

REPORT

Government of Northwest Territories

Advanced Phase I Environmental Site Assessment Tin Can Hill Yellowknife, NT



MARCH 2023

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EXECUTIVE SUMMARY

Associated Environmental Consultants Inc. (Associated) was retained by the Government of Northwest Territories (GNWT) Department of Infrastructure (INF) in September 2022 to conduct an Advanced Phase I Environmental Site Assessment (ESA) of a land parcel referred to as Tin Can Hill, located in Yellowknife, NT (the Subject Site) (Figure 1).

The ESA is required to determine whether there are any environmental liabilities associated with the Subject Site, and to inform a Phase II ESA, if applicable.

Based on available aerial photographs dating back to 1937, the Subject Site has consisted of undeveloped forested areas used predominantly for recreational purposes. The road which transects the Subject Site from the west to the south was constructed sometime between 1937 and 1946 (based on available aerals), which coincides with the time that Con Mine was being established. The northern portion of the Subject Site is occupied by the City of Yellowknife's water treatment plant. Based on anecdotal information, Associated understands that the area was called Tin Can Hill because it was a dumping ground for emptied tin cans left behind by prospectors, and some of these cans remain.

The City of Yellowknife has been the titled owner of the Subject Site since 2007; no land titles were available for years prior to 2007.

During the site inspection, general garbage was observed, including two disintegrated batteries, Styrofoam packaging, tin cans, bottles, fire pit remnants, metal waste, and several wooden planks. The metal waste consisted of spiral corrugated pipe and drums that were empty.

Other than the road construction (which is thought to have been constructed to link the city with Con Mine), no mining activities were identified to have occurred on the Subject Site; for example, no shafts, vent openings or raises were observed or documented.

There is evidence that former activities relating to gold mining and the subsequent release of arsenic trioxide dust from ore roasting has had an impact on soil quality in the surrounding area, with concentrations of arsenic within surface soils exceeding the NWT residential guideline value of 160 ppm on the Subject Site. Available air pollution records identified additional emissions from the Con Mine, which included zinc, copper, cyanides, hydrogen cyanide, total ammonia, and nickel between the years 1994 to 2003. Zinc, copper, and sulphate (amongst other reagents) were used at the mine for ore processing (MCML 2007). Therefore, it is possible that these constituents have also had an impact on soil quality in the surrounding area.

Several mine road networks were constructed using excavated Con Mine waste (MCML 2007). Therefore, there is potential that the road constructed on the Subject Site in the late 1930s to early 1940s, was constructed using excavated mine waste, which may contain elevated concentrations of arsenic and other PCOCs.

Surrounding land use was undeveloped and forested up until the 1930s. The Con Mine opened in 1938 and began operations adjacent and to the south of the Subject Site. During this time, the area, which is now known as the City of Yellowknife, was expanding with the influx of mining operations in the area.

The NPRI identified 11 air pollution records in relation to the Con Mine. Emissions included zinc, copper, cyanides, hydrogen cyanide, total ammonia, and nickel between the years 1994 to 2003. Zinc, copper, and sulphate (amongst

other reagents) were used at the mine for ore processing (MCML 2007). Therefore, it is possible that these constituents have also had an environmental impact on soil quality in the surrounding area.

It is likely that there would have been some downward infiltration from Rat Lake (located hydraulically upgradient of the Subject Site, approximately 170 m to the west) into groundwater, however due to low permeability of the underlying bedrock, volumes are expected to have been small. Groundwater flow from Rat Lake, based on topography and surface water flow patterns, would be to the south towards Kam Lake, or to the east towards Yellowknife Bay.

Based on the ESA results, there is **moderate potential**¹ that historical or current land use activities at the Subject Site and on surrounding properties have resulted in contamination of soil and/or groundwater.

Further investigation (i.e., Phase II Environmental Site Assessment) is recommended to assess soil and water quality, and the materials used in the construction of the road on the Subject Site for PCOCs related to past mining activities and general waste.

This executive summary is subject to the same limitations presented in the Disclaimer provided in Section 12 of this report.

¹ **High potential** means there is physical, visual, olfactory, or recent factual evidence of contamination on site. **Moderate potential** means there is evidence or knowledge of past or current land uses or infrastructure with the potential to release contaminant(s) into the environment. **Low potential** means there is little or no evidence of sources of contamination.

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LIST OF ABBREVIATIONS

APEC	area of potential environmental concern
AST	aboveground storage tank
CCME	Canadian Council of the Ministry of Environment
CSA	Canadian Standards Association
ECCC	Environment and Climate Change Canada
EPA	Environmental Protection Act
ENR	Environment and Natural Resources
ESA	Environmental Site Assessment
ERIS	Environmental Risk Information Services
FCSI	Federal Contaminated Sites Inventory
GNWT	Government of Northwest Territories
HBM	hazardous building materials
NPRI	National Pollutant Release Inventory
NT	Northwest Territories
PCOC	potential contaminant of concern

Units & Symbols

°C	degrees Celsius
km	kilometre
L	litre
m	metre
m ²	square metre
m ³	cubic metre
<	less than
>	greater than
ppm	parts per million

1 INTRODUCTION

Associated Environmental Consultants Inc. (Associated) was retained by the Government of Northwest Territories (GNWT) Department of Infrastructure in September 2022 to conduct an Advanced Phase I Environmental Site Assessment (ESA) of a land parcel referred to as Tin Can Hill, located in Yellowknife, NT (the Subject Site) (Figure 1).

2 OBJECTIVE

The objective of the ESA was to determine whether areas of potential environmental concern (APECs) and potential contaminants of concern (PCOCs) exist on the Subject Site. The potential risk level of soil and/or groundwater contamination was qualitatively assessed based on the past, current, or intended land use(s) at the Subject Site and neighbouring properties.

This report describes the methods and results of the ESA and, in consideration of the results, presents conclusions and recommendations.

3 RELEVANT ACTS, GUIDELINES, AND PROTOCOLS

The ESA was conducted in accordance with the general guidelines for conducting a site information assessment, as described in the Environmental Guideline for Contaminated Site Remediation (ENR 2003), published by the Environment Division of the Department of Environment and Natural Resources (ENR), under the Northwest Territories *Environment Protection Act* (EPA) (R.S.N.W.T. 1988 c-E-7), and followed the general protocols defined in the Canadian Standards Association (CSA) Standard Z768-01 (R2022) – Phase I Environmental Site Assessment (CSA 2022).

The NWT EPA gives the GNWT the authority to take all necessary measures to ensure the prevention, protection, or enhancement of the environment, with the goal of sustainability and stewardship. Section 2.2 of the EPA gives the Minister of the ENR the authority to develop, coordinate, and administer the Environmental Guideline for Contaminated Site Remediation (ENR 2003).

The Subject Site is currently undeveloped green space, used predominantly by the public for recreational activities. The northern portion of the Subject Site is occupied by the City of Yellowknife's water treatment plant. The proposed future land use of the Subject Site is educational (Polytechnic University); therefore, the remediation criteria applicable to the Subject Site are residential/parkland (Section 2.2.2) (ENR 2003).

4 SCOPE

The scope of the ESA included the following activities:

- Review of records relevant to the Subject Site and adjacent properties;
- Interview of an individual with knowledge of current and/or historical activities on the Subject Site and neighbouring properties;
- Visual inspection of the Subject Site and adjacent properties visible from either the Subject Site or public property; and

- Preparation of this report, which includes a discussion of the risk of soil, groundwater, and vapour contamination at the Subject Site with respect to territorial standards for the current or intended land use.

The ESA did not include sampling, testing, or remediation activities of any kind, including soil, groundwater, surface water, sediment, vapour, or building materials.

The findings of this report are subject to the standard limitations described in the disclaimer.

5 SITE DESCRIPTION

5.1 Location, Zoning, and Land Use

The Subject Site comprises one irregularly shaped legal lot located in the City of Yellowknife, North Slave Region, NT (Figure 1) (Table 5-1). A map of the lot is enclosed in Appendix A, Survey, Topography and Surface Water Flow Maps.

Table 5-1
Subject Site Description

	Lot Description
Civic Address	Tin Can Hill, Yellowknife
Legal Land Description	Lot 10, Block 203, Plan 4460
Size (m ²)	325079.3
Zoning (current land use)	Greenspace/Recreational
Site Use	Predominantly undeveloped. Used by the public for recreational purposes. The northern portion of the Subject Site is used for the City of Yellowknife water treatment plant.

Notes: Lot description information sourced from the ATLAS database (GNWT 2022a).

Based on anecdotal information, Associated understands that the area was called Tin Can Hill because it is a dumping ground for emptied tin cans left behind by prospectors, and some of these cans remain.

5.1.1 Climate

The Subject Site is located approximately 400 km south of the Arctic Circle, within the continental sub-Arctic climate. The continental sub-Arctic climate is characterized by long, cold winters, and short, cool summers.

The nearest climate station (Yellowknife Airport) is located at 62°28'28.000" N 114°26'57.000" W in Yellowknife, NT X1A 3T2, within the Yellowknife Airport limits. The climate station is at an elevation of 205.74 metres above sea level. Climate normal data between 2013–2022 indicates temperatures ranging from –30.0°C (daily minimum) in January to 22°C in July (daily maximum). The mean annual precipitation is 288.6 mm, with 170.7 mm falling as rain and the remainder falling as snow (ECCC 2022).

5.1.2 Geology

Surficial geology is discontinuous and shallow and typically comprises silt, clay, and peat (MCML 2007). The bedrock geology of the Subject Site consists of the Kam Group, which comprises mafic volcanic rocks and related intrusions and volcanoclastic rocks and gabbro sills of the Banting Group. A mafic intrusion comprising gabbro,

anorthosite and diorite, intersects the centre of the Subject Site (the Rycon-Negus Shears and West Bay Fault) (Stubley, M.P. and Irwin, D. 2019) (GNWT 2022b).

5.1.3 Surface Waterbodies

Surface waterbodies within a 1 km radius of the Subject Site consist of Rat Lake and Great Slave Lake. Rat Lake is located approximately 170 m to the west and is upgradient of the subject site. Great Slave Lake borders the Subject Site to the east and is inferred to be downgradient (Government of Canada 2022b).

5.1.4 Groundwater Wells

Residents in the City of Yellowknife, Ndilo, and Dettah obtain their drinking water from the Yellowknife River (upstream of the former Giant Mine and before the river enters Yellowknife Bay). Some residents may also obtain water from other lakes in the area (Kam Lake, Frame Lake, Rat Lake, Peg Lake, Meg Lake, Jackfish Lake, Fox Lake, Handle Lake, Gar Lake, David Lake, and other unnamed local lakes) for personal use (GNWT 2019). Drinking water wells are therefore not expected to exist in the vicinity of the Subject Site.

5.1.5 Topography and Inferred Surface Water and Groundwater Flow

Surface topography can influence the direction of contaminant migration at ground level. The local topography generally slopes to the south to southeast (Government of Canada 2022b).

Groundwater is a common pathway for contaminant transport. Based on regional topography and the location and flow of surface waterbodies, groundwater beneath the Subject Site is inferred to flow in a generally southeasterly direction, toward Great Slave Lake, located to the east. The inferred groundwater flow direction for the general area is a good approximation; however, localized variations in actual flow direction may exist due to unverified subsurface features, temporal variation, and influence from surface water bodies. Surveyed groundwater elevation measurements would be required to determine groundwater flow direction. A topographic map with surface water flow is enclosed in Appendix A.

6 METHODS

6.1 Records Review

The information reviewed for this ESA included records, databases, maps, and reports relevant to the Subject Site (Table 6-1).

Table 6-1
Records Reviewed

Record	Purpose
Aerial Photographs and Satellite Imagery	Aerial photographs and satellite imagery provide a visual history of the Subject Site and typically show site features (e.g., buildings) and how the Subject Site and surrounding area have developed over time. Sources reviewed: Government of Canada’s Earth Observation Data Management System (Government of Canada 2022c), DigitalGlobe 2022, Google Earth® Street View, and Associated’s database of aerial imagery.
Company Records	Company records comprising but not limited to:

Record	Purpose
	<ul style="list-style-type: none"> • Site plans • Building plans • Permit records • Maintenance records • Asbestos surveys • Utility drawings • Emergency response or contingency plans • Spill reporting plans and records • Inventories of chemicals and their usage • Material safety data sheets • Waste management records • Environmental assessment reports, studies, or data • Inventory of underground and aboveground storage tanks • Environmental audit reports • Previous reports and studies (e.g., Phase II ESAs, remediation reports)
Current and Historical Land Titles	Land titles indicate the registered owners of the Subject Site over time and any encumbrances such as mortgages or easements.
City Directories	Reverse directories indicate who has operated at an address over time (search by address). Telephone directories indicate who has operated at an address over time, but the search input is by a business or a person's name.
Environment and Natural Resources Hazardous Materials Spill Database	Provides information for reported spills in NWT.
Environmental Offenders Registry	The Environmental Offenders Registry contains information on convictions of corporations obtained under certain federal environmental laws.
Environmental Risk Information Services (ERIS)	<p>ERIS conducted searches of several databases for detailed environmental risk data and records of properties that may present environmental risks. The following reports were obtained from ERIS:</p> <ul style="list-style-type: none"> • Automobile Wrecking and Supplies (AUWR) • Crown Land Fuel Storage Tanks (CFST) • Chemical Register (CHM) • Environmental Issues Inventory System (EIIS) • Federal Convictions (FCON) • Federal Identification Registry for Storage Tank Systems (FIRSTS) (FRST) • Indian & Northern Affairs Fuel Tanks (IAFT) • Canadian Mine Locations (MINE) • Mineral occurrences (MNR) • National Defense & Canadian Forces Fuel Tanks (NDFT) • National Defense & Canadian Forces Spills (NDSP) • National Defense & Canadian Forces Waste Disposal Sites (NDWD) • National Energy Board Pipeline Incidents (NEBI) • Northwest Territories Oil and Gas Wells (NOGW) • National PCB Inventory (NPCB) • National Pollutant Release Inventory (NPRI) • Oil and Gas Wells (OGWE) • Parks Canada Fuel Storage Tanks (PCFT) • Retail Fuel Storage Tanks (RST) • Scott's Manufacturing Directory (SCT) • Spills (SPL) • Well Water Information System (WWIS)

Record	Purpose
Federal Contaminated Sites Inventory (FCSI)	The FCSI is an online database of active, suspected, and closed federal contaminated sites across Canada. The FCSI contains information about each site, its classification and location, the severity of the contamination, the contaminated medium, the nature of the contaminant, and the progress made to date in identifying and addressing contamination (Government of Canada 2016).
Regulatory Information	<ul style="list-style-type: none"> • Permits; • Past, pending, outstanding, or continuing prosecutions, work orders, control orders, or complaints related to environmental compliance that may impact the condition of the property; and • Violations of environmental statutes, regulations, by-laws, approvals, and permits that may impact the condition of the property.
Environment and Climate Change Canada (ECCC) National Pollutant Release Inventory (NPRI)	The NPRI is a legislated record of pollutant releases (i.e., air, land, and water), disposables, and transfers for recycling. It comprises information reported by facilities and published by ECCC, as per sections 46 to 50 of the <i>Canadian Environmental Protection Act, 1999</i> (SC 1999, c. 33), as well as emission summaries and trends for key air pollutants based on facility-reported data and emission estimates for other sources, such as motor vehicles, residential heating, forest fires, and agriculture.
Previous Reports (if available)	<p>Previous environmental reports for any studies conducted on the Subject Site. Geological and geotechnical reports contain information about the nature of soils and/or groundwater.</p> <p>Reports are either provided by the client or are publicly available.</p>

6.2 Site Interviews and Consultations

Associated interviewed and consulted the following individuals and government bodies to obtain anecdotal or documented accounts of current and past uses of the Subject Site:

- Dwight Grabke from Newmont Corporation (gold mine legacy sites)
- The GNWT Environmental Health Officer
- Office of the Fire Marshal
- City of Yellowknife Planning and Lands Department
- Environment and Natural Resources

The results of the interviews are discussed in Section 8.

6.3 Drone Survey and Site Visit

Due to the extent of the property and the challenges presented by the vegetation and ground cover, an aerial video and photographic drone survey was conducted in addition to the ground-based visual site assessment to identify the current site conditions and to document evidence of the following¹: evidence of contamination at the site or from neighbouring properties (e.g., odours and staining), surface and sub-surface drainage patterns, existing and former infrastructure locations and uses, sewage or wastewater storage, chemical storage and handling, non-hazardous and hazardous waste, air and water discharges, stockpiling, dumping, or landfilling activities, materials and product handling, use, disposal methods, and storage vessels (e.g., sumps and aboveground and underground storage tanks).

¹ The full list of site conditions assessed during the drone survey and site visit is described in the request for proposal.

The drone survey was conducted by Alietum Ltd. on September 16, 2022. The results of the drone survey are provided in Section 9.

On September 27, 2022, Associated conducted a site visit of the Subject Site. The results of the visit are provided in Section 10.

7 RECORDS REVIEW

The following sections provide the results of the records review. Indications of any environmental risks are described in Section 10.

7.1 Aerial Photographs and Satellite Imagery

The results of the aerial photograph and satellite imagery review are provided in Table 7-1. Copies of the aerials and satellite imagery are provided in Appendix B.

Table 7-1
Interpretation of Aerial Photographs

Date of Photograph	Subject Site	Surrounding Area
1937	Undeveloped and forested. The aerial image is not clear.	Undeveloped and forested.
1946	A road has been built on the western perimeter of the site.	A significant road network has been developed at the nearby Con Mine (located adjacent to the south and downgradient of the Subject Site).
1948	No significant changes.	Significant development has occurred approximately 180 m northwest, with several buildings with roads.
1953	No significant changes. The aerial image is not clear.	No significant changes.
1964	No significant changes.	Road network has been expanded around the Con Mine, with the construction of what appears to be a tailings dam approximately 880 m south of the Subject Site (Negus tailing, as identified in MCML 2007). Bulk storage tanks are present approximately 800 m south (Imperial Oil, as identified in MCML 2007) and approximately 90 m south, at the former dock of the Con Mine. Construction has occurred adjacent to the north.
1966	No significant changes.	Expansion of the development to the northwest.
1970	No significant changes.	No significant changes.
1970	No significant changes.	No significant changes.

Date of Photograph	Subject Site	Surrounding Area
2022	Hiking trails. Construction of a water treatment facility in the north.	The Con Mine and the nearby tailings dam have been decommissioned and partially converted into Con Mine Park. The nearby Rat Lake (approximately 230 m west) has lost approximately half to three-quarters of its historical water volume. The bulk storage tanks have been removed.

Note: *Distances are approximations from the closest property boundary.

7.2 Company and Landowner Records

No company or landowner records were available for review.

7.3 Current and Historical Land Titles

A current and historical land title search completed on September 30, 2022, identified four certificates of title. The search identified the City of Yellowknife as being the owner of the Subject Site since 2007. No land titles were found for previous years. Copies of the land titles are provided in Appendix C.

7.4 City Directories

No city or telephone directories were available for review.

7.5 ENR Hazardous Materials Spills Database

A search of the ENR spills database identified no records in relation to the Subject Site or neighbouring properties within a 0.5 km radius (GNWT 2022c).

7.6 Environmental Offenders Registry

A search of the Environmental Offenders Registry identified no records in relation to the Subject Site or neighbouring properties within a 0.5 km radius (Government of Canada 2022d).

7.7 ERIS Database

Associated submitted a request to ERIS for a review of various databases as they pertain to the Subject Site and neighbouring properties. The ERIS database identified one record for the Subject Site and 45 records for neighbouring properties. A summary of each record is presented in Sections 7.7.1 to 7.7.3. A copy of the ERIS report is provided in Appendix D.

7.7.1 Crown Land Fuel Storage Tanks

The Crown Land Fuel Storage Tanks Database² returned no records for the Subject Site and three records for properties within a 0.5 km radius of the Subject Site (Table 7-2).

² For October 1997 to April 2022

Table 7-2
Crown Land Fuel Storage Tanks Database

Location*		Tank Information
Yellowknife – Rockhill Apartments (4904 54 Avenue)	170 m northwest and downgradient of the Subject Site	An aboveground building heating oil system with a tank capacity of 11,940 L
4701 52 Avenue	370 m northwest and downgradient of the Subject Site	Used oil storage tank containing 2,500 L of waste oil 2,500 L Recycoil® aboveground waste oil storage tank

Notes:

*Distances are approximations from the closest property boundary.

7.7.2 Scott's Manufacturing Directory

The Scott's Manufacturing Directory³ returned the following two off-site records for properties located within a 0.5 km radius of the Subject Site:

- Miramar Con Mine Ltd. (75 Con Rd.) – Gold and Silver Ore Mining
- Miramar Northern Mining Ltd. (75 Con Rd.) – Other Support Activities for Mining

The properties are located approximately 350 m southwest and downgradient of the Subject Site.

7.7.3 Spills

The Spills database returned no records for the Subject Site and 30 off-site records⁴ for properties within a 0.5 km radius of the Subject Site (Table 7-3).

Table 7-3
Spills Database

Location*		Date of Spill	Description of Spill
End of School Draw Avenue, new development on a lot across from Copper Sky Condos	Adjacent to the west and downgradient from the Subject Site	April 21, 2020	Hydraulic fluid spill of an unknown quantity, across approximately 2.00 m ² .
School Draw by Copper Sky Town across from 4844 School Draw Avenue	25 m west and downgradient of the Subject Site	January 13, 2016	Fuel spill from an unknown cause/transportation. Spill quantity reported: 0 L.
School Draw Avenue and 49 Street	30 m northwest and downgradient of the Subject Site	November 14, 2011	Hydraulic fluid spill of 4.00 L from a pipe leak on a truck.
5405 49 Street	75 m west and downgradient of the Subject Site	May 4, 2018	Diesel spill of unknown quantity from a fitting leak on a truck.

³ For years 1992 to 2011

⁴ Database dated November 30, 2021

Location*		Date of Spill	Description of Spill
4804 School Draw	80 m northwest and downgradient of the Subject Site	July 28, 2004	Heating fuel P-50 spill from a storage tank <4,000 L leak. Spill quantity reported: 0 L.
5505 47th Street	120 m north and downgradient of the Subject Site	August 12, 2000	Deliberate discharge of 1.00 L Cygon 2E systemic insecticide.
Apt. 203 4905 54th Avenue	125 m northwest and downgradient of the Subject Site	November 6, 2007	Sewage from a pipe leak. Unknown quantity.
5456-52 St. Bison Apts.	130 m west and downgradient of the Subject Site	October 19, 2006	Transformer oil spill of 10.00 L.
49th Street & 54th Avenue	130 m northwest and downgradient of the Subject Site	October 6, 1990	Deliberate discharge of 200.00 L of oil.
5313A 49th Street, Yellowknife	145 m northwest and downgradient of the Subject Site	May 30, 2011	Heating fuel P-50 spill from a storage tank <4,000 L leak. Spill quantity reported: 0 L.
4804 54th Avenue	150 m northwest and downgradient of the Subject Site	March 3, 1999	Fuel oil spill of 45.00 L from a storage tank <4,000 L. Tank had spill containment.
PWGSC 44 Rycon Drive	200 m west and downgradient of the Subject Site	December 6, 2009	Heating oil spill from a storage tank <4,000 L. Spill quantity reported: 0 L.
5502 45th Street Alleyway	200 m north and downgradient of the Subject Site	August 5, 2008	Hydraulic fluid spill of 20.00 L from a pipe or line leak.
DIAND Core Lab, 5601 45th Street	215 m northeast and downgradient of the Subject Site	December 31, 1996	Chemicals (including transformer oils)/sewage spill from a pipe leak on a <4,000 L storage tank. Spill quantity reported: 0 L.
45 Street and School Draw Avenue	270 m north and downgradient of the Subject Site	October 10, 2001	Diesel fuel leak from a pipe or line leak. Spill quantity reported: 0 L.
At a municipal lot at the end of 54th street, Block 110, plan 2093	285 m west and downgradient of the Subject Site	May 18, 2021	Motor oil spill of 5.00 L across approximately 2.00 m ² from a transportation vehicle breakage.
5300 49th Street Anderson Thomson Tower	315 m northwest and downgradient of the Subject Site	October 25, 2008	Overflow event of diesel fuel from a storage tank <4,000 L. Spill quantity reported: 0 L.
4701 52nd Avenue	350 m northwest and downgradient of the Subject Site	August 23, 2000	Asphalt sealant spill of 10.00 L.
5216 53 Avenue	400 m northwest and downgradient of the Subject Site	April 24, 2012	Heating fuel P-50 leak from a storage tank <4,000 L. Spill quantity reported: 0 L.

Location*		Date of Spill	Description of Spill
42 Con Road Ptarmigan Apts. Parking Stall	400 m west and downgradient of the Subject Site	April 28, 2009	Oil spill from a truck. Spill quantity reported: 0 L.
5135 Forrest Drive	410 m west and downgradient of the Subject Site	September 13, 2013	Heating fuel P-50 from a truck. Spill quantity reported: 0 L.
5133 Forrest Drive Area	420 m west and downgradient of the Subject Site	June 29, 1992	Sewage spill of approximately 4,000 L from a pipe leak.
5211 52nd Street	420 m northwest and downgradient of the Subject Site	October 26, 1999	Fuel oil P-50 leak of 69.00 L from a storage tank <4,000 L.
Road in front of 5140 Forrest Drive on pavements	420 m west and downgradient of the Subject Site	June 28, 2014	Engine oil spill of 6.00 L.
5201 51st Street Simpson House Apartments	420 m northwest and downgradient of the Subject Site	January 12, 2001	Fuel oil spill from a storage tank leak >4,000 L. Spill quantity reported: 0 L.
Intersection of Con Road & Rycon Drive	430 m west and downgradient of the Subject Site	August 29, 1994	Heating fuel P-50 spill from a truck. Spill quantity reported: 0 L.
Intersection of 44th Street and School Draw Avenue	430 m north and downgradient of the Subject Site	September 25, 2011	Deliberate discharge of 12.00 L of oil from a drum or barrel.
5209 52 Street	440 m northwest and downgradient of the Subject Site	April 22, 2002	Fuel oil spill from a truck. Spill quantity reported: 0 L.
Polar Bowl Parking Lot 52nd Avenue & 50th Street	460 m northwest and downgradient of the Subject Site	July 20, 2003	Gasoline spill from a truck. Spill quantity reported: 0 L.
Corner of Forrest Drive and Forrest Drive North	500 m west and downgradient of the Subject Site	August 23, 2011	Sewage Spill of 100.00 L from a truck.

Note: *Distances are approximations from the closest property boundary.

A further 22 records were identified by ERIS (unplottable sites); however, these properties were identified to be over 500 m from the Subject Site.

7.8 Federal Contaminated Sites Inventory

A search of the FCSI identified no records in relation to the Subject Site and no records for neighbouring properties within a 0.5 km radius (Government of Canada 2022e). The FCSI search is enclosed in Appendix E.

7.9 National Pollutant Release Inventory

A search of the NPRI identified no records in relation to the Subject Site and 11 records for one neighbouring property within a 0.5 km radius (Table 7-4) (Government of Canada 2022f).

Table 7-4
National Pollutant Release Inventory – Miramar Con Mine Ltd. 75 Con Road

Report Year	Pollutant Release Information
1993	No information available
1994	Zinc (and its compounds) – 0.0 tonnes Copper (and its compounds) – 0.262 tonnes Cyanides (ionic) – 0.263 tonnes
1995	Zinc (and its compounds) – 0.0 tonnes Copper (and its compounds) – 0.288 tonnes Cyanides (ionic) – 0.386 tonnes Hydrogen cyanide (VOCs) – 0.19 tonnes Ammonia (total) – 10.79 tonnes
1996	Zinc (and its compounds) – 0.66 tonnes Copper (and its compounds) – 0.532 tonnes Cyanides (ionic) – 0.687 tonnes Hydrogen cyanide (VOCs) – 12.6 tonnes Ammonia (total) – 17.72 tonnes
1997	Zinc (and its compounds) – 0.1 tonnes Copper (and its compounds) – 0.236 tonnes Hydrogen Cyanide (VOCs) – 9.46 tonnes Cyanides (ionic) – 0.333 tonnes Ammonia (total) – 7.49 tonnes
1998	Zinc (and its compounds) – 0.1 tonnes Copper (and its compounds) – 0.173 tonnes Cyanides (ionic) – 0.253 tonnes Hydrogen cyanide (VOCs) – 2.30 tonnes Ammonia (total) – 16.00 tonnes
1999	Zinc (and its compounds) – 0.033 tonnes Copper (and its compounds) – 0.053 tonnes Cyanides (ionic) – 0.210 tonnes Hydrogen cyanide (VOCs) – 9.46 tonnes Ammonia (total) – 6.31 tonnes
2000	Zinc (and its compounds) – 0.033 tonnes Copper (and its compounds) – 0.209 tonnes Cyanides (ionic) – 0.318 tonnes Hydrogen cyanide (VOCs) – 2.87 tonnes Ammonia (total) – 12.52 tonnes Nickel (and its compounds) – 0.264 tonnes
2001	Zinc (and its compounds) – 0.033 tonnes Copper (and its compounds) – 0.204 tonnes Cyanides (ionic) – 0.376 tonnes

Report Year	Pollutant Release Information
	Hydrogen cyanide (VOCs) – 2.54 tonnes Ammonia (total) – 12.96 tonnes Nickel (and its compounds) – 0.232 tonnes
2002	Zinc (and its compounds) – 0.023 tonnes Copper (and its compounds) – 0.206 tonnes Cyanides (ionic) – 0.376 tonnes Hydrogen cyanide (VOCs) – 2.54 tonnes Ammonia (total) – 14.763 tonnes Nickel (and its compounds) – 0.194 tonnes
2003	Zinc (and its compounds) – 0.139 tonnes Copper (and its compounds) – 0.270 tonnes Cyanides (ionic) – 0.431 tonnes Hydrogen cyanide (VOCs) – 2.54 tonnes Ammonia (total) – 33.86 tonnes Nickel (and its compounds) – 0.272 tonnes

Note: VOC – volatile organic compound

7.10 Previous Reports and Studies

The following reports were publicly accessible to view on the Mackenzie Valley Land and Water Board (MVLWB 2022) or online and were chosen for review based on their applicability to the Subject Site. Locations are depicted in Figure 3.

Environmental Sciences Group (ESG). 2001. Arsenic Levels in the Yellowknife Area: Distinguishing Between Natural and Anthropogenic Inputs.

- For over 10 years, ESG has been studying arsenic in the terrestrial and freshwater environment in Yellowknife, with efforts focused on elucidating the background concentration range of arsenic in soils not affected by mining operations.
- In 2000, soil samples were collected and analyzed.
- Average background concentrations in the Yellowknife area was determined to be 150 ppm, with a reasonable upper limit of approximately 300 ppm.

Miramar Mining Corporation. 2007. Con Mine Final Closure and Reclamation Plan. (MCML 2007)

- The Con Mine was opened in 1938 by Consolidated Mining and Smelting Ltd. (Cominco). Nerco Minerals Ltd. purchased the operation in 1986 and owned and operated the mine until 1993, at which time Kennecott Ltd. purchased Nerco and sold the Con Mine to Miramar Mining Corporation, who has owned and operated the mine site since 1993. The mine ceased production in September 2003, and the pumps were turned off in the mine in November 2003. The mill was to be utilized for arsenic sludge processing until completion in around 2007.
- Rat Lake, Tin Can Hill, the Con and Rycon Camp areas, and Mosher Island were classified as Zone 4 – “the area outside the main mine lease.” Soil sampling results and other information from the mine records suggest that there was minimal historical mining impact in this area (see Figure 2).

Tailing/waste containment areas:

- Six tailing containment areas were located on the mine property. Historical tailing areas included Crank Lake, Lower Pud Lake, Negus, and Neil Lake (reclamation expected to be completed in 2009). The more recent mine tailing containment areas were the Upper and Middle Pud Lakes. Reclamation was anticipated to be completed at these areas in 2008 and 2010, respectively. Reclamation would consist of drainage, contouring, and establishing a vegetative cover.
- Prior to construction of the Upper and Middle Pud tailing containment areas, surface drainage from the northwest of the property flowed south into Pud Lake and then west to Kam Lake. Near-surface groundwater was inferred to move in the same direction. Since construction of the tailing containment area, surface water collected north of or below Taylor Road Dam is tested to verify that no contaminants are present, and then it is pumped to Kam Lake each summer (located to the southwest).
- Negus Pond (hazardous waste site) and the hazardous waste disposal site near the Mill Complex at the former Con Mine are located over 900 m and downgradient to the south/southwest of the Subject Site.
- In 1953 and just after 1961, a jetty was constructed at the south end of Rat Lake. At the same time a portion of the south end of the lake was filled with waste rock. The lake level was lowered with installation of an excavated drainage system at the lake's north end. It appeared that this work was undertaken to prevent water from entering underground mine workings immediately below the lake. The lake level is now maintained by the City of Yellowknife.
- In 2000, approximately 5,000 m³ of waste rock and affected silt and tailing-like material was excavated from the south end of Rat Lake and placed in the Middle Pud tailing containment area.

Potential contaminants:

- Reagents were formerly used at the mine for ore processing. Reagents include acetylene, antiscalant, argon, borax, calcium hydroxide, calcium lignosulphonate, calcium oxide (lime), carbon, cement, copper sulphate, diatomaceous earth, diesel fuel, DOWFROTH™ 250-C, flocculants, flotation frothers, gasoline, grease, hydraulic fluid, hydrogen, lead acetate, lead nitrate, lubricants, nitrogen, oxygen, potassium amyl xanthate, potassium iodine, propane, salt, silica, silver nitrate, sodium carbonate, sodium cyanide, sodium isopropyl xanthate, sodium nitrate, stannous chloride, and zinc.
- Arsenic sources include rock outcrops, waste mine rock used for road construction, arsenic-bearing dust from roasting activities, or a combination of these sources.

Monitoring/sampling:

- Ongoing monitoring of surface water and groundwater was conducted during and following mine closure.
- Closure and reclamation of the Rat Lake area was completed in fall 2006, with ongoing groundwater monitoring at two monitoring wells constructed to the south of Rat Lake (monitoring point SNP 40-12).
- In 2004, sampling indicated that it would be necessary to remove the remaining material (2,500 m³) at the south end of Rat Lake, comprising soil with less than approximately 2,000 mg/kg of arsenic. The material was excavated and placed into Middle Pud tailing containment area in fall 2005. Further sampling and testing in 2005 identified a small volume of material in the northeast corner of the excavated area that still exceeded applicable standards. This material was removed in 2006.
- In 2006 the area was resampled, and the results indicated that the material had been removed successfully; however, mine waste rock on the west side of the excavation still indicated that concentrations of arsenic

were above 340 mg/kg (and exceeded the relevant guidelines). This waste rock was to remain in place as the arsenic in the waste rock was concluded to be naturally occurring arsenopyrite.

- Con Dock had a boiler/pump house. Surface water monitoring points SNP 40-2 and SNP 40-11 were established to monitor an oil slick from two bulk storage tanks. The tanks and affected soil were removed.
- Soil samples were collected from the Subject Site for total arsenic analysis in 1987. Results indicated that total arsenic concentrations within soil exceeded the GNWT site-specific, health-based soil quality remediation objectives for arsenic concentrations in Yellowknife soils (2003) of 160 ppm, and Health Canada's 2010 Canadian Soil Quality Guideline of 12 ppm. Some areas were identified to have concentrations between 0 and 340 ppm and other locations had concentrations between 340 and 1,000 ppm.

Golder Associates Ltd. January 2015. Environmental Effects Monitoring Phase 5 Study Design. Miramar Northern Mining Ltd. Con Mine Report. (Golder 2015)

- The Con Mine closed in 2003, and the underground workings are being allowed to flood.
- As per the final closure and reclamation plan approved in 2007, decommissioning, demolition of structures, and clean-up of the mine site have been in progress for nine years.
- Mine water has not been pumped to surface since 2003.
- Treated effluent quality is improving over time due to the cessation in mining and milling activities and on-going reclamation activities.
- Treated effluent quality complies with the mine's water licence and with the *Metal Mining Effluent Regulations*.
- Treated effluent exceeds Canadian water quality guidelines for the protection of aquatic life, for ammonia and some metals (including non-metals such as selenium and metalloids such as arsenic) (CCME 2020). There was no discharge of treated effluent in 2009, or 2011 to 2014; there will be discharge in 2015 during Phase 5 monitoring.
- Remaining reclamation measures for Con Mine include commissioning of new water treatment plant, installation of mine dewatering infrastructure, promotion and maintenance of vegetation cover, and removal of remaining infrastructure.
- Mine tailings were deposited in Crank Lake and Negus Lake when mining began in the 1930s until 1961, when deposition into Crank Lake discontinued. Tailings from this basin flowed south-southwest to Pud Lake. Between 1961 and the mid-1970s, tailings were deposited in the Upper Pud and Neil Lake basins. After the mid-1970s, tailings deposition has only been into the Upper and Middle Pud.
- After construction of the water treatment plant in 1987, tailings were pumped from the mill into the Upper Pud, and the solids were allowed to settle. The surface water was siphoned into the Middle Pud tailing containment area and pumped through the water treatment plant, where remaining chemical residues were removed, and the treated water was released to the environment. The mineralogical composition of the tailings is predominantly quartz (40% to 50%), chlorite (10% to 20%), ankerite (10% to 20%), muscovite (10% to 15%), calcite (5% to 10%), and sulphide minerals (1% to 3%).

Miramar Northern Mining Ltd. has a water licence for Con Mine to use water and dispose of waste and associated uses as part of remediation (effective 2019 to 2023) (water licence number MV2017L8-0008). Since 2015, water has been pumped from the site to a water treatment plant. The treated effluent from the plant is discharged to Middle Pud basin.

Government of Northwest Territories, Northwest Territories Geology Survey, H.E. Jamieson, K.M. Maitland, J.T. Oliver, and M.J. Palmer. 2017. Regional distribution of arsenic in near-surface soils in the Yellowknife area.

- The report focuses on the concentration of arsenic in soils beyond the mine properties and within 30 km of the City of Yellowknife. Its purpose was also to determine, where present, the legacy contamination from aerial roaster stack emissions and the natural arsenic concentrations occurring as a result of bedrock weathering and glacial transport.
- The Yellowknife Greenstone Belt was the source of gold mined by Con Mine.
- Production of gold resulted in the deposition of arsenic-bearing materials on the mine properties and beyond through tailing spills, the use of waste rock for construction, and aerial deposits from the roaster stack emissions.
- Gold-bearing arsenopyrite ore was roasted as a pre-treatment for cyanidation, creating sulphur dioxide and arsenic vapour, some of which was released into the surrounding environment through roaster stack emissions and condensed to arsenic trioxide dust.
- Over an estimated 20,000 tonnes of arsenic trioxide dust was released into the surrounding area via roaster emissions at Giant Mine (located approximately 5 km north of the Subject Site) between 1948 and 1999.
- From 1948 to 1970, approximately 2,500 tonnes of arsenic trioxide were released to the atmosphere as stack emissions from the Con Mine roaster.
- Arsenical gold ores were also roasted at the nearby Con Mine (1938–2003) and ceased in 1970 as ores extracted from deeper in the mine became more free-milling and less refractory. Pressure oxidation, which does not produce stack emissions, was used instead of roasting to process the refractory ore in the early 1990s.
- Most of the arsenic trioxide was captured. At Giant Mine, 90% of the dust is currently stored in underground chambers, and at Con Mine, the arsenic trioxide was treated on site, integrated with tailings, or sold.
- Arsenic concentrations in soil affected by stack emissions decline rapidly with depth, with the highest concentrations occurring in the first 0.05 m below the surface. The influence of wind direction on arsenic concentrations in near-surface soils were highest to the west/northwest of the Con Mine.
- Prevailing wind direction was identified to be from the east, with the dominating wind direction originating from the south in the summer months.
- Near-surface soil samples were collected within 30 km of Yellowknife in 2015, 2016, and 2017 from locations that were undisturbed by buildings, roads, mining, or other visible human activities to minimize the influence of recent post-mining activities and examine the effect of natural processes and the legacy of airborne emissions from former ore roasting.
- Elevated concentrations of arsenic were observed near the Con Mine property. Concentrations were found to be considerably lower near the outer perimeter of the former mine.
- 36 near-surface soil samples collected from the Tin Can Hill area (the Subject Site), had arsenic concentrations of 0 to 340 ppm and nine samples had concentration of 341 to 1,000 ppm (Figure 4).
- It was not clear whether roaster products from Con Mine can be distinguished from those of Giant Mine.
- The evaluation of the risk of arsenic to humans requires additional information, particularly an assessment of exposure. Oral ingestion, inhalation, and dermal contact are all pathways in which humans and other organisms can be exposed to arsenic in soil. Arsenic trioxide, the dominant solid phase of arsenic released by roaster stacker emissions, is considered to be the most toxic and bio-accessible form of solid-phase arsenic.

- An industrial site-specific remediation guideline of 340 mg/kg total arsenic and a residential guideline of 160 mg/kg of arsenic were established by the GNWT in 2003 (GNWT 2003). These criteria are much higher than the Canadian Soil Quality Guideline of 12 mg/kg (CCME 1997) and were based on the expectation that exposure would be limited by the cold climate and that the “average natural background concentration of arsenic in and around Yellowknife was determined to be 150 ppm.” The industrial guideline was also based on the expectation that there would be “little or no public access.” The results reported here show the natural background in near-surface soil concentrations of arsenic are much lower (approximately 3 mg/kg to 63 mg/kg). This is consistent with previous studies (Hocking et al. 1978, Hutchinson et al. 1982, Kerr 2006, St. Onge 2006), which show that elevated natural background arsenic is restricted to soils above mineralized veins and shear zones (Kerr 2006). The results of our ongoing research on the speciation of arsenic in soils with hundreds to thousands of milligrams per kilogram of arsenic will provide insight into whether these high concentrations are the result of natural or anthropogenic sources and will help identify the main solid-phase hosts of arsenic.

The reports are provided in Appendix F.

8 SITE INTERVIEWS AND CONSULTATIONS

The City of Yellowknife, Planning and Lands Department and Environment and Natural Resources were contacted. Associated received a response in January 2023; no additional information or records were found for the Subject Site or for neighbouring properties.

8.1 Newmont

Associated spoke with Dwight Grabke, of Newmont Corporation, Legacy Sites on September 27, 2022. The information gathered from the interview has been included in Sections 7 and 9 of this report.

8.2 GNWT Environmental Health Officer

The Office of the Chief Public Health Officer and regional environmental health officers have documented public health notices regarding hazardous materials on the Subject Site.

Associated contacted the environmental health officer at the GNWT between September 2022 and January 2023. No information was on file for the Subject Site or Adjacent Properties.

8.3 GNWT Assistant Fire Marshal

GNWT’s Office of the Fire Marshal has authority over the storage, handling, use, and processing of flammable and combustible liquids under the *Fire Prevention Act* and the withdrawal of tanks from service.

Associated contacted John Ritchie, assistant fire marshal for North Slave Region, on September 21, 2022. Associated received a response from John Ritchie and Anthony Ondrack (from the Office of the Fire Marshal, Public Safety Division), indicating that no documentation was on file for the Subject Site in relation to underground storage tanks.

9 SUBJECT SITE VISIT AND DRONE SURVEY

Associated conducted a site visit of the Subject Site and surrounding area on September 27, 2022. The site visit was documented with notes and photographs, and the results are discussed below. The drone survey footage is provided in Appendix G, and select photographs of features noted during the site visit are provided in Appendix H.

A site-specific health and safety plan was compiled prior to the site inspection, and no limitations were encountered during the inspection.

9.1 Site Use

The majority of the Subject Site is undeveloped and is used by the public for recreational purposes. A water treatment facility is present in the north area of the Subject Site.

9.2 Grounds

The grounds at the Subject Site are described in Table 9-1. Key features observed are depicted in Figure 2.

Table 9-1
Observations of the Subject Site Grounds

Subject Site Grounds	Comments/Observations
Buildings and structures	Water treatment facility and related buildings and structures located in the north.
Ground cover and topographic conditions	Vegetated, with cleared dirt trails and constructed boardwalk trails over boggy/marshy areas in the southeast. The topography slopes generally to the south to southeast, and to the west.
Roads, parking facilities, and rights-of-way	None were identified during the site visit. Only trails were observed. Boulders are present along entry points to prevent vehicles from entering.
Overhead and/or underground lines	An overhead electricity line intersects the Subject Site in the northwest.
Potential noise sources	None identified during the site visit.
Vegetation	No signs of stressed vegetation (e.g., noticeable die off). Vegetation appeared to be within seasonal norms.
Visual or olfactory signs of contamination (any staining?)	None identified during the site visit.
Imported fill materials/landfilling	Material was observed in the north (soil and rock mix), understood to have originated from the excavation and land flattening to accommodate the construction of the water treatment plant.
Storage tanks (aboveground or underground) (age, size, contents). Abandoned or removed tanks?	An aboveground storage tank (approximately 30,000 L) was observed within the water treatment facility, located in the north end of the Subject Site.
Underground structures	None identified during the site visit.
Potable water supply	None identified during the site visit.

Subject Site Grounds	Comments/Observations
Wells (abandoned and existing water, oil, gas, and disposal wells)	None identified during the site visit.
Non-hazardous waste generation and handling	Garbage (Styrofoam packaging, cans, bottles) alongside metal and wooden planks. The metal appeared to be spiral corrugated pipe and drums (empty). Remnant fire pits were also observed.
Hazardous substance generation, use, handling, storage, and disposal (quantities, type, storage conditions)	None identified during the site visit.
Unidentified substances (quantities, types of containers, storage conditions)	None identified during the site visit.
Polychlorinated biphenyls (PCBs)	None identified during the site visit.
Drains/sumps/oil-water separators	None identified during the site visit.
Wastewater or other discharges	None identified during the site visit.
Pits and lagoons (connection with waste disposal or treatment?)	None identified during the site visit.
Sewage (septic system or cesspools)	None identified during the site visit.
Surface water features (ditches, streams, rivers, ponds, lakes, or standing water)	None were identified during the site visit. Marsh and boggy areas were observed.
Drainage/stormwater run-off	A culvert used to direct surface water away from the entrance road to the Subject Site (located in the north of the Subject Site) was dry at the time of the site visit.

9.3 Hazardous Building Materials

Testing for the presence of hazardous building materials (HBMs) such as asbestos-containing materials, lead-based paints, ozone-depleting substances, urea foam formaldehyde insulation, mercury in switches, and polychlorinated biphenyls was not conducted as part of this assessment. HBMs are not anticipated to be present due to the age of the building on the Subject Site (age of the construction was 2015).

9.4 Neighbouring Properties

Properties surrounding the Subject Site are predominantly residential and commercial. Table 9-2 lists the neighbouring properties at the time of the site visit. Figures 2 and 3 show the locations of the neighbouring properties and features.

Table 9-2
Neighbouring Properties

Direction Relative to Subject Site	Description*
North (inferred cross-gradient)	North:
	- Residential and commercial
	- Recreational trails and parks
	Northeast:
East (inferred downgradient)	- Yellowknife Bay/Great Slave Lake
	Northwest:
	- Residential (adjacent)
	Yellowknife Bay/Great Slave Lake (adjacent)
South (inferred downgradient)	South:
	- Lakeview Road and recreational areas (adjacent)
	- Con Mine Park
	- Commercial
West (inferred upgradient)	Southeast:
	- Mosher Island (170 m)
	- Boat launch (160 m)
	- Residential (150 m)
	Southwest:
	- Adjacent: Lakeview Road and recreational areas
	- Residential – Con Trailer Park (170 m)
	- Con Road (380 m)
	- Telecommunications tower (adjacent)
	- Recreational area (adjacent)
	- Rat Lake (170 m) – formerly leased to Con Mine
	- Residential and commercial (340 m)

Note: *Distances are approximations from the closest property boundary.

10 INDICATIONS OF ENVIRONMENTAL RISK

The potential for soil, groundwater, and/or vapour concentrations exceeding territorial guidelines is derived from the current and historical zoning and land use of the Subject Site. Neighbouring properties can also pose environmental risks, based on their current and past uses and their distance and relative position to the Subject Site, with respect to the groundwater flow gradient. Upgradient sites are generally associated with higher risk due to the potential for groundwater transport of contaminants to downgradient locations.

