9
22-Dec	0.00	7.9
23-Dec	0.00	7.8
24-Dec	0.00	8.4
25-Dec	0.00	8.2
26-Dec	0.00	7.7
27-Dec	0.00	7.1
28-Dec	0.00	7.2
29-Dec	0.00	8.2
30-Dec	0.00	7.7
31-Dec	0.00	6.0

* S13L1-0072 temperature sensor experienced downtime due to technical issue Sensor replacement successful on March 25, 2023.

Table A-4: 2023 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	1.1	8.07	243	0.01	-*
Feb 1 - 28	<2.0	<0.0015	1.0	8.03	250	0.00	-*
Mar 1 - 31	<2.0	<0.0015	1.4	7.88	261	0.01	10.0
April 1-30	<2.0	<0.0015	1.1	8.03	274	0.01	10.4
May 1-31	<2.0	0.0016	11.3	7.94	260	0.00	16.2
June 1-30	<2.0	<0.0015	11.1	7.94	258	0.01	22.5
July 1 - 31	2.20	<0.0015	55.6	8.01	288	0.00	21.2
Aug 1 - 31	<2.0	<0.0015	12.9	7.80	290	0.01	23.7
Sept 1 - 30	<2.0	<0.0015	2.9	7.36	296	0.01	21.7
Oct 1 - 31	<2.0	<0.0015	1.8	7.69	289	0.00	14.1
Nov 1 - 30	<2.0	<0.0015	1.7	8.01	301	0.01	9.5
Dec 1 - 31	<2.0	<0.0015	1.1	7.77	300	0.01	7.5

* S13L1-0072 temperature sensor experienced downtime due to technical issue.

Sensor replacement successful on March 25, 2023.

Table A-5: 2023 Quarterly Acute Lethality Data

Date	CPF Outlet (S13L1-007-2)	
	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: 2023 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	7.25	8.01	6.72	7.09	7.27
Phenols	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Dissolved Sodium	9.2	8	11	9.3	9.4
Total Sodium	9	8.3	25	9.5	13.0
Dissolved Potassium	0.8	0.85	1.5	0.93	1.02
Total Potassium	0.8	1.3	2.6	0.94	1.41
Dissolved Sulphate	40	42	44	33	39.8
Dissolved Chloride	11	8.4	12	11	10.6
Dissolved Calcium	28	33	37	29	31.8
Total Calcium	28	39	74	30	42.8
Dissolved Magnesium	10	11	12	10	10.8
Total Magnesium	10	11	27	10	14.5
Total Alkalinity	83	110	110	93	99.0
Specific Conductivity	260	280	290	260	272.5
Total Suspended Solids	<1.0	24	63	<1.0	22.3
Total Dissolved Solids	150	160	160	150	155.0
Total Petroleum Hydrocarbons	<2.0	<2.0	<2.0	<2.0	<2.0
Total Phosphorus	<0.10	<0.10	0.5	<0.10	0.2
Total Hardness	110	130	140	110	122.5

Table A-7: 2023 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	7.31	7.79	6.72	7.23	7.26
Phenols	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Dissolved Sodium	9.2	8	11	9.1	9.3
Total Sodium	8.9	8.2	9.9	9.5	9.1
Dissolved Potassium	0.79	0.82	1.5	0.91	1.01
Total Potassium	0.8	3.0	1.0	0.8	1.41
Dissolved Sulphate	39	42	44	34	39.8
Dissolved Chloride	12	8.6	12	12	11.2
Dissolved Calcium	28	33	37	28	31.5
Total Calcium	28	71	34	30	40.8
Dissolved Magnesium	11	11	12	9.9	11.0
Total Magnesium	10	21	11	10	13.0
Total Alkalinity	83	110	110	95	99.5
Specific Conductivity	260	280	290	260	272.5
Total Suspended Solids	<1.0	120	2	<1.0	31.1
Total Dissolved Solids	150	160	160	160	157.5
Total Petroleum Hydrocarbons	<2.0	<2.0	<2.0	<2.0	<2.0
Total Phosphorus	<0.1	<0.5	<0.1	<0.1	0.2
Total Hardness	110	130	140	110	122.5

Appendix B Surface Water Runoff Data

Table B-1: 2023 Surface Water Discharge Analytical Results for Category A Locations

	Date	Total Discharge Volume (m³)	Chlorides (mg/L)	pH	Sheen (Y/N)
Sample Limits			< 500 mg/L	6.0-9.0	N
Mainland					
LB-4	4-May	108	<30	7	N
LB-4	5-May	162	<25	7	N
LB-4	6-May	36	<25	7	N
E-36X	6-May	81	<30	6	N
A-43X	2-May	372	<50	6	N
A-43X	4-May	372	<50	6	N
A-43X	5-May	372	<50	6	N
A-43X	6-May	310	<50	6	N
A-43X	7-May	310	<50	6	N
A-43X	8-May	248	<50	6	N
LT 11 Culvert	7-May	170	<30	7	N
LT 11 Culvert	8-May	170	<30	7	N
LT 11 Culvert	9-May	170	<30	6	N
LT 11 Culvert	10-May	170	<30	6.5	N
LT 11 Culvert	11-May	170	<30	6.5	N
LT 11 Culvert	12-May	170	<30	7	N
LT 11 Culvert	13-May	170	<30	6.5	N
LT 11 Culvert	14-May	170	<30	6.5	N
LT 11 Culvert	15-May	170	<30	6	N
LT 11 Culvert	16-May	170	<30	7	N
LT 11 Culvert	20-May	170	<30	7	N
LT 11 Culvert	9-Jun	170	<30	7	N
Bear Island					
K-48	21-Jun	3.0	<30	6.0	N
M-48	21-Jun	1.0	<30	8.0	N
M-46	21-Jun	2.5	<30	7.0	N
M-43	21-Jun	3.0	<30	7.0	N
L-52	21-Jun	3.5	<30	7.0	N
J-52	21-Jun	3.5	<30	6.0	N
J-47	22-Jun	3.0	<30	6.0	N
J-45	22-Jun	3.0	<30	6.0	N
I-47	22-Jun	2.5	<30	6.0	N
I-50	22-Jun	3.0	<30	7.0	N

	Date	Total Discharge Volume (m³)	Chlorides (mg/L)	pH	Sheen (Y/N)
Sample Limits			< 500 mg/L	6.0-9.0	N
Goose Island					
O-08	2-Jun	4.0	<30	6.0	N
S-10x	3-Jun	3.5	<30	7.0	N
O-18	4-Jun	4.5	<30	7.0	N
O-17-1x	4-Jun	2.5	<30	6.0	N
O-20X	4-Jun	4.5	<30	7.0	N
R-09	6-Jun	6.0	<30	6.5	N
S-08	6-Jun	9.0	<30	6.5	N
O-16	7-Jun	8.0	<30	7.0	N
O-19	7-Jun	8.0	<30	7.0	N
N-18	8-Jun	9.0	<30	7.0	N
N-13	9-Jun	8.0	<30	7.0	N
N-17	9-Jun	6.0	<30	6.5	N
M-13	9-Jun	7.0	<30	7.0	N
Q-17-1x	10-Jun	1.2	<30	7.0	N
N-15	10-Jun	9.0	<30	6.5	N
P-12	11-Jun	2.0	<30	6.5	N
Q-14	13-Jun	7.0	<30	6.0	N
P-15	13-Jun	4.0	<30	6.5	N
N-22	13-Jun	9.0	<30	8.0	N
S-12	13-Jun	7.0	<30	7.0	N
Q-06	13-Jun	2.0	<30	6.5	N
P-22	14-Jun	8.0	<30	7.0	N
S-06	14-Jun	5.0	<30	6.0	N
T-12	14-Jun	9.0	<30	6.0	N
T-11	14-Jun	9.0	<30	6.0	N
T-13	14-Jun	9.0	<30	6.0	N
R-13	14-Jun	7.0	<30	6.0	N
T-16	15-Jun	7.0	<30	7.0	N
T-09	15-Jun	4.0	<30	6.0	N
P-21	15-Jun	4.0	<30	6.5	N
R-11	15-Jun	8.0	<30	6.5	N
O-23	15-Jun	2.0	<30	6.5	N
Q-12	15-Jun	5.0	<30	6.5	N
T-14	15-Jun	8.0	<30	6.5	N
N-19	15-Jun	7.5	<30	7.0	N
N-21	15-Jun	4.0	<30	7.0	N

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	Date	Total Discharge Volume (m3)	Chlorides (mg/L)	pH	Sheen (Y/N)
Sample Limits			< 500 mg/L	6.0-9.0	N
Goose Island					
N-23	15-Jun	5.0	<30	7.0	N
N-25	15-Jun	5.0	<30	7.0	N
N-27	15-Jun	1.0	<30	6.5	N
P-09	16-Jun	4.0	<30	6.0	N
R-15	16-Jun	9.0	<30	6.5	N
T-19	16-Jun	4.0	<30	6.5	N
T-15	16-Jun	4.0	<30	6.5	N
T-21x	16-Jun	4.0	<30	7.0	N
O-14	16-Jun	9.0	<30	7.0	N
O-15	16-Jun	9.0	<30	7.0	N
P-13	16-Jun	7.0	<30	6.5	N
P-19	16-Jun	4.0	<30	7.0	N
O-07	16-Jun	9.0	<30	7.0	N
L-15	16-Jun	3.0	<30	6.5	N
R-27	16-Jun	9.0	<30	6.5	N
S-26	16-Jun	9.0	<30	6.5	N
T-25	16-Jun	9.0	<30	6.5	N
T-23	16-Jun	9.0	<30	6.5	N
P-17	17-Jun	5.0	<30	6.0	N
N-11	17-Jun	7.0	<30	6.5	N
P-19	19-Jun	2.0	<30	6.5	N
Q-10	19-Jun	9.0	<30	6.5	N

Table B-2: 2023 Surface Water Discharge Analytical Results for Category B Locations

	Date	Start/ Middle/ End	Total Discharge Volume (m ³)	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										
CPF Impound Basin	8-May	Start	11979	<2.0	<0.0015	2.1	6.76	2.1	160	250
	15-May	Mid 1		<2.0	<0.0015	12.0	7.84	5.9	240	370
	22-May	Mid 2		<2.0	<0.0015	11.0	7.89	<1.0	800	1000
	29-May	Mid 3		<2.0	<0.0015	12.0	7.90	1.3	910	1200
	6-Jul	Start	60171	<2.0	<0.0015	11	7.77	19	210	360
	13-Jul	Mid 1		<2.0	<0.0015	11	7.99	2.2	190	330
	20-Jul	Mid 2		<2.0	<0.0015	12	7.78	4.2	220	320
	27-Jul	Mid 3		<2.0	<0.0015	11	7.98	4.7	320	330
LT 11 Impound Basin	8-May	Start	1422	<2.0	<0.0015	11.0	7.43	4.6	280	440
	15-May	Mid 1		<2.0	<0.0015	5.4	7.68	3.4	310	450
Refinery Impound Basin	4-May	Start	9156	<2.0	<0.0015	9.6	7.24	1.9	310	450
	8-May	Mid 1		<2.0	<0.0015	5.5	6.92	1.6	270	410
	15-May	Mid 2		<2.0	<0.0015	10.0	7.89	33	410	620
	22-May	Mid 3		<2.0	<0.0015	14.0	8.09	1.8	500	750
	29-May	Mid 4		<2.0	<0.0015	17.0	8.08	2.1	540	810
	5-Jun	Mid 5	593	<2.0	<0.0015	14	7.95	4.9	920	1200
	8-Jun	Mid 6		4.0	<0.0015	13	8.09	<1.0	1100	1300
	15-Jun	Mid 7		<2.0	<0.0015	20	8.27	<1.0	810	910
	8-Aug	Start	553	<2.0	<0.0015	30	8.35	<1.0	460	830
	10-Aug	Mid 1		<2.0	<0.0015	31	8.54	<1.0	460	820
	17-Aug	Mid 2		<2.0	<0.0015	31	8.26	<6.0	500	820
	24-Aug	Mid 3		<2.0	<0.0015	32	8.48	1.0	520	770

**Appendix C 2023 SNP Groundwater Quality Monitoring Report
(TRSA)**



2023 SNP Groundwater Quality Monitoring

Norman Wells, NT

Imperial Oil Ltd.

26 March 2024

417085-49223-23100





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.I"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.

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PROJECT: 417085-49223-23100-CA-REP-0001 : 2023 SNP Groundwater Quality Monitoring - Norman Wells, NT

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- Appendix B Background Geochemical Statistical Summary
- Appendix C Field Methodologies
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- Appendix G Borehole Logs



1 Introduction

Tłegóhłi 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 (Latitude 65°17' N, Longitude 126°51' W; referred to as the "Site"). Related operations include a Central Processing Facility (CPF) on the northeastern shore of the Mackenzie River which receives production from wells located on the mainland, three natural islands (Goose Island, Bear Island, and Frenchy's Island), and six artificial islands (Figure 1).

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

1.1 Background

The NWO's Groundwater Management Plan (GMP) was created in September 2014 (and later updated in September 2015 and December 2022; Imperial 2015 and 2022) 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 2023 groundwater monitoring program at the Site included the following:

- Check monitoring well integrity and measure static groundwater levels of 15 groundwater monitoring wells.
- Redrill damaged wells CPF-98-8-3, TF-03-12-3 and WSY-97-1-5, and complete a survey of the newly installed 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 2023 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. These parameters include:

- Major Ions:
 - Sulphate, calcium, magnesium, total dissolved solids (TDS).
- Dissolved Metals:
 - Aluminium, arsenic, barium, cadmium, chromium, copper, iron, 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 2024), 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 for different geographical areas and geological units incorporating 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

Fifteen monitoring wells make up the SNP per Imperial's Water Licence S13L1-007. Wells were previously grouped as primary wells and contingency wells, but due to frequency of dry or damaged wells, all available wells have been sampled historically and all data have been incorporated. 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 served as replacement sampling locations in the event that a primary SNP monitoring well was dry, damaged, frozen, or otherwise could not 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 - well was abandoned in 2023 and reinstalled as CPF 23-1-3.
WSY 97-1-5	Mainland East	Situated between Well Services Yard and Bosworth Creek - well was abandoned in 2023 and reinstalled as WSY 23-1-5.
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 - well was abandoned in 2023 and reinstalled as TF 23-1-3.
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 No. 5 and the Mackenzie River.
BI-13-3-4.5	Bear Island	Situated near Bear Island Sump No. 6 and the Mackenzie River.
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.
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.



Monitoring Well	Location	Rationale for Selection
MEBG-10-1-3	Mainland East	Situated between Mainland Sumps and Mackenzie River.
BI-13-1-4	Bear Island	Situated near Bear Island Sump No. 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-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.
BIBG-20-01-4	Bear Island	Situated at western edge of development on Bear Island, near Mackenzie River.

Notes:

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

In 2018, well 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, well 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. However, BIBG-20-01-4 has since been damaged and BIBG-10-1-4 has been reinstated. Installation details for the new well are provided in Table 1.

In 2023, wells CPF 98-8-3, WSY 97-1-5, and TF 03-12-3 were abandoned and reinstalled as CPF 23-1-3, WSY 23-1-5, and TF 23-1-3, respectively (Appendix G). The older wells were previously observed to be damaged (frost jacked). The abandoned wells were included in the 2023 program prior to replacement and removal. Replacement wells were redrilled in the same locations and depths.

Historical data for wells GIP11 09-1-4, BIBG-12-1-7, BIBG-10-1-4, CPF 98-8-3, WSY 97-1-5, and TF 03-12-3 are still included in this report for comparison purposes.



5 Field Methodology

5.1 Groundwater Sampling

The SNP groundwater monitoring was conducted by TRSA personnel in August and September 2023. 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 22 groundwater samples, three field duplicate samples, two field blank samples, and two trip blank samples, 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 Calgary (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 2023 from most planned sampling locations. Deviations from the planned scope are detailed below:

- Well CPF 97-7-5 could not be sampled in 2023 due to insufficient water.
- Well WSY 97-1-5 could not be sampled in 2023 due to insufficient water.
- Well BI-13-1-4 could not be sampled in August 2023 because it was dry and damaged.
- Location GIBG-10-2-3 was not sampled in 2023 as it was observed to be blocked/damaged.
- A severe wildfire season in the Northwest Territories presented numerous logistical challenges, including delays and/or cancellations of shipments. Due to these issues, field parameters could not be measured in 2023.

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)
- 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. 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 in the mainland SNP wells ranged from 56.54 to 63.58 masl in August and from 56.47 to 63.65 masl in September (Table 1), not including newly installed wells. 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 in SNP wells on Bear Island ranged from 48.33 to 49.14 masl in August and from 47.76 to 48.89 masl in September.

The groundwater surface elevations on Goose Island could only be calculated for GIQ8-10-2-4 in 2023, as GIBG-10-2-3 was damaged by ice and no survey data are available for GIP11 09-1-4-R. Groundwater elevations at GIQ8-10-2-4 were 44.69 masl (August) and 44.42 masl (September).

6.2 Groundwater Analytical Results

Current and historical groundwater chemistry data are presented in Tables 2 through 4. Analytical exceedances for select primary indicators, as compared to the CCME FWAL guidelines, are discussed below.



The 2023 laboratory analytical reports, including primary indicator parameters and other associated chemistry data, are compiled in Appendix D. A summary of the quality assurance and quality control (QA/QC) program is provided in Appendix E and Section 7.

The background geochemistry for the Norman Wells field was revised in 2020 (Appendix B). Estimated natural background geochemistry for shallow groundwater has been included for comparison purposes in Tables 2 through 4. These background values are referred to periodically in the discussion below.

6.2.1 Routine Potability Parameters and Major Ions

Exceedances of the applied guidelines and/or background concentrations for routine parameters and major ions are presented in Table 6-1. Only primary indicator parameters listed in Section 2 are considered in this summary table.

Table 6-1 Routine Parameter Guideline and Background Exceedances for Primary Indicator Parameters

Well ID	Parameter	Exceeds Guideline	Exceeds Background	Exceeds Guideline and Background
MEBG 10-1-3	F	August/September		
	SO ₄		August/September	
	Ca		August/September	
	TDS		August/September	
TF 03-12-3	Cl		August/September	
	Ca		September	
BIS 97-1-3	TDS		September	
BI-13-3-4.5	SO ₄		August/September	
	Ca		August/September	
GIQ8-10-2-4	Cl		August/September	
	SO ₄		September	
	Ca		August/September	

Chloride is the key inorganic indicator parameter for groundwater at the Site. As summarized in Table 6-1, chloride concentrations fall outside of anticipated background ranges in two SNP wells (TF-03-12-3 and GIQ8-10-2-4). At location TF-03-12-3, chloride concentrations ranged from 95-100 mg/L during 2023, which is consistent with values observed since 2018. Chloride concentrations exceeding the CCME FAL guideline of 120 mg/L were observed at this well prior to 2018 but have remained below that guideline over the past six years. Chloride data for this well from 2003 to 2023 are shown on a trend chart in Appendix F (APP F-7) indicating that conditions with respect to chloride have improved considerably over a 20-year period.



For well GIQ8-10-2-4 on Goose Island, the chloride value was 30 mg/L during both sampling events in 2023. Although this concentration exceeds the inferred background value of about 23 mg/L, it is far below the applied CCME guideline of 120 mg/L. Chloride data for this well from 2012 to 2023 are shown on a trend chart in Appendix F (APP F-17) indicating that conditions with respect to chloride remain well below the applied 120 mg/L guideline over a ten-year period.

6.2.2 Dissolved Metals

Exceedances of the applied guidelines and/or background concentrations for dissolved metals that are considered key indicators are presented in Table 6-2. Only primary indicator parameters listed in Section 2 are considered in this summary table.

Table 6-2 Dissolved Metals Guideline and Background Exceedances for Primary Indicator Parameters

Well ID	Parameter	Exceeds Guideline	Exceeds Background	Exceeds Guideline and Background
ARB 12-3-3	Mo		August	
C38 08-1-4	Al			August
	As	August		
	Fe			August/September
CPF 98-8-3	Fe	August/September		
MEBG 10-1-3	Cd	August		
	Fe	August		September
	Mo		August/September	
	Ni		August/September	
	Se			August
	U		August/September	
MTF 97-1-5	Al			August
	Cd	August		
	Fe	August		
	Mo		August	
	Se			August
	U		August/September	



Well ID	Parameter	Exceeds Guideline	Exceeds Background	Exceeds Guideline and Background
TF 03-12-3	Al			August
	As			August/September
	Cd	August		
	Cu	August		
	Fe			August/September
	Mo			August/September
	Ni		August	
	Se		August	
	Zn			August
BI-13-3-4.5	Cd	August/September		
	Fe	September		
	Ni		August/September	
	Se			August
	U		August/September	
	Zn			August/September
BIBG-10-1-4	Cd	August/September		
	Mo		August/September	
	U		August/September	
BIS 97-1-3	Cu	August		
	Fe	August		
GIQ8-10-2-4	As			August
	Cd	September		
	Fe			August/September
	Ni		August/September	



Increases in the concentrations of some metals have been observed over recent years, and are addressed below:

- C38-08-1-4:
 - Iron is elevated above guideline and background, with a potential increasing trend developing over the last three sampling events.
 - Increases in concentrations of aluminum and arsenic were observed in August 2023, but returned to historical ranges in September.
- MEBG-10-1-3:
 - Iron concentrations had been stable below background but jumped in September 2023 to above background.
 - Increases in molybdenum and nickel are also observed at this well.
- TF-03-12-3:
 - Iron concentrations are elevated above guideline and background, and appear to be increasing since 2020 with a marked increase in 2023.
 - Arsenic concentrations increased above background in 2023.
 - Barium concentrations remain within the inferred background range, but may be increasing.
- GIQ8-10-2-4:
 - Iron concentrations are elevated above guideline and background, and appear to be increasing since 2021.
 - Arsenic concentrations are higher than the background range at times, and may be increasing over the last few events.

6.2.3 Petroleum Hydrocarbon Parameters

PHC parameter concentrations in all SNP wells were below the applied guidelines and reported detection limits (RDLs), with the single exception of well C38-08-1-4 (Table 4).

At location C38-08-1-4 benzene was reported above background but below the applied guideline. Benzene results were less than five times the RDL. Benzene was first detected at well C38 08-1-4 in 2019, and has consistently been detectable and stable, but below the applied guideline, over most of the past 10 sampling events.

6.3 Mann-Kendall Statistical Analyses

Mann-Kendall statistical analyses have been performed for select primary indicator parameters having four or more historical data points. Statistics were only completed on chloride as the most relevant inorganic parameter. Statistics were not run on BTEX parameters as the dataset does not meet the requirement of greater than 50% detectable concentrations for any BTEX parameter.



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

- >95% probability of occurrence (two-sided p-value <0.05).
- 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.

Upon examination of the 2023 Mann-Kendall statistical analyses, no statistically relevant trends were observed for chloride.

6.4 Temporal Trend Charts of Key Parameters

Temporal trend charts for chloride and BTEX parameters at the SNP wells are provided in Appendix F, Figures APP F-1 to APP F-17.



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, two field blank samples, and two groundwater trip blank samples.

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 blank and trip blank results were below the laboratory reportable detection limits (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 2023. Activities included measurement of hydraulic head and collection of groundwater samples for laboratory analyses. A summary of the general conclusions from the 2023 sampling program is as follows:

- Three damaged monitoring wells were abandoned and reinstalled in 2023. These wells were CPF 98-8-3, WSY 97-1-5 and TF 03-12-3, which were re-installed as CPF 23-1-3, WSY 23-1-5, and TF 23-1-3, respectively.
- Monitoring wells BIBG-20-01-4 and GIBG-10-2-3 were observed to be damaged and were not sampled in 2023.
- 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 toward the Mackenzie River, with localized flow towards Bosworth Creek. However, in some areas, groundwater is effectively stagnant due to presence of shallow permafrost.
- Groundwater surface elevations on Bear Island 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 SNP monitoring locations and exceeded the expected background concentration at two locations TF 03-12-3 and GIQ8-10-2-4.
- Most analyzed PHC results for the SNP network wells were below the reportable detection limits, with the exception of below-guideline benzene detections at C38 08-1-4. These findings are consistent with recent results.
- Mann-Kendall trend analyses indicated no statistically significant trends were observed in chloride within the SNP network monitoring wells. Statistically analysis could not be completed on BTEX parameters as the dataset does not meet the minimum criterion for detected concentrations.



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:

Tino Ngulube, B.Sc.
Environmental Scientist

Senior Review by:




26 Mar 2024

PERMIT TO PRACTICE	
TRS ADVISIAN LIMITED	
PARTNERSHIP of TRS ADVISIAN	
Signature	
Date	March 26, 2024
PERMIT NUMBER: P 1538	
NT/NU Association of Professional Engineers and Geoscientists	

Lorian Glatiotis, B.Sc., P.Geo.
Hydrogeologist

Tłegóħi 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) 2024. Canadian Environmental Quality Guidelines - Water Quality Guidelines for the Protection of Freshwater Aquatic Life. Canadian Council of Ministers of the Environment. Accessed March 2024.

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 2004. Preferred Operating Practices for the Quality Review of Environmental Analytical Laboratory Data. 30 August 2004.

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.

Imperial (Imperial Oil Resources NWT Limited) 2022. Norman Wells Operations Groundwater Management Plan. December 2022.

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.



Tables

Table 1



PROJECT No.: 417085-49223-23100

Monitoring Well Installation Details: Datum/Groundwater Surface Elevations

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 (mbtoc) (mbgs)	Depth to Groundwater (mbgs)	Groundwater Surface Elevation (masl)	Lithology	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	2.56	2.10	63.23	Gravel fill/Sand/Peat	Replaced waterra with dedicated bailer
												14-Sep-2015	2.57	1.88	63.45		
												05-Aug-2016	2.71	2.02	63.31		
												02-Oct-2016	2.54	1.85	63.48		
												04-Nov-2016	2.79	2.10	63.23		
												12-Aug-2017	2.62	1.93	63.40		
												12-Sep-2017	2.45	1.76	63.57		
												11-Jul-2018	2.44	1.75	63.58		
												15-Sep-2018	2.48	1.79	63.54		
												11-Jul-2019	2.42	1.73	63.60		
												28-Sep-2019	2.53	1.84	63.49		
												23-Jul-2020	2.44	1.75	63.58		
												17-Sep-2020	2.40	1.71	63.62		
												20-Aug-2021	2.36	1.67	63.66		
												15-Sep-2021	2.47	1.78	63.55		
												09-Aug-2022	2.42	1.73	63.60		
												23-Sep-2022	2.50	1.81	63.52		
												16-Aug-2023	2.44	1.75	63.58		
												22-Sep-2023	2.37	1.68	63.65		
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	Sandy silt/peat/silty clay	Frost jacked
												14-Sep-2015	1.65	0.90	59.58		
												05-Aug-2016	1.92	1.17	59.31		
												02-Oct-2016	1.83	1.08	59.40		
												04-Nov-2016	2.17	1.42	59.06		
												12-Aug-2017	1.97	1.22	59.26		
												12-Sep-2017	1.74	0.99	59.49		
												13-Jul-2018	1.90	1.15	59.33		
												15-Sep-2018	1.97	1.22	59.26		
												15-Jul-2019	2.07	1.32	59.16		
												28-Sep-2019	2.09	1.34	59.14		
												23-Jul-2020	2.02	1.27	59.21		
												17-Sep-2020	2.01	1.26	59.22		
												20-Aug-2021	2.11	1.36	59.12		
												15-Sep-2021	2.25	1.50	58.98	Well is frost-jacked	
												08-Aug-2022	2.36	1.61	58.87		
												23-Sep-2022	2.47	1.72	58.76		
												17-Aug-2023	2.76	2.01	58.47	Elevation based on measured stick up	
CPF 97-7-5	Active	W-CAT-1	599100.347	7241852.827	58.64	59.49	0.84	4.9	53.87	1.30 - 4.30	1.20 - 4.90	07-Aug-2015	1.37	0.53	58.12	Silt/siltstone	Replaced lock
												14-Sep-2015	1.42	0.58	58.07		
												06-Aug-2016	1.35	0.51	58.14		
												02-Oct-2016	1.76	0.92	57.73		
												04-Nov-2016	4.71	3.87	54.78		
												17-Aug-2017	1.25	0.41	58.24		
												12-Sep-2017	1.39	0.55	58.10		
												20-Jul-2018	1.43	0.59	58.06		
												15-Sep-2018	1.56	0.72	57.93		
												11-Jul-2019	> 5.88	> 5.04	< 53.61		dry
												26-Jul-2019	1.54	0.70	57.95		
												28-Sep-2019	2.04	1.20	57.45		
												23-Jul-2020	5.45	4.61	54.04		
												17-Sep-2020	1.90	1.06	57.59		
												20-Aug-2021	1.36	0.52	58.13		
												15-Sep-2021	1.94	1.10	57.55		
												08-Aug-2022	5.21	4.37	54.28		
												24-Sep-2022	3.84	3.00	55.65		
												16-Aug-2023	> 5.75	> 4.91	< 53.74	Dry	
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	Clay silt	Dry
												14-Sep-2015	1.27	0.52	58.27		
												06-Aug-2016	1.72	0.97	57.82		
												02-Oct-2016	1.35	0.60	58.19		
												04-Nov-2016	1.89	1.14	57.65		
												17-Aug-2017	1.66	0.91	57.88		
												12-Sep-2017	1.31	0.56	58.23		
												22-Jul-2018	1.53	0.78	58.01		
												16-Sep-2018	1.31	0.56	58.23		
												11-Jul-2019	1.49	0.74	58.05	limited sample	

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Monitoring Station	Status	Background Category	Easting (m)	Northing (m)	Ground Elevation (masl)	Datum Elevation (masl)	Surveyed Stickup (m)	Total Depth of Piezometer (mbgss)	Bottom of Piezometer Elevation (masl)	Depth Interval of Screen (mbgss)	Depth Interval of Sand (mbgss)	Date (dd-mm-yyy)	Depth to Groundwater (mbtoc)	Depth to Groundwater (mbgss)	Groundwater Surface Elevation (masl)	Lithology	Comments
CPF 23-1-3 MEBG-10-1-3	New Active	W-CAT-1 W-CAT-1	598616.2 600011.383	7242045.02 7241831.078	58.60 63.73	59.58 64.47	0.98 0.75	4.35 3.0	54.25 60.73	1.90 - 3.30 1.50 - 3.00	1.70 - 3.50 1.00 - 3.00	28-Sep-2019 23-Jul-2020 17-Sep-2020 20-Aug-2021 15-Sep-2021 08-Aug-2022 24-Sep-2022 16-Aug-2023 22-Sep-2023 06-Aug-2015 14-Sep-2015 03-Aug-2016 02-Oct-2016 04-Nov-2016 12-Aug-2017 12-Sep-2017 16-Jul-2018 15-Sep-2018 15-Jul-2019 04-Oct-2019 23-Jul-2020 17-Sep-2020 20-Aug-2021 15-Sep-2021 09-Aug-2022 23-Sep-2022 16-Aug-2023 22-Sep-2023	1.31 1.31 1.37 1.47 1.18 1.32 1.73 1.59 1.84 0.89 0.88 1.00 0.96 1.10 1.02 0.92 0.96 0.93 1.00 0.99 0.98 1.01 1.08 1.14 1.22 1.36 1.36 1.41	0.56 0.56 0.62 0.72 0.43 0.57 0.98 0.84 1.09 0.14 0.13 0.25 0.21 0.35 0.27 0.17 0.21 0.18 0.25 0.24 0.23 0.26 > 4.70 3.39 3.22 3.13 3.45 6.03 > 5.61 < 58.79 4.30 3.39 4.13 3.22 4.25 3.34 4.14 3.24 4.63 3.72 4.28 3.37 4.13 3.22 4.24 3.33 4.25 3.34 4.38 3.47 4.27 3.36 4.51 3.60 4.51 3.60 4.66 5.57	58.23 58.23 58.17 58.07 58.36 58.22 57.81 57.95 57.70 63.58 63.59 63.47 63.51 63.37 63.45 63.55 63.51 63.54 63.47 63.48 63.49 63.46 63.39 63.33 63.25 63.11 63.11 63.06	Silty Clay Silty Sand / Clayey Silt	Decommissioned after sampling, replaced with CPF 23-1-3 Redrill of CPF 98-8-3 Clear
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 15-Sep-2015 02-Oct-2016 04-Nov-2016 17-Aug-2017 14-Sep-2017 16-Jul-2018 16-Sep-2018 18-Jun-2019 28-Sep-2019 23-Jul-2020 24-Sep-2022 17-Aug-2023 23-Sep-2023	4.21 4.04 4.36 > 5.61 4.30 4.13 4.25 4.14 4.63 4.28 4.30 4.39 4.32 4.25 4.14 4.63 4.28 4.13 4.24 4.25 4.38 4.27 4.51 4.51 4.66	3.30 3.13 3.45 > 4.70 3.39 3.22 3.34 3.24 3.72 3.37 3.22 3.33 3.34 3.47 3.47 3.36 3.60 3.60 5.57	60.18 60.35 60.03 < 58.79 60.09 60.26 60.14 60.25 59.76 60.11 60.26 60.15 60.14 60.01 60.12 59.88 59.88 58.82	Silt	Dry
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 15-Sep-2015 06-Aug-2016 02-Oct-2016 04-Nov-2016 17-Aug-2017 13-Sep-2017 16-Jul-2018 16-Sep-2018 18-Jun-2019 28-Sep-2019 23-Jul-2020 17-Sep-2020 20-Aug-2021 15-Sep-2021 07-Aug-2022 23-Sep-2022 16-Aug-2023 22-Sep-2023	1.74 1.74 1.78 1.78 1.87 1.72 1.73 1.82 1.77 1.75 1.84 1.85 1.88 1.84 1.97 1.96 2.13 2.09 2.16	0.19 0.19 0.23 0.23 0.32 0.17 0.18 0.27 0.22 0.20 0.29 0.30 0.33 0.29 0.42 0.41 0.58 0.54 0.61	56.89 56.89 56.85 56.85 56.76 56.91 56.90 56.81 56.86 56.88 56.79 56.78 56.75 56.79 56.66 56.67 56.50 56.54 56.47	Silty clay and shale fill	Frost jacked 15cm Frost jacked
TF 23-1-3	New	W-CAT-1	600481.12	7241638.62	58.58	59.67	1.09	4.06	54.52	1.00 - 4.00	0.85 - 4.00	27-Sep-2023	2.05	0.96	57.62	Silty Clay	Decommissioned after sampling, replaced with TF 23-1-3 Redrill of TF 03-12-3

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			Easting (m)	Northing (m)	Ground Elevation (masl)	Datum Elevation (masl)	Surveyed Stickup (m)	Total Depth of Plezometer (mbgs)	Bottom of Plezometer Elevation (masl)	Depth Interval of Screen (mbgs)	Depth Interval of Sand (mbgs)	Date (dd-mm-yyy)	Depth to Groundwater (mbtoc)	Depth to Groundwater (mbgs)	Groundwater Surface Elevation (masl)		
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	Silt	Frost jacked, cannot clean red casing Well bent downhole, hard to get bailer down
												14-Sep-2015	4.12	3.33	59.28		
												05-Aug-2016	5.24	4.45	58.16		
												02-Oct-2016	4.15	3.36	59.25		
												04-Nov-2016	5.48	4.69	57.92		
												18-Aug-2017	2.69	1.90	60.71		
												12-Sep-2017	2.86	2.07	60.54		
												11-Jul-2018	5.15	4.36	58.25		
												18-Sep-2018	4.32	3.53	59.08		
												15-Jul-2019	5.20	4.41	58.20		
												28-Sep-2019	4.97	4.18	58.43		
												23-Jul-2020	5.15	4.36	58.25		
												20-Aug-2021	2.84	2.05	60.56		
												15-Sep-2021	5.51	4.72	57.89		
												09-Aug-2022	5.43	4.64	57.97		
												24-Sep-2022	> 5.72	> 4.93	< 57.68		
												16-Aug-2023	> 3.72	> 2.93	< 59.68		
												22-Sep-2023	> 3.72	> 2.93	< 59.68		
WSY 23-1-5	New	W-CAT-1	599195.47	7242239.68	62.28	63.31	1.04	5.82	56.46	2.00 - 5.00	1.80 - 5.20	27-Sep-2023	>6.24	>5.20	N/C	Sandy Clay/Silty Clay	Dry; Decommissioned after sampling, replaced with WSY 23-1-5 Dry; Redrill of WSY 97-1-5
Surveillance Network Program - Bear Island Locations																	
BI-13-1-4	Damaged	W-CAT-2	599964.584	7238301.752	49.7	49.7	0.9	4.3	45.4	1.30 - 4.30	1.00 - 4.60	07-Aug-2015	1.02	1.02	48.68	Clayey silt/sandy silt	
												07-Aug-2016	1.13	1.13	48.57		
												15-Aug-2017	1.30	1.30	48.40		
												22-Nov-2017	1.89	1.89	47.81		
												18-Jul-2018	1.08	1.08	48.62		
												20-Sep-2018	1.00	1.00	48.70		
												12-Jul-2019	1.15	1.15	48.55		
												29-Sep-2019	1.05	1.05	48.65	casing loose	
												26-Jul-2020	1.03	1.03	48.67	potential blockage or bailer at bottom. limited sample no fp	
												16-Sep-2020	1.07	1.07	48.63		
												18-Sep-2021	1.36	1.36	48.34		
												25-Sep-2022	1.81	1.81	47.89		
												16-Aug-2023	> 2.15	> 2.15	< 47.55		
												23-Sep-2023	> 2.15	> 2.15	< 47.55	Well damaged/frost jacked	
BI-13-3-4.5	Active	W-CAT-2	599813.864	7238463.124	50.62	51.57	0.95	4.5	46.12	1.50 - 4.50	1.20 - 4.80	07-Aug-2015	1.65	0.70	49.92	Clayey silt/sandy silt	
												08-Aug-2016	1.74	0.79	49.83		
												15-Aug-2017	1.81	0.86	49.76		
												22-Nov-2017	N/M	N/M	N/A	Froze @ 0.99m	
												18-Jul-2018	1.67	0.72	49.90		
												20-Sep-2018	1.69	0.74	49.88		
												29-Sep-2019	N/M	N/M	N/A	Damaged - no sample	
												26-Jul-2020	1.66	0.71	49.91		
												16-Sep-2020	1.75	0.80	49.82		
												22-Aug-2021	1.81	0.86	49.76		
												18-Sep-2021	1.84	0.89	49.73		
												25-Sep-2022	2.44	1.49	49.13		
												16-Aug-2023	2.43	1.48	49.14		
												23-Sep-2023	2.68	1.73	48.89		
BIBG-10-1-4	Active	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	Silty Clay / Sand	
												08-Aug-2016	1.87	1.09	49.02		
												11-Aug-2017	3.57	2.79	47.32		
												17-Jul-2018	3.39	2.61	47.50		
												20-Sep-2018	1.63	0.85	49.26		
												17-Jul-2019	2.94	2.16	47.95		
												29-Sep-2019	1.96	1.18	48.93		
												25-Jul-2020	3.30	2.52	47.59		
												16-Sep-2020	N/M	N/M	N/A		
												16-Aug-2023	2.96	1.78	48.33		
												23-Sep-2023	3.12	2.35	seen a	Damaged	
BIBG-12-1-7	Damaged	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	1.20	0.40	49.00	Silty Sand/Sandy Silt	
												17-Sep-2015	N/M	N/M	N/A		
												07-Aug-2016	1.35	0.55	48.85		
												02-Oct-2016	N/M	N/M	N/A		
												04-Nov-2016	1.83	1.03	48.37		
												15-Aug-2017	> 1.31	> 0.51	< 48.89	Dry, Compromised, bentonite on water level tape	
												29-Sep-2019	1.29	0.49	48.91	No sample	
												26-Jul-2020	N/M	N/M	N/A	Cannot Lock	
												16-Sep-2020	N/M	N/M	N/A	Cannot Lock. Well removed from scope	

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			Easting (m)	Northing (m)	Ground Elevation (masl)	Datum Elevation (masl)	Surveyed Stickup (m)	Total Depth of Plezometer (mbgs)	Bottom of Plezometer Elevation (masl)	Depth Interval of Screen (mbgs)	Depth Interval of Sand (mbgs)	Date (dd-mm-yyy)	Depth to Groundwater (mbtoc)	Depth to Groundwater (mbgs)	Groundwater Surface Elevation (masl)		
BIBG-20-01-4	Damaged	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	Sand	Dry Dry, well damaged Dry Dry Well damaged, removed from scope
BIS 97-1-3	Active	W-CAT-2	598365.067	7238610.352	51	51.93	0.93	2.6	48.47	1.10 - 2.50	0.60 - 2.60	22-Nov-2017	1.82	0.89	50.11	Silty peat/silt	orange
GIBG-10-2-3	Damaged	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	Sand	Frost jacked Fished out bailer limited sample, silty Blocked at 0.6mbtoc. Well damaged, removed from scope
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	Silty sand/sandy silt and clay/sand	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	16-Sep-2015	3.29	2.94	42.61	Silty Sand	Well not surveyed
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	02-Oct-2016	> 1.32	> 0.97	< 44.58	Sandy Silt	Dry



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												16-Sep-2020	2.31	2.09	45.41		
												21-Aug-2021	2.31	2.09	45.41		
												17-Sep-2021	2.39	2.17	45.33		
												09-Aug-2022	2.18	1.96	45.54		
												25-Sep-2022	2.74	2.52	44.98		
												16-Aug-2023	3.03	2.81	44.69		
												23-Sep-2023	3.30	3.08	44.42		

NOTES: 1. Data may be entered to the nearest mm, but are reported above to the nearest cm.

Apparent rounding errors may occasionally occur in calculated fields (e.g. Groundwater Surface Elevation).

2. 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/C - Denotes not calculated.

5. masl - Denotes metres above sea level.

6. mbgs - Denotes metres below ground surface.

7. mbtoc - Denotes metres below top of PVC casing.

8. ✓ - 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 Analytical Results: Indicator Analysis Parameters

PROJECT No.: 417085-49223-23100				Anions						Cations				General				Inorganic Nitrogen Compounds				Miscellaneous				
Sampling Location		Date (dd-mmm-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)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (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 (pH Units)	Total Dissolved Solids (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)
CCME CEQG Freshwater Aquatic Life		---	---	120	0.12	---	---	---	---	---	---	---	---	---	---	---	---	(6.5 - 9)	---	---	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	--	0.43	---	0.03	---	---			
W-CAT-2		975	1.0	23	--	930	1.0	477	--	4.5	100	--	1.0	2600	1600	8	2255	--	2.4	---	0.03	---	---			
Surveillance Network Program - Mainland Locations																										
ARB-12-3-3	07-Aug-2015 14-Sep-2015 05-Aug-2016 02-Oct-2016 12-Aug-2017 12-Sep-2017 11-Jul-2018 15-Sep-2018 11-Jul-2019 28-Sep-2019 23-Jul-2020 17-Sep-2020 20-Aug-2021 15-Sep-2021 09-Aug-2022 09-Aug-2022 23-Sep-2022 16-Aug-2023 22-Sep-2023	Active	W-CAT-1	590 < 0.50	16	---	53 < 0.50	130	43	1.3	12	480 < 0.50	950	510	7.55	600	4.8	1.1	0.053	0.016	1.1	0.96				
				670 < 0.50	8.7	0.093	33 < 0.50	160	48	1.5	11	550 < 0.50	1000	600	7.52	610	2.9	0.66	< 0.033	< 0.010	0.66	1				
				620 < 0.50	19	--	79 < 0.50	150	47	2.1	24	510 < 0.50	1100	580	7.6	690	4.5	1	0.042	0.013	1	1				
				860 < 0.50	12	--	87 < 0.50	180	60	2.2	25	690 < 0.50	1300	700	7.49	770	2.4	0.54	< 0.033	< 0.010	0.54	0.94				
				650 < 0.50	12	--	60 < 0.50	160	44	1.9	12	530 < 0.50	1100	580	--	640	4.8	1.1	< 0.033	< 0.010	1.1	--				
				560 < 0.50	22	--	160 < 0.50	160	46	2.3	46	460 < 0.50	1100	590	--	810	1.5	0.34	< 0.033	< 0.010	0.34	--				
				460 < 1.0	27	--	180 #1 < 1.0	150	49	2.5	31	380 < 1.0	1100	580	--	760	4.7	1.1	0.043	0.013	1.1	--				
				790 < 1.0	16	--	140 < 1.0	170	52	2.5	29	650 < 1.0	1300	640	--	800	1.1	0.25	< 0.033	< 0.010	0.25	--				
				450 < 1.0	26	--	190 #1 < 1.0	150	50	2.9	25	370 < 1.0	1000	580	--	740	1.8	0.41	< 0.033	< 0.010	0.41	--				
				500 < 1.0	17	0.088	180 < 1.0	140	43	2.5	27	410 < 1.0	1000	530	--	780	0.51	0.12	0.048	0.015	0.13	--				
				330 < 1.0	11	0.09	150 < 1.0	110	35	2.1	17	270 < 1.0	820	410	--	550	5.2	1.2	< 0.033	< 0.010	1.2	--				
				680 < 1.0	7	0.072	100 < 1.0	160	46	2.5	19	550 < 1.0	1200	600	--	780	2	0.44	0.07	0.021	0.47	--				
				400 < 1.0	7.1	0.11	140 < 1.0	120	36	1.8	12	330 < 1.0	840	440	--	470	1.5	0.33	< 0.033	< 0.010	0.33	--				
				480	7.2	11	0.092	110 < 1.0	130	42	2.5	14	410	6	940	510	--	580	0.65	0.15	0.066	0.02	0.17			
				490 < 1.0	14	0.1	120 < 1.0	130	42	2.4	13	400 < 1.0	930	500	--	630	1.4	0.32	< 0.033	< 0.010	0.32	--				
				480 < 1.0	14	0.1	120 < 1.0	130	42	2.4	12	400 < 1.0	930	510	--	620	1.5	0.33	< 0.033	< 0.010	0.33	--				
				460 < 1.0	19	0.11	140 < 1.0	140	47	2.7	13	380 < 1.0	970	550	--	670	0.38	0.085	0.095	0.029	0.11	--				
				450 < 1.0	11	0.1	93 < 1.0	110	33	2.1	11	360 < 1.0	780	400	--	530	0.048	0.011	0.039	0.012	0.023	--				
				590 < 1.0	7.8	0.18 #1	100 < 1.0	150	48	2.5	13	480 < 1.0	970	580	--	550 #3	2.9	0.64	0.034	0.01	0.66	--				
(Duplicate)	06-Aug-2015 14-Sep-2015 05-Aug-2016 02-Oct-2016 12-Aug-2017 12-Sep-2017 13-Jul-2018 16-Sep-2018 15-Jul-2019 15-Jul-2019 28-Sep-2019 23-Jul-2020 17-Sep-2020 20-Aug-2021 16-Sep-2021 08-Aug-2022 23-Sep-2022 17-Aug-2023 17-Aug-2023 22-Sep-2023	Active	W-CAT-1	840 < 0.50	19	--	200 #3 < 0.50	220	70	4.3	65	690 < 0.50	1600	840	6.95	1100	0.053	0.012	< 0.033	< 0.010	< 0.020	1.1				
				950 < 0.50	20	0.098	130 < 0.50	230	70	4.3	53	780 < 0.50	1600	850	6.91	1100 #2	< 0.044	< 0.010	< 0.033	< 0.010	< 0.020	1.1				
				980 < 0.50	23	--	58 < 0.50	190	63	3.9	55	800 < 0.50	1600	740	7.17	1000 #2	< 0.044	< 0.010	< 0.033	< 0.010	< 0.020	1				
				990 < 0.50	21	--	24 < 0.50	180	60	3.9	53	810 < 0.50	1400	700	7.02	980 #2	< 0.044	< 0.010	< 0.033	< 0.010	< 0.020	1				
				820 < 0.50	19	--	18 < 0.50	160	50	3.3	39	670 < 0.50	1300	590	--	780 #2	< 0.044	< 0.01								



Table 2

Groundwater Analytical Results: Indicator Analysis Parameters

PROJECT No.: 417085-49223-23100

				Anions						Cations				General				Inorganic Nitrogen Compounds				Miscellaneous				
Sampling Location		Date (dd-mmm-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)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (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 (pH Units)	Total Dissolved Solids (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)
CCME CEQG Freshwater Aquatic Life					---	---	120	0.12	---	---	---	---	---	---	---	---	---	(6.5 - 9)	---	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	--	0.43	---	0.03	---	--			
W-CAT-2		975	1.0	23	--	930	1.0	477	---	4.5	100	---	1.0	2600	1600	8	2255	--	2.4	---	0.03	---	--			
CPF 97-7-5 (Duplicate)	07-Aug-2015	Active	W-CAT-1	350	< 0.50	11	--	750 #3	< 0.50	320	75	4.9	290	< 0.50	1800	1100	6.99	1500	< 0.044	< 0.010	< 0.033	< 0.010	< 0.020	1.1		
	07-Aug-2015			---	---	---	--	---	---	320	73	4.8	9	---	---	---	---	---	---	---	---	---	---			
(Duplicate)	14-Sep-2015			400	< 0.50	11	0.11	730 #3	< 0.50	300	67	4.2	7.9	330	< 0.50	1800	1000	6.84	1500	< 0.044	< 0.010	< 0.033	< 0.010	< 0.020	0.95	
	06-Aug-2016			340	< 0.50	22	--	730 #3	< 0.50	310	68	4.5	8.5	280	< 0.50	1700	1000	7.13	1400	0.13	0.028	< 0.033	< 0.010	0.028	1	
(Duplicate)	06-Aug-2016			350	< 0.50	22	--	720 #3	< 0.50	310	68	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 #3	< 0.50	320	74	4.9	8.6	350	< 0.50	1800	1100	7.05	1400	0.42	0.095	< 0.033	< 0.010	0.095	1.1	
(Duplicate)	17-Aug-2017			360	< 0.50	19	--	730 #3	< 0.50	310	66	4.5	9.1	290	< 0.50	1700	1000	--	1400	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	--	
	17-Aug-2017			350	< 0.50	19	--	720 #3	< 0.50	310	66	4.5	9	290	< 0.50	1700	1000	--	1400	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	--	
(Duplicate)	12-Sep-2017			370	< 0.50	18	--	660 #3	< 0.50	310	73	4.5	9.8	310	< 0.50	1700	1100	--	1400	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	--	
	20-Jul-2018			390	< 1.0	16	--	780 #3	< 1.0	330	74	4.6	9.1	320	< 1.0	1800	1100	--	1600	0.15	0.034	< 0.033	< 0.010	0.034	--	
(Duplicate)	20-Jul-2018			370	< 1.0	16	--	790 #3	< 1.0	310	69	4.4	8.5	300	< 1.0	1900	1100	--	1500	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	--	
	15-Sep-2018			440	< 1.0	15	--	770 #3	< 1.0	340	75	4.4	9.6	360	< 1.0	1900	1200	--	1600	< 0.44	< 0.10 #1	< 0.33	< 0.10 #1	< 0.14	--	
(Duplicate)	27-Jul-2019			370	< 1.0	16	--	980 #3	< 1.0	380	83	4.7	9.2	300	< 1.0	2000	1300	--	1800	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	--	
	28-Sep-2019			370	< 1.0	74	0.12	880 #3	< 1.0	350	70	4.3	9.7	300	< 1.0	1900	1200	--	1700 #2	0.88	0.2	< 0.033	< 0.010	0.019	--	
(Duplicate)	23-Jul-2020			440	< 1.0	15	0.084	940 #3	< 1.0	380	84	3.8	9.8	360	< 1.0	2100	1300	--	1700 #2	0.88	0.2	< 0.033	< 0.010	0.2	--	
	17-Sep-2020			360	< 1.0	11	0.083	970 #3	< 1.0	400	85	4.8	9.7	290	< 1.0	2100	1300	--	1800	< 0.22	< 0.050	< 0.033	< 0.010	< 0.050 #1	--	
(Duplicate)	17-Sep-2020			360	< 1.0	10	0.08	1000 #3	< 1.0	400	85	4.9	9.8	290	< 1.0	2100	1400	--	1800	< 0.044	< 0.010	< 0.033	< 0.010	< 0.010	--	
	20-Aug-2021			270	< 1.0	8.4	0.076	1100	< 1.0	430	90	5.2	9.9	220	< 1.0	2100	1400	--	1800	0.88	0.2	< 0.033	< 0.010	0.2	--	
(Duplicate)	15-Sep-2021			380	< 1.0	9.9	0.083	1100	< 1.0	400	83	4.9	9.5	310	< 1.0	2200	1300	--	1900	< 0.22	< 0.050	< 0.033	< 0.010	< 0.050 #1	--	
	08-Aug-2022			460	< 1.0	9.5	0.093	990	< 1.0	400	81	4.1	9.9	370	< 1.0	2100	1300	--	1800	0.96	0.22	< 0.033	< 0.010	0.22	--	
(Duplicate)	24-Sep-2022			480	< 1.0	8.6	0.096	1000	< 1.0	420	85	4.7	9.9	400	< 1.0	2200	1400	--	1900	0.51	0.11	< 0.033	< 0.010	0.11	--	
	22-Sep-2023			720	< 1.0	10	0.13 #1	67	< 1.0	160	40	2.6	37	590	< 1.0	1100	570	--	600 #5	< 0.044	< 0.010	0.05	0.015	0.021	--	
CPF 98-8-3	07-Aug-2015	Active	W-CAT-1	330	< 0.50	7.1	--	200 #1	< 0.50	160	32	2.6	13	270	< 0.50	900	540	6.91	740 #2	0.098	0.022	0.033	0.01	0.032	1.2	
	14-Sep-2015			490	< 0.50	8.7	0.086	190 #3	< 0.50	180	37	2.6	18	4												



Table 2

Groundwater Analytical Results: Indicator Analysis Parameters

PROJECT No.: 417085-49223-23100				Anions						Cations				General				Inorganic Nitrogen Compounds				Miscellaneous				
Sampling Location		Date (dd-mmm-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)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (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 (pH Units)	Total Dissolved Solids (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)
CCME CEQG Freshwater Aquatic Life					---	---	120	0.12	---	---	---	---	---	---	---	---	---	(6.5 - 9)	---	---	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	--	0.43	--	0.03	--	
W-CAT-2					975	1.0	23	--	930	1.0	477	--	4.5	100	--	1.0	2600	1600	8	2255	--	2.4	--	0.03	--	
MEBG-10-1-3	06-Aug-2015	Active	W-CAT-1	610	< 0.50	3	---	190 #1	< 0.50	200	42	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	44	1.9	23	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	37	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	46	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	48	1.5	40	630	< 0.50	1400	760	---	890	0.048	0.011	< 0.033	< 0.010	< 0.014	---	
	12-Sep-2017			750	< 0.50	2.4	---	180	< 0.50	220	51	1.7	33	620	< 0.50	1300	770	---	910	0.41	0.091	< 0.033	< 0.010	0.091	---	
	16-Jul-2018			610	< 1.0	1.9	---	250 #3	< 1.0	230	44	1.3	22	500	< 1.0	1300	750	---	900	0.38	0.087	< 0.033	< 0.010	0.087	---	
	15-Sep-2018			630	< 1.0	2.3	---	240 #3	< 1.0	210	45	1.6	18	510	< 1.0	1300	710	---	880	0.26	0.058	< 0.033	< 0.010	0.058	---	
	15-Jul-2019			290	< 1.0	2.3	---	240 #3	< 1.0	210	45	1.6	18	230	< 1.0	630	330	---	310	0.11	0.024	< 0.033	< 0.010	0.024	---	
	04-Oct-2019			830	< 1.0	1.9	0.11	260 #3	< 1.0	240	51	1.3	25	680	< 1.0	1500	810	---	980	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	
	23-Jul-2020			350	< 1.0	1.7	0.072	200 #3	< 1.0	210	40	0.67	9.9	290	< 1.0	940	680	---	1100	0.2	0.046	< 0.033	< 0.010	0.046	---	
	17-Sep-2020			590	< 1.0	2.2	0.099	500 #3	< 1.0	300	59	1	14	480	< 1.0	1600	990	---	1200	0.092	0.021	< 0.033	< 0.010	0.021	---	
	17-Sep-2020			570	< 1.0	1.9	0.099	500 #3	< 1.0	300	58	0.95	14	470	< 1.0	1600	980	---	1200	0.12	0.027	< 0.033	< 0.010	0.027	---	
	20-Aug-2021			340	< 1.0	< 2.0 #1	0.072	370	< 1.0	380	75	1.5	14	280	< 1.0	1100	1300	---	750	< 0.22	< 0.050	< 0.033	< 0.010	< 0.050 #1	---	
	15-Sep-2021			600	< 1.0	3.4	0.11	1100	< 1.0	440	89	1.6	14	490	< 1.0	2400	1500	---	2000	< 0.22	< 0.050	< 0.033	< 0.010	< 0.050 #1	---	
	09-Aug-2022			560	< 1.0	3.8	0.15	910	< 1.0	360	70	2.5	11	460	< 1.0	2100	1200	---	1700	< 0.22	< 0.050	< 0.033	< 0.010	< 0.050 #1	---	
	23-Sep-2022			550	< 1.0	4.2	0.17	980	< 1.0	440	86	3.5	14	450	< 1.0	2100	1400	---	1800	0.055	0.013	< 0.033	< 0.010	0.013	---	
	16-Aug-2023			410	< 1.0	3	0.19 #1	1200	< 1.0	420	71	2.3	6.3	330	< 1.0	2100	1400	---	2000	0.045	0.01	< 0.033	< 0.010	0.01	---	
	22-Sep-2023			490	< 1.0	3.8	0.47 #1	1200	< 1.0	480	85	3	8.1	400	< 1.0	2300	1600	---	1800 #5	< 0.22	< 0.050	< 0.033	< 0.010	< 0.050 #2	---	
	22-Sep-2023			530	< 1.0	3.7	0.45	1200	< 1.0	440	76	2.8	7.6	430	< 1.0	2200	1400	---	1800 #3	< 0.044	< 0.010	< 0.033	< 0.010	< 0.010	---	
MTF 97-1-5	08-Aug-2015	Active	W-CAT-1	410	< 0.50	1.2	---	630 #3	< 0.50	330	86	1.8	4.7	340	< 0.50	1700	1200	7.63	1400	17	3.9	< 0.033	< 0.010	3.9	1.2	
	15-Sep-2015			300	< 0.50	< 1.0	0.16	580 #3	< 0.50	240	59	1.5	5.1	240	< 0.50	1400	850	7.93	1200	13	2.9	< 0.033	< 0.010	2.9	1	
	03-Oct-2016			500	< 0.50																					



Table 2

Groundwater Analytical Results: Indicator Analysis Parameters

PROJECT No.: 417085-49223-23100

				Anions						Cations				General				Inorganic Nitrogen Compounds				Miscellaneous				
Sampling Location		Date (dd-mmm-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)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (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 (pH Units)	Total Dissolved Solids (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)
CCME CEQG Freshwater Aquatic Life					---	---	120	0.12	---	---	---	---	---	---	---	---	---	(6.5 - 9)	---	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	--	0.43	---	0.03	---				
W-CAT-2		975	1.0	23	--	930	1.0	477	--	4.5	100	--	1.0	2600	1600	8	2255	--	2.4	---	0.03	---				
TF 03-12-3	08-Aug-2015	Active	W-CAT-1	710	< 0.50	140	--	150	< 0.50	220	90	6.2	55	580	< 0.50	1700	930	7.29	1200 ^{#2}	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	70	5.3	68 ^{#8}	600	< 0.50	1700	750	7.87	1100	0.21	0.047	< 0.033	< 0.010	0.047	0.92	
	06-Aug-2016	(Duplicate)		830	< 0.50	130	--	140	< 0.50	220	86	5.5	53	680	< 0.50	1700	900	7.5	1200 ^{#2}	0.062	0.014	< 0.033	< 0.010	< 0.020	1	
	02-Oct-2016			830	< 0.50	120	--	160	< 0.50	220	88	5.4	59	680	< 0.50	1700	900	7.22	1200 ^{#2}	0.095	0.021	< 0.033	< 0.010	0.021	1	
	17-Aug-2017			700	< 0.50	160	--	170	< 0.50	190	77	5	60	570	< 0.50	1700	800	--	1200 ^{#2}	0.15	0.034	< 0.033	< 0.010	0.034	--	
	13-Sep-2017			820	< 0.50	190	--	110	< 0.50	190	79	5.1	54	670	< 0.50	1900	800	--	1100 ^{#2}	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	--	
	13-Sep-2017			690	< 0.50	160	--	150	< 0.50	200	81	5	56	570	< 0.50	1700	820	--	990 ^{#2}	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	--	
	16-Jul-2018			740	< 1.0	170	--	130	< 1.0	220	84	4.6	50	610	< 1.0	1800	900	--	1100 ^{#2}	0.36	0.082	< 0.033	< 0.010	0.082	--	
	16-Jul-2018			730	< 1.0	170	--	130	< 1.0	220	83	4.6	50	600	< 1.0	1800	900	--	1200 ^{#2}	0.51	0.12	0.035	0.011	0.13	--	
	16-Sep-2018			810	< 1.0	110	--	180 ^{#1}	< 1.0	200	76	4.7	50	670	< 1.0	1700	810	--	1100	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	--	
	19-Jun-2019			590	< 1.0	110	--	140	< 1.0	180	67	3.7	29	480	< 1.0	1400	730	--	970	0.12	0.026	< 0.033	< 0.010	0.026	--	
	28-Sep-2019			840	< 1.0	80	0.35	280 ^{#3}	< 1.0	230	87	4.8	41	690	< 1.0	1700	940	--	1300 ^{#5}	0.057	0.013	< 0.033	< 0.010	< 0.014	--	
	28-Sep-2019			820	< 1.0	78	0.35	280 ^{#3}	< 1.0	240	86	4.8	41	680	< 1.0	1700	940	--	1300 ^{#5}	0.13	0.028	< 0.033	< 0.010	0.028	--	
	23-Jul-2020	(Duplicate)		750	< 1.0	99	0.32	210 ^{#3}	< 1.0	240	92	4.8	43	610	< 1.0	1800	970	--	1300	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	--	
	23-Jul-2020			760	< 1.0	100	0.33	210 ^{#3}	< 1.0	230	90	4.7	44	620	< 1.0	1800	950	--	1300 ^{#2}	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	--	
	19-Sep-2020	(Duplicate)		1100	< 1.0	100	0.48	200 ^{#3}	< 1.0	280	100	5.5	48	870	< 1.0	2100	1100	--	1600 ^{#2}	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	--	
	20-Aug-2021			880	< 1.0	84	0.44	180	< 1.0	240	86	5.1	41	720	< 1.0	1700	950	--	990 ^{#2}	< 0.22	< 0.050	0.067	0.02	< 0.050 ^{#1}	--	
	15-Sep-2021			800	< 1.0	72	0.47	230	< 1.0	240	86	5.2	46	650	< 1.0	1600	950	--	1000 ^{#2}	< 0.044	< 0.010	< 0.033	< 0.010	< 0.010	--	
	15-Sep-2021			910	< 1.0	76	0.42	210	< 1.0	250	91	5.5	43	750	< 1.0	1800	1000	--	1200 ^{#2}	< 0.044	< 0.010	< 0.033	< 0.010	< 0.010	--	
	07-Aug-2022			890	< 1.0	95	0.47	190	< 1.0	250	91	5.4	36	730	< 1.0	1800	1000	--	1300 ^{#2}	< 0.044	< 0.010	< 0.033	< 0.010	< 0.026	--	
	23-Sep-2022			1100	< 1.0	76	0.49	140	< 1.0	280	100	7.1	38	920	< 1.0	1900	1100	--	1300 ^{#2}	< 0.044	< 0.010	< 0.033	< 0.010	< 0.010	--	
	17-Sep-2020			1200	< 1.0	100	0.50 ^{#1}	140	< 1.0	300	100	6.3	40	980	< 1.0	2100	1200	--	1500 ^{#5}	< 0.044	< 0.010	< 0.033	< 0.010	< 0.010	--	
	17-Aug-2023			1200	< 1.0	100	0.50 ^{#1}	140	< 1.0	300	100	6.3	40	980	< 1.0	2100	1200	--	1500 ^{#5}	< 0.044	< 0.050	< 0.033	< 0.010	< 0.010	--	
	22-Sep-2023			1200	< 1.0	95	0.82 ^{#1}	120	< 1.0																	