The environmental risk at the Subject Site and its associated rationale are described below.

10.1 Subject Site

The City of Yellowknife has been the titled owner of the Subject Site since 2007; no land titles were available for years prior to 2007.

Based on available aerial photographs dating back to 1937, the Subject Site has consisted of undeveloped forested areas used for recreational purposes. The road that transects the Subject Site from the west to the south was constructed sometime between 1937 and 1946 (based on available aeriels), which coincides with the time that Con Mine was being established. More recently, a water treatment facility was constructed in the north of the Subject Site.

During the site inspection, general garbage was observed, including two disintegrated batteries, Styrofoam packaging, cans, bottles, fire pit remnants, metal waste, and several wooden planks. The metal consisted of spiral corrugated pipe and drums (empty).

Other than the road construction (which is thought to have been constructed to link the city with the Con Mine), no mining activities were identified to have occurred on the Subject Site; for example, no shafts, vent openings, or raises were observed or documented.

There is evidence that former activities relating to gold mining and the subsequent release of arsenic trioxide dust from ore roasting between the 1940s and 1970s have affected soil quality in the surrounding area, with concentrations of arsenic within surface soils exceeding the NWT guideline value of 160 ppm for residential land use on the Subject Site.

Several mine road networks were constructed using excavated Con Mine waste (MCML 2007). Therefore, there is potential that the road constructed on the Subject Site in the late 1930s to early 1940s was constructed using excavated mine waste that may contain elevated concentrations of arsenic and other PCOCs.

Based on the historical release of arsenic trioxide dust and the evidence of impact on the Subject Site, alongside the possible use of mine waste material for road construction and the presence of general waste observed, the current and future environmental risk to the Subject Site from these APECs is considered moderate.

10.2 Neighbouring Properties

The surrounding land use was undeveloped and forested up until the 1930s. The Con Mine opened in 1938 and began operations adjacent and to the south of the Subject Site. During this time, the area, which is now known as the City of Yellowknife, was expanding, with the influx of mining operations in the area.

The NPRI identified 11 air pollution records in relation to the Con Mine. Emissions included zinc, copper, cyanides, hydrogen cyanide, total ammonia, and nickel between 1994 and 2003. Zinc, copper, and sulphate (among other reagents) were used at the mine for ore processing (MCML 2007). Therefore, it is possible that these constituents have also had an environmental impact on soil quality in the surrounding area.

It is likely that there would have been some downward infiltration from Rat Lake (located hydraulically upgradient of the Subject Site, to the west) into groundwater; however, due to the low permeability of the underlying bedrock, volumes are expected to have been small. Groundwater flow from Rat Lake, based on hydrogeological and surface water flow patterns, would be to the south toward Kam Lake, or to the east toward Yellowknife Bay.

Based on the historical release of arsenic trioxide dust and other emissions from past mining activity on neighbouring properties, the current and future environmental risk to the Subject Site from these historical operations is considered moderate.

11 CONCLUSIONS AND RECOMMENDATIONS

Based on the ESA results, there is **moderate potential**⁵ that historical or current land use activities at the Subject Site and on surrounding properties have resulted in contamination of soil or groundwater.

Further investigation (i.e., Phase II Environmental Site Assessment) is recommended to assess soil and water quality, and the materials used in the construction of the road on the Subject Site for PCOCs related to past mining activities and general waste.

⁵ **High potential** means there is physical, visual, olfactory, or recent factual evidence of contamination on site. **Moderate potential** means there is evidence or knowledge of past or current land uses or infrastructure with the potential to release contaminant(s) into the environment. **Low potential** means there is little or no evidence of sources of contamination.

12 DISCLAIMER

STANDARD DISCLAIMER FOR CONTAMINATED SITE INVESTIGATIONS, MONITORING AND CONFIRMATION OF REMEDIATION SERVICES

Subject to the following conditions and limitations, the investigation described in this report has been conducted by Associated Environmental Consultants Inc. (Associated) for **The GNWT** (the Client) in a manner consistent with a reasonable level of care and skill normally exercised by members of the environmental science profession currently practicing under similar conditions in the area.

1. The scope of the investigation described in this report has been limited by the budget set for the investigation in the work program. The scope of the investigation has been reasonable having regard to that budget constraint.
2. The investigation described in this report has been limited to the scope of work described in the work program.
3. The investigation described in this report has relied upon information provided by third parties concerning the history of the site. Except as stated in this report, we have not made independent verification of such historical information.
4. The investigation described in this report has been made in the context of existing government regulations generally promulgated at the date of this report. Except as specifically noted, the investigation did not take account of any government regulations not in effect and generally promulgated at the date of this report.
5. The findings and conclusions are valid only for the specific site identified in the report.
6. Since site conditions may change over time, the report is intended for immediate use.
7. This report is intended for the exclusive use of the Client, including all successors and assigns. The material in it reflects Associated's best judgement, in light of the information available to it, at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Associated accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report and makes no representation of fact or opinion of any nature whatsoever to any person or entity other than the Client.

In accepting delivery of this report, the Client hereby agrees that:

- A. Associated's liability for all claims of the Client, arising out of the agreement between Associated and the Client, pursuant to which this report has been prepared (the Agreement) shall absolutely cease to exist after a period of six (6) years from the date of:
 - i. substantial completion of the investigation described in this report,
 - ii. termination of Associated's Services under the Agreement,
 - iii. commencement of the limitation period for claims prescribed by any statute of the Province or Territory for the site of the investigation described in this report,
 - iv. any significant alteration of the site of the investigation described in this report, and/or neighbouring properties after the date of the final report that would change the conclusions and recommendations of the final report,

whichever shall first occur, and following the expiration of such period, the Client shall have no claim whatsoever against Associated.

- B. Any and all claims which it may have against Associated or any of its servants, agents, or employees arising out of or in any way connected with the investigation described in this report or the preparation of this report, whether such claims are in contract or in tort, and whether such claims are based on negligence or otherwise, shall be limited to a total amount equal to the fees payable to Associated under the contract with the Client. Associated shall bear no liability whatsoever for any consequential loss, injury or damage incurred by the Client, including but not limited to claims for loss of profits and loss of markets.

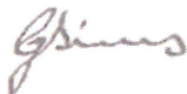
13 CLOSING

This Advanced Phase I ESA report was prepared for GNWT Department of Infrastructure to determine whether APECs or PCOCs exist for the Subject Site. The potential risk level of soil, vapour, or groundwater contamination was qualitatively assessed based on current or intended zoning and land use(s) at the Subject Site.

The services provided by Associated Environmental Consultants Inc. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practising under similar conditions. No other warranty expressed or implied is made.

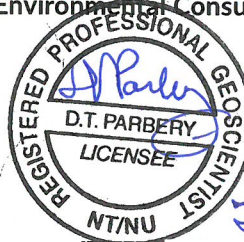
We trust this completes the assignment to your satisfaction. Please feel free to contact the undersigned if you have any questions.

This report was prepared by:
Associated Environmental Consultants Inc.



Gemma Simmons, M.Sc.
Environmental Scientist

The report was reviewed by:
Associated Environmental Consultants Inc.



February 27, 2023

David Parbery, M.Sc., MNRM, P.Geo. (NAPEG)
NAPEG Representative and Senior Reviewer

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14 QUALIFICATIONS OF ASSESSORS

Adrian Wasawo, B.Sc.

Role: Reporting

Experience: Adrian is an Environmental Scientist working on contaminated site projects in the Yukon and Northwest Territories. Adrian's experience includes environmental site assessments, environmental monitoring, and remediation.

Gemma Simmons, M.Sc.

Role: Reporting

Experience: Gemma is an Environmental Scientist with 10 years of experience managing contaminated site projects throughout the Yukon, Northwest Territories, British Columbia, Ontario and overseas. Gemma's experience includes environmental and geotechnical site assessments, hazardous building materials assessments, risk assessments, environmental monitoring, earthwork supervision, and soil and groundwater remediation.

David Parbery, M.Sc., M.N.R.M, P.Geo. (NAPEG)

Role: NAPEG Representative and Senior Reviewer

David is a Registered Professional Geoscientist (NAPEG Registered) with over 25 years of work experience in Alberta, Manitoba, Saskatchewan, and Northwest Territories. His focus is on assisting clients with their environmental regulatory compliance issues, contaminated site remediation, and environmental monitoring programs. David has experience conducting Phase I, II and III Environmental Site Assessments, Remedial Options Analyses, Emergency Spill Response, and Hazardous Building Material Assessments.

REFERENCES

Aerial Photos

Year	Photo Identification Number/Source	Year	Photo Identification Number/Source
2022	Google Earth® Street View	1953	A13621-179
1970	A21548-136	1948	No ID
1970	GNWT NAPL	1937	No ID
1966	A19748-75		
1964	A18310		

Canadian Standards Association (CSA). 2022. CSA Standard Z7 68-01 (R2022) – Phase I Environmental Site Assessment.

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FIGURES

Figure 1: Subject Site Location

Figure 2: Subject Site Features

Figure 3: Surrounding Land Use and Historical Features

Figure 4: Surface Soil Sample Locations and Total Arsenic Concentrations

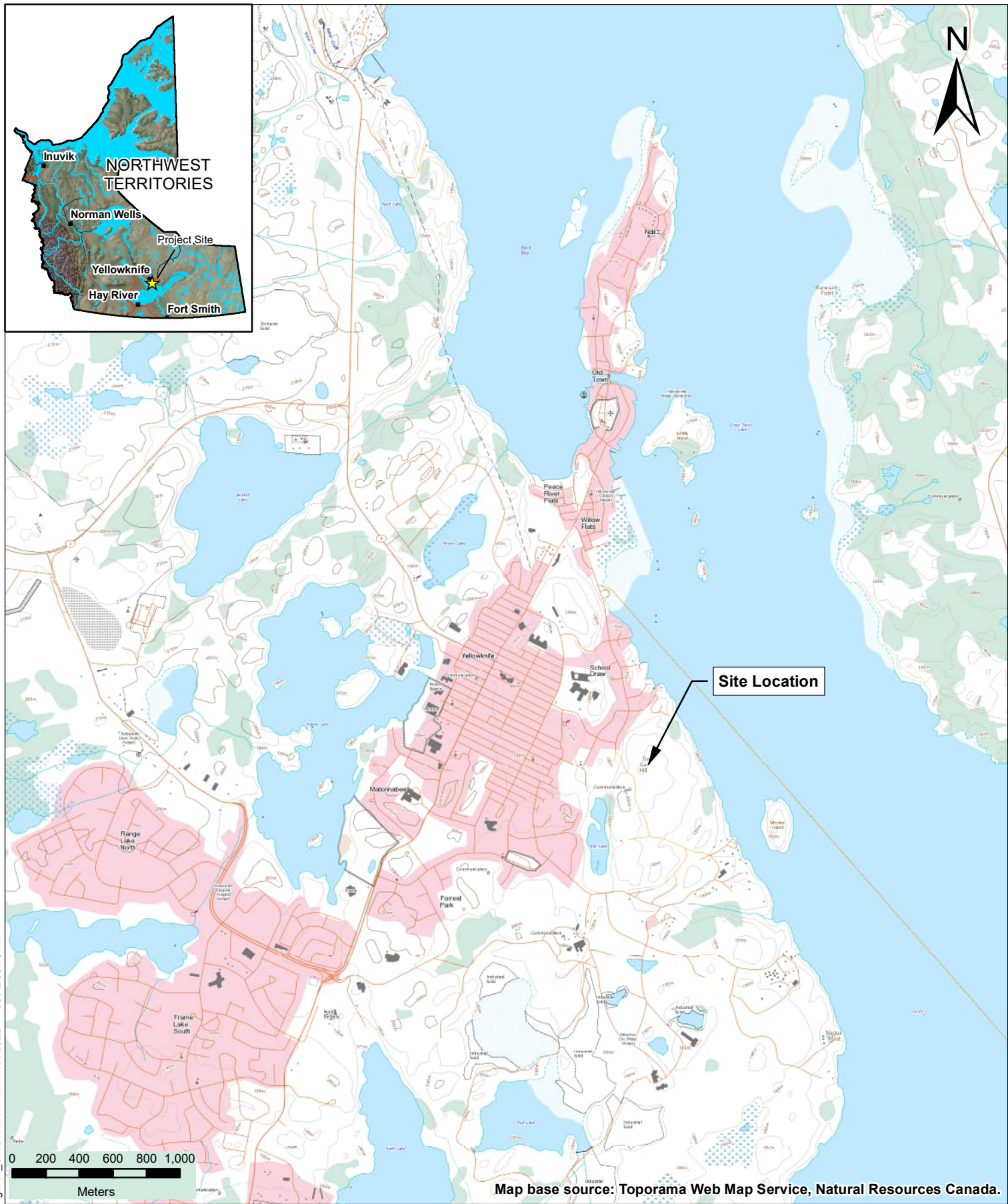


Figure1_SiteLocationPlan.mxd / 2022-11-03 / 2:08:48 PM



PROJECT NO.: 2022-8296
 DATE: November 2022
 DRAWN BY: SC

FIGURE 1: SITE LOCATION PLAN

Government of Northwest Territories
 GNWT Tin Can Hill
 Advanced Phase I ESA



Above Ground Storage Tank


Water treatment plant

Excavated surplus material
(rock/soil mix) from the earthworks and construction of the water treatment plant

Overhead utilities
(electric)

Recreational
paths

Legend

 Approximate Subject Site Boundary

0 50 100 150 200 250
Meters



PROJECT NO.: 2022-8296
DATE: November 2022
DRAWN BY: SC

FIGURE 2: SUBJECT SITE FEATURES

Government of Northwest Territories
GNWT Tin Can Hill
Advanced Phase I ESA



Figure3_SurroundingLandUse.mxd / 2022-11-03 / 2:48:04 PM



Inferred groundwater flow direction

Locations are approximations

PROJECT NO.: 2022-8296
DATE: November 2022
DRAWN BY: SC

FIGURE 3: SURROUNDING LAND USE AND HISTORICAL FEATURES

Government of Northwest Territories

GNWT Tin Can Hill
Advanced Phase I ESA



GNWT Tin Can Hill Advanced Phase I ESA

APPENDIX A – SURVEY, TOPOGRAPHY AND SURFACE WATER FLOW MAPS

Tools

Markup & Measure

Search

Upload & Download Data

Imagery

Help



Tool Labels



Open



Save



Save as



Home



Show Layer List



Print



Export Map



Pan



Zoom In



Zoom Out



Initial View



Full Extent



Previous Extent



Next Extent

Zoom to
Community...

Save Map

Basic Tools

Navigation

Surveyed Lot 10 Block 203 PI ▾

◀ 1 of 5 ▶



☆ Surveyed Lot 10 Block 203 Plan 4460

Surveyed Parcels: Surveyed Lot 10

[Add to Results](#)[View Additional Details](#)Suspension on New Recreational
Lease ApplicationsRat
LakeGreat
Slave Lake

World To...



1:500

Scale 1:

18,056



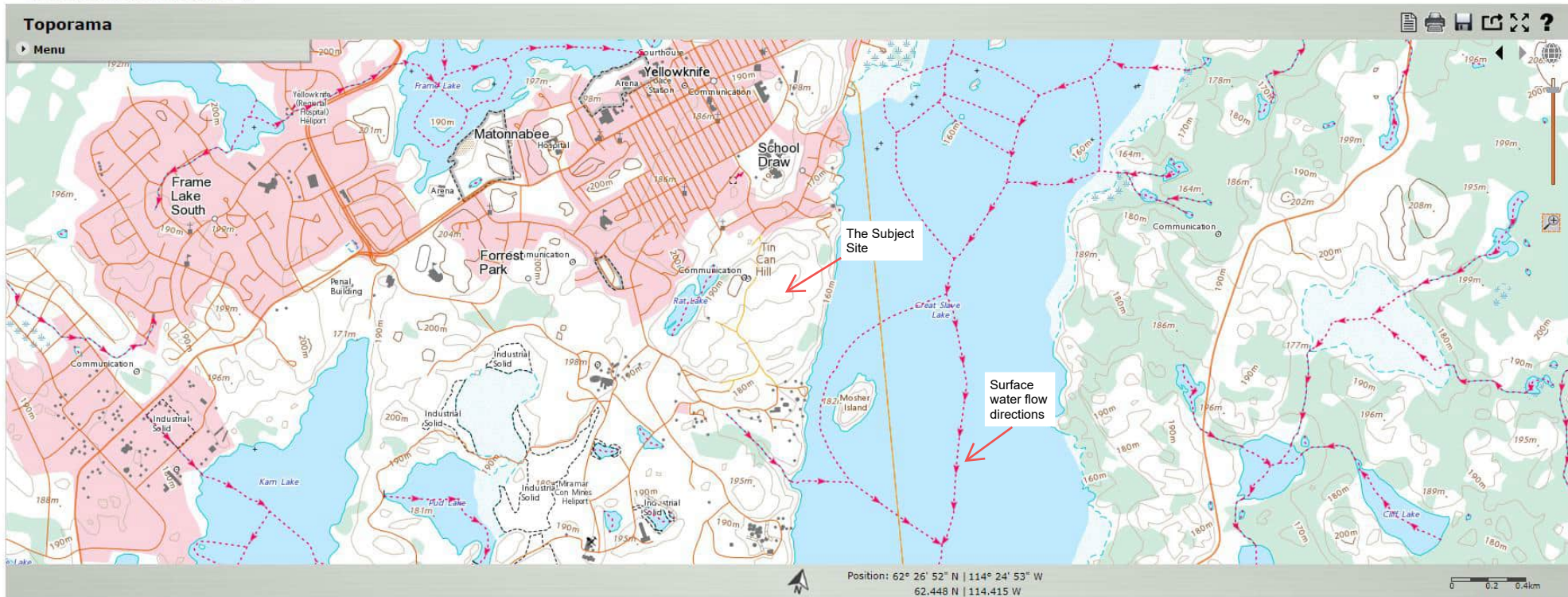
Go

0 0.1 0.2km

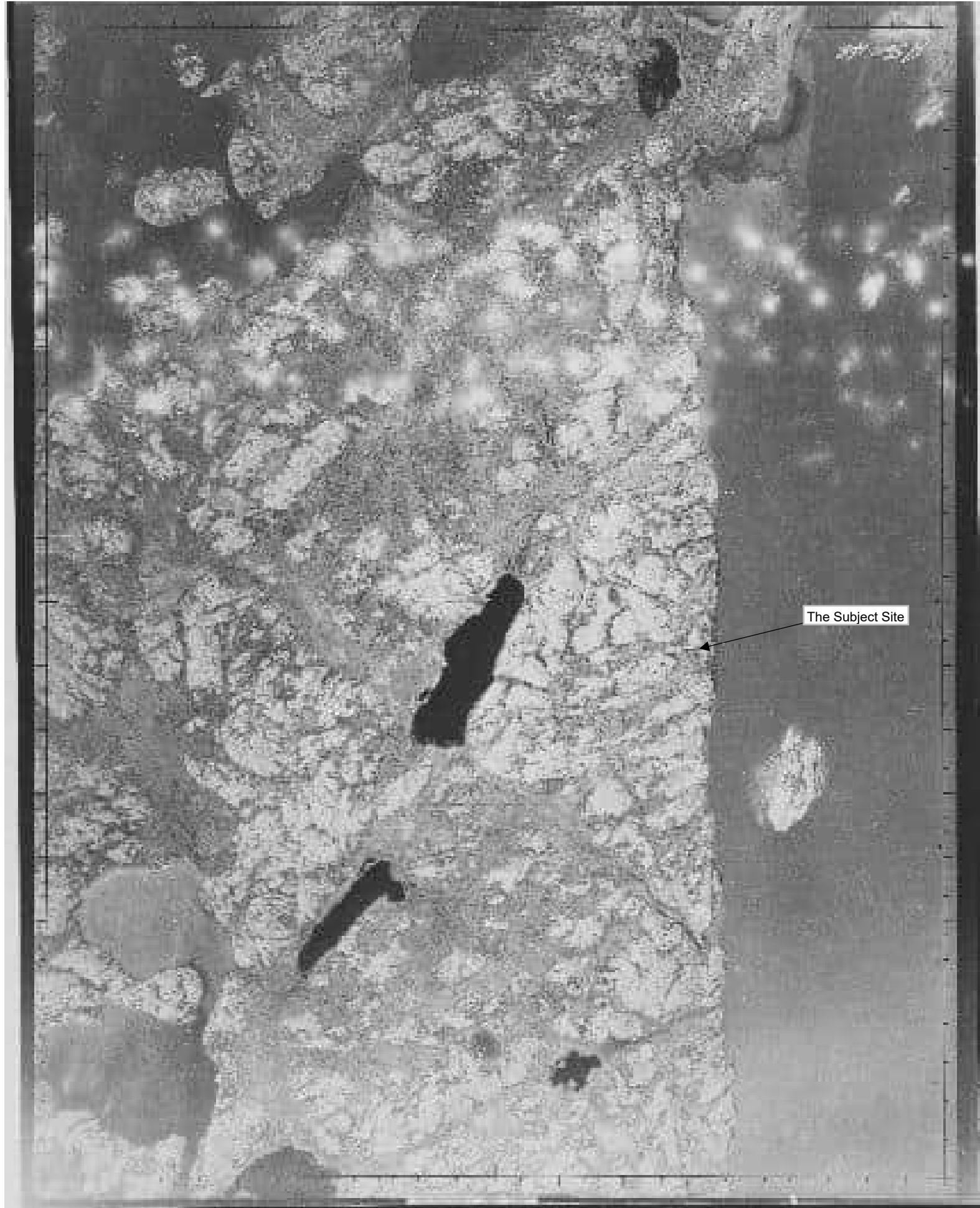


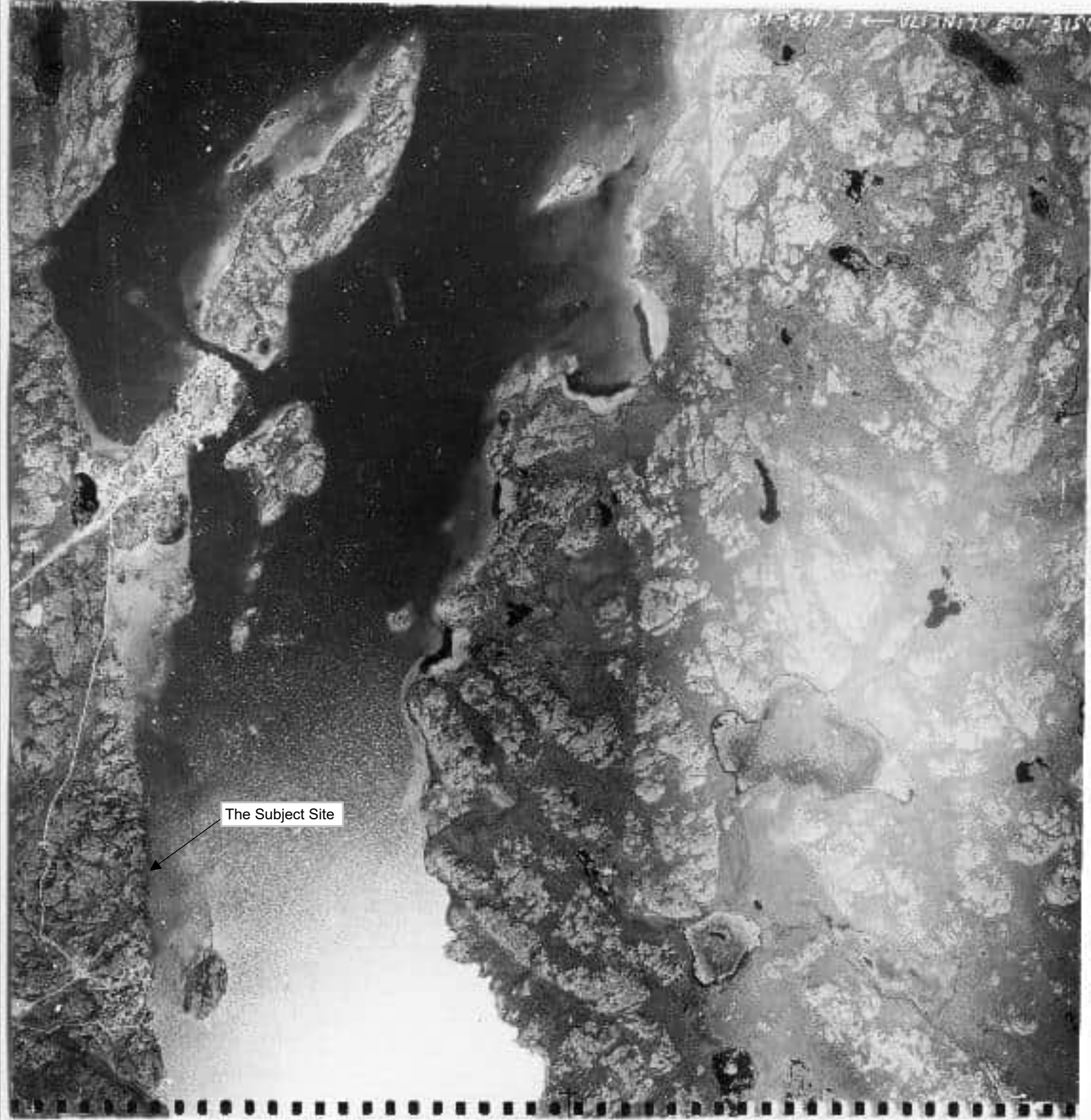
The Atlas of Canada - Toporama

► [Instructions: Keyboard Navigation](#) ⓘ

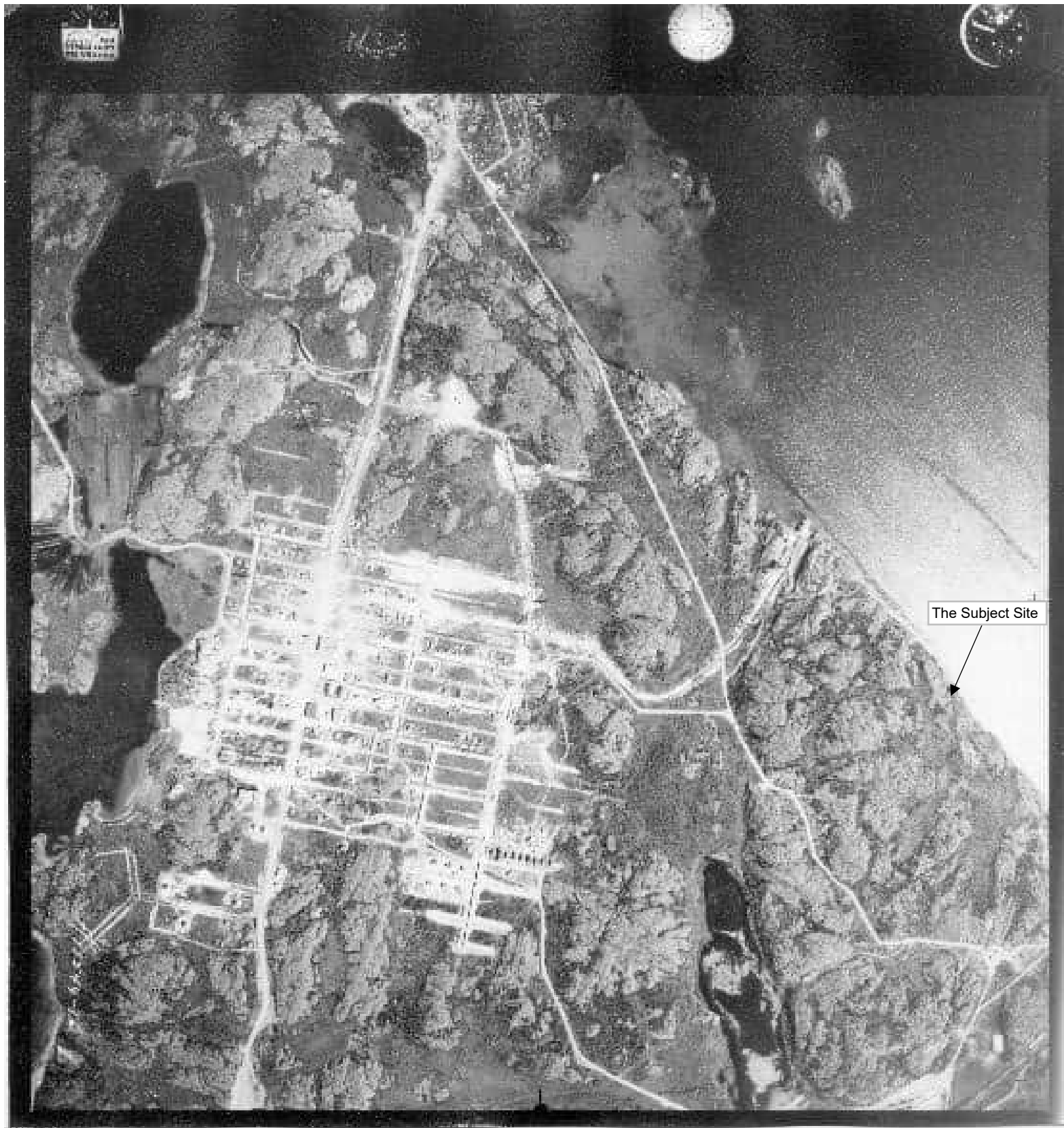


APPENDIX B – AERIALS

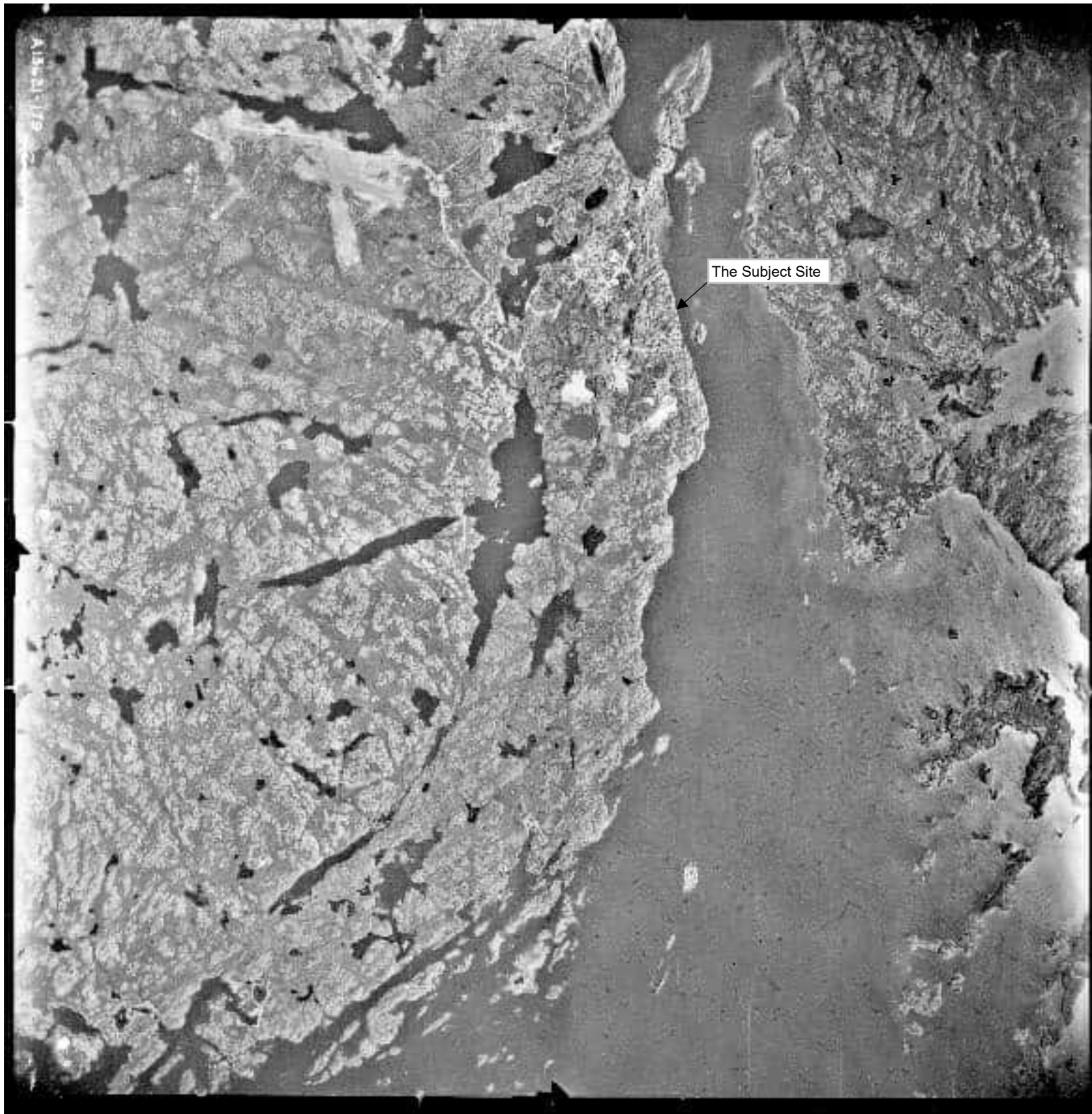




July 1946



July 1948



July 1953


59 A. 1964

The Subject Site

July 1964

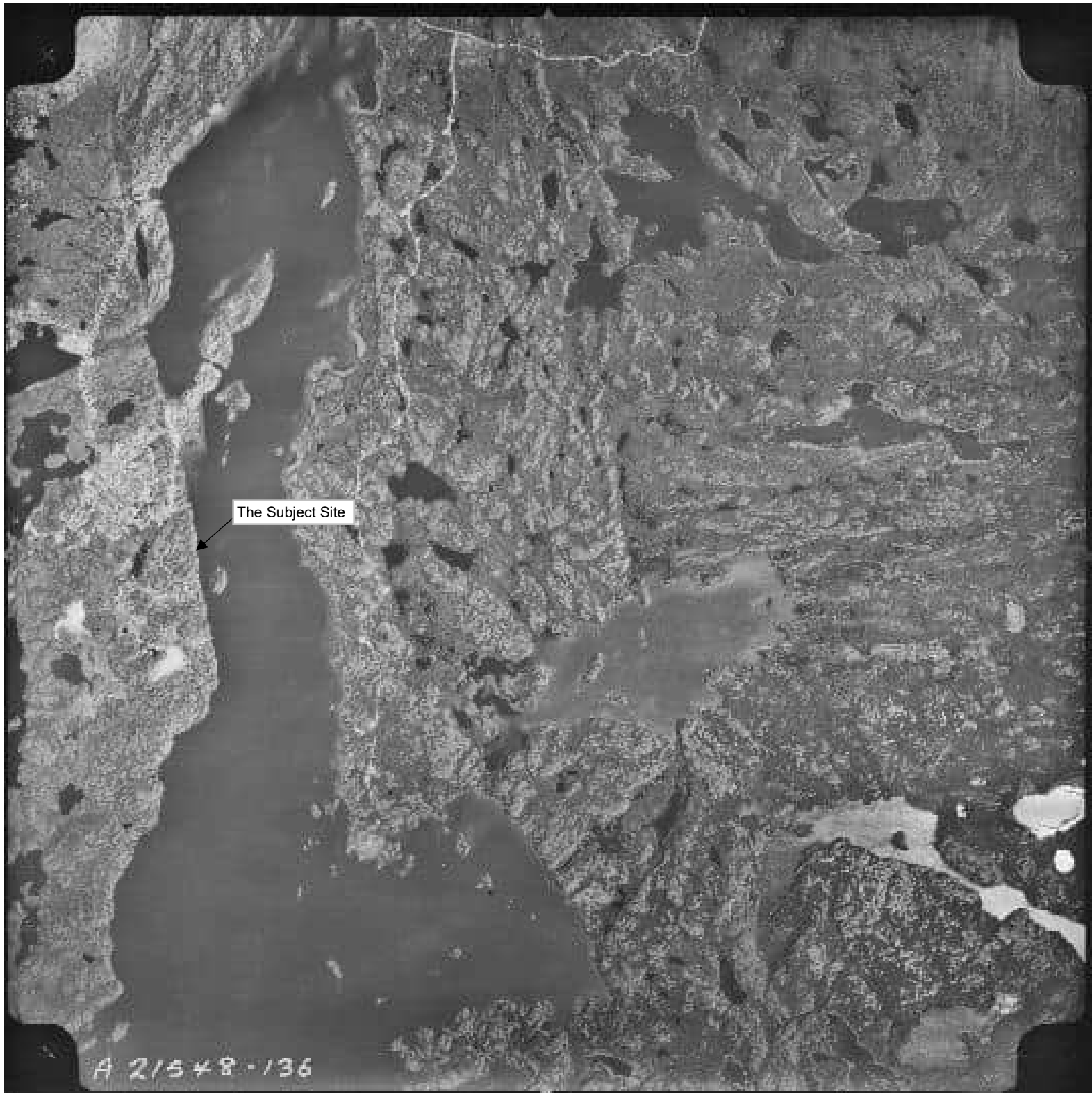


September 1966



The Subject Site


An aerial photograph showing a large body of water, likely a bay or inlet, surrounded by rugged, forested land. The shoreline is irregular, with several small islands and peninsulas. A label 'The Subject Site' with an arrow points to a specific location on the western shoreline, near a small peninsula. The terrain appears to be a mix of forest and open land, with some roads or tracks visible.





Google Earth imagery 2022

APPENDIX C – LAND TITLES

Implied Reservations The title to the land mentioned in this certificate is, unless otherwise indicated on the certificate of title, subject to the following reservations, which are more particularly set out in section 69 of the Land Titles Act: - subsisting reservations or exceptions in the original grant of the land; - unpaid taxes, unregistered tax sale transfers and claims of lien for property tax arrears; - public highways, rights-of-way and other public easements; - certain leases or agreements to lease for a term not exceeding three years; - decrees, orders or writs filed and in force; - rights of expropriation.	Conditions implicites Le titre de bien-fonds mentionné dans le présent certificat de titre est, à moins d'indications contraires prévues au certificat, assujéti aux conditions suivantes, lesquelles sont précisées à l'article 69 de la Loi sur les titres de biens-fonds: - toutes réserves ou exceptions existantes contenues dans le concession primitive du bien-fonds; - toutes taxes non payées, tout acte de vente pour défaut de paiement de l'impôt foncier non enregistré et toutes revendications de privilège quant au paiement d'arriérés d'impôt foncier; - tout chemin public, droit de passage ou servitude publique; - certains baux ou conventions de bail pour une période maximale de trois ans; - tous décrets, ordonnances ou ordres déposés et maintenus en vigueur; - tous droits d'expropriation.	Crown Grant Concession de la Couronne Puissance To En vertu de 154,168 154,168 Previous Title Titre précédent Valeur (optionnel) Valeur (optionnel) CERTIFICATE No. - CERTIFICAT N°  64823
--	--	--

Land Titles Act
**Certificate of Title
 (General)**
 NORTHWEST TERRITORIES
 REGISTRATION DISTRICT



Loi sur les titres de biens-fonds
**Certificat de titre
 (Général)**
 CIRCONSCRIPTION D'ENREGISTREMENT
 DES TERRITOIRES DU NORD-OUEST

This is to Certify that

Les présentes attestent que

MUNICIPAL CORPORATION OF THE CITY OF YELLOWKNIFE,

is (are) now the owner(s) of an estate in fee simple
 and in

est (sont) actuellement le(s) propriétaire(s) d'un domaine
 en fief simple sur le(s) bien(s)-fonds suivant(s)

LOT 1

BLOCK 203

PLAN 4109

YELLOWKNIFE

This Certificate is **CANCELLED** wholly for two new Certificates of Title, numbers 69726 and 69728, issued to the **MUNICIPAL CORPORATION OF THE CITY OF YELLOWKNIFE**, pursuant to Plan 4297 registered under daybook number 169,283 on 2010-06-08 at 1340 hours.



Registrar of Land Titles

subject to the provisions of the Land Titles Act, and the encumbrances and interests listed on this certificate.

sous réserve de la Loi sur les titres de biens-fonds, et des charges et intérêts énoncés au présent certificat.

Postal Address of owner
 Adresse postale du propriétaire

Signed and sealed
 Signé et scellé

2007-07-12

Box 580
 Yellowknife NT X1A 2N4


 REGISTRAR
 REGISTRATEUR
 Northwest Territories Registration District
 circonscription d'enregistrement des Territoires du Nord-Ouest

052003

2501

ABBREVIATIONS - ABBREVIATIONS

NAME MUNICIPAL CORPORATION OF THE CITY OF
MOM YELLOWKNIFE

CERTIFICATE OF TITLE NO.
CERTIFICAT DE TITRE N° :

64823

ABBREVIATIONS - ABBREVIATIONS


- | | |
|--|--|
| C. CARGO / CARGATION | D. DECLARATION / DÉCLARATION |
| T. TRANSMISSION / TRANSMISSION | B. BY-LAWS / RÈGLEMENT ADMINISTRATIF |
| TB. TRANSFER / TRANSFERT | CL. CLARK / LÉN / LÉNEC / DE PHILADELPHIE |
| MP. MORTUARY / HYPOTHÈQUE | E. EMBROIDER / BROCHER |
| O-4-C. CROWN IN COUNCIL / DÉCRET DU CONSEIL EN COUNCIL | UM. UTILITY RIGHT OF WAY / DROIT DE PASSAGE D'UTILITÉ PUBLIQUE |

- LAND
BIENS-FONDS
LOT 1, BLOCK 203, PLAN 4109,
YELLOWKNIFE

- | | |
|------------------------------------|---|
| 1. LEASE DATE | |
| MC - DIRECTOR'S CAVAT 1 | |
| DISPOSITION CLAIMANT | |
| WE - PART OF EXECUTION / OTHER DE | A of B - AGREEMENT OF BUYERS / MODIFICATION |
| MARK DESCRIPTION | DES REGULATORY ADMINISTRATION |
| UP - CERTIFICATE OF LEASEHOLDERS / | MS - NOTICE OF SECURITY INTEREST / AAMS |
| CERTIFY DOWNGRADE BY RAILROAD | OF CONCRETE |

ENCUMBRANCES AND INTERESTS - CHARGES ET INTÉRÊTS

[illegible]

Implied Reservations	Conditions implicites	Crown Grant Concession de la Couronne Pursuant To En vertu de 166,110 Previous Title Titre précédent ----- Value (optional) Valeur (optionnelle) -----
<p>The title to the land mentioned in this certificate is, unless otherwise indicated on the certificate of title, subject to the following reservations, which are more particularly set out in section 69 of the Land Titles Act:</p> <ul style="list-style-type: none"> - subsisting reservations or exceptions in the original grant of the land; - unpaid taxes, unregistered tax sale transfers and claims of lien for property tax arrears; - public highways, rights-of-way and other public easements; - certain leases or agreements to lease for a term not exceeding three years; - decrees, orders or writs filed and in force; - rights of expropriation. 	<p>Le titre de bien-fonds mentionné dans le présent certificat de titre est, à moins d'indication contraire prévue au certificat, assujéti aux conditions suivantes lesquelles sont précisées à l'article 69 de la Loi sur les titres de bien-fonds:</p> <ul style="list-style-type: none"> - toutes réserves ou exceptions existantes contenues dans la concession primitive du bien-fonds; - toutes taxes non payées, tout acte de vente pour défaut de paiement de l'impôt foncier non enregistré et toutes revendications de privilège quant au paiement d'arrérages d'impôt foncier; - tout chemin public, droit de passage ou servitude publique; - certains baux ou conventions de bail pour une période maximale de trois ans; - tous décrets, ordonnances ou brevets déposés et maintenus en vigueur; - tous droits d'expropriation. 	CERTIFICATE No. - CERTIFICAT N°  68669

Land Titles Act
Certificate of Title
(General)
 NORTHWEST TERRITORIES
 REGISTRATION DISTRICT



Loi sur les titres de bien-fonds
Certificat de titre
(Général)
 CIRCONSCRIPTION D'ENREGISTREMENT
 DES TERRITOIRES DU NORD-OUEST

This is to Certify that

Les présentes attestent que

MUNICIPAL CORPORATION OF THE CITY OF YELLOWKNIFE,

is (are) now the owner(s) of an estate in fee simple
 of and in

est (sont) actuellement le(s) propriétaire(s) d'un domaine
 en fief simple sur le(s) bien(s)-fonds suivant(s)

LOT 2

BLOCK 203

PLAN 4228

YELLOWKNIFE

This Certificate is **CANCELLED** wholly for three new Certificates of Title, numbers 69726 to 69728, issued to the **MUNICIPAL CORPORATION OF THE CITY OF YELLOWKNIFE**, pursuant to Plan 4297 registered under daybook number 169,283 on 2010-06-08 at 1340 hours.

[Signature]

Registrar of Land Titles

This Certificate is **CANCELLED** wholly for the new Certificates of Title, numbers 69726 to 69728, issued to the **MUNICIPAL CORPORATION OF THE CITY OF YELLOWKNIFE**, pursuant to Plan 4297 registered under daybook number 169,283 on 2010-06-08 at 1340 hours.

Registrar of Land Titles

subject to the provisions of the Land Titles Act, and the encumbrances and interests listed on this certificate

sous réserve de la Loi sur les titres de bien-fonds, et des charges et intérêts énoncés au présent certificat.

Postal Address of owner
 Adresse postale du propriétaire


Signed and sealed
 Signé et scellé

2009-09-16

Box 580
 Yellowknife NT X1A 2N4

[Signature] 21 REGISTRAR
 REGISTRATEUR
 Northwest Territories Registration District
 circonscription d'enregistrement des Territoires du Nord-Ouest

06/2005

Implied Reservations The title to the land mentioned in this certificate is, unless otherwise indicated on the certificate of title, subject to the following reservations, which are more particularly set out in section 6(1) of the Land Titles Act: - subsisting reservations or exceptions in the original grant of the land; - unpaid taxes, unregistered tax sale transfers and claims of lien for property tax arrears; - public highways, rights-of-way and other public easements; - certain leases or agreements to lease for a term not exceeding three years; - decrees, orders or writs filed and in force; - rights of expropriation.	Conditions implicites Le titre de bien-fonds mentionné dans le présent certificat de titre est, à moins d'indications contraires prévues au certificat, assujéti aux conditions suivantes, lesquelles sont précisées à l'article 6(1) de la Loi sur les titres de biens-fonds: - toutes réserves ou exceptions existantes contenues dans la concession primitive du bien-fonds; - toutes taxes non payées, tout acte de vente pour défaut de paiement de l'impôt foncier non enregistré et toutes revendications de privilège quant au paiement d'arrérages d'impôt foncier; - tout chemin public, droit de passage ou servitude publique; - certains baux ou conventions de bail pour une période maximale de trois ans; - tous décrets, ordonnances ou writs déposés et maintenus en vigueur; - tous droits d'expropriation.	Crown Grant Concession de la Couronne Pursuant To En vertu de 154,168; 166,110 Previous Title Titre précédent 169,283 64823; 68669 Value (optional) Valeur (optionnel) -----
		CERTIFICATE No. - CERTIFICAT N°  69728

Land Titles Act
Certificate of Title
(General)
 NORTHWEST TERRITORIES
 REGISTRATION DISTRICT



Loi sur les titres de biens-fonds
Certificat de titre
(Général)
 CIRCONSCRIPTION D'ENREGISTREMENT
 DES TERRITOIRES DU NORD-OUEST

This is to Certify that

Les présentes attestent que

MUNICIPAL CORPORATION OF THE CITY OF YELLOWKNIFE,

is (are) now the owner(s) of an estate in fee simple
 et in

est (sont) actuellement le(s) propriétaire(s) d'un domaine
 en fief simple sur le(s) bien(s)-fonds suivant(s)

LOT 5

BLOCK 203

PLAN 4297

YELLOWKNIFE

This Certificate is **CANCELLED** wholly for two new Certificates of Title, numbers 73012 and 73013, issued to the **MUNICIPAL CORPORATION OF THE CITY OF YELLOWKNIFE** pursuant to Plan 4460 registered under daybook number 179,451 on 2012-10-30 at 1435 hours.

Registrar of Land Titles

subject to the provisions of the Land Titles Act, and the encumbrances
 and interests listed on this certificate.


sous réserve de la Loi sur les titres de biens-fonds, et des charges et
 intérêts énoncés au présent certificat.

Postal Address of owner
 Adresse postale du propriétaire

Signed and sealed
 Signé et scellé

2010-06-08

Box 580
 Yellowknife NT X1A 2N4


 REGISTRAR
 REGISTRATEUR
 Northwest Territories Registration District
 circonscription d'enregistrement des Territoires du Nord-Ouest

69728

NAME MUNICIPAL CORPORATION OF
NOW THE CITY OF YELLOWKNIFE

ABBREVIATIONS - ABBREVIATIONS

**INC - MINISTERS CAVEAT!
OPPOSITION DU MINISTRE**


UP - CERTIFICATE OF US PENDING;
CERTIF DRAFT ARE IN INSTANCE

NOTICE OF SECURITY INTEREST / AVO
DE SURETÉ

ENCUMBRANCES AND INTERESTS - CHARGES ET INTÉRÊTS

C - CEMENT / CEMENTATION	D - DECONTAMINATION / DECONTAMINATE
T - TRANSMISSION / TRANSMISSION	B - BULKY / BULKY / BULKY / BULKY
T - TRANSPORT / TRANSPORT	C - CLAIM / CLAIM / CLAIM / CLAIM
H - HITCHHIKE / HITCHHIKE	E - EMBLEM / EMBLEM
O - OCEAN / OCEAN / OCEAN / OCEAN	U - UTILITY / UTILITY / UTILITY / UTILITY
O - OCEAN / OCEAN / OCEAN / OCEAN	D - DUTY / DUTY / DUTY / DUTY

[illegible]

Implied Reservations The title to the land mentioned in this certificate is, unless otherwise indicated on the certificate of title, subject to the following reservations, which are more particularly set out in section 55 of the Land Titles Act: - outstanding reservations or exceptions in the original grant of the land; - unpaid taxes, unregistered tax sale transfers and claims of lien for property tax arrears; - public highways, rights-of-way and other public easements; - certain leases or agreements to lease for a term not exceeding three years; - decrees, orders or writs filed and in force; - rights of expropriation.	Conditions implicites Le titre de bien-fonds mentionné dans le présent certificat de titre est, à moins d'indications contraires portées au certificat, assujéti aux conditions suivantes, lesquelles sont précisées à l'article 55 de la Loi sur les biens-fonds: - toutes réserves ou exceptions existantes contenues dans le concession primitive du bien-fonds; - toutes taxes non payées, tout acte de vente pour défaut de paiement de l'impôt foncier non enregistré et toutes revendications de privilège quant au paiement d'arriérés d'impôt foncier; - tout chemin public, droit de passage ou servitude publique; - certains baux ou conventions de bail pour une période maximale de trois ans; - tous décrets, ordonnances ou brevets déposés et existants en vigueur; - tous droits d'expropriation.	Crown Grant Concession de la Couronne Pursuant To En vertu de 154,168; 166,110 179,451 Previous Title Titre précédent 69728 Value (optional) Valeur (optionnel) -----
		CERTIFICATE No. - CERTIFICAT N°  73013

Land Titles Act
Certificate of Title
(General)
 NORTHWEST TERRITORIES
 REGISTRATION DISTRICT



Loi sur les titres de biens-fonds
Certificat de titre
(Général)
 CIRCONSCRIPTION D'ENREGISTREMENT
 DES TERRITOIRES DU NORD-OUEST

This is to Certify that

Les présentes attestent que

MUNICIPAL CORPORATION OF THE CITY OF YELLOWKNIFE,

is (are) now the owner(s) of an estate in fee simple
 of and in

est (sont) actuellement le(s) propriétaire(s) d'un domaine
 en fief simple sur le(s) bien(s)-fonds suivant(s)

LOT 10

BLOCK 203

PLAN 4460

YELLOWKNIFE

subject to the provisions of the Land Titles Act, and the encumbrances
 and interests listed on this certificate.

sous réserve de la Loi sur les titres de biens-fonds, et des charges et
 intérêts énoncés au présent certificat.

Postal Address of owner
 Adresse postale du propriétaire

Signed and sealed
 Signé et scellé

2012-10-30

Box 580
 Yellowknife NT X1A 2N4


 Registrar
 Registrateur
 Northwest Territories Registration District
 circonscription d'enregistrement des Territoires du Nord-Ouest

060003

73013

NAME MUNICIPAL CORPORATION OF
MOM THE CITY OF YELLOWKNIFE

73013

D - DECLARATION / DÉCLARATION

B - BULAWIS / REGLEMENT ADMINISTRATIF

CL: CLAMOR DE LLEN I REVENOR, DE PRIVILEGI

E - 6240 PAPERBACK / \$29.95 US/\$37.95 CAN.

OUTSIDE PURCHASE

LAND
FOWDS
LOT 10, BLOCK 203, PLAN 4460,
YELLOWKNIFE

MINISTÈRE DE LA
DÉFENSE

IN-FILE EXECUTION

DE SINGE

A 511 - AMENDMENT OF BYLAWS / MODIFICATION OFSPECIAL EVENTS ADMINISTRATION

ENCUMBRANCES AND INTERESTS - CHARGES ET INTÉRÊTS

[illegible]

APPENDIX D – ERIS



DATABASE REPORT

Project Property:	<i>Tin Can Hill Tin Can Hill Yellowknife NT</i>
Project No:	<i>2022-8296</i>
Report Type:	<i>Quote - Custom-Build Your Own Report</i>
Order No:	<i>22092704056</i>
Requested by:	<i>Associated Environmental Consultants Inc.</i>
Date Completed:	<i>September 30, 2022</i>

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Notice: IMPORTANT LIMITATIONS and YOUR LIABILITY

Reliance on information in Report: This report DOES NOT replace a full Phase I Environmental Site Assessment but is solely intended to be used as a database review of environmental records.

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Executive Summary

Property Information:

Project Property: *Tin Can Hill
Tin Can Hill Yellowknife NT*

Project No: *2022-8296*

Order Information:

Order No: *22092704056*
Date Requested: *September 27, 2022*
Requested by: *Associated Environmental Consultants Inc.*
Report Type: *Quote - Custom-Build Your Own Report*

Historical/Products:

ERIS Xplorer [*ERIS Xplorer*](#)
Land Title Search *Current Land Title Search*
Land Title Search *Historical Land Title Search*

Executive Summary: Report Summary

<i>Database</i>	<i>Name</i>	<i>Searched</i>	<i>Project Property</i>	<i>Boundary to 0.50km</i>	<i>Total</i>
AUWR	Automobile Wrecking & Supplies	Y	0	0	0
CDRY	Dry Cleaning Facilities	N	-	-	-
CFST	Crown Land Fuel Storage Tanks	Y	0	3	3
CHM	Chemical Register	Y	0	0	0
CNG	Compressed Natural Gas Stations	N	-	-	-
EHS	ERIS Historical Searches	N	-	-	-
EIIS	Environmental Issues Inventory System	Y	0	0	0
FCON	Federal Convictions	Y	0	0	0
FCS	Contaminated Sites on Federal Land	N	-	-	-
FRST	Federal Identification Registry for Storage Tank Systems (FIRSTS)	Y	0	0	0
GHG	Greenhouse Gas Emissions from Large Facilities	N	-	-	-
IAFT	Indian & Northern Affairs Fuel Tanks	Y	0	0	0
MINE	Canadian Mine Locations	Y	0	0	0
MNR	Mineral Occurrences	Y	0	0	0
NATE	National Analysis of Trends in Emergencies System (NATES)	N	-	-	-
NDFT	National Defense & Canadian Forces Fuel Tanks	Y	0	0	0
NDSP	National Defense & Canadian Forces Spills	Y	0	0	0
NDWD	National Defence & Canadian Forces Waste Disposal Sites	Y	0	0	0
NEBI	National Energy Board Pipeline Incidents	Y	0	0	0
NEBT	National Energy Board Wells	N	-	-	-
NEES	National Environmental Emergencies System (NEES)	N	-	-	-
NOGW	Northwest Territories Oil and Gas Wells	Y	0	0	0
NPCB	National PCB Inventory	Y	0	0	0
NPRI	National Pollutant Release Inventory	Y	0	11	11
OGWE	Oil and Gas Wells	Y	0	0	0
PCFT	Parks Canada Fuel Storage Tanks	Y	0	0	0
RST	Retail Fuel Storage Tanks	Y	0	0	0
SCT	Scott's Manufacturing Directory	Y	0	2	2
SPL	Spills	Y	1	29	30
WWIS	Water Well Information System	Y	0	0	0
Total:			1	45	46

Executive Summary: Site Report Summary - Project Property

<i>Map Key</i>	<i>DB</i>	<i>Company/Site Name</i>	<i>Address</i>	<i>Dir/Dist (m)</i>	<i>Elev diff (m)</i>	<i>Page Number</i>
1	SPL		End of Schooldraw Avenue, new development on a lot across from copper sky condos, near tin can hill. Yellowknife, Community, Northwest Territories NT	WNW/0.0	-12.72	18

Executive Summary: Site Report Summary - Surrounding Properties

Map Key	DB	Company/Site Name	Address	Dir/Dist (m)	Elev Diff (m)	Page Number
<u>2</u>	SPL		School Draw by copper sky town across from 4844 school draw Yellowknife NT	WNW/25.2	-14.27	<u>18</u>
<u>3</u>	SPL		School Draw and 49 Street Yellowknife NT	NW/33.0	-16.64	<u>19</u>
<u>4</u>	SPL		5405 49 St Yellowknife, Community, Northwest Territories NT	NW/75.8	-15.89	<u>19</u>
<u>5</u>	SPL		4804 School Draw Yellowknife NT	NNW/81.0	-22.00	<u>19</u>
<u>6</u>	SPL		5505 - 47th Street Yellowknife NT	N/121.7	-24.13	<u>20</u>
<u>7</u>	SPL		Apt. 203 4905 54th Avenue Yellowknife NT	WNW/125.7	-14.68	<u>20</u>
<u>8</u>	SPL		5456-52 St. Bison Apts. Yellowknife NT	W/127.9	-11.02	<u>21</u>
<u>9</u>	SPL		49th Street & 54th Avenue Yellowknife NT	WNW/130.0	-14.64	<u>21</u>
<u>10</u>	SPL		5313A 49th Street, Yellowknife Yellowknife NT	WNW/146.1	-13.44	<u>22</u>
<u>11</u>	SPL		4804-54th Ave Yellowknife NT	NW/153.5	-17.75	<u>22</u>
<u>12</u>	CFST		4904 - 54 Avenue Yellowknife NT	WNW/166.0	-12.28	<u>22</u>
<u>13</u>	SPL	PWGSC	44 Rycon Drive NT X1A 2V6	W/205.4	-5.07	<u>26</u>

Map Key	DB	Company/Site Name	Address	Dir/Dist (m)	Elev Diff (m)	Page Number
14	SPL		5502 - 45TH Street Alleyway Yellowknife NT	N/209.9	-28.44	26
15	SPL		DIAND Core Lab, 5601 45th Street Yellowknife NT	NNE/215.4	-33.15	26
16	SPL		45 Street and School Draw Avenue Yellowknife NT	N/269.7	-23.00	27
17	SPL		At a municipal lot at the end of 54th street, Bloc 110, plan 2093 Yellowknife, Community, Northwest Territories NT	W/285.4	-2.67	27
18	SPL		5300 - 49th St Anderson Thomson Tower Yellowknife NT	WNW/315.4	-2.00	28
19	SPL		4701 - 52nd Ave. Yellowknife NT	NW/347.0	-2.69	28
19	CFST		4701-52nd Avenue Yellowknife NT	NW/347.0	-2.69	29
20	NPRI	MIRAMAR CON MINE, LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	WSW/347.7	-8.05	29
20	NPRI	MIRAMAR CON MINE LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	WSW/347.7	-8.05	30
20	NPRI	MIRAMAR CON MINE LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	WSW/347.7	-8.05	32
20	NPRI	MIRAMAR CON MINE LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	WSW/347.7	-8.05	33
20	NPRI	MIRAMAR CON MINE LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	WSW/347.7	-8.05	35

Map Key	DB	Company/Site Name	Address	Dir/Dist (m)	Elev Diff (m)	Page Number
<u>20</u>	NPRI	MIRAMAR CON MINE LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	WSW/347.7	-8.05	<u>36</u>
<u>20</u>	NPRI	MIRAMAR CON MINE LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	WSW/347.7	-8.05	<u>38</u>
<u>20</u>	NPRI	MIRAMAR CON MINE LTD	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	WSW/347.7	-8.05	<u>40</u>
<u>20</u>	NPRI	MIRAMAR CON MINE LTD	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	WSW/347.7	-8.05	<u>42</u>
<u>20</u>	SCT	Miramar Con Mine Ltd.	75 Con Rd Yellowknife NT X1A 2M1	WSW/347.7	-8.05	<u>44</u>
<u>20</u>	SCT	Miramar Northern Mining Ltd.	75 Con Rd Yellowknife NT X1A 2M1	WSW/347.7	-8.05	<u>44</u>
<u>20</u>	NPRI	MIRAMAR CON MINE, LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	WSW/347.7	-8.05	<u>44</u>
<u>20</u>	NPRI	MIRAMAR CON MINE, LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	WSW/347.7	-8.05	<u>46</u>
<u>21</u>	CFST		4701 - 52 Avenue Yellowknife NT	NW/391.4	-2.12	<u>47</u>
<u>22</u>	SPL		5216 53 Avenue Yellowknife NT	WNW/403.6	-4.80	<u>50</u>
<u>23</u>	SPL		42 Con Road Ptarmigan Apts. Parking Stall Yellowknife NT	W/403.7	-1.81	<u>50</u>
<u>24</u>	SPL		5135 Forest Drive Yellowknife NT	W/406.8	-7.00	<u>51</u>
<u>25</u>	SPL		5133 Forrest Drive Area Yellowknife NT	W/418.7	-6.40	<u>51</u>

Map Key	DB	Company/Site Name	Address	Dir/Dist (m)	Elev Diff (m)	Page Number
<u>26</u>	SPL		5211-52nd St. Yellowknife NT	WNW/419.4	-7.00	<u>52</u>
<u>27</u>	SPL		Road in front of 5140 Forrest Dr. on pavements Yellowknife NT	W/421.0	-7.08	<u>52</u>
<u>28</u>	SPL		5201 - 51st Street Simpson House Apartments Yellowknife NT	WNW/423.0	-6.10	<u>53</u>
<u>29</u>	SPL		Intersection of Con Road & Rycon Drive Yellowknife NT	W/431.4	-2.06	<u>53</u>
<u>30</u>	SPL		Intersection of 44th Street and School Draw Avenue, Yellowknife NT Yellowknife NT	N/433.8	-25.34	<u>53</u>
<u>31</u>	SPL		5209 - 52 St. Yellowknife NT	WNW/439.0	-7.00	<u>54</u>
<u>32</u>	SPL		Polar Bowl Parking Lot 52nd Ave. & 50th Street Yellowknife NT	WNW/456.3	-3.97	<u>54</u>
<u>33</u>	SPL		Corner of Forrest Drive and Forrest Drive North Yellowknife NT	W/497.7	-5.00	<u>55</u>

Executive Summary: Summary By Data Source

CFST - Crown Land Fuel Storage Tanks

A search of the CFST database, dated Oct 1997-Apr 2022 has found that there are 3 CFST site(s) within approximately 0.50 kilometers of the project property.

<u>Site</u>	<u>Address</u>	<u>Distance (m)</u>	<u>Map Key</u>
	4904 - 54 Avenue Yellowknife NT	166.0	<u>12</u>
	4701-52nd Avenue Yellowknife NT	347.0	<u>19</u>
	4701 - 52 Avenue Yellowknife NT	391.4	<u>21</u>

NPRI - National Pollutant Release Inventory

A search of the NPRI database, dated 1993-May 2017 has found that there are 11 NPRI site(s) within approximately 0.50 kilometers of the project property.

<u>Site</u>	<u>Address</u>	<u>Distance (m)</u>	<u>Map Key</u>
MIRAMAR CON MINE LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	347.7	<u>20</u>
MIRAMAR CON MINE LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	347.7	<u>20</u>
MIRAMAR CON MINE LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	347.7	<u>20</u>
MIRAMAR CON MINE LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	347.7	<u>20</u>
MIRAMAR CON MINE, LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	347.7	<u>20</u>

<u>Site</u>	<u>Address</u>	<u>Distance (m)</u>	<u>Map Key</u>
MIRAMAR CON MINE, LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	347.7	<u>20</u>
MIRAMAR CON MINE, LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	347.7	<u>20</u>
MIRAMAR CON MINE LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	347.7	<u>20</u>
MIRAMAR CON MINE LTD.	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	347.7	<u>20</u>
MIRAMAR CON MINE LTD	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	347.7	<u>20</u>
MIRAMAR CON MINE LTD	75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	347.7	<u>20</u>

SCT - Scott's Manufacturing Directory

A search of the SCT database, dated 1992-Mar 2011* has found that there are 2 SCT site(s) within approximately 0.50 kilometers of the project property.

<u>Site</u>	<u>Address</u>	<u>Distance (m)</u>	<u>Map Key</u>
Miramar Con Mine Ltd.	75 Con Rd Yellowknife NT X1A 2M1	347.7	<u>20</u>
Miramar Northern Mining Ltd.	75 Con Rd Yellowknife NT X1A 2M1	347.7	<u>20</u>

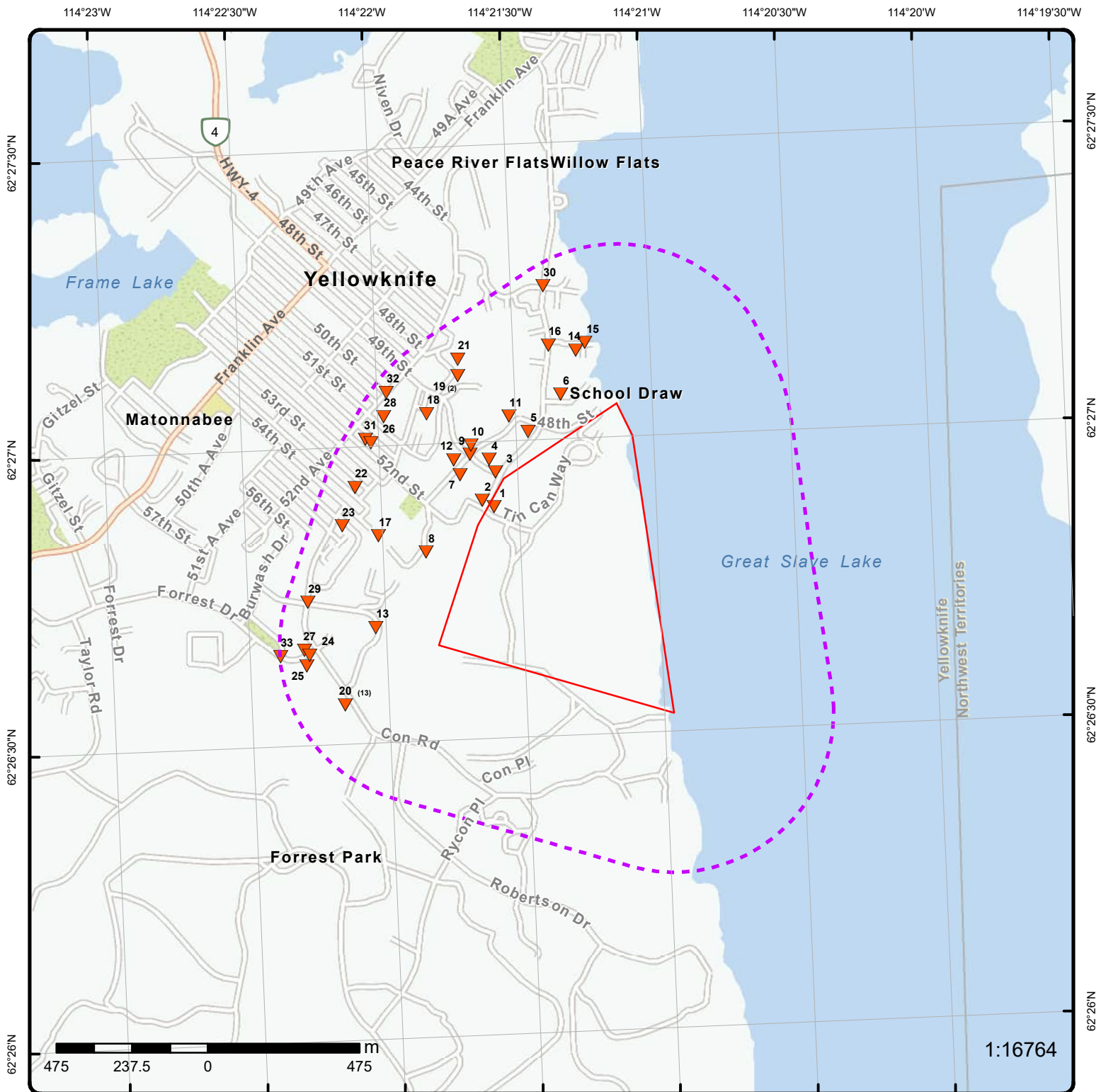
SPL - Spills

A search of the SPL database, dated Nov 30, 2021 has found that there are 30 SPL site(s) within approximately 0.50 kilometers of the project property.

<u>Site</u>	<u>Address</u>	<u>Distance (m)</u>	<u>Map Key</u>
	End of Schooldraw Avenue, new development on a lot across from copper sky condos, near tin can hill. Yellowknife, Community, Northwest Territories NT	0.0	<u>1</u>
	School Draw by copper sky town across from 4844 school draw Yellowknife NT	25.2	<u>2</u>
	School Draw and 49 Street Yellowknife NT	33.0	<u>3</u>
	5405 49 St Yellowknife, Community, Northwest Territories NT	75.8	<u>4</u>
	4804 School Draw Yellowknife NT	81.0	<u>5</u>
	5505 - 47th Street Yellowknife NT	121.7	<u>6</u>
	Apt. 203 4905 54th Avenue Yellowknife NT	125.7	<u>7</u>
	5456-52 St. Bison Apts. Yellowknife NT	127.9	<u>8</u>
	49th Street & 54th Avenue Yellowknife NT	130.0	<u>9</u>
	5313A 49th Street, Yellowknife Yellowknife NT	146.1	<u>10</u>
	4804-54th Ave Yellowknife NT	153.5	<u>11</u>

<u>Site</u>	<u>Address</u>	<u>Distance (m)</u>	<u>Map Key</u>
PWGSC	44 Rycon Drive NT X1A 2V6	205.4	<u>13</u>
	5502 - 45TH Street Alleyway Yellowknife NT	209.9	<u>14</u>
	DIAND Core Lab, 5601 45th Street Yellowknife NT	215.4	<u>15</u>
	45 Street and School Draw Avenue Yellowknife NT	269.7	<u>16</u>
	At a municipal lot at the end of 54th street, Bloc 110, plan 2093 Yellowknife, Community, Northwest Territories NT	285.4	<u>17</u>
	5300 - 49th St Anderson Thomson Tower Yellowknife NT	315.4	<u>18</u>
	4701 - 52nd Ave. Yellowknife NT	347.0	<u>19</u>
	5216 53 Avenue Yellowknife NT	403.6	<u>22</u>
	42 Con Road Ptarmigan Apts. Parking Stall Yellowknife NT	403.7	<u>23</u>
	5135 Forest Drive Yellowknife NT	406.8	<u>24</u>
	5133 Forrest Drive Area Yellowknife NT	418.7	<u>25</u>
	5211-52nd St. Yellowknife NT	419.4	<u>26</u>

<u>Site</u>	<u>Address</u>	<u>Distance (m)</u>	<u>Map Key</u>
	Road in front of 5140 Forrest Dr. on pavements Yellowknife NT	421.0	<u>27</u>
	5201 - 51st Street Simpson House Apartments Yellowknife NT	423.0	<u>28</u>
	Intersection of Con Road & Rycon Drive Yellowknife NT	431.4	<u>29</u>
	Intersection of 44th Street and School Draw Avenue, Yellowknife NT Yellowknife NT	433.8	<u>30</u>
	5209 - 52 St. Yellowknife NT	439.0	<u>31</u>
	Polar Bowl Parking Lot 52nd Ave. & 50th Street Yellowknife NT	456.3	<u>32</u>
	Corner of Forrest Drive and Forrest Drive North Yellowknife NT	497.7	<u>33</u>



Map: 0.5 Kilometer Radius

Order Number: 22092704056

Address: Tin Can Hill, Yellowknife, NT



 Project Property	 Freeways; Highways	 Beach	 Shopping & Sports Area
 Buffer Outline	 Traffic Circle; Ramp	 Airport	 University/College
▲ Eris Sites with Higher Elevation	 Major Arterial; Minor Arterial	 Industrial Area	 Cemetery; Golf Course
▲ Eris Sites with Same Elevation	 Local Road	 Military Base	 Parkt (National)
▼ Eris Sites with Lower Elevation	 Service Road; Traffic Circle; Ramp	 Aircraft Roads	 Park (City/County)
○ Eris Sites with Unknown Elevation	 Rail	 Native Reservation	
		 Hospital	

114°21'W

62°27'N

62°27'N



Aerial Year: 2019

Order Number: 22092704056

Address: Tin Can Hill, Yellowknife, NT



Source: ESRI World Imagery

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114°24'W

114°22'30"W

114°21'W

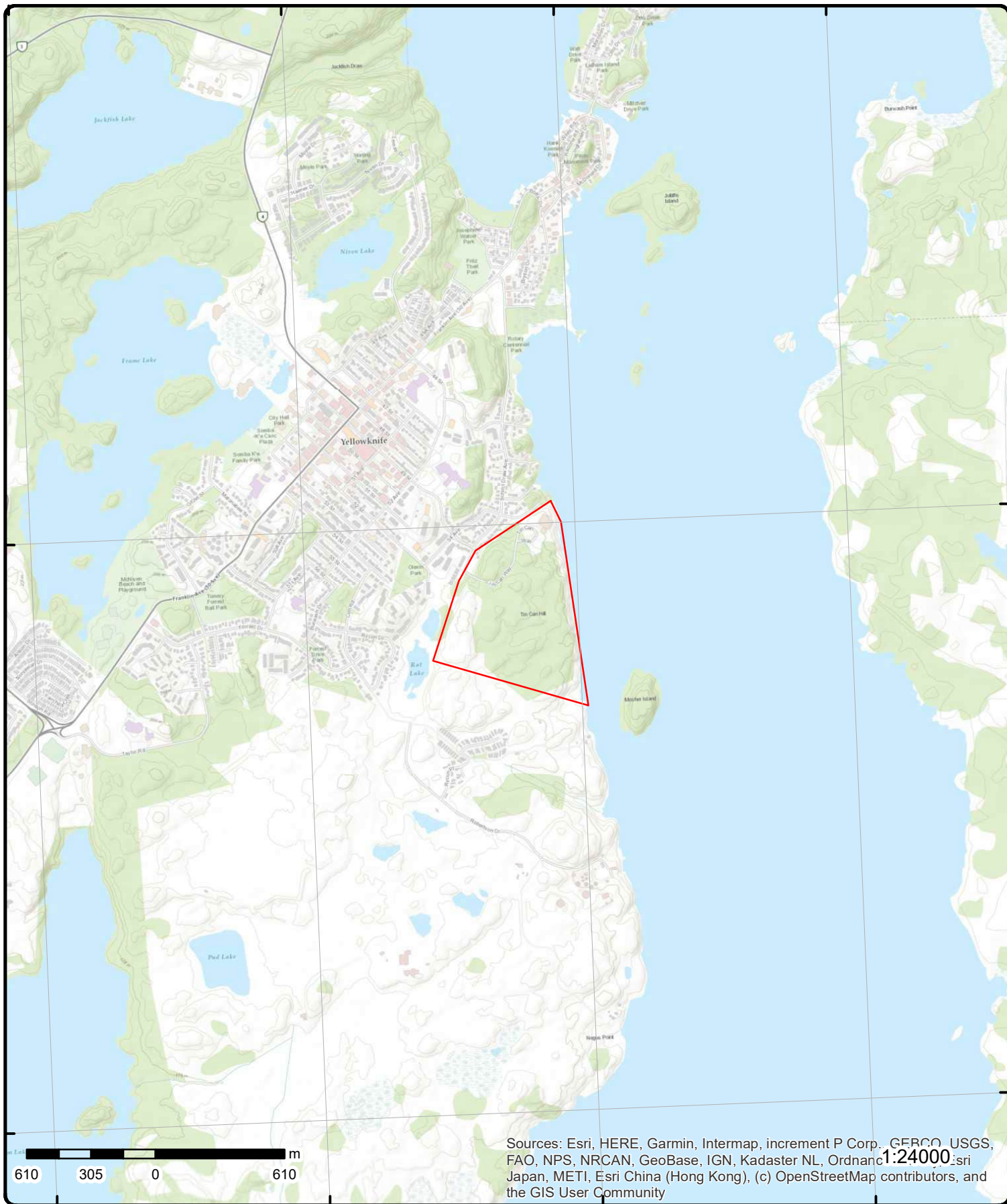
114°19'30"W

62°27'N

62°27'N

62°25'30"N

62°25'30"N



Topographic Map

Address: Tin Can Hill, NT

Source: ESRI World Topographic Map

Order Number: 22092704056



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Detail Report

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
1	1 of 1	WNW/0.0	178.3 / -12.72	End of Schooldraw Avenue, new development on a lot across from copper sky condos, near tin can hill. Yellowknife, Community, Northwest Territories NT	SPL
<div> <div> Spill No: spill-2020107 Spill Date: Spill Quantity: Unknown Quantity Measurement: Spill Cause: Fitting Leak Spill Source: Truck Product Spilled: Petroleum - lubricating oil (lube, hydraulic) Product Spilled Description: Hydraulic Fluid Area of Contamination: 2.00 Spill Location Descriptio: End of Schooldraw Avenue, new development on a lot across from copper sky condos, near tin can hill. Known Hazards: Occurrence Date/Time: April 21, 2020 Reporting Date and Time: Tuesday, April 21, 2020 - 14:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: GNWT - Department of Environment and Natural Resources URL: https://www.enr.gov.nt.ca/en/spill/spill-2020107 </div> <div> Land Sea Indicator: Land Potential Spill: No Received Method: Email Involved Parties Type: Construction Companies Spill Region: North Slave </div> </div>					
2	1 of 1	WNW/25.2	176.7 / -14.27	School Draw by copper sky town across from 4844 school draw Yellowknife NT	SPL
<div> <div> Spill No: spill-2016016 Spill Date: Spill Quantity: 0.00 Measurement: Litres Spill Cause: Unkown Cause Spill Source: Other Transportation Product Spilled: Petroleum - fuel oil (jet A, diesel, turbo A, heat) Product Spilled Description: Fuel Area of Contamination: Spill Location Descriptio: School Draw by copper sky town across from 4844 school draw Known Hazards: Occurrence Date/Time: Reporting Date and Time: Wednesday, January 13, 2016 - 17:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: GNWT - Department of Environment and Natural Resources </div> <div> Land Sea Indicator: Land Potential Spill: No Received Method: Involved Parties Type: Private Individuals Spill Region: North Slave </div> </div>					

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
URL:		https://www.enr.gov.nt.ca/en/spill/spill-2016016			
3	1 of 1	NW/33.0	174.4 / -16.64	School Draw and 49 Street Yellowknife NT	SPL
Spill No: spill-2011440		Land Sea Indicator: Land			
Spill Date:		Potential Spill: No			
Spill Quantity: 4.00		Received Method:			
Measurement: Litres		Involved Parties Type: Municipal Government			
Spill Cause: Pipe Leaks		Spill Region: North Slave			
Spill Source: Truck					
Product Spilled: Petroleum - lubricating oil (lube, hydraulic)					
Product Spilled Description: Hydraulic Fluid					
Area of Contamination:					
Spill Location Descriptio: School Draw and 49 Street					
Known Hazards:					
Occurrence Date/Time: November 14, 2011					
Reporting Date and Time: Sunday, November 13, 2011 - 17:00					
Support Info Un No:					
Supp Info Describe Any Assi:					
Support Info Water Use Permit:					
Supp Info Land Use Permit N:					
Support Info Factors Affecting:					
Support Info Additional Inform:					
Supporting Agencies:					
Lead Agency: GNWT - Department of Environment and Natural Resources					
URL: https://www.enr.gov.nt.ca/en/spill/spill-2011440					
4	1 of 1	NW/75.8	175.1 / -15.89	5405 49 St Yellowknife, Community, Northwest Territories NT	SPL
Spill No: spill-2018152		Land Sea Indicator:			
Spill Date:		Potential Spill: No			
Spill Quantity: Unknown Quantity		Received Method: Fax			
Measurement:		Involved Parties Type:			
Spill Cause: Fitting Leak		Spill Region: North Slave			
Spill Source: Truck					
Product Spilled: Petroleum - fuel oil (jet A, diesel, turbo A, heat)					
Product Spilled Description: diesel					
Area of Contamination:					
Spill Location Descriptio: 5405 49 St					
Known Hazards:					
Occurrence Date/Time: May 4, 2018					
Reporting Date and Time: Friday, May 4, 2018 - 16:00					
Support Info Un No:					
Supp Info Describe Any Assi:					
Support Info Water Use Permit:					
Supp Info Land Use Permit N:					
Support Info Factors Affecting:					
Support Info Additional Inform:					
Supporting Agencies:					
Lead Agency: GNWT - Department of Environment and Natural Resources					
URL: https://www.enr.gov.nt.ca/en/spill/spill-2018152					
5	1 of 1	NNW/81.0	169.0 / -22.00	4804 School Draw Yellowknife NT	SPL
Spill No: spill-2004502		Land Sea Indicator: Land			
Spill Date:		Potential Spill: No			

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
Spill Quantity: Measurement: Spill Cause: Spill Source: Product Spilled: Product Spilled Description: Area of Contamination: Spill Location Descriptio: Known Hazards: Occurrence Date/Time: Reporting Date and Time: Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: URL:	0.00 Litres Tank Leak Storage tank < 4000 Litre Petroleum - fuel oil (jet A, diesel, turbo A, heat) Heating Fuel P-50 4804 School Draw Wednesday, July 28, 2004 - 18:00 GNWT - Department of Environment and Natural Resources https://www.enr.gov.nt.ca/en/spill/spill-2004502			Received Method: Involved Parties Type: Private Individuals Spill Region: North Slave	

6	1 of 1	N/121.7	166.9 / -24.13	5505 - 47th Street Yellowknife NT	SPL
Spill No: Spill Date: Spill Quantity: Measurement: Spill Cause: Spill Source: Product Spilled: Product Spilled Description: Area of Contamination: Spill Location Descriptio: Known Hazards: Occurrence Date/Time: Reporting Date and Time: Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: URL:	spill-2000223 1.00 Litres Deliberate Discharge Other Transportation Chemicals (including transformer oils) Cygon 2E Systemic Insecticide 5505 - 47th Street August 12, 2000 Friday, August 11, 2000 - 18:00 GNWT - Department of Environment and Natural Resources https://www.enr.gov.nt.ca/en/spill/spill-2000223			Land Sea Indicator: Land Potential Spill: No Received Method: Involved Parties Type: Private Individuals Spill Region: North Slave	

7	1 of 1	WNW/125.7	176.3 / -14.68	Apt. 203 4905 54th Avenue Yellowknife NT	SPL
Spill No: Spill Date: Spill Quantity: Measurement: Spill Cause: Spill Source: Product Spilled: Product Spilled Description: Area of Contamination: Spill Location Descriptio: Known Hazards: Occurrence Date/Time:	spill-2007508 0.00 Litres Pipe Leaks Pipe or Line Wastewater (sewage, mine tailings) Sewage Apt. 203 4905 54th Avenue November 6, 2007			Land Sea Indicator: Land Potential Spill: No Received Method: Involved Parties Type: Other Spill Region: North Slave	

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
Reporting Date and Time: Tuesday, November 6, 2007 - 17:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: GNWT - Department of Environment and Natural Resources URL: https://www.enr.gov.nt.ca/en/spill/spill-2007508					
8	1 of 1	W/127.9	180.0 / -11.02	5456-52 St. Bison Apts. Yellowknife NT	SPL
Spill No: spill-2006423 Spill Date: Spill Quantity: 10.00 Measurement: Litres Spill Cause: Other Spill Source: Other Transportation Product Spilled: Chemicals (including transformer oils) Product Spilled Description: Transformer Oil Area of Contamination: Spill Location Descriptio: 5456-52 St. Bison Apts. Known Hazards: Occurrence Date/Time: October 19, 2006 Reporting Date and Time: Thursday, November 9, 2006 - 17:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: GNWT - Department of Environment and Natural Resources URL: https://www.enr.gov.nt.ca/en/spill/spill-2006423					
9	1 of 1	WNW/130.0	176.4 / -14.64	49th Street & 54th Avenue Yellowknife NT	SPL
Spill No: spill-1990178 Spill Date: Spill Quantity: 200.00 Measurement: Litres Spill Cause: Deliberate Discharge Spill Source: Truck Product Spilled: Petroleum - unknown Product Spilled Description: Oil Product Area of Contamination: Spill Location Descriptio: 49th Street & 54th Avenue Known Hazards: Occurrence Date/Time: October 6, 1990 Reporting Date and Time: Friday, October 5, 1990 - 18:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: GNWT - Department of Environment and Natural Resources URL: https://www.enr.gov.nt.ca/en/spill/spill-1990178					

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
10	1 of 1	WNW/146.1	177.6 / -13.44	5313A 49th Street, Yellowknife Yellowknife NT	SPL
<div> <div> Spill No: spill-2011197 Spill Date: Spill Quantity: 0.00 Measurement: Litres Spill Cause: Tank Leak Spill Source: Storage tank < 4000 Litre Product Spilled: Petroleum - fuel oil (jet A, diesel, turbo A, heat) Product Spilled Description: Heating Fuel P-50 Area of Contamination: Spill Location Descriptio: 5313A 49th Street, Yellowknife Known Hazards: Occurrence Date/Time: Reporting Date and Time: Monday, May 30, 2011 - 18:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: GNWT - Department of Environment and Natural Resources URL: https://www.enr.gov.nt.ca/en/spill/spill-2011197 </div> <div> Land Sea Indicator: Land Potential Spill: No Received Method: Involved Parties Type: Private Individuals Spill Region: North Slave </div> </div>					
11	1 of 1	NW/153.5	173.3 / -17.75	4804-54th Ave Yellowknife NT	SPL
<div> <div> Spill No: spill-1999023 Spill Date: Spill Quantity: 45.00 Measurement: Litres Spill Cause: Fitting Leak Spill Source: Storage tank < 4000 Litre Product Spilled: Petroleum - fuel oil (jet A, diesel, turbo A, heat) Product Spilled Description: Fuel Oil Area of Contamination: Spill Location Descriptio: 4804-54th Ave Known Hazards: Occurrence Date/Time: March 3, 1999 Reporting Date and Time: Tuesday, March 2, 1999 - 17:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: GNWT - Department of Environment and Natural Resources URL: https://www.enr.gov.nt.ca/en/spill/spill-1999023 </div> <div> Land Sea Indicator: Land Potential Spill: No Received Method: Involved Parties Type: Private Individuals Spill Region: North Slave </div> </div>					
12	1 of 1	WNW/166.0	178.7 / -12.28	4904 - 54 Avenue Yellowknife NT	CFST
<div> <div> Tank System ID: 40874 EC No: 00033775 File No: Status: </div> <div> Commencement Dt: Application Date: Confirmation Date: Expiry Date: </div> </div>					

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
NTS:					
Tank System Prov E:	Northwest Territories			Disposition Type:	
Tank System Prov F:	Territoires du Nord-Ouest			Land Description:	
Tank System PO Box:				Fuel Registration:	
Tank System Postal:	X1A 1H7			No of Tanks:	
Removed Date:				Location:	
Withdrawn Date:				Latitude:	
Temp Withdrawn Dt:				Longitude:	
Land Owner E:	Federal entity under Financial Administration Act				
Land Owner F:	Entité fédérale sous la loi sur la gestion des finances publiques				
<u>Tank Information</u>					
Tank ID:	69919			TankType of Pump E:	No pump
Other Tank Content:				TankType of Pump F:	Aucune pompe
Installation Dt:	1994			Piping Type E:	Aboveground
Withdrawn Tank Dt:				Piping Type F:	Hors sol
Removed Tank Dt:				Withdrwn Piping Dt:	
Tank Capacity:	11940			Removed Piping Dt:	
Tank Type E:	Aboveground			Withdrwn Oth Cmp Dt:	
Tank Type F:	Hors sol			Rmvd Othr Cmpnt Dt:	
Internal No:	B_150387				
Tank Description:					
Tank Standard No E:	ULC-S601				
Tank Standard No F:	ULC-S601				
Tank Standard No Other:					
Tank Content E:	Heating oil				
Tank Content F:	Huile à chauffage				
Tank Cnstrctin Material E:	Steel				
Tank Cnstrctin Material F:	Acier				
Tank Cnstrctin Material Othr:					
Piping Diameter Unit:	inch				
Piping Diameter:	2				
Spill Containment E:	Spill box at fill point (aboveground tank)				
Spill Containment F:	Boîte de confinement de déversement au site de remplissage (réservoir hors sol)				
Spill Containment Other:					
Product Transfer Area:	Direct fill on top of tank with spill containment box				
<u>Tank Systems</u>					
Component E:	Containment tank assembly				
Component F:	Ensemble réservoir de confinement				
Other:					
<u>Tank Overfill Protection</u>					
Component E:	Other (specify)				
Component F:	Autre (spécifiez)				
Other:	Whistle				
<u>Tank Leak Detection</u>					
Component E:	Visual inspection				
Component F:	Inspection visuelle				
Other:					
<u>Tank Corrosion Protection</u>					
Component E:	Painted				
Component F:	Peinturé				
Other:					

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
<u>Sump Leak Detection</u>					
Component E:		No sump for storage tank system			
Component F:		Aucun puisard pour le système de stockage			
Other:					
<u>Piping Secondary Containment</u>					
Component E:		None			
Component F:		Aucun			
Other:					
<u>Piping Leak Detection</u>					
Component E:		Visual inspection			
Component F:		Inspection visuelle			
Other:					
<u>Piping Corrosion Protection</u>					
Component E:		Painted			
Component F:		Peinturé			
Other:					
<u>Piping Construction Material</u>					
Component E:		Steel			
Component F:		Acier			
Other:					
<u>Tank Systems</u>					
Creation Date:	9/25/2014			Operator Phone:	8677679049
Creation By:				Operator Phone Ext:	32154
Modified Date:	10/2/2019			System Record City:	
Modified By:	Craig Wessner			Sys Record Prov E:	
Owner Contact:	Cameron Wilson			Sys Record Prov F:	
Owner Email:	Cameron_Wilson@gov.nt.ca			Sys Record PO Box:	
Owner Phone:	8677679089			Sys Record Postal:	
Owner Phone Ext:	31186			Sys Record Same As:	TRUE
Is Perm Withdrawal:	FALSE			Tank Use E:	Heating
Operator Email:	Jason_Carroll@gov.nt.ca			Tank Use F:	Chauffage
Operator Contact:	Jason Carroll				
Group Name:	Government of the NWT - Infrastructure				
Master Group Name:	Government of the NWT - Infrastructure				
Internal No:	001078				
System Description:	Yellowknife - Rockhill Apartments - Building Heating Oil System				
Sys Record Address:					
Tank Use:					
Tank Manufacturer:					
Year of Manufacturer:					
Cert Sys Installer:					
Cert Sys Remover:					
Emergency Plan Same As:	TRUE				
<u>Months</u>					
Service Months E:	January				
Service Months F:	Janvier				

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
<u>Months</u>					
Service Months E:		February			
Service Months F:		Février			
<u>Months</u>					
Service Months E:		December			
Service Months F:		Décembre			
<u>Months</u>					
Service Months E:		March			
Service Months F:		Mars			
<u>Months</u>					
Service Months E:		June			
Service Months F:		Juin			
<u>Months</u>					
Service Months E:		April			
Service Months F:		Avril			
<u>Months</u>					
Service Months E:		October			
Service Months F:		Octobre			
<u>Months</u>					
Service Months E:		November			
Service Months F:		Novembre			
<u>Months</u>					
Service Months E:		July			
Service Months F:		Juillet			
<u>Months</u>					
Service Months E:		August			
Service Months F:		Août			
<u>Months</u>					
Service Months E:		September			
Service Months F:		Septembre			
<u>Months</u>					
Service Months E:		May			
Service Months F:		Mai			

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
13	1 of 1	W/205.4	185.9 / -5.07	PWGSC 44 Rycon Drive NT X1A 2V6	SPL
<div> <div> Spill No: 2009290 Spill Date: 6/12/2009 Spill Quantity: 0 L Measurement: Spill Cause: Spill Source: Storage Tank <4000 litres Product Spilled: Heating Oil Product Spilled Description: Area of Contamination: Spill Location Descriptio: Known Hazards: Occurrence Date/Time: Reporting Date and Time: Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: Government of the Northwest Territories URL: </div> <div> Land Sea Indicator: Potential Spill: Received Method: Involved Parties Type: Spill Region: North Slave </div> </div>					
14	1 of 1	N/209.9	162.6 / -28.44	5502 - 45TH Street Alleyway Yellowknife NT	SPL
<div> <div> Spill No: spill-2008376 Spill Date: Spill Quantity: 20.00 Measurement: Litres Spill Cause: Pipe Leaks Spill Source: Pipe or Line Product Spilled: Petroleum - lubricating oil (lube, hydraulic) Product Spilled Description: Hydraulic Fluid Area of Contamination: Spill Location Descriptio: 5502 - 45TH Street Alleyway Known Hazards: Occurrence Date/Time: August 5, 2008 Reporting Date and Time: Monday, August 4, 2008 - 18:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: GNWT - Department of Environment and Natural Resources URL: https://www.enr.gov.nt.ca/en/spill/spill-2008376 </div> <div> Land Sea Indicator: Land Potential Spill: No Received Method: Involved Parties Type: Municipal Government Spill Region: North Slave </div> </div>					
15	1 of 1	NNE/215.4	157.9 / -33.15	DIAND Core Lab, 5601 45th Street Yellowknife NT	SPL
<div> <div> Spill No: spill-1997215 Spill Date: Spill Quantity: 0.00 Measurement: Spill Cause: Pipe Leaks Spill Source: Storage tank < 4000 Litre </div> <div> Land Sea Indicator: Potential Spill: No Received Method: Involved Parties Type: Federal Government Department Spill Region: North Slave </div> </div>					

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
Product Spilled: Product Spilled Description: Area of Contamination: Spill Location Descriptio: Known Hazards: Occurrence Date/Time: Reporting Date and Time: Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: URL:		Chemicals (including transformer oils) Chemicals/Sewage DIAND Core Lab, 5601 45th Street Tuesday, December 31, 1996 - 17:00 ECCC - Environment and Climate Change Canada https://www.enr.gov.nt.ca/en/spill/spill-1997215			

16	1 of 1	N/269.7	168.0 / -23.00	45 Street and School Draw Avenue Yellowknife NT	SPL
Spill No:	spill-2001320	Land Sea Indicator:	Land		
Spill Date:		Potential Spill:	No		
Spill Quantity:	0.00	Received Method:			
Measurement:	Litres	Involved Parties Type:	Private Individuals		
Spill Cause:	Pipe Leaks	Spill Region:	North Slave		
Spill Source:	Pipe or Line				
Product Spilled:	Petroleum - fuel oil (jet A, diesel, turbo A, heat)				
Product Spilled Description:	Diesel Fuel				
Area of Contamination:					
Spill Location Descriptio:	45 Street and School Draw Avenue				
Known Hazards:					
Occurrence Date/Time:	October 10, 2001				
Reporting Date and Time:	Tuesday, October 9, 2001 - 18:00				
Support Info Un No:					
Supp Info Describe Any Assi:					
Support Info Water Use Permit:					
Supp Info Land Use Permit N:					
Support Info Factors Affecting:					
Support Info Additional Inform:					
Supporting Agencies:					
Lead Agency:	GNWT - Department of Environment and Natural Resources				
URL:	https://www.enr.gov.nt.ca/en/spill/spill-2001320				