Table 2

Groundwater Analytical Results: Indicator Analysis Parameters

PROJECT No.: 417085-49223-23100			Anions						Cations				General				Inorganic Nitrogen Compounds				Miscellaneous				
Sampling Location	Date (dd-mmm-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)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (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 (pH Units)	Total Dissolved Solids (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)
CCME CEQG Freshwater Aquatic Life				---	---	120	0.12	---	---	---	---	---	---	---	---	---	(6.5 - 9)	---	---	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	---	0.43	---	0.03	---	---	---		
W-CAT-2	975	1.0	23	---	930	1.0	477	---	4.5	100	---	1.0	2600	1600	8	2255	---	2.4	---	0.03	---	---	---		
Surveillance Network Program - Bear Island Locations																									
BI-13-1-4	07-Aug-2015	Active	W-CAT-2	860	< 0.50	7.7	---	450 #3	< 0.50	280	84	2.1	45	700	< 0.50	1900	1000	7.07	1400 #2	0.079	0.018	0.048	0.014	0.032	1
	07-Aug-2016			860	< 0.50	7.9	---	280 #3	< 0.50	280	100	2.1	26	710	< 0.50	1700	1100	7.14	980	0.23	0.053	0.042	0.013	0.066	1.2
	15-Aug-2017			650	< 0.50	6.2	---	220 #3	< 0.50	210	73	1.6	15	530	< 0.50	1300	820	---	1000	0.07	0.016	< 0.033	< 0.010	0.016	---
	18-Jul-2018			---	---	4.6	---	100	---	---	---	---	---	---	---	890	---	---	---	0.15	0.034	0.055	0.017	0.051	---
	20-Sep-2018			880	< 1.0	8.3	---	160	< 1.0	230	72	1.6	13	720	< 1.0	1400	870	---	1300	1.2	0.28	< 0.033	< 0.010	0.28	---
	12-Jul-2019			240	< 1.0	2.5	---	88	< 1.0	68	25	0.41	4.6	200	< 1.0	540	270	---	300	1.5	0.35	< 0.033	< 0.010	0.35	---
	29-Sep-2019			980	< 1.0	8.7	0.23	290 #3	< 1.0	280	95	1.5	16	810	< 1.0	1800	1100	---	1300	0.092	0.021	< 0.033	< 0.010	0.021	---
	26-Jul-2020			360	< 1.0	3.1	0.081	88	< 1.0	130	40	0.53	5.9	290	< 1.0	750	490	---	450	0.72	0.16	< 0.033	< 0.010	0.16	---
	16-Sep-2020			1000	< 1.0	8.5	---	110	< 1.0	260	78	1.3	15	830	< 1.0	1600	970	---	1000 #2	< 0.22	< 0.050 #4	< 0.16	< 0.050 #4	< 0.071	---
	22-Aug-2021			470	< 1.0	5.3	0.3	95	< 1.0	110	35	1.3	11	380	< 1.0	860	420	---	800	< 0.44	< 0.10	< 0.033	< 0.010	< 0.10 #1	---
	18-Sep-2021			960	< 1.0	11	0.28	79	< 1.0	240	79	1.5	14	780	< 1.0	1500	910	---	890	0.26	0.059	< 0.033	< 0.010	0.059 #1	---
	25-Sep-2022			1000	< 1.0	12	0.26	30	< 1.0	210	87	1.5	16	830	< 1.0	1400	890	---	930	< 0.044	< 0.010	< 0.033	< 0.010	< 0.010	---
BI-13-3-4.5	07-Aug-2015	Active	W-CAT-2	540	< 0.50	11	---	810 #3	< 0.50	300	160	3.5	18	440	< 0.50	2000	1400	7.44	1600	0.19	0.042	0.048	0.015	0.057	1.1
	08-Aug-2016			620	< 0.50	8.5	---	890 #3	< 0.50	310	170	3.4	17	510	< 0.50	2200	1500	7.66	1800	0.13	0.029	< 0.033	< 0.010	0.029	1.1
	15-Aug-2017			500	< 0.50	8.7	---	850 #3	< 0.50	280	150	3.6	15	410	< 0.50	2000	1300	---	1700	0.38	0.085	< 0.033	< 0.010	0.085	---
	22-Nov-2017			530	< 1.0	6.5	---	700 #3	< 1.0	280	120	2.3	13	440	< 1.0	1800	1200	---	1500	0.19	0.043	< 0.033	< 0.010	0.043	---
	18-Jul-2018			420	< 1.0	7.2	---	890 #3	< 1.0	250	140	3.3	13	340	< 1.0	1900	1200	---	1700	0.18	0.04	< 0.033	< 0.010	0.04	---
	20-Sep-2018			550	< 1.0	10	---	710 #3	< 1.0	250	130	3.1	14	450	< 1.0	1900	1200	---	1600	0.6	0.14	< 0.033	< 0.010	0.14	---
	12-Jul-2019			420	< 1.0	8.4	---	870 #3	< 1.0	280	140	3.7	14	340	< 1.0	1900	1300	---	1700	0.082	0.019	< 0.033	< 0.010	0.019	---
	26-Jul-2020			340	< 1.0	6	0.23	840 #3	< 1.0	310	150	3	14	280	< 1.0	1900	1400	---	1600	1.7	0.38	< 0.033	< 0.010	0.38	---
	16-Sep-2020			560	< 1.0	7.1	0.27	860 #3	< 1.0	290	140	3	13	460	< 1.0	2100	1300	---	1700	0.15	0.035	< 0.033	< 0.010	0.035	---
	21-Aug-2021			470	< 1.0	6	---	860	< 1.0	270	110	2.7	11	390	< 1.0	2000	1100	---	1700	< 0.44	< 0.10	< 0.033	< 0.010	< 0.10 #1	---
	18-Sep-2021			480	< 1.0	5.5	0.3	800	< 1.0	310	130	2.9	12	390	< 1.0	2000	1300	---	1700	< 0.44	< 0.10	< 0.033	< 0.010	< 0.010	---
	07-Aug-2022			850	< 1.0	11	0.23	34	< 1.0	170	67	1.5	13	690	< 1.0	1300	700	---	680	< 0.044	< 0.010	< 0.033	< 0.010	< 0.010	---
	25-Sep-2022			530	< 1.0	6.9	0.3	920	< 1.0	330	140	3.1	12</												



Table 2

Groundwater Analytical Results: Indicator Analysis Parameters

PROJECT No.: 417085-49223-23100				Anions						Cations				General				Inorganic Nitrogen Compounds				Miscellaneous				
Sampling Location		Date (dd-mmm-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)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (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 (pH Units)	Total Dissolved Solids (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)
CCME CEQG Freshwater Aquatic Life					---	---	120	0.12	---	---	---	---	---	---	---	---	---	(6.5 - 9)	---	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	--	0.43	---	0.03	---	---			
W-CAT-2		975	1.0	23	--	930	1.0	477	---	4.5	100	--	1.0	2600	1600	8	2255	--	2.4	---	0.03	---	---			
BIBG-12-1-7		09-Aug-2015	Active	W-CAT-2	960	< 0.50	8.1	--	670 #3	< 0.50	110	42	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	76	1.5	300	740	< 0.50	2400	770	7.42	1700 #2	1.8	0.4	0.14	0.043	0.44	1
BIS 97-1-3		22-Nov-2017	Active	W-CAT-2	1000	< 1.0	20	--	110	< 1.0	240	91	3.8	19	840	< 1.0	1700	980	--	940 #2	0.22	0.05	0.062	0.019	0.068	---
		20-Jul-2018			720	< 1.0	16	--	160	< 1.0	170	77	3.1	16	590	< 1.0	1300	750	--	900	3.7	0.83	< 0.033	< 0.010	0.83	---
(Duplicate)		20-Sep-2018			950	< 1.0	22	--	160	< 1.0	230	87	3.5	18	780	< 1.0	1500	940	--	1100	0.051	0.011	< 0.033	< 0.010	< 0.014	---
(Duplicate)		17-Jul-2019			820	< 1.0	19	--	180	< 1.0	210	93	3.5	20	670	< 1.0	1500	910	--	1000	2.4	0.53	0.037	0.011	0.55	---
(Duplicate)		17-Jul-2019			840	< 1.0	19	--	180	< 1.0	210	93	3.5	20	690	< 1.0	1500	910	--	1000	2.4	0.54	0.043	0.013	0.56	---
(Duplicate)		29-Sep-2019			1000	< 1.0	22	0.21	200	< 1.0	270	100	3.7	19	830	< 1.0	1700	1100	--	1100	0.26	0.059	0.045	0.014	0.072	---
(Duplicate)		26-Jul-2020			840	< 1.0	18	0.17	190	< 1.0	230	97	3.1	19	690	< 1.0	1600	980	--	980 #2	0.87	0.2	0.04	0.012	0.21	---
(Duplicate)		26-Jul-2020			850	< 1.0	20	0.17	190	< 1.0	210	93	3.3	19	700	< 1.0	1600	920	--	1000	0.64	0.15	0.034	0.01	0.16	---
(Duplicate)		16-Sep-2020			970	< 1.0	19	0.21	210 #3	< 1.0	250	100	3.9	19	800	< 1.0	1700	1000	--	1100	0.35	0.078 #4	< 0.16	< 0.050 #4	0.078	---
(Duplicate)		21-Aug-2021			940	< 1.0	20	--	180	< 1.0	220	82	3	16	770	< 1.0	1600	880	--	1000	1.7	0.39	< 0.033	< 0.010	0.39	---
(Duplicate)		18-Sep-2021			1100	< 1.0	23	0.25	180	< 1.0	250	92	3.3	17	870	< 1.0	1800	1000	--	1200	0.054	0.012	< 0.033	< 0.010	0.012	---
(Duplicate)		07-Aug-2022			880	< 1.0	24	0.17	340	< 1.0	300	97	3.2	19	730	< 1.0	1800	1200	--	1400	1.5	0.35	0.045	0.014	0.36	---
(Duplicate)		25-Sep-2022			1100	< 1.0	26	0.23	300	< 1.0	320	110	3.5	20	910	< 1.0	2000	1300	--	1500	0.16	0.035	0.046	0.014	0.049	---
(Duplicate)		16-Aug-2023			810	< 1.0	23	0.16 #1	290	< 1.0	220	71	2.5	14	660	< 1.0	1600	850	--	1100	1.7	0.38	0.037	0.011	0.39	---
(Duplicate)		22-Sep-2023			820	< 1.0	--	--	< 1.0		220	100	< 6.0	23	670	< 1.0	1900	960	--	2700	---	---	---	---	---	---
Surveillance Network Program - Goose Island Locations																										
GIBG-10-2-3		10-Aug-2015	Active	W-CAT-2	270	< 0.50	1.9	--	58	< 0.50	71	12	2.5	18	220	< 0.50	510	230	7.71	330 #2	0.25	0.057	0.035	0.011	0.067	0.96
(Duplicate)		10-Aug-2015			---	---	---	--	---	--	71	12	2.4	17	---	---	---	---	---	---	---	---	---	---		
(Duplicate)		16-Sep-2015			440	< 0.50	3.1	0.086	330 #3	< 0.50	170	28	3.9	57	360	< 0.50	1200	530	7.9	690	0.79	0.18	< 0.033	< 0.010	0.18	0.95
(Duplicate)		07-Aug-2016			290	< 0.50	< 1.0	--	77	< 0.50	87	13	2.6	30	240	< 0.50	610	270	7.85	430 #2	0.47	0.11	< 0.033	< 0.010	0.11	1.1
(Duplicate)		07-Aug-2016			310	< 0.50	< 1.0	--	84	< 0.50	87	13	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			470	< 0.50	2.3	--	98	< 0.50	120	20	3	34	390	< 0.50	840	390	7.76	570 #2	0.069	0.016	< 0.033	< 0.010	< 0.020	0.95
(Duplicate)		20-Aug-2017			370	< 0.50	2.4	--	140	< 0.50	130</td															



Table 2

Groundwater Analytical Results: Indicator Analysis Parameters

PROJECT No.: 417085-49223-23100				Anions						Cations				General				Inorganic Nitrogen Compounds				Miscellaneous				
Sampling Location		Date (dd-mmm-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)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (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 (pH Units)	Total Dissolved Solids (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)
CCME CEQG Freshwater Aquatic Life					---	---	120	0.12	---	---	---	---	---	---	---	---	---	(6.5 - 9)	---	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	---	0.43	---	0.03	---	---			
W-CAT-2		975	1.0	23	---	930	1.0	477	---	4.5	100	---	1.0	2600	1600	8	2255	---	2.4	---	0.03	---	---			
GIP11 09-1-4	10-Aug-2015	Replaced	W-CAT-2	520	< 0.50	4.5	---	290 # ³	< 0.50	220	45	2.9	21	430	< 0.50	1200	730	7.14	930	1.5	0.33	< 0.033	< 0.010	0.33	1.1	
	16-Sep-2015			530	< 0.50	6.3	0.062	260 # ³	< 0.50	190	38	2.9	24 # ⁸	430	< 0.50	1200	630	7.76	780	0.14	0.032	< 0.033	< 0.010	0.032	0.98	
GIP11 09-1-4-R	14-Jul-2018	Active	W-CAT-2	800	< 1.0	50	---	200 # ¹	< 1.0	270	51	4	8.8	660	< 1.0	1600	890	---	1100	0.6	0.13	< 0.033	< 0.010	0.13	---	
	20-Sep-2018			800	< 1.0	14	---	200	< 1.0	250	47	3.7	6.2	650	< 1.0	1400	810	---	970	1.2	0.27	< 0.033	< 0.010	0.27	---	
	16-Jul-2019			580	< 1.0	14	---	110	< 1.0	170	29	6	8.8	470	< 1.0	1000	550	---	690	0.54	0.12	< 0.033	< 0.010	0.12	---	
	04-Oct-2019			---	---	17	0.061	---	---	---	---	---	---	---	---	1100	---	---	---	---	---	---	---	---		
	25-Jul-2020			300	< 1.0	5.9	0.053	49	< 1.0	93	18	2.2	7.1	250	< 1.0	610	300	---	290 # ²	1.5	0.34	< 0.033	< 0.010	0.34	---	
	16-Sep-2020			330	< 1.0	5	0.077	58	< 1.0	97	21	2.3	7.9	270	< 1.0	610	330	---	390 # ²	0.78	0.18	< 0.033	< 0.010	0.18	---	
	17-Sep-2021			280	< 1.0	5.4	0.078	42	< 1.0	80	16	2.5	6.6	230	< 1.0	510	260	---	320	0.71	0.16	< 0.033	< 0.010	0.16	---	
	08-Aug-2022			760	< 1.0	7.1	< 0.050	120	< 1.0	220	43	4	7	630	< 1.0	1300	740	---	830	4.7	1.1	< 0.033	< 0.010	1.1	---	
	25-Sep-2022			780	< 1.0	9.1	0.057	120	< 1.0	230	46	4	6.7	640	< 1.0	1300	750	---	760 # ²	0.47	0.11	< 0.033	< 0.010	0.11	---	
	23-Sep-2023			420	< 1.0	8	---	63	< 1.0	120	26	3.1	10	340	< 1.0	730	410	---	630 # ⁵	5.1	1.2	0.18	0.054	1.2	---	
GIQ8-10-2-4	16-Sep-2015	Active	W-CAT-2	640	< 0.50	20	< 0.050	690 # ³	< 0.50	330	81	3.1	26	530	< 0.50	2000	1200	7.77	1700	0.062	0.014	< 0.033	< 0.010	< 0.020	0.97	
	07-Aug-2016			630	< 0.50	14	---	580 # ³	< 0.50	300	86	3.3	22	520	< 0.50	1900	1100	7.49	1500	< 0.044	< 0.010	< 0.033	< 0.010	< 0.020	1	
	03-Oct-2016			740	< 0.50	18	---	640 # ³	< 0.50	340	94	3.7	25	610	< 0.50	2000	1200	7.45	1700 # ²	< 0.044	< 0.010	< 0.033	< 0.010	< 0.020	1	
	03-Oct-2016			740	< 0.50	19	---	660 # ³	< 0.50	340	94	3.6	25	590	< 0.50	2000	1200	7.48	1700	< 0.044	< 0.010	< 0.033	< 0.010	< 0.020	1	
	20-Aug-2017			450	< 0.50	5.8	---	91	< 0.50	140	28	2.8	8.5	370	< 0.50	820	460	---	560 # ²	0.089	0.02	< 0.033	< 0.010	0.02	---	
	12-Sep-2017			390	< 0.50	9.4	---	220 # ³	< 0.50	150	36	2.3	11	320	< 0.50	990	520	---	740 # ²	0.09	0.02	< 0.033	< 0.010	0.02	---	
	14-Jul-2018			800	< 1.0	21	---	680 # ³	< 1.0	340	83	3.1	21	660	< 1.0	2200	1200	---	1700 < 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---		
	20-Sep-2018			780	< 1.0	21	---	700 # ³	< 1.0	370	95	3.6	25	640	< 1.0	2100	1300	---	1800 # ²	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	
	20-Sep-2018			860	< 1.0	21	---	690 # ³	< 1.0	380	98	3.7	25	710	< 1.0	2100	1300	---	1800 # ²	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	
	16-Jul-2019			780	< 1.0	20	---	710 # ³	< 1.0	370	92	3.5	43	640	< 1.0	2100	1300	---	1800 # ⁵	< 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---	
	30-Sep-2019			750	< 1.0	20	< 0.050	740 # ³	< 1.0	380	100	3.5	29	610	< 1.0	2200	1400	---	1800 < 0.044	< 0.010	< 0.033	< 0.010	< 0.014	---		
	30-Sep-2019			730	< 1.0	20	< 0.050	740 # ³	< 1.0	380	100	3.5	30	600	< 1.0	2200	1400	---	1800	0.18	0.040 # ^{9</sup}					



Table 2

Groundwater Analytical Results: Indicator Analysis Parameters

PROJECT No.: 417085-49223-23100

			Anions						Cations				General				Inorganic Nitrogen Compounds				Miscellaneous				
Sampling Location	Date (dd-mmm-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)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (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 (pH Units)	Total Dissolved Solids (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)
CCME CEQG Freshwater Aquatic Life				---	---	120	0.12	---	---	---	---	---	---	---	---	---	(6.5 - 9)	---	---	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	---	0.43	---	0.03	---	
W-CAT-2				975	1.0	23	--	930	1.0	477	---	4.5	100	---	1.0	2600	1600	8	2255	---	2.4	---	0.03	---	

NOTES:

Chloride

910

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. Green font indicates Primary Indicator Parameters

4. Blue font indicates values above calculated background concentration.

5. Green highlighting indicates parameters above applied guideline/criteria, but within local background range.

6. Yellow highlight indicates value above calculated background concentration and above applied guideline/criteria.

7. Blue highlighting indicates non-detect parameters above applied guideline/criteria.

8. Orange highlighting indicates parameters at applied guideline/criteria.

9. Denotes values exceeding

(CCME. 2024. 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 March, 2024.)

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.10. Superscript ^{#1} - Detection limits raised due to matrix interference.11. Superscript ^{#2} - Detection limit raised based on sample volume used for analysis.12. Superscript ^{#3} - Detection limits raised due to dilution to bring analyte within the calibrated range.13. Superscript ^{#4} - Detection limits raised due to sample matrix.14. Superscript ^{#5} - Detection limit raised based on sample volume used and sample matrix15. Superscript ^{#6} - Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.16. Superscript ^{#7} - Matrix Spike exceeds acceptance limits for dissolved Mg, due to matrix interference. Reanalysis yields similar results. (Recovery:76%, limits 80-120%)17. Superscript ^{#8} - Dissolved greater than total. Results within acceptable limits of precision.18. Superscript ^{#9} - Sample was originally processed within hold time. Data quality required investigation. Re-analysis was completed past recommended hold time.19. Superscript ^{#10} - Detection limit raised based on sample volume used for analysis20. Superscript ^{#11} - Dissolved greater than total. Reanalysis yields similar results.



Table 3

Groundwater Analytical Results: Dissolved Metals and Trace Elements

PROJECT No.: 417085-49223-23100



Table 3

Groundwater Analytical Results: Dissolved Metals and Trace Elements

PROJECT No.: 417085-49223-23100

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				0.1	--	0.005	--	--	1.5	0.00009	0.0089	--	0.004	0.3	0.007	--	0.00026	0.073	0.15	--	0.001	--	0.00025	--	0.0008	--	--	0.015	--	0.03	
W-CAT-1				0.13	--	0.01	0.53	--	0.04	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
W-CAT-2				0.03	--	0.0024	0.22	--	0.04	0.00045	0.001	--	0.01	7.5	0.001	--	5.44	0.000003	0.026	0.02	--	0.001	--	0.0001	--	0.0002	--	--	0.024	--	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	< 0.00020	< 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	0.096
06-Aug-2016				0.047	< 0.00060	0.0009	0.18	< 0.0010	< 0.020	0.00055	< 0.0010	0.0023	0.0013	0.45	0.00036	< 0.020	2.2	--	0.0016	0.005	< 0.10	0.00026	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	0.0017	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				--	--	--	--	--	--	--	--	--	--	--	--	--	0.000068	--	--	--	--	--	--	--	--	--	--	--	--		
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	< 0.000020	0.0012	0.0023	< 0.10	0.00024	3.8	< 0.00010	0.55	< 0.00020	< 0.0010	< 0.0010	0.00042	< 0.0010	0.012
12-Sep-2017				0.049	< 0.00060	0.00063	0.16	< 0.0010	0.021	0.000032	< 0.0010	0.0098	0.0016	0.76	< 0.00020	< 0.020	0.63	< 0.000020	0.00081	0.0032	< 0.10	0.00022	4.6	< 0.00010	0.56	< 0.00020	< 0.0010	< 0.0010	0.0059	< 0.0010	0.015
22-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	< 0.000020	0.0012	0.0026	< 0.10	0.00046	3.3	< 0.00010	0.53	< 0.00020	< 0.0010	< 0.0010	0.0033	< 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	< 0.000020	0.0043	0.0039	< 0.10	0.00078	4.5	< 0.00010	0.6	< 0.00020	< 0.0010	< 0.0010	0.0057	< 0.0010	0.093
11-Jul-2019				0.034	< 0.00060	0.00038	0.16	< 0.0010	0.022	< 0.000019	< 0.0010	0.0067	0.0017	0.069	0.00022	< 0.020	0.63	< 0.000020	0.00083	0.0044	< 0.10	0.00020	3.6	< 0.00010	0.63	< 0.00020	< 0.0010	< 0.0010	0.0098	< 0.0010	0.036
28-Sep-2019				0.029	< 0.00060	0.0015	0.18	< 0.0010	< 0.020	< 0.000020	< 0.0010	0.0026	0.0005	2.6	< 0.00020	< 0.020	1.3	< 0.000020	0.0004	0.0042	< 0.10	0.00037	5.1	< 0.00010	0.77	< 0.00020	< 0.0010	< 0.0010	0.0068	< 0.0010	0.071
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	< 0.000019	0.0071	0.0026	< 0.10	0.00042	4	< 0.00010	0.7	< 0.00020	< 0.0010	< 0.0010	0.0083	< 0.0010	0.030
17-Sep-2020				0.028	< 0.00060	0.0029	0.18	< 0.0010	0.043	< 0.000020	< 0.0010	0.0034	0.0045	4.8	< 0.00020	< 0.020	1.1	0.00030	0.00042	0.0054	< 0.10	0.00047	5.5	< 0.00010	0.81	< 0.00020	< 0.0010	< 0.0010	0.0092	< 0.0010	0.064
20-Aug-2021				0.044	< 0.00060	0.00025	0.18	< 0.0010	0.025	0.000034	< 0.0010	0.0009	0.0009	0.14	< 0.00020	< 0.020	0.65	< 0.000019	0.0062	0.0028	< 0.10	< 0.00020	4.7	< 0.00010	0.63	< 0.00020	< 0.0010	< 0.0010	0.0088	< 0.0010	0.088
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	0.00036	0.00037	0.003	< 0.10	< 0.00020	4.1	< 0.00010	0.74	< 0.00020	< 0.0010	< 0.0010	0.0057	< 0.0010	0.08
(Duplicate)				0.034	< 0.00060	0.00038	0.16	< 0.0010	0.022	< 0.000020	< 0.0010	0.00061	< 0.000019	0.0017	< 0.00020	< 0.020	1.3	< 0.000020	0.0004	0.0042	< 0.10	0.00037	5.1	< 0.00010	0.77	< 0.00020	< 0.0010	< 0.0010	0.0098	< 0.0010	0.036
15-Sep-2021				0.044	< 0.00060	0.00058	0.21	< 0.0010	0.023	< 0.000020	< 0.0010	0.00020	< 0.000019	0.0041	0.47	< 0.00020	< 0.020	1.1	0.00037	0.00047											



Table 3

Groundwater Analytical Results: Dissolved Metals and Trace Elements

PROJECT No.: 417085-49223-23100

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)	Sodium (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				0.1	--	0.005	--	--	1.5	0.00009	0.0089	--	0.004	0.3	0.007	--	0.00026	0.073	0.15	--	0.001	--	0.00025	--	0.0008	--	--	0.015	--	0.03		
W-CAT-1				0.13	--	0.01	0.53	--	0.04	0.002	0.007	--	0.01	6.11	0.023	--	3.01	0.00288	0.005	0.03	--	0.002	--	0.01	--	0.02	--	--	0.039	--	0.03	
W-CAT-2				0.03	--	0.0024	0.22	--	0.04	0.0045	0.001	--	0.01	7.5	0.001	--	5.44	0.00003	0.026	0.02	--	0.001	--	0.0001	--	0.0002	--	--	0.024	--	0.03	
(Duplicate)	13-Sep-2017	Active	W-CAT-1	0.018	< 0.00060	0.0058	0.068	< 0.0010	0.039	0.00098	< 0.0010	0.0041	0.00061	3.7	< 0.00020	< 0.020	0.38	< 0.000020	0.2	0.025	< 0.10	0.0021	14	< 0.00010	0.71	0.0015	< 0.0010	< 0.0010	0.015	0.0046	0.0087	
(Duplicate)	16-Jul-2018			0.013	0.001	0.0042	0.09	< 0.0010	0.038	0.00065	< 0.0010	0.0035	0.0013	2.8	< 0.00020	< 0.020	0.33	< 0.000026	0.22	0.025	< 0.10	0.0025	11	< 0.00010	0.81	0.0009	< 0.0010	< 0.0010	0.033	0.0064	0.0094	
(Duplicate)	16-Jul-2018			0.0098	0.0011	0.0043	0.088	< 0.0010	0.038	0.00074	< 0.0010	0.0034	0.0013	2.6	< 0.00020	< 0.020	0.31	< 0.000026	0.22	0.024	< 0.10	0.0028	11	< 0.00010	0.81	0.00098	< 0.0010	< 0.0010	0.032	0.0065	0.0085	
(Duplicate)	16-Sep-2018			0.013	< 0.00060	0.0082	0.073	< 0.0010	0.04	0.00075	< 0.0010	0.0036	0.0011	3.3	< 0.00020	< 0.020	0.39	< 0.000020	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	
(Duplicate)	19-Jun-2019			0.006	0.00098	0.0018	0.053	< 0.0010	0.035	0.00096	< 0.0010	0.0025	0.0012	0.78	< 0.00020	< 0.020	0.22	< 0.000020	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	
(Duplicate)	28-Sep-2019			0.014	< 0.00060	0.0066	0.081	< 0.0010	0.023	0.00076	< 0.0010	0.0043	0.0022	4.5	< 0.00020	< 0.020	0.5	< 0.000020	0.17	0.03	< 0.10	0.0012	13	< 0.00010	0.8	0.0015	< 0.0010	< 0.0010	0.018	0.0039	0.0083	
(Duplicate)	28-Sep-2019			0.014	< 0.00060	0.0067	0.081	< 0.0010	0.023	0.00076	< 0.0010	0.0043	0.0033	4.5	< 0.00020	< 0.020	0.5	< 0.000020	0.17	0.03	< 0.10	0.0013	12	< 0.00010	0.79	0.0015	< 0.0010	< 0.0010	0.019	0.0041	0.0068	
(Duplicate)	23-Jul-2020			0.0098	< 0.00060	0.0051	0.08	< 0.0010	0.031	0.00029	< 0.0010	0.0057	0.0009	11	< 0.00020	< 0.020	0.63	< 0.000019	#2	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
(Duplicate)	23-Jul-2020			0.0086	< 0.00060	0.0053	0.074	< 0.0010	0.033	0.00003	< 0.0010	0.0052	0.00046	9.4	< 0.00020	< 0.020	0.55	< 0.000019	#2	0.17	0.032	< 0.10	0.001	11	< 0.00010	0.84	0.001	< 0.0010	< 0.0010	0.018	< 0.0030	
(Duplicate)	19-Sep-2020			0.015	< 0.00060	0.0066	0.087	< 0.0010	0.036	0.00044	< 0.0010	0.0061	< 0.00020	13	< 0.00020	< 0.020	0.73	< 0.000019	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	
(Duplicate)	20-Aug-2021			0.016	< 0.00060	0.0059	0.098	< 0.0010	0.057	0.00045	< 0.0010	0.0047	0.0017	15	< 0.00020	< 0.020	0.68	< 0.000019	0.18	0.034	< 0.10	0.0019	12	< 0.00010	0.91	< 0.00020	< 0.0010	0.021	0.015	0.0036	0.0075	
(Duplicate)	15-Sep-2021			0.019	< 0.00060	0.0063	0.077	< 0.0010	0.036	0.00073	< 0.0010	0.0044	0.00032	11	< 0.00020	< 0.020	0.51	< 0.000032	0.19	0.031	< 0.10	0.0014	11	< 0.00010	0.89	< 0.00020	< 0.0010	0.002	0.015	0.0035	0.0042	
(Duplicate)	15-Sep-2021			0.013	< 0.00060	0.0069	0.083	< 0.0010	0.038	0.00054	< 0.0010	0.0048	0.0028	13	< 0.00020	< 0.020	0.57	< 0.000033	0.21	0.036	< 0.10	0.0014	12	< 0.00010	0.95	< 0.00020	< 0.0010	0.019	0.0039	0.0084		
(Duplicate)	07-Aug-2022			0.015	< 0.00060	0.0075	0.096	< 0.0010	0.031	0.00043	< 0.0010	0.0039	< 0.0010	18	< 0.00020	< 0.020	0.66	< 0.000061	0.19	0.032	< 0.10	0.0018	13	< 0.00010	0.89	< 0.00020	< 0.0010	0.012	0.0036	0.0092		
(Duplicate)	23-Sep-2022			0.014	< 0.00060	0.0073	0.073	< 0.0010	0.034	0.00023	< 0.0010	0.0039	0.0017	16	< 0.00020	< 0.020	0.92	< 0.000024	0.024	0.032	< 0.10	0.0011	14	< 0.00010	0.99	< 0.00010	< 0.0010	0.0069	0.0031	0.0061		
(Duplicate)	16-Aug-2023			1.8 ^{#1}	< 0.00060	0.018 ^{#1}	--	< 0.0010	--	0.00034 ^{#1}	0.026	0.0087	0.0056 ^{#1}	41 ^{#1}	0.0095 ^{#1}	--	1.2	0.00053 ^{#1}	0.077 ^{#1}	0.056 ^{#1}	--	< 0.00010	--	0.0043 ^{#1}	< 0.0010	0.0054	0.0097	0.023	0.051 ^{#1}			
(Duplicate)	22-Sep-2023			0.015 ^{#1}	< 0.00060	0.016 ^{#1</sup}																										



Table 3

Groundwater Analytical Results: Dissolved Metals and Trace Elements

PROJECT No.: 417085-49223-23100



Table 3

Groundwater Analytical Results: Dissolved Metals and Trace Elements

PROJECT No.: 417085-49223-23100

Sampling Location	Date (dd-mm-yyyy)	Status	Background Category	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium (Total)	Cobalt	Copper	Iron	Lead	Lithium	Manganese	Mercury	Molybdenum	Nickel	Phosphorus	Selenium	Silicon	Silver	Strontium	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc
CCME CEQG Freshwater Aquatic Life				0.1	---	0.005	---	---	1.5	0.00009	0.0089	---	0.004	0.3	0.007	---	0.00026	0.073	0.15	---	0.001	---	0.00025	---	0.0008	---	---	0.015	---	0.03	
W-CAT-1				0.13	---	0.01	0.53	---	0.04	0.002	0.007	---	0.01	6.11	0.023	---	3.01	0.00288	0.005	0.03	---	0.002	---	0.01	---	0.02	---	---	0.039	---	0.03
W-CAT-2				0.03	---	0.0024	0.22	---	0.04	0.00045	0.001	---	0.01	7.5	0.001	---	5.44	0.00003	0.026	0.02	---	0.001	---	0.0002	---	---	0.024	---	0.024	---	0.03
(Duplicate)	04-Nov-2016			---	---	---	---	---	---	---	---	---	---	---	---	---	0.000034	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	20-Aug-2017			0.012	< 0.00060	0.00097	0.16	< 0.0010	0.033	0.00026	< 0.0010	0.0053	0.0022	2.7	< 0.00020	< 0.020	1.5	0.00002	0.00061	0.011	< 0.10	0.00029	4.6	< 0.00010	0.7	< 0.00020	< 0.0010	< 0.0010	0.019	< 0.0010	0.015
	12-Sep-2017			0.0068	< 0.00060	0.0003	0.15	< 0.0010	< 0.020	0.00026	< 0.0010	0.0031	0.0022	0.31	< 0.00020	< 0.020	1.5	< 0.000020	0.0088	0.0081	< 0.10	< 0.00020	3.7	< 0.00010	0.67	< 0.00020	< 0.0010	0.0037	< 0.0010	0.0058	
	14-Jul-2018			0.0048	< 0.00060	0.0005	0.13	< 0.0010	0.027	0.00037	< 0.0010	0.0096	0.0025	2.2	< 0.00020	0.022	3.5	< 0.000020	0.0049	0.021	< 0.10	< 0.00020	5.3	< 0.00010	1.6	< 0.00020	< 0.0010	0.0081	< 0.0010	0.024	
	20-Sep-2018			0.01	< 0.00060	0.00086	0.16	< 0.0010	0.026	0.00037	< 0.0010	0.012	0.0023	3.6	< 0.00020	< 0.020	5.8	0.00002	0.0062	0.022	< 0.10	0.00022	5.7	< 0.00010	1.6	< 0.00020	< 0.0010	0.0082	< 0.0010	0.018	
	20-Sep-2018			0.017	< 0.00060	0.00089	0.16	< 0.0010	0.029	0.00034	< 0.0010	0.012	0.0018	4	< 0.00020	< 0.020	6	< 0.000020	0.0061	0.021	< 0.10	< 0.00020	5.9	< 0.00010	1.7	< 0.00020	< 0.0010	0.0085	< 0.0010	0.015	
	16-Jul-2019			0.008	< 0.00060	0.0014	0.096	< 0.0010	0.024	0.00038	< 0.0010	0.014	0.0034	5.5	< 0.00020	0.025	4.7	0.000027	0.0067	0.027	< 0.10	0.0008	6.2	< 0.00010	1.4	< 0.00020	< 0.0010	0.0088	< 0.0010	0.027	
	30-Sep-2019			0.0076	< 0.00060	0.0026	0.15	< 0.0010	0.03	0.00031	< 0.0010	0.017	0.00089	8.3	< 0.00020	0.022	6.7	< 0.000020	0.0071	0.024	< 0.10	0.00029	6.3	< 0.00010	1.6	< 0.00020	< 0.0010	0.0072	< 0.0010	0.016	
	30-Sep-2019			0.0073	< 0.00060	0.0027	0.15	< 0.0010	0.03	0.00032	< 0.0010	0.017	0.00087	8.5	< 0.00020	0.022	6.7	< 0.000020	0.0007	0.025	< 0.10	0.00034	6.4	< 0.00010	1.6	< 0.00020	< 0.0010	0.0072	< 0.0010	0.017	
	25-Jul-2020			0.017	< 0.00060	< 0.00020	0.19	< 0.0010	0.023	0.00029	< 0.0010	0.0031	0.0024	0.071	< 0.00020	< 0.020	1.8	< 0.000019	0.00047	0.0076	< 0.10	< 0.00020	4.1	< 0.00010	0.61	< 0.00020	< 0.0010	0.0015	< 0.0010	0.033	
	16-Sep-2020			0.012	< 0.00060	0.00052	0.22	< 0.0010	0.029	0.00063	< 0.0010	0.014	0.0051	0.84	< 0.00020	< 0.020	4	0.000038	0.0007	0.02	< 0.10	< 0.00020	5.1	< 0.00010	1.1	< 0.00020	< 0.0010	0.0055	< 0.0010	0.017	
	21-Aug-2021			0.019	< 0.00060	0.0076	0.18	< 0.0010	0.032	0.00046	< 0.0010	0.015	0.0082	3.8	0.0004	< 0.020	2.5	0.000067	0.011	0.036	< 0.10	0.0029	5.5	< 0.00010	1.4	< 0.00020	< 0.0010	0.0014	0.011	0.097	
	17-Sep-2021			0.021	< 0.00060	0.0036	0.15	< 0.0010	0.029	0.0004	< 0.0010	0.012	0.0038	5.4	< 0.00020	< 0.020	4	< 0.000019	0.00073	0.02	< 0.10	0.00069	5	< 0.00010	1.3	< 0.00020	< 0.0010	0.0077	< 0.0010	0.017	
	09-Aug-2022			0.019	< 0.00060	0.0086	0.13	< 0.0010	0.031	0.00041	< 0.0010	0.019	0.0061	17	0.00026	0.021	4.5	0.000074	0.0095	0.039	< 0.10	0.0018	6.1	< 0.00010	1.8	< 0.00020	< 0.0010	0.0019	0.015	0.032	
	25-Sep-2022			0.016	< 0.0012	0.0058	0.16	< 0.0020	< 0.020	0.00018	< 0.00020	0.024	0.0020	21	< 0.00040	< 0.020	6.2	0.000049	0.0017	0.039	< 0.10	0.00085	6.3	< 0.00010	1.9	< 0.00040	< 0.0200	0.011	< 0.0020	0.024	
	16-Aug-2023			0.018 ^{#1}	< 0.00060	0.015 ^{#1}	---	< 0.0010	---	0.00061	< 0.0010	0.025	0.0015	50 ^{#1}	0.00021	---	6.3	0.000043	0.0019	0.036 ^{#1}	---	0.00053	---	< 0.00010	---	< 0.00020	< 0.0010	0.0085	0.0011	0.0073	
	23-Sep-2023			0.0065 ^{#1}	< 0.00060	0.0013	0.14	< 0.0010	0.023	0.00011 ^{#1}	< 0.0010	0.023	< 0.00020	0.024	6.8	---	0.0014	0.033 ^{#1}	< 0.10	0.00041	6.7	< 0.00010	1.7	< 0.00020	< 0.0010	< 0.0010	0.01	< 0.0010	0.016		
Surveillance Network Program - Duplicate RPDs																															
C38 08-1-4	17-Aug-2023			0.3	< 0.00060	0.0067	---	< 0.0010	---	< 0.00020	< 0.0010	0.00096	< 0.0010	18	0.00029	---	0.65	0.000011	< 0.00020	0.002	---	0.00034	---	&							



Table 4

Groundwater Analytical Results: Petroleum Hydrocarbons (PHCs)



Table 4

Groundwater Analytical Results: Petroleum Hydrocarbons (PHCs)



Table 4

Groundwater Analytical Results: Petroleum Hydrocarbons (PHCs)

PROJECT No.: 417085-49223-23100



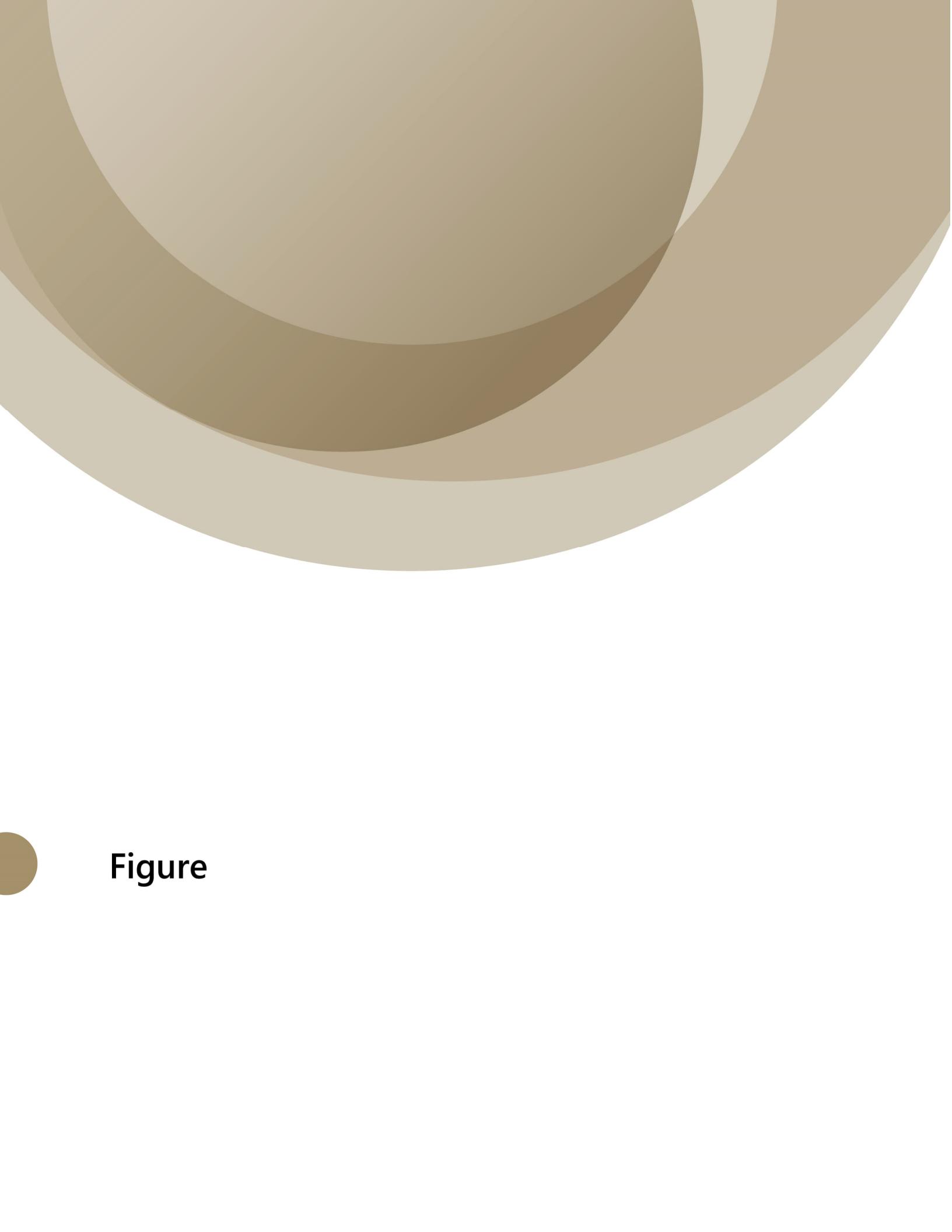
Table 4

Groundwater Analytical Results: Petroleum Hydrocarbons (PHCs)

PROJECT No.: 417085-49223-23100

NOTES:

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. 2024. Canadian Environmental Quality Guidelines Summary Table. Water Quality Guidelines for the Protection of Freshwater Aquatic Life.
<http://st-ts.ec.gc.ca/?chems=all&chapters=1> accessed March, 2024.)
 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 analyses acceptance criteria due to sample size heterogeneity. Unable to reanalyze due to insufficient sample.

The background features a series of overlapping circles in various shades of beige and light brown, creating a layered, organic pattern.

Figure





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 Tłęgóhkij 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.

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Appendix B

Background Geochemical Statistical Summary



Table B-1

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

PROJECT No.: 417085-49223

Monitoring Station	Bicarbonate (mg/L)	Calcium (mg/L)	Carbonate (CO ₃) (mg/L)	Chloride (mg/L)	Electrical Conductivity (uS/cm)	Hardness (as CaCO ₃) (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 CaCO ₃) (mg/L)	Sodium (mg/L)	Sulphate (mg/L)	Total Dissolved Solids (mg/L)
CCME 2024. 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.: 417085-49223

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 2024. 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	0.00002	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.: 417085-49223

Monitoring Station	Benzene (mg/L)	Ethylbenzene (mg/L)	PHC F1 (C6-C10) - BTEX		PHC F2 (C10-C16) (mg/L)	Toluene (mg/L)	Xylenes-Total (mg/L)
			(mg/L)	(mg/L)			
CCME 2024. 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

Yellow shading indicates parameters above most restrictive guidelines selected



Appendix C

Field Methodologies



C.1 Groundwater Sampling Methods

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 is typically 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: One 500 mL aliquot (unfiltered and chemically unpreserved) for analysis of major ions.
- BTEX: Three 44 mL aliquots (placed in glass vials containing NaHSO₄ preservative, no headspace) for analysis of BTEX compounds (benzene, toluene, ethylbenzene and xylenes).

Due to logistical problems with shipping of field equipment caused by widespread wildfires in the Northwest Territories in 2023, no field parameters could be measured for the current programs.

Additional samples were collected for analysis of additional 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 Calgary, Alberta. Standard chain-of-custody procedures were followed.



Appendix D

Laboratory Analytical Reports



BUREAU
VERITAS

Attention: Alex Haigh

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

Task Order#: 417085-49223
Site#: N/A
Site Location: Norman Wells, NWT
Project #: 417085-49223.23100
Your C.O.C. #: 299438

Report Date: 2024/02/27
Report #: R3468129
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C364163

Received: 2023/08/18, 10:20

Sample Matrix: Water
Samples Received: 7

Analyses	Quantity	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH (1)	7	AB SOP-00005	SM 24 2320 B m
BTEX/F1 in Water by HS GC/MS/FID (1)	7	AB SOP-00039	CCME CWS/EPA 8260d m
F1-BTEX (1)	7		Auto Calc
Cadmium - low level CCME - Dissolved (1)	7		Auto Calc
Chloride/Sulphate by Auto Colourimetry (1)	7	AB SOP-00020	SM24-4500-Cl/SO4-E m
Conductivity @25C (1)	7	AB SOP-00005	SM 24 2510 B m
Fluoride (1)	7	AB SOP-00005	SM 24 4500-F C m
CCME Hydrocarbons in Water (F2; C10-C16) (1, 2)	7	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
NO2 (N); NO2 (N) + NO3 (N) in Water (1)	7	AB SOP-00091	SM 24 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 24 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, EPA, APHA or the Quebec Ministry of Environment.

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



BUREAU
VERITAS

Attention: Alex Haigh

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

Task Order#: 417085-49223
Site#: N/A
Site Location: Norman Wells, NWT
Project #: 417085-49223.23100
Your C.O.C. #: 299438

Report Date: 2024/02/27
Report #: R3468129
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C364163

Received: 2023/08/18, 10:20

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:

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 Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Scott Cantwell, General Manager responsible for Alberta Environmental laboratory operations.



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Bureau Veritas Job #: C364163

Report Date: 2024/02/27

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

AT1 BTEX AND F1-F2 IN WATER (WATER)

Bureau Veritas ID		BXC128	BXC129	BXC130	BXC131	BXC132		
Sampling Date		2023/08/17 08:30	2023/08/16 13:05	2023/08/16 09:05	2023/08/16 10:15	2023/08/16 12:25		
COC Number		299438	299438	299438	299438	299438		
	UNITS	MTF 97-1-5	BIS 97-1-3	MEBG-10-1-3	TF 03-12-3	BI-13-3-4.5	RDL	QC Batch
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	B077917
Volatiles								
Benzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	B078096
Toluene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	B078096
Ethylbenzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	B078096
m & p-Xylene	mg/L	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080	0.00080	B078096
o-Xylene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	B078096
Xylenes (Total)	mg/L	<0.00089	<0.00089	<0.00089	<0.00089	<0.00089	0.00089	B077812
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	B077812
F1 (C6-C10)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	B078096
Extraction								
Surrogate Recovery (%)								
O-TERPHENYL (sur.)	%	93	92	92	92	92		B077917
Instrument								
Surrogate Recovery (%)								
1,4-Difluorobenzene (sur.)	%	103	101	103	103	103		B078096
4-Bromofluorobenzene (sur.)	%	96	97	94	97	95		B078096
D4-1,2-Dichloroethane (sur.)	%	105	108	105	110	107		B078096
RDL = Reportable Detection Limit								



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Bureau Veritas Job #: C364163

Report Date: 2024/02/27

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Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

AT1 BTEX AND F1-F2 IN WATER (WATER)

Bureau Veritas ID		BXC133	BXC134		
Sampling Date		2023/08/17 10:45	2023/08/17 10:50		
COC Number		299438	299438		
	UNITS	C38 08-1-4	DUP 4	RDL	QC Batch
Ext. Pet. Hydrocarbon					
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	0.10	B077917
Volatiles					
Benzene	mg/L	0.00065	0.00064	0.00040	B078633
Toluene	mg/L	<0.00040	<0.00040	0.00040	B078633
Ethylbenzene	mg/L	<0.00040	<0.00040	0.00040	B078633
m & p-Xylene	mg/L	<0.00080	<0.00080	0.00080	B078633
o-Xylene	mg/L	<0.00040	<0.00040	0.00040	B078633
Xylenes (Total)	mg/L	<0.00089	<0.00089	0.00089	B077812
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	0.10	B077812
F1 (C6-C10)	mg/L	<0.10	<0.10	0.10	B078633
Extraction Surrogate Recovery (%)					
O-TERPHENYL (sur.)	%	92	92		B077917
Instrument Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	96	95		B078633
4-Bromofluorobenzene (sur.)	%	113	113		B078633
D4-1,2-Dichloroethane (sur.)	%	107	107		B078633
RDL = Reportable Detection Limit					



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Bureau Veritas Job #: C364163

Report Date: 2024/02/27

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

IOL ROUTINE WATER (WATER)

Bureau Veritas ID		BXC128			BXC129			BXC130		
Sampling Date		2023/08/17 08:30			2023/08/16 13:05			2023/08/16 09:05		
COC Number		299438			299438			299438		
	UNITS	MTF 97-1-5	RDL	QC Batch	BIS 97-1-3	RDL	QC Batch	MEBG-10-1-3	RDL	QC Batch
Calculated Parameters										
Hardness (CaCO3)	mg/L	1000	0.50	B077791	850	0.50	B077791	1400	0.50	B077791
Ion Balance (% Difference)	%	3.2	N/A	B077854	6.3	N/A	B077854	5.7	N/A	B077854
Nitrate (N)	mg/L	3.6	0.050	B082131	0.38	0.010	B082131	0.010	0.010	B082131
Nitrate (NO3)	mg/L	16	0.22	B077541	1.7	0.044	B077541	0.045	0.044	B077541
Nitrite (NO2)	mg/L	<0.033	0.033	B077541	0.037	0.033	B077541	<0.033	0.033	B077541
Misc. Inorganics										
Conductivity	uS/cm	1700	2.0	B081932	1600	2.0	B081932	2100	2.0	B081932
Total Dissolved Solids	mg/L	1300 (1)	17	B081289	1100	10	B081284	2000	10	B081284
Anions										
Alkalinity (PP as CaCO3)	mg/L	<1.0	1.0	B081923	<1.0	1.0	B081923	<1.0	1.0	B081923
Alkalinity (Total as CaCO3)	mg/L	380	1.0	B081923	660	1.0	B081923	330	1.0	B081923
Bicarbonate (HCO3)	mg/L	460	1.0	B081923	810	1.0	B081923	410	1.0	B081923
Carbonate (CO3)	mg/L	<1.0	1.0	B081923	<1.0	1.0	B081923	<1.0	1.0	B081923
Hydroxide (OH)	mg/L	<1.0	1.0	B081923	<1.0	1.0	B081923	<1.0	1.0	B081923
Chloride (Cl)	mg/L	1.3	1.0	B079083	23	1.0	B079092	3.0	1.0	B079091
Sulphate (SO4)	mg/L	670	10	B079083	290	5.0	B079092	1200	25	B079091
Nutrients										
Nitrite (N)	mg/L	<0.010	0.010	B078077	0.011	0.010	B081203	<0.010	0.010	B081203
Nitrate plus Nitrite (N)	mg/L	3.6	0.050	B078077	0.39	0.010	B081203	0.010	0.010	B081203
Elements										
Dissolved Calcium (Ca)	mg/L	280	0.30	B081542	220	0.30	B081542	420	0.30	B081542
Dissolved Iron (Fe)	mg/L	0.39	0.060	B081542	0.47	0.060	B081542	1.7	0.060	B081542
Dissolved Magnesium (Mg)	mg/L	78	0.20	B081542	71	0.20	B081542	71	0.20	B081542
Dissolved Manganese (Mn)	mg/L	0.034	0.0040	B081542	0.69	0.0040	B081542	1.4	0.0040	B081542
Dissolved Potassium (K)	mg/L	1.8	0.30	B081542	2.5	0.30	B081542	2.3	0.30	B081542
Dissolved Sodium (Na)	mg/L	4.1	0.50	B081542	14	0.50	B081542	6.3	0.50	B081542
RDL = Reportable Detection Limit										
N/A = Not Applicable										
(1) Detection limit raised based on sample volume used for analysis.										



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Bureau Veritas Job #: C364163

Report Date: 2024/02/27

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

IOL ROUTINE WATER (WATER)

Bureau Veritas ID		BXC131			BXC132			BXC132		
Sampling Date		2023/08/16 10:15			2023/08/16 12:25			2023/08/16 12:25		
COC Number		299438			299438			299438		
	UNITS	TF 03-12-3	RDL	QC Batch	BI-13-3-4.5	RDL	QC Batch	BI-13-3-4.5 Lab-Dup	RDL	QC Batch
Calculated Parameters										
Hardness (CaCO ₃)	mg/L	1200	0.50	B077791	1600	0.50	B077791			
Ion Balance (% Difference)	%	2.4	N/A	B077854	2.9	N/A	B077854			
Nitrate (N)	mg/L	<0.010	0.010	B082131	<0.050	0.050	B082131			
Nitrate (NO ₃)	mg/L	<0.044	0.044	B077541	<0.22	0.22	B077541			
Nitrite (NO ₂)	mg/L	<0.033	0.033	B077541	<0.033	0.033	B077541			
Misc. Inorganics										
Conductivity	uS/cm	2100	2.0	B081932	2300	2.0	B081932			
Total Dissolved Solids	mg/L	1500 (1)	25	B081284	2000	10	B081289	2100	10	B081289
Anions										
Alkalinity (PP as CaCO ₃)	mg/L	<1.0	1.0	B081923	<1.0	1.0	B081923			
Alkalinity (Total as CaCO ₃)	mg/L	980	1.0	B081923	370	1.0	B081923			
Bicarbonate (HCO ₃)	mg/L	1200	1.0	B081923	460	1.0	B081923			
Carbonate (CO ₃)	mg/L	<1.0	1.0	B081923	<1.0	1.0	B081923			
Hydroxide (OH)	mg/L	<1.0	1.0	B081923	<1.0	1.0	B081923			
Chloride (Cl)	mg/L	100	1.0	B079091	6.1	1.0	B079091			
Sulphate (SO ₄)	mg/L	140	2.0	B079091	1200	25	B079091			
Nutrients										
Nitrite (N)	mg/L	<0.010	0.010	B081203	<0.010	0.010	B081203			
Nitrate plus Nitrite (N)	mg/L	<0.010	0.010	B081203	<0.050 (2)	0.050	B081203			
Elements										
Dissolved Calcium (Ca)	mg/L	300	0.30	B081542	360	0.30	B081542			
Dissolved Iron (Fe)	mg/L	41	0.060	B081542	0.096	0.060	B081542			
Dissolved Magnesium (Mg)	mg/L	100	0.20	B081542	160	0.20	B081542			
Dissolved Manganese (Mn)	mg/L	1.2	0.0040	B081542	0.29	0.0040	B081542			
Dissolved Potassium (K)	mg/L	6.3	0.30	B081542	3.8	0.30	B081542			
Dissolved Sodium (Na)	mg/L	40	0.50	B081542	11	0.50	B081542			

RDL = Reportable Detection Limit

Lab-Dup = Laboratory Initiated Duplicate

N/A = Not Applicable

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

(2) Detection limits raised due to matrix interference.