17	1 of 1	W/285.4	188.3 / -2.67	At a municipal lot at the end of 54th street, Bloc 110, plan 2093 Yellowknife, Community, Northwest Territories NT	SPL
Spill No:		spill-2021186		Land Sea Indicator:	Land
Spill Date:				Potential Spill:	No
Spill Quantity:		5.00		Received Method:	Phone
Measurement:		Litres		Involved Parties Type:	Unknown
Spill Cause:		Breakage		Spill Region:	North Slave
Spill Source:		Other Transportation			
Product Spilled:		Petroleum - lubricating oil (lube, hydraulic)			
Product Spilled Description:		Motor oil			
Area of Contamination:		2.00			
Spill Location Descriptio:		At a municipal lot at the end of 54th street, Bloc 110, plan 2093			
Known Hazards:					
Occurrence Date/Time:		May 18, 2021			
Reporting Date and Time:		Wednesday, May 19, 2021 - 14:30			
Support Info Un No:					

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: URL:					
		GNWT - Department of Environment and Natural Resources https://www.enr.gov.nt.ca/en/spill/spill-2021186			
18	1 of 1	WNW/315.4	189.0 / -2.00	5300 - 49th St Anderson Thomson Tower Yellowknife NT	SPL
Spill No: spill-2008516 Spill Date: Spill Quantity: 0.00 Measurement: Litres Spill Cause: Overflow Event Spill Source: Storage tank < 4000 Litre Product Spilled: Petroleum - fuel oil (jet A, diesel, turbo A, heat) Product Spilled Description: Diesel Fuel Area of Contamination: Spill Location Descriptio: 5300 - 49th St Anderson Thomson Tower Known Hazards: Occurrence Date/Time: Reporting Date and Time: Saturday, October 25, 2008 - 18:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: URL:					
		GNWT - Department of Environment and Natural Resources https://www.enr.gov.nt.ca/en/spill/spill-2008516			
19	1 of 2	NW/347.0	188.3 / -2.69	4701 - 52nd Ave. Yellowknife NT	SPL
Spill No: spill-2000240 Spill Date: Spill Quantity: 10.00 Measurement: Litres Spill Cause: Other Spill Source: Other Transportation Product Spilled: Petroleum - other (bunker, asphalt, propane) Product Spilled Description: Asphalt Sealant Area of Contamination: Spill Location Descriptio: 4701 - 52nd Ave. Known Hazards: Occurrence Date/Time: August 23, 2000 Reporting Date and Time: Tuesday, August 22, 2000 - 18:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: URL:					
		GNWT - Department of Environment and Natural Resources https://www.enr.gov.nt.ca/en/spill/spill-2000240			

29 erisinfo.com | Environmental Risk Information Services Order No: 22092704056

30 erisinfo.com | Environmental Risk Information Services Order No: 22092704056

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
NAICS Code (6 digit):		212220			
NAICS 6 Description:		Gold and silver ore mining			
<u>Substance Release Report</u>					
Category Type ID:		13			
Category Type Desc:		All Media			
Category Type Desc (fr):		Rejets à tous les médias			
Grouping:		Total All Media<1t			
Trans Code:					
Chem:		Zinc (and its compounds)			
Chem (fr):		Zinc (et ses composés)			
Quantity:		.066			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Copper (and its compounds)			
Chem (fr):		Cuivre (et ses composés)			
Quantity:		.532			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Cyanides (ionic)			
Chem (fr):		Cyanures (ioniques)			
Quantity:		.687			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		3			
Category Type Desc:		Fugitive			
Category Type Desc (fr):		Émissions fugitives			
Grouping:		Total Air			
Trans Code:		VOCs			
Chem:		Hydrogen cyanide			
Chem (fr):		Cyanure d'hydrogène			
Quantity:		12.6			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Ammonia (total)			
Chem (fr):		Ammoniac (total)			
Quantity:		17.72			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
20	3 of 13	WSW/347.7	182.9 / -8.05	MIRAMAR CON MINE LTD. 75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	NPRI
NPRI ID: 2548				Org ID: 16210	
Other ID: Y				Submit Date: 4/23/1999	
No Other ID: 2				Last Modified: 5/29/2015 3:28:24 PM	
Track ID: 7080				Contact ID:	
Report ID:				Cont Type:	
Report Type: NPRI				Contact Title:	
Rpt Type ID: 1				Cont First Name:	
Report Year: 1997				Cont Last Name:	
Not-Current Rpt?: No				Contact Position:	
Yr of Last Filed Rpt: 2003				Contact Fax:	
Fac ID: 43417				Contact Ph.:	
Fac Name: NOT AVAILABLE				Cont Area Code:	
Fac Address1: 75 CON ROAD				Contact Tel.:	
Fac Address2: P.O. BOX 2000				Contact Ext.:	
Fac Postal Zip: X1A 2M1				Cont Fax Area Cde:	
Facility Lat: 62.4335				Contact Fax:	
Facility Long: -114.3946				Contact Email:	
DLS (Last Filed Rpt):				Latitude: 62.4335	
Facility DLS:				Longitude: -114.3946	
Datum: 1983				UTM Zone: 11	
Facility Cmnts: FALSE				UTM Northing: 6924965	
URL:				UTM Easting: 634568	
No of Empl.: 227				Waste Streams: TRUE	
Parent Co.: Y				No Streams: 2	
No Parent Co.: 1				Waste Off Sites: FALSE	
Pollut Prev Cmnts: FALSE				No Off Sites: 0	
Stacks:				Shutdown:	
No of Stacks:				No of Shutdown:	
Canadian SIC Code (2 digit):					
Canadian SIC Code:					
SIC Code Description:					
American SIC Code:					
NAICS Code (2 digit): 21					
NAICS 2 Description: Mining and Oil and Gas Extraction					
NAICS Code (4 digit): 2122					
NAICS 4 Description: Metal ore mining					
NAICS Code (6 digit): 212220					
NAICS 6 Description: Gold and silver ore mining					
<u>Substance Release Report</u>					
Category Type ID: 13					
Category Type Desc: All Media					
Category Type Desc (fr): Rejets à tous les médias					
Grouping: Total All Media<1t					
Trans Code:					
Chem: Zinc (and its compounds)					
Chem (fr): Zinc (et ses composés)					
Quantity: .1					
Unit: tonnes					
Basis of Estimate Cd: M					
Basis of Estimate Desc: M- Monitoring or Direct Measurement - In use from 1994 to 2002					
Category Type ID: 7					
Category Type Desc: Direct Discharges					
Category Type Desc (fr): Évacuation directes					
Grouping: Total Water					
Trans Code: WatD					
Chem: Copper (and its compounds)					
Chem (fr): Cuivre (et ses composés)					

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
<hr/>					
Quantity:		.236			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		3			
Category Type Desc:		Fugitive			
Category Type Desc (fr):		Émissions fugitives			
Grouping:		Total Air			
Trans Code:		VOCs			
Chem:		Hydrogen cyanide			
Chem (fr):		Cyanure d'hydrogène			
Quantity:		9.46			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Cyanides (ionic)			
Chem (fr):		Cyanures (ioniques)			
Quantity:		.333			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Ammonia (total)			
Chem (fr):		Ammoniac (total)			
Quantity:		7.49			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
<hr/>					
<u>20</u>	4 of 13	WSW/347.7	182.9 / -8.05	MIRAMAR CON MINE LTD. 75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	NPRI
NPRI ID:	2548			Org ID:	16210
Other ID:	Y			Submit Date:	5/14/1999
No Other ID:	2			Last Modified:	5/29/2015 3:28:24 PM
Track ID:	7076			Contact ID:	86985
Report ID:				Cont Type:	MED
Report Type:	NPRI			Contact Title:	
Rpt Type ID:	1			Cont First Name:	GAIL
Report Year:	1998			Cont Last Name:	SETO
Not-Current Rpt?:	No			Contact Position:	SR. LABORATORY TECHNICIAN
Yr of Last Filed Rpt:	2003			Contact Fax:	8679204238
Fac ID:	43417			Contact Ph.:	8678732783
Fac Name:	NOT AVAILABLE			Cont Area Code:	867
Fac Address1:	75 CON ROAD			Contact Tel.:	78732783
Fac Address2:	P.O. BOX 2000			Contact Ext.:	5610
Fac Postal Zip:	X1A 2M1			Cont Fax Area Cde:	867
Facility Lat:	62.4335			Contact Fax:	79204238
Facility Long:	-114.3946			Contact Email:	NOT AVAILABLE
DLS (Last Filed Rpt):				Latitude:	62.4335
Facility DLS:				Longitude:	-114.3946
Datum:	1983			UTM Zone:	11

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
Facility Cmnts:	True			UTM Northing:	6924965
URL:				UTM Easting:	634568
No of Empl.:	227			Waste Streams:	Fals
Parent Co.:	Y			No Streams:	2
No Parent Co.:	1			Waste Off Sites:	False
Pollut Prev Cmnts:	False			No Off Sites:	0
Stacks:				Shutdown:	
No of Stacks:				No of Shutdown:	
Canadian SIC Code (2 digit):					
Canadian SIC Code:					
SIC Code Description:					
American SIC Code:					
NAICS Code (2 digit):		21			
NAICS 2 Description:		Mining and Oil and Gas Extraction			
NAICS Code (4 digit):		2122			
NAICS 4 Description:		Metal ore mining			
NAICS Code (6 digit):		212220			
NAICS 6 Description:		Gold and silver ore mining			
<u>Substance Release Report</u>					
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Cyanides (ionic)			
Chem (fr):		Cyanures (ioniques)			
Quantity:		.253			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Copper (and its compounds)			
Chem (fr):		Cuivre (et ses composés)			
Quantity:		.173			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Ammonia (total)			
Chem (fr):		Ammoniac (total)			
Quantity:		16			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		13			
Category Type Desc:		All Media			
Category Type Desc (fr):		Rejets à tous les médias			
Grouping:		Total All Media<1t			
Trans Code:					
Chem:		Zinc (and its compounds)			
Chem (fr):		Zinc (et ses composés)			
Quantity:		.1			

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
<div> Unit: tonnes Basis of Estimate Cd: M Basis of Estimate Desc: M- Monitoring or Direct Measurement - In use from 1994 to 2002 Category Type ID: 3 Category Type Desc: Fugitive Category Type Desc (fr): Émissions fugitives Grouping: Total Air Trans Code: VOCs Chem: Hydrogen cyanide Chem (fr): Cyanure d'hydrogène Quantity: 2.3 Unit: tonnes Basis of Estimate Cd: M Basis of Estimate Desc: M- Monitoring or Direct Measurement - In use from 1994 to 2002 </div>					
20	5 of 13	WSW/347.7	182.9 / -8.05	MIRAMAR CON MINE LTD. 75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	NPRI
<div> NPRI ID: 2548 Other ID: Y No Other ID: 1 Track ID: 7073 Report ID: Report Type: NPRI Rpt Type ID: 1 Report Year: 1999 Not-Current Rpt?: No Yr of Last Filed Rpt: 2003 Fac ID: 112336 Fac Name: CON MINE Fac Address1: 75 CON ROAD Fac Address2: P.O. BOX 2000 Fac Postal Zip: X1A 2M1 Facility Lat: 62.4335 Facility Long: -114.3946 DLS (Last Filed Rpt): Facility DLS: Datum: 1983 Facility Cmnts: False URL: No of Empl.: 266 Parent Co.: Y No Parent Co.: 1 Pollut Prev Cmnts: False Stacks: No of Stacks: Canadian SIC Code (2 digit): Canadian SIC Code: SIC Code Description: American SIC Code: NAICS Code (2 digit): 21 NAICS 2 Description: Mining and Oil and Gas Extraction NAICS Code (4 digit): 2122 NAICS 4 Description: Metal ore mining NAICS Code (6 digit): 212220 NAICS 6 Description: Gold and silver ore mining </div>					
<div> Org ID: 16210 Submit Date: 5/25/2000 Last Modified: 5/29/2015 3:28:24 PM Contact ID: 99026 Cont Type: MED Contact Title: Cont First Name: MICHAEL Cont Last Name: BORDEN Contact Position: SR. ENVIRONMENTAL COORDINATOR Contact Fax: 8679204238 Contact Ph.: 8678732783 Cont Area Code: 867 Contact Tel.: 78732783 Contact Ext.: 5605 Cont Fax Area Cde: 867 Contact Fax: 79204238 Contact Email: MBORDEN@NT.SYMPATICO.CA Latitude: 62.4335 Longitude: -114.3946 UTM Zone: 11 UTM Northing: 6924965 UTM Easting: 634568 Waste Streams: Yes No Streams: 2 Waste Off Sites: Yes No Off Sites: 0 Shutdown: No of Shutdown: </div>					
<u>Substance Release Report</u>					
<div> Category Type ID: 7 Category Type Desc: Direct Discharges Category Type Desc (fr): Évacuation directes </div>					

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
<hr/>					
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Copper (and its compounds)			
Chem (fr):		Cuivre (et ses composés)			
Quantity:		.053			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Cyanides (ionic)			
Chem (fr):		Cyanures (ioniques)			
Quantity:		.21			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Zinc (and its compounds)			
Chem (fr):		Zinc (et ses composés)			
Quantity:		.033			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Ammonia (total)			
Chem (fr):		Ammoniac (total)			
Quantity:		6.31			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		3			
Category Type Desc:		Fugitive			
Category Type Desc (fr):		Émissions fugitives			
Grouping:		Total Air			
Trans Code:		VOCs			
Chem:		Hydrogen cyanide			
Chem (fr):		Cyanure d'hydrogène			
Quantity:		9.46			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			

20	6 of 13	WSW/347.7	182.9 / -8.05	MIRAMAR CON MINE LTD. 75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	NPRI
NPRI ID:	2548			Org ID:	16210
Other ID:	Y			Submit Date:	
No Other ID:	1.00			Last Modified:	5/29/2015 3:28:24 PM
Track ID:	7075			Contact ID:	99026

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
<hr/>					
Report ID:				Cont Type:	MED
Report Type:	NPRI			Contact Title:	
Rpt Type ID:	1			Cont First Name:	MICHAEL
Report Year:	2000			Cont Last Name:	BORDEN
Not-Current Rpt?:	No			Contact Position:	SR. ENVIRONMENTAL COORDINATOR
Yr of Last Filed Rpt:	2003			Contact Fax:	8679204238
Fac ID:	112336			Contact Ph.:	8678732783
Fac Name:	CON MINE			Cont Area Code:	867
Fac Address1:	75 CON ROAD			Contact Tel.:	78732783
Fac Address2:	P.O. BOX 2000			Contact Ext.:	5605
Fac Postal Zip:	X1A 2M1			Cont Fax Area Cde:	867
Facility Lat:	62.4335			Contact Fax:	79204238
Facility Long:	-114.3946			Contact Email:	MBORDEN@NT.SYMPATICO.CA
DLS (Last Filed Rpt):				Latitude:	62.4335
Facility DLS:				Longitude:	-114.3946
Datum:	1983			UTM Zone:	
Facility Cmnts:	False			UTM Northing:	
URL:				UTM Easting:	
No of Empl.:	282			Waste Streams:	Yes
Parent Co.:	Y			No Streams:	2
No Parent Co.:	1.00			Waste Off Sites:	No
Pollut Prev Cmnts:	False			No Off Sites:	0.00
Stacks:				Shutdown:	
No of Stacks:				No of Shutdown:	
Canadian SIC Code (2 digit):					
Canadian SIC Code:					
SIC Code Description:					
American SIC Code:					
NAICS Code (2 digit):	21				
NAICS 2 Description:	Mining and Oil and Gas Extraction				
NAICS Code (4 digit):	2122				
NAICS 4 Description:	Metal ore mining				
NAICS Code (6 digit):	212220				
NAICS 6 Description:	Gold and silver ore mining				
 <u>Substance Release Report</u>					
Category Type ID:	7				
Category Type Desc:	Direct Discharges				
Category Type Desc (fr):	Évacuation directes				
Grouping:	Total Water				
Trans Code:	WatD				
Chem:	Ammonia (total)				
Chem (fr):	Ammoniac (total)				
Quantity:	12.52				
Unit:	tonnes				
Basis of Estimate Cd:	M				
Basis of Estimate Desc:	M- Monitoring or Direct Measurement - In use from 1994 to 2002				
Category Type ID:	7				
Category Type Desc:	Direct Discharges				
Category Type Desc (fr):	Évacuation directes				
Grouping:	Total Water				
Trans Code:	WatD				
Chem:	Copper (and its compounds)				
Chem (fr):	Cuivre (et ses composés)				
Quantity:	.209				
Unit:	tonnes				
Basis of Estimate Cd:	M				
Basis of Estimate Desc:	M- Monitoring or Direct Measurement - In use from 1994 to 2002				
Category Type ID:	7				
Category Type Desc:	Direct Discharges				
Category Type Desc (fr):	Évacuation directes				
Grouping:	Total Water				

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
Trans Code:		WatD			
Chem:		Cyanides (ionic)			
Chem (fr):		Cyanures (ioniques)			
Quantity:		.318			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Nickel (and its compounds)			
Chem (fr):		Nickel (et ses composés)			
Quantity:		.264			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Zinc (and its compounds)			
Chem (fr):		Zinc (et ses composés)			
Quantity:		.033			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		3			
Category Type Desc:		Fugitive			
Category Type Desc (fr):		Émissions fugitives			
Grouping:		Total Air			
Trans Code:		VOCs			
Chem:		Hydrogen cyanide			
Chem (fr):		Cyanure d'hydrogène			
Quantity:		2.87			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			

20	7 of 13	WSW/347.7	182.9 / -8.05	MIRAMAR CON MINE LTD. 75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	NPRI
NPRI ID:	2548			Org ID:	16210
Other ID:	Y			Submit Date:	5/30/2002
No Other ID:	1.00			Last Modified:	5/29/2015 3:28:24 PM
Track ID:	7081			Contact ID:	90720
Report ID:				Cont Type:	MED
Report Type:	NPRI			Contact Title:	
Rpt Type ID:	1			Cont First Name:	JAMES
Report Year:	2001			Cont Last Name:	MCKAY
Not-Current Rpt?:	No			Contact Position:	ENVIRONMENTAL SUPERINTENDENT
Yr of Last Filed Rpt:	2003			Contact Fax:	8679204238
Fac ID:	112336			Contact Ph.:	8678732783
Fac Name:	CON MINE			Cont Area Code:	867
Fac Address1:	75 CON ROAD			Contact Tel.:	78732783
Fac Address2:	P.O. BOX 2000			Contact Ext.:	5605
Fac Postal Zip:	X1A 2M1			Cont Fax Area Cde:	867
Facility Lat:	62.4335			Contact Fax:	79204238
Facility Long:	-114.3946			Contact Email:	JMCKAY@MIRAMARMINING.COM

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
DLS (Last Filed Rpt):				Latitude:	62.4335
Facility DLS:				Longitude:	-114.3946
Datum:	1983			UTM Zone:	
Facility Cmnts:	No			UTM Northing:	
URL:				UTM Easting:	
No of Empl.:	262			Waste Streams:	Yes
Parent Co.:	Y			No Streams:	2.00
No Parent Co.:	1.00			Waste Off Sites:	No
Pollut Prev Cmnts:	No			No Off Sites:	0.00
Stacks:				Shutdown:	
No of Stacks:				No of Shutdown:	
Canadian SIC Code (2 digit):					
Canadian SIC Code:					
SIC Code Description:					
American SIC Code:					
NAICS Code (2 digit):		21			
NAICS 2 Description:		Mining and Oil and Gas Extraction			
NAICS Code (4 digit):		2122			
NAICS 4 Description:		Metal ore mining			
NAICS Code (6 digit):		212220			
NAICS 6 Description:		Gold and silver ore mining			
<u>Substance Release Report</u>					
Category Type ID:		3			
Category Type Desc:		Fugitive			
Category Type Desc (fr):		Émissions fugitives			
Grouping:		Total Air			
Trans Code:		VOCs			
Chem:		Hydrogen cyanide			
Chem (fr):		Cyanure d'hydrogène			
Quantity:		2.54			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Zinc (and its compounds)			
Chem (fr):		Zinc (et ses composés)			
Quantity:		.033			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Copper (and its compounds)			
Chem (fr):		Cuivre (et ses composés)			
Quantity:		.204			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
<hr/>					
Chem:		Cyanides (ionic)			
Chem (fr):		Cyanures (ioniques)			
Quantity:		.376			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Nickel (and its compounds)			
Chem (fr):		Nickel (et ses composés)			
Quantity:		.232			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Ammonia (total)			
Chem (fr):		Ammoniac (total)			
Quantity:		12.96			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
<hr/>					
20	8 of 13	WSW/347.7	182.9 / -8.05	MIRAMAR CON MINE LTD 75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	NPRI
NPRI ID:	2548			Org ID:	58081
Other ID:	Y			Submit Date:	5/30/2003
No Other ID:	1			Last Modified:	5/29/2015 3:28:24 PM
Track ID:	76222			Contact ID:	161045
Report ID:	160650			Cont Type:	MED
Report Type:	NPRI			Contact Title:	
Rpt Type ID:	1			Cont First Name:	JAMES
Report Year:	2002			Cont Last Name:	MCKAY
Not-Current Rpt?:	No			Contact Position:	ENVIRONMENTAL COORDINATOR
Yr of Last Filed Rpt:	2003			Contact Fax:	8679204238
Fac ID:	112336			Contact Ph.:	8677665300
Fac Name:	CON MINE			Cont Area Code:	867
Fac Address1:	75 CON ROAD			Contact Tel.:	77665300
Fac Address2:	P.O. BOX 2000			Contact Ext.:	5605
Fac Postal Zip:	X1A 2M1			Cont Fax Area Cde:	867
Facility Lat:	62.4335			Contact Fax:	79204238
Facility Long:	-114.3946			Contact Email:	JMCKAY@MIRAMARYK.COM
DLS (Last Filed Rpt):				Latitude:	62.4335
Facility DLS:				Longitude:	-114.3946
Datum:	1983			UTM Zone:	
Facility Cmnts:	False			UTM Northing:	
URL:				UTM Easting:	
No of Empl.:	254			Waste Streams:	Fals
Parent Co.:	Y			No Streams:	2
No Parent Co.:	1			Waste Off Sites:	False
Pollut Prev Cmnts:	False			No Off Sites:	0
Stacks:	False			Shutdown:	False
No of Stacks:				No of Shutdown:	0
Canadian SIC Code (2 digit):					
Canadian SIC Code:					

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
SIC Code Description:					
American SIC Code:					
NAICS Code (2 digit):		21			
NAICS 2 Description:		Mining and Oil and Gas Extraction			
NAICS Code (4 digit):		2122			
NAICS 4 Description:		Metal ore mining			
NAICS Code (6 digit):		212220			
NAICS 6 Description:		Gold and silver ore mining			
<u>Substance Release Report</u>					
Category Type ID:		13			
Category Type Desc:		All Media			
Category Type Desc (fr):		Rejets à tous les médias			
Grouping:		Total All Media<1t			
Trans Code:					
Chem:		Nickel (and its compounds)			
Chem (fr):		Nickel (et ses composés)			
Quantity:		.194			
Unit:		tonnes			
Basis of Estimate Cd:					
Basis of Estimate Desc:					
Category Type ID:		13			
Category Type Desc:		All Media			
Category Type Desc (fr):		Rejets à tous les médias			
Grouping:		Total All Media<1t			
Trans Code:					
Chem:		Zinc (and its compounds)			
Chem (fr):		Zinc (et ses composés)			
Quantity:		.023			
Unit:		tonnes			
Basis of Estimate Cd:					
Basis of Estimate Desc:					
Category Type ID:		13			
Category Type Desc:		All Media			
Category Type Desc (fr):		Rejets à tous les médias			
Grouping:		Total All Media<1t			
Trans Code:					
Chem:		Cyanides (ionic)			
Chem (fr):		Cyanures (ioniques)			
Quantity:		.376			
Unit:		tonnes			
Basis of Estimate Cd:					
Basis of Estimate Desc:					
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Ammonia (total)			
Chem (fr):		Ammoniac (total)			
Quantity:		14.763			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		13			
Category Type Desc:		All Media			
Category Type Desc (fr):		Rejets à tous les médias			
Grouping:		Total All Media<1t			
Trans Code:					
Chem:		Copper (and its compounds)			

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
Chem (fr): Quantity: Unit: Basis of Estimate Cd: Basis of Estimate Desc:		Cuivre (et ses composés) .206 tonnes			
Category Type ID: Category Type Desc: Category Type Desc (fr): Grouping: Trans Code: Chem: Chem (fr): Quantity: Unit: Basis of Estimate Cd: Basis of Estimate Desc:		3 Fugitive Émissions fugitives Total Air VOCs Hydrogen cyanide Cyanure d'hydrogène 2.54 tonnes M M- Monitoring or Direct Measurement - In use from 1994 to 2002			
<u>20</u>	9 of 13	WSW/347.7	182.9 / -8.05	MIRAMAR CON MINE LTD 75 CON ROAD P.O. BOX 2000 YELLOWKNIFE NT X1A 2M1	NPRI
NPRI ID: Other ID: No Other ID: Track ID: Report ID: Report Type: Rpt Type ID: Report Year: Not-Current Rpt?: Yr of Last Filed Rpt: Fac ID: Fac Name: Fac Address1: Fac Address2: Fac Postal Zip: Facility Lat: Facility Long: DLS (Last Filed Rpt): Facility DLS: Datum: Facility Cmnts: URL: No of Empl.: Parent Co.: No Parent Co.: Pollut Prev Cmnts: Stacks: No of Stacks: Canadian SIC Code (2 digit): Canadian SIC Code: SIC Code Description: American SIC Code: NAICS Code (2 digit): NAICS 2 Description: NAICS Code (4 digit): NAICS 4 Description: NAICS Code (6 digit): NAICS 6 Description:	2548 Y 2 72860 152215 NPRI 1 2003 No 2003 112336 CON MINE 75 CON ROAD P.O. BOX 2000 X1A 2M1 62.4335 -114.3946 1983 False 254 Y 1 False True 21 Mining and Oil and Gas Extraction 2122 Metal ore mining 212220 Gold and silver ore mining			Org ID: Submit Date: Last Modified: Contact ID: Cont Type: Contact Title: Cont First Name: Cont Last Name: Contact Position: Contact Fax: Contact Ph.: Cont Area Code: Contact Tel.: Contact Ext.: Cont Fax Area Cde: Contact Fax: Contact Email: Latitude: Longitude: UTM Zone: UTM Northing: UTM Easting: Waste Streams: No Streams: Waste Off Sites: No Off Sites: Shutdown: No of Shutdown:	58081 5/30/2004 5/29/2015 3:28:24 PM 161045 MED JAMES MCKAY ENVIRONMENTAL COORDINATOR 8679204238 8677665300 867 77665300 5605 867 79204238 JMCKAY@MIRAMARYK.COM 62.4335 -114.3946 True 2 False True

Substance Release Report

Category Type ID: 13

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
Category Type Desc:		All Media			
Category Type Desc (fr):		Rejets à tous les médias			
Grouping:		Total All Media<1t			
Trans Code:					
Chem:		Nickel (and its compounds)			
Chem (fr):		Nickel (et ses composés)			
Quantity:		.272			
Unit:		tonnes			
Basis of Estimate Cd:					
Basis of Estimate Desc:					
Category Type ID:		13			
Category Type Desc:		All Media			
Category Type Desc (fr):		Rejets à tous les médias			
Grouping:		Total All Media<1t			
Trans Code:					
Chem:		Copper (and its compounds)			
Chem (fr):		Cuivre (et ses composés)			
Quantity:		.27			
Unit:		tonnes			
Basis of Estimate Cd:					
Basis of Estimate Desc:					
Category Type ID:		3			
Category Type Desc:		Fugitive			
Category Type Desc (fr):		Émissions fugitives			
Grouping:		Total Air			
Trans Code:		VOCs			
Chem:		Hydrogen cyanide			
Chem (fr):		Cyanure d'hydrogène			
Quantity:		2.54			
Unit:		tonnes			
Basis of Estimate Cd:		M1			
Basis of Estimate Desc:		M1- Continuous Emission Monitoring - In use from 2003 and onward			
Category Type ID:		13			
Category Type Desc:		All Media			
Category Type Desc (fr):		Rejets à tous les médias			
Grouping:		Total All Media<1t			
Trans Code:					
Chem:		Cyanides (ionic)			
Chem (fr):		Cyanures (ioniques)			
Quantity:		.431			
Unit:		tonnes			
Basis of Estimate Cd:					
Basis of Estimate Desc:					
Category Type ID:		13			
Category Type Desc:		All Media			
Category Type Desc (fr):		Rejets à tous les médias			
Grouping:		Total All Media<1t			
Trans Code:					
Chem:		Zinc (and its compounds)			
Chem (fr):		Zinc (et ses composés)			
Quantity:		.139			
Unit:		tonnes			
Basis of Estimate Cd:					
Basis of Estimate Desc:					
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Ammonia (total)			
Chem (fr):		Ammoniac (total)			

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Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
No of Stacks:				No of Shutdown:	
Canadian SIC Code (2 digit):					
Canadian SIC Code:					
SIC Code Description:					
American SIC Code:					
NAICS Code (2 digit):					
NAICS 2 Description:					
NAICS Code (4 digit):					
NAICS 4 Description:					
NAICS Code (6 digit):					
NAICS 6 Description:					
<u>Substance Release Report</u>					
Category Type ID:					
Category Type Desc:					
Category Type Desc (fr):					
Grouping:					
Trans Code:					
Chem:					
Chem (fr):					
Quantity:					
Unit:					
Basis of Estimate Cd:					
Basis of Estimate Desc:					
Category Type ID:					
Category Type Desc:					
Category Type Desc (fr):					
Grouping:					
Trans Code:					
Chem:					
Chem (fr):					
Quantity:					
Unit:					
Basis of Estimate Cd:					
Basis of Estimate Desc:					
Category Type ID:					
Category Type Desc:					
Category Type Desc (fr):					
Grouping:					
Trans Code:					
Chem:					
Chem (fr):					
Quantity:					
Unit:					
Basis of Estimate Cd:					
Basis of Estimate Desc:					
Category Type ID:					
Category Type Desc:					
Category Type Desc (fr):					
Grouping:					
Trans Code:					
Chem:					
Chem (fr):					
Quantity:					
Unit:					
Basis of Estimate Cd:					
Basis of Estimate Desc:					
Category Type ID:					
Category Type Desc:					
Category Type Desc (fr):					

<i>Map Key</i>	<i>Number of Records</i>	<i>Direction/ Distance (m)</i>	<i>Elev/Diff (m)</i>	<i>Site</i>	<i>DB</i>
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Cyanides (ionic)			
Chem (fr):		Cyanures (ioniques)			
Quantity:		.386			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			

NPRI ID:	2548	Org ID:	16213
Other ID:		Submit Date:	
No Other ID:		Last Modified:	5/29/2015 3:28:24 PM
Track ID:	7078	Contact ID:	
Report ID:		Cont Type:	
Report Type:	NPRI	Contact Title:	
Rpt Type ID:	1	Cont First Name:	
Report Year:	1994	Cont Last Name:	
Not-Current Rpt?:	No	Contact Position:	
Yr of Last Filed Rpt:	2003	Contact Fax:	
Fac ID:	43417	Contact Ph.:	
Fac Name:	NOT AVAILABLE	Cont Area Code:	
Fac Address1:	75 CON ROAD	Contact Tel.:	
Fac Address2:	P.O. BOX 2000	Contact Ext.:	
Fac Postal Zip:	X1A 2M1	Cont Fax Area Cde:	
Facility Lat:	62.4335	Contact Fax:	
Facility Long:	-114.3946	Contact Email:	
DLS (Last Filed Rpt):		Latitude:	62.4335
Facility DLS:		Longitude:	-114.3946
Datum:	1983	UTM Zone:	
Facility Cmnts:		UTM Northing:	
URL:		UTM Easting:	
No of Empl.:	349	Waste Streams:	
Parent Co.:		No Streams:	
No Parent Co.:		Waste Off Sites:	
Pollut Prev Cmnts:		No Off Sites:	
Stacks:		Shutdown:	
No of Stacks:		No of Shutdown:	
Canadian SIC Code (2 digit):			
Canadian SIC Code:			
SIC Code Description:			
American SIC Code:			
NAICS Code (2 digit):	21		
NAICS 2 Description:	Mining and Oil and Gas Extraction		
NAICS Code (4 digit):	2122		
NAICS 4 Description:	Metal ore mining		
NAICS Code (6 digit):	212220		
NAICS 6 Description:	Gold and silver ore mining		

Substance Release Report

Category Type ID:	13
Category Type Desc:	All Media
Category Type Desc (fr):	Rejets à tous les médias
Grouping:	Total All Media<1t
Trans Code:	
Chem:	Zinc (fume or dust)
Chem (fr):	Zinc (fumée ou poussière)
Quantity:	0
Unit:	tonnes
Basis of Estimate Cd:	M

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Copper (and its compounds)			
Chem (fr):		Cuivre (et ses composés)			
Quantity:		.262			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
Category Type ID:		7			
Category Type Desc:		Direct Discharges			
Category Type Desc (fr):		Évacuation directes			
Grouping:		Total Water			
Trans Code:		WatD			
Chem:		Cyanides (ionic)			
Chem (fr):		Cyanures (ioniques)			
Quantity:		.263			
Unit:		tonnes			
Basis of Estimate Cd:		M			
Basis of Estimate Desc:		M- Monitoring or Direct Measurement - In use from 1994 to 2002			
21	1 of 1	NW/391.4	188.9 / -2.12	4701 - 52 Avenue Yellowknife NT	CFST
Tank System ID:		52801		Commencement Dt:	
EC No:		00037943		Application Date:	
File No:				Confirmation Date:	
Status:				Expiry Date:	
NTS:				Disposition Type:	
Tank System Prov E:		Northwest Territories		Land Description:	
Tank System Prov F:		Territoires du Nord-Ouest		Fuel Registration:	
Tank System PO Box:				No of Tanks:	
Tank System Postal:		X1A 2N8		Location:	
Removed Date:				Latitude:	
Withdrawn Date:				Longitude:	
Temp Withdrawn Dt:					
Land Owner E:		Federal entity under Financial Administration Act			
Land Owner F:		Entité fédérale sous la loi sur la gestion des finances publiques			
Tank Information					
Tank ID:		87571		TankType of Pump E:	
Other Tank Content:				No oil-water separator	
Installation Dt:		1999		TankType of Pump F:	
Withdrawn Tank Dt:				Aucun Séparateur huile-eau	
Removed Tank Dt:				Piping Type E:	
Tank Capacity:		2500		Aboveground	
Tank Type E:		Aboveground		Piping Type F:	
Tank Type F:		Hors sol		Hors sol	
Internal No:					
Tank Description:		Westeel R2500 Recycoil Tank (2,500 L waste oil storage tank)			
Tank Standard No E:		ULC-S652			
Tank Standard No F:		ULC-S652			
Tank Standard No Other:					
Tank Content E:		Used oil			
Tank Content F:		Huile usée			
Tank Cnstrctin Material E:		Steel			
Tank Cnstrctin Material F:		Acier			
Tank Cnstrctin Material Othr:					

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
Piping Diameter Unit:		inch			
Piping Diameter:		1			
Spill Containment E:		Spill box at fill point (aboveground tank)			
Spill Containment F:		Boîte de confinement de déversement au site de remplissage (réservoir hors sol)			
Spill Containment Other:					
Product Transfer Area:		Spill Box			
<u>Tank Systems</u>					
Component E:		Double Walled			
Component F:		Double paroi			
Other:					
<u>Tank Overfill Protection</u>					
Component E:		Overfill alarm and overfill automatic shutoff			
Component F:		Alarme anti-débordement et dispositif d'arrêt automatique anti-débordement			
Other:					
<u>Tank Leak Detection</u>					
Component E:		Visual inspection			
Component F:		Inspection visuelle			
Other:					
<u>Tank Corrosion Protection</u>					
Component E:		Painted			
Component F:		Peinturé			
Other:					
<u>Sump Leak Detection</u>					
Component E:		No sump for storage tank system			
Component F:		Aucun puisard pour le système de stockage			
Other:					
<u>Piping Secondary Containment</u>					
Component E:		Unknown			
Component F:		Inconnu			
Other:					
<u>Piping Leak Detection</u>					
Component E:		Visual inspection			
Component F:		Inspection visuelle			
Other:					
<u>Piping Corrosion Protection</u>					
Component E:		Unknown			
Component F:		Inconnue			
Other:					
<u>Piping Construction Material</u>					
Component E:		Black Iron			

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
Component F:		Fer noir			
Other:					
<u>Tank Systems</u>					
Creation Date:	10/27/2015			Operator Phone:	19(1)
Creation By:	Craig Wessner			Operator Phone Ext:	
Modified Date:	10/2/2019			System Record City:	
Modified By:	Craig Wessner			Sys Record Prov E:	
Owner Contact:	Marissa Martin			Sys Record Prov F:	
Owner Email:	Marissa_Martin@gov.nt.ca			Sys Record PO Box:	
Owner Phone:	8677679350			Sys Record Postal:	
Owner Phone Ext:	71125			Sys Record Same As:	TRUE
Is Perm Withdrawal:	FALSE			Tank Use E:	Waste Oil Storage
Operator Email:	19(1)			Tank Use F:	Stockage huile usée
Operator Contact:	19(1)				
Group Name:	Government of the NWT - Infrastructure				
Master Group Name:	Government of the NWT - Infrastructure				
Internal No:	(YK1)				
System Description:	Yellowknife - École Sir John Franklin High School - Waste Oil Tank				
Sys Record Address:					
Tank Use:					
Tank Manufacturer:	Westeel				
Year of Manufacturer:	35796				
Cert Sys Installer:					
Cert Sys Remover:					
Emergency Plan Same As:	TRUE				
<u>Months</u>					
Service Months E:	February				
Service Months F:	Février				
<u>Months</u>					
Service Months E:	March				
Service Months F:	Mars				
<u>Months</u>					
Service Months E:	April				
Service Months F:	Avril				
<u>Months</u>					
Service Months E:	May				
Service Months F:	Mai				
<u>Months</u>					
Service Months E:	September				
Service Months F:	Septembre				
<u>Months</u>					
Service Months E:	December				
Service Months F:	Décembre				
<u>Months</u>					

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
<hr/>					
Service Months E:		June			
Service Months F:		Juin			
<u>Months</u>					
Service Months E:		August			
Service Months F:		Août			
<u>Months</u>					
Service Months E:		January			
Service Months F:		Janvier			
<u>Months</u>					
Service Months E:		July			
Service Months F:		Juillet			
<u>Months</u>					
Service Months E:		October			
Service Months F:		Octobre			
<u>Months</u>					
Service Months E:		November			
Service Months F:		Novembre			
<hr/>					
22	1 of 1	WNW/403.6	186.2 / -4.80	5216 53 Avenue Yellowknife NT	SPL
Spill No:	spill-2012144			Land Sea Indicator:	Land
Spill Date:				Potential Spill:	No
Spill Quantity:	0.00			Received Method:	
Measurement:	Litres			Involved Parties Type:	Private Individuals
Spill Cause:	Tank Leak			Spill Region:	North Slave
Spill Source:	Storage tank < 4000 Litre				
Product Spilled:	Petroleum - fuel oil (jet A, diesel, turbo A, heat)				
Product Spilled Description:	Heating Fuel P-50				
Area of Contamination:					
Spill Location Descriptio:	5216 53 Avenue				
Known Hazards:					
Occurrence Date/Time:					
Reporting Date and Time:	Tuesday, April 24, 2012 - 18:00				
Support Info Un No:					
Supp Info Describe Any Assi:					
Support Info Water Use Permit:					
Supp Info Land Use Permit N:					
Support Info Factors Affecting:					
Support Info Additional Inform:					
Supporting Agencies:					
Lead Agency:	GNWT - Department of Environment and Natural Resources				
URL:	https://www.enr.gov.nt.ca/en/spill/spill-2012144				
<hr/>					
23	1 of 1	W/403.7	189.2 / -1.81	42 Con Road Ptarmigan Apts. Parking Stall Yellowknife NT	SPL
Spill No:	spill-2009169			Land Sea Indicator:	Land

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
Spill Date: Spill Quantity: 0.00 Measurement: Litres Spill Cause: Other Spill Source: Truck Product Spilled: Petroleum - lubricating oil (lube, hydraulic) Product Spilled Description: Oil Area of Contamination: Spill Location Descriptio: 42 Con Road Ptarmigan Apts. Parking Stall Known Hazards: Occurrence Date/Time: April 28, 2009 Reporting Date and Time: Monday, April 27, 2009 - 18:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: GNWT - Department of Environment and Natural Resources URL: https://www.enr.gov.nt.ca/en/spill/spill-2009169					
				Potential Spill: No Received Method: Involved Parties Type: Private Individuals Spill Region: North Slave	

24	1 of 1	W/406.8	184.0 / -7.00	5135 Forest Drive Yellowknife NT	SPL
Spill No: spill-2013312 Spill Date: Spill Quantity: 0.00 Measurement: Litres Spill Cause: Unkown Cause Spill Source: Truck Product Spilled: Petroleum - fuel oil (jet A, diesel, turbo A, heat) Product Spilled Description: Heating Fuel P-50 Area of Contamination: Spill Location Descriptio: 5135 Forest Drive Known Hazards: Occurrence Date/Time: September 13, 2013 Reporting Date and Time: Thursday, September 12, 2013 - 18:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: GNWT - Department of Environment and Natural Resources URL: https://www.enr.gov.nt.ca/en/spill/spill-2013312					
				Land Sea Indicator: Land Potential Spill: No Received Method: Involved Parties Type: Unknown Spill Region: North Slave	

25	1 of 1	W/418.7	184.6 / -6.40	5133 Forrest Drive Area Yellowknife NT	SPL
Spill No: spill-1992145 Spill Date: Spill Quantity: 4000.00 Measurement: Litres Spill Cause: Pipe Leaks Spill Source: Pipe or Line Product Spilled: Wastewater (sewage, mine tailings) Product Spilled Description: Sewage Area of Contamination: Spill Location Descriptio: 5133 Forrest Drive Area Known Hazards:					
				Land Sea Indicator: Potential Spill: No Received Method: Involved Parties Type: Municipal Government Spill Region: North Slave	

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
Occurrence Date/Time: June 30, 1992 Reporting Date and Time: Monday, June 29, 1992 - 18:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: CIRNAC - Crown-Indigenous Relations and Northern Affairs Canada URL: https://www.enr.gov.nt.ca/en/spill/spill-1992145					
26	1 of 1	WNW/419.4	184.0 / -7.00	5211-52nd St. Yellowknife NT	SPL
Spill No: spill-1999148 Spill Date: Spill Quantity: 69.00 Measurement: Litres Spill Cause: Fitting Leak Spill Source: Storage tank < 4000 Litre Product Spilled: Petroleum - fuel oil (jet A, diesel, turbo A, heat) Product Spilled Description: Fuel Oil P-50 Area of Contamination: Spill Location Descriptio: 5211-52nd St. Known Hazards: Occurrence Date/Time: October 27, 1999 Reporting Date and Time: Tuesday, October 26, 1999 - 18:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: GNWT - Department of Environment and Natural Resources URL: https://www.enr.gov.nt.ca/en/spill/spill-1999148					
Land Sea Indicator: Land Potential Spill: No Received Method: Involved Parties Type: Construction Companies Spill Region: North Slave					
27	1 of 1	W/421.0	183.9 / -7.08	Road in front of 5140 Forrest Dr. on pavements Yellowknife NT	SPL
Spill No: spill-2014242 Spill Date: Spill Quantity: 6.00 Measurement: Litres Spill Cause: Other Spill Source: Instrument Product Spilled: Petroleum - fuel oil (jet A, diesel, turbo A, heat) Product Spilled Description: Engine Oil Area of Contamination: Spill Location Descriptio: Road in front of 5140 Forrest Dr. on pavements Known Hazards: Occurrence Date/Time: June 28, 2014 Reporting Date and Time: Saturday, June 28, 2014 - 18:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: GNWT - Department of Environment and Natural Resources					
Land Sea Indicator: Land Potential Spill: No Received Method: Involved Parties Type: Unknown Spill Region: North Slave					

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
URL:		https://www.enr.gov.nt.ca/en/spill/spill-2014242			
28	1 of 1	WNW/423.0	184.9 / -6.10	5201 - 51st Street Simpson House Apartments Yellowknife NT	SPL
Spill No: spill-2001009		Land Sea Indicator: Land			
Spill Date:		Potential Spill: No			
Spill Quantity: 0.00		Received Method:			
Measurement: Litres		Involved Parties Type: Other			
Spill Cause: Tank Leak		Spill Region: North Slave			
Spill Source: Storage Tank > 4000 Litre					
Product Spilled: Petroleum - fuel oil (jet A, diesel, turbo A, heat)					
Product Spilled Description: Fuel Oil					
Area of Contamination:					
Spill Location Descriptio: 5201 - 51st Street Simpson House Apartments					
Known Hazards:					
Occurrence Date/Time:					
Reporting Date and Time: Friday, January 12, 2001 - 17:00					
Support Info Un No:					
Supp Info Describe Any Assi:					
Support Info Water Use Permit:					
Supp Info Land Use Permit N:					
Support Info Factors Affecting:					
Support Info Additional Inform:					
Supporting Agencies:					
Lead Agency: GNWT - Department of Environment and Natural Resources					
URL: https://www.enr.gov.nt.ca/en/spill/spill-2001009					
29	1 of 1	W/431.4	188.9 / -2.06	Intersection of Con Road & Rycon Drive Yellowknife NT	SPL
Spill No: spill-1994162		Land Sea Indicator: Land			
Spill Date:		Potential Spill: No			
Spill Quantity: 0.00		Received Method:			
Measurement:		Involved Parties Type: Unknown			
Spill Cause: Unkown Cause		Spill Region: North Slave			
Spill Source: Truck					
Product Spilled: Petroleum - fuel oil (jet A, diesel, turbo A, heat)					
Product Spilled Description: Heating Fuel P-50					
Area of Contamination:					
Spill Location Descriptio: Intersection of Con Road & Rycon Drive					
Known Hazards:					
Occurrence Date/Time: August 30, 1994					
Reporting Date and Time: Monday, August 29, 1994 - 18:00					
Support Info Un No:					
Supp Info Describe Any Assi:					
Support Info Water Use Permit:					
Supp Info Land Use Permit N:					
Support Info Factors Affecting:					
Support Info Additional Inform:					
Supporting Agencies:					
Lead Agency: GNWT - Department of Environment and Natural Resources					
URL: https://www.enr.gov.nt.ca/en/spill/spill-1994162					
30	1 of 1	N/433.8	165.7 / -25.34	Intersection of 44th Street and School Draw Avenue, Yellowknife NT Yellowknife NT	SPL
Spill No: spill-2011380		Land Sea Indicator: Land			
Spill Date:		Potential Spill: No			

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
Spill Quantity: 12.00 Measurement: Litres Spill Cause: Deliberate Discharge Spill Source: Drum or Barrel Product Spilled: Petroleum - lubricating oil (lube, hydraulic) Product Spilled Description: Oil Area of Contamination: Spill Location Descriptio: Intersection of 44th Street and School Draw Avenue, Yellowknife NT Known Hazards: Occurrence Date/Time: September 26, 2011 Reporting Date and Time: Sunday, September 25, 2011 - 18:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: GNWT - Department of Environment and Natural Resources URL: https://www.enr.gov.nt.ca/en/spill/spill-2011380					
				Received Method: Involved Parties Type: Unknown Spill Region: North Slave	

31	1 of 1	WNW/439.0	184.0 / -7.00	5209 - 52 St. Yellowknife NT	SPL
Spill No: spill-2002291 Spill Date: Spill Quantity: 0.00 Measurement: Litres Spill Cause: Unkown Cause Spill Source: Truck Product Spilled: Petroleum - fuel oil (jet A, diesel, turbo A, heat) Product Spilled Description: Fuel Oil Area of Contamination: Spill Location Descriptio: 5209 - 52 St. Known Hazards: Occurrence Date/Time: Reporting Date and Time: Monday, April 22, 2002 - 18:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: GNWT - Department of Environment and Natural Resources URL: https://www.enr.gov.nt.ca/en/spill/spill-2002291					
				Land Sea Indicator: Land Potential Spill: No Received Method: Involved Parties Type: Unknown Spill Region: North Slave	