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Bureau Veritas Job #: C364163

Report Date: 2024/02/27

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

IOL ROUTINE WATER (WATER)

Bureau Veritas ID		BXC133		BXC134			BXC134		
Sampling Date		2023/08/17 10:45		2023/08/17 10:50			2023/08/17 10:50		
COC Number		299438		299438			299438		
	UNITS	C38 08-1-4	RDL	DUP 4	RDL	QC Batch	DUP 4 Lab-Dup	RDL	QC Batch
Calculated Parameters									
Hardness (CaCO ₃)	mg/L	600	0.50	590	0.50	B077791			
Ion Balance (% Difference)	%	0.45	N/A	1.2	N/A	B077854			
Nitrate (N)	mg/L	<0.10	0.10	<0.10	0.10	B082131			
Nitrate (NO ₃)	mg/L	<0.44	0.44	<0.44	0.44	B077541			
Nitrite (NO ₂)	mg/L	<0.033	0.033	<0.033	0.033	B077541			
Misc. Inorganics									
Conductivity	uS/cm	1200	2.0	1200	2.0	B081932	1200	2.0	B081932
Total Dissolved Solids	mg/L	730 (1)	25	730 (1)	17	B081289			
Anions									
Alkalinity (PP as CaCO ₃)	mg/L	<1.0	1.0	<1.0	1.0	B081923	<1.0	1.0	B081923
Alkalinity (Total as CaCO ₃)	mg/L	670	1.0	670	1.0	B081923	670	1.0	B081923
Bicarbonate (HCO ₃)	mg/L	810	1.0	810	1.0	B081923	820	1.0	B081923
Carbonate (CO ₃)	mg/L	<1.0	1.0	<1.0	1.0	B081923	<1.0	1.0	B081923
Hydroxide (OH)	mg/L	<1.0	1.0	<1.0	1.0	B081923	<1.0	1.0	B081923
Chloride (Cl)	mg/L	16	1.0	16	1.0	B078899			
Sulphate (SO ₄)	mg/L	<5.0 (2)	5.0	<1.0	1.0	B078899			
Nutrients									
Nitrite (N)	mg/L	<0.010	0.010	<0.010	0.010	B078077			
Nitrate plus Nitrite (N)	mg/L	<0.10 (2)	0.10	<0.10 (2)	0.10	B078077			
Elements									
Dissolved Calcium (Ca)	mg/L	150	0.30	150	0.30	B081542			
Dissolved Iron (Fe)	mg/L	18	0.060	18	0.060	B081542			
Dissolved Magnesium (Mg)	mg/L	53	0.20	52	0.20	B081542			
Dissolved Manganese (Mn)	mg/L	0.65	0.0040	0.63	0.0040	B081542			
Dissolved Potassium (K)	mg/L	2.9	0.30	2.9	0.30	B081542			
Dissolved Sodium (Na)	mg/L	22	0.50	22	0.50	B081542			

RDL = Reportable Detection Limit

Lab-Dup = Laboratory Initiated Duplicate

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 #: C364163

Report Date: 2024/02/27

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Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		BXC128	BXC129	BXC130		BXC131		
Sampling Date		2023/08/17 08:30	2023/08/16 13:05	2023/08/16 09:05		2023/08/16 10:15		
COC Number		299438	299438	299438		299438		
	UNITS	MTF 97-1-5	BIS 97-1-3	MEBG-10-1-3	QC Batch	TF 03-12-3	RDL	QC Batch

Elements

Dissolved Cadmium (Cd)	mg/L	0.00022	0.000073	0.00020	B077534	0.00034	0.000020	B077534
Anions								
Dissolved Fluoride (F)	mg/L	0.13	0.16	0.19	B081949	0.50	0.050	B081949
Misc. Organics								
Phenols	mg/L	<0.0015	<0.0015	<0.0015	B079780	<0.0015	0.0015	B081823

RDL = Reportable Detection Limit

Bureau Veritas ID		BXC132		BXC133		BXC134		
Sampling Date		2023/08/16 12:25		2023/08/17 10:45		2023/08/17 10:50		
COC Number		299438		299438		299438		
	UNITS	BI-13-3-4.5	QC Batch	C38 08-1-4	QC Batch	DUP 4	RDL	QC Batch

Elements

Dissolved Cadmium (Cd)	mg/L	0.00041	B077534	<0.000020	B077534	<0.000020	0.000020	B077534
Anions								
Dissolved Fluoride (F)	mg/L	0.27	B081949	0.091	B081949	0.087	0.050	B081949
Misc. Organics								
Phenols	mg/L	<0.0015	B079780	0.0022	B081823	0.0026	0.0015	B079780

RDL = Reportable Detection Limit

Bureau Veritas ID		BXC134		
Sampling Date		2023/08/17 10:50		
COC Number		299438		
	UNITS	DUP 4 Lab-Dup	RDL	QC Batch

Anions

Dissolved Fluoride (F)	mg/L	0.086	0.050	B081949
RDL = Reportable Detection Limit				
Lab-Dup = Laboratory Initiated Duplicate				



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Bureau Veritas Job #: C364163

Report Date: 2024/02/27

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

MERCURY BY COLD VAPOR (WATER)

Bureau Veritas ID		BXC128	BXC129	BXC130		BXC131		BXC132		
Sampling Date		2023/08/17 08:30	2023/08/16 13:05	2023/08/16 09:05		2023/08/16 10:15		2023/08/16 12:25		
COC Number		299438	299438	299438		299438		299438		
	UNITS	MTF 97-1-5	BIS 97-1-3	MEBG-10-1-3	RDL	TF 03-12-3	RDL	BI-13-3-4.5	RDL	QC Batch
Elements										
Dissolved Mercury (Hg)	ug/L	0.0029	0.0029	<0.0019	0.0019	0.053	0.019	<0.0019	0.0019	B082261

RDL = Reportable Detection Limit

Bureau Veritas ID		BXC133	BXC134		
Sampling Date		2023/08/17 10:45	2023/08/17 10:50		
COC Number		299438	299438		
	UNITS	C38 08-1-4	DUP 4	RDL	QC Batch
Elements					
Dissolved Mercury (Hg)	ug/L	0.011	0.012	0.0019	B082261
RDL = Reportable Detection Limit					



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Bureau Veritas Job #: C364163

Report Date: 2024/02/27

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		BXC128	BXC129	BXC130	BXC131		BXC132		
Sampling Date		2023/08/17 08:30	2023/08/16 13:05	2023/08/16 09:05	2023/08/16 10:15		2023/08/16 12:25		
COC Number		299438	299438	299438	299438		299438		
UNITS	MTF 97-1-5	BIS 97-1-3	MEBG-10-1-3	TF 03-12-3	QC Batch	BI-13-3-4.5	RDL	QC Batch	
Elements									
Dissolved Aluminum (Al)	mg/L	0.23	0.0055	0.0039	1.9	B079034	0.0032	0.0030	B080314
Dissolved Antimony (Sb)	mg/L	<0.00060	<0.00060	<0.00060	<0.00060	B079034	0.00073	0.00060	B080314
Dissolved Arsenic (As)	mg/L	0.00060	0.00064	0.00029	0.018	B079034	0.00067	0.00020	B080314
Dissolved Beryllium (Be)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	B079034	<0.0010	0.0010	B080314
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	<0.0010	0.0026	B079034	<0.0010	0.0010	B080314
Dissolved Cobalt (Co)	mg/L	0.00050	0.0026	0.011	0.0087	B079034	0.0023	0.00030	B080314
Dissolved Copper (Cu)	mg/L	0.0030	0.0059	0.0012	0.0056	B079034	0.0033	0.0010	B080314
Dissolved Lead (Pb)	mg/L	0.00063	<0.00020	<0.00020	0.0095	B079034	<0.00020	0.00020	B080314
Dissolved Molybdenum (Mo)	mg/L	0.012	0.0030	0.0064	0.077	B079034	0.019	0.00020	B080314
Dissolved Nickel (Ni)	mg/L	0.0063	0.012	0.060	0.056	B079034	0.049	0.00050	B080314
Dissolved Selenium (Se)	mg/L	0.16	0.00063	0.0056	0.0015	B079034	0.0029	0.00020	B080314
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	B079034	<0.00010	0.00010	B080314
Dissolved Thallium (Tl)	mg/L	<0.00020	<0.00020	0.00022	0.0043	B079034	<0.00020	0.00020	B080314
Dissolved Tin (Sn)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	B079034	<0.0010	0.0010	B080314
Dissolved Titanium (Ti)	mg/L	0.0039	<0.0010	<0.0010	0.0054	B079034	<0.0010	0.0010	B080314
Dissolved Uranium (U)	mg/L	0.025	0.0021	0.017	0.0097	B079034	0.019	0.00010	B080314
Dissolved Vanadium (V)	mg/L	0.0011	<0.0010	<0.0010	0.023	B079034	<0.0010	0.0010	B080314
Dissolved Zinc (Zn)	mg/L	0.012	0.0062	0.021	0.051	B079034	0.068	0.0030	B080314
RDL = Reportable Detection Limit									



BUREAU
VERITAS

Bureau Veritas Job #: C364163

Report Date: 2024/02/27

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		BXC133	BXC134		
Sampling Date		2023/08/17 10:45	2023/08/17 10:50		
COC Number		299438	299438		
	UNITS	C38 08-1-4	DUP 4	RDL	QC Batch
Elements					
Dissolved Aluminum (Al)	mg/L	0.30	0.20	0.0060	B084672
Dissolved Antimony (Sb)	mg/L	<0.00060	<0.00060	0.00060	B080314
Dissolved Arsenic (As)	mg/L	0.0067	0.0075	0.00020	B080314
Dissolved Beryllium (Be)	mg/L	<0.0010	<0.0010	0.0010	B080314
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	0.0010	B080314
Dissolved Cobalt (Co)	mg/L	0.00096	0.0011	0.00030	B080314
Dissolved Copper (Cu)	mg/L	<0.0010	<0.0010	0.0010	B080314
Dissolved Lead (Pb)	mg/L	0.00029	<0.00020	0.00020	B080314
Dissolved Molybdenum (Mo)	mg/L	<0.00020	<0.00020	0.00020	B080314
Dissolved Nickel (Ni)	mg/L	0.0020	0.0023	0.00050	B080314
Dissolved Selenium (Se)	mg/L	0.00034	0.00037	0.00020	B080314
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	0.00010	B080314
Dissolved Thallium (Tl)	mg/L	<0.00020	<0.00020	0.00020	B080314
Dissolved Tin (Sn)	mg/L	<0.0010	<0.0010	0.0010	B080314
Dissolved Titanium (Ti)	mg/L	0.0038	0.0027	0.0010	B080314
Dissolved Uranium (U)	mg/L	0.00043	0.00042	0.00010	B080314
Dissolved Vanadium (V)	mg/L	0.0013	0.0012	0.0010	B080314
Dissolved Zinc (Zn)	mg/L	0.0035	0.0031	0.0030	B080314
RDL = Reportable Detection Limit					



BUREAU
VERITAS

Bureau Veritas Job #: C364163

Report Date: 2024/02/27

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

TEST SUMMARY

Bureau Veritas ID: BXC128	Collected: 2023/08/17
Sample ID: MTF 97-1-5	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B081923	N/A	2023/08/24	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B078096	N/A	2023/08/22	Darrus Ong
F1-BTEX	CALC/MS	B077812	N/A	2023/08/22	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B077534	N/A	2023/08/22	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B079083	N/A	2023/08/21	Shanna McKort
Conductivity @25C	COND	B081932	N/A	2023/08/24	Jeanette Chavol Melo
Fluoride	AT	B081949	N/A	2023/08/24	Jeanette Chavol Melo
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B077917	2023/08/23	2023/08/24	Chuhan Huang
Hardness	CALC	B077791	N/A	2023/08/24	Automated Statchk
Mercury (Dissolved) by CV	CV	B082261	2023/08/23	2023/08/23	Kiran Kumari
Elements by ICP - Dissolved	ICPA	B081542	N/A	2023/08/23	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B079034	N/A	2023/08/21	Jason Bao
Ion Balance	CALC	B077854	N/A	2023/08/25	Automated Statchk
Nitrate and Nitrite	CALC	B077541	N/A	2023/08/21	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B078077	N/A	2023/08/20	Isabelle White
Nitrate (as N)	CALC	B082131	2023/08/23	2023/08/24	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B079780	N/A	2023/08/22	Ming Dong
Total Dissolved Solids (Filt. Residue)	BAL	B081289	2023/08/23	2023/08/24	Haydee Estilong

Bureau Veritas ID: BXC129	Collected: 2023/08/16
Sample ID: BIS 97-1-3	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B081923	N/A	2023/08/24	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B078096	N/A	2023/08/22	Darrus Ong
F1-BTEX	CALC/MS	B077812	N/A	2023/08/22	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B077534	N/A	2023/08/22	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B079092	N/A	2023/08/21	Shanna McKort
Conductivity @25C	COND	B081932	N/A	2023/08/24	Jeanette Chavol Melo
Fluoride	AT	B081949	N/A	2023/08/24	Jeanette Chavol Melo
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B077917	2023/08/23	2023/08/24	Chuhan Huang
Hardness	CALC	B077791	N/A	2023/08/24	Automated Statchk
Mercury (Dissolved) by CV	CV	B082261	2023/08/23	2023/08/23	Kiran Kumari
Elements by ICP - Dissolved	ICPA	B081542	N/A	2023/08/23	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B079034	N/A	2023/08/22	Jason Bao
Ion Balance	CALC	B077854	N/A	2023/08/25	Automated Statchk
Nitrate and Nitrite	CALC	B077541	N/A	2023/08/23	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B081203	N/A	2023/08/23	Adam Fishleigh
Nitrate (as N)	CALC	B082131	2023/08/23	2023/08/24	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B079780	N/A	2023/08/22	Ming Dong
Total Dissolved Solids (Filt. Residue)	BAL	B081284	2023/08/23	2023/08/24	Daryl Viktoria Noval



BUREAU
VERITAS

Bureau Veritas Job #: C364163

Report Date: 2024/02/27

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Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

TEST SUMMARY

Bureau Veritas ID: BXC130	Collected: 2023/08/16
Sample ID: MEBG-10-1-3	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B081923	N/A	2023/08/24	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B078096	N/A	2023/08/22	Darrus Ong
F1-BTEX	CALC/MS	B077812	N/A	2023/08/22	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B077534	N/A	2023/08/22	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B079091	N/A	2023/08/21	Shanna McKort
Conductivity @25C	COND	B081932	N/A	2023/08/24	Jeanette Chavol Melo
Fluoride	AT	B081949	N/A	2023/08/24	Jeanette Chavol Melo
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B077917	2023/08/23	2023/08/24	Chuhan Huang
Hardness	CALC	B077791	N/A	2023/08/24	Automated Statchk
Mercury (Dissolved) by CV	CV	B082261	2023/08/23	2023/08/23	Kiran Kumari
Elements by ICP - Dissolved	ICPA	B081542	N/A	2023/08/23	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B079034	N/A	2023/08/22	Jason Bao
Ion Balance	CALC	B077854	N/A	2023/08/25	Automated Statchk
Nitrate and Nitrite	CALC	B077541	N/A	2023/08/23	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B081203	N/A	2023/08/23	Adam Fishleigh
Nitrate (as N)	CALC	B082131	2023/08/23	2023/08/24	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B079780	N/A	2023/08/22	Ming Dong
Total Dissolved Solids (Filt. Residue)	BAL	B081284	2023/08/23	2023/08/24	Daryl Viktoria Noval

Bureau Veritas ID: BXC131	Collected: 2023/08/16
Sample ID: TF 03-12-3	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B081923	N/A	2023/08/24	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B078096	N/A	2023/08/22	Darrus Ong
F1-BTEX	CALC/MS	B077812	N/A	2023/08/22	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B077534	N/A	2023/08/22	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B079091	N/A	2023/08/21	Shanna McKort
Conductivity @25C	COND	B081932	N/A	2023/08/24	Jeanette Chavol Melo
Fluoride	AT	B081949	N/A	2023/08/24	Jeanette Chavol Melo
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B077917	2023/08/23	2023/08/24	Chuhan Huang
Hardness	CALC	B077791	N/A	2023/08/24	Automated Statchk
Mercury (Dissolved) by CV	CV	B082261	2023/08/23	2023/08/23	Kiran Kumari
Elements by ICP - Dissolved	ICPA	B081542	N/A	2023/08/23	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B079034	N/A	2023/08/21	Jason Bao
Ion Balance	CALC	B077854	N/A	2023/08/25	Automated Statchk
Nitrate and Nitrite	CALC	B077541	N/A	2023/08/23	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B081203	N/A	2023/08/23	Adam Fishleigh
Nitrate (as N)	CALC	B082131	2023/08/23	2023/08/23	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B081823	N/A	2023/08/23	Ming Dong
Total Dissolved Solids (Filt. Residue)	BAL	B081284	2023/08/23	2023/08/24	Daryl Viktoria Noval



BUREAU
VERITAS

Bureau Veritas Job #: C364163

Report Date: 2024/02/27

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

TEST SUMMARY

Bureau Veritas ID: BXC132	Collected: 2023/08/16
Sample ID: BI-13-3-4.5	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B081923	N/A	2023/08/24	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B078096	N/A	2023/08/22	Darrus Ong
F1-BTEX	CALC/MS	B077812	N/A	2023/08/22	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B077534	N/A	2023/08/23	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B079091	N/A	2023/08/21	Shanna McKort
Conductivity @25C	COND	B081932	N/A	2023/08/24	Jeanette Chavol Melo
Fluoride	AT	B081949	N/A	2023/08/24	Jeanette Chavol Melo
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B077917	2023/08/23	2023/08/24	Chuhan Huang
Hardness	CALC	B077791	N/A	2023/08/24	Automated Statchk
Mercury (Dissolved) by CV	CV	B082261	2023/08/23	2023/08/23	Kiran Kumari
Elements by ICP - Dissolved	ICPA	B081542	N/A	2023/08/23	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B080314	N/A	2023/08/22	Mandeep Kaur
Ion Balance	CALC	B077854	N/A	2023/08/25	Automated Statchk
Nitrate and Nitrite	CALC	B077541	N/A	2023/08/23	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B081203	N/A	2023/08/23	Adam Fishleigh
Nitrate (as N)	CALC	B082131	2023/08/23	2023/08/24	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B079780	N/A	2023/08/22	Ming Dong
Total Dissolved Solids (Filt. Residue)	BAL	B081289	2023/08/23	2023/08/24	Haydee Estilong

Bureau Veritas ID: BXC132 Dup	Collected: 2023/08/16
Sample ID: BI-13-3-4.5	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Dissolved Solids (Filt. Residue)	BAL	B081289	2023/08/23	2023/08/24	Haydee Estilong

Bureau Veritas ID: BXC133	Collected: 2023/08/17
Sample ID: C38 08-1-4	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B081923	N/A	2023/08/24	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B078633	N/A	2023/08/22	Darrus Ong
F1-BTEX	CALC/MS	B077812	N/A	2023/08/22	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B077534	N/A	2023/08/23	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B078899	N/A	2023/08/21	Shanna McKort
Conductivity @25C	COND	B081932	N/A	2023/08/24	Jeanette Chavol Melo
Fluoride	AT	B081949	N/A	2023/08/24	Jeanette Chavol Melo
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B077917	2023/08/23	2023/08/24	Chuhan Huang
Hardness	CALC	B077791	N/A	2023/08/24	Automated Statchk
Mercury (Dissolved) by CV	CV	B082261	2023/08/23	2023/08/23	Kiran Kumari
Elements by ICP - Dissolved	ICPA	B081542	N/A	2023/08/23	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B084672	N/A	2023/08/25	Kevin Huang
Ion Balance	CALC	B077854	N/A	2023/08/25	Automated Statchk



BUREAU
VERITAS

Bureau Veritas Job #: C364163

Report Date: 2024/02/27

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

TEST SUMMARY

Bureau Veritas ID: BXC133	Collected: 2023/08/17
Sample ID: C38 08-1-4	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate and Nitrite	CALC	B077541	N/A	2023/08/21	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B078077	N/A	2023/08/20	Isabelle White
Nitrate (as N)	CALC	B082131	2023/08/23	2023/08/23	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B081823	N/A	2023/08/23	Ming Dong
Total Dissolved Solids (Filt. Residue)	BAL	B081289	2023/08/23	2023/08/24	Haydee Estilong

Bureau Veritas ID: BXC134	Collected: 2023/08/17
Sample ID: DUP 4	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B081923	N/A	2023/08/24	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B078633	N/A	2023/08/22	Darrus Ong
F1-BTEX	CALC/MS	B077812	N/A	2023/08/22	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B077534	N/A	2023/08/23	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B078899	N/A	2023/08/21	Shanna McKort
Conductivity @25C	COND	B081932	N/A	2023/08/24	Jeanette Chavol Melo
Fluoride	AT	B081949	N/A	2023/08/24	Jeanette Chavol Melo
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B077917	2023/08/23	2023/08/24	Chuhan Huang
Hardness	CALC	B077791	N/A	2023/08/24	Automated Statchk
Mercury (Dissolved) by CV	CV	B082261	2023/08/23	2023/08/23	Kiran Kumari
Elements by ICP - Dissolved	ICPA	B081542	N/A	2023/08/23	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B084672	N/A	2023/08/25	Kevin Huang
Ion Balance	CALC	B077854	N/A	2023/08/25	Automated Statchk
Nitrate and Nitrite	CALC	B077541	N/A	2023/08/21	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B078077	N/A	2023/08/20	Isabelle White
Nitrate (as N)	CALC	B082131	2023/08/23	2023/08/24	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B079780	N/A	2023/08/22	Ming Dong
Total Dissolved Solids (Filt. Residue)	BAL	B081289	2023/08/23	2023/08/24	Haydee Estilong

Bureau Veritas ID: BXC134 Dup	Collected: 2023/08/17
Sample ID: DUP 4	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B081923	N/A	2023/08/24	Jeanette Chavol Melo
Conductivity @25C	COND	B081932	N/A	2023/08/24	Jeanette Chavol Melo
Fluoride	AT	B081949	N/A	2023/08/24	Jeanette Chavol Melo



BUREAU
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Bureau Veritas Job #: C364163

Report Date: 2024/02/27

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

GENERAL COMMENTS

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

Package 1	5.7°C
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Temperatures upon receipt at Bureau Veritas Labs calgary

Package 1: 2 degrees C

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

Revised report to include updated sample ID as requested on Feb 27/2024

Sample BXC129 [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.

Sample BXC130 [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 BXC131 [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 BXC132 [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.

MERCURY BY COLD VAPOR (WATER) Comments

Sample BXC131 [TF 03-12-3] Mercury (Dissolved) by CV: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER) Comments

Sample BXC131 [TF 03-12-3] Elements by ICPMS - Dissolved: Client supplied dissolved metals bottle contained particulate.

Sample BXC133 [C38 08-1-4] Elements by ICPMS - Dissolved: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

Sample BXC134 [DUP 4] Elements by ICPMS - Dissolved: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

Sample BXC133, Elements by ICPMS - Dissolved: Test repeated.

Sample BXC134, Elements by ICPMS - Dissolved: Test repeated.

Results relate only to the items tested.



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Bureau Veritas Job #: C364163

Report Date: 2024/02/27

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B077917	CHA	Method Blank	O-TERPHENYL (sur.)	2023/08/23		94	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2023/08/23	<0.10		mg/L	
B078077	ISW	Method Blank	Nitrite (N)	2023/08/20	<0.010		mg/L	
			Nitrate plus Nitrite (N)	2023/08/20	<0.010		mg/L	
B078096	DO1	Method Blank	1,4-Difluorobenzene (sur.)	2023/08/22		102	%	50 - 140
			4-Bromofluorobenzene (sur.)	2023/08/22		96	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2023/08/22		107	%	50 - 140
			Benzene	2023/08/22	<0.00040		mg/L	
			Toluene	2023/08/22	<0.00040		mg/L	
			Ethylbenzene	2023/08/22	<0.00040		mg/L	
			m & p-Xylene	2023/08/22	<0.00080		mg/L	
			o-Xylene	2023/08/22	<0.00040		mg/L	
			F1 (C6-C10)	2023/08/22	<0.10		mg/L	
			1,4-Difluorobenzene (sur.)	2023/08/22		97	%	50 - 140
B078633	DO1	Method Blank	4-Bromofluorobenzene (sur.)	2023/08/22		115	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2023/08/22		111	%	50 - 140
			Benzene	2023/08/22	<0.00040		mg/L	
			Toluene	2023/08/22	<0.00040		mg/L	
			Ethylbenzene	2023/08/22	<0.00040		mg/L	
			m & p-Xylene	2023/08/22	<0.00080		mg/L	
			o-Xylene	2023/08/22	<0.00040		mg/L	
			F1 (C6-C10)	2023/08/22	<0.10		mg/L	
			Chloride (Cl)	2023/08/21	<1.0		mg/L	
			Sulphate (SO4)	2023/08/21	<1.0		mg/L	
B078899	SKM	Method Blank	Dissolved Aluminum (Al)	2023/08/22	<0.0030		mg/L	
			Dissolved Chromium (Cr)	2023/08/22	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2023/08/22	<0.00030		mg/L	
			Dissolved Copper (Cu)	2023/08/22	<0.0010		mg/L	
			Dissolved Lead (Pb)	2023/08/22	<0.00020		mg/L	
			Dissolved Antimony (Sb)	2023/08/22	<0.00060		mg/L	
			Dissolved Molybdenum (Mo)	2023/08/22	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2023/08/22	<0.00050		mg/L	
			Dissolved Selenium (Se)	2023/08/22	<0.00020		mg/L	
			Dissolved Silver (Ag)	2023/08/22	<0.00010		mg/L	
			Dissolved Arsenic (As)	2023/08/22	<0.00020		mg/L	
			Dissolved Thallium (Tl)	2023/08/22	<0.00020		mg/L	
			Dissolved Tin (Sn)	2023/08/22	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2023/08/22	<0.0010		mg/L	
			Dissolved Uranium (U)	2023/08/22	<0.00010		mg/L	
B079083	SKM	Method Blank	Dissolved Vanadium (V)	2023/08/22	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2023/08/22	<0.0030		mg/L	
B079091	SKM	Method Blank	Dissolved Beryllium (Be)	2023/08/22	<0.0010		mg/L	
			Chloride (Cl)	2023/08/21	<1.0		mg/L	
B079092	SKM	Method Blank	Sulphate (SO4)	2023/08/21	<1.0		mg/L	
			Chloride (Cl)	2023/08/21	<1.0		mg/L	
B079780	MDO	Method Blank	Sulphate (SO4)	2023/08/21	<1.0		mg/L	
			Phenols	2023/08/22	<0.0015		mg/L	
			Dissolved Aluminum (Al)	2023/08/22	<0.0030		mg/L	
B080314	MKJ	Method Blank	Dissolved Chromium (Cr)	2023/08/22	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2023/08/22	<0.00030		mg/L	



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Bureau Veritas Job #: C364163

Report Date: 2024/02/27

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Copper (Cu)	2023/08/22	<0.0010		mg/L	
			Dissolved Lead (Pb)	2023/08/22	<0.00020		mg/L	
			Dissolved Antimony (Sb)	2023/08/22	<0.00060		mg/L	
			Dissolved Molybdenum (Mo)	2023/08/22	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2023/08/22	<0.00050		mg/L	
			Dissolved Selenium (Se)	2023/08/22	<0.00020		mg/L	
			Dissolved Silver (Ag)	2023/08/22	<0.00010		mg/L	
			Dissolved Arsenic (As)	2023/08/22	<0.00020		mg/L	
			Dissolved Thallium (Tl)	2023/08/22	<0.00020		mg/L	
			Dissolved Tin (Sn)	2023/08/22	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2023/08/22	<0.0010		mg/L	
			Dissolved Uranium (U)	2023/08/22	<0.00010		mg/L	
			Dissolved Vanadium (V)	2023/08/22	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2023/08/22	<0.0030		mg/L	
			Dissolved Beryllium (Be)	2023/08/22	<0.0010		mg/L	
B081203	AFI	Method Blank	Nitrite (N)	2023/08/23	<0.010		mg/L	
			Nitrate plus Nitrite (N)	2023/08/23	<0.010		mg/L	
B081284	DVN	Method Blank	Total Dissolved Solids	2023/08/24	<10		mg/L	
B081289	HE1	Method Blank	Total Dissolved Solids	2023/08/24	<10		mg/L	
B081542	VSC	Method Blank	Dissolved Iron (Fe)	2023/08/23	<0.060		mg/L	
			Dissolved Magnesium (Mg)	2023/08/23	<0.20		mg/L	
			Dissolved Manganese (Mn)	2023/08/23	<0.0040		mg/L	
			Dissolved Potassium (K)	2023/08/23	<0.30		mg/L	
			Dissolved Sodium (Na)	2023/08/23	<0.50		mg/L	
			Dissolved Calcium (Ca)	2023/08/23	<0.30		mg/L	
B081823	MDO	Method Blank	Phenols	2023/08/23	<0.0015		mg/L	
B081923	JVM	Method Blank	Alkalinity (Total as CaCO ₃)	2023/08/24	<1.0		mg/L	
			Alkalinity (PP as CaCO ₃)	2023/08/24	<1.0		mg/L	
			Bicarbonate (HCO ₃)	2023/08/24	<1.0		mg/L	
			Carbonate (CO ₃)	2023/08/24	<1.0		mg/L	
			Hydroxide (OH)	2023/08/24	<1.0		mg/L	
B081932	JVM	Method Blank	Conductivity	2023/08/24	<2.0		uS/cm	
B081949	JVM	Method Blank	Dissolved Fluoride (F)	2023/08/24	<0.050		mg/L	
B082261	KKM	Method Blank	Dissolved Mercury (Hg)	2023/08/23	<0.0019		ug/L	
B084672	KH2	Method Blank	Dissolved Aluminum (Al)	2023/08/25	<0.0030		mg/L	
B081289	HE1	RPD [BXC132-02]	Total Dissolved Solids	2023/08/24	3.4	%	20	
B081923	JVM	RPD [BXC134-01]	Alkalinity (Total as CaCO ₃)	2023/08/24	0.66	%	20	
			Alkalinity (PP as CaCO ₃)	2023/08/24	NC	%	20	
			Bicarbonate (HCO ₃)	2023/08/24	0.66	%	20	
			Carbonate (CO ₃)	2023/08/24	NC	%	20	
			Hydroxide (OH)	2023/08/24	NC	%	20	
B081932	JVM	RPD [BXC134-01]	Conductivity	2023/08/24	0.67	%	10	
B081949	JVM	RPD [BXC134-01]	Dissolved Fluoride (F)	2023/08/24	1.0	%	20	
B081949	JVM	Matrix Spike [BXC134-01]	Dissolved Fluoride (F)	2023/08/24		90	%	80 - 120
B077917	CHA	LCS	O-TERPHENYL (sur.)	2023/08/23		94	%	60 - 140
B078077	ISW	LCS	F2 (C10-C16 Hydrocarbons)	2023/08/23		94	%	60 - 140
			Nitrite (N)	2023/08/20		102	%	80 - 120
			Nitrate plus Nitrite (N)	2023/08/20		101	%	80 - 120
B078096	DO1	LCS	1,4-Difluorobenzene (sur.)	2023/08/22		97	%	50 - 140
			4-Bromofluorobenzene (sur.)	2023/08/22		96	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2023/08/22		95	%	50 - 140
			Benzene	2023/08/22		98	%	60 - 130

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Bureau Veritas Job #: C364163

Report Date: 2024/02/27

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B078633	DO1	LCS	Toluene	2023/08/22	101	%	60 - 130	
			Ethylbenzene	2023/08/22	98	%	60 - 130	
			m & p-Xylene	2023/08/22	104	%	60 - 130	
			o-Xylene	2023/08/22	104	%	60 - 130	
			F1 (C6-C10)	2023/08/22	100	%	60 - 140	
			1,4-Difluorobenzene (sur.)	2023/08/22	97	%	50 - 140	
			4-Bromofluorobenzene (sur.)	2023/08/22	115	%	50 - 140	
			D4-1,2-Dichloroethane (sur.)	2023/08/22	114	%	50 - 140	
			Benzene	2023/08/22	102	%	60 - 130	
			Toluene	2023/08/22	96	%	60 - 130	
B078899	SKM	LCS	Ethylbenzene	2023/08/22	103	%	60 - 130	
			m & p-Xylene	2023/08/22	95	%	60 - 130	
			o-Xylene	2023/08/22	90	%	60 - 130	
			F1 (C6-C10)	2023/08/22	101	%	60 - 140	
			Chloride (Cl)	2023/08/21	99	%	80 - 120	
B079034	JAB	LCS	Sulphate (SO4)	2023/08/21	103	%	80 - 120	
			Dissolved Aluminum (Al)	2023/08/21	119	%	80 - 120	
			Dissolved Chromium (Cr)	2023/08/21	99	%	80 - 120	
			Dissolved Cobalt (Co)	2023/08/21	99	%	80 - 120	
			Dissolved Copper (Cu)	2023/08/21	99	%	80 - 120	
			Dissolved Lead (Pb)	2023/08/21	100	%	80 - 120	
			Dissolved Antimony (Sb)	2023/08/21	105	%	80 - 120	
			Dissolved Molybdenum (Mo)	2023/08/21	103	%	80 - 120	
			Dissolved Nickel (Ni)	2023/08/21	101	%	80 - 120	
			Dissolved Selenium (Se)	2023/08/21	107	%	80 - 120	
			Dissolved Silver (Ag)	2023/08/21	100	%	80 - 120	
			Dissolved Arsenic (As)	2023/08/21	101	%	80 - 120	
			Dissolved Thallium (Tl)	2023/08/21	103	%	80 - 120	
			Dissolved Tin (Sn)	2023/08/21	102	%	80 - 120	
			Dissolved Titanium (Ti)	2023/08/21	98	%	80 - 120	
			Dissolved Uranium (U)	2023/08/21	100	%	80 - 120	
			Dissolved Vanadium (V)	2023/08/21	100	%	80 - 120	
			Dissolved Zinc (Zn)	2023/08/21	103	%	80 - 120	
			Dissolved Beryllium (Be)	2023/08/21	98	%	80 - 120	
			Chloride (Cl)	2023/08/21	101	%	80 - 120	
			Sulphate (SO4)	2023/08/21	106	%	80 - 120	
B079091	SKM	LCS	Chloride (Cl)	2023/08/21	98	%	80 - 120	
			Sulphate (SO4)	2023/08/21	97	%	80 - 120	
B079092	SKM	LCS	Chloride (Cl)	2023/08/21	105	%	80 - 120	
			Sulphate (SO4)	2023/08/21	103	%	80 - 120	
B079780	MDO	LCS	Phenols	2023/08/22	98	%	80 - 120	
			Dissolved Aluminum (Al)	2023/08/22	111	%	80 - 120	
B080314	MKJ	LCS	Dissolved Chromium (Cr)	2023/08/22	91	%	80 - 120	
			Dissolved Cobalt (Co)	2023/08/22	93	%	80 - 120	
			Dissolved Copper (Cu)	2023/08/22	90	%	80 - 120	
			Dissolved Lead (Pb)	2023/08/22	102	%	80 - 120	
			Dissolved Antimony (Sb)	2023/08/22	112	%	80 - 120	
			Dissolved Molybdenum (Mo)	2023/08/22	103	%	80 - 120	
			Dissolved Nickel (Ni)	2023/08/22	89	%	80 - 120	
			Dissolved Selenium (Se)	2023/08/22	108	%	80 - 120	
			Dissolved Silver (Ag)	2023/08/22	97	%	80 - 120	
			Dissolved Arsenic (As)	2023/08/22	100	%	80 - 120	



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Bureau Veritas Job #: C364163

Report Date: 2024/02/27

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B081203	AFI	LCS	Dissolved Thallium (Tl)	2023/08/22	100	%	80 - 120	
			Dissolved Tin (Sn)	2023/08/22	111	%	80 - 120	
			Dissolved Titanium (Ti)	2023/08/22	90	%	80 - 120	
			Dissolved Uranium (U)	2023/08/22	96	%	80 - 120	
			Dissolved Vanadium (V)	2023/08/22	95	%	80 - 120	
			Dissolved Zinc (Zn)	2023/08/22	100	%	80 - 120	
			Dissolved Beryllium (Be)	2023/08/22	91	%	80 - 120	
			Nitrite (N)	2023/08/23	104	%	80 - 120	
			Nitrate plus Nitrite (N)	2023/08/23	104	%	80 - 120	
B081284	DVN	LCS	Total Dissolved Solids	2023/08/24	98	%	80 - 120	
B081289	HE1	LCS	Total Dissolved Solids	2023/08/24	99	%	80 - 120	
B081542	VSC	LCS	Dissolved Iron (Fe)	2023/08/23	107	%	80 - 120	
			Dissolved Magnesium (Mg)	2023/08/23	108	%	80 - 120	
			Dissolved Manganese (Mn)	2023/08/23	104	%	80 - 120	
			Dissolved Potassium (K)	2023/08/23	100	%	80 - 120	
			Dissolved Sodium (Na)	2023/08/23	100	%	80 - 120	
			Dissolved Calcium (Ca)	2023/08/23	103	%	80 - 120	
			Phenols	2023/08/23	99	%	80 - 120	
			Alkalinity (Total as CaCO3)	2023/08/24	97	%	80 - 120	
			Conductivity	2023/08/24	100	%	90 - 110	
B081823	MDO	LCS	Dissolved Fluoride (F)	2023/08/24	93	%	80 - 120	
B082261	KKM	LCS	Dissolved Mercury (Hg)	2023/08/23	103	%	80 - 120	
B084672	KH2	LCS	Dissolved Aluminum (Al)	2023/08/25	115	%	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).



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Bureau Veritas Job #: C364163

Report Date: 2024/02/27

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

VALIDATION SIGNATURE PAGE

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

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

Gita Pokhrel, Laboratory Supervisor

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

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



Bureau Veritas Proprietary Software

Logiciel Propriétaire de Bureau Veritas

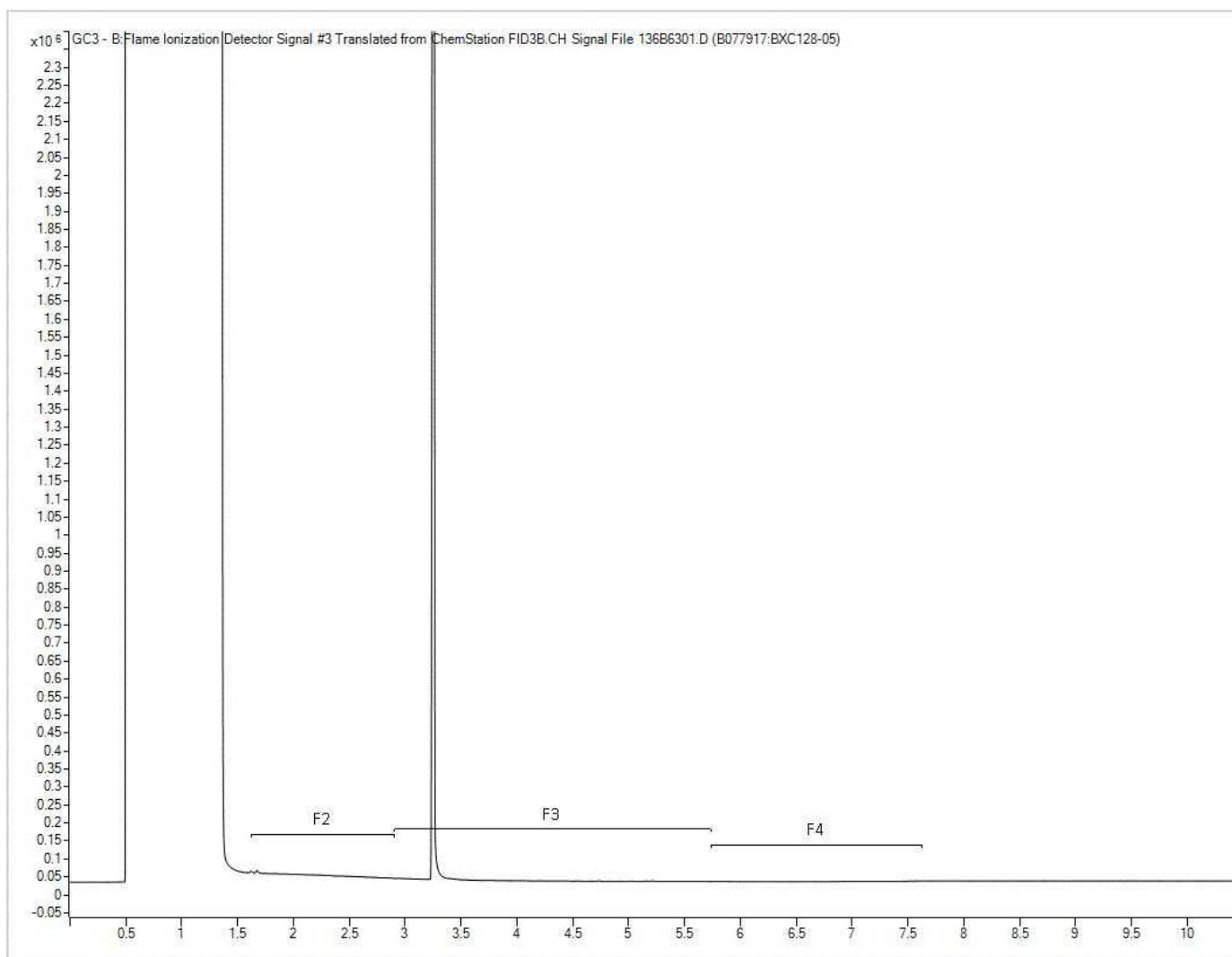
Automated Statck

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 Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Scott Cantwell, General Manager responsible for Alberta Environmental laboratory operations.

Bureau Veritas Job #: C364163
Report Date: 2024/02/27
Bureau Veritas Sample: BXC128

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: MTF 97-1-5

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



Diesel, Gas Oil, Furnace Oil

Gasolines

Motor Oil, Lubricating Oils & Greases

BTEX

Creosote

Parent PAHs

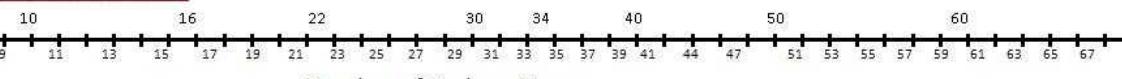
Purgeable HC

Waxes, Heavy Fuel Oils, Road Oils, Asphalts

Natural Gas

Extractable Hydrocarbons

Kerosene



Number of Carbon Atoms

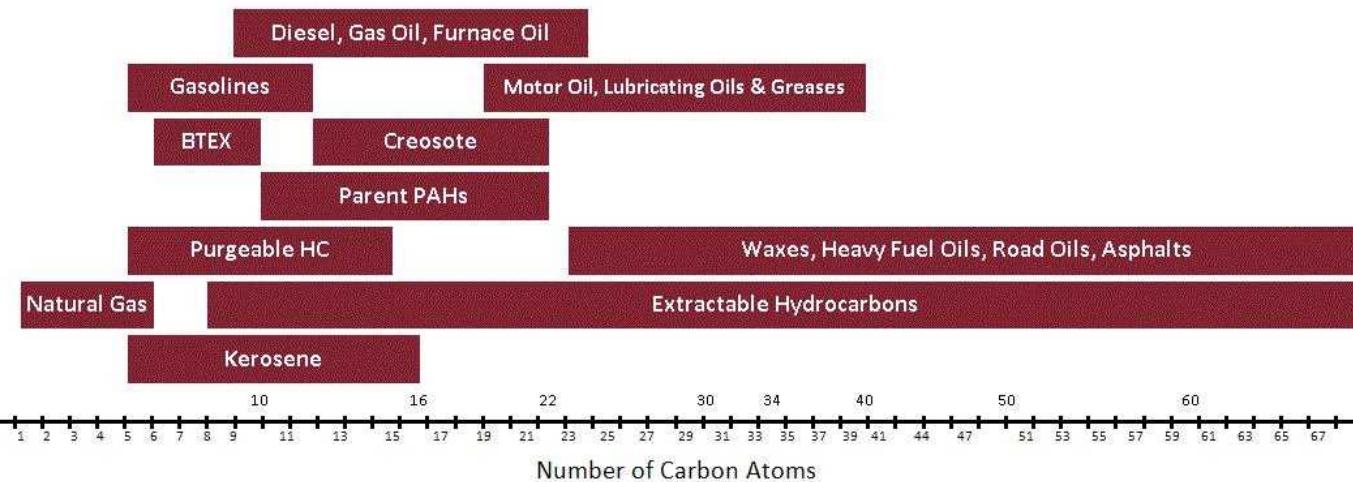
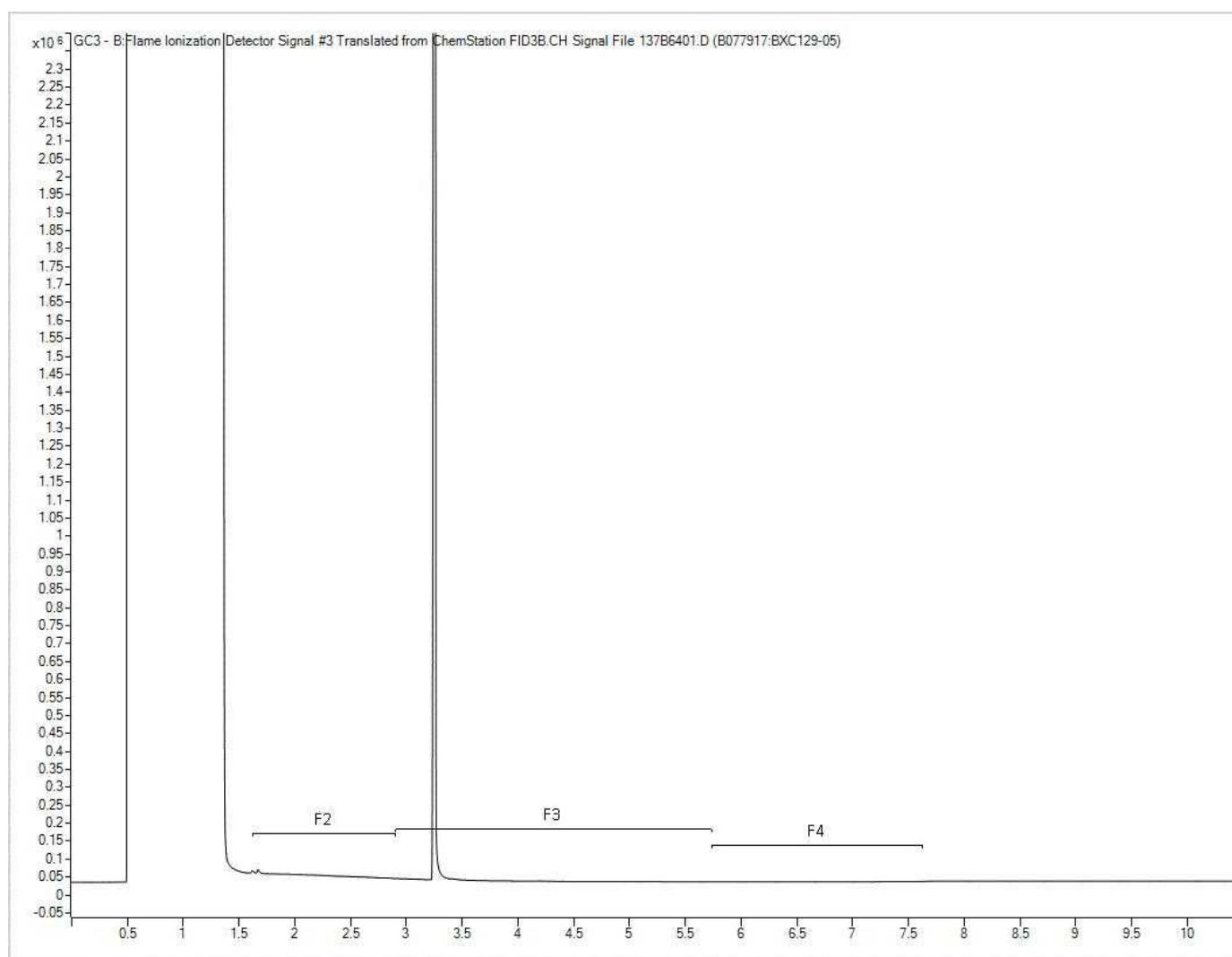
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem20\HPchem\1\DATA\2023\06\RUNK0823

Bureau Veritas Job #: C364163
Report Date: 2024/02/27
Bureau Veritas Sample: BXC129

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: BIS 97-1-3

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



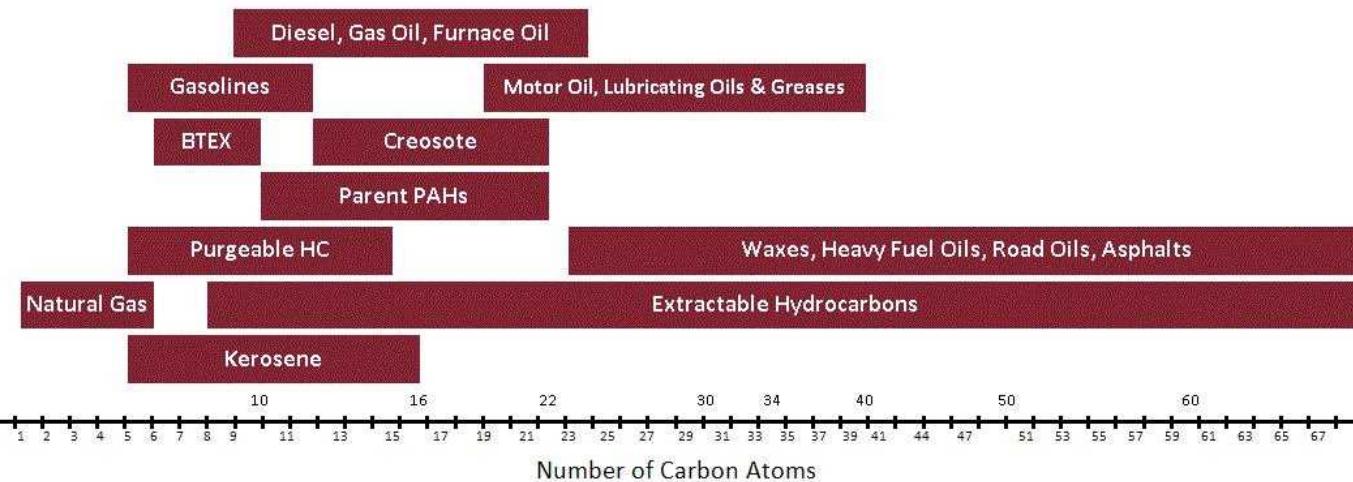
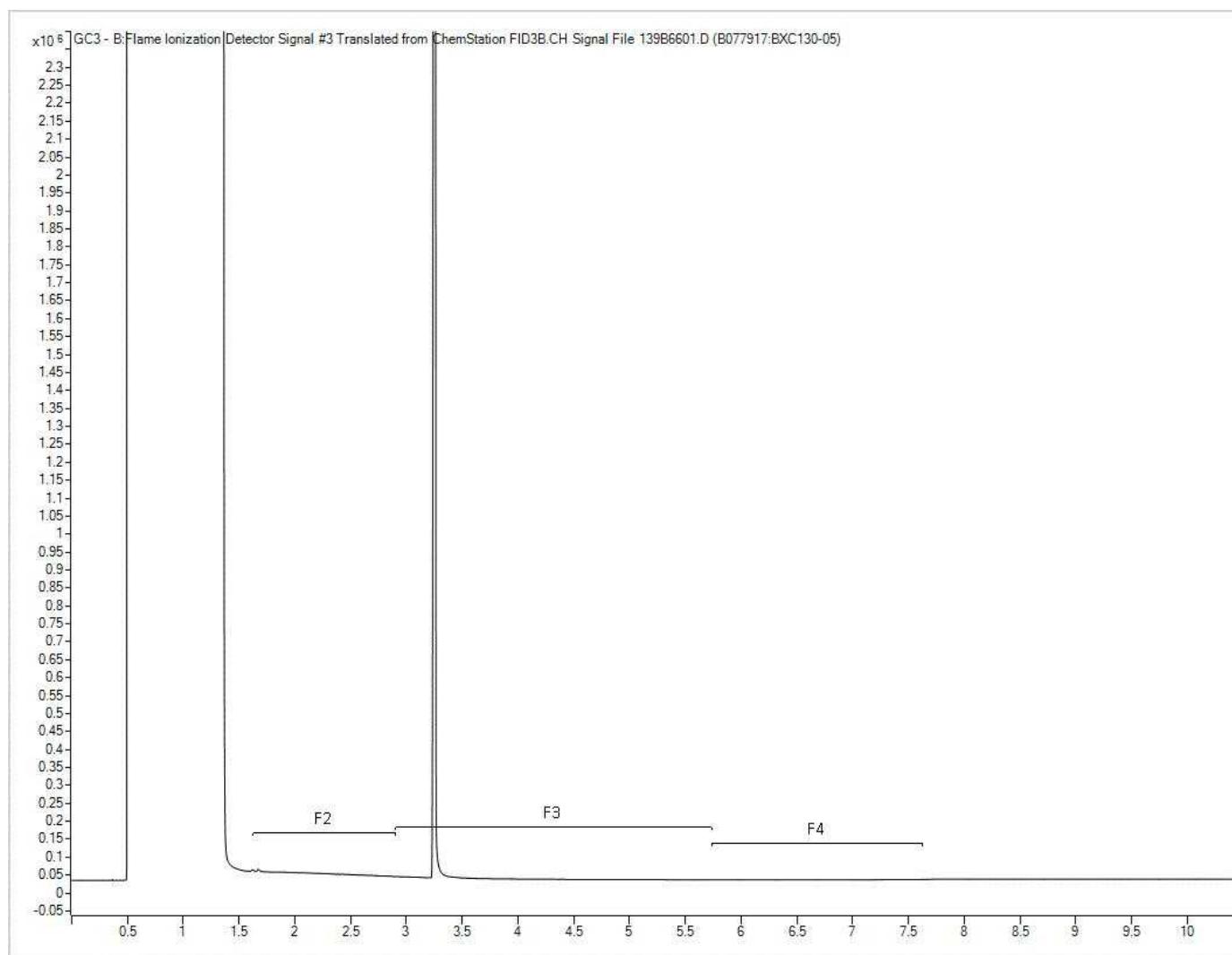
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem20\HPchem\1\DATA\2023\06\RUN0823

Bureau Veritas Job #: C364163
Report Date: 2024/02/27
Bureau Veritas Sample: BXC130

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: MEBG-10-1-3

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



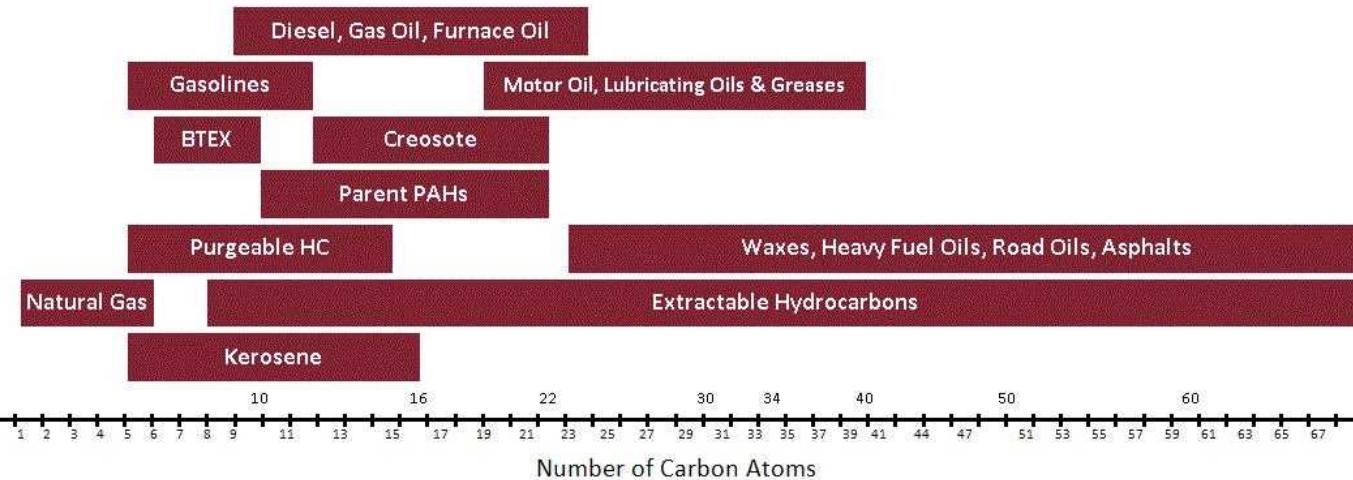
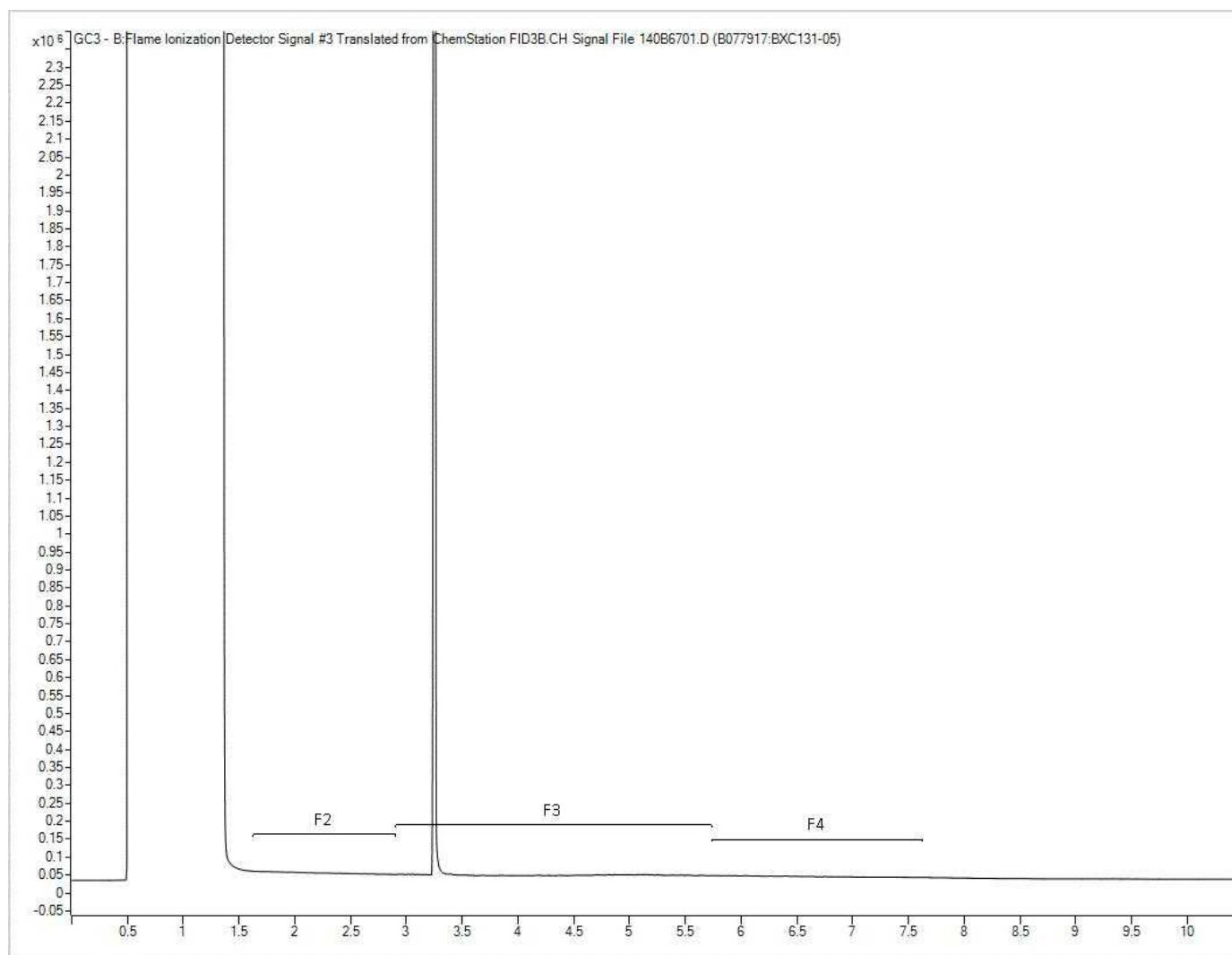
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem20\HPchem\1\DATA\2023\06\RUN0823

Bureau Veritas Job #: C364163
Report Date: 2024/02/27
Bureau Veritas Sample: BXC131

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: TF 03-12-3

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



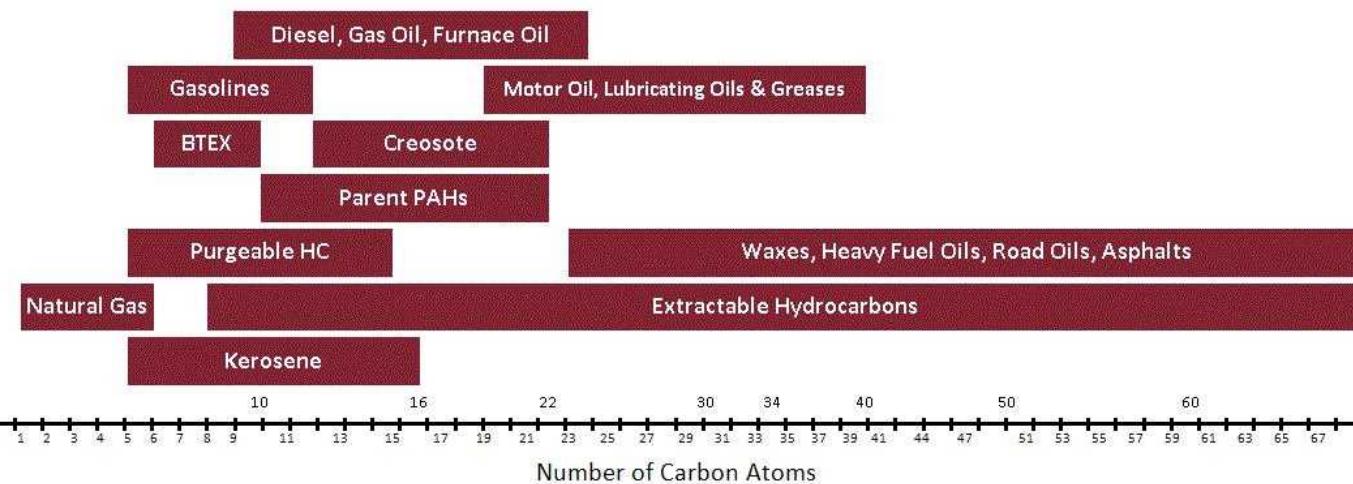
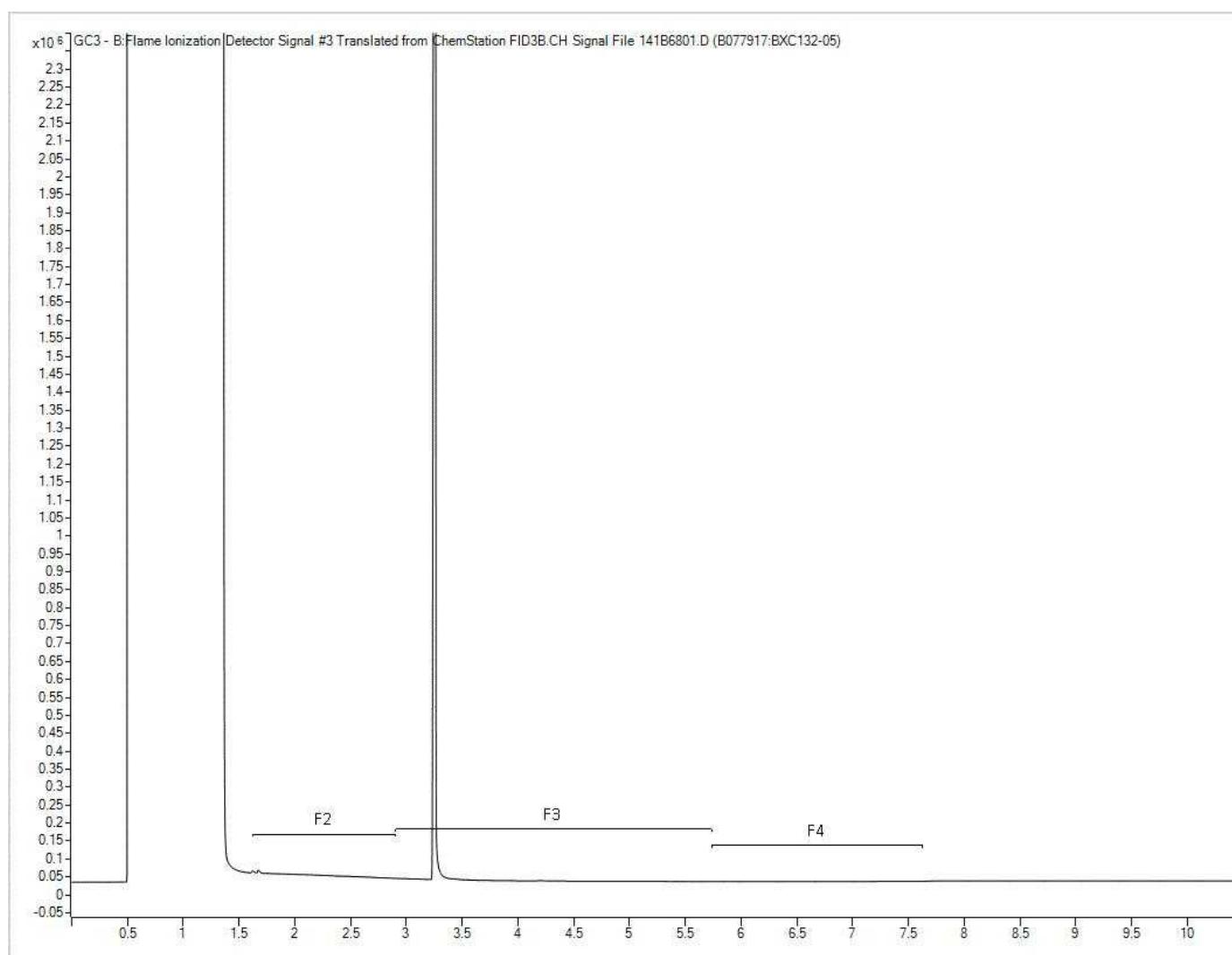
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem20\HPchem\1\DATA\2023\06\RUN0823