32	1 of 1	WNW/456.3	187.0 / -3.97	Polar Bowl Parking Lot 52nd Ave. & 50th Street Yellowknife NT	SPL
Spill No: spill-2003502 Spill Date: Spill Quantity: 0.00 Measurement: Litres Spill Cause: Unkown Cause Spill Source: Truck Product Spilled: Petroleum - gasoline (aviation, turbo B, jet B) Product Spilled Description: Gasoline Area of Contamination: Spill Location Descriptio: Polar Bowl Parking Lot 52nd Ave. & 50th Street Known Hazards: Occurrence Date/Time:					
				Land Sea Indicator: Land Potential Spill: No Received Method: Involved Parties Type: Other Spill Region: North Slave	

Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB
Reporting Date and Time: Sunday, July 20, 2003 - 18:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: GNWT - Department of Environment and Natural Resources URL: https://www.enr.gov.nt.ca/en/spill/spill-2003502					
33	1 of 1	W/497.7	186.0 / -5.00	Corner of Forrest Drive and Forrest Drive North Yellowknife NT	SPL
Spill No: spill-2011343 Spill Date: Spill Quantity: 100.00 Measurement: Litres Spill Cause: Fitting Leak Spill Source: Truck Product Spilled: Wastewater (sewage, mine tailings) Product Spilled Description: Sewage Area of Contamination: Spill Location Descriptio: Corner of Forrest Drive and Forrest Drive North Known Hazards: Occurrence Date/Time: August 23, 2011 Reporting Date and Time: Monday, August 22, 2011 - 18:00 Support Info Un No: Supp Info Describe Any Assi: Support Info Water Use Permit: Supp Info Land Use Permit N: Support Info Factors Affecting: Support Info Additional Inform: Supporting Agencies: Lead Agency: GNWT - Department of Environment and Natural Resources URL: https://www.enr.gov.nt.ca/en/spill/spill-2011343					
Land Sea Indicator: Land Potential Spill: No Received Method: Involved Parties Type: Municipal Government Spill Region: North Slave					

Unplottable Summary

Total: 25 Unplottable sites

DB	Company Name/Site Name	Address	City	Postal
PCFT	Wood Buffalo National Park, PWGSC		NT	
PCFT	Wood Buffalo National Park, PWGSC		NT	
PCFT	Wood Buffalo National Park, PWGSC		NT	
SPL		48th Street by the Mailbox	Yellowknife NT	
SPL		50th St Alley behind Key West Travel	Yellowknife NT	
SPL		48th Street Main Entrance Panda II	Yellowknife NT	
SPL		Tin Can Hill	Yellowknife NT	
SPL		52nd Street Behind Northwest Tower in Parking Lot	Yellowknife NT	
SPL		Yellowknife Inn parking lot along 50th Street	Yellowknife NT	
SPL		Quality Furniture on 50th Street	Yellowknife NT	
SPL		48th Street Mackenzie House	Yellowknife NT	
SPL		Forrest Drive	Yellowknife NT	
SPL		Polaris Apartments, 49th Street	Yellowknife NT	
SPL		On 44th Street Between School Draw & 52nd Ave	Yellowknife NT	
SPL		Sewage Dump Station School Draw Ave	Yellowknife NT	
SPL		Negus Point	Yellowknife NT	
SPL		Empty Lot next to Roy's on 50th Street	Yellowknife NT	

SPL	City of Yellowknife, Liftstation # 1, School Draw	Yellowknife NT
SPL	Corner of Forrest Drive and 51 St	Yellowknife NT
SPL	Lift Station #1 School Draw Avenue	Yellowknife NT
SPL	45th Street	Yellowknife NT
SPL	Back Alley of Fuego's Restaurant on 50th Street	Yellowknife NT
SPL	Rycon Street Area (#38)	Yellowknife NT
SPL	48th Street	Yellowknife NT
SPL	SMH Building, 49th Street	Yellowknife NT

Unplottable Report

Site: Wood Buffalo National Park, PWGSC
NT

Database:
PCFT

Tank Id: AST WOOD0019
Tank Type: Aboveground Tank
Park/Site Name: Wood Buffalo National Park
Date Installed: 8/1/1998
Tank System Location: GARDEN RIVER
Indoor/Outdoor: Outdoor
Contents: Middle Distillate - Furnace/Heating Oil, Diesel
Date Removed:
Product Stored: Petroleum Product
Status: In service
Volume: 15000 Litres
Status As Of: Jan 2005
Tank Material: Steel
Internal Lining: No
Piping Material: Steel
Tank Manuf.: DUREX STEEL AND ALLOT INDUSTRIES LTD.
Tank Orientation: Horizontal
Tank Corrosive Prot: Coated
Pipe Corrosive Prot: Coated
Pump Type: Suction
VOC-Emission Contr: No
Double Walled Tank: Yes
Dike Material: No Dike
Leak Detect.Device: No
Monitoring Wells: No
Location of M. Wells:
No. of M. Wells:
Overfill Protect.Device: Fill pipe shut-off device
Facility Type: Public Works Yard
Parks Owned: No
Tank Owner: PWGSC
Owner Address: BAG 7000 HIGH LEVEL,AB
Operator: PWGSC
Landowner: Parks Canada

Site: Wood Buffalo National Park, PWGSC
NT

Database:
PCFT

Tank Id: AST WOOD0009
Tank Type: Aboveground Tank
Park/Site Name: Wood Buffalo National Park
Date Installed: 1/1/1968
Tank System Location: GARDEN RIVER
Indoor/Outdoor: Outdoor
Contents: Middle Distillate - Furnace/Heating Oil, Diesel
Date Removed: 1/7/1998
Product Stored: Motive Fuel
Status: Withdrawn from Service
Volume: 18000 Litres
Status As Of: Jan 2005
Tank Material: Steel
Internal Lining: No
Piping Material: Steel
Tank Manuf.: UNKNOWN
Tank Orientation: Horizontal

Tank Corrosive Prot:	Coated
Pipe Corrosive Prot:	Coated
Pump Type:	Suction
VOC-Emission Contr:	No
Double Walled Tank:	No
Dike Material:	No Dike
Leak Detect.Device:	No
Monitoring Wells:	No
Location of M. Wells:	
No. of M. Wells:	
Overfill Protect.Device:	None
Facility Type:	Public Works Yard
Parks Owned:	No
Tank Owner:	PWGSC
Owner Address:	BAG 7000 HIGH LEVEL, AB
Operator:	Little Red River Cree Nation
Landowner:	Parks Canada

Site: Wood Buffalo National Park, PWGSC
NT

Database:
PCFT

Tank Id:	AST WOOD0008
Tank Type:	Aboveground Tank
Park/Site Name:	Wood Buffalo National Park
Date Installed:	1/1/1968
Tank System Location:	GARDEN RIVER
Indoor/Outdoor:	Outdoor
Contents:	Middle Distillate - Furnace/Heating Oil, Diesel
Date Removed:	7/1/1998
Product Stored:	Motive Fuel
Status:	Withdrawn from Service
Volume:	22500 Litres
Status As Of:	Jan 2005
Tank Material:	Steel
Internal Lining:	No
Piping Material:	Steel
Tank Manuf.:	UNKNOWN
Tank Orientation:	Horizontal
Tank Corrosive Prot:	Coated
Pipe Corrosive Prot:	Coated
Pump Type:	Suction
VOC-Emission Contr:	No
Double Walled Tank:	No
Dike Material:	No Dike
Leak Detect.Device:	No
Monitoring Wells:	No
Location of M. Wells:	
No. of M. Wells:	
Overfill Protect.Device:	None
Facility Type:	Public Works Yard
Parks Owned:	No
Tank Owner:	PWGSC
Owner Address:	BAG 7000 HIGH LEVEL, AB
Operator:	PWGSC
Landowner:	Parks Canada

Site: 48th Street by the Mailbox Yellowknife NT

Database:
SPL

Spill No:	spill-2006147	Land Sea Indicator:	Land
Spill Date:		Potential Spill:	No
Spill Quantity:	0.00	Received Method:	
Measurement:	Litres	Involved Parties Type:	Unknown
Spill Cause:	Unkown Cause	Spill Region:	North Slave
Spill Source:	Truck		
Product Spilled:	Petroleum - fuel oil (jet A, diesel, turbo A, heat)		

Product Spilled Description: Diesel Fuel
Area of Contamination:
Spill Location Descriptio: 48th Street by the Mailbox
Known Hazards:
Occurrence Date/Time: March 31, 2006
Reporting Date and Time: Tuesday, April 11, 2006 - 18:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Supp Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency: GNWT - Department of Environment and Natural Resources
URL: <https://www.enr.gov.nt.ca/en/spill/spill-2006147>

Site: 50th St Alley behind Key West Travel Yellowknife NT **Database:** [SPL](#)

Spill No: spill-2004409 **Land Sea Indicator:** Land
Spill Date: **Potential Spill:** No
Spill Quantity: 20.00 **Received Method:**
Measurement: Litres **Involved Parties Type:** Municipal Government
Spill Cause: Pipe Leaks **Spill Region:** North Slave
Spill Source: Truck
Product Spilled: Chemicals (including transformer oils)
Product Spilled Description: Antifreeze
Area of Contamination:
Spill Location Descriptio: 50th St Alley behind Key West Travel
Known Hazards:
Occurrence Date/Time: June 22, 2004
Reporting Date and Time: Monday, June 21, 2004 - 18:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Supp Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency: GNWT - Department of Environment and Natural Resources
URL: <https://www.enr.gov.nt.ca/en/spill/spill-2004409>

Site: 48th Street Main Entrance Panda II Yellowknife NT **Database:** [SPL](#)

Spill No: spill-2008382 **Land Sea Indicator:** Land
Spill Date: **Potential Spill:** No
Spill Quantity: 3.00 **Received Method:**
Measurement: Litres **Involved Parties Type:** Private Individuals
Spill Cause: Overflow Event **Spill Region:** North Slave
Spill Source: Truck
Product Spilled: Petroleum - gasoline (aviation, turbo B, jet B)
Product Spilled Description: Gasoline
Area of Contamination:
Spill Location Descriptio: 48th Street Main Entrance Panda II
Known Hazards:
Occurrence Date/Time: August 7, 2008
Reporting Date and Time: Wednesday, August 6, 2008 - 18:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Supp Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency: GNWT - Department of Environment and Natural Resources

Site:**Tin Can Hill Yellowknife NT****Database:****SPL**

Spill No:	spill-2011179	Land Sea Indicator:	
Spill Date:		Potential Spill:	No
Spill Quantity:	0.00	Received Method:	
Measurement:	Litres	Involved Parties Type:	Unknown
Spill Cause:	Unkown Cause	Spill Region:	North Slave
Spill Source:	Drum or Barrel		
Product Spilled:	Petroleum - unknown		
Product Spilled Description:	Gas or Diesel		
Area of Contamination:			
Spill Location Descriptio:	Tin Can Hill		
Known Hazards:			
Occurrence Date/Time:			
Reporting Date and Time:	Monday, May 23, 2011 - 18:00		
Support Info Un No:			
Supp Info Describe Any Assi:			
Support Info Water Use Permit:			
Supp Info Land Use Permit N:			
Support Info Factors Affecting:			
Support Info Additional Inform:			
Supporting Agencies:			
Lead Agency:	GNWT - Department of Environment and Natural Resources		
URL:	https://www.enr.gov.nt.ca/en/spill/spill-2011179		

Site:**52nd Street Behind Northwest Tower in Parking Lot Yellowknife NT****Database:****SPL**

Spill No:	spill-2000149	Land Sea Indicator:	Land
Spill Date:		Potential Spill:	No
Spill Quantity:	23.00	Received Method:	
Measurement:	Litres	Involved Parties Type:	Private Individuals
Spill Cause:	Overflow Event	Spill Region:	North Slave
Spill Source:	Truck		
Product Spilled:	Petroleum - fuel oil (jet A, diesel, turbo A, heat)		
Product Spilled Description:	Diesel Fuel		
Area of Contamination:			
Spill Location Descriptio:	52nd Street Behind Northwest Tower in Parking Lot		
Known Hazards:			
Occurrence Date/Time:	June 9, 2000		
Reporting Date and Time:	Thursday, June 8, 2000 - 18:00		
Support Info Un No:			
Supp Info Describe Any Assi:			
Support Info Water Use Permit:			
Supp Info Land Use Permit N:			
Support Info Factors Affecting:			
Support Info Additional Inform:			
Supporting Agencies:			
Lead Agency:	GNWT - Department of Environment and Natural Resources		
URL:	https://www.enr.gov.nt.ca/en/spill/spill-2000149		

Site:**Yellowknife Inn parking lot along 50th Street Yellowknife NT****Database:****SPL**

Spill No:	spill-2000105	Land Sea Indicator:	Land
Spill Date:		Potential Spill:	No
Spill Quantity:	200.00	Received Method:	
Measurement:	Litres	Involved Parties Type:	Other
Spill Cause:	Fitting Leak	Spill Region:	North Slave
Spill Source:	Storage Tank > 4000 Litre		
Product Spilled:	Petroleum - fuel oil (jet A, diesel, turbo A, heat)		

Product Spilled Description: Fuel Oil
Area of Contamination:
Spill Location Descriptio: Yellowknife Inn parking lot along 50th Street
Known Hazards:
Occurrence Date/Time: April 28, 2000
Reporting Date and Time: Thursday, April 27, 2000 - 18:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Supp Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency: GNWT - Department of Environment and Natural Resources
URL: <https://www.enr.gov.nt.ca/en/spill/spill-2000105>

Site: **Quality Furniture on 50th Street Yellowknife NT** **Database:** **SPL**

Spill No: spill-1998144 **Land Sea Indicator:** Land
Spill Date: **Potential Spill:** No
Spill Quantity: 0.00 **Received Method:**
Measurement: **Involved Parties Type:** Other
Spill Cause: Pipe Leaks **Spill Region:** North Slave
Spill Source: Storage tank < 4000 Litre
Product Spilled: Petroleum - fuel oil (jet A, diesel, turbo A, heat)
Product Spilled Description: Fuel Oil
Area of Contamination:
Spill Location Descriptio: Quality Furniture on 50th Street
Known Hazards:
Occurrence Date/Time:
Reporting Date and Time: Wednesday, December 31, 1997 - 17:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Supp Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency: GNWT - Department of Environment and Natural Resources
URL: <https://www.enr.gov.nt.ca/en/spill/spill-1998144>

Site: **48th Street Mackenzie House Yellowknife NT** **Database:** **SPL**

Spill No: spill-1994187 **Land Sea Indicator:** Land
Spill Date: **Potential Spill:** No
Spill Quantity: 9.00 **Received Method:**
Measurement: Litres **Involved Parties Type:** Construction Companies
Spill Cause: Tank Leak **Spill Region:** North Slave
Spill Source: Truck
Product Spilled: Petroleum - gasoline (aviation, turbo B, jet B)
Product Spilled Description: Gasoline
Area of Contamination:
Spill Location Descriptio: 48th Street Mackenzie House
Known Hazards:
Occurrence Date/Time: September 30, 1994
Reporting Date and Time: Thursday, September 29, 1994 - 18:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Supp Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency: GNWT - Department of Environment and Natural Resources

Site:**Forrest Drive Yellowknife NT****Database:****SPL**

Spill No:	spill-1992171	Land Sea Indicator:	Land
Spill Date:		Potential Spill:	No
Spill Quantity:	0.00	Received Method:	
Measurement:	Litres	Involved Parties Type:	Mining Company
Spill Cause:	Other	Spill Region:	North Slave
Spill Source:	Truck		
Product Spilled:	Petroleum - unknown		
Product Spilled Description:	Oil or Fuel		
Area of Contamination:			
Spill Location Descriptio:	Forrest Drive		
Known Hazards:			
Occurrence Date/Time:	July 29, 1992		
Reporting Date and Time:	Tuesday, July 28, 1992 - 18:00		
Support Info Un No:			
Supp Info Describe Any Assi:			
Support Info Water Use Permit:			
Supp Info Land Use Permit N:			
Support Info Factors Affecting:			
Support Info Additional Inform:			
Supporting Agencies:			
Lead Agency:	GNWT - Department of Environment and Natural Resources		
URL:	https://www.enr.gov.nt.ca/en/spill/spill-1992171		

Site:**Polaris Apartments, 49th Street Yellowknife NT****Database:****SPL**

Spill No:	spill-1992087	Land Sea Indicator:	Land
Spill Date:		Potential Spill:	No
Spill Quantity:	9.00	Received Method:	
Measurement:	Litres	Involved Parties Type:	Unknown
Spill Cause:	Unkown Cause	Spill Region:	North Slave
Spill Source:	Truck		
Product Spilled:	Unknown		
Product Spilled Description:	Unknown		
Area of Contamination:			
Spill Location Descriptio:	Polaris Apartments, 49th Street		
Known Hazards:			
Occurrence Date/Time:			
Reporting Date and Time:	Tuesday, May 19, 1992 - 18:00		
Support Info Un No:			
Supp Info Describe Any Assi:			
Support Info Water Use Permit:			
Supp Info Land Use Permit N:			
Support Info Factors Affecting:			
Support Info Additional Inform:			
Supporting Agencies:			
Lead Agency:	GNWT - Department of Environment and Natural Resources		
URL:	https://www.enr.gov.nt.ca/en/spill/spill-1992087		

Site:**On 44th Street Between School Draw & 52nd Ave Yellowknife NT****Database:****SPL**

Spill No:	spill-1992053	Land Sea Indicator:	
Spill Date:		Potential Spill:	No
Spill Quantity:	0.00	Received Method:	
Measurement:	Litres	Involved Parties Type:	Unknown
Spill Cause:	Unkown Cause	Spill Region:	North Slave
Spill Source:	Truck		
Product Spilled:	Petroleum - unknown		

Product Spilled Description: Oil
Area of Contamination:
Spill Location Descriptio: On 44th Street Between School Draw & 52nd Ave
Known Hazards:
Occurrence Date/Time:
Reporting Date and Time: Sunday, April 26, 1992 - 18:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Supp Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency: GNWT - Department of Environment and Natural Resources
URL: <https://www.enr.gov.nt.ca/en/spill/spill-1992053>

Site:

Sewage Dump Station School Draw Ave Yellowknife NT

Database:
SPL

Spill No: spill-1992020
Spill Date:
Spill Quantity: 22.00
Measurement: Litres
Spill Cause: Tank Leak
Spill Source: Truck
Product Spilled: Wastewater (sewage, mine tailings)
Product Spilled Description: Sewage
Area of Contamination:
Spill Location Descriptio: Sewage Dump Station School Draw Ave
Known Hazards:
Occurrence Date/Time:
Reporting Date and Time: Sunday, February 23, 1992 - 17:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Supp Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency: GNWT - Department of Environment and Natural Resources
URL: <https://www.enr.gov.nt.ca/en/spill/spill-1992020>

Land Sea Indicator: Land
Potential Spill: No
Received Method:
Involved Parties Type: Other
Spill Region: North Slave

Site:

Negus Point Yellowknife NT

Database:
SPL

Spill No: spill-1991174
Spill Date:
Spill Quantity: 681.00
Measurement: Litres
Spill Cause: Tank Leak
Spill Source: Marine Vessel
Product Spilled: Petroleum - gasoline (aviation, turbo B, jet B)
Product Spilled Description: Gasoline
Area of Contamination:
Spill Location Descriptio: Negus Point
Known Hazards:
Occurrence Date/Time: September 5, 1991
Reporting Date and Time: Wednesday, September 4, 1991 - 18:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Supp Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency:

Land Sea Indicator: Fresh Water
Potential Spill: No
Received Method:
Involved Parties Type: Private Individuals
Spill Region: North Slave

Site:**Empty Lot next to Roy's on 50th Street Yellowknife NT****Database:****SPL**

Spill No: spill-1989033
Spill Date:
Spill Quantity: 1.00
Measurement: Litres
Spill Cause: Unknown Cause
Spill Source: Other Transportation
Product Spilled: Petroleum - fuel oil (jet A, diesel, turbo A, heat)
Product Spilled Description: Fuel Oil #1
Area of Contamination:
Spill Location Descriptio: Empty Lot next to Roy's on 50th Street
Known Hazards:
Occurrence Date/Time: April 1, 1989
Reporting Date and Time: Friday, March 31, 1989 - 17:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Supp Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency: GNWT - Department of Environment and Natural Resources
URL: <https://www.enr.gov.nt.ca/en/spill/spill-1989033>

Site:**City of Yellowknife, Liftstation # 1, School Draw Yellowknife NT****Database:****SPL**

Spill No: spill-2016424
Spill Date:
Spill Quantity: 0.00
Measurement: Litres
Spill Cause: Pipe Leaks
Spill Source: Truck
Product Spilled: Wastewater (sewage, mine tailings)
Product Spilled Description: Sewage
Area of Contamination:
Spill Location Descriptio: City of Yellowknife, Liftstation # 1, School Draw
Known Hazards:
Occurrence Date/Time: December 9, 2016
Reporting Date and Time: Thursday, December 8, 2016 - 17:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Supp Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency: GNWT - Department of Environment and Natural Resources
URL: <https://www.enr.gov.nt.ca/en/spill/spill-2016424>

Site:**Corner of Forrest Drive and 51 St Yellowknife NT****Database:****SPL**

Spill No: spill-2016232
Spill Date:
Spill Quantity: 30.00
Measurement: Litres
Spill Cause: Pipe Leaks
Spill Source: Pipe or Line
Product Spilled: Petroleum - lubricating oil (lube, hydraulic)
Land Sea Indicator: Land
Potential Spill: No
Received Method:
Involved Parties Type: Construction Companies
Spill Region: North Slave

Product Spilled Description: Hydraulic Fluid
Area of Contamination:
Spill Location Descriptio: Corner of Forrest Drive and 51 St
Known Hazards:
Occurrence Date/Time: June 20, 2016
Reporting Date and Time: Sunday, June 19, 2016 - 18:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Supp Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency: GNWT - Department of Environment and Natural Resources
URL: <https://www.enr.gov.nt.ca/en/spill/spill-2016232>

Site: **Lift Station #1 School Draw Avenue Yellowknife NT** **Database:** **SPL**

Spill No: spill-2016437 **Land Sea Indicator:** Land
Spill Date: **Potential Spill:** No
Spill Quantity: 40.00 **Received Method:**
Measurement: Litres **Involved Parties Type:** Other
Spill Cause: Pipe Leaks **Spill Region:** North Slave
Spill Source: Pipe or Line
Product Spilled: Wastewater (sewage, mine tailings)
Product Spilled Description: Residential Sewage
Area of Contamination:
Spill Location Descriptio: Lift Station #1 School Draw Avenue
Known Hazards:
Occurrence Date/Time: December 27, 2016
Reporting Date and Time: Thursday, December 29, 2016 - 17:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Supp Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency: GNWT - Department of Environment and Natural Resources
URL: <https://www.enr.gov.nt.ca/en/spill/spill-2016437>

Site: **45th Street Yellowknife NT** **Database:** **SPL**

Spill No: spill-2015452 **Land Sea Indicator:**
Spill Date: **Potential Spill:** No
Spill Quantity: 0.00 **Received Method:**
Measurement: Litres **Involved Parties Type:** Unknown
Spill Cause: Unknown Cause **Spill Region:** North Slave
Spill Source: Truck
Product Spilled: Petroleum - fuel oil (jet A, diesel, turbo A, heat)
Product Spilled Description: Diesel Fuel
Area of Contamination:
Spill Location Descriptio: 45th Street
Known Hazards:
Occurrence Date/Time:
Reporting Date and Time: Wednesday, October 28, 2015 - 18:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Supp Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency: GNWT - Department of Environment and Natural Resources

Site:**Back Alley of Fuego's Restaurant on 50th Street Yellowknife NT****Database:****SPL**

Spill No: spill-2013139
Spill Date:
Spill Quantity: 19.00
Measurement: Litres
Spill Cause: Unknown Cause
Spill Source: Truck
Product Spilled: Other
Product Spilled Description: Cooking Oil
Area of Contamination:
Spill Location Descriptio: Back Alley of Fuego's Restaurant on 50th Street
Known Hazards:
Occurrence Date/Time: May 6, 2013
Reporting Date and Time: Sunday, May 5, 2013 - 18:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Support Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency: GNWT - Department of Environment and Natural Resources
URL: <https://www.enr.gov.nt.ca/en/spill/spill-2013139>

Land Sea Indicator: Land
Potential Spill: No
Received Method:
Involved Parties Type: Unknown
Spill Region: North Slave

Site:**Rycon Street Area (#38) Yellowknife NT****Database:****SPL**

Spill No: spill-2014335
Spill Date:
Spill Quantity: 0.00
Measurement: Litres
Spill Cause: Unknown Cause
Spill Source: Truck
Product Spilled: Unknown
Product Spilled Description: Unknown
Area of Contamination:
Spill Location Descriptio: Rycon Street Area (#38)
Known Hazards:
Occurrence Date/Time: September 19, 2014
Reporting Date and Time: Thursday, September 18, 2014 - 18:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Support Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency: GNWT - Department of Environment and Natural Resources
URL: <https://www.enr.gov.nt.ca/en/spill/spill-2014335>

Land Sea Indicator:
Potential Spill: No
Received Method:
Involved Parties Type: Unknown
Spill Region: North Slave

Site:**48th Street Yellowknife NT****Database:****SPL**

Spill No: spill-2011451
Spill Date:
Spill Quantity: 2500.00
Measurement: Litres
Spill Cause: Collision or Crash
Spill Source: Truck
Product Spilled: Petroleum - fuel oil (jet A, diesel, turbo A, heat)

Land Sea Indicator:
Potential Spill: No
Received Method:
Involved Parties Type: Unknown
Spill Region: North Slave

Product Spilled Description: Oil
Area of Contamination:
Spill Location Descriptio: 48th Street
Known Hazards:
Occurrence Date/Time: December 5, 2011
Reporting Date and Time: Sunday, December 4, 2011 - 17:00
Support Info Un No:
Supp Info Describe Any Assi:
Support Info Water Use Permit:
Supp Info Land Use Permit N:
Support Info Factors Affecting:
Support Info Additional Inform:
Supporting Agencies:
Lead Agency: GNWT - Department of Environment and Natural Resources
URL: <https://www.enr.gov.nt.ca/en/spill/spill-2011451>

Site:		Database:	
SMH Building, 49th Street Yellowknife NT		SPL	
Spill No:	spill-2014376	Land Sea Indicator:	Land
Spill Date:		Potential Spill:	No
Spill Quantity:	110.00	Received Method:	
Measurement:	Kilograms	Involved Parties Type:	Construction Companies
Spill Cause:	Breakage	Spill Region:	North Slave
Spill Source:	Pipe or Line		
Product Spilled:	Chemicals (including transformer oils)		
Product Spilled Description:	SUVA 407C Refrigerant		
Area of Contamination:			
Spill Location Descriptio:	SMH Building, 49th Street		
Known Hazards:			
Occurrence Date/Time:	October 15, 2014		
Reporting Date and Time:	Tuesday, October 14, 2014 - 18:00		
Support Info Un No:			
Supp Info Describe Any Assi:			
Support Info Water Use Permit:			
Supp Info Land Use Permit N:			
Support Info Factors Affecting:			
Support Info Additional Inform:			
Supporting Agencies:			
Lead Agency:	GNWT - Department of Environment and Natural Resources		
URL:	https://www.enr.gov.nt.ca/en/spill/spill-2014376		

Appendix: Database Descriptions

*Environmental Risk Information Services (ERIS) can search the following databases. The extent of historical information varies with each database and current information is determined by what is publicly available to ERIS at the time of update. **Note:** Databases denoted with " * " indicates that the database will no longer be updated. See the individual database description for more information.*

Automobile Wrecking & Supplies:

Private

[AUWR](#)

This database provides an inventory of known locations that are involved in the scrap metal, automobile wrecking/recycling, and automobile parts & supplies industry. Information is provided on the company name, location and business type.

Government Publication Date: 1999-May 31, 2022

Dry Cleaning Facilities:

Federal

[CDRY](#)

List of dry cleaning facilities made available by Environment and Climate Change Canada. Environment and Climate Change Canada's Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations (SOR/2003-79) are intended to reduce releases of tetrachloroethylene to the environment from dry cleaning facilities.

Government Publication Date: Jan 2004-Dec 2020

Crown Land Fuel Storage Tanks:

Territorial

[CFST](#)

The Department of Indian and Northern Affairs Canada mandates that all fuel storage tanks on Crown Land be recorded, when an individual applies for a land use permit or surface lease. Please note that there are numerous records in the database where the "Commencement Date" is previous to 1997. However, since INAC only began registering tank locations in 1997, any tanks installed previous to that may or may not be in the database, due to lack of regulations. Note the following descriptions: Commencement Date is the original file date, Fuel Application Date is the date an application was submitted for a tank, and the Fuel Confirmation Date is the date the department accepted the application and confirmed the information submitted.

Government Publication Date: Oct 1997-Apr 2022

Chemical Register:

Private

[CHM](#)

This database includes a listing of locations of facilities within the Province or Territory that either manufacture and/or distributes chemicals.

Government Publication Date: 1999-May 31, 2022

Compressed Natural Gas Stations:

Private

[CNG](#)

Canada has a network of public access compressed natural gas (CNG) refuelling stations. These stations dispense natural gas in compressed form at 3,000 pounds per square inch (psi), the pressure which is allowed within the current Canadian codes and standards. The majority of natural gas refuelling is located at existing retail gasoline that have a separate refuelling island for natural gas. This list of stations is made available by the Canadian Natural Gas Vehicle Alliance.

Government Publication Date: Dec 2012 -Apr 2022

ERIS Historical Searches:

Private

[EHS](#)

ERIS has compiled a database of all environmental risk reports completed since March 1999. Available fields for this database include: site location, date of report, type of report, and search radius. As per all other databases, the ERIS database can be referenced on both the map and "Statistical Profile" page.

Government Publication Date: 1999-Jul 31, 2022

Environmental Issues Inventory System:

Federal

[EIIS](#)

The Environmental Issues Inventory System was developed through the implementation of the Environmental Issues and Remediation Plan. This plan was established to determine the location and severity of contaminated sites on inhabited First Nation reserves, and where necessary, to remediate those that posed a risk to health and safety; and to prevent future environmental problems. The EIIS provides information on the reserve under investigation, inventory number, name of site, environmental issue, site action (Remediation, Site Assessment), and date investigation completed.

Government Publication Date: 1992-2001*

Federal Convictions:

Federal

[FCON](#)

Environment Canada maintains a database referred to as the "Environmental Registry" that details prosecutions under the Canadian Environmental Protection Act (CEPA) and the Fisheries Act (FA). Information is provided on the company name, location, charge date, offence and penalty.

Government Publication Date: 1988-Jun 2007*

Contaminated Sites on Federal Land:

Federal

FCS

The Federal Contaminated Sites Inventory includes information on known federal contaminated sites under the custodianship of departments, agencies and consolidated Crown corporations as well as those that are being or have been investigated to determine whether they have contamination arising from past use that could pose a risk to human health or the environment. The inventory also includes non-federal contaminated sites for which the Government of Canada has accepted some or all financial responsibility. It does not include sites where contamination has been caused by, and which are under the control of, enterprise Crown corporations, private individuals, firms or other levels of government. Includes fire training sites and sites at which Per- and Polyfluoroalkyl Substances (PFAS) are a concern.

Government Publication Date: Jun 2000-Jun 2022

Federal Identification Registry for Storage Tank Systems (FIRSTS):

Federal

FRST

A list of federally regulated Storage tanks from the Federal Identification Registry for Storage Tank Systems (FIRSTS). FIRSTS is Environment and Climate Change Canada's database of storage tank systems subject to the Storage Tank for Petroleum Products and Allied Petroleum Products Regulations. The main objective of the Regulations is to prevent soil and groundwater contamination from storage tank systems located on federal and aboriginal lands. Storage tank systems that do not have a valid identification number displayed in a readily visible location on or near the storage tank system may be refused product delivery.

Government Publication Date: May 31, 2018

Greenhouse Gas Emissions from Large Facilities:

Federal

GHG

List of greenhouse gas emissions from large facilities made available by Environment Canada. Greenhouse gas emissions in kilotonnes of carbon dioxide equivalents (kt CO₂ eq).

Government Publication Date: 2013-Dec 2019

Indian & Northern Affairs Fuel Tanks:

Federal

IAFT

The Department of Indian & Northern Affairs Canada (INAC) maintains an inventory of aboveground & underground fuel storage tanks located on both federal and crown land. Our inventory provides information on the reserve name, location, facility type, site/facility name, tank type, material & ID number, tank contents & capacity, and date of tank installation.

Government Publication Date: 1950-Aug 2003*

Canadian Mine Locations:

Private

MINE

This information is collected from the Canadian & American Mines Handbook. The Mines database is a national database that provides over 290 listings on mines (listed as public companies) dealing primarily with precious metals and hard rocks. Listed are mines that are currently in operation, closed, suspended, or are still being developed (advanced projects). Their locations are provided as geographic coordinates (x, y and/or longitude, latitude). As of 2002, data pertaining to Canadian smelters and refineries has been appended to this database.

Government Publication Date: 1998-2009*

Mineral Occurrences:

Territorial

MNR

The C.S. Lord Northern Geoscience Centre maintains a database of mineral showings (commodity occurrences) for both the Northwest Territories and Nunavut. The database provides Showing ID, latitude, longitude, Showing Name, commodity type, current development stage, and general comments on lithology, mineralization and geological settings.

Government Publication Date: Jul 31, 2022

National Analysis of Trends in Emergencies System (NATES):

Federal

NATE

In 1974 Environment Canada established the National Analysis of Trends in Emergencies System (NATES) database, for the voluntary reporting of significant spill incidents. The data was to be used to assist in directing the work of the emergencies program. NATES ran from 1974 to 1994. Extensive information is available within this database including company names, place where the spill occurred, date of spill, cause, reason and source of spill, damage incurred, and amount, concentration, and volume of materials released.

Government Publication Date: 1974-1994*

National Defense & Canadian Forces Fuel Tanks:

Federal

NDFT

The Department of National Defense and the Canadian Forces maintains an inventory of all aboveground & underground fuel storage tanks located on DND lands. Our inventory provides information on the base name, location, tank type & capacity, tank contents, tank class, date of tank installation, date tank last used, and status of tank as of May 2001. This database will no longer be updated due to the new National Security protocols which have prohibited any release of this database.

Government Publication Date: Up to May 2001*

National Defense & Canadian Forces Spills:

Federal

NDSP

The Department of National Defense and the Canadian Forces maintains an inventory of spills to land and water. All spill sites have been classified under the "Transportation of Dangerous Goods Act - 1992". Our inventory provides information on the facility name, location, spill ID #, spill date, type of spill, as well as the quantity of substance spilled & recovered.

Government Publication Date: Mar 1999-Apr 2018

National Defence & Canadian Forces Waste Disposal Sites:

Federal

NDWD

The Department of National Defence and the Canadian Forces maintains an inventory of waste disposal sites located on DND lands. Where available, our inventory provides information on the base name, location, type of waste received, area of site, depth of site, year site opened/closed and status.

Government Publication Date: 2001-Apr 2007*

National Energy Board Pipeline Incidents:

Federal

NEBI

Locations of pipeline incidents from 2008 to present, made available by the Canada Energy Regulator (CER) - previously the National Energy Board (NEB). Includes incidents reported under the Onshore Pipeline Regulations and the Processing Plant Regulations related to pipelines under federal jurisdiction, does not include incident data related to pipelines under provincial or territorial jurisdiction.

Government Publication Date: 2008-Jun 30, 2021

National Energy Board Wells:

Federal

NEBT

The NEBW database contains information on onshore & offshore oil and gas wells that are outside provincial jurisdiction(s) and are thereby regulated by the National Energy Board. Data is provided regarding the operator, well name, well ID No./UWI, status, classification, well depth, spud and release date.

Government Publication Date: 1920-Feb 2003*

National Environmental Emergencies System (NEES):

Federal

NEES

In 2000, the Emergencies program implemented NEES, a reporting system for spills of hazardous substances. For the most part, this system only captured data from the Atlantic Provinces, some from Quebec and Ontario and a portion from British Columbia. Data for Alberta, Saskatchewan, Manitoba and the Territories was not captured. However, NEES is also a repository for previous Environment Canada spill datasets. NEES is composed of the historic datasets 'or Trends' which dates from approximately 1974 to present. NEES Trends is a compilation of historic databases, which were merged and includes data from NATES (National Analysis of Trends in Emergencies System), ARTS (Atlantic Regional Trends System), and NEES. In 2001, the Emergencies Program determined that variations in reporting regimes and requirements between federal and provincial agencies made national spill reporting and trend analysis difficult to achieve. As a consequence, the department has focused efforts on capturing data on spills of substances which fall under its legislative authority only (CEPA and FA). As such, the NEES database will be decommissioned in December 2004.

Government Publication Date: 1974-2003*

Northwest Territories Oil and Gas Wells:

Territorial

NOGW

The NWT Oil and Gas Wells database is a comprehensive database that includes information regarding location of well, well name, spud date, current status and purpose. Please note that this database will not be updated, information on wells drilled after 2002 can be found in the Oil and Gas Wells (OGW) database under the 'Private Source Database' section.

Government Publication Date: 1939-2002*

National PCB Inventory:

Federal

NPCB

Environment Canada's National PCB inventory includes information on in-use PCB containing equipment in Canada including federal, provincial and private facilities. Federal out-of-service PCB containing equipment and PCB waste owned by the federal government or by federally regulated industries such as airlines, railway companies, broadcasting companies, telephone and telecommunications companies, pipeline companies, etc. are also listed. Although it is not Environment Canada's mandate to collect data on non-federal PCB waste, the National PCB inventory includes some information on provincial and private PCB waste and storage sites. Some addresses provided may be Head Office addresses and are not necessarily the location of where the waste is being used or stored.

Government Publication Date: 1988-2008*

National Pollutant Release Inventory:

Federal

NPRI

Environment Canada has defined the National Pollutant Release Inventory ("NPRI") as a federal government initiative designed to collect comprehensive national data regarding releases to air, water, or land, and waste transfers for recycling for more than 300 listed substances.

Government Publication Date: 1993-May 2017

Oil and Gas Wells:

Private

OGWE

The Nickle's Energy Group (publisher of the Daily Oil Bulletin) collects information on drilling activity including operator and well statistics. The well information database includes name, location, class, status and depth. The main Nickle's database is updated on a daily basis, however, this database is updated on a monthly basis. More information is available at www.nickles.com.

Government Publication Date: 1988-Aug 31, 2022

Parks Canada Fuel Storage Tanks:

Federal

PCFT

Canadian Heritage maintains an inventory of known fuel storage tanks operated by Parks Canada, in both National Parks and at National Historic Sites. The database details information on site name, location, tank install/removal date, capacity, fuel type, facility type, tank design and owner/operator.

Government Publication Date: 1920-Jan 2005*

Retail Fuel Storage Tanks:

Private

[RST](#)

This database includes an inventory of retail fuel outlet locations (including marinas) that have on their property gasoline, oil, waste oil, natural gas and / or propane storage tanks.

Government Publication Date: 1999-May 31, 2022

Scott's Manufacturing Directory:

Private

[SCT](#)

Scott's Directories is a data bank containing information on over 200,000 manufacturers across Canada. Even though Scott's listings are voluntary, it is the most comprehensive database of Canadian manufacturers available. Information concerning a company's address, plant size, and main products are included in this database.

Government Publication Date: 1992-Mar 2011*

Spills:

Territorial

[SPL](#)

The Department of Environment and Natural Resource (ENR) in Yellowknife maintains an inventory of spill locations through the "Hazardous Materials Spills Database". Information is provided on the spill number, date, location, spill description, quantity & commodity spilled and all applicable parties involved. Data previously maintained and made available by the Department of Resources, Wildlife & Economic Development (RWED).

Government Publication Date: Nov 30, 2021

Water Well Information System:

Territorial

[WWIS](#)

This database was collected from the Water and Sanitation Department of Northwest Territories Public Works and Services and provides information on seven wells drilled in the territory. Information is provided on the well depth, year drilled, and location of well by city name. No geographic coordinates are available.

Government Publication Date: 1974-Jul 2017

Definitions

Database Descriptions: This section provides a detailed explanation for each database including: source, information available, time coverage, and acronyms used. They are listed in alphabetic order.

Detail Report: This is the section of the report which provides the most detail for each individual record. Records are summarized by location, starting with the project property followed by records in closest proximity.

Distance: The distance value is the distance between plotted points, not necessarily the distance between the sites' boundaries. All values are an approximation.

Direction: The direction value is the compass direction of the site in respect to the project property and/or center point of the report.

Elevation: The elevation value is taken from the location at which the records for the site address have been plotted. All values are an approximation. Source: Google Elevation API.

Executive Summary: This portion of the report is divided into 3 sections:

'Report Summary'- Displays a chart indicating how many records fall on the project property and, within the report search radii.

'Site Report Summary'-Project Property'- This section lists all the records which fall on the project property. For more details, see the 'Detail Report' section.

'Site Report Summary-Surrounding Properties'- This section summarizes all records on adjacent properties, listing them in order of proximity from the project property. For more details, see the 'Detail Report' section.

Map Key: The map key number is assigned according to closest proximity from the project property. Map Key numbers always start at #1. The project property will always have a map key of '1' if records are available. If there is a number in brackets beside the main number, this will indicate the number of records on that specific property. If there is no number in brackets, there is only one record for that property.

The symbol and colour used indicates 'elevation': the red inverted triangle will dictate 'ERIS Sites with Lower Elevation', the yellow triangle will dictate 'ERIS Sites with Higher Elevation' and the orange square will dictate 'ERIS Sites with Same Elevation.'

Unplottables: These are records that could not be mapped due to various reasons, including limited geographic information. These records may or may not be in your study area, and are included as reference.

APPENDIX E - FCSI



Treasury Board of Canada Secretariat



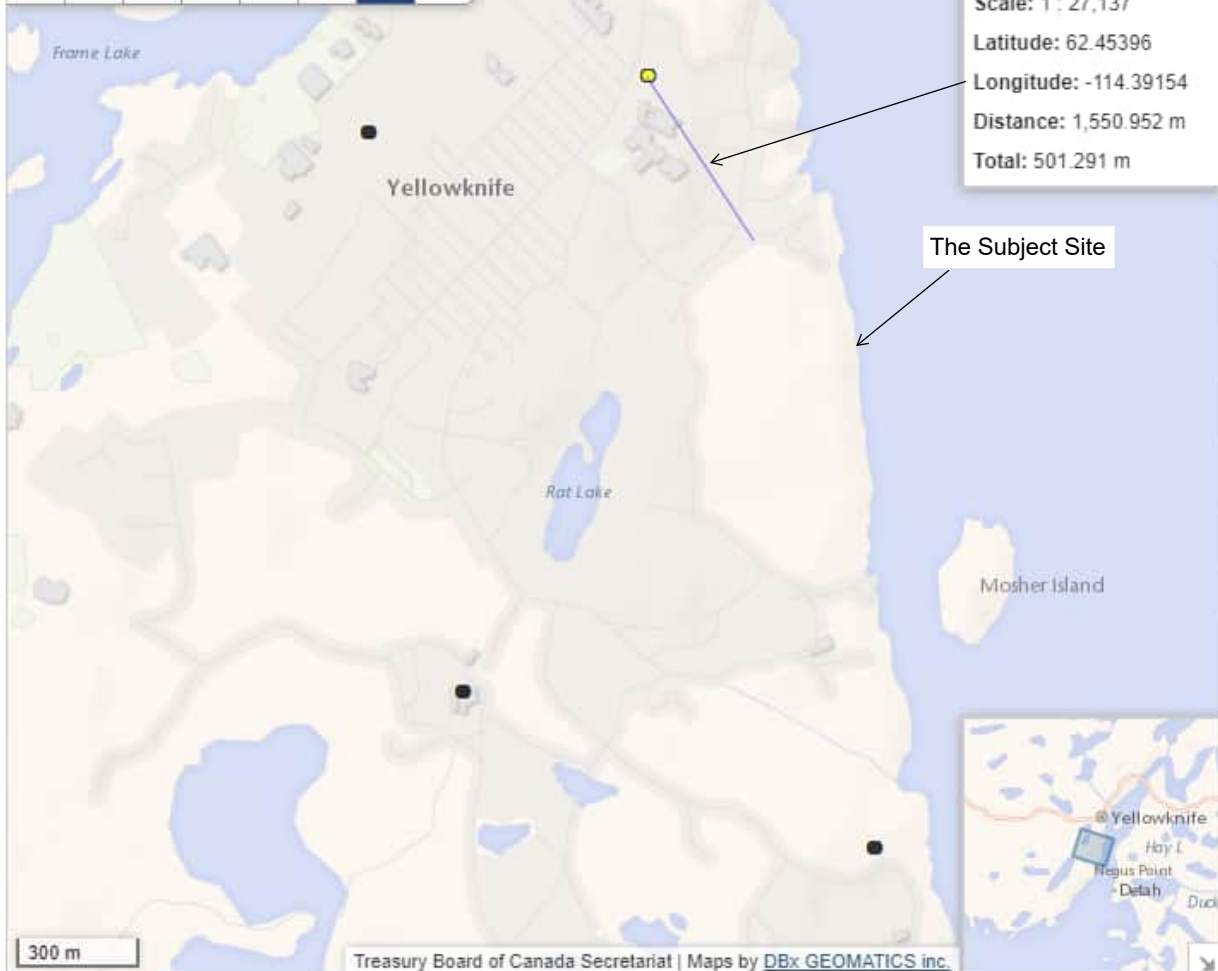
Canada

Departmental Activities ▾ Policy and Oversight ▾ Federal Public Service ▾

Home > OCG > Real Property Management > FCSI > DFRP/FCSI - Map Navigator

DFRP/FCSI - Map Navigator

Area: Yellowknife **Content:** 0 Federal Property, 0 Federal Building, 5 Federal Contaminated Sites



Guide
Scale: 1 : 27,137
Latitude: 62.45396
Longitude: -114.39154
Distance: 1,550.952 m
Total: 501.291 m

The Subject Site

Layers **Search** **Information**

Control layers and labels visibility with the checkboxes. Control the base map with the select list. Actions will automatically update the map.

Federal Properties	<input type="checkbox"/> Visibility ¹	<input type="checkbox"/> Labels
Federal Buildings	<input type="checkbox"/> Visibility ¹	<input type="checkbox"/> Labels
Federal Contaminated Sites	<input checked="" type="checkbox"/> Visibility ^{1 2}	<input type="checkbox"/> Labels
Economic Region	<input type="checkbox"/> Visibility	<input type="checkbox"/> Labels
Census Divisions	<input type="checkbox"/> Visibility	<input type="checkbox"/> Labels
Census Subdivisions	<input type="checkbox"/> Visibility	<input type="checkbox"/> Labels
Metropolitan Areas	<input type="checkbox"/> Visibility	<input type="checkbox"/> Labels
Federal Electoral Districts	<input type="checkbox"/> Visibility	<input type="checkbox"/> Labels
Treaty Areas	<input type="checkbox"/> Visibility	<input type="checkbox"/> Labels

Base map: **Standard** ³

¹ This layer is visible only when the map scale is smaller than 1:3,000,000.
² Suspected Active Closed
³ Google base maps are only available when the map scale is smaller than 1:60,000.

APPENDIX F - THIRD PARTY REPORTS

Arsenic Levels in the Yellowknife Area: Distinguishing Between Natural and Anthropogenic Inputs

Prepared for

**Yellowknife Arsenic Soil Remediation Committee
(YASRC)**

Prepared by

**Environmental Sciences Group
Royal Military College of Canada
Kingston, Ontario**



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February 2001
RMC-CCE-ES-01-01

EXECUTIVE SUMMARY

For over ten years, the Environmental Sciences Group (ESG) has been studying arsenic in the terrestrial and freshwater environment in Yellowknife, NWT. An intensive effort in the last four years has been focused on elucidating the background concentration range of arsenic in soils not impacted by mining operations.