Bureau Veritas Job #: C364163
Report Date: 2024/02/27
Bureau Veritas Sample: BXC132

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: BI-13-3-4.5

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



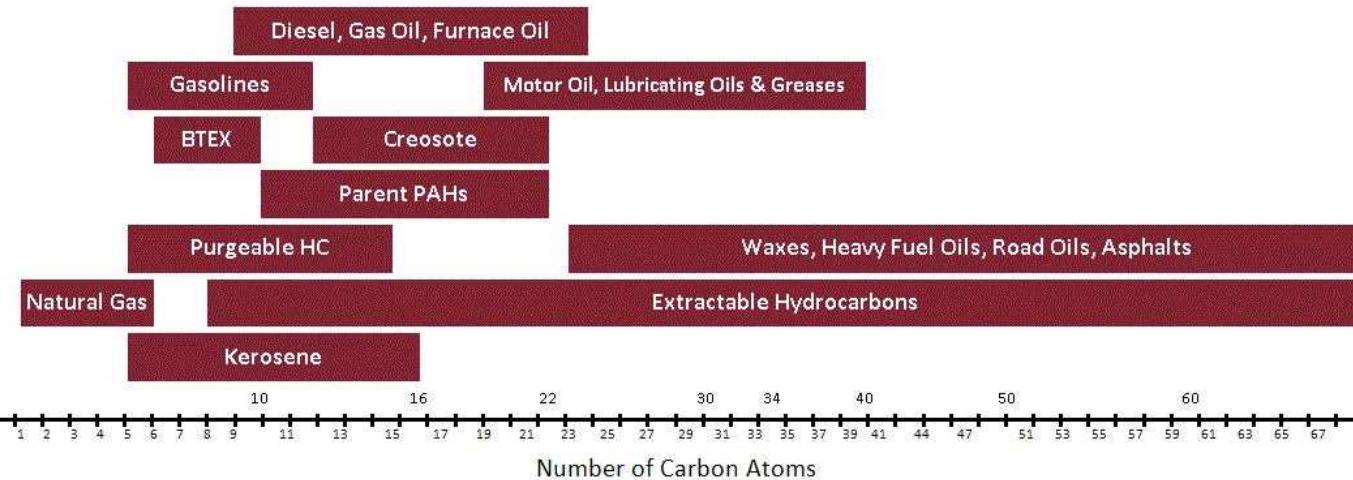
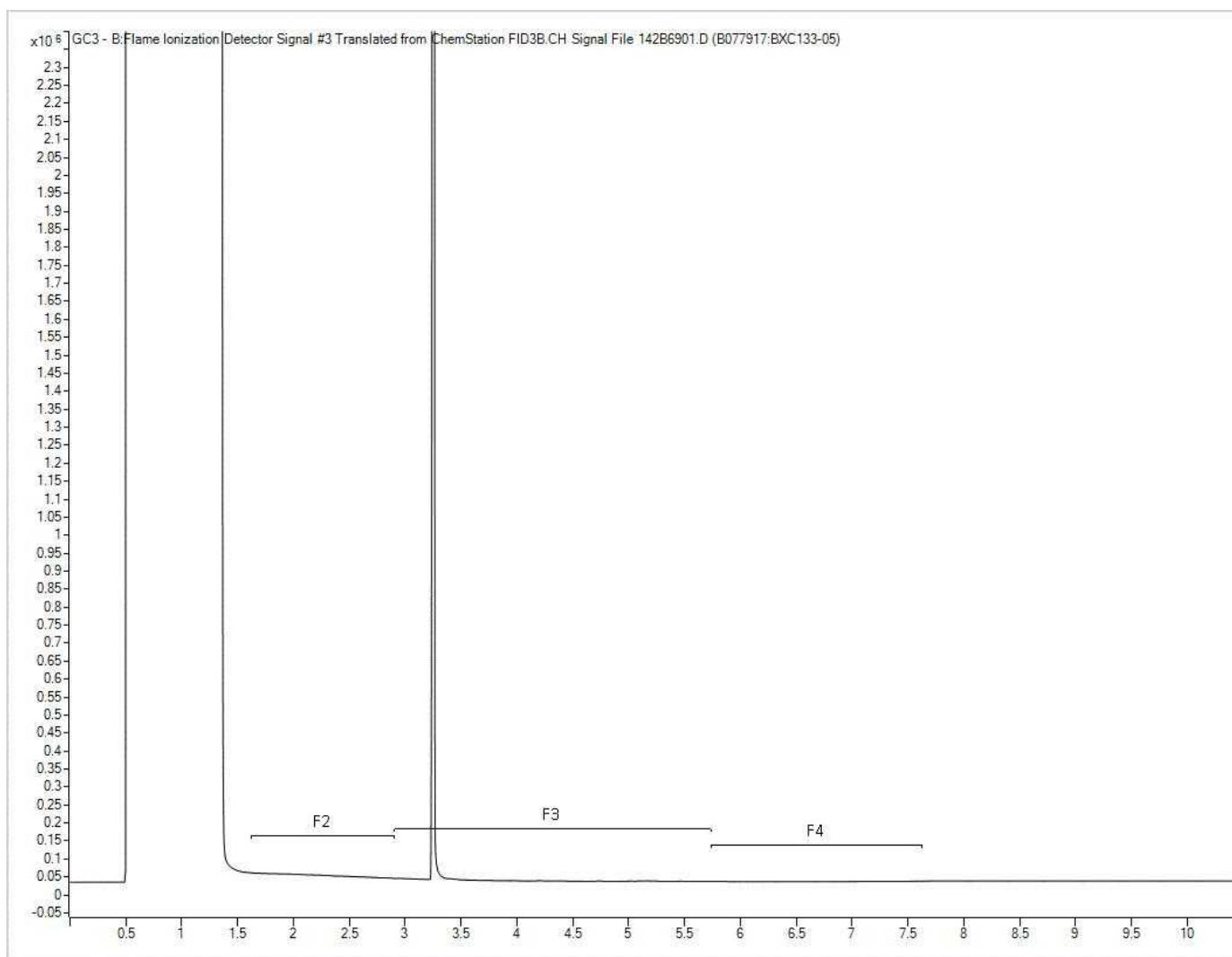
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem20\HPchem\1\DATA\2023\06\RUN0823

Bureau Veritas Job #: C364163
Report Date: 2024/02/27
Bureau Veritas Sample: BXC133

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: C38 08-1-4

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



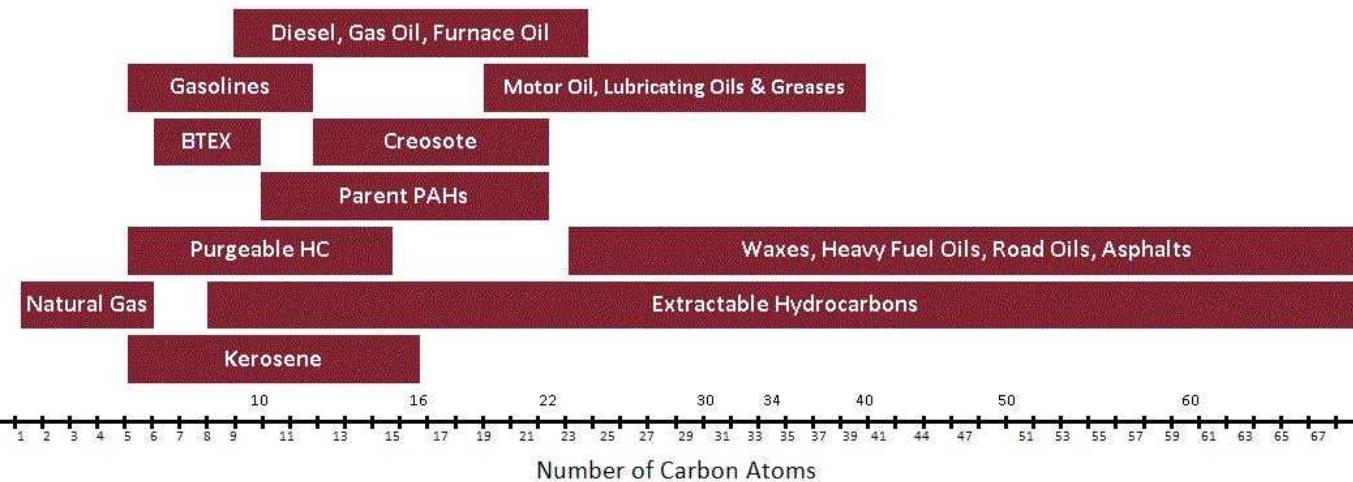
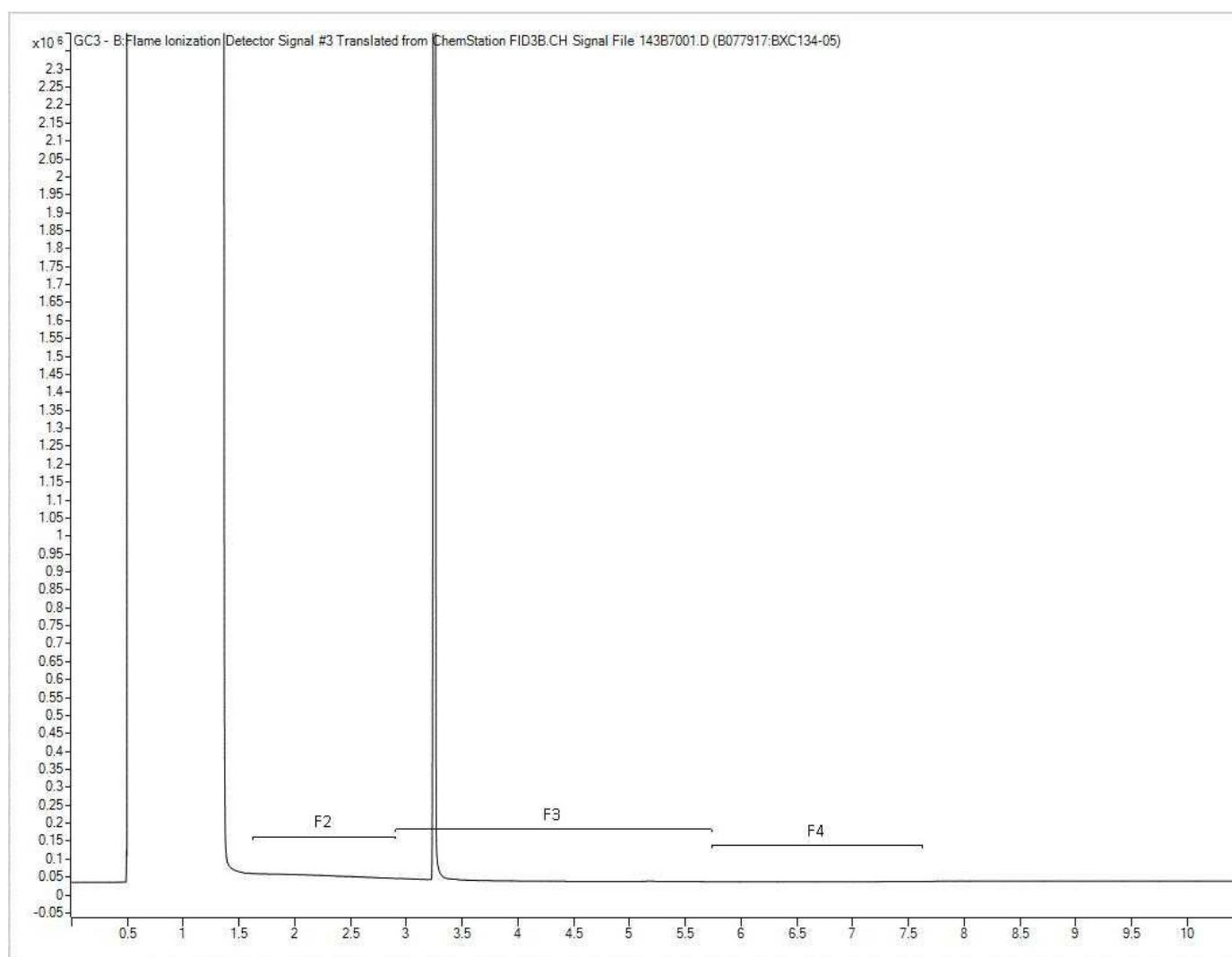
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem20\HPchem\1\DATA\2023\08\RUN0823

Bureau Veritas Job #: C364163
Report Date: 2024/02/27
Bureau Veritas Sample: BXC134

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: DUP 4

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem20\HPchem\1\DATA\2023\06\RUN0823

Calgary
4000 19th St. NE, T2E 6P8
Phone: (403) 291-3077
Fax: (403) 735-2240
Toll Free: (800) 386-7247

Edmonton
9331 - 48 Street, T6B 2R4
Phone: (780) 577-7100
Fax: (780) 450-4187
Toll Free: (800) 386-7247

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

Page 1 of 1

C of C # **299438**

4444
DW

INVOICE INFORMATION				REPORT INFORMATION				ANALYSIS REQUESTED																					
Company Name: <input checked="" type="checkbox"/> Imperial Oil <input type="checkbox"/> ExxonMobil Contact Name: ALEY HAIGH Address: 49 QUARRY PARK BLVD SE CALGARY, AB T2C 3E7 Email: aley.haigh@advision.com Ph: 587-897-6249				Company Name: ADVISION Contact Name: ALEX HAIGH Address: 49 QUARRY PARK BLVD ST CALGARY, AB T2C 3E7 Email: aley.haigh@advision.com Ph: 587-897-6249				PHCs (FRACTIONS 1-2 PLUS BTEX) PHCs (FRACTIONS 1-4 PLUS BTEX) PHCs (FRACTIONS 2-4) PHCs (FRACTION 1 PLUS BTEX) PAH GRAIN SIZE (75 MICRON) TEXTURE (% SAND, SILT, CLAY) PARTICLE SIZE DISTRIBUTION WITH GRAPH REGULATED METALS TOT <input type="checkbox"/> DIS ^A MERCURY TOTAL <input type="checkbox"/> DISSOLVED ^A SALINITY SOIL FERTILIZER SOIL FERTILIZER WATER NUTRIENTS SOIL ROUTINE POTABILITY pH <input type="checkbox"/> EC <input type="checkbox"/> ALKALINITY <input type="checkbox"/> BASIC CLASS II LANDFILL PKG FLOURIDE PHENOLS BY 4 AAP																					
FIELD SAMPLE ID				MATRIX			# CONTAINERS	SAMPLING			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 <input type="checkbox"/> DIS ^A	MERCURY TOTAL <input type="checkbox"/> DISSOLVED ^A	SALINITY SOIL	FERTILIZER SOIL	FERTILIZER WATER	NUTRIENTS SOIL	ROUTINE POTABILITY	pH <input type="checkbox"/> EC <input type="checkbox"/> ALKALINITY <input type="checkbox"/>	BASIC CLASS II LANDFILL PKG	FLOURIDE	PHENOLS BY 4 AAP
				GROUND WATER	SURFACE WATER	SOIL		OTHER	DATE (YYYY/MM/DD)	TIME (24 HR)																			
1 MTF 97-1-5	X			9	2023/08/17	0830	X			X							X	X											
2 BIS 97-1-3	X			9	2023/08/16	1305	X			X							X	X											
3 MEBG-10-1-3	X			9		0905	X			X							X	X											
4 TF 03-12-3	X			9		10:15	X			X							X	X											
5 BI-13-3-4-5	X			9		12:25	X			X							X	X											
6 C38 08-1-4	X			9	2023/08/17	10:45	X			X							X	X											
7 Dup 4	X			9		10:50	X			X							X	X											
8																													
9																													
10																													
IOL SITE LOCATION <i>NORMAN WELLS, NT</i>								REGULATORY CRITERIA / DETECTION LIMITS:						SPECIAL INSTRUCTIONS <i>email: Canada.chemistry@WorleyParsons.com craig.lord@datatrack@WorleyParsons.com Stacy.G.libb@advision.com</i>						# JARS USED & NOT SUBMITTED Enter N/A for Water		TURNAROUND TIME							
IOL PROJECT # (if applicable) <i>N/A</i>								<input type="checkbox"/> Alberta Tier 1 <input type="checkbox"/> CDWG <input type="checkbox"/> SEQG (SK) <input type="checkbox"/> NoSC (SK) <input checked="" type="checkbox"/> CCME <i>FAL</i> <input type="checkbox"/> Other												<i>N/A</i>		Standard (5 days) <input checked="" type="checkbox"/> Rush (3 days) <input type="checkbox"/> (2 days) <input type="checkbox"/> (1 day) <input type="checkbox"/> (same day) <input type="checkbox"/>							
MAXXAM TASK ORDER # OR SERVICE ORDER # + LINE ITEM <i>417085-49223.23100</i>																													
	YES	NO	COOLER ID #					YES	NO	COOLER ID #			<i>mcal</i>				YES	NO	COOLER ID #					Date Required					
SEAL PRESENT	<input checked="" type="checkbox"/>		TEMP	6	5	6	SEAL PRESENT	<input checked="" type="checkbox"/>		TEMP	1	2	3	SEAL PRESENT			TEMP	1	2	3			LAB USE ONLY						
SEAL INTACT	<input checked="" type="checkbox"/>						SEAL INTACT	<input checked="" type="checkbox"/>						SEAL INTACT										MAXXAM JOB #					
COOLING MEDIA PRESENT	<input checked="" type="checkbox"/>						COOLING MEDIA PRESENT	<input checked="" type="checkbox"/>						COOLING MEDIA PRESENT										<i>C364163</i>					
RELINQUISHED BY:								DATE:		TIME (24 HR)		RECEIVED BY:				DATE:		TIME (24 HR)											
1.		<i>Alex Haigh</i>		2023/08/17		0830		1.		<i>Aminat Azeem</i>		2023/08/18		10:20															
2.		<i>Aminat Azeem</i>		2023/08/18		13:24		2.		<i>Aminat Azeem</i>		2023/08/19		06:05															
3.																													
White: Maxxam Yellow: Client																													
SAMPLES																													
Labeled By: <i>AZE</i> Verified By: <i>DW</i>																													



BUREAU
VERITAS

Attention: Alex Haigh

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

Task Order#: 417085-49223
Site#: N/A
Site Location: Norman Wells, NWT
Project #: 417085-49223.23100
Your C.O.C. #: 299437

Report Date: 2023/08/25
Report #: R3386063
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C364179

Received: 2023/08/18, 10:20

Sample Matrix: Water
Samples Received: 8

Analyses	Quantity	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH (1)	4	AB SOP-00005	SM 24 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)	4		Auto Calc
Chloride/Sulphate by Auto Colourimetry (1)	4	AB SOP-00020	SM24-4500-Cl/SO4-E m
Conductivity @25C (1)	4	AB SOP-00005	SM 24 2510 B m
Fluoride (1)	4	AB SOP-00005	SM 24 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)	4		Auto Calc
Mercury (Dissolved) by CV (1, 3)	4	AB SOP-00084	BCMOE BCLM Oct2013 m
Elements by ICP - Dissolved (1, 3)	4	AB SOP-00042	EPA 6010d R5 m
Elements by ICPMS - Dissolved (1, 3)	4	AB SOP-00043	EPA 6020b R2 m
Ion Balance (1)	4		Auto Calc
Nitrate and Nitrite (1)	4		Auto Calc
NO2 (N); NO2 (N) + NO3 (N) in Water (1)	4	AB SOP-00091	SM 24 4500 NO3m
Nitrate (as N) (1)	4		Auto Calc
Phenols (4-AAP) (1)	4	AB SOP-00088	EPA 9066 R0 m
Total Dissolved Solids (Filt. Residue) (1)	4	AB SOP-00065	SM 24 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



BUREAU
VERITAS

Attention: Alex Haigh

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

Task Order#: 417085-49223
Site#: N/A
Site Location: Norman Wells, NWT
Project #: 417085-49223.23100
Your C.O.C. #: 299437

Report Date: 2023/08/25
Report #: R3386063
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C364179

Received: 2023/08/18, 10:20

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:

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 Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Scott Cantwell, General Manager responsible for Alberta Environmental laboratory operations.



BUREAU
VERITAS

Bureau Veritas Job #: C364179

Report Date: 2023/08/25

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

AT1 BTEX AND F1-F2 IN WATER (WATER)

Bureau Veritas ID		BXC177	BXC178	BXC179	BXC180	BXC181		
Sampling Date		2023/08/16 09:45	2023/08/16 09:50	2023/08/16 14:00	2023/08/16 08:00	2023/08/16 12:00		
COC Number		299437	299437	299437	299437	299437		
	UNITS	CPF 98-8-3	FIELD DUPLICATE	GIQ8-10-2-4	ARB-12-3-3	BIBG-10-1-4	RDL	QC Batch
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	0.14	<0.10	<0.10	0.10	B079458
Volatiles								
Benzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	B078633
Toluene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	B078633
Ethylbenzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	B078633
m & p-Xylene	mg/L	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080	0.00080	B078633
o-Xylene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	B078633
Xylenes (Total)	mg/L	<0.00089	<0.00089	<0.00089	<0.00089	<0.00089	0.00089	B077300
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	B077300
F1 (C6-C10)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	B078633
Extraction								
Surrogate Recovery (%)								
O-TERPHENYL (sur.)	%	89	92	84	93	97		B079458
Instrument								
Surrogate Recovery (%)								
1,4-Difluorobenzene (sur.)	%	98	97	97	96	97		B078633
4-Bromofluorobenzene (sur.)	%	112	114	116	112	114		B078633
D4-1,2-Dichloroethane (sur.)	%	107	108	108	106	108		B078633
RDL = Reportable Detection Limit								



BUREAU
VERITAS

Bureau Veritas Job #: C364179

Report Date: 2023/08/25

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

AT1 BTEX AND F1-F2 IN WATER (WATER)

Bureau Veritas ID		BXC182	BXC183	BXC184		
Sampling Date		2023/08/16 16:00	2023/08/16 14:45	2023/08/16 16:15		
COC Number		299437	299437	299437		
	UNITS	DUP 2-FIELD BLANK	GIP1109-1-4-R	DUP 3-TRIP BLANK	RDL	QC Batch
Ext. Pet. Hydrocarbon						
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	0.10	B079458
Volatiles						
Benzene	mg/L	<0.00040	<0.00040	<0.00040	0.00040	B078633
Toluene	mg/L	<0.00040	<0.00040	<0.00040	0.00040	B078633
Ethylbenzene	mg/L	<0.00040	<0.00040	<0.00040	0.00040	B078633
m & p-Xylene	mg/L	<0.00080	<0.00080	<0.00080	0.00080	B078633
o-Xylene	mg/L	<0.00040	<0.00040	<0.00040	0.00040	B078633
Xylenes (Total)	mg/L	<0.00089	<0.00089	<0.00089	0.00089	B077300
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	<0.10	0.10	B077300
F1 (C6-C10)	mg/L	<0.10	<0.10	<0.10	0.10	B078633
Extraction						
Surrogate Recovery (%)						
O-TERPHENYL (sur.)	%	91	92	90		B079458
Instrument						
Surrogate Recovery (%)						
1,4-Difluorobenzene (sur.)	%	97	96	99		B078633
4-Bromofluorobenzene (sur.)	%	113	115	114		B078633
D4-1,2-Dichloroethane (sur.)	%	109	108	110		B078633
RDL = Reportable Detection Limit						



BUREAU
VERITAS

Bureau Veritas Job #: C364179

Report Date: 2023/08/25

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

IOL ROUTINE WATER (WATER)

Bureau Veritas ID		BXC177			BXC179		BXC180		
Sampling Date		2023/08/16 09:45			2023/08/16 14:00		2023/08/16 08:00		
COC Number		299437			299437		299437		
	UNITS	CPF 98-8-3	RDL	QC Batch	GIQ8-10-2-4	RDL	ARB-12-3-3	RDL	QC Batch
Calculated Parameters									
Hardness (CaCO ₃)	mg/L	530	0.50	B077491	1500	0.50	400	0.50	B077491
Ion Balance (% Difference)	%	4.5	N/A	B077500	1.6	N/A	4.9	N/A	B077500
Nitrate (N)	mg/L	0.017	0.010	B084603	<0.010	0.010	0.011	0.010	B084603
Nitrate (NO ₃)	mg/L	0.074	0.044	B077424	<0.044	0.044	0.048	0.044	B077424
Nitrite (NO ₂)	mg/L	0.042	0.033	B077424	<0.033	0.033	0.039	0.033	B077424
Misc. Inorganics									
Conductivity	uS/cm	1000	2.0	B081932	2400	2.0	780	2.0	B081932
Total Dissolved Solids	mg/L	700 (1)	13	B081289	1800 (1)	25	530	10	B081289
Anions									
Alkalinity (PP as CaCO ₃)	mg/L	<1.0	1.0	B081923	<1.0	1.0	<1.0	1.0	B081923
Alkalinity (Total as CaCO ₃)	mg/L	440	1.0	B081923	710	1.0	360	1.0	B081923
Bicarbonate (HCO ₃)	mg/L	530	1.0	B081923	870	1.0	450	1.0	B081923
Carbonate (CO ₃)	mg/L	<1.0	1.0	B081923	<1.0	1.0	<1.0	1.0	B081923
Hydroxide (OH)	mg/L	<1.0	1.0	B081923	<1.0	1.0	<1.0	1.0	B081923
Chloride (Cl)	mg/L	7.7	1.0	B079091	30	1.0	11	1.0	B079091
Sulphate (SO ₄)	mg/L	160	5.0	B079091	800	10	93	1.0	B079091
Nutrients									
Nitrite (N)	mg/L	0.013	0.010	B079850	<0.010	0.010	0.012	0.010	B081203
Nitrate plus Nitrite (N)	mg/L	0.029	0.010	B079850	<0.010	0.010	0.023	0.010	B081203
Elements									
Dissolved Calcium (Ca)	mg/L	160	0.30	B081542	420	0.30	110	0.30	B081542
Dissolved Iron (Fe)	mg/L	1.0	0.060	B081542	50	0.060	0.26	0.060	B081542
Dissolved Magnesium (Mg)	mg/L	33	0.20	B081542	110	0.20	33	0.20	B081542
Dissolved Manganese (Mn)	mg/L	0.78	0.0040	B081542	6.3	0.0040	1.4	0.0040	B081542
Dissolved Potassium (K)	mg/L	2.0	0.30	B081542	3.8	0.30	2.1	0.30	B081542
Dissolved Sodium (Na)	mg/L	15	0.50	B081542	29	0.50	11	0.50	B081542

RDL = Reportable Detection Limit

N/A = Not Applicable

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



BUREAU
VERITAS

Bureau Veritas Job #: C364179

Report Date: 2023/08/25

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

IOL ROUTINE WATER (WATER)

Bureau Veritas ID		BXC181		
Sampling Date		2023/08/16 12:00		
COC Number		299437		
	UNITS	BIBG-10-1-4	RDL	QC Batch
Calculated Parameters				
Hardness (CaCO ₃)	mg/L	670	0.50	B077491
Ion Balance (% Difference)	%	5.6	N/A	B077500
Nitrate (N)	mg/L	0.085	0.010	B084603
Nitrate (NO ₃)	mg/L	0.38	0.044	B077424
Nitrite (NO ₂)	mg/L	<0.033	0.033	B077424
Misc. Inorganics				
Conductivity	uS/cm	1300	2.0	B081932
Total Dissolved Solids	mg/L	900	10	B081289
Anions				
Alkalinity (PP as CaCO ₃)	mg/L	<1.0	1.0	B081923
Alkalinity (Total as CaCO ₃)	mg/L	420	1.0	B081923
Bicarbonate (HCO ₃)	mg/L	510	1.0	B081923
Carbonate (CO ₃)	mg/L	<1.0	1.0	B081923
Hydroxide (OH)	mg/L	<1.0	1.0	B081923
Chloride (Cl)	mg/L	6.5	1.0	B079092
Sulphate (SO ₄)	mg/L	320	5.0	B079092
Nutrients				
Nitrite (N)	mg/L	<0.010	0.010	B079850
Nitrate plus Nitrite (N)	mg/L	0.085	0.010	B079850
Elements				
Dissolved Calcium (Ca)	mg/L	190	0.30	B081542
Dissolved Iron (Fe)	mg/L	<0.060	0.060	B081542
Dissolved Magnesium (Mg)	mg/L	45	0.20	B081542
Dissolved Manganese (Mn)	mg/L	0.081	0.0040	B081542
Dissolved Potassium (K)	mg/L	0.79	0.30	B081542
Dissolved Sodium (Na)	mg/L	4.4	0.50	B081542
RDL = Reportable Detection Limit				
N/A = Not Applicable				



BUREAU
VERITAS

Bureau Veritas Job #: C364179

Report Date: 2023/08/25

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		BXC177		BXC179		BXC180	BXC181		
Sampling Date		2023/08/16 09:45		2023/08/16 14:00		2023/08/16 08:00	2023/08/16 12:00		
COC Number		299437		299437		299437	299437		
	UNITS	CPF 98-8-3	QC Batch	GIQ8-10-2-4	QC Batch	ARB-12-3-3	BIBG-10-1-4	RDL	QC Batch
Elements									
Dissolved Cadmium (Cd)	mg/L	<0.000020	B077429	0.000061	B077429	0.000087	0.00015	0.000020	B077429
Anions									
Dissolved Fluoride (F)	mg/L	0.060	B081949	<0.050	B081949	0.10	0.37	0.050	B081949
Misc. Organics									
Phenols	mg/L	<0.0015	B081823	<0.0015	B080406	<0.0015	<0.0015	0.0015	B079780
RDL = Reportable Detection Limit									



BUREAU
VERITAS

Bureau Veritas Job #: C364179

Report Date: 2023/08/25

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

MERCURY BY COLD VAPOR (WATER)

Bureau Veritas ID		BXC177		BXC179		BXC180	BXC181		
Sampling Date		2023/08/16 09:45		2023/08/16 14:00		2023/08/16 08:00	2023/08/16 12:00		
COC Number		299437		299437		299437	299437		
	UNITS	CPF 98-8-3	QC Batch	GIQ8-10-2-4	QC Batch	ARB-12-3-3	BIBG-10-1-4	RDL	QC Batch
Elements									
Dissolved Mercury (Hg)	ug/L	<0.0019	B082994	0.0043	B082261	0.0041	0.0020	0.0019	B082994

RDL = Reportable Detection Limit



BUREAU
VERITAS

Bureau Veritas Job #: C364179

Report Date: 2023/08/25

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		BXC177	BXC179		BXC180		BXC181		
Sampling Date		2023/08/16 09:45	2023/08/16 14:00		2023/08/16 08:00		2023/08/16 12:00		
COC Number		299437	299437		299437		299437		
	UNITS	CPF 98-8-3	GIQ8-10-2-4	QC Batch	ARB-12-3-3	QC Batch	BIBG-10-1-4	RDL	QC Batch
Elements									
Dissolved Aluminum (Al)	mg/L	0.034	0.018	B079034	0.020	B080314	0.0054	0.0030	B079034
Dissolved Antimony (Sb)	mg/L	<0.00060	<0.00060	B079034	<0.00060	B080314	<0.00060	0.00060	B079034
Dissolved Arsenic (As)	mg/L	0.0011	0.015	B079034	0.0015	B080314	0.00027	0.00020	B079034
Dissolved Beryllium (Be)	mg/L	<0.0010	<0.0010	B079034	<0.0010	B080314	<0.0010	0.0010	B079034
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	B079034	<0.0010	B080314	<0.0010	0.0010	B079034
Dissolved Cobalt (Co)	mg/L	0.0017	0.025	B079034	0.0017	B080314	<0.00030	0.00030	B079034
Dissolved Copper (Cu)	mg/L	0.0012	0.0015	B079034	0.0017	B080314	0.0026	0.0010	B079034
Dissolved Lead (Pb)	mg/L	<0.00020	0.00021	B079034	<0.00020	B080314	<0.00020	0.00020	B079034
Dissolved Molybdenum (Mo)	mg/L	0.00051	0.0019	B079034	0.0072	B080314	0.048	0.00020	B079034
Dissolved Nickel (Ni)	mg/L	0.0040	0.036	B079034	0.0037	B080314	0.0049	0.00050	B079034
Dissolved Selenium (Se)	mg/L	0.00048	0.00053	B079034	0.00034	B080314	0.00071	0.00020	B079034
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	B079034	<0.00010	B080314	<0.00010	0.00010	B079034
Dissolved Thallium (Tl)	mg/L	<0.00020	<0.00020	B079034	<0.00020	B080314	<0.00020	0.00020	B079034
Dissolved Tin (Sn)	mg/L	<0.0010	<0.0010	B079034	<0.0010	B080314	<0.0010	0.0010	B079034
Dissolved Titanium (Ti)	mg/L	<0.0010	<0.0010	B079034	<0.0010	B080314	<0.0010	0.0010	B079034
Dissolved Uranium (U)	mg/L	0.00095	0.0085	B079034	0.0036	B080314	0.021	0.00010	B079034
Dissolved Vanadium (V)	mg/L	<0.0010	0.0011	B079034	<0.0010	B080314	<0.0010	0.0010	B079034
Dissolved Zinc (Zn)	mg/L	0.0070	0.0073	B079034	0.0064	B080314	0.0049	0.0030	B079034
RDL = Reportable Detection Limit									



BUREAU
VERITAS

Bureau Veritas Job #: C364179

Report Date: 2023/08/25

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

TEST SUMMARY

Bureau Veritas ID: BXC177	Collected: 2023/08/16
Sample ID: CPF 98-8-3	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B081923	N/A	2023/08/24	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B078633	N/A	2023/08/22	Darrus Ong
F1-BTEX	CALC/MS	B077300	N/A	2023/08/22	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B077429	N/A	2023/08/22	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B079091	N/A	2023/08/21	Shanna McKort
Conductivity @25C	COND	B081932	N/A	2023/08/24	Jeanette Chavol Melo
Fluoride	AT	B081949	N/A	2023/08/24	Jeanette Chavol Melo
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B079458	2023/08/24	2023/08/24	Abu Dani Alex
Hardness	CALC	B077491	N/A	2023/08/24	Automated Statchk
Mercury (Dissolved) by CV	CV	B082994	2023/08/24	2023/08/24	Kiran Kumari
Elements by ICP - Dissolved	ICPA	B081542	N/A	2023/08/23	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B079034	N/A	2023/08/22	Jason Bao
Ion Balance	CALC	B077500	N/A	2023/08/25	Automated Statchk
Nitrate and Nitrite	CALC	B077424	N/A	2023/08/22	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B079850	N/A	2023/08/22	Adam Fishleigh
Nitrate (as N)	CALC	B084603	2023/08/25	2023/08/25	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B081823	N/A	2023/08/23	Ming Dong
Total Dissolved Solids (Filt. Residue)	BAL	B081289	2023/08/23	2023/08/24	Haydee Estilong

Bureau Veritas ID: BXC178	Collected: 2023/08/16
Sample ID: FIELD DUPLICATE	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B078633	N/A	2023/08/22	Darrus Ong
F1-BTEX	CALC/MS	B077300	N/A	2023/08/22	Automated Statchk
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B079458	2023/08/24	2023/08/24	Abu Dani Alex

Bureau Veritas ID: BXC179	Collected: 2023/08/16
Sample ID: GIQ8-10-2-4	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B081923	N/A	2023/08/24	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B078633	N/A	2023/08/22	Darrus Ong
F1-BTEX	CALC/MS	B077300	N/A	2023/08/22	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B077429	N/A	2023/08/22	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B079091	N/A	2023/08/21	Shanna McKort
Conductivity @25C	COND	B081932	N/A	2023/08/24	Jeanette Chavol Melo
Fluoride	AT	B081949	N/A	2023/08/24	Jeanette Chavol Melo
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B079458	2023/08/24	2023/08/24	Abu Dani Alex
Hardness	CALC	B077491	N/A	2023/08/24	Automated Statchk
Mercury (Dissolved) by CV	CV	B082261	2023/08/23	2023/08/23	Kiran Kumari
Elements by ICP - Dissolved	ICPA	B081542	N/A	2023/08/23	Vincy Scaria



BUREAU
VERITAS

Bureau Veritas Job #: C364179

Report Date: 2023/08/25

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

TEST SUMMARY

Bureau Veritas ID: BXC179
Sample ID: GIQ8-10-2-4
Matrix: Water

Collected: 2023/08/16
Relinquished: 2023/08/17
Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICPMS - Dissolved	ICPM	B079034	N/A	2023/08/22	Jason Bao
Ion Balance	CALC	B077500	N/A	2023/08/25	Automated Statchk
Nitrate and Nitrite	CALC	B077424	N/A	2023/08/23	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B081203	N/A	2023/08/23	Adam Fishleigh
Nitrate (as N)	CALC	B084603	2023/08/25	2023/08/25	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B080406	N/A	2023/08/22	Ming Dong
Total Dissolved Solids (Filt. Residue)	BAL	B081289	2023/08/23	2023/08/24	Haydee Estilong

Bureau Veritas ID: BXC180
Sample ID: ARB-12-3-3
Matrix: Water

Collected: 2023/08/16
Relinquished: 2023/08/17
Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B081923	N/A	2023/08/24	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B078633	N/A	2023/08/22	Darrus Ong
F1-BTEX	CALC/MS	B077300	N/A	2023/08/22	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B077429	N/A	2023/08/23	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B079091	N/A	2023/08/21	Shanna McKort
Conductivity @25C	COND	B081932	N/A	2023/08/24	Jeanette Chavol Melo
Fluoride	AT	B081949	N/A	2023/08/24	Jeanette Chavol Melo
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B079458	2023/08/24	2023/08/24	Abu Dani Alex
Hardness	CALC	B077491	N/A	2023/08/24	Automated Statchk
Mercury (Dissolved) by CV	CV	B082994	2023/08/24	2023/08/24	Kiran Kumari
Elements by ICP - Dissolved	ICPA	B081542	N/A	2023/08/23	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B080314	N/A	2023/08/22	Mandeep Kaur
Ion Balance	CALC	B077500	N/A	2023/08/25	Automated Statchk
Nitrate and Nitrite	CALC	B077424	N/A	2023/08/23	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B081203	N/A	2023/08/23	Adam Fishleigh
Nitrate (as N)	CALC	B084603	2023/08/25	2023/08/25	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B079780	N/A	2023/08/22	Ming Dong
Total Dissolved Solids (Filt. Residue)	BAL	B081289	2023/08/23	2023/08/24	Haydee Estilong

Bureau Veritas ID: BXC181
Sample ID: BIBG-10-1-4
Matrix: Water

Collected: 2023/08/16
Relinquished: 2023/08/17
Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B081923	N/A	2023/08/24	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B078633	N/A	2023/08/22	Darrus Ong
F1-BTEX	CALC/MS	B077300	N/A	2023/08/22	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B077429	N/A	2023/08/22	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B079092	N/A	2023/08/21	Shanna McKort
Conductivity @25C	COND	B081932	N/A	2023/08/24	Jeanette Chavol Melo
Fluoride	AT	B081949	N/A	2023/08/24	Jeanette Chavol Melo

BUREAU
VERITAS

Bureau Veritas Job #: C364179

Report Date: 2023/08/25

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

TEST SUMMARY

Bureau Veritas ID: BXC181	Collected: 2023/08/16
Sample ID: BIBG-10-1-4	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B079458	2023/08/24	2023/08/24	Abu Dani Alex
Hardness	CALC	B077491	N/A	2023/08/24	Automated Statchk
Mercury (Dissolved) by CV	CV	B082994	2023/08/24	2023/08/24	Kiran Kumari
Elements by ICP - Dissolved	ICPA	B081542	N/A	2023/08/23	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B079034	N/A	2023/08/22	Jason Bao
Ion Balance	CALC	B077500	N/A	2023/08/25	Automated Statchk
Nitrate and Nitrite	CALC	B077424	N/A	2023/08/22	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B079850	N/A	2023/08/22	Adam Fishleigh
Nitrate (as N)	CALC	B084603	2023/08/25	2023/08/25	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B079780	N/A	2023/08/22	Ming Dong
Total Dissolved Solids (Filt. Residue)	BAL	B081289	2023/08/23	2023/08/24	Haydee Estilong

Bureau Veritas ID: BXC182	Collected: 2023/08/16
Sample ID: DUP 2-FIELD BLANK	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B078633	N/A	2023/08/22	Darrus Ong
F1-BTEX	CALC/MS	B077300	N/A	2023/08/22	Automated Statchk
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B079458	2023/08/24	2023/08/24	Abu Dani Alex

Bureau Veritas ID: BXC183	Collected: 2023/08/16
Sample ID: GIP1109-1-4-R	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B078633	N/A	2023/08/22	Darrus Ong
F1-BTEX	CALC/MS	B077300	N/A	2023/08/22	Automated Statchk
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B079458	2023/08/24	2023/08/24	Abu Dani Alex

Bureau Veritas ID: BXC184	Collected: 2023/08/16
Sample ID: DUP 3-TRIP BLANK	Relinquished: 2023/08/17
Matrix: Water	Received: 2023/08/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B078633	N/A	2023/08/22	Darrus Ong
F1-BTEX	CALC/MS	B077300	N/A	2023/08/22	Automated Statchk
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B079458	2023/08/24	2023/08/24	Abu Dani Alex



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VERITAS

Bureau Veritas Job #: C364179

Report Date: 2023/08/25

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Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

GENERAL COMMENTS

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

Package 1	5.3°C
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Temperatures upon receipt at Bureau Veritas Labs calgary

Package 1: 2 degrees C

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

Sample BXC177 [CPF 98-8-3] : 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 BXC179 [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 BXC180 [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.

Sample BXC181 [BIBG-10-1-4] : 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.



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Bureau Veritas Job #: C364179

Report Date: 2023/08/25

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B078633	DO1	Method Blank	1,4-Difluorobenzene (sur.)	2023/08/22	97	%	50 - 140	
			4-Bromofluorobenzene (sur.)	2023/08/22	115	%	50 - 140	
			D4-1,2-Dichloroethane (sur.)	2023/08/22	111	%	50 - 140	
			Benzene	2023/08/22	<0.00040		mg/L	
			Toluene	2023/08/22	<0.00040		mg/L	
			Ethylbenzene	2023/08/22	<0.00040		mg/L	
			m & p-Xylene	2023/08/22	<0.00080		mg/L	
			o-Xylene	2023/08/22	<0.00040		mg/L	
			F1 (C6-C10)	2023/08/22	<0.10		mg/L	
B079034	JAB	Method Blank	Dissolved Aluminum (Al)	2023/08/22	<0.0030		mg/L	
			Dissolved Chromium (Cr)	2023/08/22	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2023/08/22	<0.00030		mg/L	
			Dissolved Copper (Cu)	2023/08/22	<0.0010		mg/L	
			Dissolved Lead (Pb)	2023/08/22	<0.00020		mg/L	
			Dissolved Antimony (Sb)	2023/08/22	<0.00060		mg/L	
			Dissolved Molybdenum (Mo)	2023/08/22	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2023/08/22	<0.00050		mg/L	
			Dissolved Selenium (Se)	2023/08/22	<0.00020		mg/L	
			Dissolved Silver (Ag)	2023/08/22	<0.00010		mg/L	
			Dissolved Arsenic (As)	2023/08/22	<0.00020		mg/L	
			Dissolved Thallium (Tl)	2023/08/22	<0.00020		mg/L	
			Dissolved Tin (Sn)	2023/08/22	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2023/08/22	<0.0010		mg/L	
			Dissolved Uranium (U)	2023/08/22	<0.00010		mg/L	
			Dissolved Vanadium (V)	2023/08/22	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2023/08/22	<0.0030		mg/L	
			Dissolved Beryllium (Be)	2023/08/22	<0.0010		mg/L	
B079091	SKM	Method Blank	Chloride (Cl)	2023/08/21	<1.0		mg/L	
			Sulphate (SO4)	2023/08/21	<1.0		mg/L	
B079092	SKM	Method Blank	Chloride (Cl)	2023/08/21	<1.0		mg/L	
			Sulphate (SO4)	2023/08/21	<1.0		mg/L	
B079458	AAX	Method Blank	O-TERPHENYL (sur.)	2023/08/24		87	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2023/08/24	<0.10		mg/L	
B079780	MDO	Method Blank	Phenols	2023/08/22	<0.0015		mg/L	
B079850	AFI	Method Blank	Nitrite (N)	2023/08/22	<0.010		mg/L	
			Nitrate plus Nitrite (N)	2023/08/22	<0.010		mg/L	
B080314	MKJ	Method Blank	Dissolved Aluminum (Al)	2023/08/22	<0.0030		mg/L	
			Dissolved Chromium (Cr)	2023/08/22	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2023/08/22	<0.00030		mg/L	
			Dissolved Copper (Cu)	2023/08/22	<0.0010		mg/L	
			Dissolved Lead (Pb)	2023/08/22	<0.00020		mg/L	
			Dissolved Antimony (Sb)	2023/08/22	<0.00060		mg/L	
			Dissolved Molybdenum (Mo)	2023/08/22	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2023/08/22	<0.00050		mg/L	
			Dissolved Selenium (Se)	2023/08/22	<0.00020		mg/L	
			Dissolved Silver (Ag)	2023/08/22	<0.00010		mg/L	
			Dissolved Arsenic (As)	2023/08/22	<0.00020		mg/L	
			Dissolved Thallium (Tl)	2023/08/22	<0.00020		mg/L	
			Dissolved Tin (Sn)	2023/08/22	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2023/08/22	<0.0010		mg/L	
			Dissolved Uranium (U)	2023/08/22	<0.00010		mg/L	
			Dissolved Vanadium (V)	2023/08/22	<0.0010		mg/L	



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Bureau Veritas Job #: C364179

Report Date: 2023/08/25

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Zinc (Zn)	2023/08/22	<0.0030		mg/L	
			Dissolved Beryllium (Be)	2023/08/22	<0.0010		mg/L	
B080406	MDO	Method Blank	Phenols	2023/08/22	<0.0015		mg/L	
B081203	AFI	Method Blank	Nitrite (N)	2023/08/23	<0.010		mg/L	
			Nitrate plus Nitrite (N)	2023/08/23	<0.010		mg/L	
B081289	HE1	Method Blank	Total Dissolved Solids	2023/08/24	<10		mg/L	
B081542	VSC	Method Blank	Dissolved Iron (Fe)	2023/08/23	<0.060		mg/L	
			Dissolved Magnesium (Mg)	2023/08/23	<0.20		mg/L	
			Dissolved Manganese (Mn)	2023/08/23	<0.0040		mg/L	
			Dissolved Potassium (K)	2023/08/23	<0.30		mg/L	
			Dissolved Sodium (Na)	2023/08/23	<0.50		mg/L	
			Dissolved Calcium (Ca)	2023/08/23	<0.30		mg/L	
B081823	MDO	Method Blank	Phenols	2023/08/23	<0.0015		mg/L	
B081923	JVM	Method Blank	Alkalinity (Total as CaCO ₃)	2023/08/24	<1.0		mg/L	
			Alkalinity (PP as CaCO ₃)	2023/08/24	<1.0		mg/L	
			Bicarbonate (HCO ₃)	2023/08/24	<1.0		mg/L	
			Carbonate (CO ₃)	2023/08/24	<1.0		mg/L	
			Hydroxide (OH)	2023/08/24	<1.0		mg/L	
B081932	JVM	Method Blank	Conductivity	2023/08/24	<2.0		uS/cm	
B081949	JVM	Method Blank	Dissolved Fluoride (F)	2023/08/24	<0.050		mg/L	
B082261	KKM	Method Blank	Dissolved Mercury (Hg)	2023/08/23	<0.0019		ug/L	
B082994	KKM	Method Blank	Dissolved Mercury (Hg)	2023/08/24	<0.0019		ug/L	
B081289	HE1	Matrix Spike [BXC177-02]	Total Dissolved Solids	2023/08/24		NC	%	80 - 120
B078633	DO1	LCS	1,4-Difluorobenzene (sur.)	2023/08/22	97	%	50 - 140	
			4-Bromofluorobenzene (sur.)	2023/08/22	115	%	50 - 140	
			D4-1,2-Dichloroethane (sur.)	2023/08/22	114	%	50 - 140	
			Benzene	2023/08/22	102	%	60 - 130	
			Toluene	2023/08/22	96	%	60 - 130	
			Ethylbenzene	2023/08/22	103	%	60 - 130	
			m & p-Xylene	2023/08/22	95	%	60 - 130	
			o-Xylene	2023/08/22	90	%	60 - 130	
			F1 (C6-C10)	2023/08/22	101	%	60 - 140	
B079034	JAB	LCS	Dissolved Aluminum (Al)	2023/08/21	119	%	80 - 120	
			Dissolved Chromium (Cr)	2023/08/21	99	%	80 - 120	
			Dissolved Cobalt (Co)	2023/08/21	99	%	80 - 120	
			Dissolved Copper (Cu)	2023/08/21	99	%	80 - 120	
			Dissolved Lead (Pb)	2023/08/21	100	%	80 - 120	
			Dissolved Antimony (Sb)	2023/08/21	105	%	80 - 120	
			Dissolved Molybdenum (Mo)	2023/08/21	103	%	80 - 120	
			Dissolved Nickel (Ni)	2023/08/21	101	%	80 - 120	
			Dissolved Selenium (Se)	2023/08/21	107	%	80 - 120	
			Dissolved Silver (Ag)	2023/08/21	100	%	80 - 120	
			Dissolved Arsenic (As)	2023/08/21	101	%	80 - 120	
			Dissolved Thallium (Tl)	2023/08/21	103	%	80 - 120	
			Dissolved Tin (Sn)	2023/08/21	102	%	80 - 120	
			Dissolved Titanium (Ti)	2023/08/21	98	%	80 - 120	
			Dissolved Uranium (U)	2023/08/21	100	%	80 - 120	
			Dissolved Vanadium (V)	2023/08/21	100	%	80 - 120	
			Dissolved Zinc (Zn)	2023/08/21	103	%	80 - 120	
			Dissolved Beryllium (Be)	2023/08/21	98	%	80 - 120	
			Chloride (Cl)	2023/08/21	98	%	80 - 120	
			Sulphate (SO ₄)	2023/08/21	97	%	80 - 120	
B079091	SKM	LCS						



BUREAU
VERITAS

Bureau Veritas Job #: C364179

Report Date: 2023/08/25

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B079092	SKM	LCS	Chloride (Cl)	2023/08/21	105	%	80 - 120	
			Sulphate (SO4)	2023/08/21	103	%	80 - 120	
B079458	AAX	LCS	O-TERPHENYL (sur.)	2023/08/24	89	%	60 - 140	
			F2 (C10-C16 Hydrocarbons)	2023/08/24	88	%	60 - 140	
B079780	MDO	LCS	Phenols	2023/08/22	98	%	80 - 120	
B079850	AFI	LCS	Nitrite (N)	2023/08/22	104	%	80 - 120	
			Nitrate plus Nitrite (N)	2023/08/22	101	%	80 - 120	
B080314	MKJ	LCS	Dissolved Aluminum (Al)	2023/08/22	111	%	80 - 120	
			Dissolved Chromium (Cr)	2023/08/22	91	%	80 - 120	
			Dissolved Cobalt (Co)	2023/08/22	93	%	80 - 120	
			Dissolved Copper (Cu)	2023/08/22	90	%	80 - 120	
			Dissolved Lead (Pb)	2023/08/22	102	%	80 - 120	
			Dissolved Antimony (Sb)	2023/08/22	112	%	80 - 120	
			Dissolved Molybdenum (Mo)	2023/08/22	103	%	80 - 120	
			Dissolved Nickel (Ni)	2023/08/22	89	%	80 - 120	
			Dissolved Selenium (Se)	2023/08/22	108	%	80 - 120	
			Dissolved Silver (Ag)	2023/08/22	97	%	80 - 120	
			Dissolved Arsenic (As)	2023/08/22	100	%	80 - 120	
			Dissolved Thallium (Tl)	2023/08/22	100	%	80 - 120	
			Dissolved Tin (Sn)	2023/08/22	111	%	80 - 120	
			Dissolved Titanium (Ti)	2023/08/22	90	%	80 - 120	
			Dissolved Uranium (U)	2023/08/22	96	%	80 - 120	
			Dissolved Vanadium (V)	2023/08/22	95	%	80 - 120	
			Dissolved Zinc (Zn)	2023/08/22	100	%	80 - 120	
			Dissolved Beryllium (Be)	2023/08/22	91	%	80 - 120	
B080406	MDO	LCS	Phenols	2023/08/22	100	%	80 - 120	
B081203	AFI	LCS	Nitrite (N)	2023/08/23	104	%	80 - 120	
B081289	HE1	LCS	Nitrate plus Nitrite (N)	2023/08/23	104	%	80 - 120	
			Total Dissolved Solids	2023/08/24	99	%	80 - 120	
B081542	VSC	LCS	Dissolved Iron (Fe)	2023/08/23	107	%	80 - 120	
B081823	MDO	LCS	Dissolved Magnesium (Mg)	2023/08/23	108	%	80 - 120	
			Dissolved Manganese (Mn)	2023/08/23	104	%	80 - 120	
			Dissolved Potassium (K)	2023/08/23	100	%	80 - 120	
			Dissolved Sodium (Na)	2023/08/23	100	%	80 - 120	
			Dissolved Calcium (Ca)	2023/08/23	103	%	80 - 120	
			Phenols	2023/08/23	99	%	80 - 120	
			Alkalinity (Total as CaCO3)	2023/08/24	97	%	80 - 120	
B081932	JVM	LCS	Conductivity	2023/08/24	100	%	90 - 110	
B081949	JVM	LCS	Dissolved Fluoride (F)	2023/08/24	93	%	80 - 120	
B082261	KKM	LCS	Dissolved Mercury (Hg)	2023/08/23	103	%	80 - 120	
B082994	KKM	LCS	Dissolved Mercury (Hg)	2023/08/24	103	%	80 - 120	

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 (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)



BUREAU
VERITAS

Bureau Veritas Job #: C364179

Report Date: 2023/08/25

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23100

VALIDATION SIGNATURE PAGE

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

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

Jared Wiseman, B.Sc., P.Chem., QP, Senior Analyst, Organics

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 Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.



BUREAU
VERITAS

Attention: Alex Haigh

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

Task Order#: 417085-49223
Site#: N/A
Site Location: Norman Wells, NWT
Project #: 417085-49223.23600
Your C.O.C. #: 299604

Report Date: 2023/10/03
Report #: R3404802
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C376516

Received: 2023/09/25, 15:45

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	6	AB SOP-00005	SM 24 2320 B m
Send Part to Archive	6		
BTEX/F1 in Water by HS GC/MS/FID	6	AB SOP-00039	CCME CWS/EPA 8260d m
F1-BTEX	6		Auto Calc
Cadmium - low level CCME - Dissolved	6		Auto Calc
Chloride/Sulphate by Auto Colourimetry	6	AB SOP-00020	SM24-4500-Cl/SO4-E m
Container Supply & Nonhazardous Disposal	6		
Conductivity @25C	6	AB SOP-00005	SM 24 2510 B m
Fluoride	6	AB SOP-00005	SM 24 4500-F C m
CCME Hydrocarbons in Water (F2; C10-C16) (1)	6	AB SOP-00037 AB SOP-00040	CCME PHC-CWS m
Hardness	6		Auto Calc
Elements by ICP - Dissolved (2)	6	AB SOP-00042	EPA 6010d R5 m
Elements by ICPMS - Dissolved (2)	6	AB SOP-00043	EPA 6020b R2 m
Ion Balance	6		Auto Calc
Nitrate and Nitrite	6		Auto Calc
NO2 (N); NO2 (N) + NO3 (N) in Water	6	AB SOP-00091	SM 24 4500 NO3m
Nitrate (as N)	6		Auto Calc
Phenols (4-AAP)	6	AB SOP-00088	EPA 9066 R0 m
Total Dissolved Solids (Filt. Residue)	6	AB SOP-00065	SM 24 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



BUREAU
VERITAS

Attention: Alex Haigh

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

Task Order#: 417085-49223
Site#: N/A
Site Location: Norman Wells, NWT
Project #: 417085-49223.23600
Your C.O.C. #: 299604

Report Date: 2023/10/03
Report #: R3404802
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C376516

Received: 2023/09/25, 15:45

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) Silica gel clean up employed.

(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:

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 Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Scott Cantwell, General Manager responsible for Alberta Environmental laboratory operations.



BUREAU
VERITAS

Bureau Veritas Job #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

AT1 BTEX AND F1-F2 IN WATER (WATER)

Bureau Veritas ID		CAA163	CAA164	CAA165	CAA166	CAA167		
Sampling Date		2023/09/22 15:45	2023/09/22 13:34	2023/09/22 13:58	2023/09/22 14:00	2023/09/22 14:48		
COC Number		299604	299604	299604	299604	299604		
	UNITS	CPF 98-8-3	ARB-12-3-3	MEBG-10-1-3	FIELD DUPLICATE 1	C38 08-1-4	RDL	QC Batch
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	B130069
Volatiles								
Benzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00044	0.00040	B131693
Toluene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	B131693
Ethylbenzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	B131693
m & p-Xylene	mg/L	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080	0.00080	B131693
o-Xylene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	B131693
Xylenes (Total)	mg/L	<0.00089	<0.00089	<0.00089	<0.00089	<0.00089	0.00089	B127626
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	B127626
F1 (C6-C10)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	B131693
Extraction								
Surrogate Recovery (%)								
O-TERPHENYL (sur.)	%	96	95	96	97	97		B130069
Instrument								
Surrogate Recovery (%)								
1,4-Difluorobenzene (sur.)	%	96	96	97	96	96		B131693
4-Bromofluorobenzene (sur.)	%	109	112	106	110	111		B131693
D4-1,2-Dichloroethane (sur.)	%	86	87	88	86	87		B131693
RDL = Reportable Detection Limit								



BUREAU
VERITAS

Bureau Veritas Job #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

AT1 BTEX AND F1-F2 IN WATER (WATER)

Bureau Veritas ID		CAA168		
Sampling Date		2023/09/22 14:26		
COC Number		299604		
	UNITS	TF 03-12-3	RDL	QC Batch
Ext. Pet. Hydrocarbon				
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	0.10	B130069
Volatiles				
Benzene	mg/L	<0.00040	0.00040	B131693
Toluene	mg/L	<0.00040	0.00040	B131693
Ethylbenzene	mg/L	<0.00040	0.00040	B131693
m & p-Xylene	mg/L	<0.00080	0.00080	B131693
o-Xylene	mg/L	<0.00040	0.00040	B131693
Xylenes (Total)	mg/L	<0.00089	0.00089	B127626
F1 (C6-C10) - BTEX	mg/L	<0.10	0.10	B127626
F1 (C6-C10)	mg/L	<0.10	0.10	B131693
Extraction				
Surrogate Recovery (%)				
O-TERPHENYL (sur.)	%	97		B130069
Instrument				
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	95		B131693
4-Bromofluorobenzene (sur.)	%	112		B131693
D4-1,2-Dichloroethane (sur.)	%	85		B131693
RDL = Reportable Detection Limit				



BUREAU
VERITAS

Bureau Veritas Job #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

IOL ROUTINE WATER (WATER)

Bureau Veritas ID		CAA163			CAA163			CAA164		
Sampling Date		2023/09/22 15:45			2023/09/22 15:45			2023/09/22 13:34		
COC Number		299604			299604			299604		
	UNITS	CPF 98-8-3	RDL	QC Batch	CPF 98-8-3 Lab-Dup	RDL	QC Batch	ARB-12-3-3	RDL	QC Batch
Calculated Parameters										
Hardness (CaCO ₃)	mg/L	570	0.50	B127628				580	0.50	B127628
Ion Balance (% Difference)	%	0.61	N/A	B127650				0.96	N/A	B127650
Nitrate (N)	mg/L	<0.010	0.010	B127581				0.64	0.010	B127581
Nitrate (NO ₃)	mg/L	<0.044	0.044	B127580				2.9	0.044	B127580
Nitrite (NO ₂)	mg/L	0.050	0.033	B127580				0.034	0.033	B127580
Misc. Inorganics										
Conductivity	uS/cm	1100	2.0	B133115				970	2.0	B133115
Total Dissolved Solids	mg/L	600 (1)	25	B127922				550 (2)	25	B135021
Anions										
Alkalinity (PP as CaCO ₃)	mg/L	<1.0	1.0	B133106				<1.0	1.0	B133106
Alkalinity (Total as CaCO ₃)	mg/L	590	1.0	B133106				480	1.0	B133106
Bicarbonate (HCO ₃)	mg/L	720	1.0	B133106				590	1.0	B133106
Carbonate (CO ₃)	mg/L	<1.0	1.0	B133106				<1.0	1.0	B133106
Hydroxide (OH)	mg/L	<1.0	1.0	B133106				<1.0	1.0	B133106
Chloride (Cl)	mg/L	10	1.0	B131643				7.8	1.0	B131643
Sulphate (SO ₄)	mg/L	67	1.0	B131643				100	1.0	B131643
Nutrients										
Nitrite (N)	mg/L	0.015	0.010	B131331				0.010	0.010	B131304
Nitrate plus Nitrite (N)	mg/L	0.021	0.010	B131331				0.66	0.010	B131304
Elements										
Dissolved Barium (Ba)	mg/L	0.21	0.010	B132026	0.21	0.010	B132026	0.13	0.010	B132026
Dissolved Boron (B)	mg/L	0.051	0.020	B132026	0.045	0.020	B132026	0.043	0.020	B132026
Dissolved Calcium (Ca)	mg/L	160	0.30	B132026	170	0.30	B132026	150	0.30	B132026
RDL = Reportable Detection Limit										
Lab-Dup = Laboratory Initiated Duplicate										
N/A = Not Applicable										
(1) Detection limit raised based on sample volume used for analysis.										
(2) Detection limit raised based on sample volume used for analysis.										
Sample was originally processed within hold time. Data quality required investigation. Re-analysis was completed past recommended hold time.										



BUREAU
VERITAS

Bureau Veritas Job #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

IOL ROUTINE WATER (WATER)

Bureau Veritas ID		CAA163			CAA163			CAA164		
Sampling Date		2023/09/22 15:45			2023/09/22 15:45			2023/09/22 13:34		
COC Number		299604			299604			299604		
	UNITS	CPF 98-8-3	RDL	QC Batch	CPF 98-8-3 Lab-Dup	RDL	QC Batch	ARB-12-3-3	RDL	QC Batch
Dissolved Iron (Fe)	mg/L	5.8	0.060	B132026	5.8	0.060	B132026	0.26	0.060	B132026
Dissolved Lithium (Li)	mg/L	<0.020	0.020	B132026	<0.020	0.020	B132026	<0.020	0.020	B132026
Dissolved Magnesium (Mg)	mg/L	40	0.20	B132026	40	0.20	B132026	48	0.20	B132026
Dissolved Manganese (Mn)	mg/L	1.1	0.0040	B132026	1.1	0.0040	B132026	0.48	0.0040	B132026
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	B132026	<0.10	0.10	B132026	0.24	0.10	B132026
Dissolved Potassium (K)	mg/L	2.6	0.30	B132026	2.6	0.30	B132026	2.5	0.30	B132026
Dissolved Silicon (Si)	mg/L	6.5	0.50	B132026	6.5	0.50	B132026	6.1	0.50	B132026
Dissolved Sodium (Na)	mg/L	37	0.50	B132026	37	0.50	B132026	13	0.50	B132026
Dissolved Strontium (Sr)	mg/L	0.82	0.020	B132026	0.82	0.020	B132026	0.50	0.020	B132026
Dissolved Sulphur (S)	mg/L	24	0.20	B132026	23	0.20	B132026	28	0.20	B132026

RDL = Reportable Detection Limit

Lab-Dup = Laboratory Initiated Duplicate



BUREAU
VERITAS

Bureau Veritas Job #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

IOL ROUTINE WATER (WATER)

Bureau Veritas ID		CAA164			CAA165			CAA166		
Sampling Date		2023/09/22 13:34			2023/09/22 13:58			2023/09/22 14:00		
COC Number		299604			299604			299604		
	UNITS	ARB-12-3-3 Lab-Dup	RDL	QC Batch	MEBG-10-1-3	RDL	QC Batch	FIELD DUPLICATE 1	RDL	QC Batch
Calculated Parameters										
Hardness (CaCO ₃)	mg/L				1600	0.50	B127628	1400	0.50	B127628
Ion Balance (% Difference)	%				2.3	N/A	B127650	6.7	N/A	B127650
Nitrate (N)	mg/L				<0.050	0.050	B127581	<0.010	0.010	B127581
Nitrate (NO ₃)	mg/L				<0.22	0.22	B127580	<0.044	0.044	B127580
Nitrite (NO ₂)	mg/L				<0.033	0.033	B127580	<0.033	0.033	B127580
Misc. Inorganics										
Conductivity	uS/cm				2300	2.0	B133115	2200	2.0	B133115
Total Dissolved Solids	mg/L	450	25	B135021	1800 (1)	25	B127922	1800 (1)	25	B127922
Anions										
Alkalinity (PP as CaCO ₃)	mg/L				<1.0	1.0	B133106	<1.0	1.0	B133106
Alkalinity (Total as CaCO ₃)	mg/L				400	1.0	B133106	430	1.0	B133106
Bicarbonate (HCO ₃)	mg/L				490	1.0	B133106	530	1.0	B133106
Carbonate (CO ₃)	mg/L				<1.0	1.0	B133106	<1.0	1.0	B133106
Hydroxide (OH)	mg/L				<1.0	1.0	B133106	<1.0	1.0	B133106
Chloride (Cl)	mg/L				3.8	1.0	B131643	3.7	1.0	B131643
Sulphate (SO ₄)	mg/L				1200	25	B131643	1200	25	B131643
Nutrients										
Nitrite (N)	mg/L				<0.010	0.010	B131304	<0.010	0.010	B131331
Nitrate plus Nitrite (N)	mg/L				<0.050 (2)	0.050	B131304	<0.010	0.010	B131331
Elements										
Dissolved Barium (Ba)	mg/L				0.054	0.010	B132026	0.053	0.010	B132026
Dissolved Boron (B)	mg/L				<0.020	0.020	B132026	<0.020	0.020	B132026
Dissolved Calcium (Ca)	mg/L				480	0.30	B132026	440	0.30	B132026
Dissolved Iron (Fe)	mg/L				9.2	0.060	B132026	9.2	0.060	B132026
Dissolved Lithium (Li)	mg/L				0.020	0.020	B132026	<0.020	0.020	B132026
Dissolved Magnesium (Mg)	mg/L				85	0.20	B132026	76	0.20	B132026

RDL = Reportable Detection Limit

Lab-Dup = Laboratory Initiated Duplicate

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 #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

IOL ROUTINE WATER (WATER)

Bureau Veritas ID		CAA164			CAA165			CAA166		
Sampling Date		2023/09/22 13:34			2023/09/22 13:58			2023/09/22 14:00		
COC Number		299604			299604			299604		
	UNITS	ARB-12-3-3 Lab-Dup	RDL	QC Batch	MEBG-10-1-3	RDL	QC Batch	FIELD DUPLICATE 1	RDL	QC Batch
Dissolved Manganese (Mn)	mg/L				1.9	0.0040	B132026	1.9	0.0040	B132026
Dissolved Phosphorus (P)	mg/L				<0.10	0.10	B132026	<0.10	0.10	B132026
Dissolved Potassium (K)	mg/L				3.0	0.30	B132026	2.8	0.30	B132026
Dissolved Silicon (Si)	mg/L				5.5	0.50	B132026	5.5	0.50	B132026
Dissolved Sodium (Na)	mg/L				8.1	0.50	B132026	7.6	0.50	B132026
Dissolved Strontium (Sr)	mg/L				0.87	0.020	B132026	0.83	0.020	B132026
Dissolved Sulphur (S)	mg/L				390	0.20	B132026	390	0.20	B132026
RDL = Reportable Detection Limit										
Lab-Dup = Laboratory Initiated Duplicate										



BUREAU
VERITAS

Bureau Veritas Job #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

IOL ROUTINE WATER (WATER)

Bureau Veritas ID		CAA167			CAA168		
Sampling Date		2023/09/22 14:48			2023/09/22 14:26		
COC Number		299604			299604		
	UNITS	C38 08-1-4	RDL	QC Batch	TF 03-12-3	RDL	QC Batch
Calculated Parameters							
Hardness (CaCO ₃)	mg/L	600	0.50	B127628	1200	0.50	B127628
Ion Balance (% Difference)	%	0.43	N/A	B127650	5.1	N/A	B127650
Nitrate (N)	mg/L	<0.010	0.010	B127581	<0.050	0.050	B127581
Nitrate (NO ₃)	mg/L	<0.044	0.044	B127651	<0.22	0.22	B127651
Nitrite (NO ₂)	mg/L	<0.033	0.033	B127651	<0.033	0.033	B127651
Misc. Inorganics							
Conductivity	µS/cm	1200	2.0	B133115	2000	2.0	B133115
Total Dissolved Solids	mg/L	620 (1)	25	B127922	1200 (1)	25	B127922
Anions							
Alkalinity (PP as CaCO ₃)	mg/L	<1.0	1.0	B133106	<1.0	1.0	B133106
Alkalinity (Total as CaCO ₃)	mg/L	660	1.0	B133106	1000	1.0	B133106
Bicarbonate (HCO ₃)	mg/L	810	1.0	B133106	1200	1.0	B133106
Carbonate (CO ₃)	mg/L	<1.0	1.0	B133106	<1.0	1.0	B133106
Hydroxide (OH)	mg/L	<1.0	1.0	B133106	<1.0	1.0	B133106
Chloride (Cl)	mg/L	17	1.0	B131643	95	1.0	B131643
Sulphate (SO ₄)	mg/L	<4.0 (2)	4.0	B131643	120	1.0	B131643
Nutrients							
Nitrite (N)	mg/L	<0.010	0.010	B131304	<0.010	0.010	B131331
Nitrate plus Nitrite (N)	mg/L	<0.010	0.010	B131304	<0.050 (2)	0.050	B131331
Elements							
Dissolved Barium (Ba)	mg/L	0.40	0.010	B132026	0.16	0.010	B132026
Dissolved Boron (B)	mg/L	0.021	0.020	B132026	0.022	0.020	B132026
Dissolved Calcium (Ca)	mg/L	150	0.30	B132026	320	0.30	B132026
Dissolved Iron (Fe)	mg/L	22	0.060	B132026	51	0.060	B132026
Dissolved Lithium (Li)	mg/L	<0.020	0.020	B132026	<0.020	0.020	B132026
Dissolved Magnesium (Mg)	mg/L	53	0.20	B132026	110	0.20	B132026
Dissolved Manganese (Mn)	mg/L	0.66	0.0040	B132026	1.6	0.0040	B132026

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 #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

IOL ROUTINE WATER (WATER)

Bureau Veritas ID		CAA167			CAA168		
Sampling Date		2023/09/22 14:48			2023/09/22 14:26		
COC Number		299604			299604		
	UNITS	C38 08-1-4	RDL	QC Batch	TF 03-12-3	RDL	QC Batch
Dissolved Phosphorus (P)	mg/L	0.63	0.10	B132026	0.11	0.10	B132026
Dissolved Potassium (K)	mg/L	2.9	0.30	B132026	6.3	0.30	B132026
Dissolved Silicon (Si)	mg/L	10	0.50	B132026	11	0.50	B132026
Dissolved Sodium (Na)	mg/L	22	0.50	B132026	41	0.50	B132026
Dissolved Strontium (Sr)	mg/L	0.42	0.020	B132026	1.0	0.020	B132026
Dissolved Sulphur (S)	mg/L	3.4	0.20	B132026	38	0.20	B132026
RDL = Reportable Detection Limit							



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Bureau Veritas Job #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CAA163	CAA164	CAA165	CAA166	CAA167		
Sampling Date		2023/09/22 15:45	2023/09/22 13:34	2023/09/22 13:58	2023/09/22 14:00	2023/09/22 14:48		
COC Number		299604	299604	299604	299604	299604		
	UNITS	CPF 98-8-3	ARB-12-3-3	MEBG-10-1-3	FIELD DUPLICATE 1	C38 08-1-4	RDL	QC Batch
Elements								
Dissolved Cadmium (Cd)	mg/L	<0.000020	0.000069	0.000086	0.000089	<0.000020	0.000020	B127578
Anions								
Dissolved Fluoride (F)	mg/L	0.13	0.18	0.47	0.45	0.17	0.050	B133116
Misc. Organics								
Phenols	mg/L	<0.0015	<0.0015	<0.0015	<0.0015	0.0033	0.0015	B131496
RDL = Reportable Detection Limit								

Bureau Veritas ID		CAA167			CAA168		
Sampling Date		2023/09/22 14:48			2023/09/22 14:26		
COC Number		299604			299604		
	UNITS	C38 08-1-4 Lab-Dup	RDL	QC Batch	TF 03-12-3	RDL	QC Batch
Elements							
Dissolved Cadmium (Cd)	mg/L				0.000034	0.000020	B127578
Anions							
Dissolved Fluoride (F)	mg/L				0.82	0.050	B133116
Misc. Organics							
Phenols	mg/L	0.0032	0.0015	B131496	<0.0015	0.0015	B131496
RDL = Reportable Detection Limit							
Lab-Dup = Laboratory Initiated Duplicate							



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VERITAS

Bureau Veritas Job #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CAA163	CAA164	CAA165		CAA166	CAA167		
Sampling Date		2023/09/22 15:45	2023/09/22 13:34	2023/09/22 13:58		2023/09/22 14:00	2023/09/22 14:48		
COC Number		299604	299604	299604		299604	299604		
	UNITS	CPF 98-8-3	ARB-12-3-3	MEBG-10-1-3	QC Batch	FIELD DUPLICATE 1	C38 08-1-4	RDL	QC Batch
Elements									
Dissolved Aluminum (Al)	mg/L	0.039	0.034	0.019	B132331	0.014	0.062	0.0030	B132456
Dissolved Antimony (Sb)	mg/L	<0.00060	<0.00060	<0.00060	B132331	<0.00060	<0.00060	0.00060	B132456
Dissolved Arsenic (As)	mg/L	0.0041	0.0012	0.00062	B132331	0.00063	0.0043	0.00020	B132456
Dissolved Beryllium (Be)	mg/L	<0.0010	<0.0010	<0.0010	B132331	<0.0010	<0.0010	0.0010	B132456
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	<0.0010	B132331	<0.0010	<0.0010	0.0010	B132456
Dissolved Cobalt (Co)	mg/L	0.0034	0.0015	0.025	B132331	0.025	0.0012	0.00030	B132456
Dissolved Copper (Cu)	mg/L	<0.0010	0.0022	0.0017	B132331	0.0018	<0.0010	0.0010	B132456
Dissolved Lead (Pb)	mg/L	<0.00020	<0.00020	<0.00020	B132331	<0.00020	<0.00020	0.00020	B132456
Dissolved Molybdenum (Mo)	mg/L	0.00051	0.0048	0.010	B132331	0.010	<0.00020	0.00020	B132456
Dissolved Nickel (Ni)	mg/L	0.0062	0.0044	0.11	B132331	0.11	0.0020	0.00050	B132456
Dissolved Selenium (Se)	mg/L	0.00037	0.0010	0.00062	B132331	0.00088	0.00073	0.00020	B132456
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	<0.00010	B132331	<0.00010	<0.00010	0.00010	B132456
Dissolved Thallium (Tl)	mg/L	<0.00020	<0.00020	<0.00020	B132331	<0.00020	<0.00020	0.00020	B132456
Dissolved Tin (Sn)	mg/L	<0.0010	<0.0010	<0.0010	B132331	<0.0010	<0.0010	0.0010	B132456
Dissolved Titanium (Ti)	mg/L	0.0015	<0.0010	<0.0010	B132331	<0.0010	0.0018	0.0010	B132456
Dissolved Uranium (U)	mg/L	0.0012	0.0060	0.024	B132331	0.023	0.00019	0.00010	B132456
Dissolved Vanadium (V)	mg/L	0.0013	<0.0010	<0.0010	B132331	<0.0010	0.0011	0.0010	B132456
Dissolved Zinc (Zn)	mg/L	<0.0030	0.0037	0.015	B132331	0.016	0.0079	0.0030	B132456

RDL = Reportable Detection Limit



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VERITAS

Bureau Veritas Job #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CAA168		
Sampling Date		2023/09/22 14:26		
COC Number		299604		
	UNITS	TF 03-12-3	RDL	QC Batch
Elements				
Dissolved Aluminum (Al)	mg/L	0.015	0.0030	B132331
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	B132331
Dissolved Arsenic (As)	mg/L	0.016	0.00020	B132331
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	B132331
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	B132331
Dissolved Cobalt (Co)	mg/L	0.0062	0.00030	B132331
Dissolved Copper (Cu)	mg/L	<0.0010	0.0010	B132331
Dissolved Lead (Pb)	mg/L	<0.00020	0.00020	B132331
Dissolved Molybdenum (Mo)	mg/L	0.25	0.00020	B132331
Dissolved Nickel (Ni)	mg/L	0.030	0.00050	B132331
Dissolved Selenium (Se)	mg/L	0.0010	0.00020	B132331
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	B132331
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	B132331
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	B132331
Dissolved Titanium (Ti)	mg/L	0.0011	0.0010	B132331
Dissolved Uranium (U)	mg/L	0.0069	0.00010	B132331
Dissolved Vanadium (V)	mg/L	0.0024	0.0010	B132331
Dissolved Zinc (Zn)	mg/L	<0.0030	0.0030	B132331
RDL = Reportable Detection Limit				



BUREAU
VERITAS

Bureau Veritas Job #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

TEST SUMMARY

Bureau Veritas ID: CAA163	Collected: 2023/09/22
Sample ID: CPF 98-8-3	Relinquished: 2023/09/24
Matrix: Water	Received: 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B133106	N/A	2023/10/02	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B131693	N/A	2023/10/02	Richard Ly
F1-BTEX	CALC/MS	B127626	N/A	2023/10/03	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B127578	N/A	2023/10/01	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B131643	N/A	2023/09/29	Tyler Orr
Conductivity @25C	COND	B133115	N/A	2023/10/02	Jeanette Chavol Melo
Fluoride	AT	B133116	N/A	2023/10/02	Jeanette Chavol Melo
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B130069	2023/09/29	2023/09/30	Bryanna Quach
Hardness	CALC	B127628	N/A	2023/10/02	Automated Statchk
Elements by ICP - Dissolved	ICPA	B132026	N/A	2023/10/01	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B132331	N/A	2023/09/30	Jason Bao
Ion Balance	CALC	B127650	N/A	2023/10/02	Automated Statchk
Nitrate and Nitrite	CALC	B127580	N/A	2023/10/02	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B131331	N/A	2023/09/29	Isabelle White
Nitrate (as N)	CALC	B127581	2023/10/02	2023/10/02	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B131496	N/A	2023/09/29	Joshua Fine
Total Dissolved Solids (Filt. Residue)	BAL	B127922	2023/09/28	2023/09/29	Rachel Tomecek

Bureau Veritas ID: CAA163 Dup	Collected: 2023/09/22
Sample ID: CPF 98-8-3	Relinquished: 2023/09/24
Matrix: Water	Received: 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICP - Dissolved	ICPA	B132026	N/A	2023/10/01	Vincy Scaria

Bureau Veritas ID: CAA164	Collected: 2023/09/22
Sample ID: ARB-12-3-3	Relinquished: 2023/09/24
Matrix: Water	Received: 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B133106	N/A	2023/10/02	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B131693	N/A	2023/10/02	Richard Ly
F1-BTEX	CALC/MS	B127626	N/A	2023/10/03	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B127578	N/A	2023/10/01	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B131643	N/A	2023/09/29	Tyler Orr
Conductivity @25C	COND	B133115	N/A	2023/10/02	Jeanette Chavol Melo
Fluoride	AT	B133116	N/A	2023/10/02	Jeanette Chavol Melo
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B130069	2023/09/29	2023/09/30	Bryanna Quach
Hardness	CALC	B127628	N/A	2023/10/02	Automated Statchk
Elements by ICP - Dissolved	ICPA	B132026	N/A	2023/10/01	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B132331	N/A	2023/09/30	Jason Bao
Ion Balance	CALC	B127650	N/A	2023/10/02	Automated Statchk
Nitrate and Nitrite	CALC	B127580	N/A	2023/09/30	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B131304	N/A	2023/09/29	Isabelle White



BUREAU
VERITAS

Bureau Veritas Job #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

TEST SUMMARY

Bureau Veritas ID: CAA164
Sample ID: ARB-12-3-3
Matrix: Water

Collected: 2023/09/22
Relinquished: 2023/09/24
Received: 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (as N)	CALC	B127581	2023/09/30	2023/09/30	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B131496	N/A	2023/09/29	Joshua Fine
Total Dissolved Solids (Filt. Residue)	BAL	B135021	2023/10/03	2023/10/03	Daryl Viktoria Noval

Bureau Veritas ID: CAA164 Dup
Sample ID: ARB-12-3-3
Matrix: Water

Collected: 2023/09/22
Relinquished: 2023/09/24
Received: 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Dissolved Solids (Filt. Residue)	BAL	B135021	2023/10/03	2023/10/03	Daryl Viktoria Noval

Bureau Veritas ID: CAA165
Sample ID: MEBG-10-1-3
Matrix: Water

Collected: 2023/09/22
Relinquished: 2023/09/24
Received: 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B133106	N/A	2023/10/02	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B131693	N/A	2023/10/02	Richard Ly
F1-BTEX	CALC/MS	B127626	N/A	2023/10/03	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B127578	N/A	2023/10/01	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B131643	N/A	2023/09/29	Tyler Orr
Conductivity @25C	COND	B133115	N/A	2023/10/02	Jeanette Chavol Melo
Fluoride	AT	B133116	N/A	2023/10/02	Jeanette Chavol Melo
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B130069	2023/09/29	2023/09/30	Bryanna Quach
Hardness	CALC	B127628	N/A	2023/10/02	Automated Statchk
Elements by ICP - Dissolved	ICPA	B132026	N/A	2023/10/01	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B132331	N/A	2023/09/30	Jason Bao
Ion Balance	CALC	B127650	N/A	2023/10/02	Automated Statchk
Nitrate and Nitrite	CALC	B127580	N/A	2023/09/30	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B131304	N/A	2023/09/29	Isabelle White
Nitrate (as N)	CALC	B127581	2023/09/30	2023/09/30	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B131496	N/A	2023/09/29	Joshua Fine
Total Dissolved Solids (Filt. Residue)	BAL	B127922	2023/09/28	2023/09/29	Rachel Tomecek

Bureau Veritas ID: CAA166
Sample ID: FIELD DUPLICATE 1
Matrix: Water

Collected: 2023/09/22
Relinquished: 2023/09/24
Received: 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B133106	N/A	2023/10/02	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B131693	N/A	2023/10/02	Richard Ly
F1-BTEX	CALC/MS	B127626	N/A	2023/10/03	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B127578	N/A	2023/10/01	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B131643	N/A	2023/09/29	Tyler Orr
Conductivity @25C	COND	B133115	N/A	2023/10/02	Jeanette Chavol Melo



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Bureau Veritas Job #: C376516

Report Date: 2023/10/03

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Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

TEST SUMMARY

Bureau Veritas ID: CAA166	Collected: 2023/09/22
Sample ID: FIELD DUPLICATE 1	Relinquished: 2023/09/24
Matrix: Water	Received: 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Fluoride	AT	B133116	N/A	2023/10/02	Jeanette Chavol Melo
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B130069	2023/09/29	2023/09/30	Bryanna Quach
Hardness	CALC	B127628	N/A	2023/10/02	Automated Statchk
Elements by ICP - Dissolved	ICPA	B132026	N/A	2023/10/01	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B132456	N/A	2023/09/30	Mandeep Kaur
Ion Balance	CALC	B127650	N/A	2023/10/02	Automated Statchk
Nitrate and Nitrite	CALC	B127580	N/A	2023/10/02	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B131331	N/A	2023/09/29	Isabelle White
Nitrate (as N)	CALC	B127581	2023/10/02	2023/10/02	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B131496	N/A	2023/09/29	Joshua Fine
Total Dissolved Solids (Filt. Residue)	BAL	B127922	2023/09/28	2023/09/29	Rachel Tomecek

Bureau Veritas ID: CAA167	Collected: 2023/09/22
Sample ID: C38 08-1-4	Relinquished: 2023/09/24
Matrix: Water	Received: 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B133106	N/A	2023/10/02	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B131693	N/A	2023/10/02	Richard Ly
F1-BTEX	CALC/MS	B127626	N/A	2023/10/03	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B127578	N/A	2023/10/01	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B131643	N/A	2023/09/29	Tyler Orr
Conductivity @25C	COND	B133115	N/A	2023/10/02	Jeanette Chavol Melo
Fluoride	AT	B133116	N/A	2023/10/02	Jeanette Chavol Melo
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B130069	2023/09/29	2023/09/30	Bryanna Quach
Hardness	CALC	B127628	N/A	2023/10/02	Automated Statchk
Elements by ICP - Dissolved	ICPA	B132026	N/A	2023/10/01	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B132456	N/A	2023/09/30	Mandeep Kaur
Ion Balance	CALC	B127650	N/A	2023/10/02	Automated Statchk
Nitrate and Nitrite	CALC	B127651	N/A	2023/09/30	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B131304	N/A	2023/09/29	Isabelle White
Nitrate (as N)	CALC	B127581	2023/09/30	2023/09/30	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B131496	N/A	2023/09/29	Joshua Fine
Total Dissolved Solids (Filt. Residue)	BAL	B127922	2023/09/28	2023/09/29	Rachel Tomecek

Bureau Veritas ID: CAA167 Dup	Collected: 2023/09/22
Sample ID: C38 08-1-4	Relinquished: 2023/09/24
Matrix: Water	Received: 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Phenols (4-AAP)	TECH/4AAP	B131496	N/A	2023/09/29	Joshua Fine



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Bureau Veritas Job #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

TEST SUMMARY

Bureau Veritas ID: CAA168
Sample ID: TF 03-12-3
Matrix: Water

Collected: 2023/09/22
Relinquished: 2023/09/24
Received: 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B133106	N/A	2023/10/02	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B131693	N/A	2023/10/02	Richard Ly
F1-BTEX	CALC/MS	B127626	N/A	2023/10/03	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B127578	N/A	2023/10/01	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B131643	N/A	2023/09/29	Tyler Orr
Conductivity @25C	COND	B133115	N/A	2023/10/02	Jeanette Chavol Melo
Fluoride	AT	B133116	N/A	2023/10/02	Jeanette Chavol Melo
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B130069	2023/09/29	2023/09/30	Bryanna Quach
Hardness	CALC	B127628	N/A	2023/10/02	Automated Statchk
Elements by ICP - Dissolved	ICPA	B132026	N/A	2023/10/01	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B132331	N/A	2023/09/30	Jason Bao
Ion Balance	CALC	B127650	N/A	2023/10/02	Automated Statchk
Nitrate and Nitrite	CALC	B127651	N/A	2023/10/02	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B131331	N/A	2023/09/29	Isabelle White
Nitrate (as N)	CALC	B127581	2023/10/02	2023/10/02	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B131496	N/A	2023/09/29	Joshua Fine
Total Dissolved Solids (Filt. Residue)	BAL	B127922	2023/09/28	2023/09/29	Rachel Tomecek



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Bureau Veritas Job #: C376516

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Project #: 417085-49223.23600

GENERAL COMMENTS

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

Package 1	6.7°C
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Note: Analysis required not listed or clearly specified on C of C. Dissolved mercury vials were received for all samples however, dissolved mercury was not requested on chain of custody. Client was notified via email.

Sample CAA163 [CPF 98-8-3] : 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 CAA164 [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. Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue).

Sample CAA165 [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 CAA166 [FIELD DUPLICATE 1] : 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 CAA167 [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 CAA168 [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.

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
CAA163	CPF 98-8-3	Water	F2FIDE-W	EPH	O-TERPHENYL (sur.)	#18 Method Blank Surrogate High	#10 Lab Error	This may represent a high bias for this parameter. However, since the results were non detect, there is no impact on data quality.
CAA164	ARB-12-3-3	Water	F2FIDE-W	EPH	O-TERPHENYL (sur.)	#18 Method Blank Surrogate High	#10 Lab Error	This may represent a high bias for this parameter. However, since the results were non detect, there is no impact on data quality.
CAA164	ARB-12-3-3	Water	NO23AC-W	NUTS	Sample	#10 Past Hold Time	#10 Lab Error	This may increase the uncertainty associated with these results.
CAA164	ARB-12-3-3	Water	TDS	INORG	Sample	#10 Past Hold Time	#4 Re-Analysis Required	This may increase the uncertainty associated with these results.



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Bureau Veritas Job #: C376516

Report Date: 2023/10/03

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Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

DATA QUALITY OVERVIEW

Lab ID	Client Sample ID	Matrix	Test Code	Analysis Type	Parameters	Deviation	Root Cause	Potential Impact
CAA165	MEBG-10-1-3	Water	F2FIDE-W	EPH	O-TERPHENYL (sur.)	#18 Method Blank Surrogate High	#10 Lab Error	This may represent a high bias for this parameter. However, since the results were non detect, there is no impact on data quality.
CAA165	MEBG-10-1-3	Water	NO23AC-W	NUTS	Sample	#10 Past Hold Time	#10 Lab Error	This may increase the uncertainty associated with these results.
CAA166	FIELD DUPLICATE 1	Water	F2FIDE-W	EPH	O-TERPHENYL (sur.)	#18 Method Blank Surrogate High	#10 Lab Error	This may represent a high bias for this parameter. However, since the results were non detect, there is no impact on data quality.
CAA167	C38 08-1-4	Water	F2FIDE-W	EPH	O-TERPHENYL (sur.)	#18 Method Blank Surrogate High	#10 Lab Error	This may represent a high bias for this parameter. However, since the results were non detect, there is no impact on data quality.
CAA167	C38 08-1-4	Water	NO23AC-W	NUTS	Sample	#10 Past Hold Time	#10 Lab Error	This may increase the uncertainty associated with these results.
CAA168	TF 03-12-3	Water	F2FIDE-W	EPH	O-TERPHENYL (sur.)	#18 Method Blank Surrogate High	#10 Lab Error	This may represent a high bias for this parameter. However, since the results were non detect, there is no impact on data quality.



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Bureau Veritas Job #: C376516

Report Date: 2023/10/03

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Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B127922	RTM	Method Blank	Total Dissolved Solids	2023/09/29	<10		mg/L	
B130069	BQU	Method Blank	O-TERPHENYL (sur.)	2023/09/30		200 (1)	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2023/09/30	<0.10		mg/L	
B131304	ISW	Method Blank	Nitrite (N)	2023/09/29	<0.010		mg/L	
			Nitrate plus Nitrite (N)	2023/09/29	<0.010		mg/L	
B131331	ISW	Method Blank	Nitrite (N)	2023/09/29	<0.010		mg/L	
			Nitrate plus Nitrite (N)	2023/09/29	<0.010		mg/L	
B131496	JFE	Method Blank	Phenols	2023/09/29	<0.0015		mg/L	
B131643	TOR	Method Blank	Chloride (Cl)	2023/09/29	<1.0		mg/L	
			Sulphate (SO4)	2023/09/29	<1.0		mg/L	
B131693	RIL	Method Blank	1,4-Difluorobenzene (sur.)	2023/10/02		101	%	50 - 140
			4-Bromofluorobenzene (sur.)	2023/10/02		113	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2023/10/02		88	%	50 - 140
			Benzene	2023/10/02	<0.00040		mg/L	
			Toluene	2023/10/02	<0.00040		mg/L	
			Ethylbenzene	2023/10/02	<0.00040		mg/L	
			m & p-Xylene	2023/10/02	<0.00080		mg/L	
			o-Xylene	2023/10/02	<0.00040		mg/L	
			F1 (C6-C10)	2023/10/02	<0.10		mg/L	
B132026	VSC	Method Blank	Dissolved Iron (Fe)	2023/10/01	<0.060		mg/L	
			Dissolved Lithium (Li)	2023/10/01	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2023/10/01	<0.20		mg/L	
			Dissolved Manganese (Mn)	2023/10/01	<0.0040		mg/L	
			Dissolved Potassium (K)	2023/10/01	<0.30		mg/L	
			Dissolved Sodium (Na)	2023/10/01	<0.50		mg/L	
			Dissolved Strontium (Sr)	2023/10/01	<0.020		mg/L	
			Dissolved Sulphur (S)	2023/10/01	<0.20		mg/L	
			Dissolved Phosphorus (P)	2023/10/01	<0.10		mg/L	
			Dissolved Barium (Ba)	2023/10/01	<0.010		mg/L	
			Dissolved Silicon (Si)	2023/10/01	<0.50		mg/L	
			Dissolved Boron (B)	2023/10/01	<0.020		mg/L	
			Dissolved Calcium (Ca)	2023/10/01	<0.30		mg/L	
B132331	JAB	Method Blank	Dissolved Aluminum (Al)	2023/09/30	<0.0030		mg/L	
			Dissolved Chromium (Cr)	2023/09/30	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2023/09/30	<0.00030		mg/L	
			Dissolved Copper (Cu)	2023/09/30	<0.0010		mg/L	
			Dissolved Lead (Pb)	2023/09/30	<0.00020		mg/L	
			Dissolved Antimony (Sb)	2023/09/30	<0.00060		mg/L	
			Dissolved Molybdenum (Mo)	2023/09/30	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2023/09/30	<0.00050		mg/L	
			Dissolved Selenium (Se)	2023/09/30	<0.00020		mg/L	
			Dissolved Silver (Ag)	2023/09/30	<0.00010		mg/L	
			Dissolved Arsenic (As)	2023/09/30	<0.00020		mg/L	
			Dissolved Thallium (Tl)	2023/09/30	<0.00020		mg/L	
			Dissolved Tin (Sn)	2023/09/30	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2023/09/30	<0.0010		mg/L	
			Dissolved Uranium (U)	2023/09/30	<0.00010		mg/L	
			Dissolved Vanadium (V)	2023/09/30	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2023/09/30	<0.0030		mg/L	
			Dissolved Beryllium (Be)	2023/09/30	<0.0010		mg/L	
B132456	MKJ	Method Blank	Dissolved Aluminum (Al)	2023/09/30	<0.0030		mg/L	
			Dissolved Chromium (Cr)	2023/09/30	<0.0010		mg/L	

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Bureau Veritas Job #: C376516

Report Date: 2023/10/03

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Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Cobalt (Co)	2023/09/30	<0.00030		mg/L	
			Dissolved Copper (Cu)	2023/09/30	<0.0010		mg/L	
			Dissolved Lead (Pb)	2023/09/30	<0.00020		mg/L	
			Dissolved Antimony (Sb)	2023/09/30	<0.00060		mg/L	
			Dissolved Molybdenum (Mo)	2023/09/30	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2023/09/30	<0.00050		mg/L	
			Dissolved Selenium (Se)	2023/09/30	<0.00020		mg/L	
			Dissolved Silver (Ag)	2023/09/30	<0.00010		mg/L	
			Dissolved Arsenic (As)	2023/09/30	<0.00020		mg/L	
			Dissolved Thallium (Tl)	2023/09/30	<0.00020		mg/L	
			Dissolved Tin (Sn)	2023/09/30	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2023/09/30	<0.0010		mg/L	
			Dissolved Uranium (U)	2023/09/30	<0.00010		mg/L	
			Dissolved Vanadium (V)	2023/09/30	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2023/09/30	<0.0030		mg/L	
			Dissolved Beryllium (Be)	2023/09/30	<0.0010		mg/L	
B133106	JVM	Method Blank	Alkalinity (Total as CaCO ₃)	2023/10/02	<1.0		mg/L	
			Alkalinity (PP as CaCO ₃)	2023/10/02	<1.0		mg/L	
			Bicarbonate (HCO ₃)	2023/10/02	<1.0		mg/L	
			Carbonate (CO ₃)	2023/10/02	<1.0		mg/L	
			Hydroxide (OH)	2023/10/02	<1.0		mg/L	
B133115	JVM	Method Blank	Conductivity	2023/10/02	<2.0		uS/cm	
B133116	JVM	Method Blank	Dissolved Fluoride (F)	2023/10/02	<0.050		mg/L	
B135021	DVN	Method Blank	Total Dissolved Solids	2023/10/03	<10		mg/L	
B132026	VSC	RPD [CAA163-04]	Dissolved Iron (Fe)	2023/10/01	0.13	%	20	
			Dissolved Lithium (Li)	2023/10/01	NC	%	20	
			Dissolved Magnesium (Mg)	2023/10/01	0.42	%	20	
			Dissolved Manganese (Mn)	2023/10/01	0.081	%	20	
			Dissolved Potassium (K)	2023/10/01	0.97	%	20	
			Dissolved Sodium (Na)	2023/10/01	0.64	%	20	
			Dissolved Strontium (Sr)	2023/10/01	0.45	%	20	
			Dissolved Sulphur (S)	2023/10/01	1.9	%	20	
			Dissolved Phosphorus (P)	2023/10/01	NC	%	20	
			Dissolved Barium (Ba)	2023/10/01	0.42	%	20	
			Dissolved Silicon (Si)	2023/10/01	0.46	%	20	
			Dissolved Boron (B)	2023/10/01	13	%	20	
			Dissolved Calcium (Ca)	2023/10/01	0.38	%	20	
B135021	DVN	RPD [CAA164-01]	Total Dissolved Solids	2023/10/03	20	%	20	
B131496	JFE	RPD [CAA167-03]	Phenols	2023/09/29	5.2	%	20	
B131496	JFE	Matrix Spike [CAA167-03]	Phenols	2023/09/29		97	%	80 - 120
B132026	VSC	Matrix Spike [CAA163-04]	Dissolved Iron (Fe)	2023/10/01		NC	%	80 - 120
			Dissolved Lithium (Li)	2023/10/01		95	%	80 - 120
			Dissolved Magnesium (Mg)	2023/10/01		97	%	80 - 120
			Dissolved Manganese (Mn)	2023/10/01		96	%	80 - 120
			Dissolved Potassium (K)	2023/10/01		99	%	80 - 120
			Dissolved Sodium (Na)	2023/10/01		92	%	80 - 120
			Dissolved Strontium (Sr)	2023/10/01		87	%	80 - 120
			Dissolved Sulphur (S)	2023/10/01		99	%	80 - 120
			Dissolved Phosphorus (P)	2023/10/01		104	%	80 - 120
			Dissolved Barium (Ba)	2023/10/01		91	%	80 - 120
			Dissolved Silicon (Si)	2023/10/01		91	%	80 - 120
			Dissolved Boron (B)	2023/10/01		95	%	80 - 120



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Bureau Veritas Job #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B135021	DVN	Matrix Spike [CAA164-01]	Dissolved Calcium (Ca)	2023/10/01	NC	%	80 - 120	
			Total Dissolved Solids	2023/10/03	NC	%	80 - 120	
B127922	RTM	LCS	Total Dissolved Solids	2023/09/29	101	%	80 - 120	
B130069	BQU	LCS	O-TERPHENYL (sur.)	2023/09/30	98	%	60 - 140	
B131304	ISW	LCS	F2 (C10-C16 Hydrocarbons)	2023/09/30	93	%	60 - 140	
			Nitrite (N)	2023/09/29	102	%	80 - 120	
			Nitrate plus Nitrite (N)	2023/09/29	102	%	80 - 120	
B131331	ISW	LCS	Nitrite (N)	2023/09/29	102	%	80 - 120	
			Nitrate plus Nitrite (N)	2023/09/29	100	%	80 - 120	
B131496	JFE	LCS	Phenols	2023/09/29	105	%	80 - 120	
B131643	TOR	LCS	Chloride (Cl)	2023/09/29	98	%	80 - 120	
			Sulphate (SO4)	2023/09/29	103	%	80 - 120	
B131693	RIL	LCS	1,4-Difluorobenzene (sur.)	2023/10/02	94	%	50 - 140	
			4-Bromofluorobenzene (sur.)	2023/10/02	105	%	50 - 140	
			D4-1,2-Dichloroethane (sur.)	2023/10/02	85	%	50 - 140	
			Benzene	2023/10/02	89	%	60 - 130	
			Toluene	2023/10/02	86	%	60 - 130	
			Ethylbenzene	2023/10/02	88	%	60 - 130	
			m & p-Xylene	2023/10/02	90	%	60 - 130	
			o-Xylene	2023/10/02	85	%	60 - 130	
			F1 (C6-C10)	2023/10/02	97	%	60 - 140	
B132026	VSC	LCS	Dissolved Iron (Fe)	2023/10/01	101	%	80 - 120	
			Dissolved Lithium (Li)	2023/10/01	97	%	80 - 120	
			Dissolved Magnesium (Mg)	2023/10/01	102	%	80 - 120	
			Dissolved Manganese (Mn)	2023/10/01	102	%	80 - 120	
			Dissolved Potassium (K)	2023/10/01	100	%	80 - 120	
			Dissolved Sodium (Na)	2023/10/01	96	%	80 - 120	
			Dissolved Strontium (Sr)	2023/10/01	92	%	80 - 120	
			Dissolved Sulphur (S)	2023/10/01	100	%	80 - 120	
			Dissolved Phosphorus (P)	2023/10/01	103	%	80 - 120	
			Dissolved Barium (Ba)	2023/10/01	95	%	80 - 120	
			Dissolved Silicon (Si)	2023/10/01	97	%	80 - 120	
			Dissolved Boron (B)	2023/10/01	95	%	80 - 120	
			Dissolved Calcium (Ca)	2023/10/01	98	%	80 - 120	
B132331	JAB	LCS	Dissolved Aluminum (Al)	2023/09/30	101	%	80 - 120	
			Dissolved Chromium (Cr)	2023/09/30	84	%	80 - 120	
			Dissolved Cobalt (Co)	2023/09/30	87	%	80 - 120	
			Dissolved Copper (Cu)	2023/09/30	85	%	80 - 120	
			Dissolved Lead (Pb)	2023/09/30	85	%	80 - 120	
			Dissolved Antimony (Sb)	2023/09/30	94	%	80 - 120	
			Dissolved Molybdenum (Mo)	2023/09/30	89	%	80 - 120	
			Dissolved Nickel (Ni)	2023/09/30	84	%	80 - 120	
			Dissolved Selenium (Se)	2023/09/30	87	%	80 - 120	
			Dissolved Silver (Ag)	2023/09/30	84	%	80 - 120	
			Dissolved Arsenic (As)	2023/09/30	84	%	80 - 120	
			Dissolved Thallium (Tl)	2023/09/30	83	%	80 - 120	
			Dissolved Tin (Sn)	2023/09/30	91	%	80 - 120	
			Dissolved Titanium (Ti)	2023/09/30	83	%	80 - 120	
			Dissolved Uranium (U)	2023/09/30	84	%	80 - 120	
			Dissolved Vanadium (V)	2023/09/30	87	%	80 - 120	
			Dissolved Zinc (Zn)	2023/09/30	86	%	80 - 120	
			Dissolved Beryllium (Be)	2023/09/30	82	%	80 - 120	



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VERITAS

Bureau Veritas Job #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B132456	MKJ	LCS	Dissolved Aluminum (Al)	2023/10/01	106	%	80 - 120	
			Dissolved Chromium (Cr)	2023/10/01	90	%	80 - 120	
			Dissolved Cobalt (Co)	2023/10/01	92	%	80 - 120	
			Dissolved Copper (Cu)	2023/10/01	91	%	80 - 120	
			Dissolved Lead (Pb)	2023/10/01	90	%	80 - 120	
			Dissolved Antimony (Sb)	2023/10/01	94	%	80 - 120	
			Dissolved Molybdenum (Mo)	2023/10/01	91	%	80 - 120	
			Dissolved Nickel (Ni)	2023/10/01	89	%	80 - 120	
			Dissolved Selenium (Se)	2023/10/01	94	%	80 - 120	
			Dissolved Silver (Ag)	2023/10/01	91	%	80 - 120	
			Dissolved Arsenic (As)	2023/10/01	89	%	80 - 120	
			Dissolved Thallium (Tl)	2023/10/01	91	%	80 - 120	
			Dissolved Tin (Sn)	2023/10/01	92	%	80 - 120	
			Dissolved Titanium (Ti)	2023/10/01	88	%	80 - 120	
			Dissolved Uranium (U)	2023/10/01	89	%	80 - 120	
			Dissolved Vanadium (V)	2023/10/01	92	%	80 - 120	
			Dissolved Zinc (Zn)	2023/10/01	94	%	80 - 120	
			Dissolved Beryllium (Be)	2023/10/01	89	%	80 - 120	
B133106	JVM	LCS	Alkalinity (Total as CaCO ₃)	2023/10/02	100	%	80 - 120	
B133115	JVM	LCS	Conductivity	2023/10/02	100	%	90 - 110	
B133116	JVM	LCS	Dissolved Fluoride (F)	2023/10/02	94	%	80 - 120	
B135021	DVN	LCS	Total Dissolved Solids	2023/10/03	101	%	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 (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

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).

(1) Surrogate recovery exceeds acceptance criteria (high recovery). As results are non-detect, there is no impact on data quality.



BUREAU
VERITAS

Bureau Veritas Job #: C376516

Report Date: 2023/10/03

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223.23600

VALIDATION SIGNATURE PAGE

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

Gita Pokhrel, Laboratory Supervisor

Rahul Suryawanshi, Senior Analyst

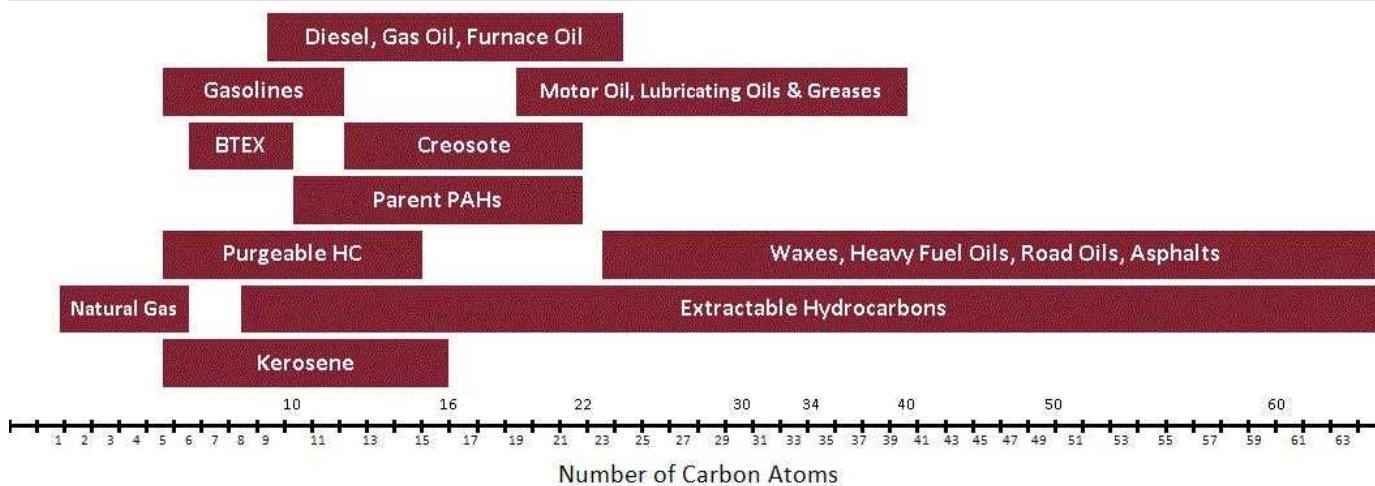
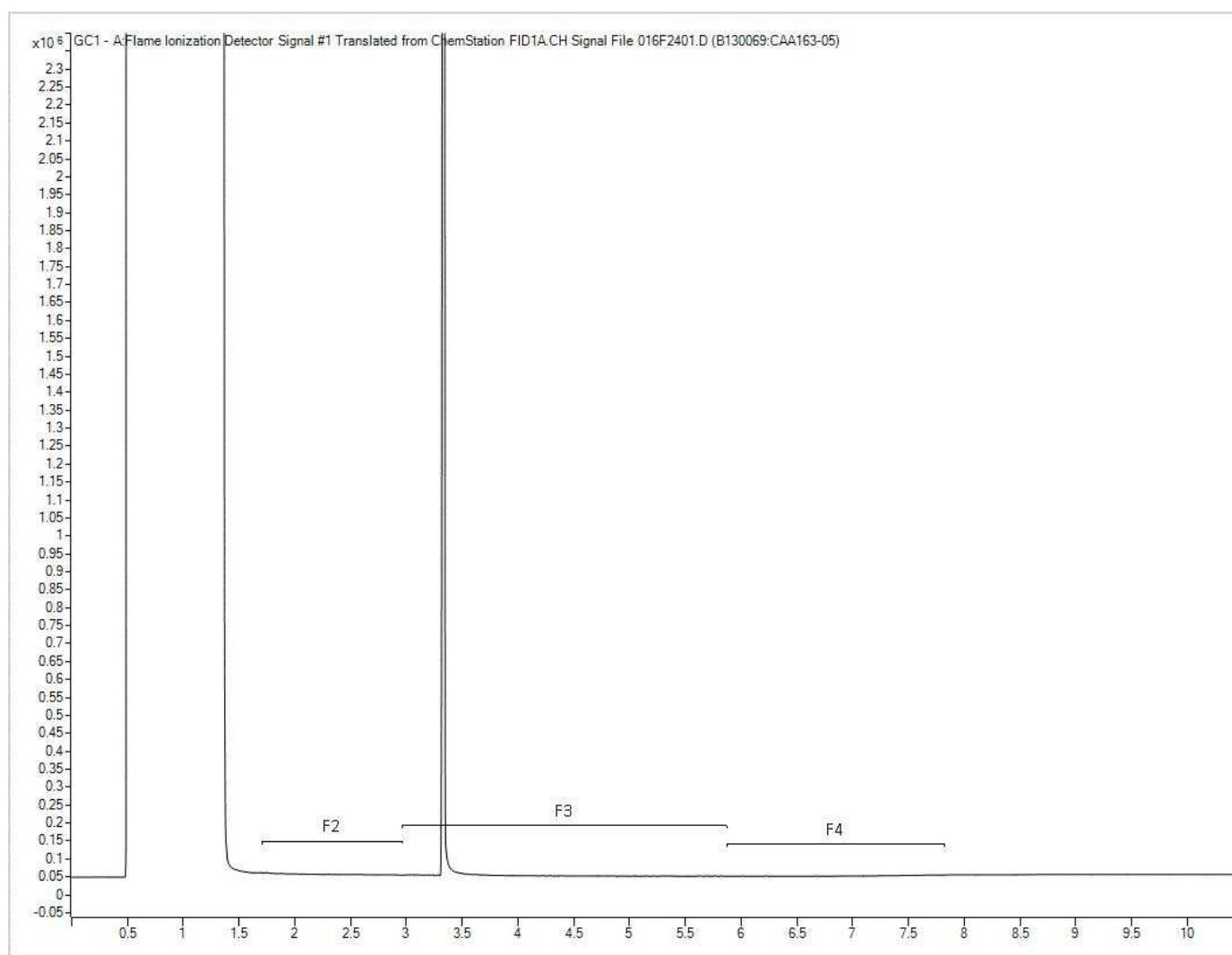
Sandy Yuan, M.Sc., QP, Scientific Specialist

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 Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Scott Cantwell, General Manager responsible for Alberta Environmental laboratory operations.

Bureau Veritas Job #: C376516
Report Date: 2023/10/03
Bureau Veritas Sample: CAA163

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: CPF 98-8-3

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



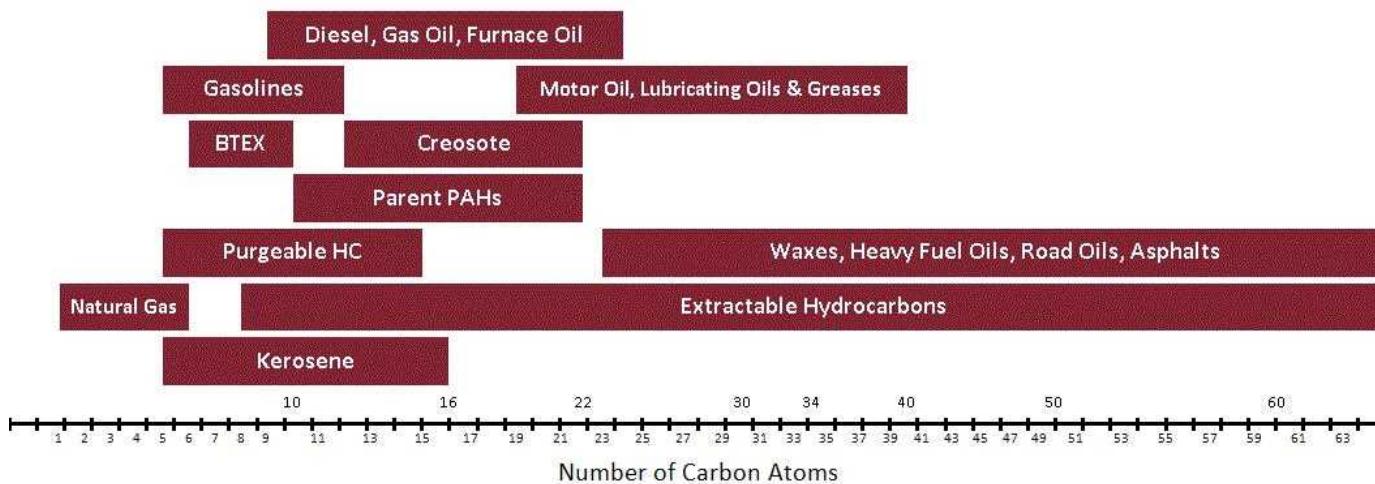
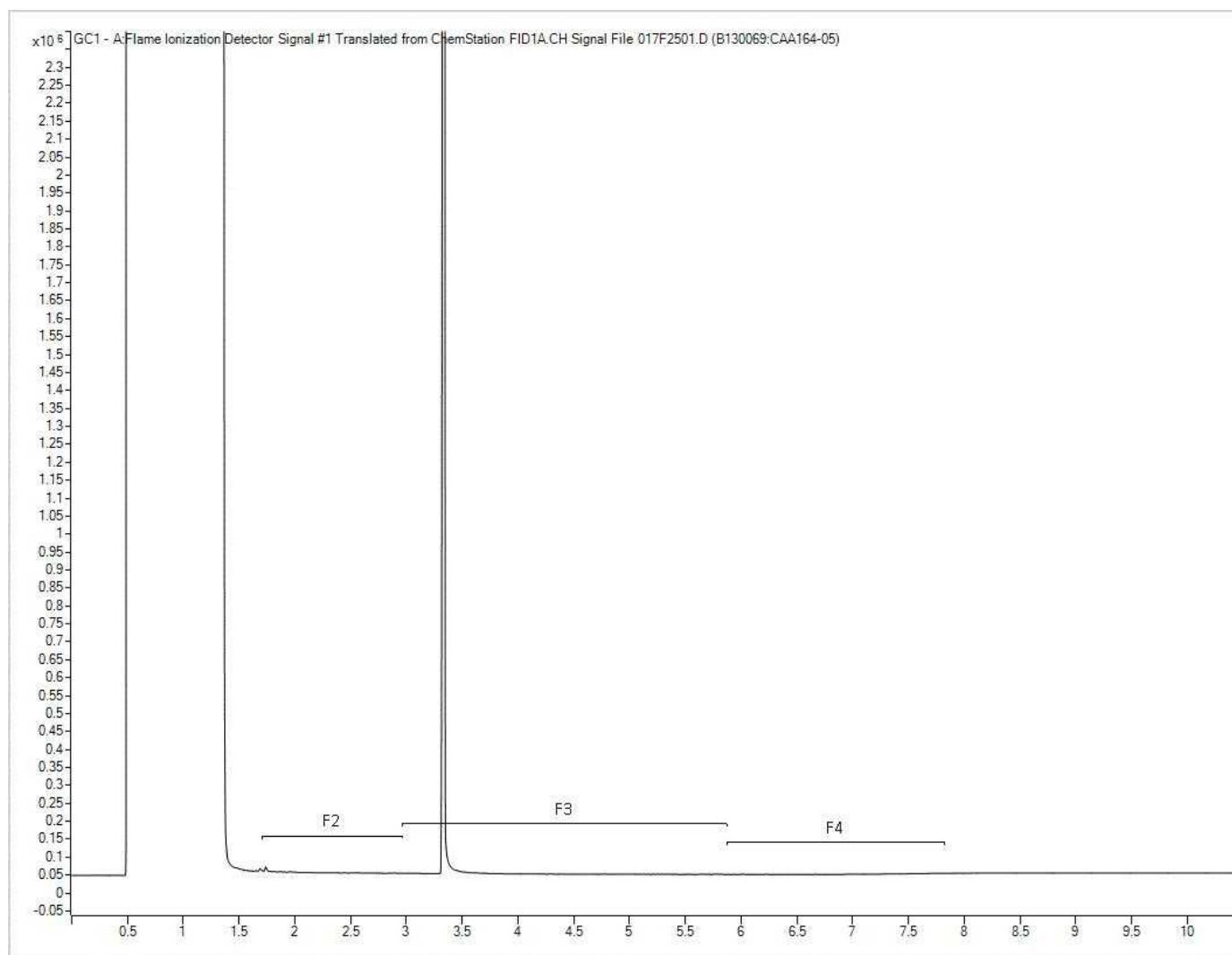
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem19\HPchem\1\DATA\2023\09\RUN0930

Bureau Veritas Job #: C376516
Report Date: 2023/10/03
Bureau Veritas Sample: CAA164

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: ARB-12-3-3

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



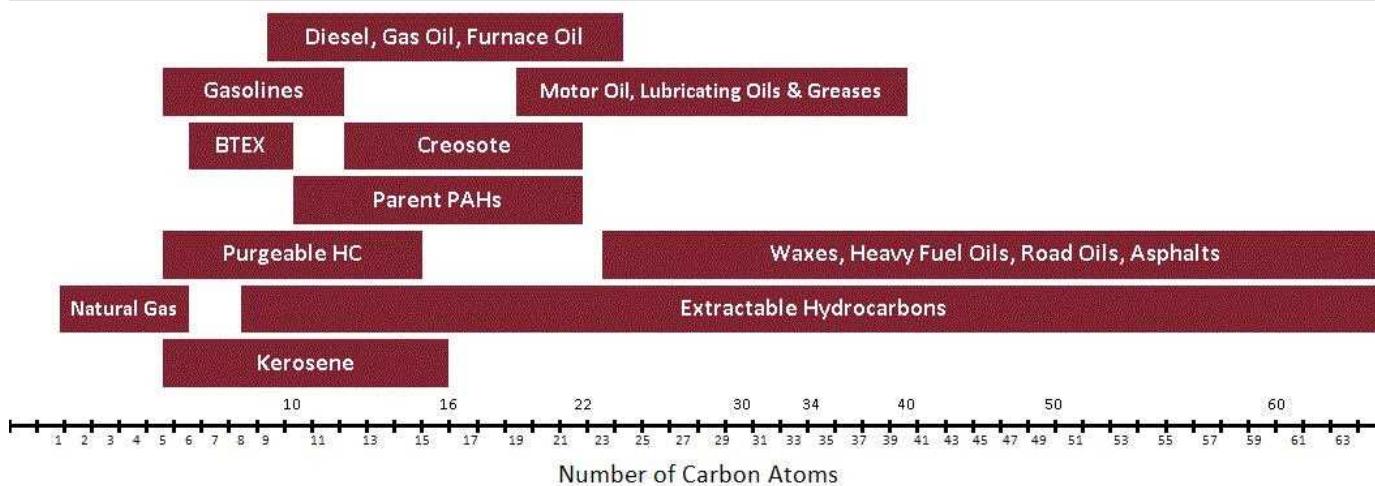
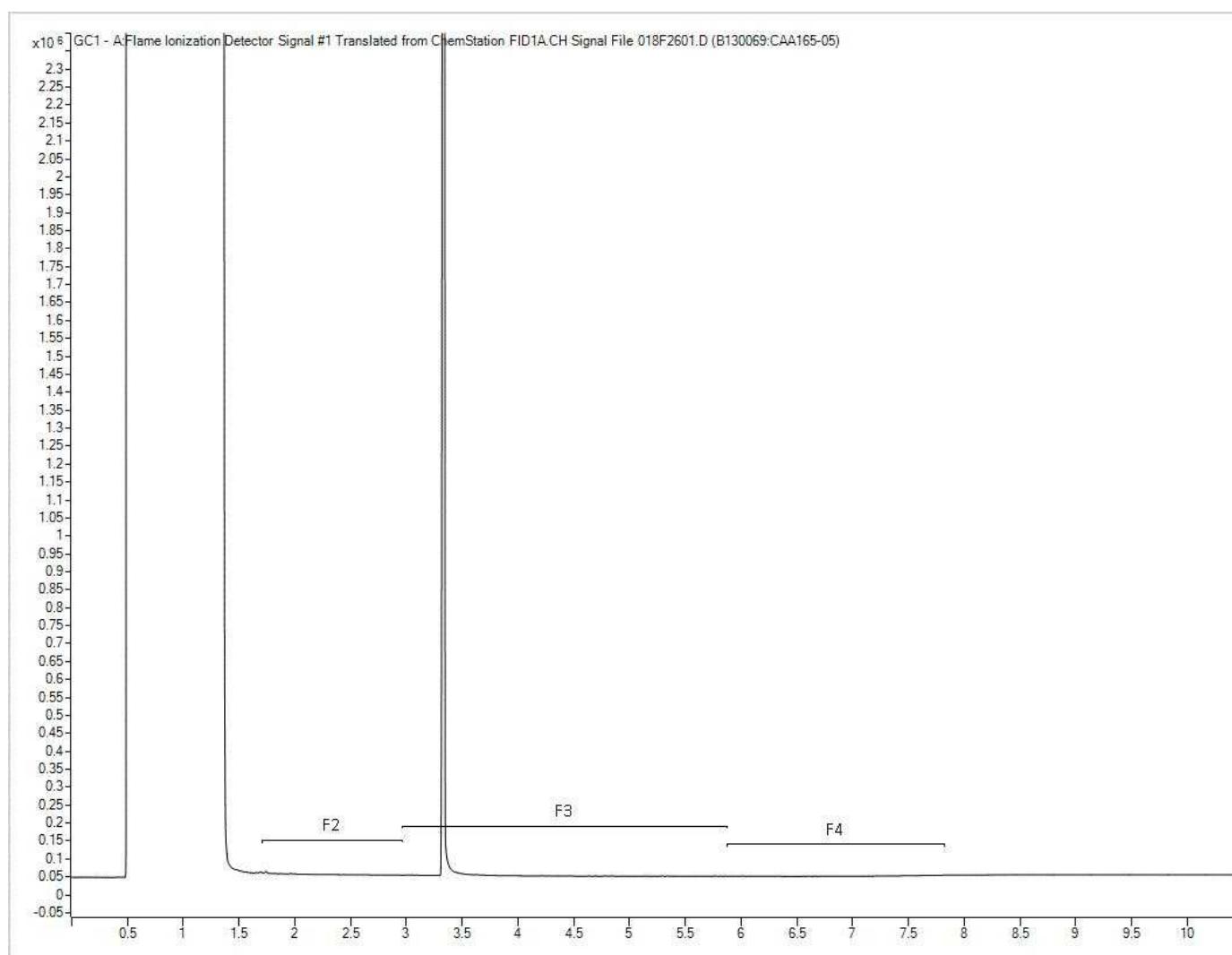
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem19\HPchem\1\DATA\2023\09\RUN0930