Estimates of the background concentration of arsenic in the Yellowknife area were previously presented in three ESG studies and ranged from 5 to 100 ppm. The estimates were not based on samples from all geographical areas in Yellowknife and thus it was determined that additional samples should be collected to strengthen this conclusion.

In September of 2000 ESG collected additional soil samples to ensure coverage of all geographical locations in the Yellowknife area. Of particular interest were parks and playgrounds in the City of Yellowknife, Ndilo and Dettah. Samples were analyzed for a suite of elements by both neutron activation analysis (As, Sb, Au, Fe, Na, K) and inductively coupled plasma – optical emission spectrometry (Cu, Ni, Zn, Mn). All soil and surficial sediment samples in the ESG database of the Yellowknife area were subjected to statistical analysis.

In most residential areas arsenic concentrations are below 150 ppm. Three exceptions are the Rat Lake area, some locations in Ndilo, and on the Giant Mine Townsite. Elevated concentrations of arsenic in themselves are not necessarily cause for immediate concern.

After completing an extensive soil sampling program and rigorous statistical analysis (including principal components analysis, t-tests, and regression analysis), ESG is confident in reporting that the typical background concentration range of arsenic in the Yellowknife area is 3 to 150 ppm.

ESG is of the view that, particularly given the local prevalence of naturally occurring arsenic, there is not enough information at present to reach a decisive plan of action for the elevated levels of arsenic in soils in the Yellowknife area. Currently, we are developing risk assessment models that will incorporate arsenic speciation and measurements of its bioavailability.

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1 INTRODUCTION

For over ten years, the Environmental Sciences Group (ESG) has been studying arsenic in the terrestrial and freshwater environment in Yellowknife, NWT (Map 1-1). An intensive effort over the past four years has lead to the development of a statistical technique to determine the natural (background) concentration of arsenic in the Yellowknife area.

Several studies describing the levels of arsenic surrounding the Giant Mine,^{1,2} the Con Mine,^{3,4,5,6,7} and the City of Yellowknife⁸ have been published by ESG in the last few years. All reported elevated levels in most of the soil, sediment, water, and plant samples collected.⁹ Estimates of the background concentration of arsenic in the Yellowknife area, presented in three of the studies, ranged from 5 to 100 ppm^{1,7,8}. As the estimates were based on limited information, it was determined that additional samples should be collected to strengthen this conclusion.

In September 2000, ESG carried out a study aimed at filling the data gaps pertaining to arsenic concentrations in soils. This work, included parks and playgrounds in Yellowknife, Ndilo and Dettah. In a concurrent soil study of arsenic contamination from the Giant Mine,¹⁰ ESG obtained additional data on the Giant Mine Townsite and an area north of the mine.

The data set representing the Yellowknife area is now large enough that a picture of the background concentration of arsenic can be presented with confidence. This study uses all of the soil and surficial sediment data that ESG has collected over the past four years. Additional information on arsenic in the Yellowknife area has been collected and reported by others, but because of differences in analytical techniques it has not been included in this work.

The objectives of this report are:

- To discuss arsenic levels in various geographical areas in the vicinity of Yellowknife (more detailed discussion is provided for those areas not previously reported);
- to use statistical methods to elucidate the background concentration of arsenic in the Yellowknife area; and,
- to describe the approach that ESG is now using to evaluate the potential bioavailability, and the resulting risk, associated with arsenic levels in a variety of soil types from Yellowknife.

Map 1-1. Location of Yellowknife, NWT



Yellowknife, NWT



Table 2-1: Some Environmentally important arsenic compounds

Name	Abbreviation	Chemical formula
Inorganic Arsenic		
Arsenate, arsenic acid	As (V)	$\text{AsO}(\text{OH})_3$, $[\text{AsO}(\text{OH})_2\text{O}^-]$, $[\text{AsO}(\text{OH})\text{O}_2^{2-}]$, $[\text{AsO}_4^{3-}]$
Arsenite, arsenous acid	As (III)	$\text{As}(\text{OH})_3$, $[\text{As}(\text{OH})_2\text{O}^-]$, $[\text{As}(\text{OH})\text{O}_2^{2-}]$, $[\text{AsO}_3^{3-}]$
Organic Arsenic		
Monomethylarsonic acid,	MMA	$\text{CH}_3\text{AsO}(\text{OH})_2$
Dimethylarsinic acid,	DMA	$(\text{CH}_3)_2\text{AsO}(\text{OH})$
Trimethylarsine oxide	TMAO	$(\text{CH}_3)_3\text{AsO}$
Methylarsine	MeAsH_2	CH_3AsH_2
Dimethylarsine	Me_2AsH	$(\text{CH}_3)_2\text{AsH}$
Trimethylarsine	Me_3As	$(\text{CH}_3)_3\text{As}$
Arsenobetaine (fish arsenic)	AB	$[(\text{CH}_3)_3\text{As}^+\text{CH}_2\text{COO}^-]$

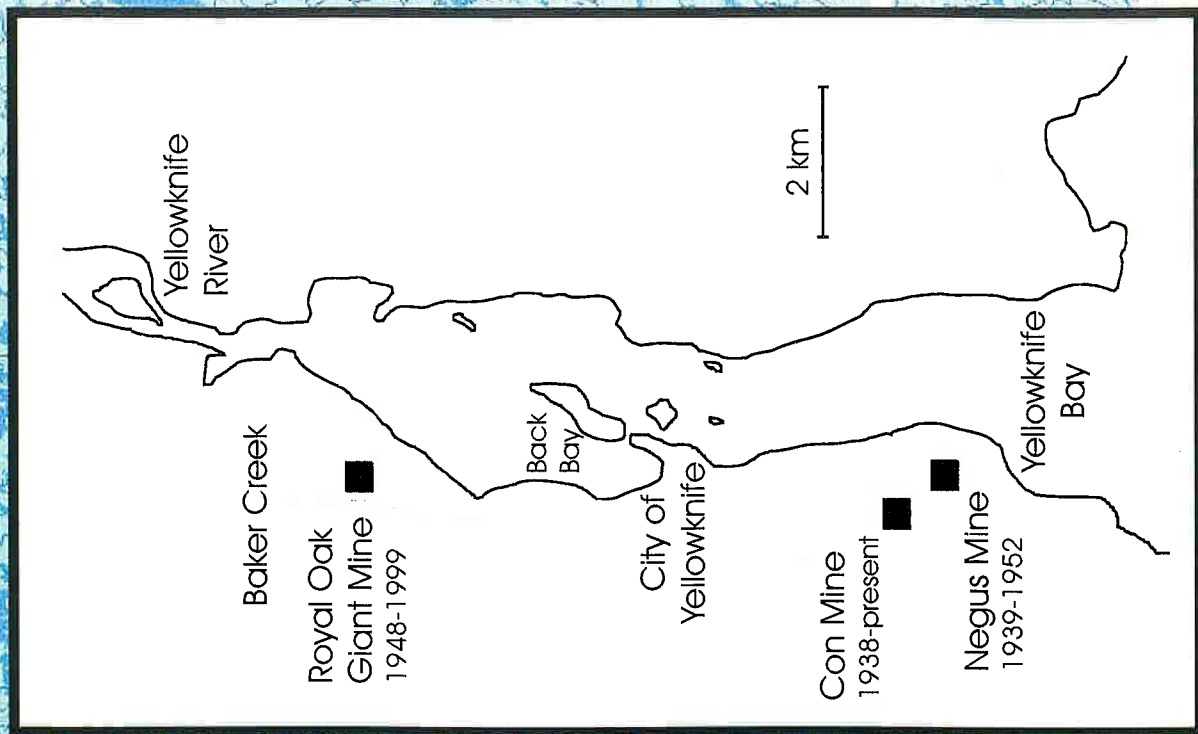
2.2 Arsenic in Yellowknife

The typical Canadian background concentration range of arsenic is between 5 and 14 ppm in soils. In areas associated with gold mining, however, natural arsenic levels have been reported to be much higher, with background concentrations of up to 250 ppm¹⁴. This is a result of natural weathering of local arsenic-rich minerals. In these areas, arsenic concentrations in soils, sediments and water tend to be much higher than the typical national average¹⁴.

The city of Yellowknife, NWT has been an active gold mining community since 1938. Three mines have operated in the city over the last sixty years under various owners: Con Mine, Negus Mine and the Giant Mine (Map 2-1). Currently, the Miramar Mining Corporation owns all three properties, but carries out milling only at Con Mine. For several years it has been known that gold mining has increased the levels of arsenic in some areas of Yellowknife. Ore mined in Yellowknife is refractory, meaning that the gold is found with arsenopyrite (FeAsS - an arsenic-iron sulphide). The milling of this arsenic-rich ore generates a considerable amount of arsenic waste.

In Yellowknife, the mining of arsenic-rich ores extracts rock that contains high levels of mineralogical arsenic. At this point, arsenic begins to be introduced into the environment through several processes associated with human activities. Open pit and underground

Map 2-1. City of Yellowknife and the location of mining operations



3 SAMPLING AND ANALYSIS

3.1 Field Study

The fieldwork was carried out in Yellowknife during the summer between 1997 to 2000. A targeted approach to environmental sampling was used in all phases in the study. Special emphasis was placed on obtaining samples representative of the various geographical areas.

Soils Samples

Samples were obtained using a plastic scoop and stored in a Whirl Pak™ bag. The plastic scoops were discarded after each sample was obtained. Each sample was given a blind number, which was the only number provided on the label when submitting for analysis. Soil samples to be analyzed for inorganic elements were kept at a temperature of less than 0 °C, prior to and during shipping and long-term storage.

Sediment Cores

A modified Kajak-Brinkhurst (KB) gravity corer outfitted with a 120 × 9 cm polyacrylic tube was used for obtaining sediment cores. The cores were obtained by lowering the corer into the sediment from a boat. For depths of water less than 1 m, the tubes were forced into the sediment by hand. The cores were topped with overlying water to prevent contact of the sediments with air, and kept at 4 °C until processing. Cores were processed within 12 hours of collection. After processing, which involved dividing the core into 5-cm sections and collecting the porewater, the squeezed sediments were stored in Whirl Pak™ bags and frozen. Each sample was given a blind number, which was the only number provided on the label when submitting for analysis.

Sampling locations and descriptions were recorded in field notebooks and/or on field maps, and a photographic record was made of each general area that was sampled. Sampling locations for this study were not surveyed and all locations indicated on maps are considered to be approximate within a few metres.

Chain-of-custody forms for each sample were filled out and checked before shipment, and the contents of the shipments were verified upon receipt in the laboratory. The relevant documentation is available on request.

3.2 Analysis

Analyses were conducted by two laboratories accredited by the Canadian Association of Environmental Analytical Laboratories (CAEAL): the Analytical Services Unit (ASU),

cooled for 80-120 hours, and then counted for 2 hours using a GMC HpGe detector coupled with a Nuclear Data μ -multichannel analyzer (MCA).

3.3 Statistical Analysis

3.3.1 Principal Components Analysis

The solid-phase compositions of samples (using the suite of ten elements: arsenic, antimony, iron, gold, nickel, copper, zinc, manganese, potassium, and sodium), were compared using the multivariate statistical technique, principal components analysis (PCA). The analysis was carried out with the statistical program SYSTAT[®] 8.0. This technique allows for multivariate pattern recognition of the metal concentrations for each sample by examining their position on a reduced (usually two- or three-dimensional) plot. The axes of the plot are linear combinations of the original n variables.

The data for each metal concentration and sample set were normalized (typically using log, log10, square root) to eliminate the effect of a large range of metal concentrations over the data set.

The selection of the suite of ten elements used was based in part on previous studies in the area. Arsenic, antimony and gold are components of the mined ore. Iron and zinc are additives in the milling and effluent treatment process, and the others are environmentally important elements. Due to financial constraints on this work, three of the elements included in Mace's 1998 analysis¹ were not used (cobalt, calcium, and lanthanum).

3.3.2 Paired t test

The paired t test can be used to compare measured means with separately determined means. In this case the means from the three different groups identified within the PCAs were examined. First the pooled standard deviation (s_p) was calculated using the standard deviations from each group and the t value was calculated. The calculated t value was then compared with the value for t from the Student's t table using N_2-2 degrees of freedom. If this value is greater than t from the table, then there is a statistical difference between x_1 and x_2 (that is, x_1 and x_2 are not from the same population).

3.3.3 Linear Regression and Correlation

Linear regression is the procedure for describing the best-fitting straight line that summarizes a linear relationship between two variables. It is expressed by the equation $y=mx+b$. To use this technique, two basic assumptions are made. The first is that y values are equally spread out around the regression line throughout the values of x, and the second is that at each value of x, the y values are normally distributed. A correlation

4 RESULTS AND DISCUSSION

The first part of this chapter describes the concentrations of total arsenic in the Yellowknife area. The second part gives an interpretation of the data using statistical relationships. Complete data tables can be found in Appendix A, and quality assurance/quality control (QA/QC) results are presented in Appendix B.

4.1 Total Arsenic Concentrations in Soil and Surficial Sediment Samples

4.1.1 *Giant Mine and Surrounding Property*

Elevated arsenic concentrations were seen in almost all samples collected on the Giant Mine property from the tailings ponds, Mill site, Townsite and Baker Creek.

In 1997, samples were collected from the Tailings Ponds, Beach Tailings area, Baker Creek, and Back Bay (Map 4-1).¹ The average arsenic concentration in the tailings ponds was 3264 ± 950 ppm, reflecting the input of the solid and liquid waste streams from the mill process. In samples collected from the Beach Tailings area south of the South Tailings pond the average arsenic concentration in soil and sediment was 909 ± 150 ppm. Historically, tailings were deposited along the shore of Back Bay in this area. At 300 m offshore, the arsenic concentration remained high (398 ppm at sample location 9G). The average concentration in surficial sediment (0-5 cm) from Baker Creek and its outflow was 2024 ± 1101 ppm. Arsenic-contaminated sediments were found outside the Baker Creek outflow breakwater (3140 ppm at location 4G) and up to 1 km away concentrations remained high (1193 ppm).

In September 2000, ESG was given permission to sample around the Giant Mine Mill Site (Map 4-2). As expected, the highest level of arsenic was found at the base of the roaster stack (87,000 ppm at location 29206). Concentrations of this magnitude can be attributed to the fallout of arsenic trioxide during the roasting of arsenic-bearing ores. A sample taken in an area where roaster calcines were previously stockpiled (location 29211) contained 21,500 ppm arsenic. The concentration in a sample representative of the ore currently being mined at the mine (location 29213) was 5462 ppm.

Samples collected from the Giant Mine Townsite in September 2000 (for a separate INAC study on arsenic levels at the Giant Mine Townsite and an area north of the mine) had arsenic concentrations of between 19 and 1850 ppm (Map 4-3). The highest concentrations were found associated with crushed rock fill on the roadways; these had an average concentration of 1174 ± 519 ppm. The average concentration in samples whose matrices were not rock was 87 ± 95 ppm (range: 19 - 366 ppm). This suggests that arsenic



Photo 4-1. The Giant Mine



Photo 4-2. Baker Creek

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Environmental Sciences Group
The Royal Military College of Canada
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Kelowna BC V1Y 9S6
Tel: (813) 541-5900 Ext: 8825
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Grid Scale: 1000ft

LEGEND:

+29000 Sample Tag Location
234 Arsenic Concentration (ppm)

NOTES:
Depth of samples is indicated in brackets (cm)

MAP 4.3: Arsenic concentration (ppm) from the Giant Mine Townsite are shown in red.

ORIGINAL SOURCE:

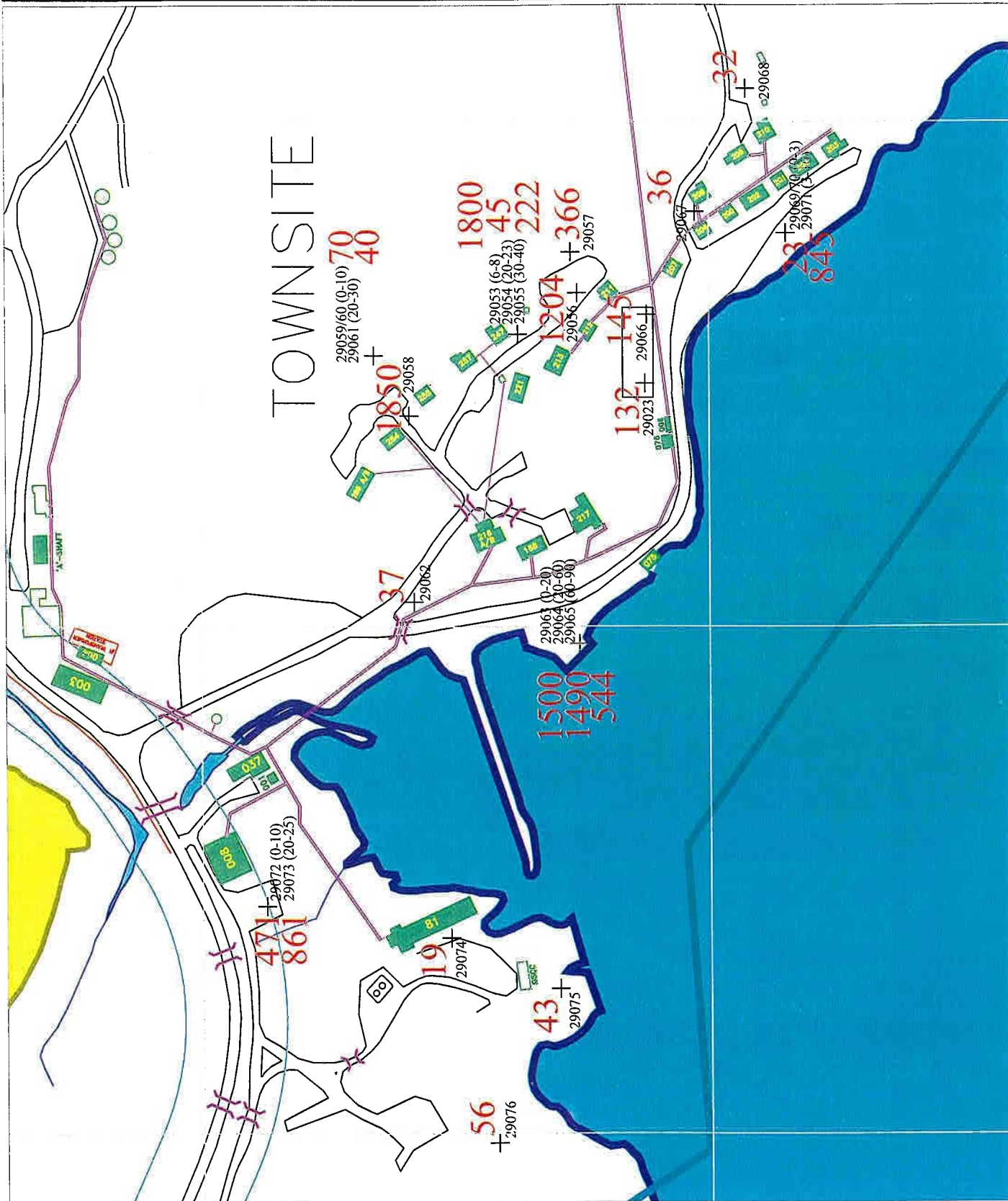
Miramar Giant Mine Ltd.

UPDATED: NOV.22/2000

Chris Olson

PRINTED: NOV.22/2000

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4.1.2 Con Mine and Surrounding Property

As found at the Giant Mine, arsenic concentrations were elevated in all samples collected on the Con Mine property from the tailings ponds, areas surrounding tailings ponds, Mill Site, Rat Lake, Frame Lake and the Meg-Keg-Peg Lake Great Slave Lake watershed. The Con Mine, too, has been operating for over sixty years and has seen its environmental practices change several times.

In a recent study, arsenic (Map 4-5) and cyanide levels (not shown) on the Con Mine property and surrounding area were examined⁷. The average arsenic concentration in the Con Mine and Negus Tailings Ponds was 6311 ± 7095 (range: 1400- 25,000 ppm, median: 3017 ppm). Concentrations in the Con ponds were higher than in the Giant Mine tailings ponds. The median concentration in soils from the perimeter of the ponds was 118 ppm (range: 5-1165 ppm), and concentrations appeared to decrease with distance from the ponds.

Concentrations of arsenic found in an area surrounding Rat Lake and along the Con Mine fence line near the secondary access gate resembled those found in tailings (Map 4-5). The average concentration of arsenic in samples from this area was 812 ± 204 ppm.

Sediment samples were collected in lakes surrounding the Con Mine Property and from Yellowknife Bay (Map 4-6 and 4-7). The arsenic concentrations in the surficial sediments (0-5 cm) of all cores collected exceeded the federal interim sediment quality guidelines. Kam Lake sediment cores had an average arsenic concentration of 893 ± 491 ppm, clearly demonstrating the historical impact of the Con Mine operations. Rat Lake sediment also had elevated concentrations (387 ppm and 820 ppm), which can also be attributed to historical practices of mill operations.

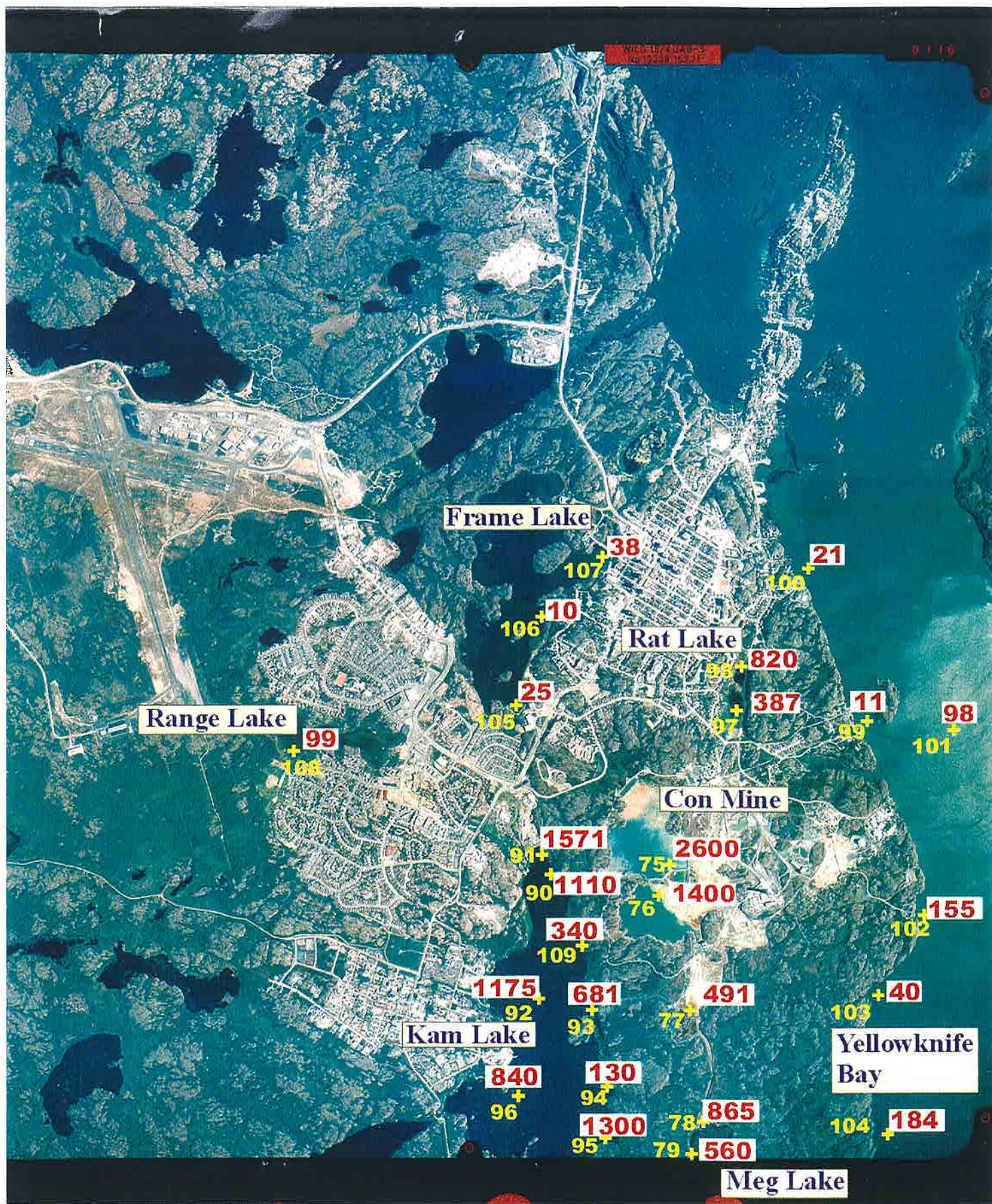
The Meg-Keg-Peg Lake-Great Slave Lake watershed was also revisited. In samples collected down the watershed system, arsenic concentrations increased from 865 ppm in Meg Lake to 5550 ppm in Peg Lake. Beyond the arsenic peak at Peg Lake, the concentration dropped dramatically towards the Great Slave Lake outflow. The concentrations in the top of the cores from the system were within the same order of magnitude as those found earlier by ESG³.



Photo 4-7. Negus Tailings Pond located east of Con Mine.



Photo 4-8. Rat Lake from the north looking towards Con Mine.



Map 4-6. Sediment core sample locations in and around the city of Yellowknife.

Arsenic concentrations (ppm) from surficial sediments (0-5 cm) are indicated in red.

4.1.3 Yellowknife Residential Areas

4.1.3.1 City of Yellowknife

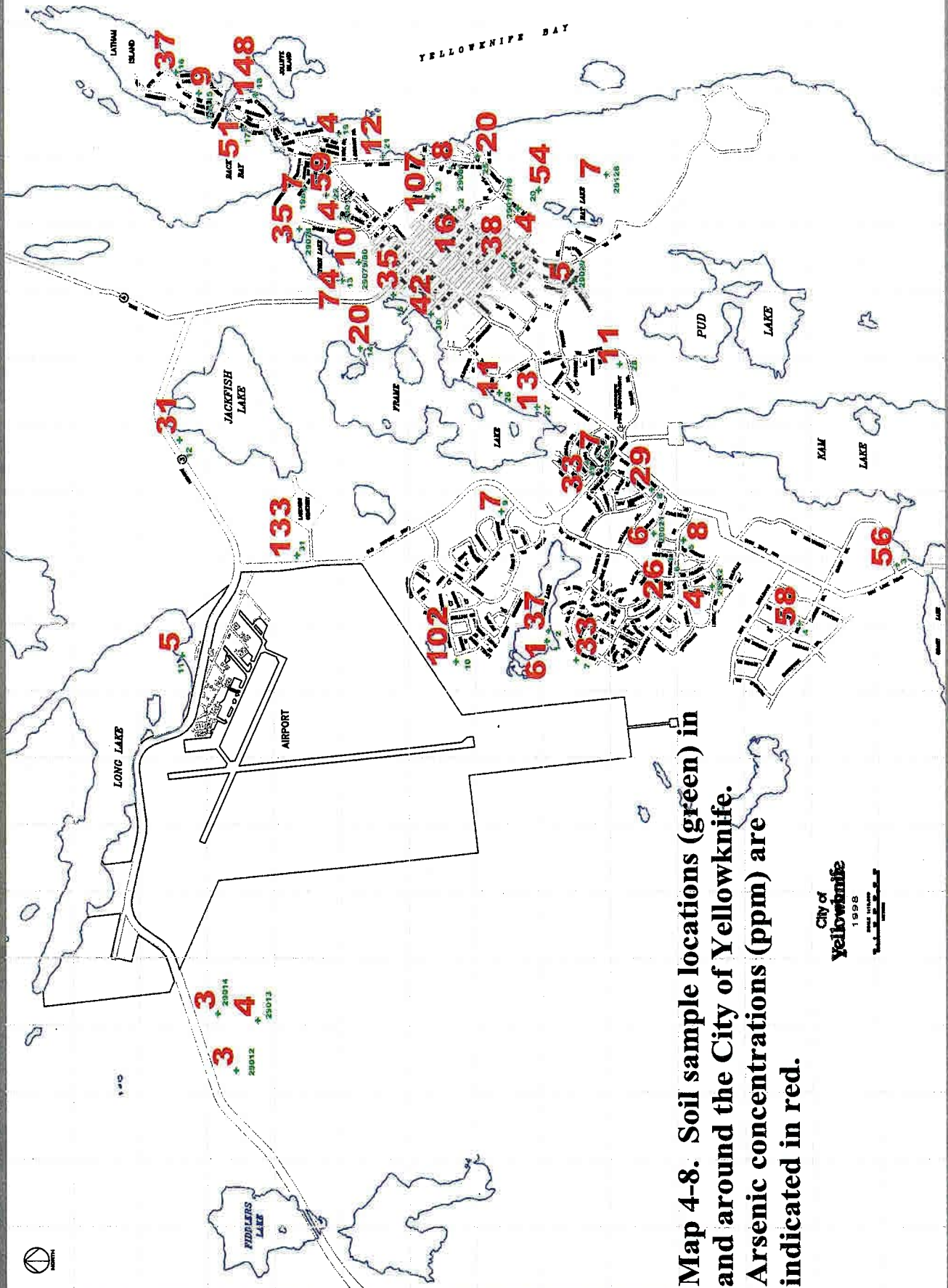
Forty-seven soil samples from around the City of Yellowknife were collected between 1998 and 2000 (Map 4-8). Sampling was focused to ensure that all neighborhoods and playgrounds received representative coverage. The average concentration of arsenic in the city was 32 ± 34 ppm (range: 3-148 ppm). The samples collected from playgrounds and parks exhibited the lowest concentrations (3-13 ppm).

4.1.3.2 Ndilo

Ndilo is located on the northern tip of Latham Island and is home to members of the Yellowknives Dene First Nation. Samples were collected in Ndilo, with permission from Chief Peter Liske, in September 2000. Sampling was carried out in areas frequented by people, along the shoreline, and on top of a hill (Map 4-9). The average concentration of arsenic was 286 ± 240 ppm (range: 7-645 ppm). The source of the elevated levels of arsenic is unknown at this point; two possibilities include that the elevated levels may be indicative of a unique geology and/or a remnant of historical aerial emissions from the Giant Mine roaster stack. Importantly, the arsenic concentrations found in the playground and other easily accessible areas were all within the range of background concentrations. It should also be noted that there are several other residential areas in Yellowknife that have comparable levels (for example, Rat Lake and the Giant Mine Townsite). For these reasons, therefore, the presence of elevated concentrations of arsenic in Ndilo is not necessarily a cause for immediate concern.

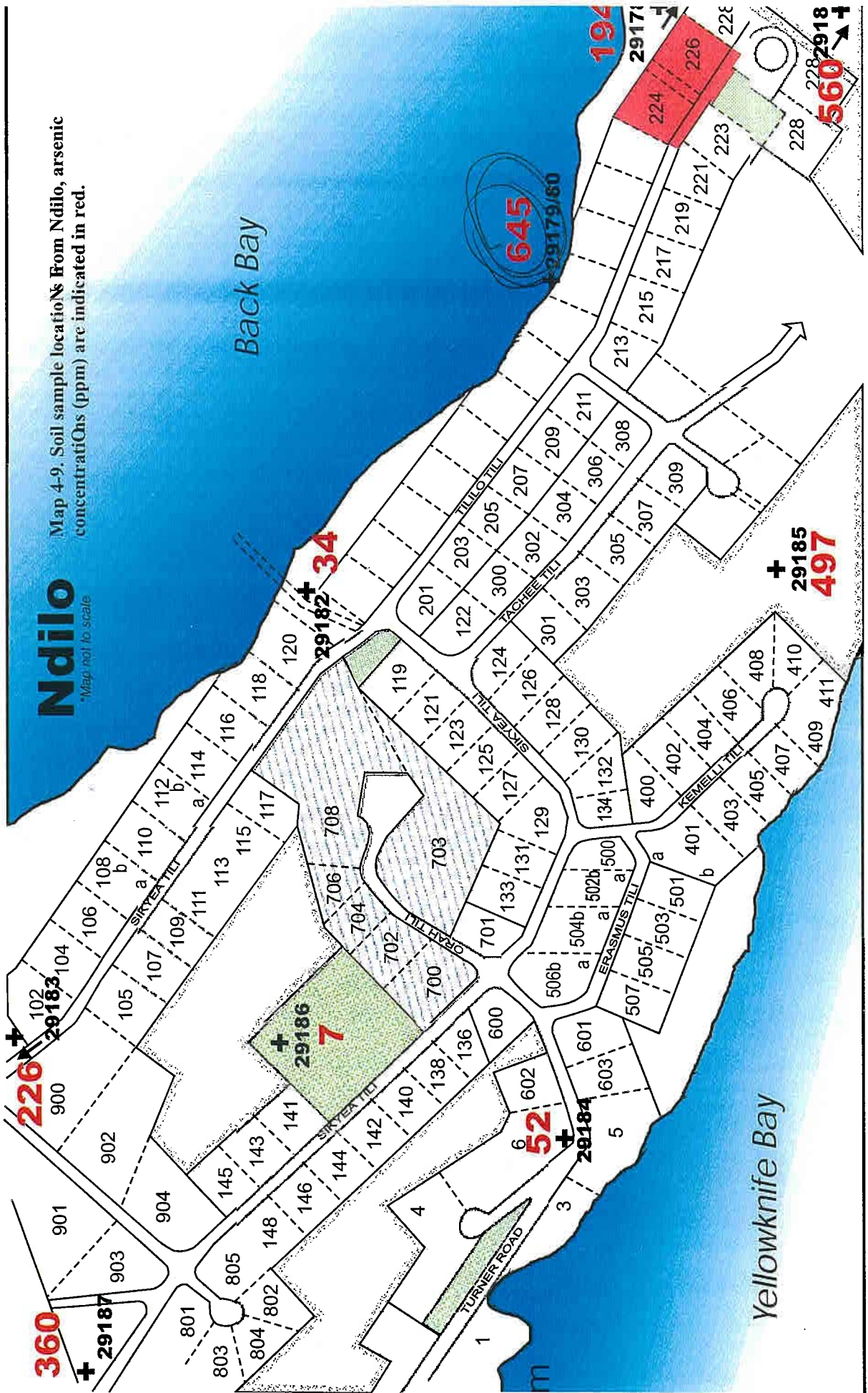
4.1.3.3 Dettah

Dettah, also a home of Yellowknives Dene First Nation people, is located across Yellowknife Bay from Yellowknife. Seven soil samples were collected in Dettah, with permission from Chief Richard Edjericon, during September 2000. The samples were taken in areas frequented by people, and were selected to be representative of the area (Map 4-10). The average arsenic concentration was 50 ± 56 ppm (range: 7.2-144 ppm). All samples collected in Dettah are believed to be representative of the natural or background level of arsenic in the area.



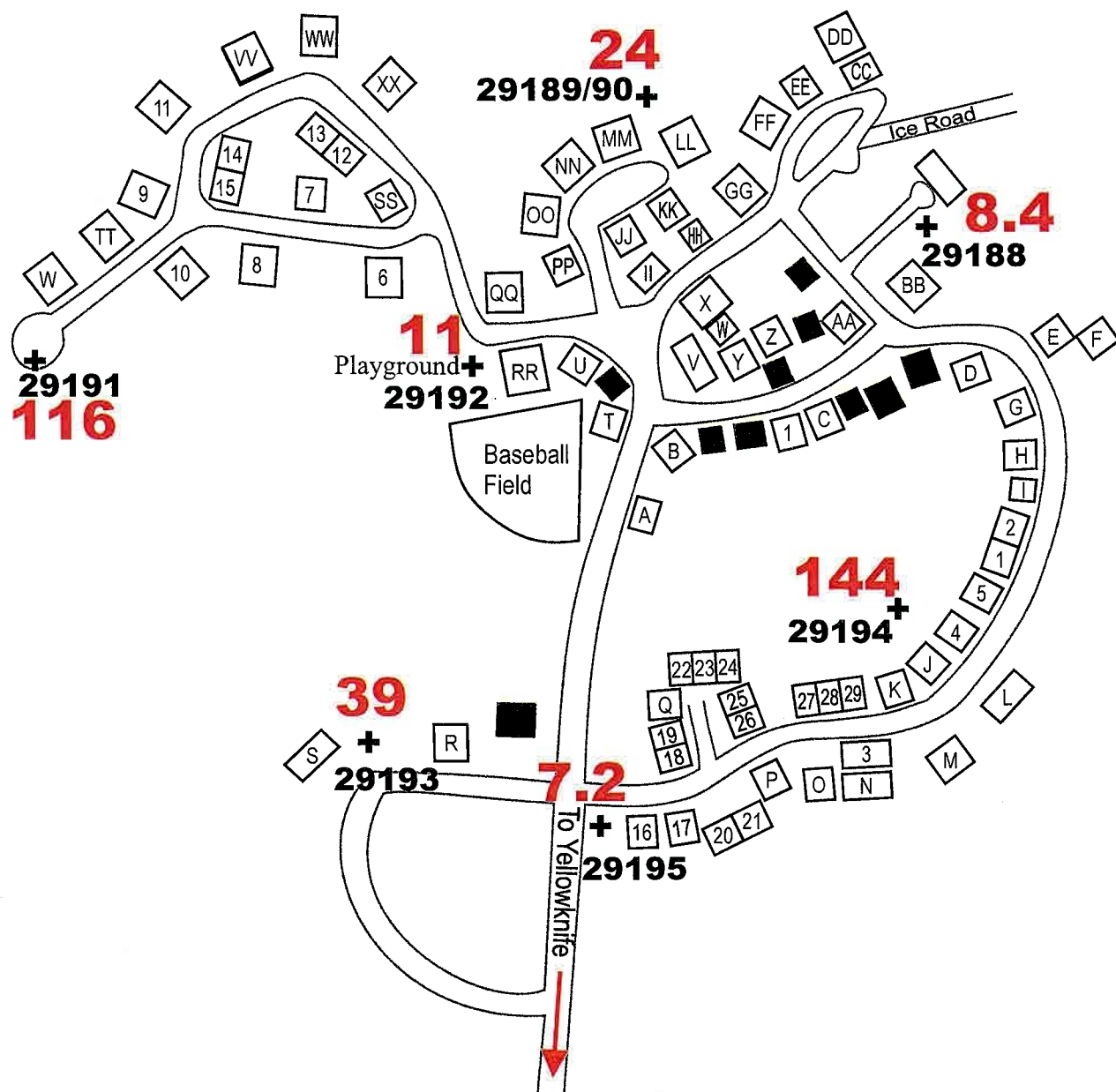
Map 4-8. Soil sample locations (green) in and around the City of Yellowknife. Arsenic concentrations (ppm) are indicated in red.

City of
yellowknife
1998



Dettah

**Map not to scale*



Map 4-10. Soil sample locations from Dettah, arsenic concentrations (ppm) are indicated in red.

average concentration of 5 ± 0.3 ppm. These samples were collected in sand from playgrounds and other high use areas.

- A loose grouping of samples below the -1 value of the y-axis is evident. These include samples collected from around the perimeter of the Con Mine Tailings Ponds, some Ndilo samples, and one sample from Dettah. The range of arsenic in these samples is 34-676 ppm. It is possible that this grouping reflects a higher background concentration in these areas, or it may represent soil that was impacted by the roaster stack, mine waste dust, or other fugitive emissions.
- When all of the samples are included in the same PCA, there is overlap between the groupings. This is illustrated by the overlap of the ellipses on the plot. Of interest is the placement of the Ndilo samples. Several of the samples fall on the y-axis between all three groupings. Possibly these samples were influenced by aerial emissions from the Giant Mine.
- When the groupings are compared statistically, using a paired t-test and pooled standard deviations, there is a significant difference between all three groupings: background (green ellipse) and anthropogenic (red ellipse) ($t=9.14$, $df=183$, $p<0.01$), background and loose grouping ($t=8.67$, $df=125$, $p<0.01$), and anthropogenic and loose grouping ($t=4.12$, $df=108$, $p<0.01$).

Based on the large number of samples (219) and the results of the PCA and paired t-tests, the background concentration of arsenic in the Yellowknife area covers a range of 3-150 ppm. Although the range in the “background” ellipse is 3-300 ppm, 99.5% of the samples have a concentration of less than 150 ppm. This also indicates that in some isolated cases the natural concentration of arsenic may be as high as 300 ppm.

4.2.2 Principal Components Analysis of ESG Yellowknife Soil and Tailings Samples

The mandate of the Yellowknife Arsenic Soil Remediation Committee is to deal exclusively with soil (and not sediment). Therefore, the solid-phase compositions of only soil and tailings samples from the Yellowknife area also underwent principal components analysis, using the suite of ten elements (arsenic, antimony, iron, gold, nickel, copper, zinc, manganese, potassium and sodium).

The positions of tailings and soil samples from the City of Yellowknife, Ndilo, Dettah, Con Mine property and Giant Mine property are illustrated in Figure 4-1. The elemental distribution is shown in the top plot (factors plot). The first two principal components combine to explain 72% of the between-sample variance in the original data set (52% and 20% for principal components 1 and 2).

As before, two distinctive groupings of sample locations occur. Most of the important features of Figure 4-2 are similar to those in Figure 4-1. Additional features of Figure 4-2 are as follows:

- The arsenic concentration range of samples within the red ellipse is 29-12,600 ppm. The average concentration is 1967 ± 2042 ppm, with a median value of 1580. Again, this ellipse contains all samples that were directly impacted by mine waste.
- The arsenic concentration range in the green ellipse is 2.5-218 ppm. The average concentration is 42.2 ± 51.7 ppm with a median value of 26 ppm. This ellipse contains samples that reflect the background concentration range of arsenic in the Yellowknife area.
- A loose grouping of samples below -2 value of the y-axis is evident. These were collected from around the perimeter of the Con Mine Tailings Ponds, and include one sample from Dettah. The range of arsenic in these samples is 34-506 ppm. The average concentration is 206 ± 165 ppm, with a median value of 157 ppm. This result may reflect a higher natural concentration of arsenic on the mine property, distinct from that found off site.
- A statistical comparison of the groupings using a paired t-test and pooled standard deviations determined that there is a significant difference between all three groupings: background (green ellipse) and anthropogenic (red ellipse) ($t=9.0$, $df=156$, $p<0.01$), background and loose grouping ($t=8.25$, $df=112$, $p<0.01$), and anthropogenic and loose grouping ($t=4.04$, $df=88$, $p<0.01$).

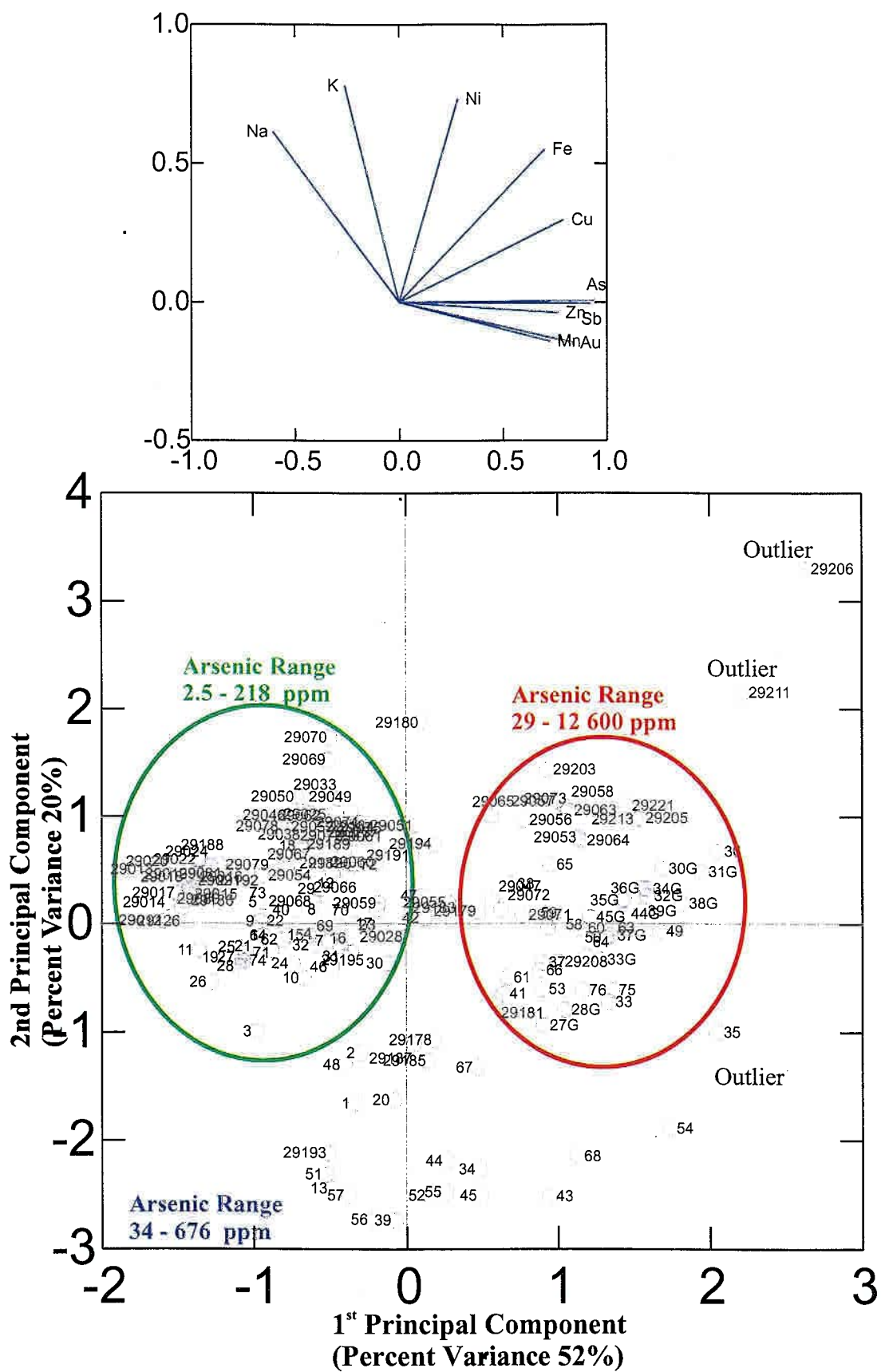


Figure 4-2. Principal components analysis biplot of soil and tailings samples from the Yellowknife area. The green ellipse on the left side of the plot is indicative of the natural concentration range of arsenic in the Yellowknife area. The red ellipse on the right contains samples impacted by mining operations.

6 NEXT STEPS

This chapter describes ESG's current research on characterizing the bioavailability and chemical forms of arsenic found in the samples collected in the area of Yellowknife.

With total concentrations of arsenic known, the question becomes: do these levels pose a risk to the environment or human health? Using traditional risk assessment models based on total arsenic levels, and the CCME recommended soil quality guideline of 12 ppm as a benchmark, the answer would be yes. Clearly this is an unrealistic outcome, as it would involve cleaning up the natural geology of the area.

The CCME recommends that the natural or background concentration be taken into consideration when assessing risk. In the Yellowknife area, this range has been established as 3-150 ppm. Another important consideration concerns the form, or speciation, of arsenic. It is now widely accepted in the scientific community that knowledge of arsenic forms is crucial to any assessment of the risk from arsenic to either the ecosystem or human health. This criterion, rather than one based solely on total arsenic, should be used in assessing risk.

An approach that is at least tangible is to deal with mine waste that exists in obviously unconfined areas. Less clear is how to treat concentrations that are above background but are not obviously mine waste. It is these soils that need a more detailed assessment, to avoid under or overestimating the risk. ESG is of the view that, particularly given the local prevalence of naturally-occurring arsenic, there is not enough information at present to reach a decisive plan of action for this material.

Currently, we are developing risk assessment models that will incorporate arsenic speciation.

6.1 Current Research of Arsenic at the Environmental Sciences Group

A preliminary analysis of arsenic species in waters and biota of the Yellowknife area is being used to explore the link (if any) between high levels of arsenic and the risk of arsenic to human and ecological health. Many questions remain, such as: Given that toxic species are the major ones extracted from many biota (higher plants, moss, algae, lichens and some fungi), how bioavailable are they? What form of arsenic is in humans' food (such as mushrooms, locally grown vegetables, local game)? And how bioavailable is it?