Bureau Veritas Job #: C376516
Report Date: 2023/10/03
Bureau Veritas Sample: CAA165

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: MEBG-10-1-3

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



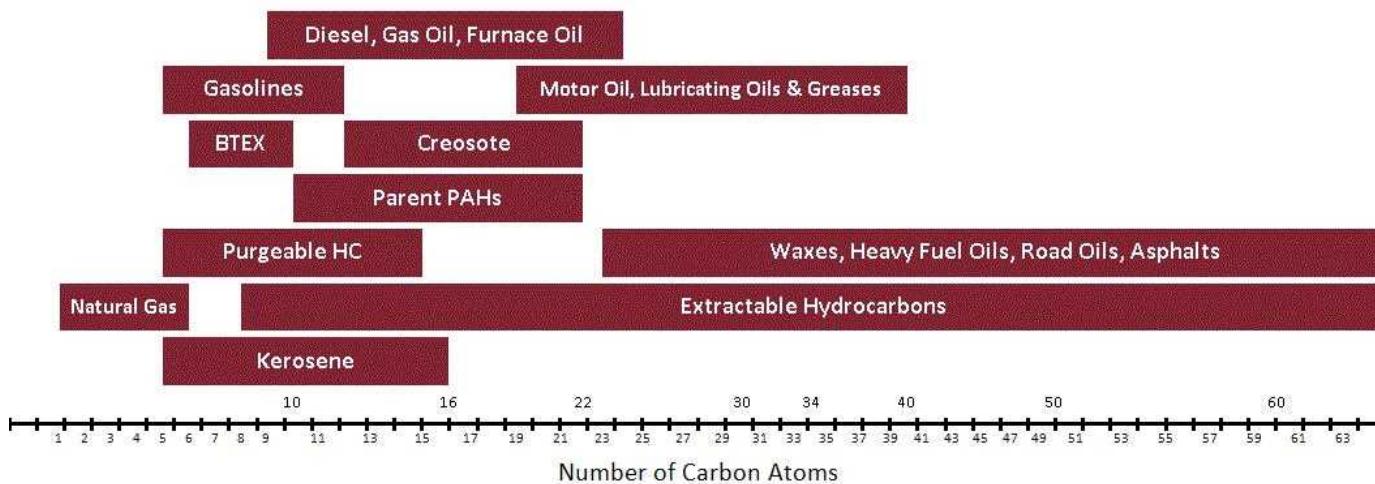
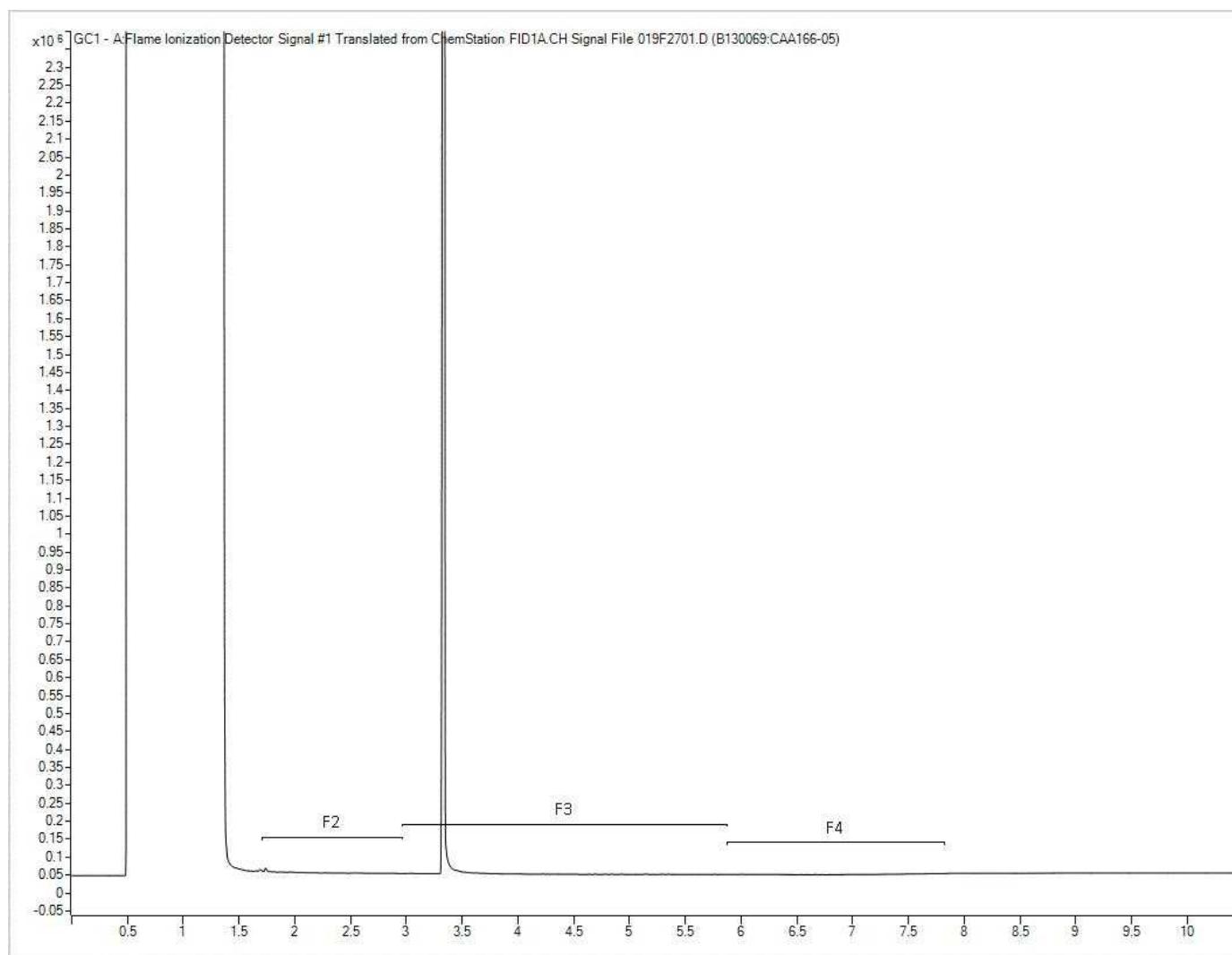
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem19\HPchem\1\DATA\2023\09\RUN0930

Bureau Veritas Job #: C376516
Report Date: 2023/10/03
Bureau Veritas Sample: CAA166

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: FIELD DUPLICATE 1

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



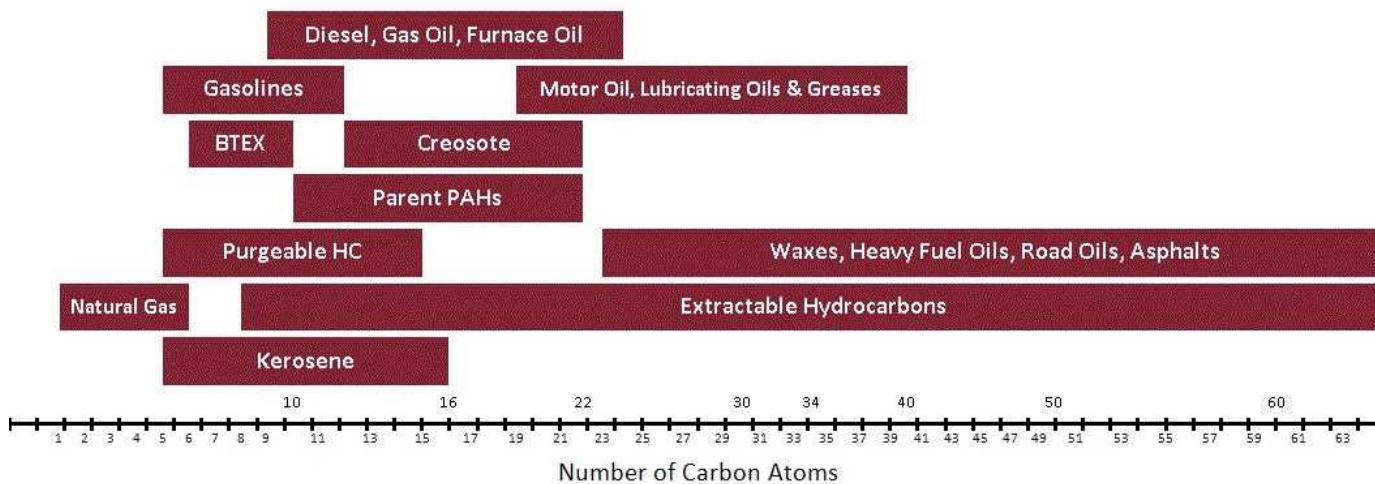
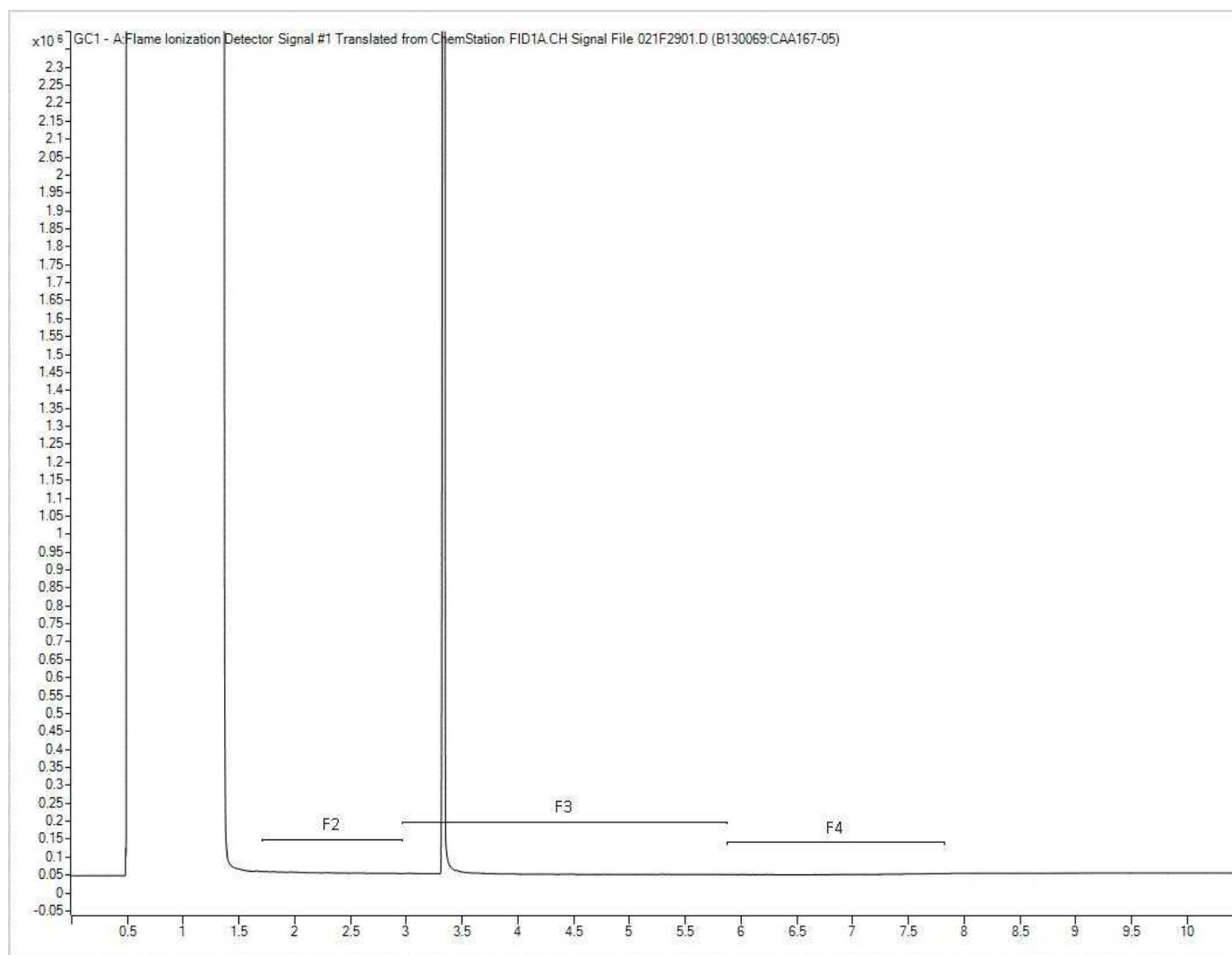
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem19\HPchem\1\DATA\2023\09\RUN0930

Bureau Veritas Job #: C376516
Report Date: 2023/10/03
Bureau Veritas Sample: CAA167

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: C38 08-1-4

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



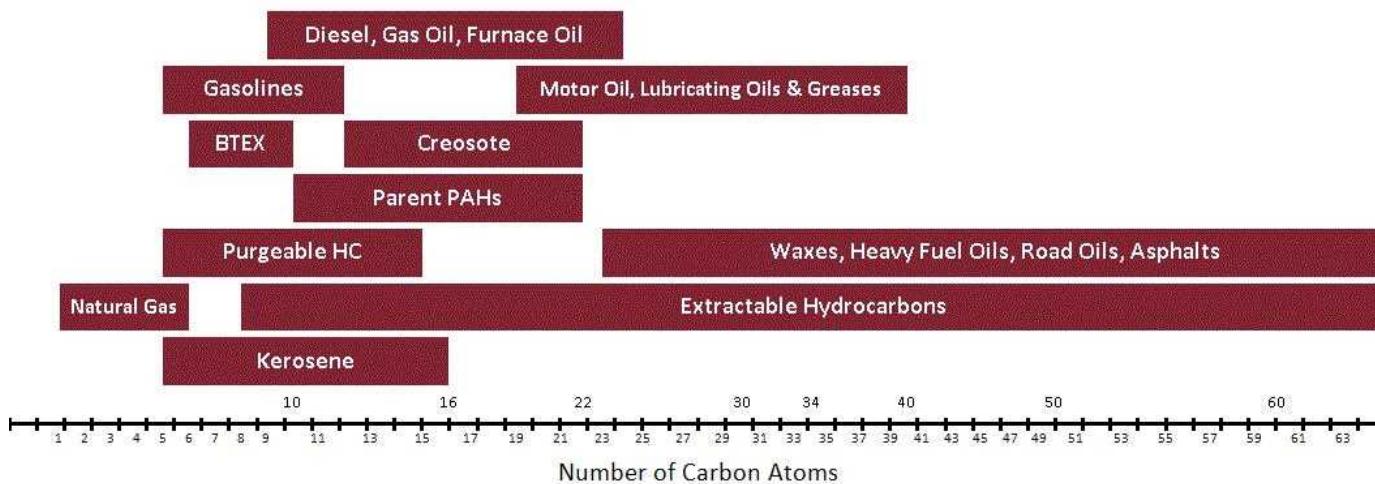
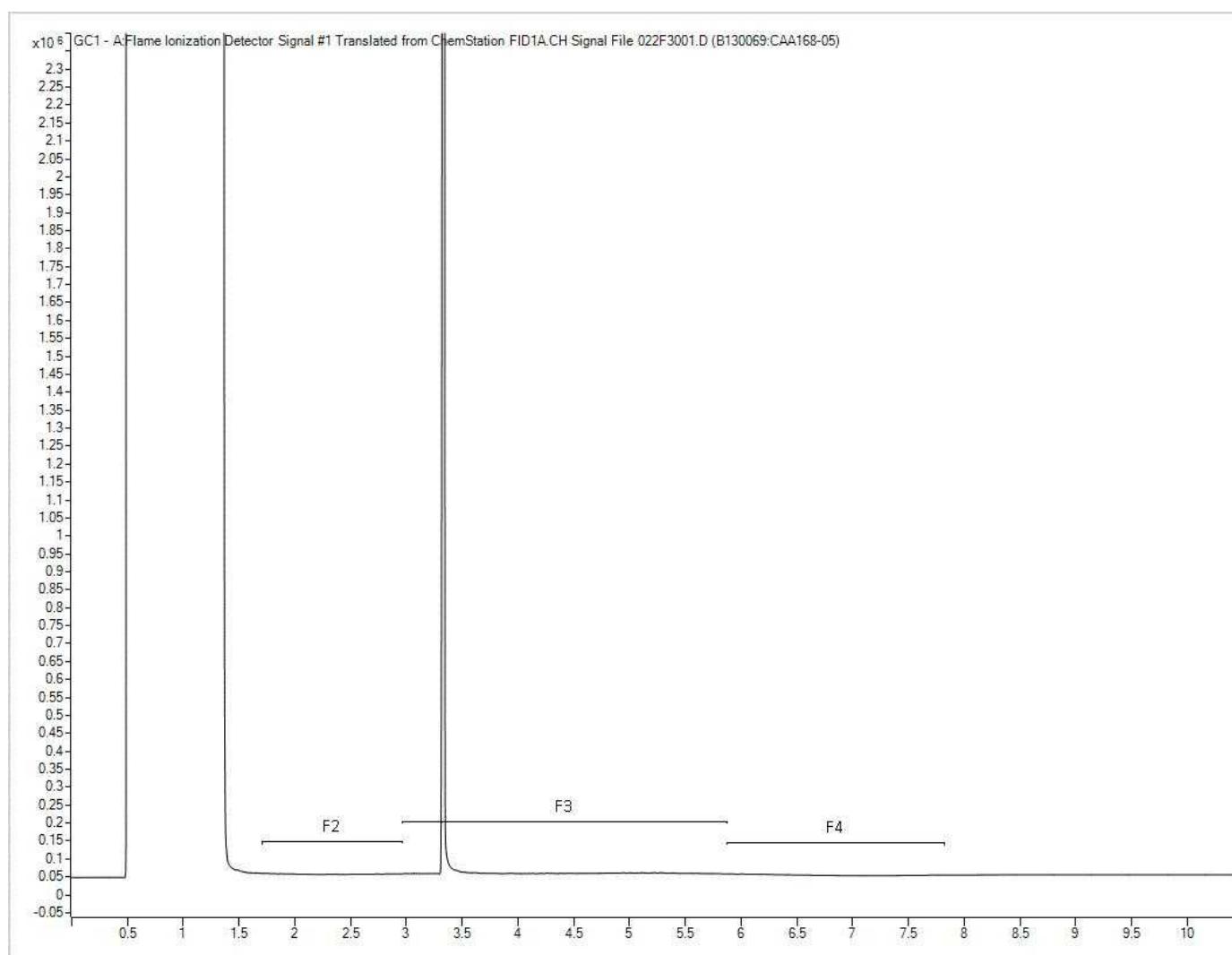
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem19\HPchem\1\DATA\2023\09\RUN0930

Bureau Veritas Job #: C376516
Report Date: 2023/10/03
Bureau Veritas Sample: CAA168

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: TF 03-12-3

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem19\HPchem\1\DATA\2023\09\RUN0930

Calgary
4000 19th St. NE, T2E 6P8
Phone: (403) 291-3077
Fax: (403) 735-2240
Toll Free: (800) 386-7247

Edmonton
9331 - 48 Street, T6B 2R4
Phone: (780) 577-7100
Fax: (780) 450-4187
Toll Free: (800) 386-7247

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

Page 1 of 1

C of C # **299604**

INVOICE INFORMATION				REPORT INFORMATION								ANALYSIS REQUESTED																																						
Company Name: <input checked="" type="checkbox"/> Imperial Oil <input type="checkbox"/> ExxonMobil Contact Name: Alex Haigh Address: 49 Quarry Park Blvd SE Calgary, AB T2C 3E7 Email: alex.haigh@advisian.com Ph: 587-897-6249 Sampler Name (Print): Alex Haigh Stacy Gibb				Company Name: Advisian Contact Name: Alex Haigh Address: 49 Quarry Park Blvd SE Calgary, AB T2C 3E7 Email: alex.haigh@advisian.com Ph: 587-897-6249 Consultant Project #: 417085 - 49223 . 23100								PAH PHCs (FRACTIONS 1-2 PLUS BTEX) PHCs (FRACTIONS 1-4 PLUS BTEX) PHCs (FRACTION 2-4) PHCs (FRACTION 1 PLUS BTEX) GRAIN SIZE (75 MICRON) TEXTURE (% SAND, SILT, CLAY) PARTICLE SIZE DISTRIBUTION WITH GRAPH REGULATED METALS TOT <input type="checkbox"/> DIS <input checked="" type="checkbox"/> MERCURY TOTAL <input type="checkbox"/> DISSOLVED <input type="checkbox"/> SALINITY SOIL FERTILIZER SOIL NUTRIENTS SOIL ROUTINE POTABILITY pH <input type="checkbox"/> EC <input type="checkbox"/> ALKALINITY <input type="checkbox"/> BASIC CLASS II LANDFILL PKG Flouride Phenols by AAP																																						
FIELD SAMPLE ID				MATRIX			SAMPLING		FIELD FILTERED & PRESERVED		LAB FILTRATION REQUIRED		VOC		PAH		PHCs (FRACTIONS 1-2 PLUS BTEX)		PHCs (FRACTIONS 1-4 PLUS BTEX)		PHCs (FRACTION 2-4)		PHCs (FRACTION 1 PLUS BTEX)		GRAIN SIZE (75 MICRON)		TEXTURE (% SAND, SILT, CLAY)		PARTICLE SIZE DISTRIBUTION WITH GRAPH		REGULATED METALS TOT <input type="checkbox"/> DIS <input checked="" type="checkbox"/>		MERCURY TOTAL <input type="checkbox"/> DISSOLVED <input type="checkbox"/>		SALINITY SOIL		FERTILIZER SOIL		NUTRIENTS SOIL		ROUTINE POTABILITY		pH <input type="checkbox"/> EC <input type="checkbox"/> ALKALINITY <input type="checkbox"/>		BASIC CLASS II LANDFILL PKG		Flouride		Phenols by AAP	
				GROUND WATER	SURFACE WATER	SOIL	OTHER	# CONTAINERS	DATE (YYYY/MM/DD)	TIME (24 HR)	FIELD FILTERED & PRESERVED	LAB FILTRATION REQUIRED	VOC	PAH	PHCs (FRACTIONS 1-2 PLUS BTEX)	PHCs (FRACTIONS 1-4 PLUS BTEX)	PHCs (FRACTION 2-4)	PHCs (FRACTION 1 PLUS BTEX)	GRAIN SIZE (75 MICRON)	TEXTURE (% SAND, SILT, CLAY)	PARTICLE SIZE DISTRIBUTION WITH GRAPH	REGULATED METALS TOT <input type="checkbox"/> DIS <input checked="" type="checkbox"/>	MERCURY TOTAL <input type="checkbox"/> DISSOLVED <input type="checkbox"/>	SALINITY SOIL	FERTILIZER SOIL	NUTRIENTS SOIL	ROUTINE POTABILITY	pH <input type="checkbox"/> EC <input type="checkbox"/> ALKALINITY <input type="checkbox"/>	BASIC CLASS II LANDFILL PKG	Flouride	Phenols by AAP																			
1	CPF 98-8-5	X		9	2023/09/24	15:45	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																
2	ARB - 12-3-3	X		9		13:34	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																	
3	MEBG -10-1-3	X		9		13:58	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																	
4	Field Duplicate 1	X		9		14:00	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																		
5	C38 08-1-4	X		9		14:48	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																			
6	TF 03-12-3	X		9		14:26	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																			
7																																																		
8																																																		
9																																																		
10																																																		
IOL SITE LOCATION Norman Wells, NT								REGULATORY CRITERIA / DETECTION LIMITS:								SPECIAL INSTRUCTIONS								# JARS USED & NOT SUBMITTED		TURNAROUND TIME																								
								<input type="checkbox"/> Alberta Tier 1				<input type="checkbox"/> CDWG				<input type="checkbox"/> Canada.chemistry@wurley.com				<input type="checkbox"/> Enter N/A for Water				Standard (5 days) <input checked="" type="checkbox"/>																										
								<input type="checkbox"/> SEQC (SK)				<input type="checkbox"/> NoSC (SK)				<input type="checkbox"/> caca.1DR.data.truck@wurley.com				N/A		Rush (3 days) <input type="checkbox"/>		(2 days) <input type="checkbox"/>		(1 day) <input type="checkbox"/>		(same day) <input type="checkbox"/>																						
								<input checked="" type="checkbox"/> CCME (incl. level)				<input type="checkbox"/> Other				<input type="checkbox"/> stacy.gibb@advisian.com				IES A2601436																														
IOL PROJECT # (if applicable) N/A								MAXXAM TASK ORDER # OR SERVICE ORDER # + LINE ITEM 417085-49223. 23100								Date Required								LAB USE ONLY																										
SEAL PRESENT								YES		NO		COOLER ID #		DATE: TIME (24 HR)								MAXXAM JOB #																												
SEAL INTACT								TEMP °C		6		7		7		SEAL PRESENT		YES		NO		COOLER ID #		Date Required																										
COOLING MEDIA PRESENT								TEMP °C		1		2		3		SEAL INTACT		TEMP °C		1		2		3		LAB USE ONLY																								
RELINQUISHED BY:								DATE:		TIME (24 HR)		RECEIVED BY:		DATE: TIME (24 HR)								MAXXAM JOB #																												
1.		Alex Haigh		2023/09/24		0900		1. <i>OJ</i>		Electra Patel		2023/09/25		15:45		Samples				Labeled By:																														
2.								2.																																										
3.								3.																																										



mca1-09-2341



BUREAU
VERITAS

Task Order#: 417085-49223
Site#: N/A
Site Location: Norman Wells, NWT
Project #: 417085-49223
Your C.O.C. #: 299603

Attention: Alex Haigh

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

Report Date: 2023/10/04
Report #: R3405059
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C376649

Received: 2023/09/25, 15:45

Sample Matrix: Water
Samples Received: 8

Analyses	Quantity	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	6	AB SOP-00005	SM 24 2320 B m
Send Part to Archive	4		
BTEX/F1 in Water by HS GC/MS/FID	7	AB SOP-00039	CCME CWS/EPA 8260d m
F1-BTEX	7		Auto Calc
Cadmium - low level CCME - Dissolved	4		Auto Calc
Chloride/Sulphate by Auto Colourimetry	5	AB SOP-00020	SM24-4500-Cl/SO4-E m
Conductivity @25C	6	AB SOP-00005	SM 24 2510 B m
Fluoride	4	AB SOP-00005	SM 24 4500-F C m
CCME Hydrocarbons in Water (F2; C10-C16) (1)	6	AB SOP-00037 AB SOP-00040	CCME PHC-CWS m
Filtration (Metals)	2		
Hardness	6		Auto Calc
Elements by ICP - Dissolved (2)	4	AB SOP-00042	EPA 6010d R5 m
Elements by ICP-Dissolved-Lab Filtered (2)	2	AB SOP-00042	EPA 6010d R5 m
Elements by ICPMS - Dissolved (2)	4	AB SOP-00043	EPA 6020b R2 m
Ion Balance	5		Auto Calc
Nitrate and Nitrite	5		Auto Calc
NO2 (N); NO2 (N) + NO3 (N) in Water	5	AB SOP-00091	SM 24 4500 NO3m
Nitrate (as N)	5		Auto Calc
Phenols (4-AAP)	4	AB SOP-00088	EPA 9066 R0 m
Total Dissolved Solids (Filt. Residue)	6	AB SOP-00065	SM 24 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

Attention: Alex Haigh

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

Task Order#: 417085-49223
Site#: N/A
Site Location: Norman Wells, NWT
Project #: 417085-49223
Your C.O.C. #: 299603

Report Date: 2023/10/04
Report #: R3405059
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C376649

Received: 2023/09/25, 15:45

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

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Reference Method suffix "n" 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) Silica gel clean up employed.

(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:

Namita Sahni, Customer Solutions Representative
Email: Namita.Sahni@bureauveritas.com
Phone# (604)639-2614

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BUREAU
VERITAS

Bureau Veritas Job #: C376649

Report Date: 2023/10/04

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

AT1 BTEX AND F1-F2 IN WATER (WATER)

Bureau Veritas ID		CAA773	CAA774	CAA775	CAA776	CAA779	CAA780		
Sampling Date		2023/09/23 12:34	2023/09/23 09:29	2023/09/23 11:53	2023/09/23 10:39	2023/09/23 16:30	2023/09/23 17:00		
COC Number		299603	299603	299603	299603	299603	299603		
	UNITS	BIBG-10-1-4	MTF97-1-6	BI-13-3-4.5	GIQ8-10-2-4	FIELD BLANK	TRIP BLANK	RDL	QC Batch
Ext. Pet. Hydrocarbon									
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	0.10	<0.10	<0.10	0.10	B130069
Volatiles									
Benzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	B129709
Toluene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	B129709
Ethylbenzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	B129709
m & p-Xylene	mg/L	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080	0.00080	B129709
o-Xylene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	B129709
Xylenes (Total)	mg/L	<0.00089	<0.00089	<0.00089	<0.00089	<0.00089	<0.00089	0.00089	B127626
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	B127626
F1 (C6-C10)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	B129709
Extraction									
Surrogate Recovery (%)									
O-TERPHENYL (sur.)	%	95	96	99	98	96	96		B130069
Instrument									
Surrogate Recovery (%)									
1,4-Difluorobenzene (sur.)	%	99	102	101	100	104	102		B129709
4-Bromofluorobenzene (sur.)	%	100	100	100	102	97	98		B129709
D4-1,2-Dichloroethane (sur.)	%	94	98	97	95	98	98		B129709

RDL = Reportable Detection Limit



BUREAU
VERITAS

Bureau Veritas Job #: C376649

Report Date: 2023/10/04

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

IOL ROUTINE WATER - LAB FILTRATION (WATER)

Bureau Veritas ID		CAA777			CAA778		
Sampling Date		2023/09/23 11:01			2023/09/23 12:14		
COC Number		299603			299603		
	UNITS	GIP1109-1-4-R	RDL	QC Batch	BIS97-1-3	RDL	QC Batch
Calculated Parameters							
Hardness (CaCO ₃)	mg/L	410	0.50	B127628	960	0.50	B130551
Ion Balance (% Difference)	%	0.73	N/A	B127225			
Nitrate (N)	mg/L	1.2	0.050	B127581			
Nitrate (NO ₃)	mg/L	5.1	0.22	B127580			
Nitrite (NO ₂)	mg/L	0.18	0.033	B127580			
Misc. Inorganics							
Conductivity	uS/cm	730	2.0	B133092	1900	2.0	B133092
Total Dissolved Solids	mg/L	630 (1)	25	B127920	2700	17	B127920
Anions							
Alkalinity (PP as CaCO ₃)	mg/L	<1.0	1.0	B133084	<1.0	1.0	B133084
Alkalinity (Total as CaCO ₃)	mg/L	340	1.0	B133084	670	1.0	B133084
Bicarbonate (HCO ₃)	mg/L	420	1.0	B133084	820	1.0	B133084
Carbonate (CO ₃)	mg/L	<1.0	1.0	B133084	<1.0	1.0	B133084
Hydroxide (OH)	mg/L	<1.0	1.0	B133084	<1.0	1.0	B133084
Chloride (Cl)	mg/L	8.0	1.0	B134446			
Sulphate (SO ₄)	mg/L	63	1.0	B134446			
Nutrients							
Nitrite (N)	mg/L	0.054	0.010	B134290			
Nitrate plus Nitrite (N)	mg/L	1.2	0.050	B134290			
Lab Filtered Elements							
Dissolved Barium (Ba)	mg/L	0.15	0.050	B134032	<0.20	0.20	B134032
Dissolved Boron (B)	mg/L	<0.10	0.10	B134032	<0.40	0.40	B134032
Dissolved Calcium (Ca)	mg/L	120	1.5	B134032	220	6.0	B134032
Dissolved Iron (Fe)	mg/L	<0.30	0.30	B134032	<1.2	1.2	B134032
Dissolved Lithium (Li)	mg/L	<0.10	0.10	B134032	<0.40	0.40	B134032
Dissolved Magnesium (Mg)	mg/L	26	1.0	B134032	100	4.0	B134032
Dissolved Manganese (Mn)	mg/L	0.025	0.020	B134032	0.28	0.080	B134032
Dissolved Phosphorus (P)	mg/L	<0.50	0.50	B134032	<2.0	2.0	B134032
Dissolved Potassium (K)	mg/L	3.1	1.5	B134032	<6.0	6.0	B134032
RDL = Reportable Detection Limit							
N/A = Not Applicable							
(1) Detection limit raised based on sample volume used for analysis.							



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VERITAS

Bureau Veritas Job #: C376649

Report Date: 2023/10/04

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Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

IOL ROUTINE WATER - LAB FILTRATION (WATER)

Bureau Veritas ID		CAA777			CAA778		
Sampling Date		2023/09/23 11:01			2023/09/23 12:14		
COC Number		299603			299603		
	UNITS	GIP1109-1-4-R	RDL	QC Batch	BIS97-1-3	RDL	QC Batch
Dissolved Silicon (Si)	mg/L	3.7	2.5	B134032	<10	10	B134032
Dissolved Sodium (Na)	mg/L	10	2.5	B134032	23	10	B134032
Dissolved Strontium (Sr)	mg/L	0.58	0.10	B134032	1.0	0.40	B134032
Dissolved Sulphur (S)	mg/L	20	1.0	B134032	160	4.0	B134032
RDL = Reportable Detection Limit							



BUREAU
VERITAS

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Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

IOL ROUTINE WATER (WATER)

Bureau Veritas ID		CAA773		CAA774			CAA775		CAA776		
Sampling Date		2023/09/23 12:34		2023/09/23 09:29			2023/09/23 11:53		2023/09/23 10:39		
COC Number		299603		299603			299603		299603		
	UNITS	BIBG-10-1-4	RDL	MTF97-1-6	RDL	QC Batch	BI-13-3-4.5	RDL	GIQ8-10-2-4	RDL	QC Batch
Calculated Parameters											
Hardness (CaCO ₃)	mg/L	910	0.50	1100	0.50	B127628	1400	0.50	1500	0.50	B127628
Ion Balance (% Difference)	%	2.8	N/A	0.32	N/A	B127225	4.0	N/A	3.4	N/A	B127650
Nitrate (N)	mg/L	0.077	0.010	2.9	0.050	B127581	<0.050	0.050	<0.050	0.050	B127581
Nitrate (NO ₃)	mg/L	0.34	0.044	13	0.22	B127580	<0.22	0.22	<0.22	0.22	B127580
Nitrite (NO ₂)	mg/L	<0.033	0.033	<0.033	0.033	B127580	<0.033	0.033	<0.16	0.16	B127580
Misc. Inorganics											
Conductivity	uS/cm	1400	2.0	1700	2.0	B130107	2100	2.0	2400	2.0	B130107
Total Dissolved Solids	mg/L	1000	10	1300	10	B127920	1800	10	1800 (1)	25	B127920
Anions											
Alkalinity (PP as CaCO ₃)	mg/L	<1.0	1.0	<1.0	1.0	B130102	<1.0	1.0	<1.0	1.0	B130102
Alkalinity (Total as CaCO ₃)	mg/L	520	1.0	470	1.0	B130102	380	1.0	740	1.0	B130102
Bicarbonate (HCO ₃)	mg/L	630	1.0	570	1.0	B130102	460	1.0	900	1.0	B130102
Carbonate (CO ₃)	mg/L	<1.0	1.0	<1.0	1.0	B130102	<1.0	1.0	<1.0	1.0	B130102
Hydroxide (OH)	mg/L	<1.0	1.0	<1.0	1.0	B130102	<1.0	1.0	<1.0	1.0	B130102
Chloride (Cl)	mg/L	11	1.0	1.5	1.0	B129331	7.9	1.0	30	1.0	B129331
Sulphate (SO ₄)	mg/L	330	5.0	580	5.0	B129331	1100	25	940	10	B129331
Nutrients											
Nitrite (N)	mg/L	<0.010	0.010	<0.010	0.010	B129262	<0.010	0.010	<0.050 (2)	0.050	B129262
Nitrate plus Nitrite (N)	mg/L	0.077	0.010	2.9	0.050	B129262	<0.050 (2)	0.050	<0.050 (2)	0.050	B129262
Elements											
Dissolved Barium (Ba)	mg/L	0.032	0.010	0.028	0.010	B132018	0.065	0.010	0.14	0.010	B132018
Dissolved Boron (B)	mg/L	<0.020	0.020	0.052	0.020	B132018	<0.020	0.020	0.023	0.020	B132018
Dissolved Calcium (Ca)	mg/L	270	0.30	290	0.30	B132018	320	0.30	430	0.30	B132018
Dissolved Iron (Fe)	mg/L	<0.060	0.060	<0.060	0.060	B132018	1.3	0.060	13	0.060	B132018
Dissolved Lithium (Li)	mg/L	<0.020	0.020	<0.020	0.020	B132018	<0.020	0.020	0.024	0.020	B132018
Dissolved Magnesium (Mg)	mg/L	58	0.20	84	0.20	B132018	150	0.20	110	0.20	B132018
Dissolved Manganese (Mn)	mg/L	0.16	0.0040	<0.0040	0.0040	B132018	0.48	0.0040	6.8	0.0040	B132018
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	<0.10	0.10	B132018	<0.10	0.10	<0.10	0.10	B132018

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 #: C376649

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Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

IOL ROUTINE WATER (WATER)

Bureau Veritas ID		CAA773		CAA774			CAA775		CAA776		
Sampling Date		2023/09/23 12:34		2023/09/23 09:29			2023/09/23 11:53		2023/09/23 10:39		
COC Number		299603		299603			299603		299603		
	UNITS	BIBG-10-1-4	RDL	MTF97-1-6	RDL	QC Batch	BI-13-3-4.5	RDL	GIQ8-10-2-4	RDL	QC Batch
Dissolved Potassium (K)	mg/L	0.99	0.30	2.0	0.30	B132018	3.7	0.30	3.9	0.30	B132018
Dissolved Silicon (Si)	mg/L	3.6	0.50	4.9	0.50	B132018	4.5	0.50	6.7	0.50	B132018
Dissolved Sodium (Na)	mg/L	5.3	0.50	4.4	0.50	B132018	12	0.50	30	0.50	B132018
Dissolved Strontium (Sr)	mg/L	0.63	0.020	0.60	0.020	B132018	0.96	0.020	1.7	0.020	B132018
Dissolved Sulphur (S)	mg/L	130	0.20	220	0.20	B132018	340	0.20	280	0.20	B132018

RDL = Reportable Detection Limit



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Report Date: 2023/10/04

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CAA773	CAA774	CAA775	CAA776		
Sampling Date		2023/09/23 12:34	2023/09/23 09:29	2023/09/23 11:53	2023/09/23 10:39		
COC Number		299603	299603	299603	299603		
	UNITS	BIBG-10-1-4	MTF97-1-6	BI-13-3-4.5	GIQ8-10-2-4	RDL	QC Batch
Elements							
Dissolved Cadmium (Cd)	mg/L	0.00013	0.00016	0.00023	0.00011	0.000020	B127578
Anions							
Dissolved Fluoride (F)	mg/L	0.36	0.12	0.26	<0.050	0.050	B130109
Misc. Organics							
Phenols	mg/L	<0.0015	<0.0015	<0.0015	<0.0015	0.0015	B130497
RDL = Reportable Detection Limit							



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Project #: 417085-49223

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CAA773	CAA773	CAA774	CAA775	CAA776		
Sampling Date		2023/09/23 12:34	2023/09/23 12:34	2023/09/23 09:29	2023/09/23 11:53	2023/09/23 10:39		
COC Number		299603	299603	299603	299603	299603		
	UNITS	BIBG-10-1-4 Lab-Dup		MTF97-1-6	BI-13-3-4.5	GIQ8-10-2-4	RDL	QC Batch
Elements								
Dissolved Aluminum (Al)	mg/L	0.0036	0.0034	<0.0030	0.0036	0.0065	0.0030	B129460
Dissolved Antimony (Sb)	mg/L	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	0.00060	B129460
Dissolved Arsenic (As)	mg/L	<0.00020	0.00026	<0.00020	0.0011	0.0013	0.00020	B129460
Dissolved Beryllium (Be)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	B129460
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	B129460
Dissolved Cobalt (Co)	mg/L	0.00031	0.00036	<0.00030	0.0033	0.023	0.00030	B129460
Dissolved Copper (Cu)	mg/L	0.0015	0.0015	0.0023	<0.0010	<0.0010	0.0010	B129460
Dissolved Lead (Pb)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	B129460
Dissolved Molybdenum (Mo)	mg/L	0.043	0.044	0.014	0.016	0.0014	0.00020	B129460
Dissolved Nickel (Ni)	mg/L	0.0054	0.0056	0.0046	0.045	0.033	0.00050	B129460
Dissolved Selenium (Se)	mg/L	0.00099	0.00097	0.14	0.00087	0.00041	0.00020	B129460
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	B129460
Dissolved Thallium (Tl)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	B129460
Dissolved Tin (Sn)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	B129460
Dissolved Titanium (Ti)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	B129460
Dissolved Uranium (U)	mg/L	0.017	0.018	0.025	0.018	0.010	0.00010	B129460
Dissolved Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	B129460
Dissolved Zinc (Zn)	mg/L	0.0046	0.0047	0.0045	0.049	0.016	0.0030	B129460

RDL = Reportable Detection Limit

Lab-Dup = Laboratory Initiated Duplicate



BUREAU
VERITAS

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Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

VOLATILE ORGANICS BY GC-MS (WATER)

Bureau Veritas ID		CAA778		
Sampling Date		2023/09/23 12:14		
COC Number		299603		
	UNITS	BIS97-1-3	RDL	QC Batch
Volatiles				
Benzene	mg/L	<0.00040	0.00040	B129709
Toluene	mg/L	<0.00040	0.00040	B129709
Ethylbenzene	mg/L	<0.00040	0.00040	B129709
m & p-Xylene	mg/L	<0.00080	0.00080	B129709
o-Xylene	mg/L	<0.00040	0.00040	B129709
Xylenes (Total)	mg/L	<0.00089	0.00089	B127626
F1 (C6-C10) - BTEX	mg/L	<0.10	0.10	B127626
F1 (C6-C10)	mg/L	<0.10	0.10	B129709
Instrument				
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	104		B129709
4-Bromofluorobenzene (sur.)	%	103		B129709
D4-1,2-Dichloroethane (sur.)	%	100		B129709
RDL = Reportable Detection Limit				

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VERITAS

Bureau Veritas Job #: C376649

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Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

TEST SUMMARY

Bureau Veritas ID: CAA773 **Collected:** 2023/09/23
Sample ID: BIBG-10-1-4 **Relinquished:** 2023/09/24
Matrix: Water **Received:** 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B130102	N/A	2023/10/01	Karen Graham
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B129709	N/A	2023/09/30	Stephane Nadon
F1-BTEX	CALC/MS	B127626	N/A	2023/09/30	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B127578	N/A	2023/09/29	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B129331	N/A	2023/09/28	Tyler Orr
Conductivity @25C	COND	B130107	N/A	2023/10/01	Karen Graham
Fluoride	AT	B130109	N/A	2023/10/01	Karen Graham
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B130069	2023/09/29	2023/09/30	Bryanna Quach
Hardness	CALC	B127628	N/A	2023/10/02	Automated Statchk
Elements by ICP - Dissolved	ICPA	B132018	N/A	2023/10/01	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B129460	N/A	2023/09/29	Jason Bao
Ion Balance	CALC	B127225	N/A	2023/10/02	Automated Statchk
Nitrate and Nitrite	CALC	B127580	N/A	2023/09/30	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B129262	N/A	2023/09/30	Isabelle White
Nitrate (as N)	CALC	B127581	2023/09/30	2023/09/30	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B130497	N/A	2023/09/29	Joshua Fine
Total Dissolved Solids (Filt. Residue)	BAL	B127920	2023/09/28	2023/09/29	Daryl Viktoria Noval

Bureau Veritas ID: CAA773 Dup **Collected:** 2023/09/23
Sample ID: BIBG-10-1-4 **Relinquished:** 2023/09/24
Matrix: Water **Received:** 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICPMS - Dissolved	ICPM	B129460	N/A	2023/09/29	Jason Bao

Bureau Veritas ID: CAA774 **Collected:** 2023/09/23
Sample ID: MTF97-1-6 **Relinquished:** 2023/09/24
Matrix: Water **Received:** 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B130102	N/A	2023/10/01	Karen Graham
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B129709	N/A	2023/09/30	Stephane Nadon
F1-BTEX	CALC/MS	B127626	N/A	2023/09/30	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B127578	N/A	2023/09/29	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B129331	N/A	2023/09/28	Tyler Orr
Conductivity @25C	COND	B130107	N/A	2023/10/01	Karen Graham
Fluoride	AT	B130109	N/A	2023/10/01	Karen Graham
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B130069	2023/09/29	2023/09/30	Bryanna Quach
Hardness	CALC	B127628	N/A	2023/10/02	Automated Statchk
Elements by ICP - Dissolved	ICPA	B132018	N/A	2023/10/01	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B129460	N/A	2023/09/28	Jason Bao
Ion Balance	CALC	B127225	N/A	2023/10/02	Automated Statchk
Nitrate and Nitrite	CALC	B127580	N/A	2023/09/30	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B129262	N/A	2023/09/29	Isabelle White



BUREAU
VERITAS

Bureau Veritas Job #: C376649

Report Date: 2023/10/04

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

TEST SUMMARY

Bureau Veritas ID: CAA774	Collected: 2023/09/23
Sample ID: MTF97-1-6	Relinquished: 2023/09/24
Matrix: Water	Received: 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (as N)	CALC	B127581	2023/09/30	2023/09/30	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B130497	N/A	2023/09/29	Joshua Fine
Total Dissolved Solids (Filt. Residue)	BAL	B127920	2023/09/28	2023/09/29	Daryl Viktoria Noval

Bureau Veritas ID: CAA775	Collected: 2023/09/23
Sample ID: BI-13-3-4.5	Relinquished: 2023/09/24
Matrix: Water	Received: 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B130102	N/A	2023/10/01	Karen Graham
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B129709	N/A	2023/09/30	Stephane Nadon
F1-BTEX	CALC/MS	B127626	N/A	2023/09/30	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B127578	N/A	2023/09/29	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B129331	N/A	2023/09/28	Tyler Orr
Conductivity @25C	COND	B130107	N/A	2023/10/01	Karen Graham
Fluoride	AT	B130109	N/A	2023/10/01	Karen Graham
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B130069	2023/09/29	2023/09/30	Bryanna Quach
Hardness	CALC	B127628	N/A	2023/10/02	Automated Statchk
Elements by ICP - Dissolved	ICPA	B132018	N/A	2023/10/01	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B129460	N/A	2023/09/28	Jason Bao
Ion Balance	CALC	B127650	N/A	2023/10/02	Automated Statchk
Nitrate and Nitrite	CALC	B127580	N/A	2023/09/30	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B129262	N/A	2023/09/30	Isabelle White
Nitrate (as N)	CALC	B127581	2023/09/30	2023/09/30	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B130497	N/A	2023/09/29	Joshua Fine
Total Dissolved Solids (Filt. Residue)	BAL	B127920	2023/09/28	2023/09/29	Daryl Viktoria Noval

Bureau Veritas ID: CAA776	Collected: 2023/09/23
Sample ID: GIQ8-10-2-4	Relinquished: 2023/09/24
Matrix: Water	Received: 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B130102	N/A	2023/10/01	Karen Graham
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B129709	N/A	2023/09/30	Stephane Nadon
F1-BTEX	CALC/MS	B127626	N/A	2023/09/30	Automated Statchk
Cadmium - low level CCME - Dissolved	CALC/MS	B127578	N/A	2023/09/29	Automated Statchk
Chloride/Sulphate by Auto Colourimetry	KONE	B129331	N/A	2023/09/28	Tyler Orr
Conductivity @25C	COND	B130107	N/A	2023/10/01	Karen Graham
Fluoride	AT	B130109	N/A	2023/10/01	Karen Graham
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B130069	2023/09/29	2023/09/30	Bryanna Quach
Hardness	CALC	B127628	N/A	2023/10/02	Automated Statchk
Elements by ICP - Dissolved	ICPA	B132018	N/A	2023/10/01	Vincy Scaria
Elements by ICPMS - Dissolved	ICPM	B129460	N/A	2023/09/28	Jason Bao
Ion Balance	CALC	B127650	N/A	2023/10/02	Automated Statchk

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VERITAS

Bureau Veritas Job #: C376649

Report Date: 2023/10/04

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

TEST SUMMARY

Bureau Veritas ID: CAA776 **Collected:** 2023/09/23
Sample ID: GIQ8-10-2-4 **Relinquished:** 2023/09/24
Matrix: Water **Received:** 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate and Nitrite	CALC	B127580	N/A	2023/10/02	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B129262	N/A	2023/09/30	Isabelle White
Nitrate (as N)	CALC	B127581	2023/10/02	2023/10/02	Automated Statchk
Phenols (4-AAP)	TECH/4AAP	B130497	N/A	2023/09/29	Joshua Fine
Total Dissolved Solids (Filt. Residue)	BAL	B127920	2023/09/28	2023/09/29	Daryl Viktoria Noval

Bureau Veritas ID: CAA777 **Collected:** 2023/09/23
Sample ID: GIP1109-1-4-R **Relinquished:** 2023/09/24
Matrix: Water **Received:** 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B133084	N/A	2023/10/02	Jeanette Chavol Melo
Chloride/Sulphate by Auto Colourimetry	KONE	B134446	N/A	2023/10/02	Tyler Orr
Conductivity @25C	COND	B133092	N/A	2023/10/02	Jeanette Chavol Melo
Hardness	CALC	B127628	N/A	2023/10/03	Automated Statchk
Elements by ICP-Dissolved-Lab Filtered	ICPA	B134032	N/A	2023/10/03	Ilonka Kovac
Ion Balance	CALC	B127225	N/A	2023/10/03	Automated Statchk
Nitrate and Nitrite	CALC	B127580	N/A	2023/10/03	Automated Statchk
NO2 (N); NO2 (N) + NO3 (N) in Water	AC/COL	B134290	N/A	2023/10/02	Isabelle White
Nitrate (as N)	CALC	B127581	2023/10/03	2023/10/03	Automated Statchk
Total Dissolved Solids (Filt. Residue)	BAL	B127920	2023/09/28	2023/09/29	Daryl Viktoria Noval

Bureau Veritas ID: CAA778 **Collected:** 2023/09/23
Sample ID: BIS97-1-3 **Relinquished:** 2023/09/24
Matrix: Water **Received:** 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity @25C (pp, total), CO3,HCO3,OH	AT/ALK	B133084	N/A	2023/10/02	Jeanette Chavol Melo
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B129709	N/A	2023/09/30	Stephane Nadon
F1-BTEX	CALC/MS	B127626	N/A	2023/09/30	Automated Statchk
Conductivity @25C	COND	B133092	N/A	2023/10/02	Jeanette Chavol Melo
Hardness	CALC	B130551	N/A	2023/10/03	Automated Statchk
Elements by ICP-Dissolved-Lab Filtered	ICPA	B134032	N/A	2023/10/03	Ilonka Kovac
Total Dissolved Solids (Filt. Residue)	BAL	B127920	2023/09/28	2023/09/29	Daryl Viktoria Noval

Bureau Veritas ID: CAA779 **Collected:** 2023/09/23
Sample ID: FIELD BLANK **Relinquished:** 2023/09/24
Matrix: Water **Received:** 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B129709	N/A	2023/09/30	Stephane Nadon
F1-BTEX	CALC/MS	B127626	N/A	2023/09/30	Automated Statchk
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B130069	2023/09/29	2023/09/30	Bryanna Quach



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VERITAS

Bureau Veritas Job #: C376649

Report Date: 2023/10/04

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

TEST SUMMARY

Bureau Veritas ID: CAA780
Sample ID: TRIP BLANK
Matrix: Water

Collected: 2023/09/23
Relinquished: 2023/09/24
Received: 2023/09/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
BTEX/F1 in Water by HS GC/MS/FID	HSGC/MS	B129709	N/A	2023/09/30	Stephane Nadon
F1-BTEX	CALC/MS	B127626	N/A	2023/09/30	Automated Statchk
CCME Hydrocarbons in Water (F2; C10-C16)	GC/FID	B130069	2023/09/29	2023/09/30	Bryanna Quach



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VERITAS

Bureau Veritas Job #: C376649

Report Date: 2023/10/04

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

GENERAL COMMENTS

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

Package 1	7.0°C
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Nitrate/Nitrate, Chloride and Sulphate couldn't be completed for sample BIS97-1-3(CAA778) due to no volume left. Informed Alex Haigh via email .

Sample CAA773 [BIBG-10-1-4] : 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 CAA774 [MTF97-1-6] : 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 CAA775 [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 CAA776 [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 CAA777 [GIP1109-1-4-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.

IOL ROUTINE WATER - LAB FILTRATION (WATER) Comments

Sample CAA777 [GIP1109-1-4-R] Elements by ICP-Dissolved-Lab Filtered: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

Sample CAA778 [BIS97-1-3] Elements by ICP-Dissolved-Lab Filtered: 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
CAA773	BIBG-10-1-4	Water	NO23AC-W	NUTS	Sample	#10 Past Hold Time	#10 Lab Error	This may increase the uncertainty associated with these results.
CAA774	MTF97-1-6	Water	NO23AC-W	NUTS	Sample	#10 Past Hold Time	#10 Lab Error	This may increase the uncertainty associated with these results.
CAA775	BI-13-3-4.5	Water	NO23AC-W	NUTS	Sample	#10 Past Hold Time	#10 Lab Error	This may increase the uncertainty associated with these results.
CAA776	GIQ8-10-2-4	Water	NO23AC-W	NUTS	Sample	#10 Past Hold Time	#10 Lab Error	This may increase the uncertainty associated with these results.