The measure of arsenic bioavailability usually involves administering a dose to a laboratory animal and measuring the levels of arsenic in blood or urine compared to the dose given (Absolute bioavailability = (Total amount of arsenic in blood/urine from

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8 APPENDICES

8.1 Appendix A: Data

The following section contains data tables and soil sample locations and descriptions.

Table 8-1. Elemental concentrations [ppm] for sample locations reported.

Sample Location	As [ppm]	Sb [ppm]	Fe [ppm]	Au [ppm]	K [ppm]	Na [ppm]	Zn [ppm]	Mn [ppm]	Cu [ppm]	Ni [ppm]
25	20	0.4	12000	0.005	18000	24500	100	18	5.7	8.6
26	11	0.2	12000	0.005	14000	23100	11	93	3.7	7.8
27	13	0.3	11000	0.005	17000	24000	131	21	6.1	7.9
28	11	0.2	12000	0.005	14000	23100	16	128	9.8	10
29	33	0.4	19000	0.005	17000	25000	56	185	48	35
30	42	1.5	16000	0.1	13000	14400	94	380	34	29
31	133	5.5	15000	0.04	15000	23000	26	192	13	12
32	16	0.5	15000	0.03	15000	18300	199	34	20	19
33	7500	65	49000	3.18	4000	6600	946	182	56	50
34	121	12	7000	0.5	1000	500	112	176	76	11
35	25000	94	1500	1.99	7000	500	553	4622	11625	93
36	12600	58	72000	2.33	11000	14300	849	3094	6031	74
37	1165	10	36000	0.06	8000	9100	2946	190	119	37
38	69	1.8	85000	0.03	7000	5200	120	65	2028	65
39	57	8.8	1000	0.03	1500	500	64	155	32	2.5
40	29	0.5	22000	0.01	19000	24100	32	185	13	19
41	2472	40	52600	0.84	7000	8600	56	173	15	22
42	300	9.4	25000	0.2	18000	20400	59	304	41	18
43	506	13	8000	4300	1500	1700	632	57	17	6.7
44	372	27	4000	0.14	1500	600	62	47	40	12
45	294	22	4000	0.2	1500	1000	244	444	26	5.4
46	174	0.8	19000	0.005	11000	12200	12	74	48	16
47	114	1.8	34000	0.2	16000	19200	51	362	92	32
48	82	1.3	8000	0.02	6000	4100	11	90	36	15
49	5028	645	58000	1.07	12000	4300	477	1023	261	58
50	3433	54	57000	1.3	16000	2600	210	1389	98	51
51	47	3.5	1800	0.09	2150	1700	5.0	16	55	2.5
52	34	9.3	1200	0.22	1500	500	80	224	56	6.7
53	2461	34	43000	0.37	9000	3100	20	1078	99	32
54	443	40	5000	8400	1500	500	1254	150	1066	45
55	379	9.9	6000	0.34	1500	500	154	71	13	6.3
56	193	7.1	1500	0.06	1500	500	43	26	14	2.5
57	90	2.3	8000	0.03	900	2000	5.0	186	16	2.5
58	1580	16	61000	0.32	10000	8200	1072	178	75	61
59	591	24	53000	1.16	7000	14300	868	135	97	68
60	566	8.7	77000	0.96	6000	11600	759	1114	102	79
61	41	7400	23000	0.03	5500	17000	39	911	193	24
62	21	0.8	15000	0.06	17000	25000	113	12	12	9.1
63	1860	64	69000	0.34	13000	3700	593	1203	110	58
64	994	104	40000	3	9000	4600	152	159	443	47
65	850	40	48800	1	19000	15000	282	608	135	67
66	717	27	42000	0.21	11000	4400	1183	117	74	29
67	676	31	14000	0.42	5000	4500	243	48	34	16
68	235	78	4000	25600	1500	2400	59	92	163	16
69	218	1.8	18000	0.02	17000	24000	210	29	12	16
70	74	2	21000	0.03	18000	21900	240	39	23	20
71	30	0.16	14700	0.005	15000	24000	16	135	7.2	12
72	29	0.8	34000	0.005	25000	15500	473	64	26	35
73	12	0.3	20000	0.005	18000	24300	211	18	15	17
74	10	0.3	11500	0.007	16000	24000	16	119	12.5	7.4
75	2600	26	58000	3.78	6500	4020	415	986	82	47
76	1400	17	51000	0.37	6000	3830	292	962	166	39
77	491	11	29000	3.46	21000	14080	252	45	105	232
78	865	18	13000	16.8	5000	4940	1031	122	96	398
79	560	19	12000	27.6	4000	7010	1501	506	94	202
80	440	6.6	32000	5.87	22000	13630	380	100	101	293
81	1660	27	31000	20.9	19000	11710	156	80	74	276

Table 8-1. Elemental concentrations [ppm] for sample locations reported.

Sample Location	As [ppm]	Sb [ppm]	Fe [ppm]	Au [ppm]	K [ppm]	Na [ppm]	Zn [ppm]	Mn [ppm]	Cu [ppm]	Ni [ppm]
29059	71	6	18000	0.04	10000	12200	50	20	45	310
29060	68	5.8	23000	0.03	15000	12600	49	21	46	354
29061	40	1.2	36000	0.003	16000	14000	59	34	69	457
29062	37	0.7	18000	0.065	15000	30800	39	17	77	228
29063	1500	61	77000	0.89	11000	10400	105	77	178	1100
29064	1490	43	79000	1.2	9000	5700	100	97	156	1266
29065	544	27	45000	0.28	13000	16200	86	64	99	934
29066	145	5.8	17000	0.2	15000	23400	9.4	12	26	135
29067	36	1.6	17000	0.011	15000	20600	12	13	26	159
29068	32	3.8	11000	0.034	13000	13900	14	9.5	38	186
29069	25	2.5	17000	0.02	25000	27700	37	10	174	503
29070	20	2	16000	0.014	28000	27100	23	10	597	458
29071	845	12	35000	0.4	5000	4800	91	62	149	986
29072	471	18	32000	0.18	6000	5400	75	64	119	927
29073	861	44	77000	0.74	9000	13600	85	68	129	1185
29074	19	2.4	32000	0.008	16000	15900	28	29	42	325
29075	43	2.5	23000	0.011	18000	22400	31	32	44	263
29076	56	4.4	24000	0.02	16000	21600	27	26	41	298
29077	64	6.1	28000	0.008	19000	21300	15	20	34	229
29078	35	0.9	22000	0.005	18000	27200	19	19	27	190
29079	11.6	0.3	12000	0.002	17000	24900	12	11	21	103
29080	8	0.2	10000	0.005	12000	23800	11	13	22	104
29081	7.6	0.21	12000	0.001	18000	24500	9.1	10	20	99
29126	7	0.2	8000	0.01	16000	23200	6.4	6.6	7	66
29178	194	29	8000	0.09	3000	2500	54	25	40	177
29179	510	24	22000	0.92	10000	9300	87	29	92	294
29180	780	23	23000	0.92	44000	29000	65	24	67	327
29181	560	21	17000	1.59	3000	7300	194	22	85	160
29182	34	1.1	20000	0.6	17000	23200	25	24	50	201
29183	226	56	15000	0.26	5500	9200	28	15	185	953
29184	52	3	21000	0.02	21000	21800	35	31	84	274
29185	497	79	5000	0.17	3000	1200	16	7.7	42	129
29186	7	0.3	8000	0.005	17000	23400	9.6	6.1	7	65
29187	360	58	6000	0.21	5000	2800	14	8.5	58	54
29188	8.4	0.17	10000	0.002	15000	27200	8.2	5.8	33	126
29189	19	1.1	24000	0.002	16000	19300	27	27	47	198
29190	28	2.5	23000	0.008	12000	15600	24	42	102	290
29191	116	6.2	28000	0.06	18000	9170	34	30	123	238
29192	11	0.21	13000	0.003	16000	23700	16	13	30	112
29193	39	3.3	6000	0.004	1100	470	13	14	30	10
29194	144	5.5	38000	0.02	10000	11100	37	59	136	903
29195	7.2	0.31	28000	0.004	5000	3700	31	35	61	402
29203	2125	140	49000	2.03	27000	11000	66	57	200	716
29205	2278	99	68000	1.78	14000	6200	1228	64	659	706
29206	87000	5000	139000	35	78000	5600	1774	433	2420	1125
29208	8158	484	15000	15.3	10000	6160	172	11	84	124
29211	21500	10700	171000	9.1	3000	72000	510	240	2543	595
29213	5462	204	68000	6.44	14000	3830	112	75	393	1455
29221	5144	185	76000	2.75	12000	8300	115	92	432	1169

Table 8-2. Soil sample descriptions from all samples analyzed in 2000 field season. Refer to other documents for further sample descriptions.

Sample Number	Location	Area	Field Duplicate	Tag Number	Depth [cm]	Sample Description
29072	pump house	Great Slave Cruising Club			0-10	grey gravel sand/fill
29073	pump house	Great Slave Cruising Club		29072	20-25	greenish grey clay mixed with gravel
29074	next to building	Great Slave Cruising Club			0-10	consistent brown clay with red brown streaks
29075	between boats	Great Slave Cruising Club			0-10	medium brown sand with rocks
29076	forested area	Great Slave Cruising Club			3-7	clay
29077	forested area	Great Slave Cruising Club		29076	10-20	till/fine sand, organic at 7-10cm
29078	Niven Lake Residential	City			0-10	medium to light brown sand with gravel
29079	Doornbos Park	City	29080		0-20	sand
29080	Doornbos Park	City	29079		0-20	sand
29081	School Draw Park	City			0-20	sand
29126	Con Mine playground (sandbox)	Con Mine town site			0-15	medium brown sand with scattered gravel
29178	North point, NE side	Ndilo			0-10	black organic
29179	W side, end of culvert ac. 213	Ndilo			0-10	black/dark brown organic with roots
29180	W side, end of culvert ac. 213	Ndilo			0-10	black/dark brown organic with roots
29181	North point, NW side	Ndilo			0-15	black organic/humic, wet, roots, boggy
29182	N of boat launch (200 lot)	Ndilo			0-15	medium brown sand with small cobble
29183	SW end, between 99 lot and road	Ndilo			0-7	black organic with root
29184	Turner road, 6 lot	Ndilo			0-10	black sand with some root, gravel
29185	Top of hill, E side	Ndilo			0-7	humic and black organic
29186	Older Playground	Ndilo			0-15	light brown sand
29187	S border, part of 909 lot	Ndilo			2-10	black organic
29188	N of dock, behind firehall	Dettah			0-15	large cobble and medium brown sand
29189	SW part, btwn LL and MM	Dettah	29190		0-7	dark brown with root
29190	SW part, btwn LL and MM	Dettah	29189		0-7	dark brown with root
29191	SE part, near W and dock at cul-de-sac	Dettah			0-8	black/brown organic with roots
29192	playground behind school	Dettah			0-10	sand with few threads of blue rope
29193	NE part, between S and R	Dettah			2-15	black organic with lots of roots
29194	On hill, near K and J	Dettah			0-7	black organic with fractured bedrock
29195	W side of main road, N part	Dettah			0-10	wet sandy gravel
29203	Assay office	Giant Mine			0-10	grey clay
29205	Reagent warehouse	Giant Mine			0-10	grey brown fill
29206	Next to Roaster	Giant Mine			0-10	white residue on top 5mm, red brown sandy clay
29208	Next to baghouse	Giant Mine			0-10	light brown sand
29211	E of Mill	Giant Mine			0-10	red brown sand
29213	Under overhead conveyor	Giant Mine			0-10	rock from crusher
29221	Next to main office parking lot	Giant Mine			0-10	grey gravel sand/fill

Precision/Repeatability

External monitoring of precision was performed by the analysis of soil sample field duplicates. These samples were homogenized in the field and then split and submitted blind to the laboratory for analysis. Four soil field duplicates from were analyzed and results are presented in Table 8-5. Average relative standard deviations or coefficients of variation (standard deviation divided by the mean) for sample pairs were expressed as percentages and used to evaluate laboratory precision. Acceptable limits are generally considered to be less than 30% relative standard deviation, with 20% or less considered good agreement. Four were analyzed average relative standard deviations for copper (11%), nickel (13%) and manganese (9.5%) were below 20% indicating good agreement between duplicates. Zinc was just above the good agreement level but within the acceptable level at 25%.

Internal monitoring of precision was carried out by ASU through the use of analytical replicates. Six soil samples were analysed in duplicate (Table 8-6). Average relative standard deviations for nickel, zinc, and manganese were below 10%, indicating excellent agreement. The average RSD for copper (18%), although higher, was still within a level considered for good agreement.

QA/QC for Inorganic Analysis by Neutron Activation Analysis – Royal Military College Analytical Services Group (ASG)***Accuracy***

Accuracy was monitored internally by ASG using NRC Canada Marine Reference Sediment MESS-2 and GSS5 soil from the Peoples Republic of China. Six reference standards were analyzed for arsenic, antimony, iron, gold, sodium and potassium (Table 8-3). These were run concurrently with sample batches throughout the analytical program. Good agreement with the certified values was obtained for all elements.

Six blank samples were run with the soil samples and results are presented in Table 8-4. All elements in the blanks were consistently below detection limits.

Precision/Repeatability

Precision was monitored externally by ESG using four pairs of soil sample duplicates; these were homogenized in the field and submitted blind as separate samples to ASG for analysis. The results are presented in Table 8-5. Average relative standard deviations for five of the six elements were below 30%, indicating satisfactory agreement. Antimony

Table 8-3: Summary of Inorganic Analysis Results for Soil Internal Standards.

Element	MESS-2 Certified Value	NAA Results Determined Value (n=6)	GSS5 Certified Value	NAA Results Determined Value (n=6)	ICP-OES Results Determined Value (n=6)
As [ppm]	20.7	22±1.1	412	427±13	
Sb [ppm]	1.09	1.2±0.3	35.4	40±4.1	
Fe (%)	4.35	4.6±0.21	8.8	8.8±0.1	
Au [ppm]		<0.01		0.26±0.04	
K (%)			1.2	1.2±0.1	
Na (%)			905	725±78	
Cu [ppm]	39.3				33 ±1.1
Ni [ppm]	49.3				40 ± 1.0
Zn [ppm]	172				149 ±5.7
Mn [ppm]	365				307 ± 17

Table 8-4. Summary of Blank Analysis Results for Soils.

	As [ppm]	Sb [ppm]	Au [ppm]	Fe(%)	K (%)	Na (%)	Cu [ppm]	Ni [ppm]	Zn [ppm]	Mn [ppm]
Blank	<0.05	<0.2	<0.003	<0.3	<0.6	<0.05	<3.0	<5.0	<15	<10
Blank	<0.05	<0.2	<0.003	<0.3	<0.6	<0.05	<3.0	<5.0	<15	<10
Blank	<0.05		<0.003	<0.3	<0.6	<0.05	<3.0	<5.0	<15	<10
Blank	<0.05	<0.2	<0.003	<0.3	<0.6	<0.05	<3.0	<5.0	<15	<10
Blank	<0.05	<0.2	<0.003	<0.3	<0.6	<0.05	<3.0	<5.0	<15	<10
Blank	<0.05	<0.2	<0.003	<0.3	<0.6	<0.05	<3.0	<5.0	<15	<10

Table 8-6. Lab Duplicate Samples for Inorganic Analysis

Sample Number	As ug / g	Sb ug / g	Fe ppm	Au ug / g	K % by weight	Na % by weight	Cu ug / g	Ni ug / g	Zn ug / g	Mn ug / g
29022	3.91	0.76	1.49	<0.0040	1.67	2.357	7.9	7.7	15	95
29022, Dup	3.74	0.161	1.04	<0.0034	1.64	2.414	7.6	7.6	16	95
Average	3.83	0.46	1.27	N/A	1.66	2.39	7.72	7.67	15.77	N/A
Standard Deviation	0.12	0.42	0.32	N/A	0.02	0.04	0.19	0.07	0.41	N/A
Relative Std Dev (%)	3.14	91.98	25.15	N/A	1.28	1.69	2.51	0.92	2.62	N/A
29078	40.63	1.05	2.43	<0.007	1.86	3.071	19.1	18.6	28	188
29078 Dup	28.98	0.754	1.89	<0.0085	1.65	2.379	18.8	18.4	26	192
Average	34.81	0.90	2.16	N/A	1.76	2.73	18.95	18.50	26.91	189.62
Standard Deviation	8.24	0.21	0.38	N/A	0.15	0.49	0.25	0.10	1.25	2.66
Relative Std Dev (%)	23.67	23.20	17.68	N/A	8.46	17.96	1.31	0.52	4.64	1.40
29183	227	54	1.5	0.25	0.6	0.92	29.3	15.8	186	978
29183 Dup	224	59	1.5	0.28	0.5	0.92	26.9	15.1	184	928
Average	225.50	56.50	N/A	0.27	0.55	N/A	28.11	15.47	185.22	953.20
Standard Deviation	2.12	3.54	N/A	0.02	0.07	N/A	1.70	0.52	1.43	35.25
Relative Std Dev (%)	0.94	6.26	N/A	8.00	12.86	N/A	6.03	3.39	0.77	3.70
29189	17.51	1.049	2.4	<0.0054	1.37	1.968	12.7	26.1	43	189
29189 Dup	20.12	1.08	1.08	<0.0051	1.89	1.89	40.7	27.9	50	208
Average	18.82	1.06	1.74	N/A	1.63	1.93	26.67	27.02	46.56	198.45
Standard Deviation	1.85	0.02	0.93	N/A	0.37	0.06	19.77	1.24	5.11	13.58
Relative Std Dev (%)	9.81	2.06	53.64	N/A	22.56	2.86	74.15	4.61	10.97	6.84
29193	Not run in Dup	Not run in Dup	Not run in Dup	Not run in Dup	Not run in Dup	Not run in Dup	12.9	13.1	29	11
29193 Dup							14.1	14.1	32	10
Average							13.49	13.62	30.06	10.40
Standard Deviation							0.80	0.69	2.19	0.64
Relative Std Dev (%)							5.91	5.10	7.30	6.14
Average RDS	9.39	30.87	25.00	8.00	11.29	7.50	17.98	2.91	5.26	4.52

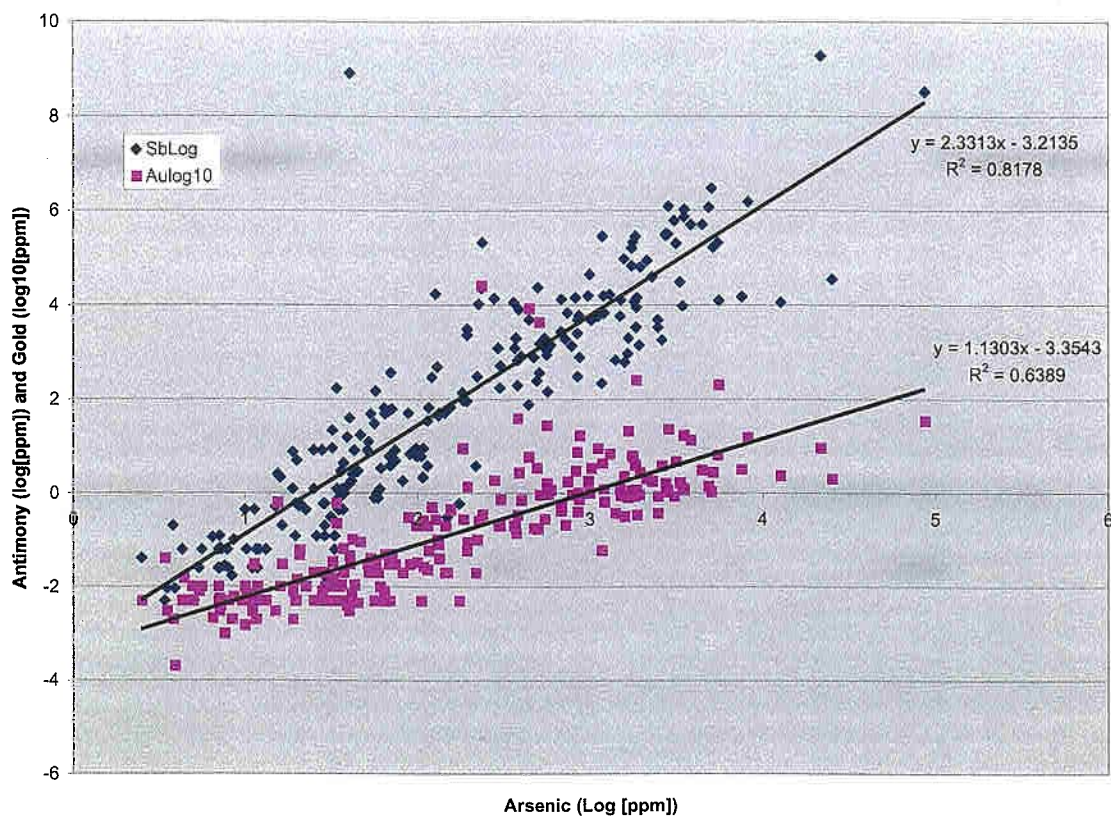


Figure 8-1. Linear regression between arsenic and the two elements antimony and gold.

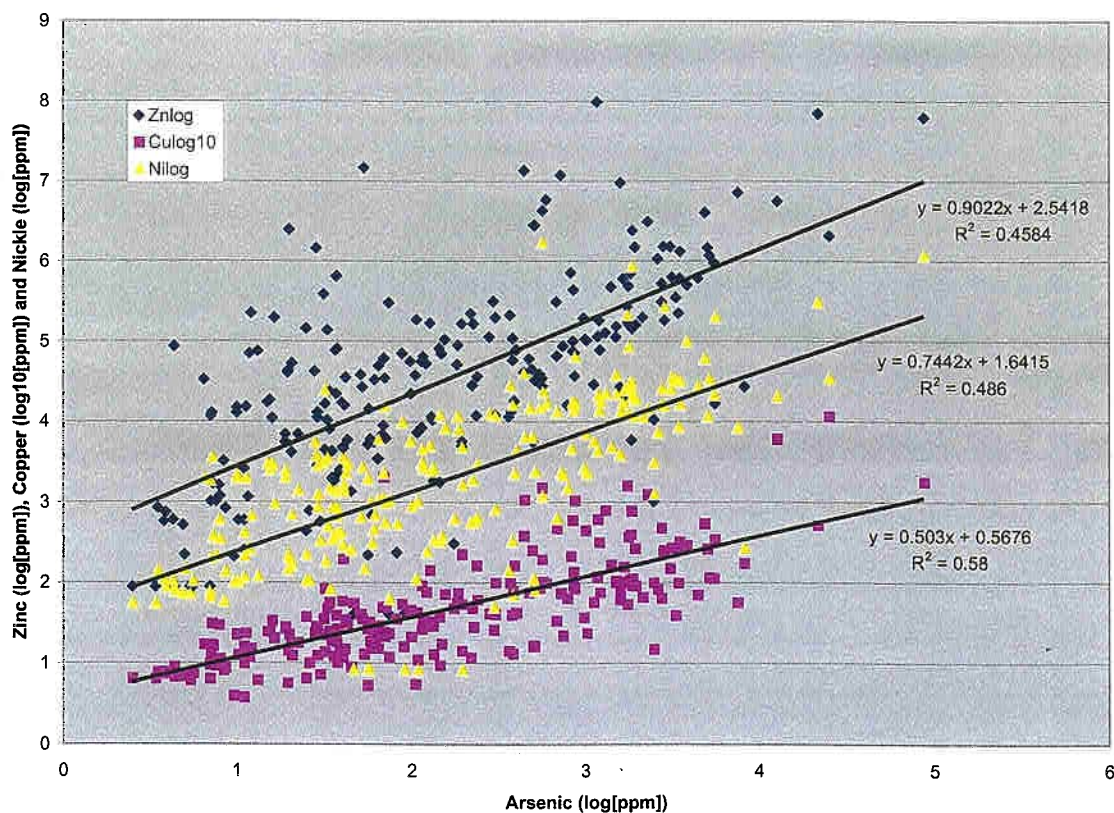


Figure 8-2. Linear regression between arsenic and the three elements zinc, copper and nickel.

Table 8-7. All soils, sediments and tailings locations in PCA and T-test

Green Ellipse		Red Ellipse		Below -1 on Y Axis		Outliers	
Sample Location	As [ppm]	Sample Location	As [ppm]	Sample Location	As [ppm]	Sample Location	As [ppm]
1G	6	10G	278			29206	87000
26G	65	16G	1764	1	61	29208	8158
29G	114	17G	1946	2	37	29211	21500
3	56	18G	2538	13	74	35	25000
4	58	19G	3921	20	54	29180	780
5	8	20G	1738	34	121	84	68.6
6	26	21G	1193	39	57		
7	33	22G	1825	43	506		
8	29	23G	88	44	372		
9	7	24G	41	45	294		
10	105	25G	302	48	82		
11	5	27G	738	51	47		
12	31	28G	974	52	34		
14	20	30G	3494	54	443		
15	35	30G	238	55	379		
16	37	31G	4842	58	193		
17	51	32G	3072	57	90		
18	148	33G	1738	67	676		
19	4	34G	2808	68	235		
21	12	35G	2740	83	108		
22	59	36G	2730	97	387		
23	107	37G	3301	108	99		
24	38	38G	3480	29178	194		
25	20	39G	4431	29181	560		
26	11	3G	1016	29185	497		
27	13	44G	1919	29187	380		
28	11	45G	1643	29193	39		
29	33	4G	3140				
30	42	8G	194				
31	133	33	7500				
32	16	38	12600				
40	29	37	1165				
42	300	38	69				
46	174	41	2472				
47	114	49	5028				
62	21	50	3433				
69	218	53	2461				
70	74	58	1580				
71	30	59	581				
73	12	60	566				
74	10	61	41				
86	61	63	1860				
88	16	64	994				
94	130	65	850				
99	11	66	717				
100	21	72	29				
101	98	75	2600				
103	40	76	1400				
105	25	77	491				
106	10	78	885				
107	38	79	560				
29012	3	80	440				
29013	4	81	1660				
29014	3	82	1840				
29015	9	85	5560				
29016	4	87	162				
29017	4	89	380				
29018	4	90	1110				
29019	5	91	1571				
29020	5	92	1175				
29021	6	93	681				
29022	4	95	1300				
29023	132	96	840				
29024	7	98	820				
29025	29	102	155				
29033	16	104	184				
29038	23	29047	127				
29048	7	29053	1800				
29049	10	29055	222				
29050	10	29056	1204				
29051	32	29057	366				
29052	15	29058	1850				
29054	45	29063	1500				
29059	71	29064	1490				
29060	68	29065	544				
29061	40	29071	845				
29062	37	29072	471				
29066	145	29073	861				
29067	36	29179	510				
29068	32	29183	228				
29069	25	29203	2125				
29070	20	29205	2278				
29074	19	29213	5462				
29075	43	29221	5144				
29076	56						
29077	64						
29078	35						
29079	12						
29080	8						
29081	8						
29126	7						
29182	34						
29184	62						
29186	7						
29188	8						
29189	19						
29190	28						
29191	116						
29192	11						
29194	144						
29195	7						
mean	41.9	mean	1687	mean	231		
std dev	50.6	std dev	2173	std dev	194		
median	25.5	median	994	median	157		
range	2.5-300	range	29-12600	range	34-676		



NWT Open File 2017-03

**Regional distribution of arsenic in near-surface soils in the
Yellowknife area**



H.E. Jamieson, K.M. Maitland, J.T. Oliver, and M.J. Palmer

**NORTHWEST TERRITORIES
GEOLOGICAL SURVEY**

Government of
Northwest Territories

Cover Image:

The general surrounding landscape of the Yellowknife area.

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Abstract

The objective of this NWT Open File is to report the concentration of arsenic and other elements in 479 near-surface soil samples collected within 30 km of Yellowknife in 2015, 2016, and 2017. For this research, the soil samples were cored from locations that were undisturbed by buildings, roads, mining or other visible human activities to minimize the influence of recent post-mining activities and examine the effect of natural processes and the legacy of airborne emissions from former ore roasting. Sampling targeted four distinct terrain units: outcrop soils, forest canopy soils, forest canopy outcrop soils, and peatland soils. Most of the analyses have been done on the Public Health Layer, which is defined as the top 5 cm of material. The arsenic concentration in outcrop soils ranged from 3.5 mg/kg to 3000 mg/kg arsenic with a median of 165 mg/kg. The arsenic concentration in the forest canopy soils ranged from 1.0 mg/kg to 1300 mg/kg with a median value of 38 mg/kg. The arsenic concentration in the forest canopy outcrop soils ranged from 2.1 mg/kg to 4700 mg/kg with a median of 150 mg/kg. Finally, the arsenic concentration in peat soils ranged from 2.9 mg/kg to 3400 mg/kg of arsenic with a median of 95.5 mg/kg. Forty soil samples collected from below the Public Health Layer (approximately 10 cm to 40 cm below the surface) were analysed and are lower in total concentration of arsenic than the corresponding samples from the Public Health Layer, with the exception of two samples. Arsenic concentrations are highly variable at the local and regional scale, and even vary between field duplicates, likely due to the uneven distribution of arsenic-rich minerals in the soil samples, which were unsieved and unground. Statistical analysis indicate that the distance and direction from the former ore roasters, soil depth, elevation and terrain type influence total arsenic concentration.

Introduction

The Yellowknife Greenstone Belt was one of the most productive and profitable gold districts in Canadian history, with the Giant and Con mines producing approximately 13 million ounces of gold (Bullen and Robb 2006; Moir *et al.* 2006). The production of this gold resulted in the deposition of arsenic-bearing materials on the mine properties and beyond through tailings spills, the use of waste rock for construction, and aerial deposits from the roaster stack emissions.

The gold-bearing arsenopyrite (FeAsS) ore was roasted as a pretreatment for cyanidation, creating sulfur dioxide and arsenic vapour, some of which was released into the surrounding environment through roaster stack emissions and condensed to arsenic trioxide (As₂O₃) dust (Walker *et al.* 2005 and references therein; Jamieson 2014). It is estimated that more than 20 000 tonnes of arsenic trioxide dust were released into the surrounding area via roaster emissions at Giant Mine between 1948 and 1999 (Wrye 2008). Annual emissions exceeded 7500 tonnes of arsenic trioxide dust per year between 1949 and 1951 and approximately 86 % of total arsenic trioxide emissions were released prior to 1963 at Giant Mine (Wrye 2008). After the installation of more efficient

technologies in 1951, arsenic trioxide emissions were gradually reduced and by the 1990s less than 4 tonnes per year were being released into the surrounding environment until roasting ceased in 1999 (Wrye 2008). Arsenical gold ores were also roasted at the nearby Con Mine (1938—2003), but this ceased in 1970 as ores extracted from deeper in the mine became more free-milling and less refractory (Walker *et al.* 2015). Pressure oxidation, which does not produce stack emissions, was used instead of roasting to process the refractory ore in the early 1990s (Wright 1992). From 1948—1970, approximately 2500 tonnes of arsenic trioxide were released to the atmosphere as stack emissions from the Con Mine roaster (Hocking *et al.* 1978). Despite high emissions in the early years of the two mines, most of the arsenic trioxide dust produced during the operation of both mines was captured. At Giant, 90 % of the dust is currently stored in underground chambers, whereas at Con, the arsenic trioxide was treated on site, integrated with tailings, or sold (Hauser *et al.* 2006).

This report focuses on the concentration of arsenic in soils beyond the mine properties and within 30 km of the City of Yellowknife. Arsenic in lake waters and lake sediments in the Yellowknife region has been examined by (Palmer *et al.* 2015) and (Galloway *et al.* 2015) respectively. The overall objective of this project is to determine, where present, the legacy contamination from aerial roaster stack emissions and the natural arsenic concentrations occurring as a result of bedrock weathering and glacial transport. Areas where arsenic may have been introduced to (or removed from) the soil via other activities such as transport of waste rock and application of fill materials were avoided, as were areas with obvious high public use. Based on evidence that arsenic concentration in soil affected by stack emissions declines rapidly with depth (Hocking *et al.* 1978; Bromstad *et al.* 2017), and since there is a concern regarding exposure of humans to these soils, most samples were collected by coring the Public Health Layer (0 cm to 5 cm; Rencz *et al.* 2011), with only larger pebbles and fragments of plant material removed. The effect of terrain type, including the presence of a forest canopy, distance and direction from the former ore roasters, and elevation have been examined. The distinction of anthropogenic (roaster-generated) arsenic-hosting solid phases from natural arsenic-hosting soil materials can be determined using advanced mineralogical methods, and has been reported for soils on the Giant Mine property (Bromstad *et al.* 2015, 2017). These methods will be applied to a subset of the soils described in this report and the results released in a future publication. This research is part of two Master of Science (M.Sc.) projects by Kirsten Maitland and Jonathan Oliver at Queen's University, supervised by Dr. Heather Jamieson. When completed, the M.Sc. theses will be published online through the Queen's University library.

Previous Research on Soils in the Yellowknife Region

Hocking *et al.* (1978) collected soil samples from 52 sites within 40 km of Giant and Con mines as part of a study instigated by the federal government in response to public concern, and demonstrated that arsenic concentrations were very high near the roasters (hundreds to thousands of mg/kg arsenic with one sample at more than 20 000 mg/kg arsenic) and decreased rapidly with soil depth and distance from the two mines. The

authors indicated that the distribution pattern was consistent with attribution to the two gold roasters. Hutchinson *et al.* (1982) reported similar results within 15 km, and particularly high arsenic concentrations in the top 2 cm of soil near the roasters. Kerr (2006) documents a comprehensive study of till (from 10 cm to 70 cm depth), humus and leaf litter in the Yellowknife area, and discusses the influence of soil depth, bedrock type, mineralization and the legacy of roaster emissions. The arsenic concentrations for the clay and silt fraction of the buried tills sampled by Kerr (2006) are not directly comparable with the shallower soils collected by the other studies reviewed here, and nor are they directly comparable with this report. However, Kerr (2006) reports several soil profiles and compares arsenic concentrations in the tills with overlying humus and leaf litter, concluding that those profiles taken near Giant and Con mines show evidence of airborne contamination. St. Onge (2007) collected soil samples (0 cm to 30 cm depth) from 12 sites within 40 km of the former mines and found a decline in arsenic concentration with distance.

Bromstad *et al.* (2017) summarizes the results of two M.Sc. theses completed at Queen's University (Wrye 2008; Bromstad 2011) on the speciation (mineral form) of arsenic in soils on the Giant Mine property. The soil samples were taken in undisturbed areas away from mine infrastructure and activities. Given that the Giant Mine property is approximately 5 km long in a north-south direction and 1 km to 2 km wide, these results provide useful data on the proximal distribution of arsenic in soils in the region. The results of Bromstad *et al.* (2017) indicate that near-surface undisturbed soils on this mine property contain up to 7700 mg/kg arsenic, and the highest concentrations are in pockets of soil on bedrock outcrops. Examination of soil samples using scanning electron microscopy (SEM) and synchrotron-based microanalysis showed that the most common arsenic hosts in the soils are arsenic trioxide and roaster-generated iron oxide (maghemite and hematite). Bromstad *et al.* (2015) presents arsenic concentration analysis results of 360 soil samples collected from the Giant Mine property, which confirms earlier results based on 40 samples taken for the M.Sc. theses in 2007 and 2010 and summarized in Bromstad *et al.* (2017). Coring soil samples instead of using grab samples proved extremely useful to determine the variation of arsenic concentration with depth. Results indicate that the top soil horizons (usually 0 cm to 5 cm depth) at a given sample site typically had the most arsenic for that site compared to samples collected from depths up to 100 cm (highest value 17 000 mg/kg As – see Figure 1). These results have important implications for interpreting the results of previous soil sampling studies, of the area where soil samples were, in some cases, taken over larger depth intervals (the top 20 cm to 30 cm) and then combined. SEM with automated mineralogy software was used to find and determine the relative proportions of arsenic hosts in 50 samples (Bromstad *et al.* 2015). Arsenic trioxide was present at every sample site and is the dominant host in many of the samples. In the two studies (Bromstad *et al.* 2015, 2017), there appears to be a relation between the dominant wind direction and the highest arsenic soil concentrations, but this is difficult to quantify in the relatively small and elongated area of the mine property. Van Den Berghe *et al.* (2016) collected several near-surface soil samples on outcrops near lakes within 3 km of the western boundary of the Giant Mine property and identified the presence of arsenic trioxide in those samples.

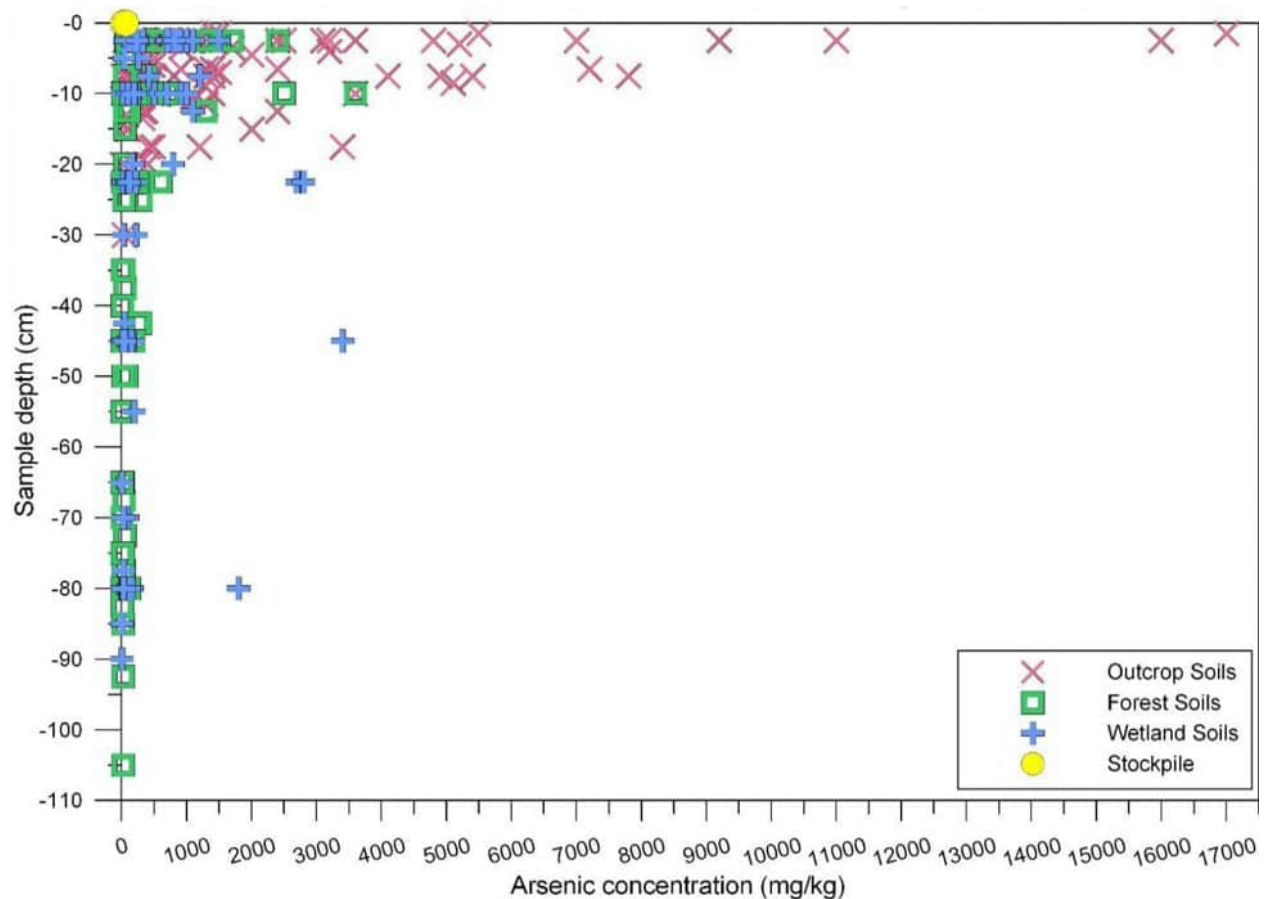


Figure 1. The variation of arsenic concentration in soil sample types (outcrop, forest, wetland, and stockpile) at sample mid-point depths on the Giant Mine property (from Bromstad *et al.* 2015).

Geology and Physiography of the Study Area

The study area, similar to that described by Palmer *et al.* (2015) and Galloway *et al.* (2015), is located along the southern edge of the Canadian Shield Slave Structural Province in the Northwest Territories. The Slave Structural Province hosts a number of gold deposits, with the largest deposits, including both Giant and Con, residing within the Yellowknife greenstone belt (YGB). The greenstone belt is a linear, north-south-trending formation located between the Western Plutonic Complex of the Deception Plutonic Suite to the west and the Duncan Lake Group metaturbidite basin that conformably overlies the Yellowstone greenstone belt to the east (Siddorn *et al.* 2006). A map illustrating the occurrence of these simplified rock units throughout the study region can be found in Figure 2. The YGB consists of a northeast striking, southeast dipping and facing homocline, of mafic volcanic and intrusive rocks belonging to the Kam Group (2.72–2.70 Ga), intermediate metavolcanic and intrusive rocks of the Banting Group (2.66 Ga), as well as conglomerates and sandstones of the Jackson Lake Formation (2.60 Ga) tectonically emplaced between the two

former groups. Archean deformation zones consisting of hydrothermally altered and deformed sericite- or chlorite-rich rocks with or without schistosity, crosscut the Kam Group, and host the Giant and Con gold deposits (Siddorn *et al.* 2006).

The study area lies in the Great Slave Uplands and Great Slave Lowlands of the Taiga Shield High Boreal Ecoregion (Ecosystem Classification Group 2009), which is characterized by elevated bedrock terrain interspersed with small areas of forest and peat. During the last period of glaciation (8000 to 12 000 years ago), Glacial Lake McConnell covered most of the study region and deposited silts and clays, which now infill many of the topographic depressions throughout the Great Slave Lowlands (Wolfe and Morse 2015).

Prevailing wind directions and wind speeds likely influence the distribution of roaster emissions throughout the study area (Bromstad *et al.* 2017). Wind measurements taken at the Yellowknife Airport indicate the dominant wind direction is from the east (34 %), while smaller wind components exist from the south-southeast (25 %), and from the northwest (23 %) (Pinard *et al.* 2008). Figure 2 shows the calculated mean wind directions at the Yellowknife Airport between 1953 and 1999, indicating wind energy is predominately generated from the east and southeast. East winds are dominate for most of the year, but not the summer. In June, July, and August, winds regularly originate from the South (Environment Canada 2017). Over a ten-year period, the mean annual wind speed measured at the Yellowknife Airport weather station was 3.28 m/s (Pinard *et al.* 2008).

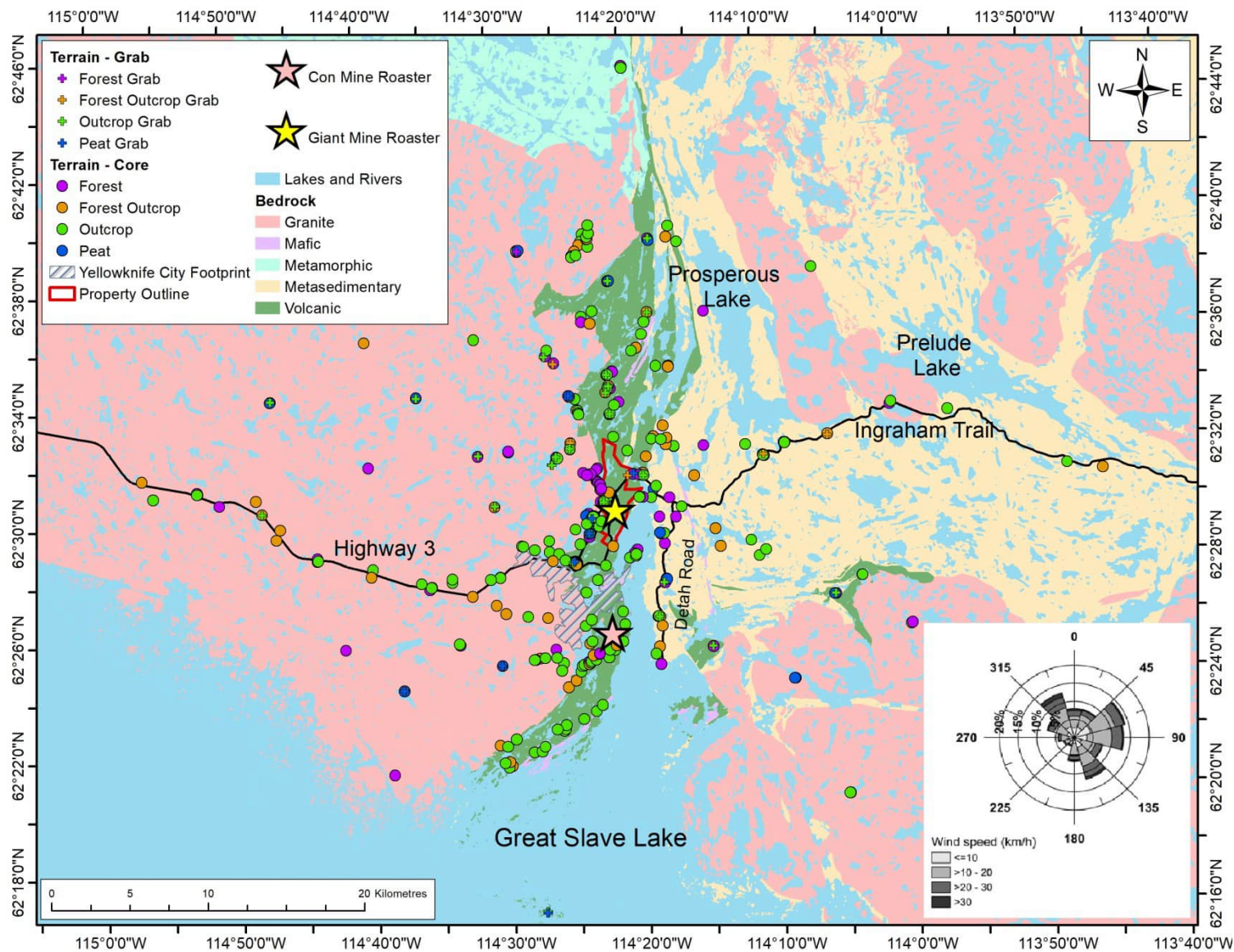


Figure 2. Soil sampling locations in the Yellowknife area. The inset shows the frequency of wind direction and corresponding wind speed at the Yellowknife airport (1953–1999). Data from Environment Canada (2017).

Soil Sampling and Analytical Methods

Sampling Protocol

During the summers of 2015, 2016, and 2017, 479 soil samples were collected from within a 30-km radius of the City of Yellowknife (sample locations are shown in Figure 2; coordinates provided in Appendix A—Table A1). The objective of the regional soil sampling survey was to collect a large quantity of samples from undisturbed sites throughout the study region from a variety of terrain units. Target areas for sampling were selected based on: (1) the distance from the former Giant and Con Mine roasters, (2) the direction from the roasters with respect to prevailing wind direction, and (3) the location of past or ongoing research.

Within each target area, soils were sampled from the four terrain units to observe how terrain impacts arsenic variation on a local scale. The four primary units sampled were: forested canopy outcrop soils, outcrop soils, forested canopy soils, and peatlands. It was recognized that accumulation of arsenic may differ within soils of different terrain types through differences in canopy interception, plant uptake, erosional transport, and soil properties (e.g., Bromstad *et al.* 2017). Forested canopy outcrop soils were collected from soil pockets located on exposed rock outcrops with significant tree canopy cover. These samples were often located at higher elevations and had numerous trees growing within the soil pockets. Outcrop soils were defined as soil pockets with little to no tree canopy cover. These sample locations were also often located at higher elevations, and contained vegetation in the form of small willow trees, juniper bushes, or long grass. Forested canopy soils were obtained from areas with dense tree canopy cover, often in low-lying areas. Peat samples were collected from peatlands and collapsed peatland areas also referred to as fens.

Bypass Road target area (BP, n=155)

Samples in this target area were retrieved from sites near the new Giant Mine Bypass Road, which was built in 2014 to re-route the Ingraham Trail. Areas with surface rock fragments that appeared to be sourced from blasting during construction of the road were avoided. These samples are close to the Giant Mine Property, often within less than 1 km to 2 km from the former roaster.