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Bureau Veritas Job #: C376649

Report Date: 2023/10/04

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B127920	DVN	Method Blank	Total Dissolved Solids	2023/09/29	<10		mg/L	
B129262	ISW	Method Blank	Nitrite (N)	2023/09/29	<0.010		mg/L	
			Nitrate plus Nitrite (N)	2023/09/29	<0.010		mg/L	
B129331	TOR	Method Blank	Chloride (Cl)	2023/09/28	<1.0		mg/L	
			Sulphate (SO4)	2023/09/28	<1.0		mg/L	
B129460	JAB	Method Blank	Dissolved Aluminum (Al)	2023/09/28	<0.0030		mg/L	
			Dissolved Chromium (Cr)	2023/09/28	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2023/09/28	<0.00030		mg/L	
			Dissolved Copper (Cu)	2023/09/28	<0.0010		mg/L	
			Dissolved Lead (Pb)	2023/09/28	<0.00020		mg/L	
			Dissolved Antimony (Sb)	2023/09/28	<0.00060		mg/L	
			Dissolved Molybdenum (Mo)	2023/09/28	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2023/09/28	<0.00050		mg/L	
			Dissolved Selenium (Se)	2023/09/28	<0.00020		mg/L	
			Dissolved Silver (Ag)	2023/09/28	<0.00010		mg/L	
			Dissolved Arsenic (As)	2023/09/28	<0.00020		mg/L	
			Dissolved Thallium (Tl)	2023/09/28	<0.00020		mg/L	
			Dissolved Tin (Sn)	2023/09/28	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2023/09/28	<0.0010		mg/L	
			Dissolved Uranium (U)	2023/09/28	<0.00010		mg/L	
			Dissolved Vanadium (V)	2023/09/28	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2023/09/28	<0.0030		mg/L	
			Dissolved Beryllium (Be)	2023/09/28	<0.0010		mg/L	
B129709	SNA	Method Blank	1,4-Difluorobenzene (sur.)	2023/09/30		103	%	50 - 140
			4-Bromofluorobenzene (sur.)	2023/09/30		100	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2023/09/30		98	%	50 - 140
			Benzene	2023/09/30	<0.00040		mg/L	
			Toluene	2023/09/30	<0.00040		mg/L	
			Ethylbenzene	2023/09/30	<0.00040		mg/L	
			m & p-Xylene	2023/09/30	<0.00080		mg/L	
			o-Xylene	2023/09/30	<0.00040		mg/L	
			F1 (C6-C10)	2023/09/30	<0.10		mg/L	
B130069	BQU	Method Blank	O-TERPHENYL (sur.)	2023/09/30		200 (1)	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2023/09/30	<0.10		mg/L	
B130102	KGR	Method Blank	Alkalinity (Total as CaCO3)	2023/10/01	<1.0		mg/L	
			Alkalinity (PP as CaCO3)	2023/10/01	<1.0		mg/L	
			Bicarbonate (HCO3)	2023/10/01	<1.0		mg/L	
			Carbonate (CO3)	2023/10/01	<1.0		mg/L	
			Hydroxide (OH)	2023/10/01	<1.0		mg/L	
B130107	KGR	Method Blank	Conductivity	2023/10/01	<2.0		uS/cm	
B130109	KGR	Method Blank	Dissolved Fluoride (F)	2023/10/01	<0.050		mg/L	
B130497	JFE	Method Blank	Phenols	2023/09/29	<0.0015		mg/L	
B132018	VSC	Method Blank	Dissolved Iron (Fe)	2023/10/01	<0.060		mg/L	
			Dissolved Lithium (Li)	2023/10/01	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2023/10/01	<0.20		mg/L	
			Dissolved Manganese (Mn)	2023/10/01	<0.0040		mg/L	
			Dissolved Potassium (K)	2023/10/01	<0.30		mg/L	
			Dissolved Sodium (Na)	2023/10/01	<0.50		mg/L	
			Dissolved Strontium (Sr)	2023/10/01	<0.020		mg/L	
			Dissolved Sulphur (S)	2023/10/01	<0.20		mg/L	
			Dissolved Phosphorus (P)	2023/10/01	<0.10		mg/L	
			Dissolved Barium (Ba)	2023/10/01	<0.010		mg/L	

BUREAU
VERITAS

Bureau Veritas Job #: C376649

Report Date: 2023/10/04

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B133084	JVM	Method Blank	Dissolved Silicon (Si)	2023/10/01	<0.50		mg/L	
			Dissolved Boron (B)	2023/10/01	<0.020		mg/L	
			Dissolved Calcium (Ca)	2023/10/01	<0.30		mg/L	
			Alkalinity (Total as CaCO ₃)	2023/10/02	<1.0		mg/L	
			Alkalinity (PP as CaCO ₃)	2023/10/02	<1.0		mg/L	
			Bicarbonate (HCO ₃)	2023/10/02	<1.0		mg/L	
			Carbonate (CO ₃)	2023/10/02	<1.0		mg/L	
			Hydroxide (OH)	2023/10/02	<1.0		mg/L	
			Conductivity	2023/10/02	<2.0		uS/cm	
			Dissolved Iron (Fe)	2023/10/02	<0.060		mg/L	
B134032	IKO	Method Blank	Dissolved Lithium (Li)	2023/10/02	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2023/10/02	<0.20		mg/L	
			Dissolved Manganese (Mn)	2023/10/02	<0.0040		mg/L	
			Dissolved Potassium (K)	2023/10/02	<0.30		mg/L	
			Dissolved Sodium (Na)	2023/10/02	<0.50		mg/L	
			Dissolved Strontium (Sr)	2023/10/02	<0.020		mg/L	
			Dissolved Sulphur (S)	2023/10/02	<0.20		mg/L	
			Dissolved Phosphorus (P)	2023/10/02	<0.10		mg/L	
			Dissolved Barium (Ba)	2023/10/02	<0.010		mg/L	
			Dissolved Silicon (Si)	2023/10/02	<0.50		mg/L	
B134290	ISW	Method Blank	Dissolved Boron (B)	2023/10/02	<0.020		mg/L	
			Dissolved Calcium (Ca)	2023/10/02	<0.30		mg/L	
			Nitrite (N)	2023/10/02	<0.010		mg/L	
			Nitrate plus Nitrite (N)	2023/10/02	<0.010		mg/L	
			Chloride (Cl)	2023/10/02	<1.0		mg/L	
			Sulphate (SO ₄)	2023/10/02	<1.0		mg/L	
			Dissolved Aluminum (Al)	2023/09/29	3.4	%	20	
			Dissolved Chromium (Cr)	2023/09/29	NC	%	20	
			Dissolved Cobalt (Co)	2023/09/29	16	%	20	
			Dissolved Copper (Cu)	2023/09/29	3.6	%	20	
B129460	JAB	RPD [CAA773-04]	Dissolved Lead (Pb)	2023/09/29	NC	%	20	
			Dissolved Antimony (Sb)	2023/09/29	NC	%	20	
			Dissolved Molybdenum (Mo)	2023/09/29	3.0	%	20	
			Dissolved Nickel (Ni)	2023/09/29	4.0	%	20	
			Dissolved Selenium (Se)	2023/09/29	1.8	%	20	
			Dissolved Silver (Ag)	2023/09/29	NC	%	20	
			Dissolved Arsenic (As)	2023/09/29	NC	%	20	
			Dissolved Thallium (Tl)	2023/09/29	NC	%	20	
			Dissolved Tin (Sn)	2023/09/29	NC	%	20	
			Dissolved Titanium (Ti)	2023/09/29	NC	%	20	
			Dissolved Uranium (U)	2023/09/29	3.7	%	20	
			Dissolved Vanadium (V)	2023/09/29	NC	%	20	
			Dissolved Zinc (Zn)	2023/09/29	2.0	%	20	
			Dissolved Beryllium (Be)	2023/09/29	NC	%	20	
			Dissolved Aluminum (Al)	2023/09/28		105	%	80 - 120
			Dissolved Chromium (Cr)	2023/09/28		95	%	80 - 120
			Dissolved Cobalt (Co)	2023/09/28		95	%	80 - 120
			Dissolved Copper (Cu)	2023/09/28		93	%	80 - 120
B129460	JAB	Matrix Spike [CAA773-04]	Dissolved Lead (Pb)	2023/09/28		93	%	80 - 120
			Dissolved Antimony (Sb)	2023/09/28		103	%	80 - 120
			Dissolved Molybdenum (Mo)	2023/09/28		104	%	80 - 120
			Dissolved Nickel (Ni)	2023/09/28		94	%	80 - 120

BUREAU
VERITAS

Bureau Veritas Job #: C376649

Report Date: 2023/10/04

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Selenium (Se)	2023/09/28	104	%	80 - 120	
			Dissolved Silver (Ag)	2023/09/28	97	%	80 - 120	
			Dissolved Arsenic (As)	2023/09/28	100	%	80 - 120	
			Dissolved Thallium (Tl)	2023/09/28	98	%	80 - 120	
			Dissolved Tin (Sn)	2023/09/28	102	%	80 - 120	
			Dissolved Titanium (Ti)	2023/09/28	102	%	80 - 120	
			Dissolved Uranium (U)	2023/09/28	98	%	80 - 120	
			Dissolved Vanadium (V)	2023/09/28	100	%	80 - 120	
			Dissolved Zinc (Zn)	2023/09/28	99	%	80 - 120	
			Dissolved Beryllium (Be)	2023/09/28	97	%	80 - 120	
B127920	DVN	LCS	Total Dissolved Solids	2023/09/29	95	%	80 - 120	
B129262	ISW	LCS	Nitrite (N)	2023/09/29	102	%	80 - 120	
B129331	TOR	LCS	Nitrate plus Nitrite (N)	2023/09/29	101	%	80 - 120	
			Chloride (Cl)	2023/09/28	98	%	80 - 120	
			Sulphate (SO4)	2023/09/28	103	%	80 - 120	
B129460	JAB	LCS	Dissolved Aluminum (Al)	2023/09/28	109	%	80 - 120	
			Dissolved Chromium (Cr)	2023/09/28	96	%	80 - 120	
			Dissolved Cobalt (Co)	2023/09/28	97	%	80 - 120	
			Dissolved Copper (Cu)	2023/09/28	98	%	80 - 120	
			Dissolved Lead (Pb)	2023/09/28	97	%	80 - 120	
			Dissolved Antimony (Sb)	2023/09/28	101	%	80 - 120	
			Dissolved Molybdenum (Mo)	2023/09/28	98	%	80 - 120	
			Dissolved Nickel (Ni)	2023/09/28	96	%	80 - 120	
			Dissolved Selenium (Se)	2023/09/28	99	%	80 - 120	
			Dissolved Silver (Ag)	2023/09/28	96	%	80 - 120	
			Dissolved Arsenic (As)	2023/09/28	97	%	80 - 120	
			Dissolved Thallium (Tl)	2023/09/28	98	%	80 - 120	
			Dissolved Tin (Sn)	2023/09/28	100	%	80 - 120	
			Dissolved Titanium (Ti)	2023/09/28	94	%	80 - 120	
			Dissolved Uranium (U)	2023/09/28	96	%	80 - 120	
			Dissolved Vanadium (V)	2023/09/28	98	%	80 - 120	
			Dissolved Zinc (Zn)	2023/09/28	101	%	80 - 120	
			Dissolved Beryllium (Be)	2023/09/28	97	%	80 - 120	
B129709	SNA	LCS	1,4-Difluorobenzene (sur.)	2023/09/30	91	%	50 - 140	
			4-Bromofluorobenzene (sur.)	2023/09/30	98	%	50 - 140	
			D4-1,2-Dichloroethane (sur.)	2023/09/30	92	%	50 - 140	
			Benzene	2023/09/30	101	%	60 - 130	
			Toluene	2023/09/30	90	%	60 - 130	
			Ethylbenzene	2023/09/30	103	%	60 - 130	
			m & p-Xylene	2023/09/30	106	%	60 - 130	
			o-Xylene	2023/09/30	106	%	60 - 130	
			F1 (C6-C10)	2023/09/30	100	%	60 - 140	
B130069	BQU	LCS	O-TERPHENYL (sur.)	2023/09/30	98	%	60 - 140	
			F2 (C10-C16 Hydrocarbons)	2023/09/30	93	%	60 - 140	
B130102	KGR	LCS	Alkalinity (Total as CaCO3)	2023/10/01	99	%	80 - 120	
B130107	KGR	LCS	Conductivity	2023/10/01	99	%	90 - 110	
B130109	KGR	LCS	Dissolved Fluoride (F)	2023/10/01	97	%	80 - 120	
B130497	JFE	LCS	Phenols	2023/09/29	101	%	80 - 120	
B132018	VSC	LCS	Dissolved Iron (Fe)	2023/10/01	102	%	80 - 120	
			Dissolved Lithium (Li)	2023/10/01	96	%	80 - 120	
			Dissolved Magnesium (Mg)	2023/10/01	103	%	80 - 120	
			Dissolved Manganese (Mn)	2023/10/01	103	%	80 - 120	



BUREAU
VERITAS

Bureau Veritas Job #: C376649

Report Date: 2023/10/04

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Potassium (K)	2023/10/01	99	%	80 - 120	
			Dissolved Sodium (Na)	2023/10/01	96	%	80 - 120	
			Dissolved Strontium (Sr)	2023/10/01	94	%	80 - 120	
			Dissolved Sulphur (S)	2023/10/01	100	%	80 - 120	
			Dissolved Phosphorus (P)	2023/10/01	103	%	80 - 120	
			Dissolved Barium (Ba)	2023/10/01	97	%	80 - 120	
			Dissolved Silicon (Si)	2023/10/01	96	%	80 - 120	
			Dissolved Boron (B)	2023/10/01	96	%	80 - 120	
			Dissolved Calcium (Ca)	2023/10/01	97	%	80 - 120	
B133084	JVM	LCS	Alkalinity (Total as CaCO3)	2023/10/02	101	%	80 - 120	
B133092	JVM	LCS	Conductivity	2023/10/02	101	%	90 - 110	
B134032	IKO	LCS	Dissolved Iron (Fe)	2023/10/02	101	%	80 - 120	
			Dissolved Lithium (Li)	2023/10/02	96	%	80 - 120	
			Dissolved Magnesium (Mg)	2023/10/02	108	%	80 - 120	
			Dissolved Manganese (Mn)	2023/10/02	106	%	80 - 120	
			Dissolved Potassium (K)	2023/10/02	104	%	80 - 120	
			Dissolved Sodium (Na)	2023/10/02	99	%	80 - 120	
			Dissolved Strontium (Sr)	2023/10/02	95	%	80 - 120	
			Dissolved Sulphur (S)	2023/10/02	101	%	80 - 120	
			Dissolved Phosphorus (P)	2023/10/02	102	%	80 - 120	
			Dissolved Barium (Ba)	2023/10/02	97	%	80 - 120	
			Dissolved Silicon (Si)	2023/10/02	98	%	80 - 120	
			Dissolved Boron (B)	2023/10/02	95	%	80 - 120	
			Dissolved Calcium (Ca)	2023/10/02	99	%	80 - 120	
B134290	ISW	LCS	Nitrite (N)	2023/10/02	102	%	80 - 120	
			Nitrate plus Nitrite (N)	2023/10/02	103	%	80 - 120	
B134446	TOR	LCS	Chloride (Cl)	2023/10/02	101	%	80 - 120	
			Sulphate (SO4)	2023/10/02	102	%	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).

(1) Surrogate recovery exceeds acceptance criteria (high recovery). As results are non-detect, there is no impact on data quality.



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Bureau Veritas Job #: C376649

Report Date: 2023/10/04

Advisian

Task Order#: 417085-49223

Site#: N/A

Site Location: Norman Wells, NWT

Project #: 417085-49223

VALIDATION SIGNATURE PAGE

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

Gita Pokhrel, Laboratory Supervisor

Jared Wiseman, B.Sc., P.Chem., QP, Senior Analyst, Organics

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



Bureau Veritas Proprietary Software
Logiciel Propriétaire de Bureau Veritas

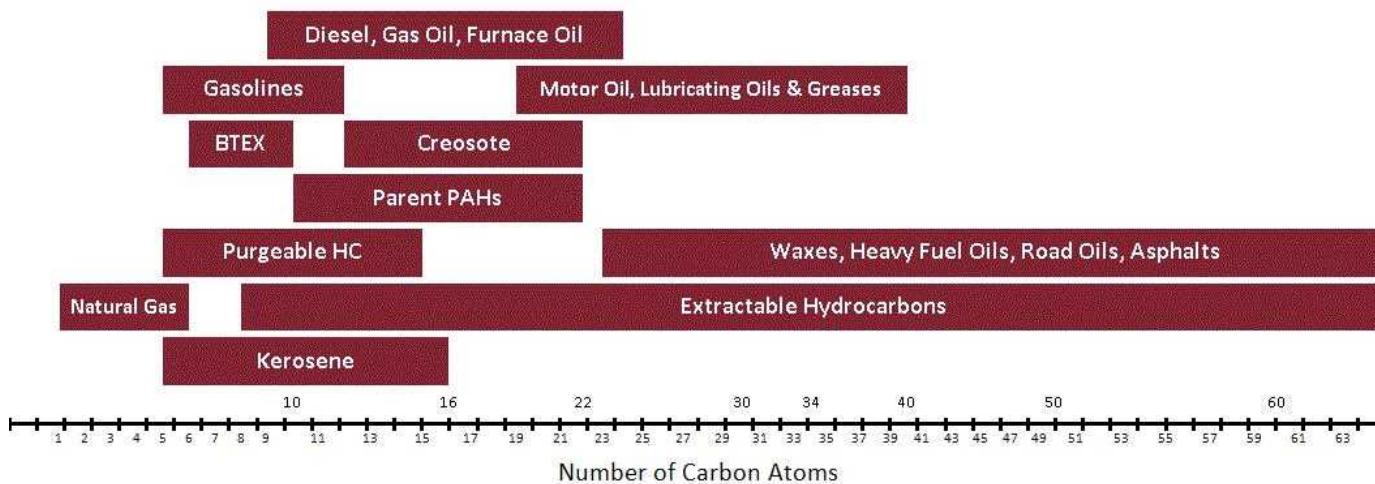
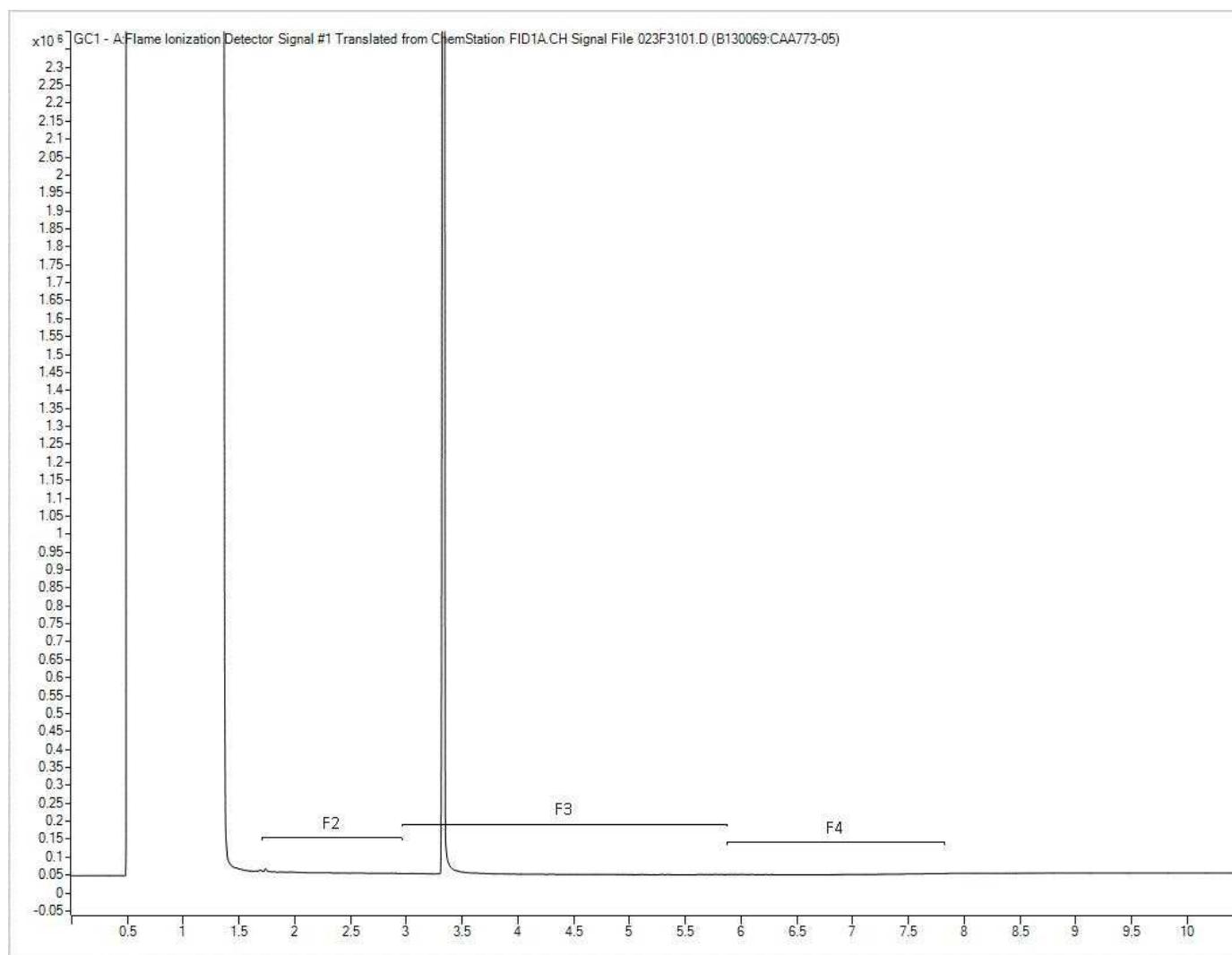
Automated Statchk

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Bureau Veritas Job #: C376649
Report Date: 2023/10/04
Bureau Veritas Sample: CAA773

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: BIBG-10-1-4

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



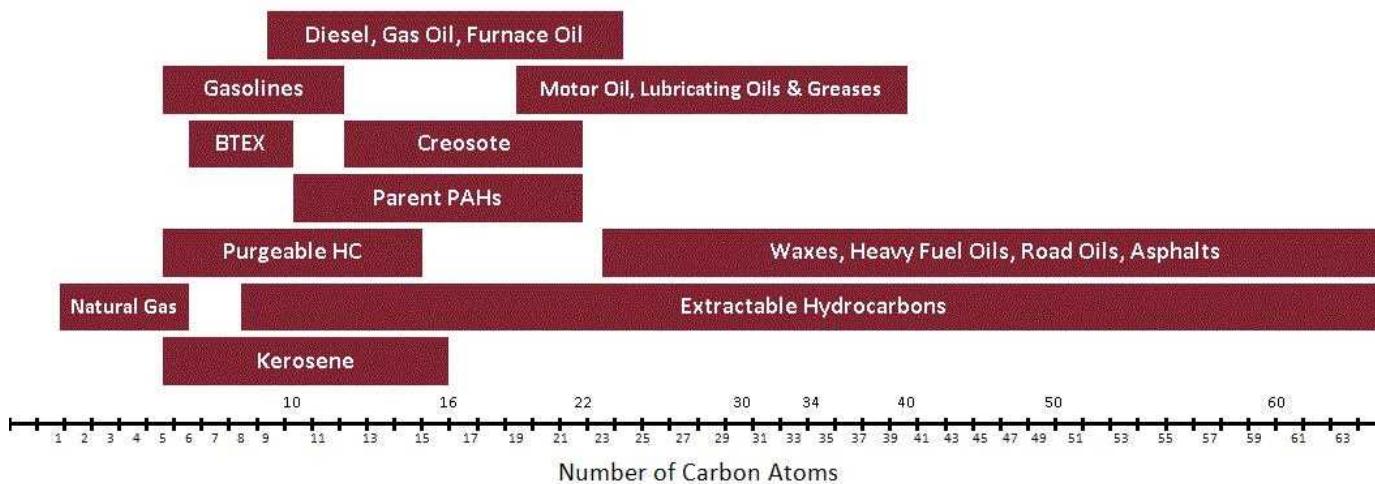
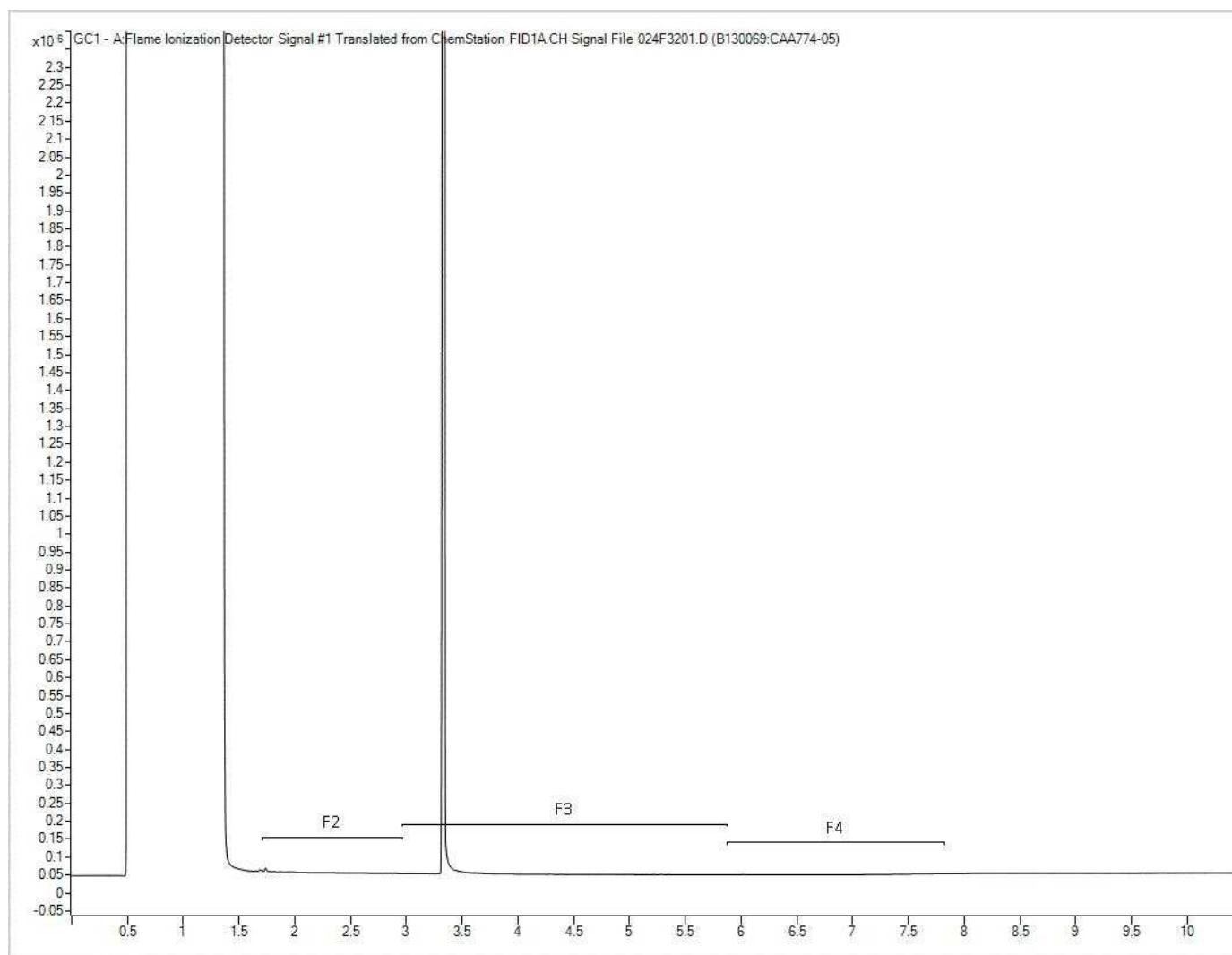
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem19\HPchem\1\DATA\2023\09\RUN0930

Bureau Veritas Job #: C376649
Report Date: 2023/10/04
Bureau Veritas Sample: CAA774

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: MTF97-1-6

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



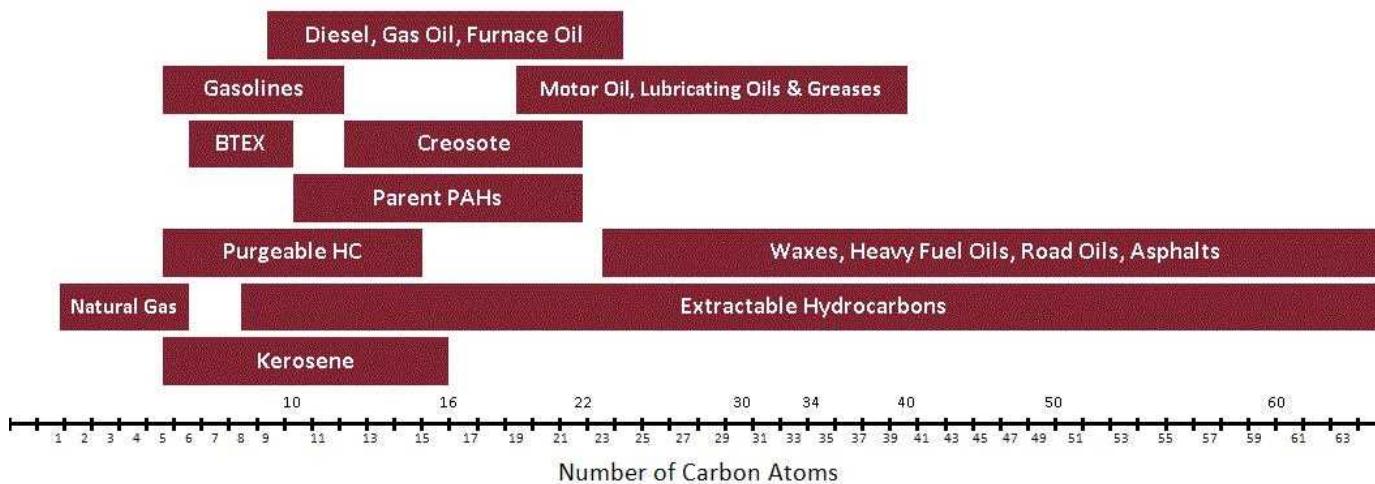
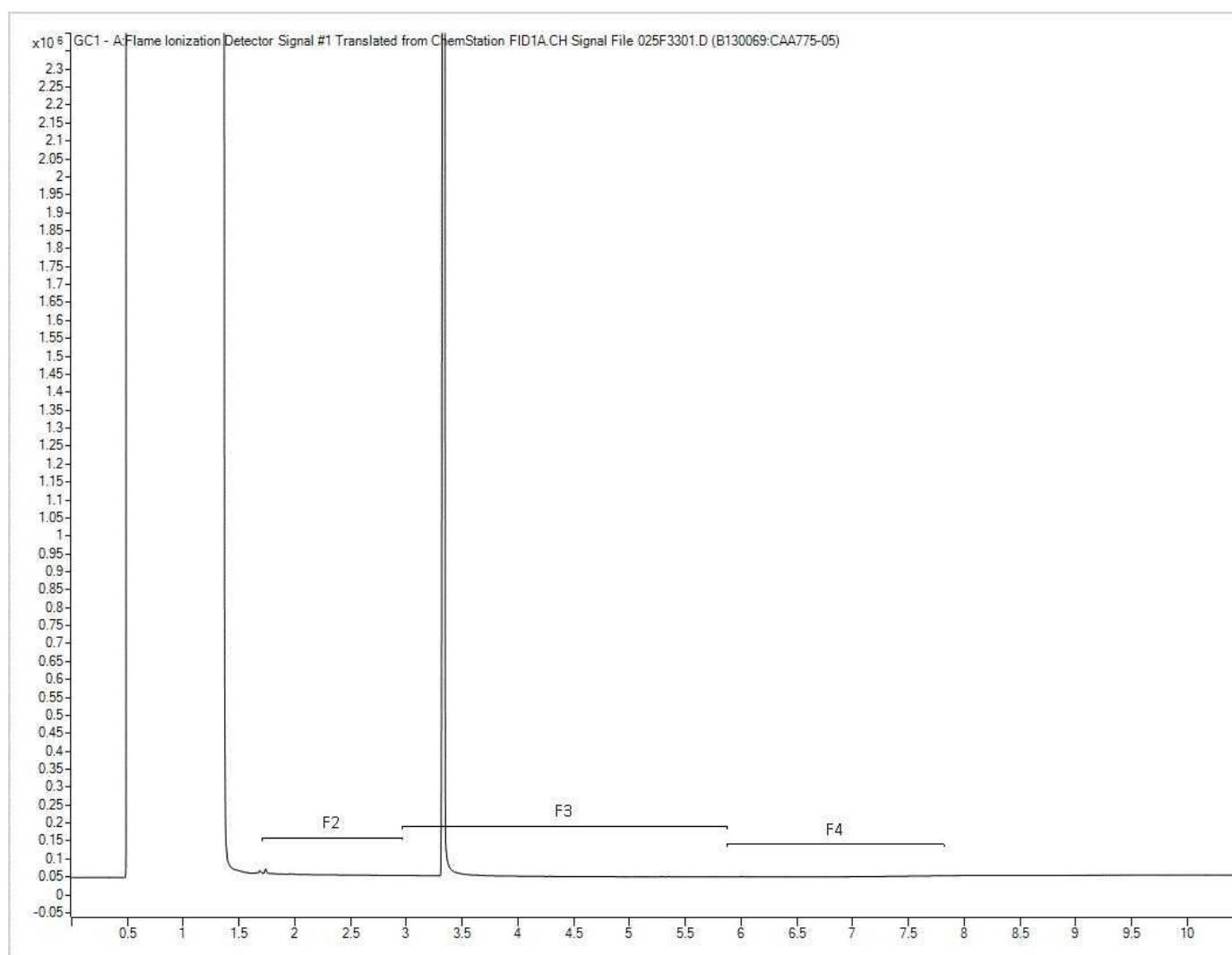
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem19\HPchem\1\DATA\2023\09\RUN0930

Bureau Veritas Job #: C376649
Report Date: 2023/10/04
Bureau Veritas Sample: CAA775

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: BI-13-3-4.5

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



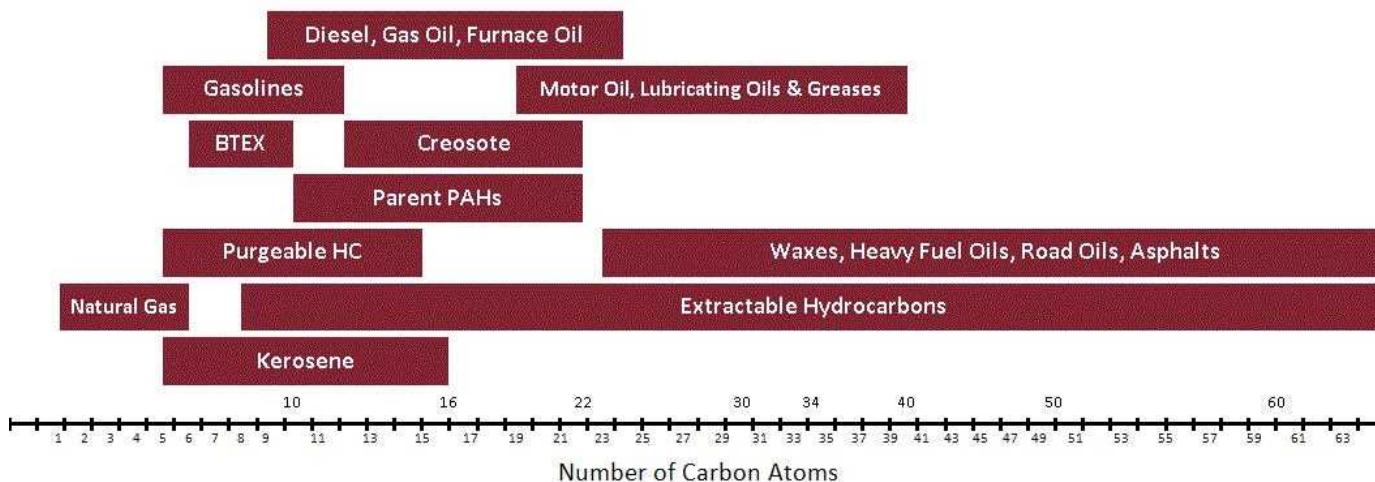
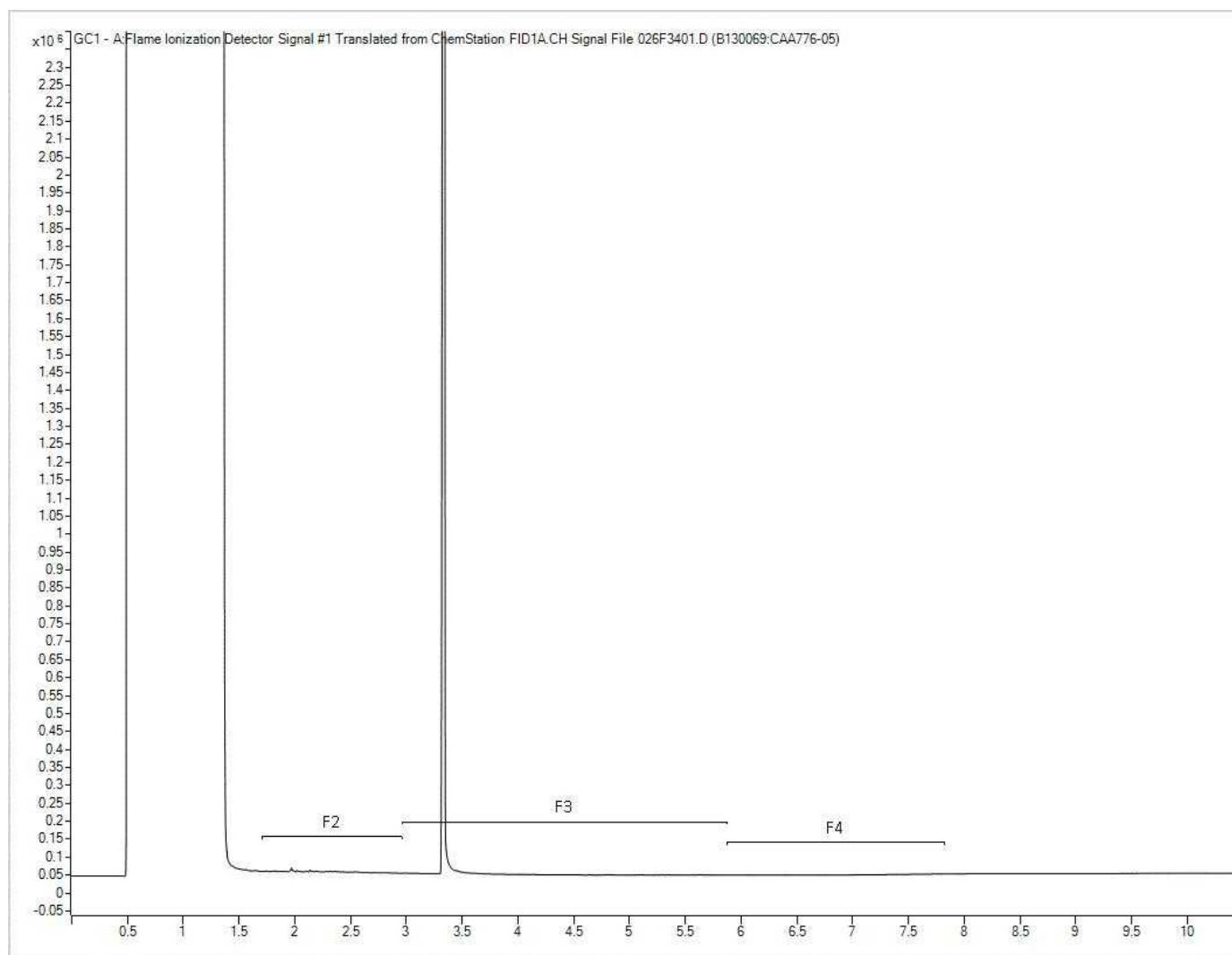
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem19\HPchem\1\DATA\2023\09\RUN0930

Bureau Veritas Job #: C376649
Report Date: 2023/10/04
Bureau Veritas Sample: CAA776

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: GIQ8-10-2-4

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



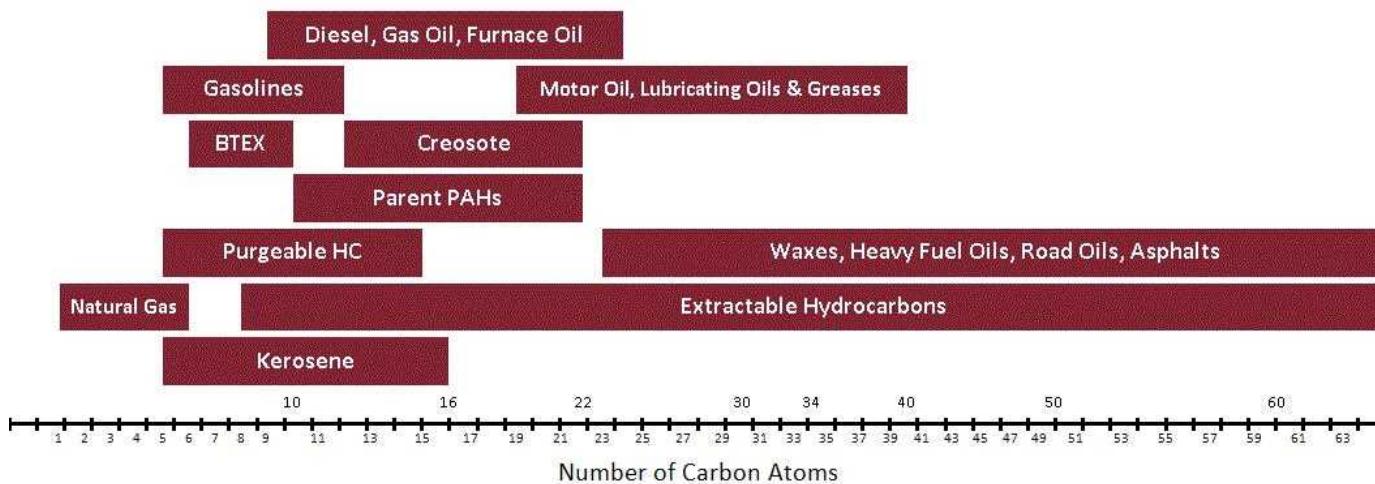
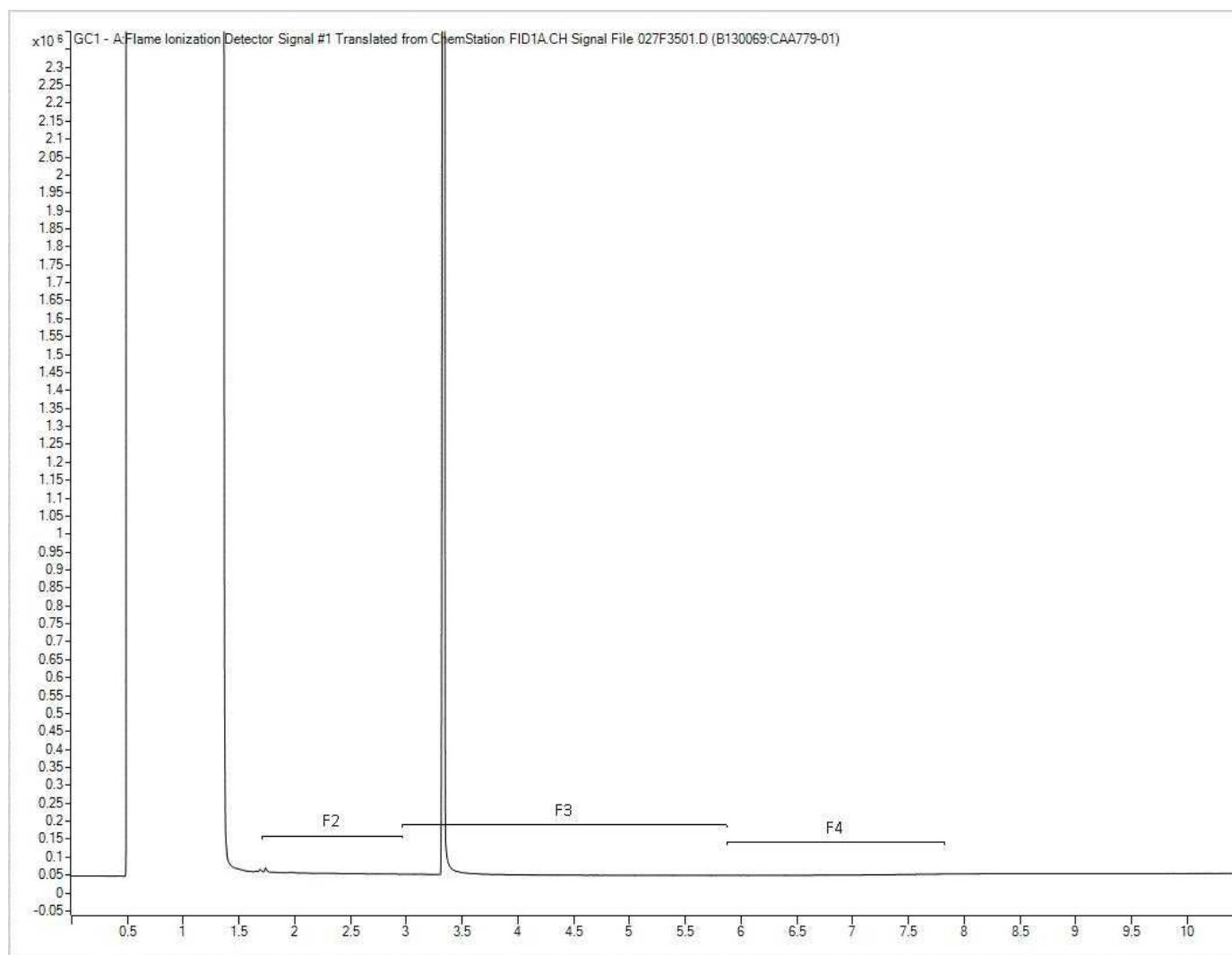
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem19\HPchem\1\DATA\2023\09\RUN0930

Bureau Veritas Job #: C376649
Report Date: 2023/10/04
Bureau Veritas Sample: CAA779

Advisian
Task Order#:417085-49223Line Item:
Site Location: Norman Wells, NWT
Client ID: FIELD BLANK

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



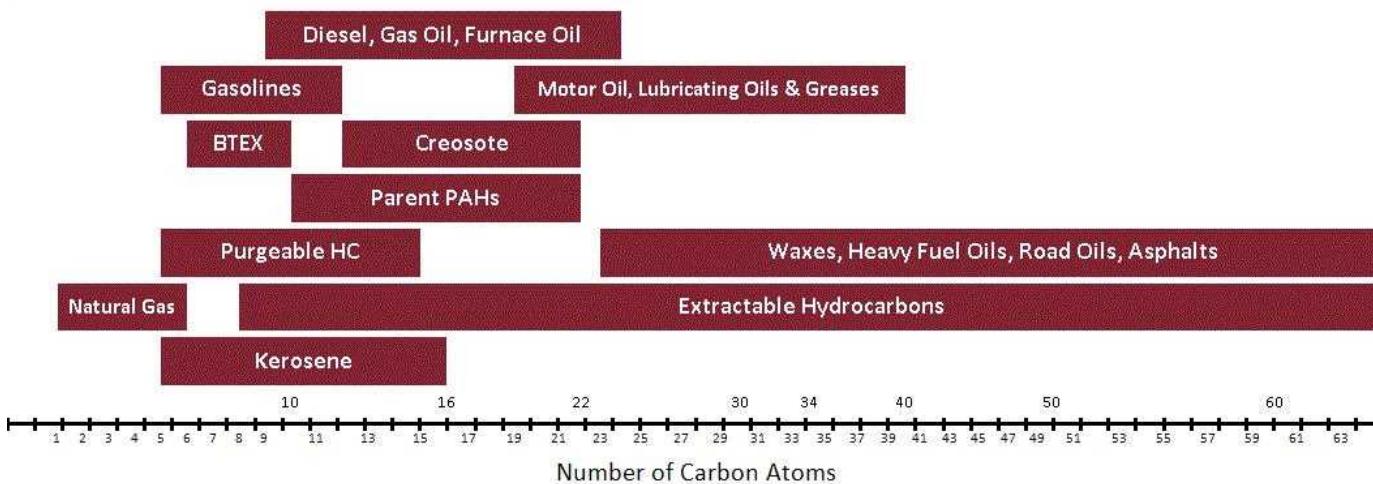
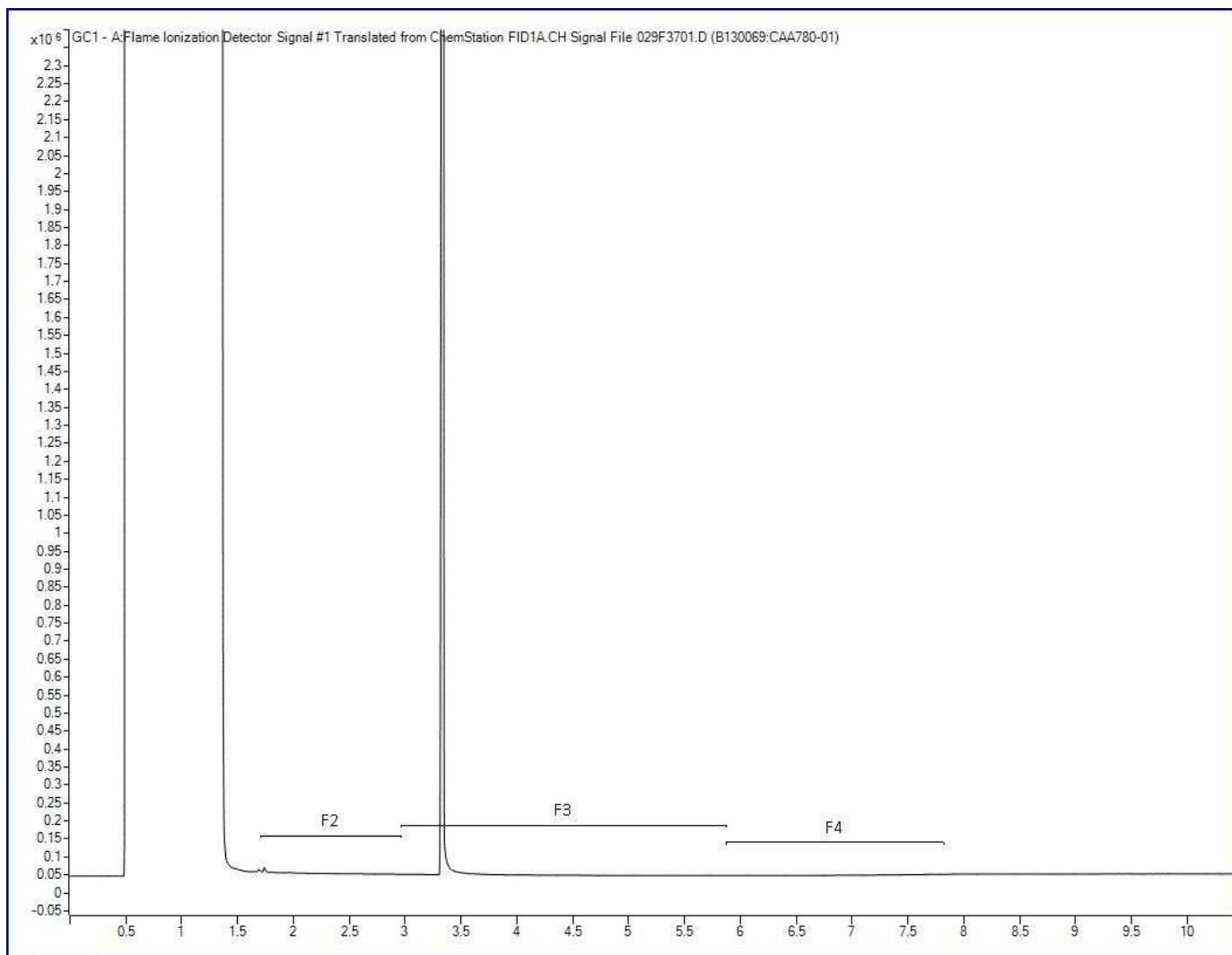
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem19\HPchem\1\DATA\2023\09\RUN0930

Bureau Veritas Job #: C376649
Report Date: 2023/10/04
Bureau Veritas Sample: CAA780

Advisian
Task Order#:417085-49223Line Item:
Site#: N/A
Site Location: Norman Wells, NWT
Client ID: TRIP BLANK

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

hpchem19\HPchem\1\DATA\2023\09\RUN0930

SOC-1010 (06/2016) IOL-AB

White: Maxxam

Yellow: Client



Appendix E

Quality Assurance/Quality Control



E.1 Quality Assurance/Quality Control

E.1.1 Field QA/QC Program

The groundwater field QA/QC program for the SNP consisted of three field duplicate samples. Two trip blank and two field blank sample were also submitted for analysis of PHCs as part of the 2023 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:

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

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 (RDL). 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 RPD alert limit for hydrocarbons is 80%, the alert limit for all other parameters presented herein is 50% (Imperial 2004).

All PHC sample results were below the laboratory detection limits so RPDs could not be calculated. RPD for all other parameters for all duplicate samples met their alert limit criteria.

The designated field and trip blank alert limits are >5X the reportable detection limit (RDL) for BTEX and 2X RDL for PHC F1 and F2. The blanks submitted during both the August and September SNP sampling programs were compared to the alert limits and are 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.



Nitrogen parameters were often analyzed past method-specific hold times due to limitations in sample shipping and delays due to a Territorial state of emergency, which may increase uncertainty in reported results. This does not alter the interpretation of data presented herein. No other data quality issues were noted that would impact the data presented.

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 E1: Field and Trip Blank Sample Results

PROJECT No.: 417085-49223-23100

Sampling Location	Date (dd-mmm-yyyy)	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	m&p-Xylene (mg/L)	σ -Xylene (mg/L)	Xylenes (Total) (mg/L)	PHC F1 (C_6-C_{10}) (mg/L)	PHC F1 (C_6-C_{10}) - BTEX (mg/L)	PHC F2 ($C_{10}-C_{16}$) (mg/L)
Laboratory Reportable Detection Limit		0.00040	0.00040	0.00040	0.00080	0.00040	0.00089	0.10	0.10	0.10
Alert Limits		5 x RDL	5 x RDL	5 x RDL	5 x RDL	5 x RDL	5 x RDL	2 x RDL	2 x RDL	2 x RDL
QA/QC Samples										
Groundwater Field Blank	16-Aug-2023	< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10
	23-Sep-2023	< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10
Groundwater Trip Blank	16-Aug-2023	< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10
	23-Sep-2023	< 0.00040	< 0.00040	< 0.00040	< 0.00080	< 0.00040	< 0.00089	< 0.10	< 0.10	< 0.10

NOTES:

1. Highlighting indicates parameters above alert limits



Appendix F

Mann-Kendall Statistical Analyses

Table F-1
Mann-Kendall Statistical Analysis (1998-2023) - 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	34	-237	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	25	-114	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
TF 03-12-3	30	-104	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
MTF 97-1-5	24	-63	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
GIQ8-10-2-4	20	15	0.22	0.0000	0	< 0.00040	0.0002	0.00041
C38 08-1-4	25	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
MEBG-10-1-3	23	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
ARB-12-3-3	21	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
BI-13-3-4.5	17	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
BIBG-10-1-4	15	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
GIP11 09-1-4-R	10	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-2
Mann-Kendall Statistical Analysis (1998-2023) - 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	25	156	0.00	0.0000	1	< 0.0008	0.0004	< 0.00089
MEBG-10-1-3	23	132	0.00	0.0000	1	< 0.0008	0.000445	< 0.00089
GIQ8-10-2-4	20	97	0.00	0.0000	1	< 0.00080	0.000445	0.0016
ARB-12-3-3	21	108	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	15	56	0.00	0.0000	1	< 0.0008	0.0004	< 0.00089
BI-13-3-4.5	17	66	0.00	0.0000	0	< 0.00080	0.000445	< 0.00089
MTF 97-1-5	24	91	0.01	0.0000	0	< 0.0005	0.000445	< 0.001
BI-13-1-4	13	40	0.01	0.0000	1	< 0.00080	0.000445	< 0.00089
WSY 97-1-5	28	82	0.08	0.0000	0	< 0.0005	0.0004	< 0.0015
BIS 97-1-3	25	55	0.17	0.0000	0	< 0.0005	0.000445	< 0.0015
TF 03-12-3	30	65	0.20	0.0000	0	< 0.0008	0.000445	< 0.0015
CPF 97-7-5	31	39	0.49	0.0000	0	< 0.0005	0.000445	< 0.0050
CPF 98-8-3	34	33	0.61	0.0000	0	< 0.0005	0.000445	< 0.0050
GIP11 09-1-4-R	10	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

Table F-3
Mann-Kendall Statistical Analysis (1998-2023) - 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	34	-231	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	25	-114	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
TF 03-12-3	30	-104	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
MTF 97-1-5	24	-63	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
C38 08-1-4	25	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
MEBG-10-1-3	23	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
ARB-12-3-3	21	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
GIQ8-10-2-4	20	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
BI-13-3-4.5	17	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
BIBG-10-1-4	15	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
GIP11 09-1-4-R	10	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 (1998-2023) - 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	34	-231	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	25	-114	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
C38 08-1-4	25	130	0.00	0.0000	10	< 0.0004	0.0002	0.00093
TF 03-12-3	30	-121	0.00	0.0000	0	< 0.0004	0.0002	0.0017
MTF 97-1-5	24	-63	0.00	0.0000	0	< 0.0004	0.0002	< 0.0005
BI-13-3-4.5	17	-10	0.35	0.0000	0	< 0.00040	0.0002	0.00042
MEBG-10-1-3	23	0	1.00	0.0000	0	< 0.0004	0.0002	< 0.0004
ARB-12-3-3	21	0	1.00	0.0000	0	< 0.00040	0.0002	< 0.00040
GIQ8-10-2-4	20	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
BIBG-10-1-4	15	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
GIP11 09-1-4-R	10	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

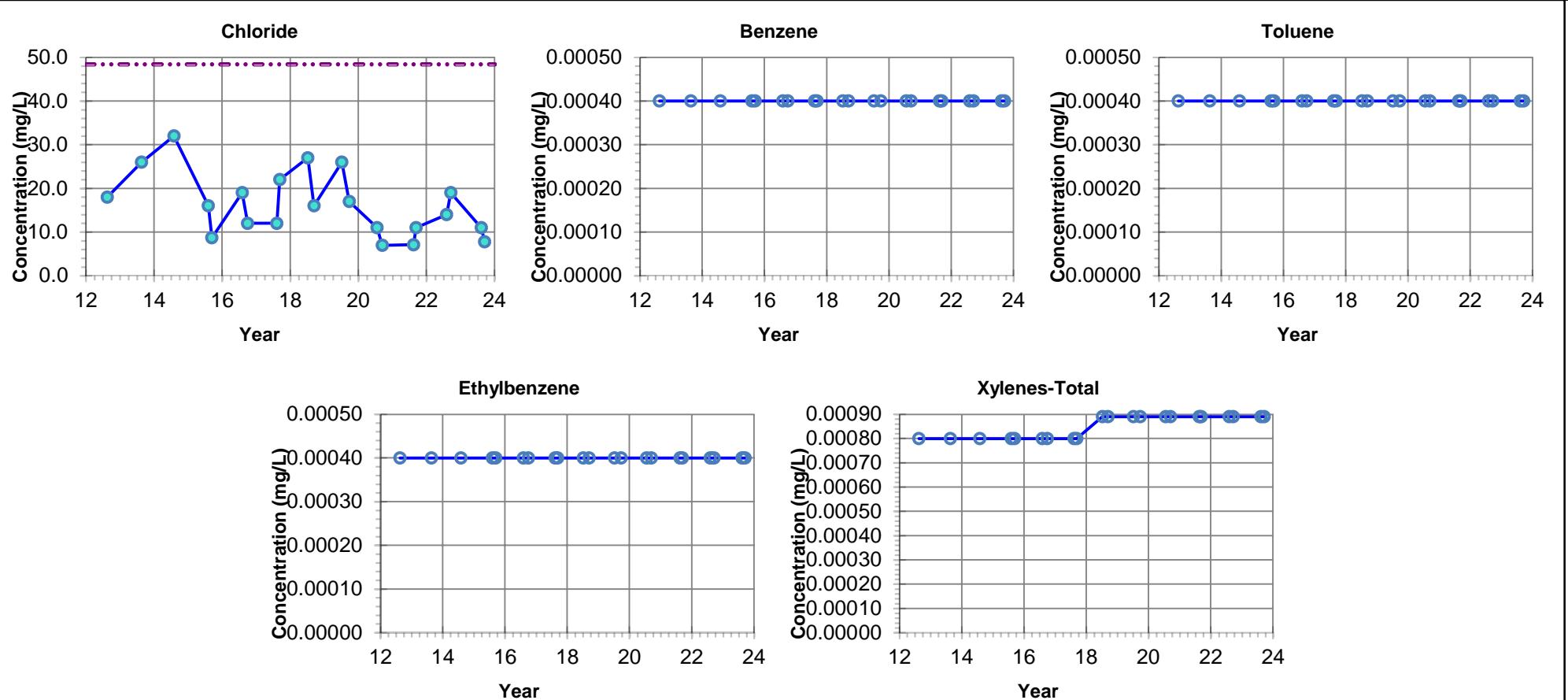
Table F-5
Mann-Kendall Statistical Analysis (1997-2023) - Chloride

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)

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	30	-296	0.00	-7.9749	-5	72	145.0	280
C38 08-1-4	25	-183	0.00	-0.5715	-3	12	19.0	25
CPF 98-8-3	34	-261	0.00	-0.3289	-3	6.6	10.1	22
GIQ8-10-2-4	20	103	0.00	1.8429	9	5.8	20.0	38
BI-13-3-4-5	17	-60	0.01	-0.4511	-6	5.5	7.9	13
ARB-12-3-3	21	-69	0.03	-1.0085	-6	7.0	16.0	32
BIS 97-1-3	28	-85	0.09	-0.1783	-1	16	22.0	35
BIBG-10-1-4	15	30	0.15	1.3107	11	3.0	12.0	25
GIP11 09-1-4-R	10	-16	0.17	-2.2522	-26	5.0	8.55	50
GIP11 09-1-4	7	-9	0.23	-4.5933	-66	3.6	7.0	110
MEBG-10-1-3	23	-45	0.24	-0.0757	-3	< 2.0	2.4	5
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	28	-43	0.40	-0.0093	-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



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
Norman Wells, NT
2023 SNP Groundwater Quality Monitoring
Trend Graphs
Monitoring Well: ARB-12-3-3

14-Mar-2024 date NA edited by JC drawn by NA app by

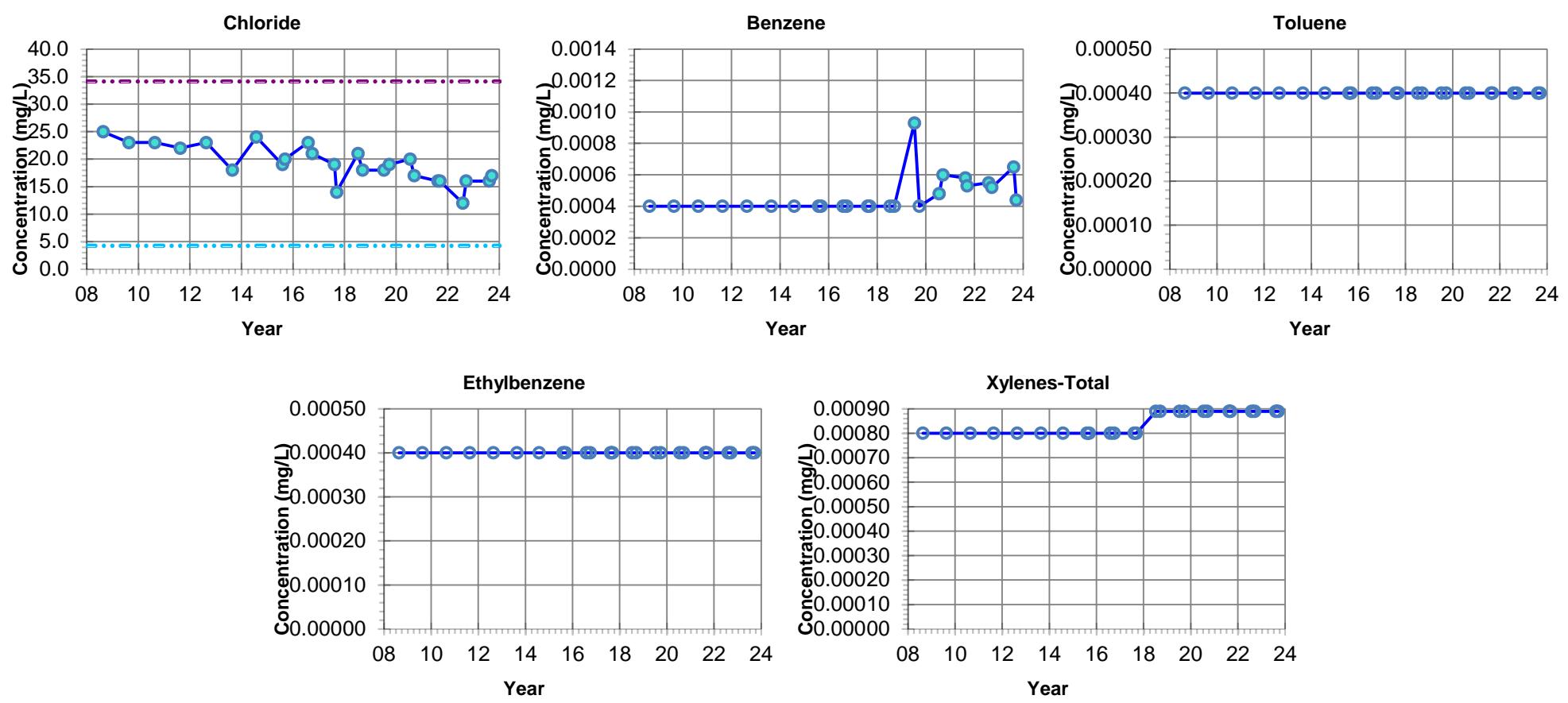
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.



PROJECT NUMBER:
417085-49223-23100

Figure

F1



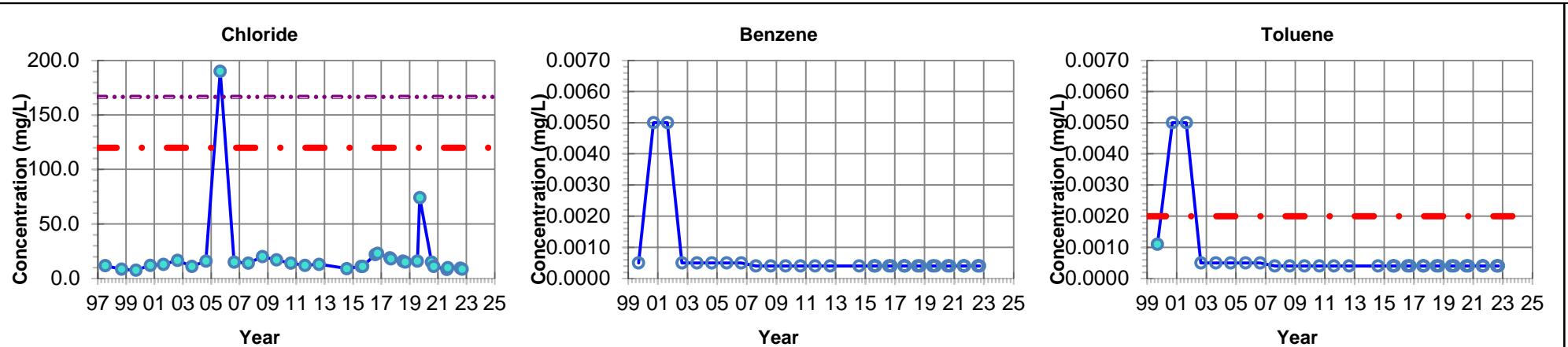
NOTES:

- 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**

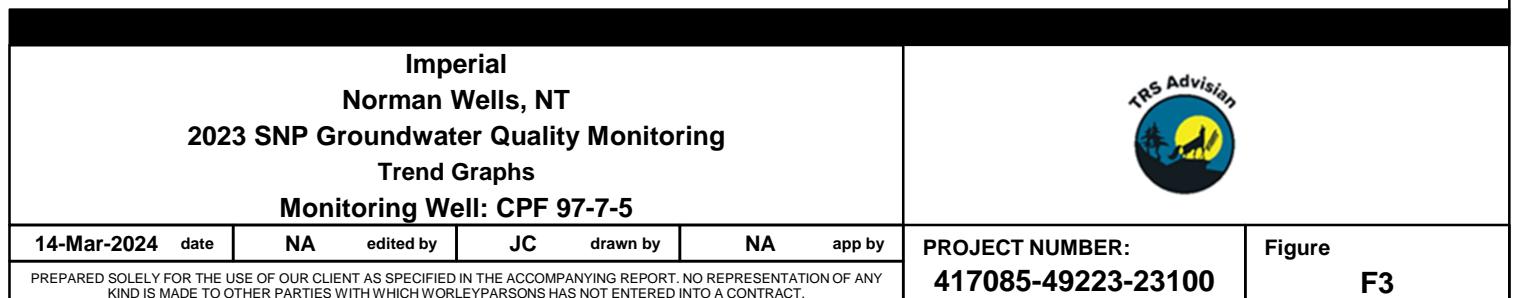
Imperial Norman Wells, NT 2023 SNP Groundwater Quality Monitoring Trend Graphs Monitoring Well: C38 08-1-4								
14-Mar-2024	date	NA	edited by	JC	drawn by	NA	app by	
PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.							PROJECT NUMBER: 417085-49223-23100	Figure F2

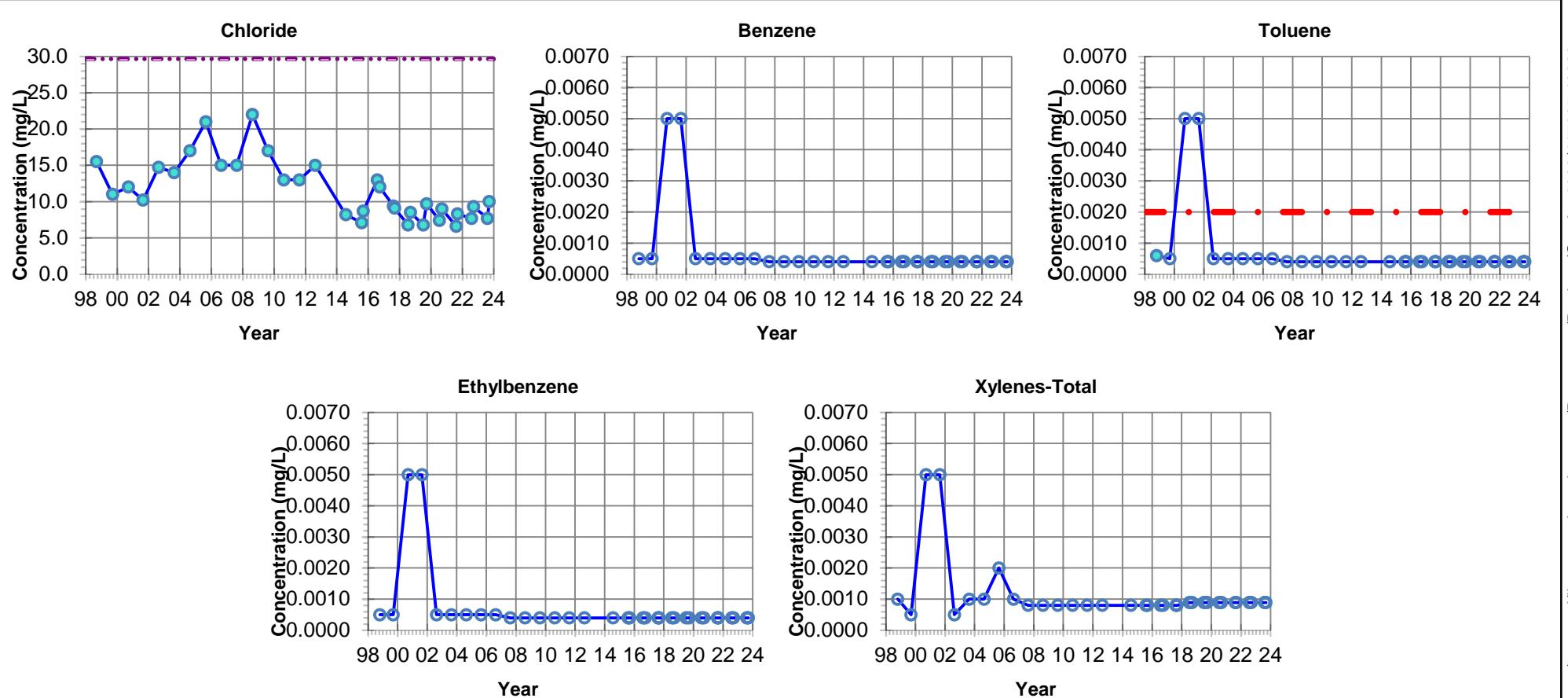


NOTES: - Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

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





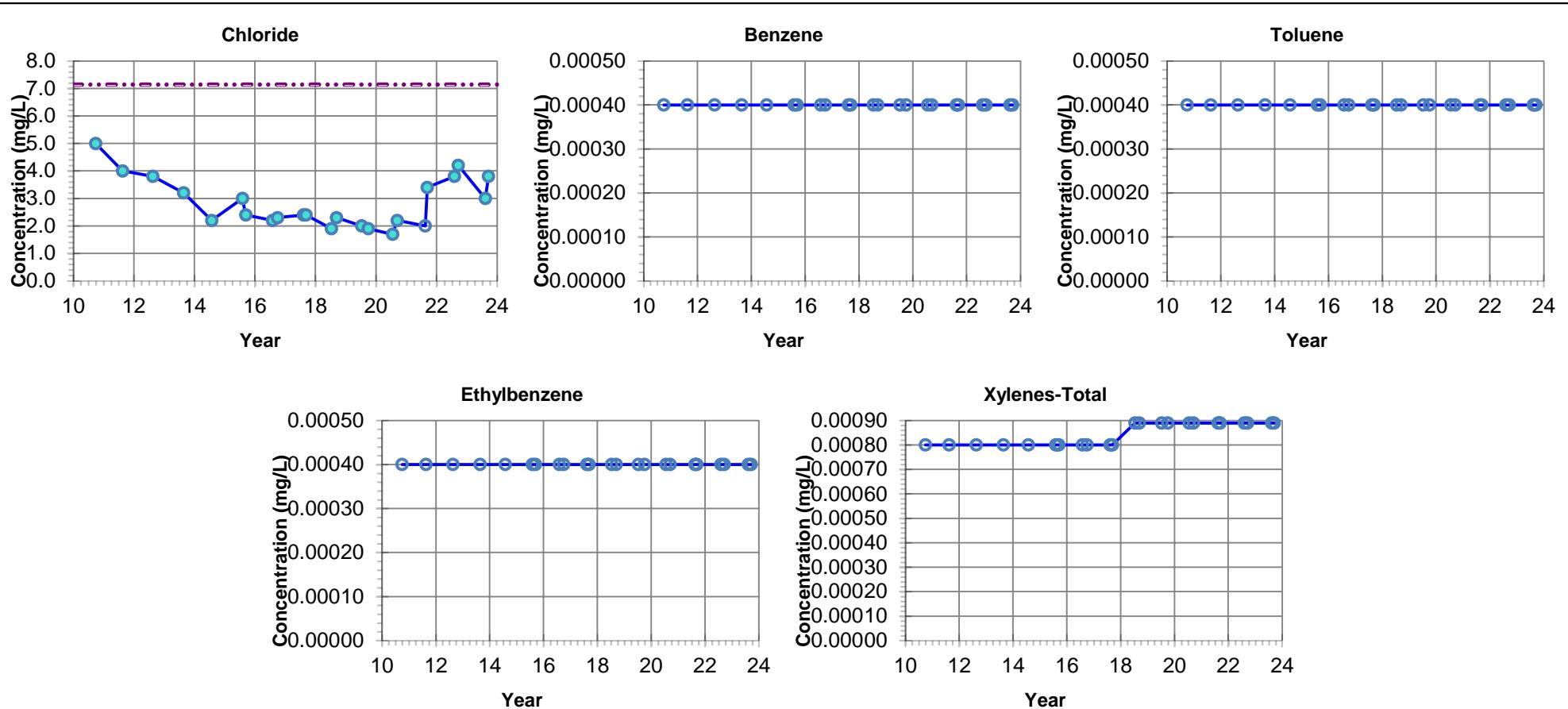
NOTES:

- 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 Norman Wells, NT 2023 SNP Groundwater Quality Monitoring Trend Graphs Monitoring Well: CPF 98-8-3								
14-Mar-2024	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: 417085-49223-23100	Figure F4



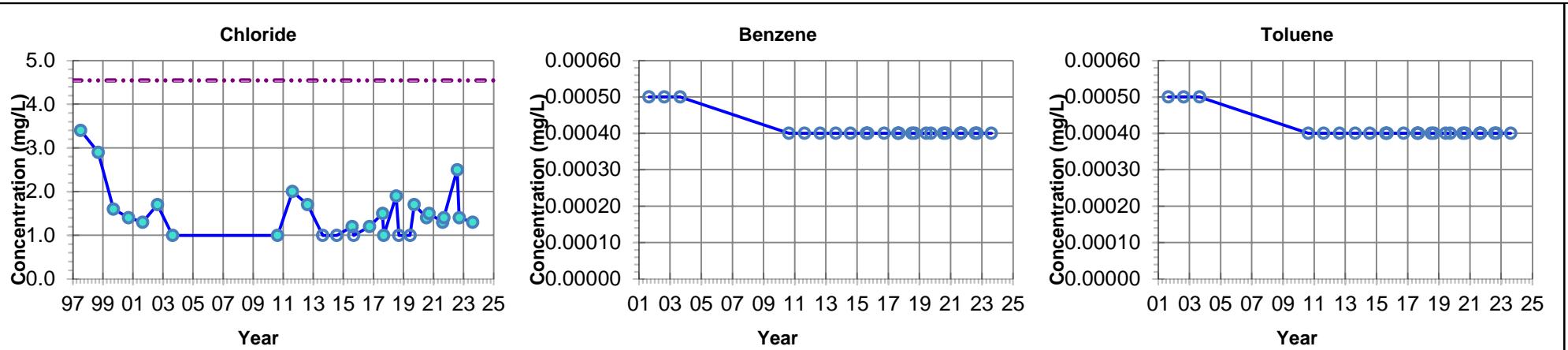
NOTES:

- 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 Norman Wells, NT 2023 SNP Groundwater Quality Monitoring Trend Graphs Monitoring Well: MEBG-10-1-3								
14-Mar-2024	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: 417085-49223-23100	Figure F5



NOTES:

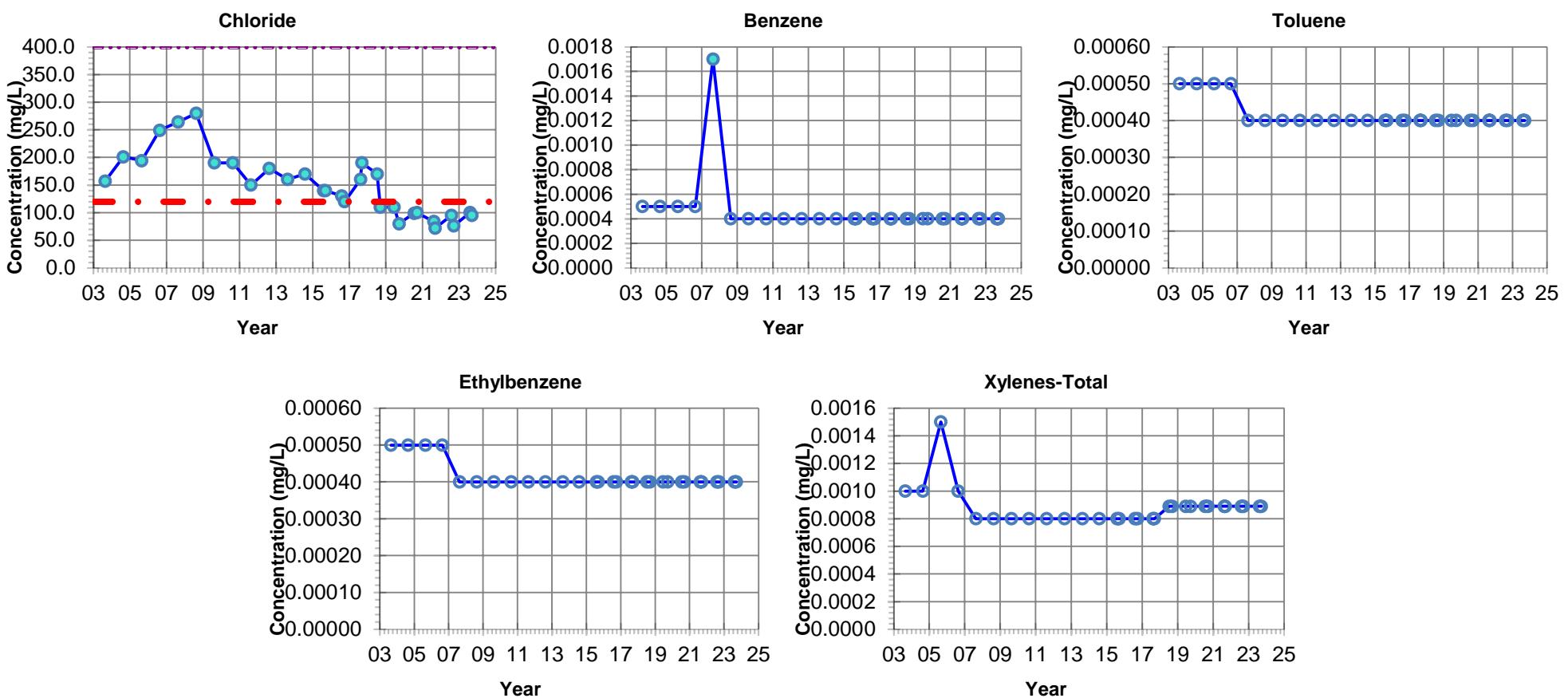
- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

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 Norman Wells, NT 2023 SNP Groundwater Quality Monitoring Trend Graphs Monitoring Well: MTF 97-1-5							PROJECT NUMBER: 417085-49223-23100	Figure F6
14-Mar-2024	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.								





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
Norman Wells, NT
2023 SNP Groundwater Quality Monitoring
Trend Graphs
Monitoring Well: TF 03-12-3

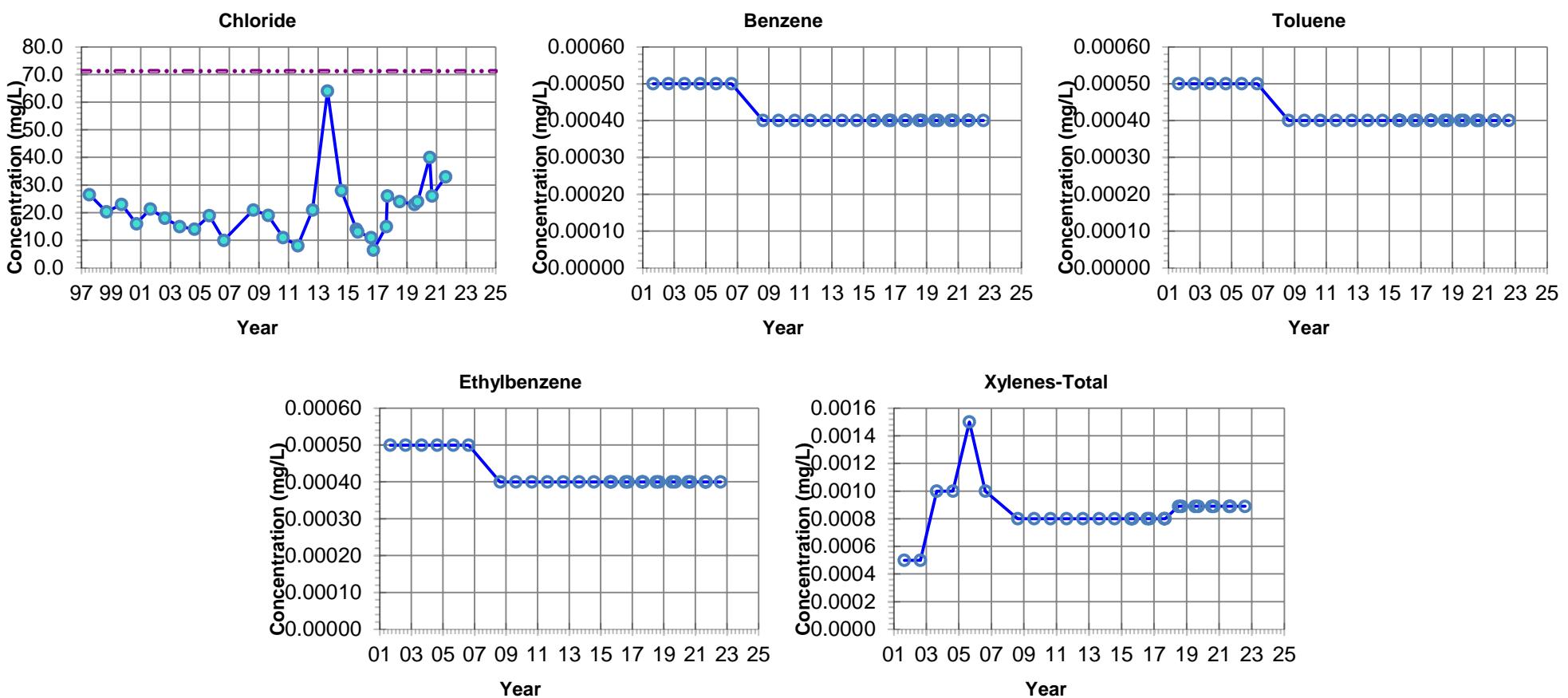
14-Mar-2024 date NA edited by JC drawn by NA app by

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:
417085-49223-23100

Figure
F7



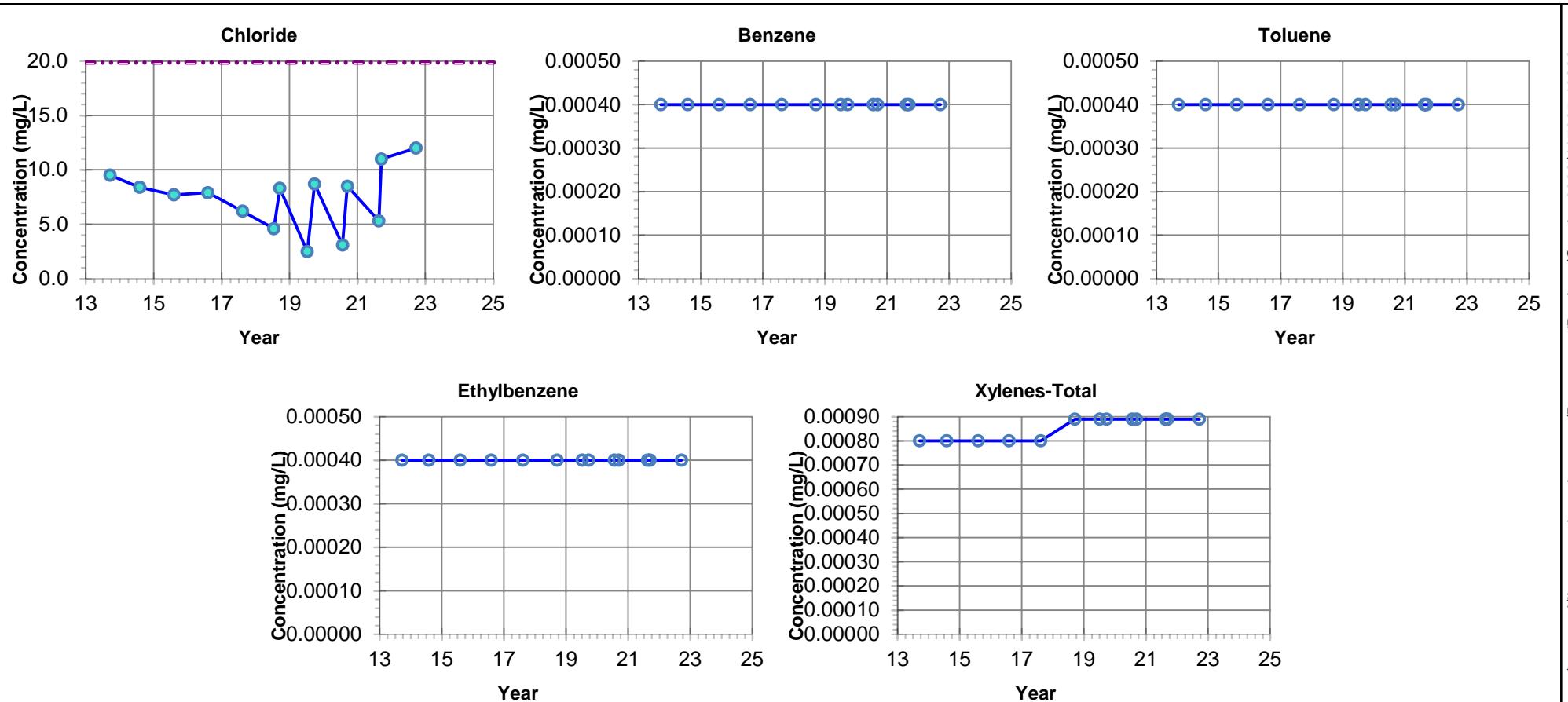
NOTES:

- 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 Norman Wells, NT 2023 SNP Groundwater Quality Monitoring Trend Graphs Monitoring Well: WSY 97-1-5								
14-Mar-2024	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: 417085-49223-23100	Figure F8



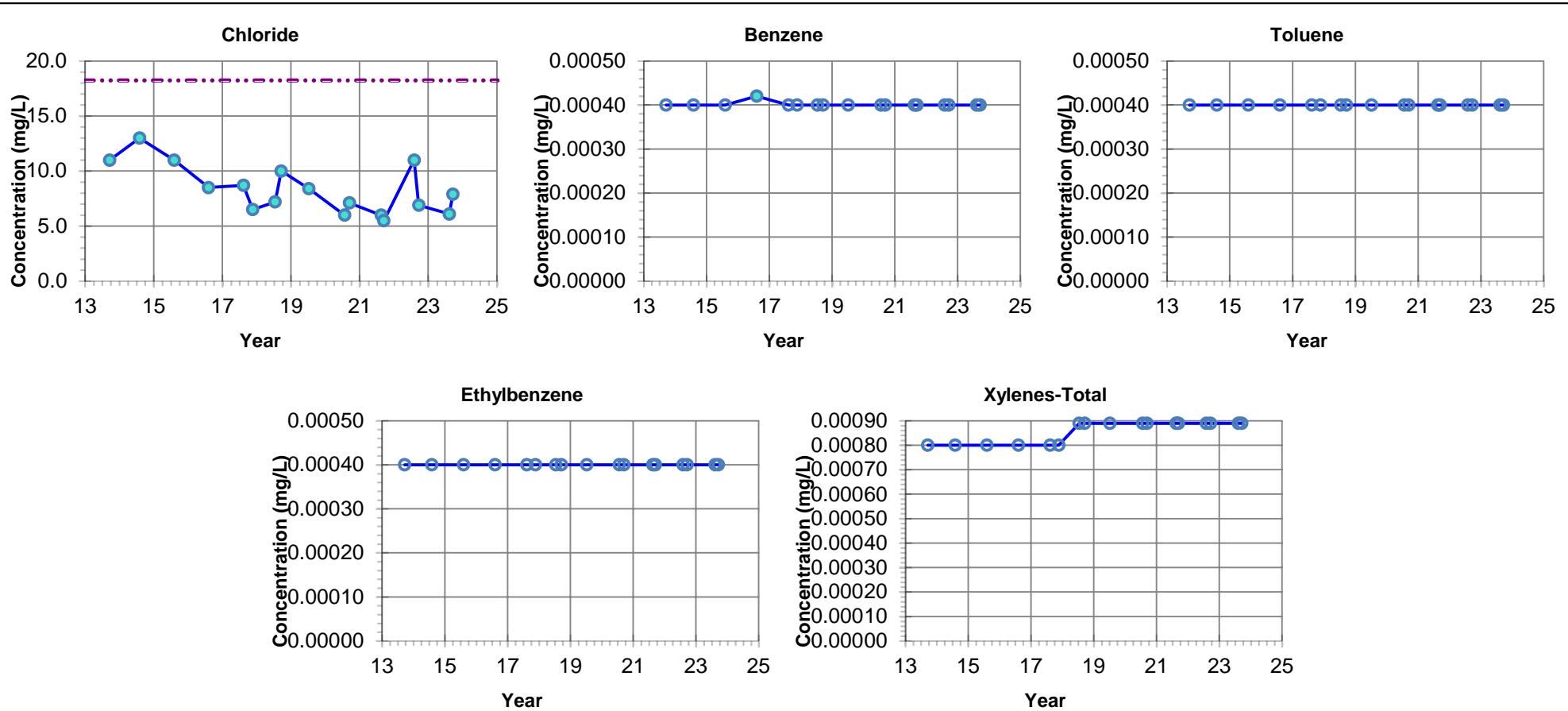
NOTES:

- 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 Norman Wells, NT 2023 SNP Groundwater Quality Monitoring Trend Graphs Monitoring Well: BI-13-1-4								
14-Mar-2024	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: 417085-49223-23100	Figure F9



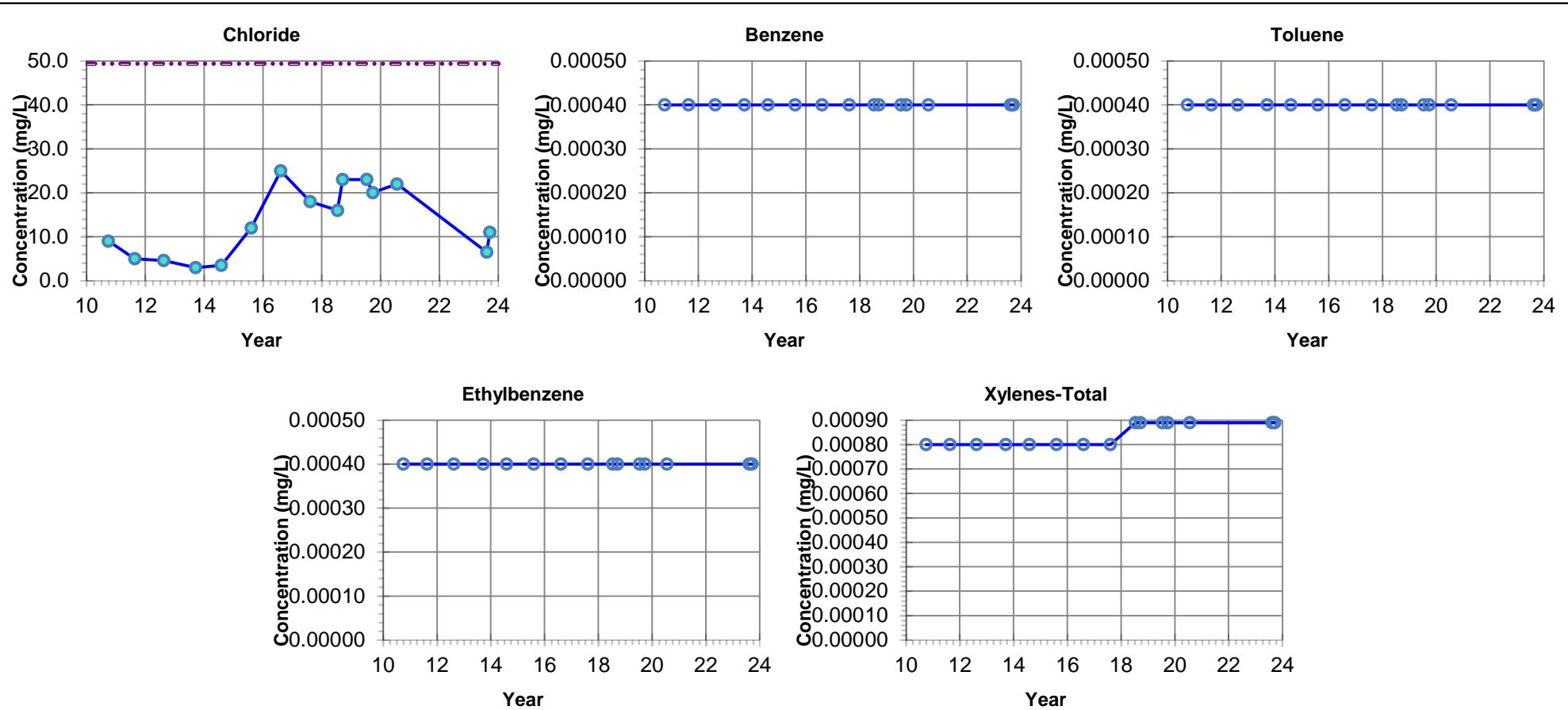
NOTES:

- 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 Norman Wells, NT 2023 SNP Groundwater Quality Monitoring Trend Graphs Monitoring Well: BI-13-3-4.5								
14-Mar-2024	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: 417085-49223-23100	Figure F10



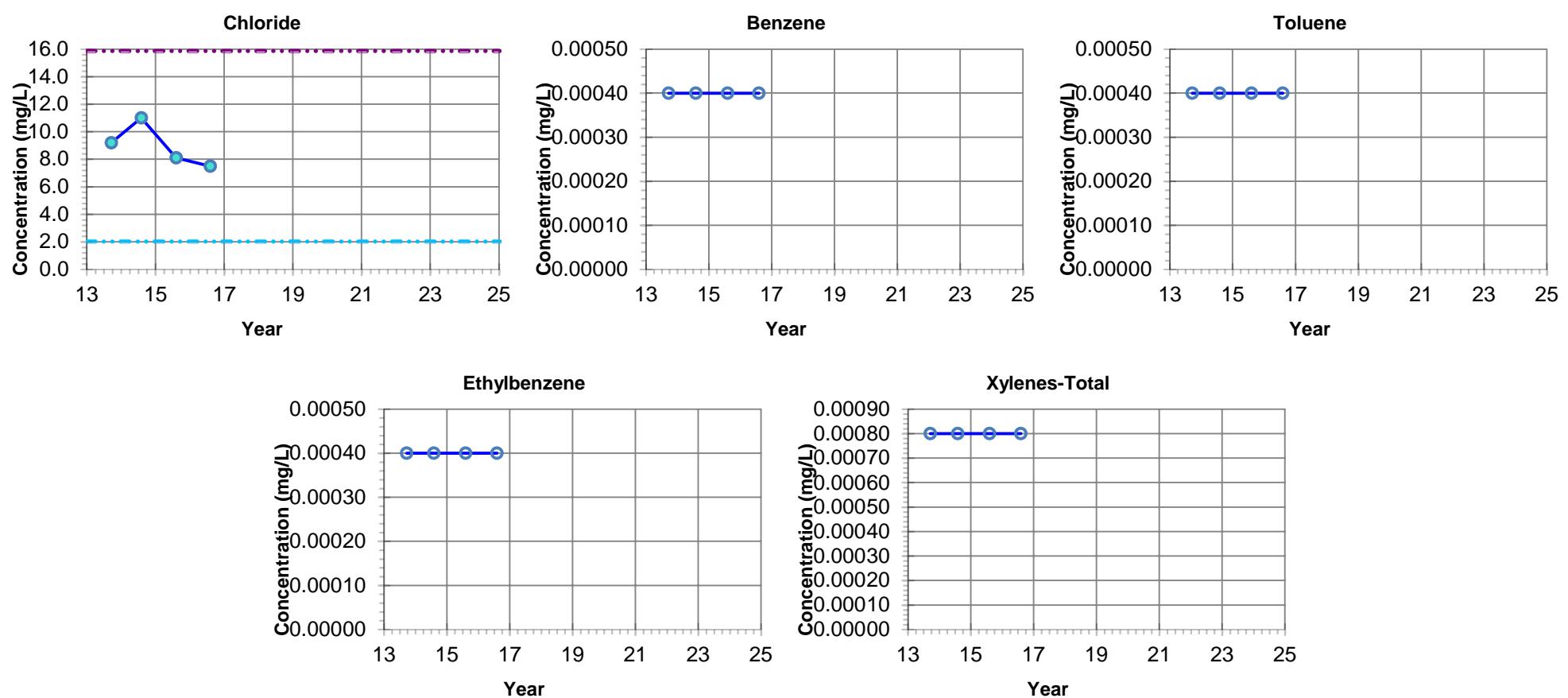
NOTES:

- 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 Norman Wells, NT 2023 SNP Groundwater Quality Monitoring Trend Graphs Monitoring Well: BIBG-10-1-4								
14-Mar-2024	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: 417085-49223-23100	Figure F11



NOTES:

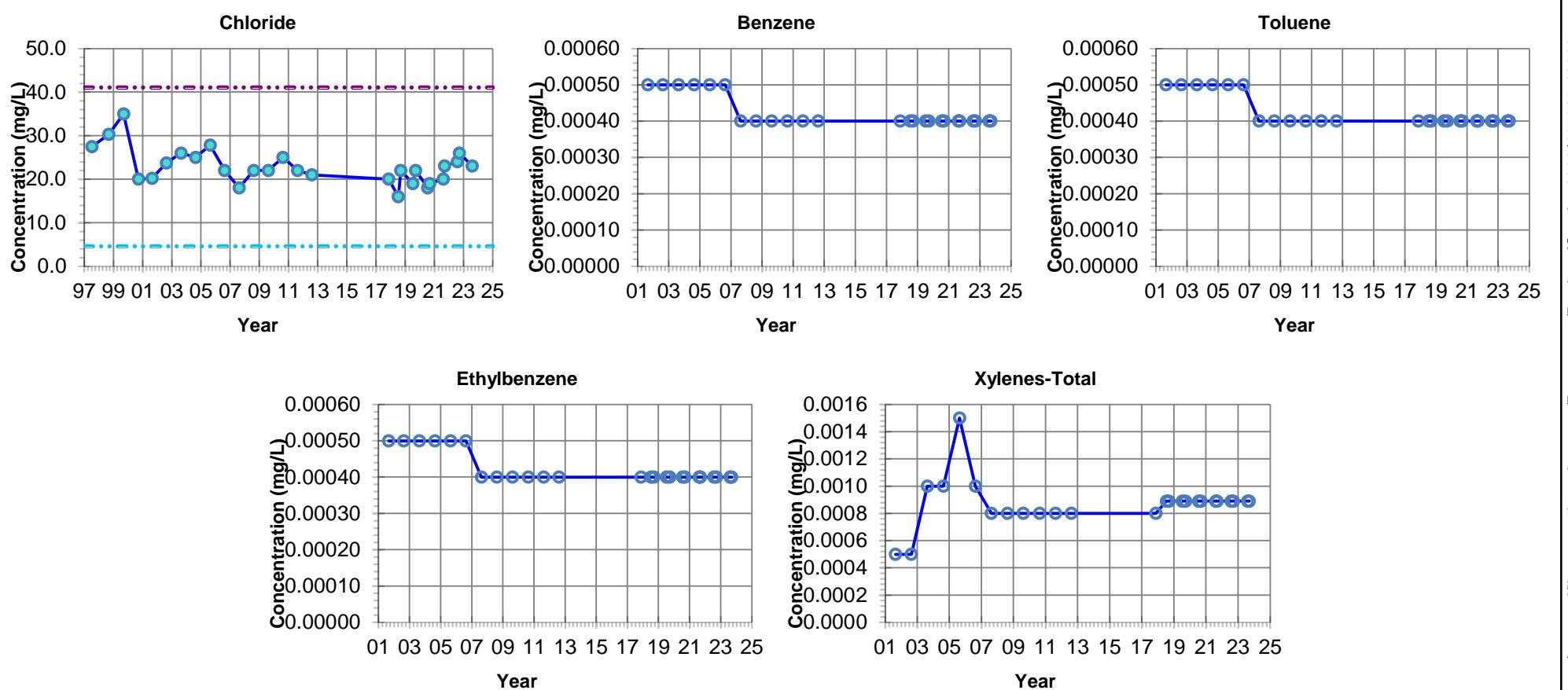
- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

— — **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 Norman Wells, NT 2023 SNP Groundwater Quality Monitoring Trend Graphs Monitoring Well: BIBG-12-1-7							PROJECT NUMBER: 417085-49223-23100	Figure F12
14-Mar-2024	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.								





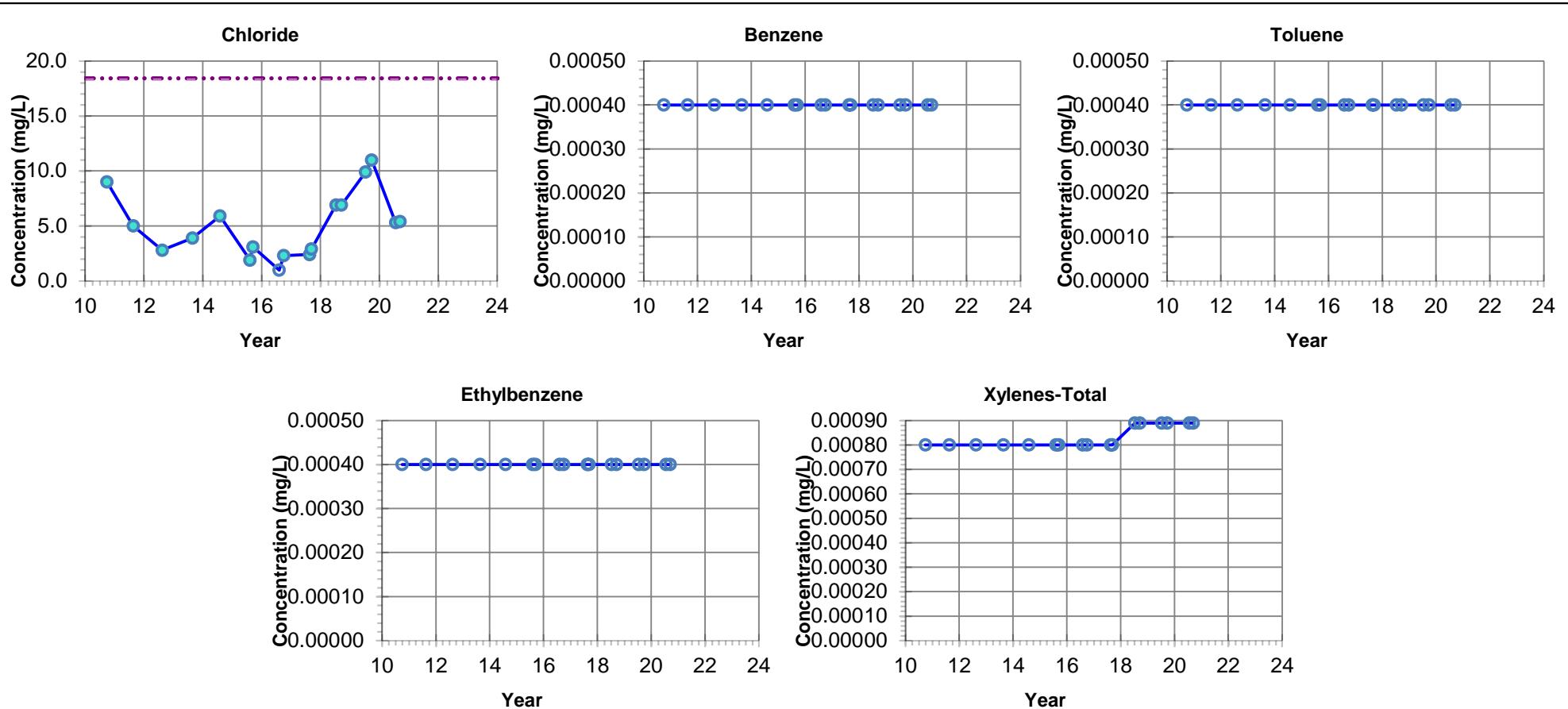
NOTES:

- 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 Norman Wells, NT 2023 SNP Groundwater Quality Monitoring Trend Graphs Monitoring Well: BIS 97-1-3								
14-Mar-2024	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: 417085-49223-23100	Figure F13



NOTES:

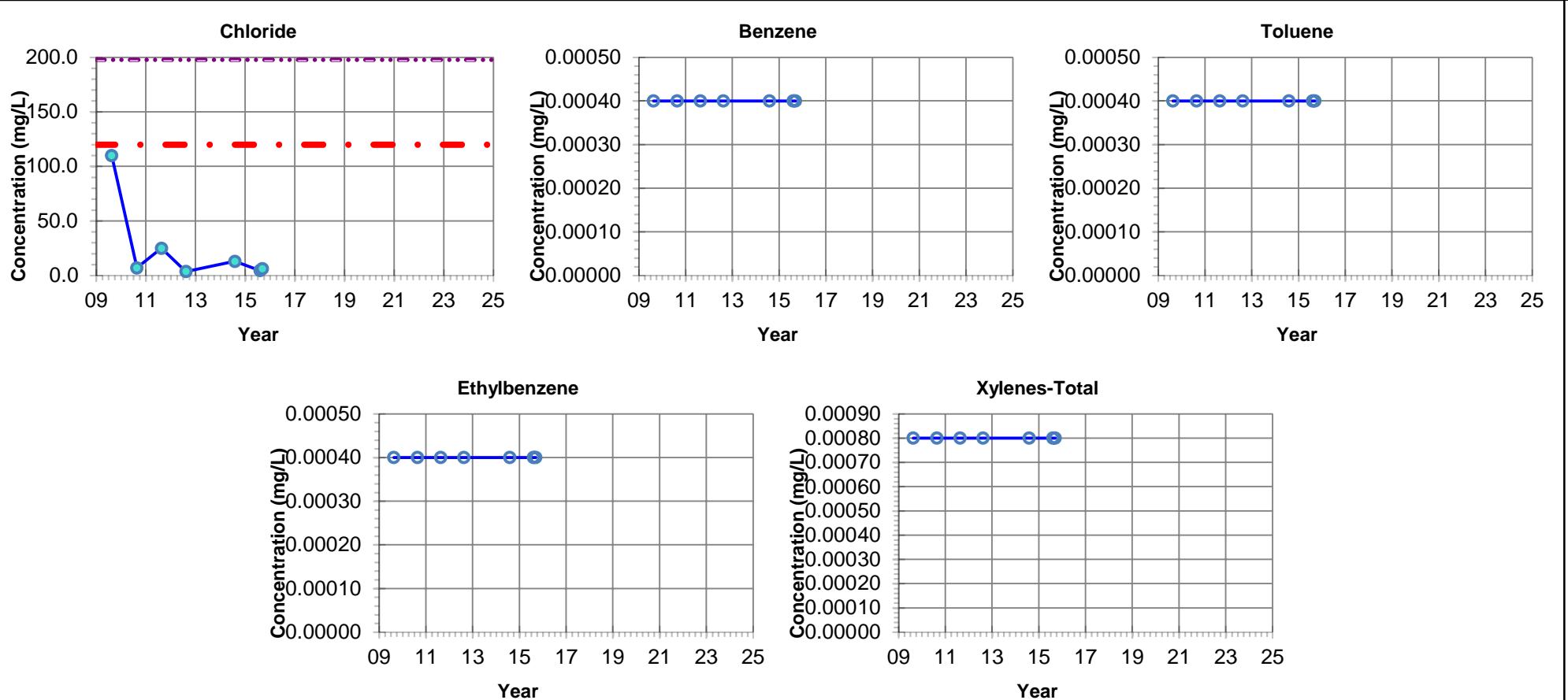
- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

— — **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 Norman Wells, NT 2023 SNP Groundwater Quality Monitoring Trend Graphs Monitoring Well: GIBG-10-2-3							PROJECT NUMBER: 417085-49223-23100	Figure F14
14-Mar-2024	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.								





NOTES:

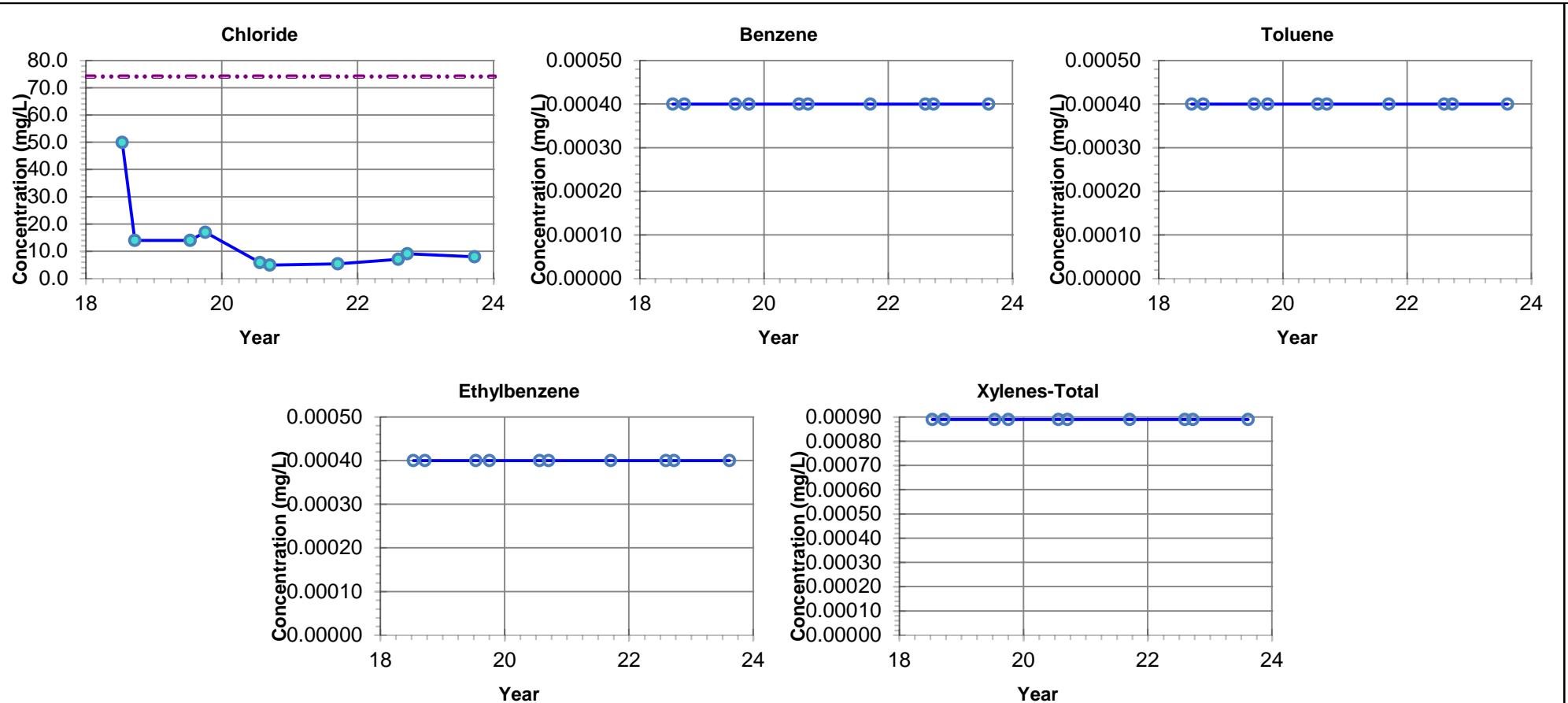
- Filled symbols denote Sample Values
- Unfilled symbols denote Values < Detection Limit(s)

— — **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 Norman Wells, NT 2023 SNP Groundwater Quality Monitoring Trend Graphs Monitoring Well: GIP11 09-1-4							PROJECT NUMBER: 417085-49223-23100	Figure F15
14-Mar-2024	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.								





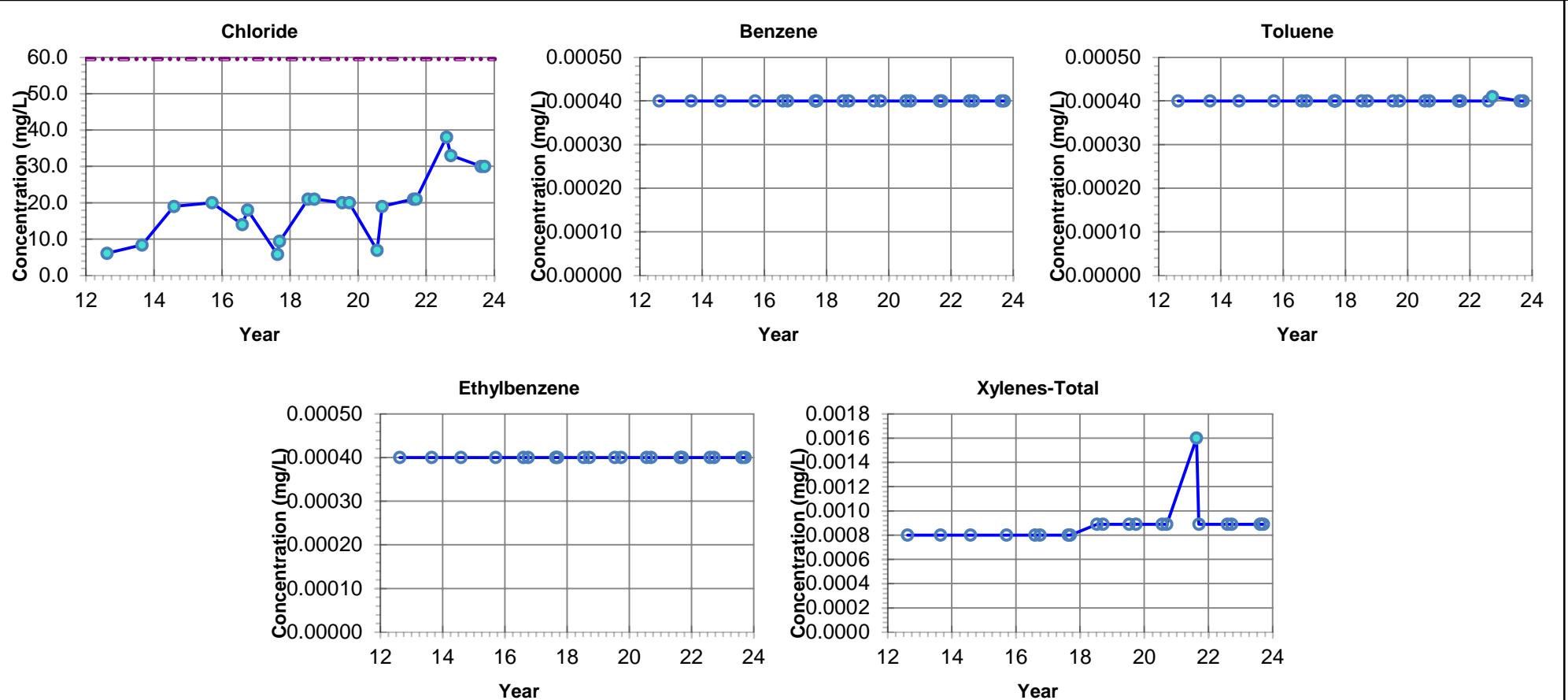
NOTES:

- 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 Norman Wells, NT 2023 SNP Groundwater Quality Monitoring Trend Graphs Monitoring Well: GIP11 09-1-4-R								
14-Mar-2024	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: 417085-49223-23100	Figure F16



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 Norman Wells, NT 2023 SNP Groundwater Quality Monitoring Trend Graphs Monitoring Well: GIQ8-10-2-4								
14-Mar-2024	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: 417085-49223-23100	Figure F17



Appendix G

Borehole Logs

CLIENT Imperial Oil Resources Ltd.

PROJECT NAME Norman Well SNP Well Replacement

PROJECT NUMBER 417085-49223-23100

PROJECT LOCATION Norman Wells, NWT

Grain Size Ranges

Description	Diameter (mm)
Clay, Silt	<0.075
Fine Sand	0.075 - 0.425
Medium Sand	0.425 - 2
Coarse Sand	2 - 4.75
Fine Gravel	4.75 - 19
Coarse Gravel	19 - 75
Cobble	75 - 300
Boulder	>300

Cohesive Soil Consistency

Description	N-Value
Very Soft	<2
Soft	2 - 4
Firm	4 - 8
Stiff	8 - 15
Very Stiff	15 - 30
Hard	>30

Particle Size Distribution

Description	Volume %
Trace (e.g. Trace Clay)	0 - 10%
Some (e.g. Some Clay)	10 - 20%
Adjective (e.g. Sandy Silt)	20 - 35%
And (e.g. Sand and Silt)	Both are >35%
Noun (e.g. Sand)	>35%

Cohesionless Soil Compactness

Description	N-Value
Very Loose	<4
Loose	4 - 10
Compact	10 - 30
Dense	30 - 50
Very dense	>50

Abbreviations

PI	Plastic Index (%)
W	Moisture Content (%)
DD	Dry Density
NP	Non Plastic
-200	Percent Passing No. 200 Sieve
PP	Pocket Penetrometer
TV	Torvane
UC	Unconfined Compression
ppm	Parts Per Million (by volume)
LEL	Lower Explosive Limit
PID	Photoionization Detector
OVA	Organic Vapour Analyzer
RQD	Rock Quality Designation
WL	Water Level

LITHOLOGIC SYMBOLS



CLAY (CL)



FILL



SILT (ML)



SILTSTONE



PEAT (PT)



SANDY CLAY (SC)



TOPSOIL

WELL CONSTRUCTION SYMBOLS



BENTONITE CHIPS



SAND



Well # CPF 23-1-3

Project Number: 417085-49223-23100

Project: Norman Well SNP Well Replacement

Client: Imperial Oil Resources Ltd.

Location: Norman Wells, NWT

Drilled by: Midnight sun

Coordinate System: UTM NAD83 Zone 9N

Drilling Method: Direct Push

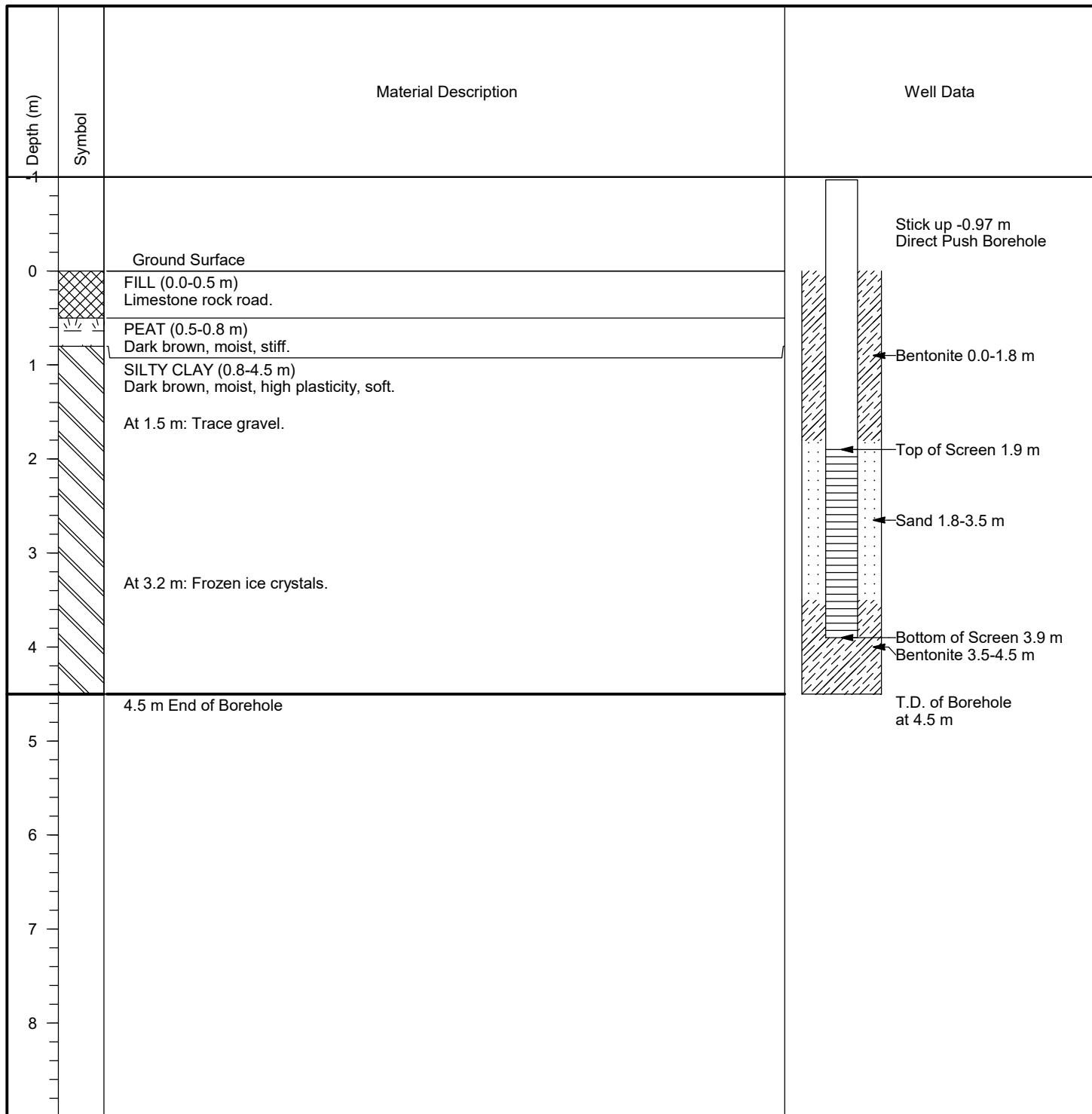
Northing: 7242045.02

Drill Date: 27-Sep-2023

Easting: 598616.20

Logged by: A. Haigh

Elevation: 59.58





Well # TF 23-1-3

Project Number: 417085-49223-23100

Project: Norman Well SNP Well Replacement

Client: Imperial Oil Resources Ltd.

Location: Norman Wells, NWT

Drilled by: Midnight Sun

Coordinate System: UTM NAD83 Zone 9N

Drilling Method: Direct Push

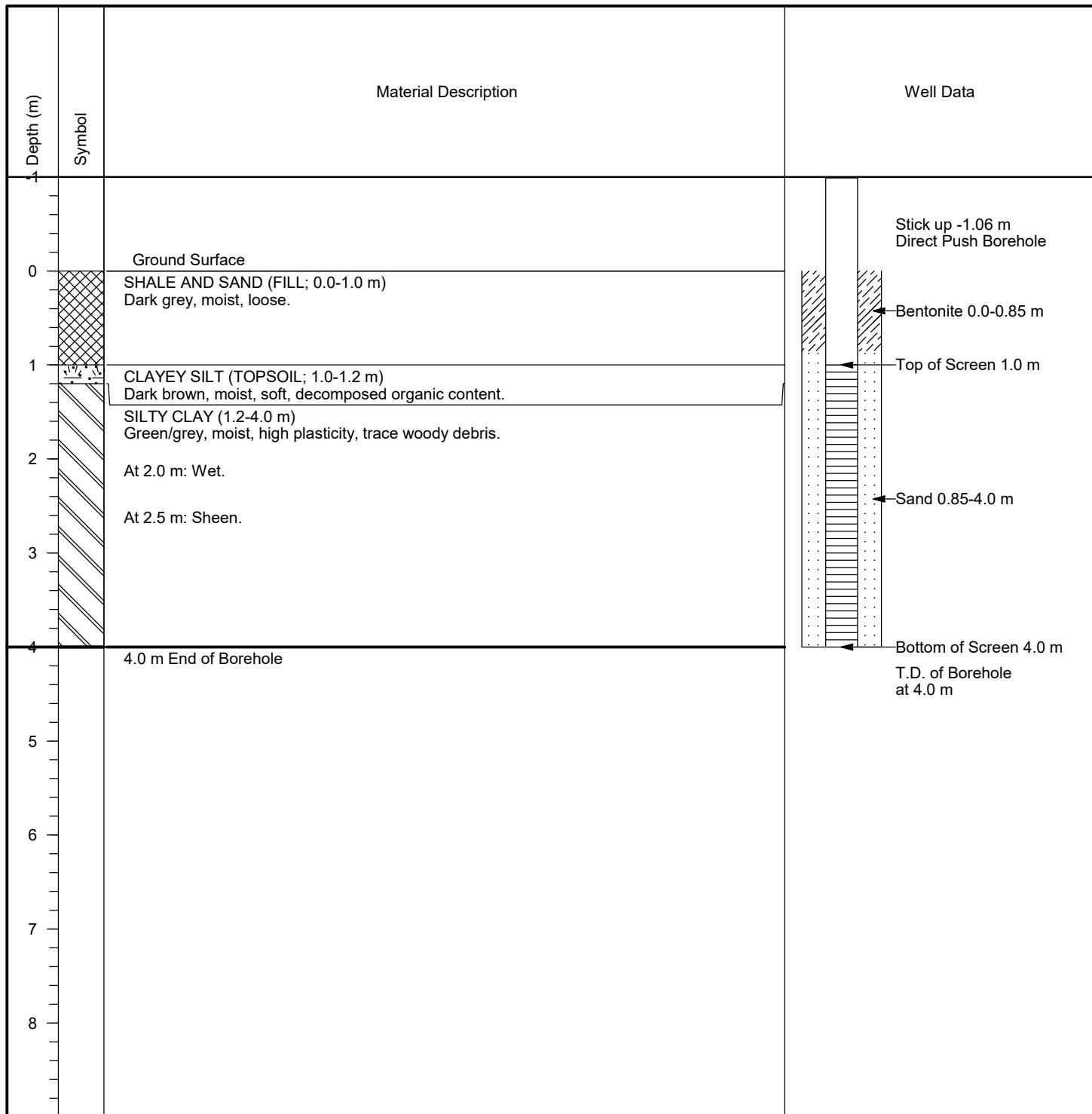
Northing: 7241638.62

Drill Date: 27-Sep-2023

Easting: 600481.12

Logged by: A. Haigh

Elevation: 59.67





Well # WSY 23-1-5

Project Number: 417085-49223-23100

Project: Norman Well SNP Well Replacement

Client: Imperial Oil Resources Ltd.

Location: Norman Wells, NWT

Drilled by: Midnight sun

Coordinate System: UTM NAD83 Zone 9N

Drilling Method: Direct Push

Northing: 7242239.68

Drill Date: 27-Sep-2023

Easting: 7242236.64

Logged by: A. Haigh

Elevation: 599194.64