Detah Road target area (n=18)

Samples were collected along the Detah road. One sample taken in this target area was retrieved directly within the Detah community, amongst the willow trees next to the community gardens.

Ndilq target area (n=5)

Soil samples were retrieved throughout Ndilq with the help of community members. Areas that were likely to be the least disturbed by human activities were chosen.

TerraX Properties – Northbelt (n=42) and Southbelt (n=20) target areas

TerraX Minerals Inc. has led recent renewed interest in gold exploration within the YGB. Exploration efforts are occurring in the TerraX Northbelt and Southbelt properties (TerraX, 2017). The TerraX Northbelt is located directly north of the Giant Mine Property, and samples were collected at this site around Landing and Vital lakes, as well as at Berry Hill. The Southbelt property is located south of Yellowknife in the YGB along the shore of Great Slave Lake.

Ingraham Trail target area (n=22)

The Ingraham Trail, a public highway east of Yellowknife, was used to access sampling sites not located downwind from the predominant wind direction of the roasters, up to 30 km from the mining and processing operations.

Highway 3 target area (n=28)

Highway 3, west of Yellowknife, was used to access sampling sites downwind from the roasters and away from the mine properties.

City of Yellowknife target area (n=9)

Samples collected within the City of Yellowknife in areas not belonging to a specific target area are in this group. Samples were taken in undisturbed areas and, as much as possible, away from human activity.

Long Lake target area (n=8)

Long Lake is a recreational area for local community members and tourists visiting Fred Henne Territorial Park. The area is also subject to other current research projects focused on the fate, transport, and mobility of arsenic in lake sediments (Schuh *et al.* 2017).

Samples were retrieved within 15 m to 175 m of the lake to assist in risk assessment studies, in addition to drawing connections between terrestrial and aquatic systems.

Martin Lake and nearby previous research sites target area (n=22)

Previous research completed by Van Den Berghe (2016) focused on the mobility and speciation of arsenic in lake sediments in three research lakes located to the west of the Bypass Road: Lower Martin Lake, BC-20 and Handle Lake. In an attempt to link previous lake sediment research to ongoing terrestrial investigations, soil samples were retrieved near these three lakes. Samples collected near Gar Lake are also included in this group.

Kam Lake target area (n=34)

Kam Lake is located south of Yellowknife, close to the former Con Mine, which also operated a roaster during the early years of mining. This is currently an area of residential, industrial and recreational use.

Hay Lake target area (n=6)

Hay Lake is accessed from the Ingraham Trail, approximately 2 km from the Detah Road. Hay Lake and the surrounding area are used for subsistence and recreational purposes by local community members.

Yellowknife River target area (n=12)

Soil sampling was completed along the Yellowknife River. The river is a popular recreational area and has been used by the local Dene people as a means of travel to remote fishing and trapping locations for centuries. The river extends to the north and east of the mine properties.

North of Giant Mine Property (n=32)

These samples were obtained using a helicopter to access areas around Duckfish Lake, Homer Lake, Chan Lake and Icing Lake. Some samples that were obtained north of the mine properties, but did not fall within the TerraX Northbelt were also included in this target area.

Distal East and Southeast Sites (n=11)

Helicopter access was required to sample distal locations east and southeast of the mine properties near Duck Lake and Mason Lake.

Distal Southwest and West Sites (n=11)

Samples sites greater than 15 km from Yellowknife in the westerly and southwesterly directions. Sites were accessed by helicopter.

Mirage Islands (n=3)

Three samples (one outcrop, one forest and one peat) were collected on the Mirage Islands, located at the mouth of Yellowknife Bay, south of the Giant and Con mine properties.

Sample Collection Methods

Soil cores, ranging from 4.9 cm to 40 cm in length, were collected so that they could be examined and subsampled at various depths. During the summer of 2015, multiple soil samples of similar terrain units were collected along the Bypass Road and from one outcrop soil pocket on Vital Lake, to test for variability at the local scale. Two grids of detailed sampling were also completed in the summer of 2016; one grid near Fred Henne Provincial Park and the second grid collected along the Giant Mine Bypass Road. Soil cores were retrieved with aluminum tubing (outside diameter of 5.08 cm) that was driven into the soil surface using a drive-head and a sledgehammer. To account for soil compression resulting from this method of sampling, the distance from the top of the core tube to the soil surface, and the top of the core to the sample surface was measured and corrections made accordingly. Peat cores were obtained by using a shovel to remove a section of material approximately 3000 cm³ to 5000 cm³ in size. A sharp knife or saw was then used to cut into the peat and extract a smaller core sample, which covered a surface area of approximately 10 cm², and extended the total depth of the previously removed material. In areas where core samples were not feasible due to a thin soil cover, and depth control was difficult to achieve due to local conditions, grab samples were retrieved at varying depths using a trowel. Outcrop, forest, and forest outcrop grab samples ranged between 3 cm and 14.5 cm in depth. Peat grab samples were taken down core in some areas where natural

transitions within the peat occurred; these samples ranged between 10 cm and 40 cm in depth. All sampling equipment was cleaned between sample sites. Cores and grab samples were frozen for transport back to Queen's University and kept frozen prior to lab preparation.

Soil samples from 2016 and 2017 were collected with a lead weight to drive the aluminum tubes into the ground instead of a drive-head. This resulted in elevated lead and antimony values compared to the 2015 samples, indicating contamination from the weight, thus the lead and antimony values are removed from the table of results (Appendix A—Table A1).

Sample Preparation

Samples were prepared and sub-sampled for analysis at Queen's University. The aluminum core tubes were placed in a refrigerator kept at 4 °C to defrost, then cut lengthwise using a table saw and carefully separated using a ceramic blade. The tube cutting process resulted in minor contamination of the soil cores by aluminum fragments, and the analytical results for aluminum have been removed from the dataset. Chemical analysis of aluminum tube fragments indicated trace quantities of other elements (Cu, Mg, Fe, Zn, Mn, Ti, V, Ni, and Cr) and thus the results for these have also been removed from Appendix A—Table A1. (Soil compression was calculated prior to sub-sectioning the Public Health Layer (top 5 cm) (Health Canada, 2010). The Public Health Layers were homogenized and divided into sub-samples. Grab samples were homogenized and emptied into plastic trays where they could also be separated into sub-samples. Peat samples were kept frozen prior to being sub-sectioned. A hacksaw was used to remove a 5-cm section representing the Public Health Layer from the top of the peat cores. At 37 locations, samples from greater depths (10 cm to 40 cm) were sub-sectioned from cores of sufficient length to document changes in arsenic concentrations at depth.

Soil Sample Analysis

A portion of each sub-sectioned core and grab sample were submitted for near-total elemental analysis at the Analytical Services Unit (ASU) at Queen's University.

The majority of the soil samples were neither sieved nor ground before analysis, the intention being that they represent the surface material as it might be encountered in the field. Sieving is usually done to compare results to guidelines or other data sets (e.g., Parsons and Little 2015), but our previous work (Bromstad *et al.* 2017) had indicated that arsenic trioxide may be present in a range of grain sizes and it was a priority to capture this solid phase. Moreover, a split of many of the samples will be characterized by scanning electron microscope to identify arsenic-hosting minerals, determine their morphology and degree of liberation, and calculate the distribution of arsenic amongst solid phases, which precludes sieving. Some samples (n=19) were sieved to less than 2 mm and the results are included in Appendix A—Table A1.

A total of 46 grab samples and 433 core samples were submitted for analysis. Samples were digested using aqua regia solution containing hydrochloric acid and nitric acid, at a 3:1 volume ratio. Digestion time was 300 minutes at 90 °C. Inductively coupled plasma - mass spectrometry (ICP-MS) was used to determine gold concentrations, and for antimony at concentrations less than 10 mg/kg. The digestion procedure for gold used a rinse composed of hydrochloric acid/cysteine rinse and standard stabilization method. This method was developed by ASU based on stabilization methods provided in Wang and Brindle (2014) and Wang *et al.* (2014). The remaining elements were analyzed by inductively coupled plasma - optical emissions spectrometry (ICP-OES).

A random selection of 258 samples were air-dried and ground before being analyzed for total organic carbon content using the LECO SC444 method. This method calculates organic carbon by subtracting inorganic carbon, determined by ashing the samples at 475 °C, from the total carbon result. Carbon percentages are determined through the combustion and oxidation of carbon to form carbon dioxide by burning the sample at 1350 °C in a stream of purified oxygen. The amount of evolved carbon dioxide is measured using infrared detection and used to calculate the percentages of carbon in each sample (Nelson and Sommers 1982).

Statistical Analysis

All statistical analyses were performed in Minitab 17. A Kruskal-Wallis test and Dunn's post hoc analysis was performed to compare arsenic concentrations between terrain units. Regression analysis was used to investigate the relationship between arsenic concentration, distance and direction from the Giant Mine roaster, and elevation. All tests were performed at a 95 % confidence interval.

Quality Assurance and Quality Control

Reproducibility

Field duplicates, split samples (two samples taken from the same depth in the same core), and internal laboratory duplicates were all analysed to evaluate sample homogeneity and analytical reproducibility (Appendix B—Table B1). The relative percent difference (RPD), calculated between the original sample (denoted as the parent (P) sample) and the quality assurance/quality control (QAQC) sample, was defined by:

$$RPD = \frac{\text{Absolute value}(\text{Parent} - \text{QAQC})}{\text{Average (Parent, QAQC)}} \times 100$$

Parameters below the analytical detection limit were disregarded for RPD calculations.

Field duplicates (FD) were samples collected in the field as close as possible to the original sampling location and provide an indication of consistency of field methods and sample

homogeneity. The results indicate a high degree of variability among the parent sample and the duplicate sample, with 72 % of the samples (n=29) having an RPD greater than 20 % for arsenic. Field observations and detailed soil descriptions in the laboratory suggest that despite samples being collected in close proximity, generally within less than 1 m, soil characteristics can vary widely and thus contributed to the high degree of variability. Examples of these characteristics include the presence or absence of moss, an organic layer, low-lying vegetation or other ground cover, and grain size distribution. Moreover, any components added to the soil from aerial deposition may not have been deposited homogeneously. Wash-down of contaminants into soil pockets surrounded by bare outcrops would also have contributed to an uneven distribution of elements associated with stack emissions. Given that several of the potential arsenic-hosting solid phases contain large amounts of arsenic (arsenopyrite contains 46 wt.% As and arsenic trioxide contains 76 wt.% As), an uneven distribution of particles would result in a relatively large difference in total arsenic concentration.

Split samples (SS) were prepared by dividing a single sample evenly into multiple samples, and submitting these with unique sample names to the laboratory. This provides an indication of variability within individual samples due to the natural properties of the soil varying at the scale of mm to cm. Although the reproducibility is higher than in the case of the field duplicates, with only 32 % of the samples (n=57) having an RPD for arsenic greater than 20 %, there is variability in the distribution of arsenic at this scale. Lab duplicates (LD) were prepared by ASU. Before analysis, samples for laboratory duplicates were selected at random. Two separate portions of the same sample were extracted, analyzed, and reported separately. Reproducibility was higher than split samples and field duplicates, with only 23 % of the samples (n=62) having an RPD for arsenic greater than 20 %. The generally low reproducibility of the duplicates is probably also due to the fact that the samples were neither mixed nor ground.

Accuracy

Accuracy of analytical results was evaluated by repeated measurements (n=44) of several certified reference materials—purchased soil sample standards (SS-1 and SS-2 from SCP Science, Quebec, and MESS-3 and MESS-4). MESS-3 and MESS-4 soil sample standards are based on the National Research Council Canada (2016) certified values for *Marine Sediment Reference Material for Trace Metals and other Constituents*. ASU's expected result of 18 mg/kg for MESS-3 and MESS-4 is based on an average of results obtained for partial digestion. One RPD for arsenic was 23 %, all others less than 20 % and most less than 10 % (Appendix B—Table B2).

Results and Discussion

Appendix A—Table A1 is a compilation of all the data for the 2015, 2016, and 2017 sampling period, including sample location, terrain type, distance to, and direction from, former ore roasters, elevation, and concentration of all elements reported. Appendix A—Table A2 explains the labels used for sampling.

Regional Variability in Arsenic Concentrations Within the Public Health Layer

Total arsenic concentrations within the Public Health Layer of soils are presented in Figure 3. Arsenic concentrations are indicated as lower than the residential remediation guideline of 160 mg/kg, between the residential and industrial remediation guideline of 340 mg/kg, or above both these concentrations in three higher concentration ranges (GNWT 2003). Concentrations are highest in the area close to the Giant Mine property, including the Bypass Road target area. Elevated concentrations are also observed near the Con Mine property. Arsenic concentrations at sites near the outer perimeter of the sampling area are considerably lower than near the two former mines. Based on the samples collected to date (n=18), 83 % of arsenic concentrations in samples collected along the Detah road were below the residential guideline of 160 mg/kg, ranging from 5.9 mg/kg to 270 mg/kg (median = 54 mg/kg). Arsenic concentrations in Ndilo (n=5) ranged from 130 mg/kg to 280 mg/kg (median = 180 mg/kg); one sample was below the residential guideline and the remaining four samples were between the residential and industrial guidelines. Arsenic concentrations near Long Lake and Fred Henne Territorial Park (n=70) range from 32 mg/kg to 3000 mg/kg, with 33 % of samples below the residential guideline (median = 240 mg/kg). Figure 4 shows the variation of arsenic concentrations in target areas in a box and whisker plot, as well as guidelines. The number of samples in each target area is highly variable and therefore comparisons between target areas should be made with caution. Figure 5 shows arsenic concentrations in the Public Health Layer in undisturbed sites near Yellowknife. In this figure, higher arsenic concentrations are indicated by larger symbols and darker colours.

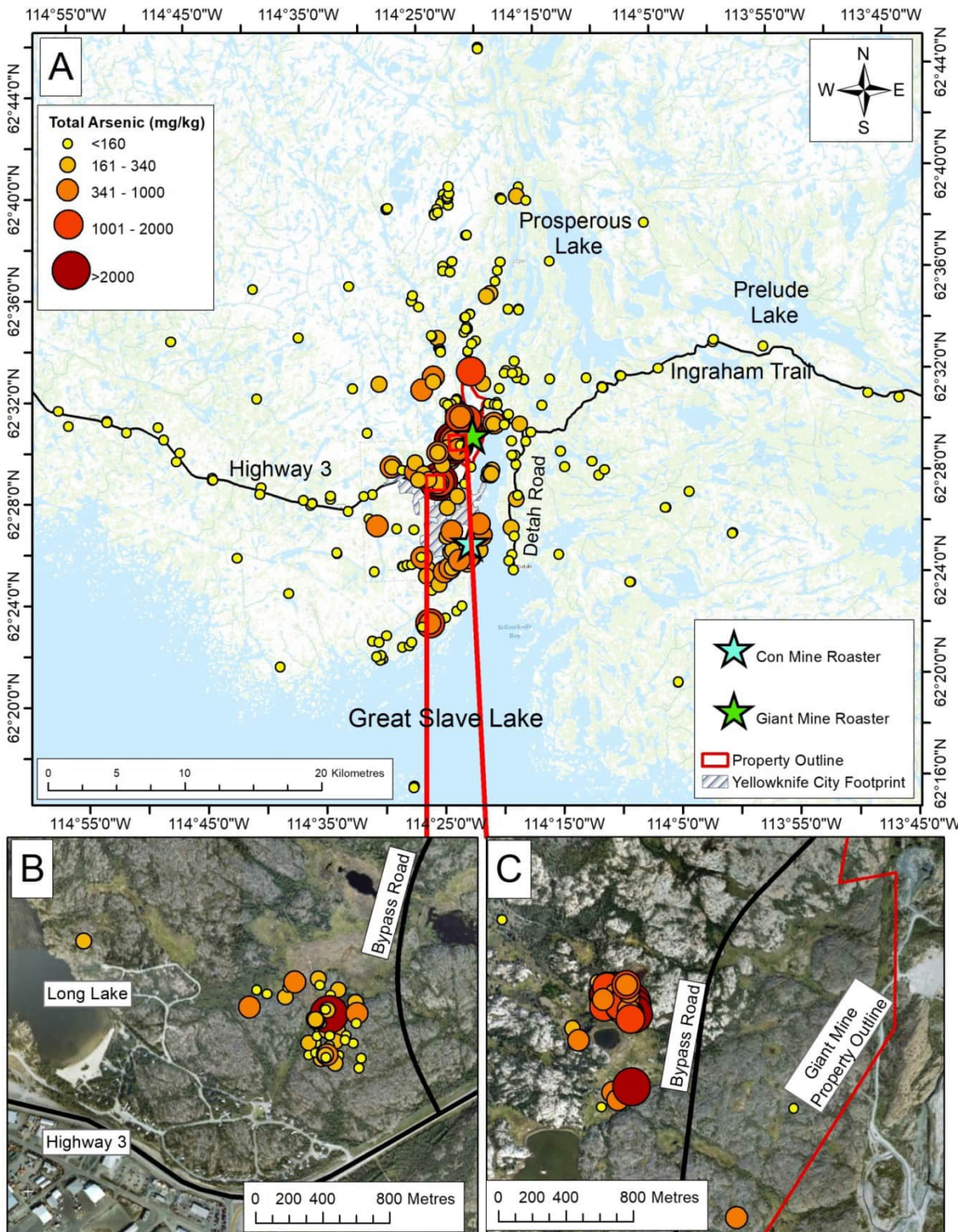


Figure 3. Total arsenic concentrations in the Public Health Layer at all core sample sites. The size and colour of the symbol indicates arsenic concentration. Figure A shows the results for the entire study area; Figure B shows the results in the detailed sampling grid located near Fred Henne Territorial Park; Figure C shows the results for the detailed sampling grid along the Giant Mine Bypass Road, west of Giant Mine.

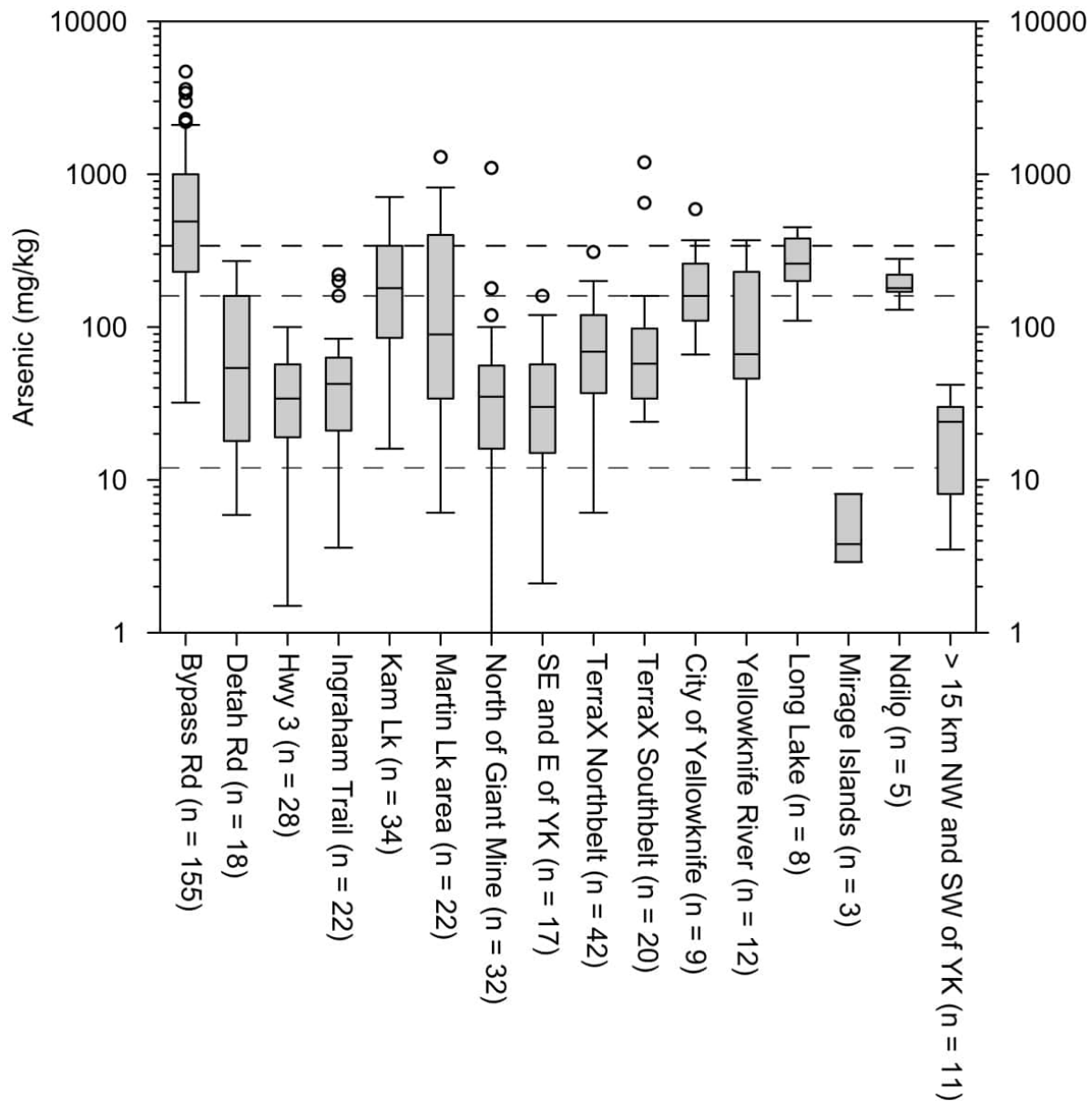


Figure 4. Box and whisker plots depicting the concentration of arsenic in the randomly selected target areas. The upper and middle dashed lines represent the Government of Northwest Territories site-specific health based soil quality remediation objectives of arsenic concentrations in Yellowknife soils (2003)—the upper dashed line is the Industrial Remediation Objective (340 mg/kg) and the middle dashed line is the Residential Remediation Objective (160 mg/kg). The lower dashed line represents Health Canada’s 2010 Canadian Soil Quality Guideline of arsenic in soil for agriculture, residential/parkland, commercial, and industrial (12 mg/kg) concentrations. The “Distal East and SE sites” and “Hay Lake” were combined as “SE and E of YK” due to small sample sizes.

Influence of Distance to Former Roasting Sites

Figure 6 shows the relationship between the concentration of arsenic in the Public Health Layer of soils and distance to the former Giant Mine roaster. There is a clear inverse relation, with arsenic concentrations decreasing with increased distance from the roaster. This observation is similar to previous studies in the area focused on soils (Hocking *et al.* 1978; Hutchinson *et al.* 1982; Kerr 2006; St. Onge 2007; Bromstad *et al.* 2017), lake waters (Palmer *et al.* 2015, Houben *et al.* 2016) and lake sediments (Galloway *et al.* 2015). Although the trendline does not reach a clear plateau, the concentrations are much lower at 25 km away from the roaster and are likely approaching background at this distance. The arsenic concentration in Public Health Layer soils from sites 20 km to 30 km from the Giant roaster ranges from 1.0 mg/kg to 63 mg/kg ($n = 25$; median = 40 mg/kg). This is generally consistent with the findings of Hocking *et al.* (1978), Hutchinson *et al.* (1982), Kerr (2006), and St. Onge (2007). Our range of background values is substantially lower than the background value of 150 mg/kg As indicated by previous studies (Risklogic 2002; GNWT 2003).

Soil samples taken within 3 km of the former Con roaster are highlighted in Figure 6, and are mostly distributed above the trendline, suggesting that arsenic concentrations in these soils may be affected by the Con mine, as concluded by Hocking *et al.* (1978). For all the data, there is considerable scatter about the trendline, suggesting that additional factors influence arsenic concentration in soils in the region.

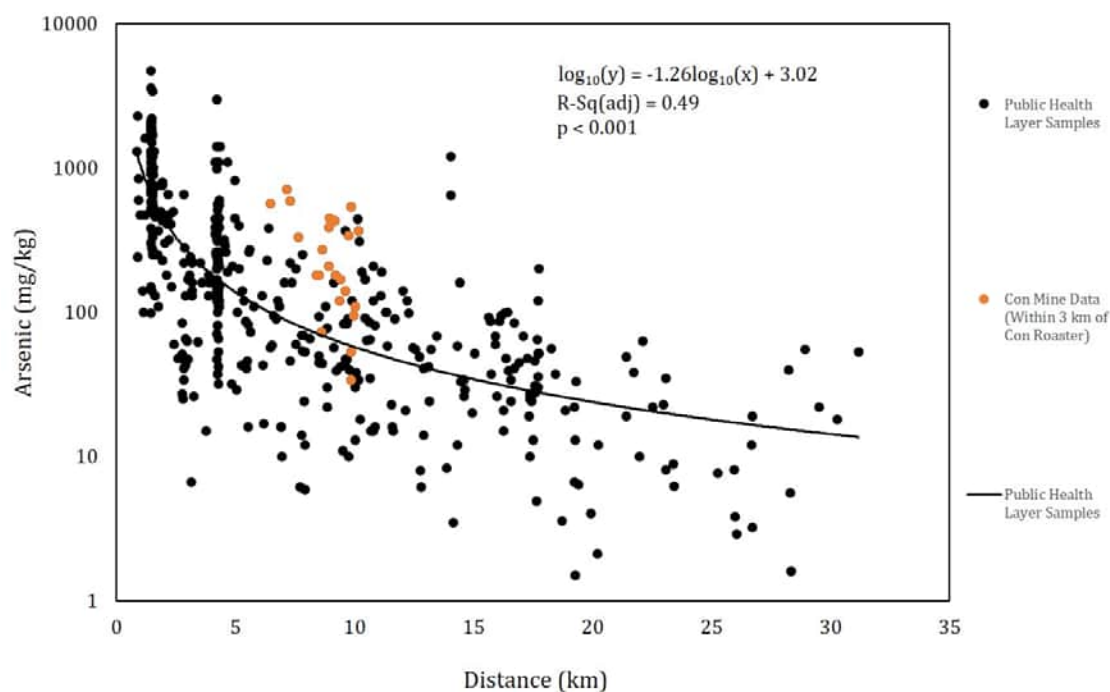


Figure 6. The variation of arsenic concentration in soil samples with distance from the former Giant Mine roaster. Samples collected from the Public Health Layer are in black and samples collected within 3 km of Con Mine are highlighted in orange and are included in the analysis.

The Influence of Wind Direction

The influence of direction from the former roasters was explored since previous studies have shown that the influence of stack emissions is greatest at sites downwind of predominant wind directions in the region (e.g., Hocking *et al.* 1982; St. Onge 2006; Palmer *et al.* 2015; Bromstad *et al.* 2017). The inset to Figure 2 shows that winds blow most frequently from the east and northeast in the region. Figure 7 demonstrates that median arsenic concentrations in near-surface soils were highest to the west of Giant Mine, consistent with the predominant wind direction in the region. Concentrations were lowest east of the historical roaster along the least frequent wind direction.

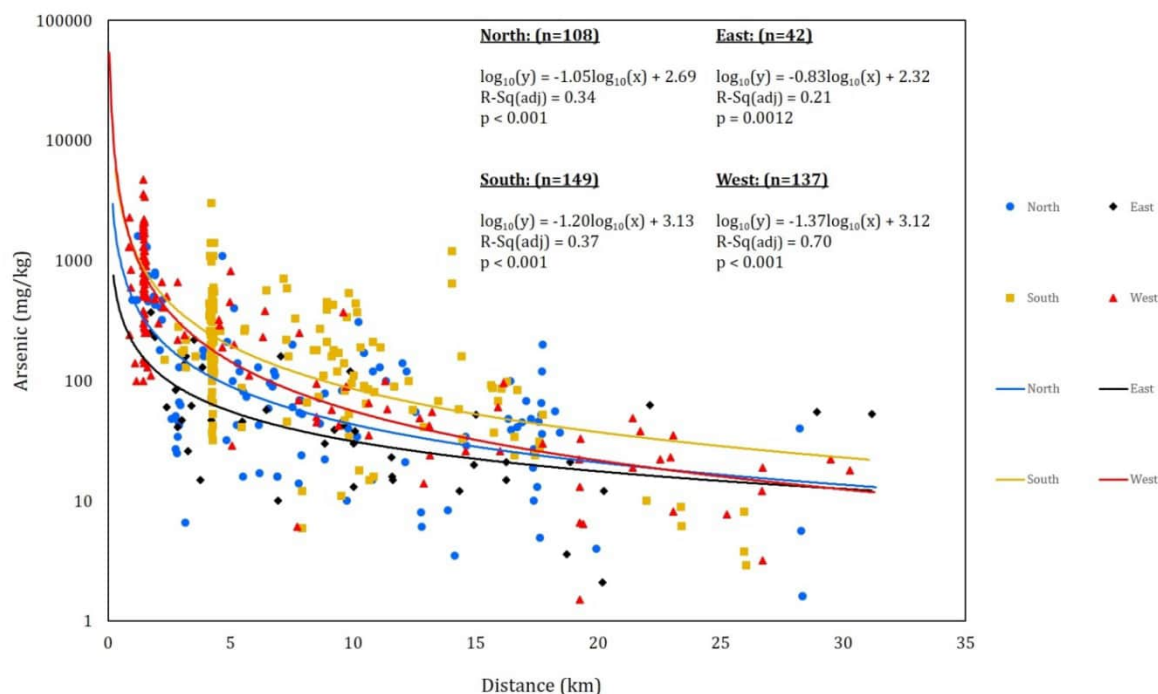


Figure 7. The variation of arsenic concentrations within 35 km of the former Giant Mine roaster with respect to direction. Direction classification is centred around the former Giant Mine roaster as East (45° to 135°), North (315° to 45°), West (225° to 315°), and South (135° to 225°). Coloured lines represent slope and coloured symbols represents the arsenic concentration in samples.

The Influence of Elevation

Figure 8 shows the variation of arsenic concentration in soils with elevation. This relation was explored since higher sites may have intercepted more stack emissions during the early years of roaster operations. There is a correlation between higher elevation and higher arsenic concentration, although it is not very strong and undoubtedly influenced by other factors such as distance and wind direction. The high elevation sites were found west of the Bypass road and north of Giant mine near Landing and Vital lakes (Appendix A—Table A1).

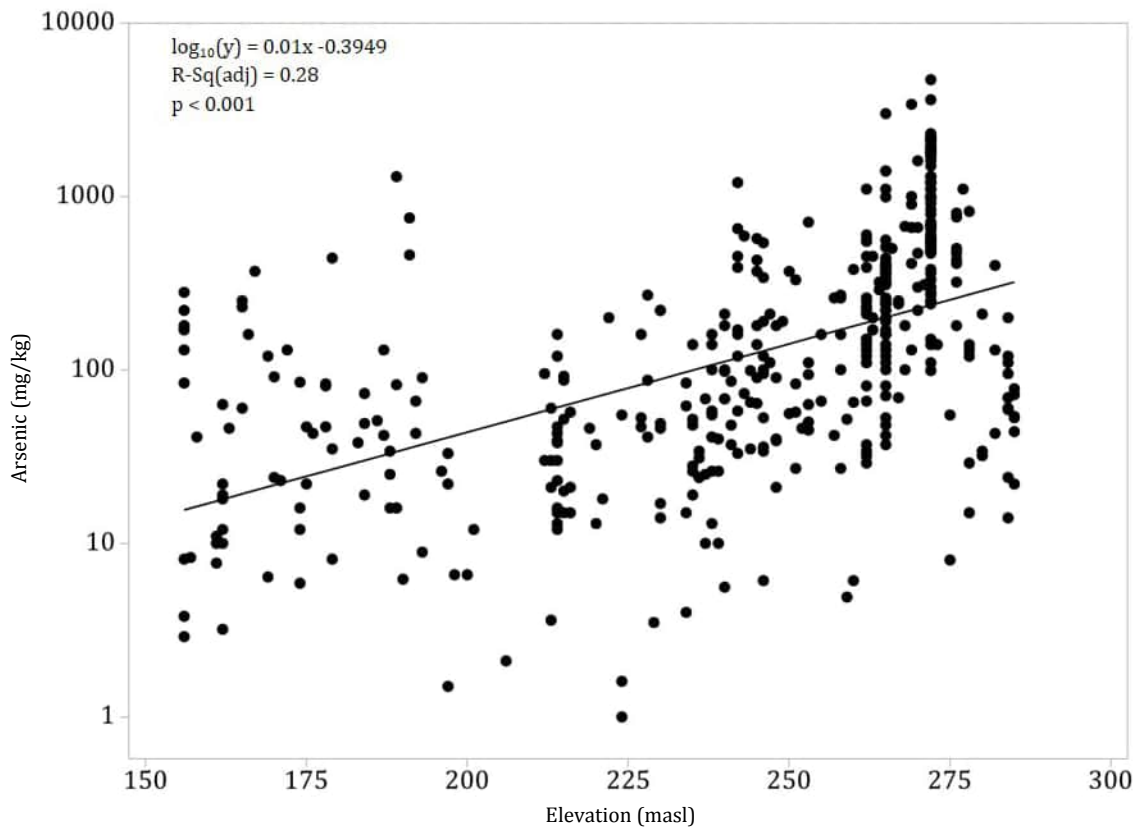


Figure 8. The relation between arsenic concentration in the Public Health Layer of soils and elevation (masl, metres above sea level) in the study area.

The Influence of Terrain Type

Figure 9 shows the relation of arsenic concentration in the Public Health Layer to terrain type, as defined above in Sampling Protocol, and documented in Appendix A—Table A1. Total arsenic in forest soil samples range from 1.0 mg/kg to 1300 mg/kg with a median of 38 mg/kg; forest outcrop samples have a range of 2.1 mg/kg to 4700 mg/kg with a median of 150 mg/kg; outcrop soil samples range from 3.5 mg/kg to 3000 mg/kg with a median of 165 mg/kg; finally, peatland samples range from 2.9 mg/kg to 3400 mg/kg with a median of 95.5 mg/kg. The distribution of arsenic concentrations in forest samples were significantly different than forest outcrop, outcrop, and peatland samples ($p < 0.001$). There were no statistically significant differences between the distributions of arsenic within the median outcrop, forest outcrop, and peatland terrain units ($p > 0.05$).

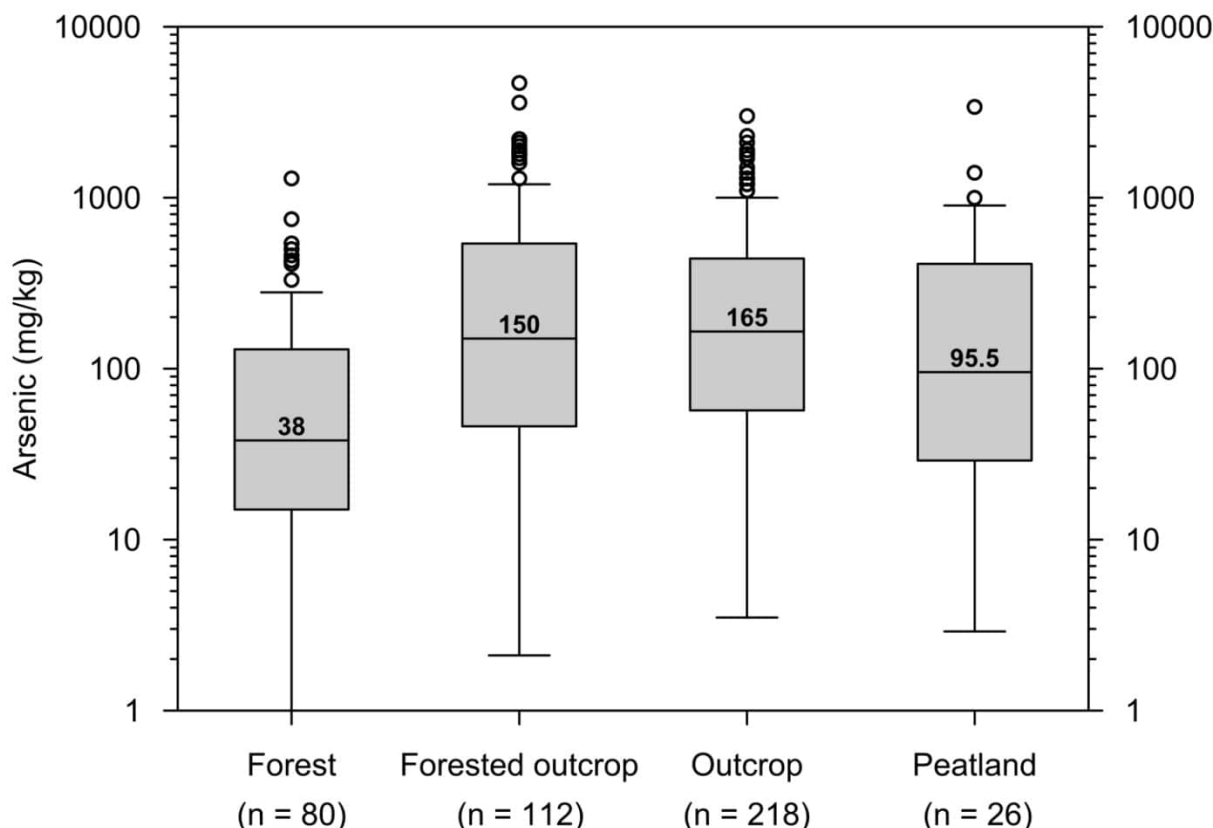


Figure 9. The relation of arsenic concentration in the Public Health Layer to terrain type. The distribution of arsenic concentrations in forest samples were significantly different than forest outcrop, outcrop, and peatland samples (Kruskal-Wallis Test, $p < 0.001$). There were no statistically significant differences between the distributions of arsenic within the median for outcrop, forest outcrop, and peatland terrain units (Kruskal-Wallis Test, $p > 0.05$). Mean values of terrain type are shown.

Considerable variability was observed between multiple samples collected in detailed sample plots (Figure 3B and Figure 3C), suggesting several factors could play a role in the distribution of arsenic and soil geochemistry at the local scale. Further research results, including identification of the arsenic-hosting solid phases, is expected to identify factors controlling local variation in arsenic concentration.

Effect of Soil Depth

Most of the results reported here are from the top 5 cm of soil (Public Health Layer) except for the 37 samples labelled DC (down core). Figure 10 shows that, with two exceptions, all of the deeper samples have much lower concentrations of arsenic than the corresponding sample from the Public Health Layer. The dashed lines connect the two samples from the same core, but are not meant to imply that arsenic decreases linearly with depth. Previous work (Hocking *et al.* 1978; Kerr 2006; Bromstad *et al.* 2015, 2017) describes a rapid drop of arsenic concentration with soil depth in the Yellowknife area.

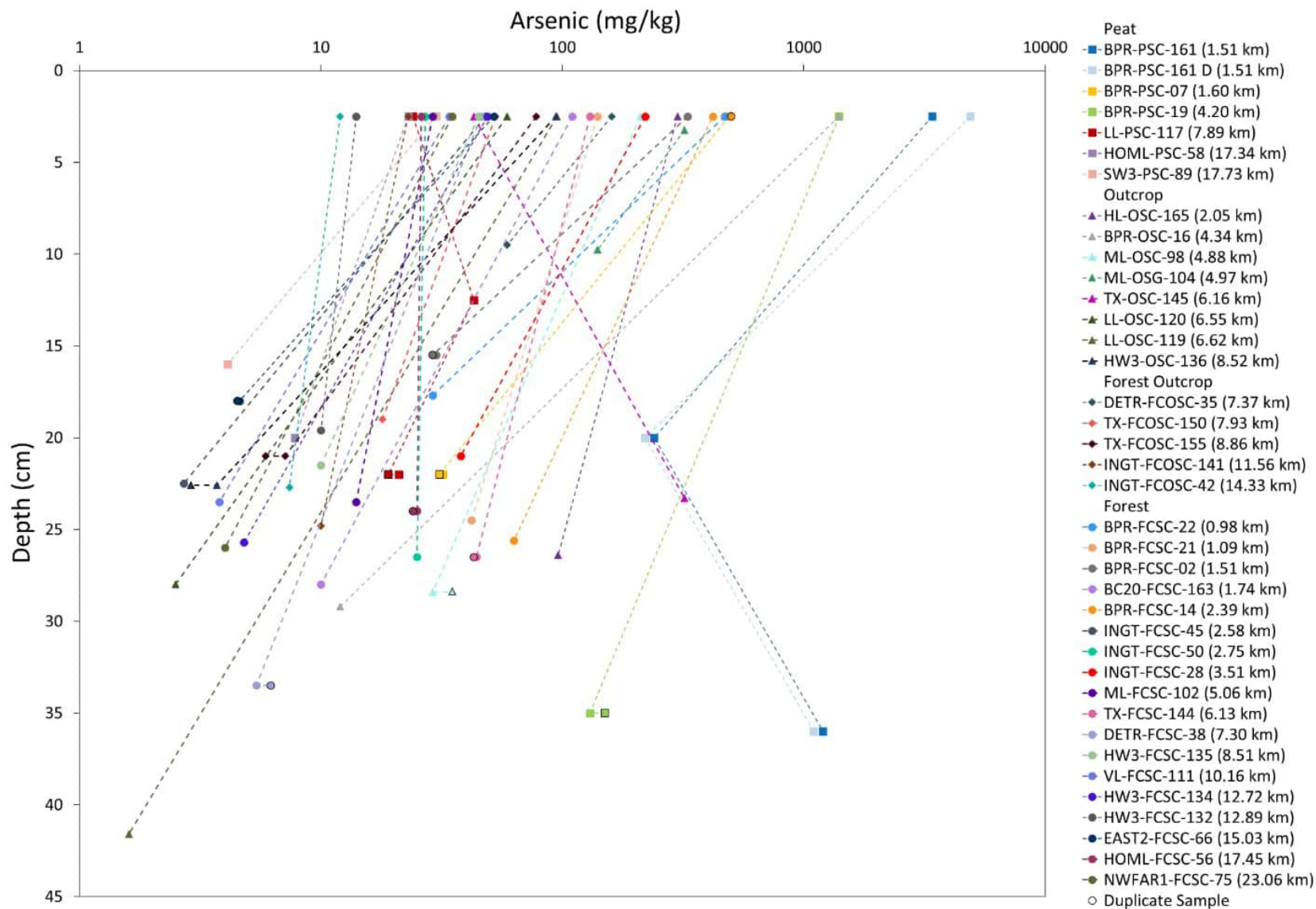


Figure 10: Arsenic concentrations from the Public Health Layer and at various depths for 17 soil cores from the Yellowknife region. Sample sites are organized by terrain type (Peat – square, Outcrop – triangle, Forest Outcrop – diamond, and Forest – circle); the distance from Giant Mine to the respective sample sites is indicated in parentheses.

Grab Samples

Grab samples, collected mainly in areas of outcrop terrain, ranged in arsenic concentration from 2.9 mg/kg to 930 mg/kg ($n = 46$; median = 120 mg/kg). Grab sample concentrations fall within the range of core sample concentrations collected in nearby areas. The samples with the highest arsenic concentrations were collected near the Bypass Road, near Giant Mine.

Conclusions

This report provides data from the top 0 cm to 5 cm of soil for 479 samples from undisturbed sites within 30 km of Yellowknife. The influence of distance from the former roasters, wind direction, elevation and terrain type have all been explored. Based on the relation between arsenic concentration and distance from the Giant roaster, soil concentrations of arsenic likely approach background concentrations at a distance of 20 km to 30 km. Arsenic concentrations range between 1 mg/kg and 63 mg/kg ($n = 25$; median = 40 mg/kg) at this distance, and can be considered a reasonable, albeit conservative, estimate of background conditions in the region. The results show that arsenic concentrations are also elevated near the former Con roaster. Higher arsenic concentrations are found downwind (i.e., west) of the Giant roaster, at higher elevations, and in outcrop and forest outcrop soils compared to forest soil. The presence of elevated concentrations of arsenic in soils in the Yellowknife area that are hundreds to thousands of times the Canadian Soil Quality Guideline has been known for at least forty years, and this enrichment is attributed to the operation of gold ore roasters based on the spatial distribution and wind direction (e.g., Hocking *et al.* 1978).

Further work on selected subsamples will include identification of the arsenic-hosting solid phases, using techniques described in Bromstad *et al.* (2015, 2017). These results will help distinguish natural from roaster-generated arsenic-bearing particles. In particular, the presence of arsenic trioxide and roaster-generated maghemite and hematite have been interpreted as clear evidence of stack emissions (Bromstad *et al.* 2015, 2017). It is not clear whether roaster products from Con can be distinguished from those from Giant.

The results documented in this report contribute to an understanding of the risk to human and ecosystem health associated with arsenic in soils in the Yellowknife region. However, evaluation of that risk requires additional information, particularly an assessment of exposure. Oral ingestion, inhalation and dermal contact are all pathways by which humans and other organisms can be exposed to arsenic in soil. In the case of arsenic, it is well known that particle size, degree of liberation, and the chemical form (mineralogy) of arsenic in the solid phase all influence bioaccessibility, or the solubility of arsenic in bodily fluids (Ruby *et al.* 1999; Meunier *et al.* 2010; Plumlee and Morman 2011). Arsenic trioxide, the dominant solid phase of arsenic released by roaster stack emissions, is considered to be the most toxic and bioaccessible form of solid-phase arsenic (Plumlee and Morman 2011;

Jamieson 2014). Exposure, in a general sense, also depends on physical access to contaminated soil. In the Yellowknife area, this may increase as a result of site remediation and construction of new infrastructure such as the Giant Mine Bypass Road.

An industrial site-specific remediation guideline of 340 mg/kg total As and residential guideline of 160 mg/kg As were established by the Government of the Northwest Territories in 2003 (GNWT 2003). These criteria are much higher than the Canadian Soil Quality Guideline of 12 mg/kg (CCME 2007), and were based on the expectation that exposure would be limited by the cold climate and that the “average natural background concentration of arsenic in and around Yellowknife was determined to be 150 ppm”. The industrial guideline was also based on the expectation of “little or no public access”. The results reported here show the natural background in near-surface soil concentrations of arsenic are much lower (~ 3 mg/kg to 63 mg/kg). This is consistent with previous studies (Hocking *et al.* 1978; Hutchinson *et al.* 1982; Kerr 2006; St. Onge 2006), which show elevated natural background arsenic is restricted to soils above mineralized veins and shear zones (Kerr 2006). The results of our ongoing research on the speciation of arsenic in soils with hundreds to thousands of mg/kg arsenic will provide insight into whether these high concentrations are the result of natural or anthropogenic sources, and will help identify the main solid-phase hosts of arsenic.

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Appendices

Appendix A — Table A1 – Compilation of all the data for the 2015, 2016, and 2017 sampling period

Appendix A — Table A2 – Definitions and abbreviations

Appendix B — Table B1 – Reproducibility of measured As concentration in Field Duplicates, Lab Duplicates and Split Samples

Appendix B — Table B2 – Comparison of measured and expected arsenic concentrations in Certified Reference Materials

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APPENDIX G - DRONE SURVEY



Looking east towards Great Slave Lake



Looking southwest towards Rat Lake, note residential land use surrounding and overhead electric utilities going through the Subject Site.



Looking southwest - note the water treatment plant and stockpiled soil and rock mix to the north of the Subject Site



Looking west - view of the water treatment plant and stockpiled soil/rock mix to the north of the Subject Site



View of the Subject Site - looking west



Looking west - view of the surrounding area to the south of the Subject Site (Con Mine Park)



Looking northwest over the Subject Site from Great Slave Lake



Looking north over the Subject Site and towards the City of Yellowknife



Looking northeast over the Subject Site towards Great Slave Lake and the City of Yellowknife. Note trails and paved road.





Looking north over the Subject Site towards the City of Yellowknife



Looking north over the Subject Site towards the City of Yellowknife



Looking north over the Subject Site towards the City of Yellowknife



Looking northeast over the Subject Site towards the Great Slave Lake. Rat Lake is in the foreground.



Looking east over the Subject Site towards the City of Yellowknife - note the telecommunications tower adjacent to the Subject Site



Looking north over the Subject Site - view of the telecommunications tower adjacent to the Subject Site to the west



Looking southwest from the Subject Site



Looking west over the Subject Site



Looking southwest



Looking southwest



Looking southwest



Looking east - view of water treatment plant



Looking south



Looking southeast - view of boardwalk constructed on the Subject Site over marshy area



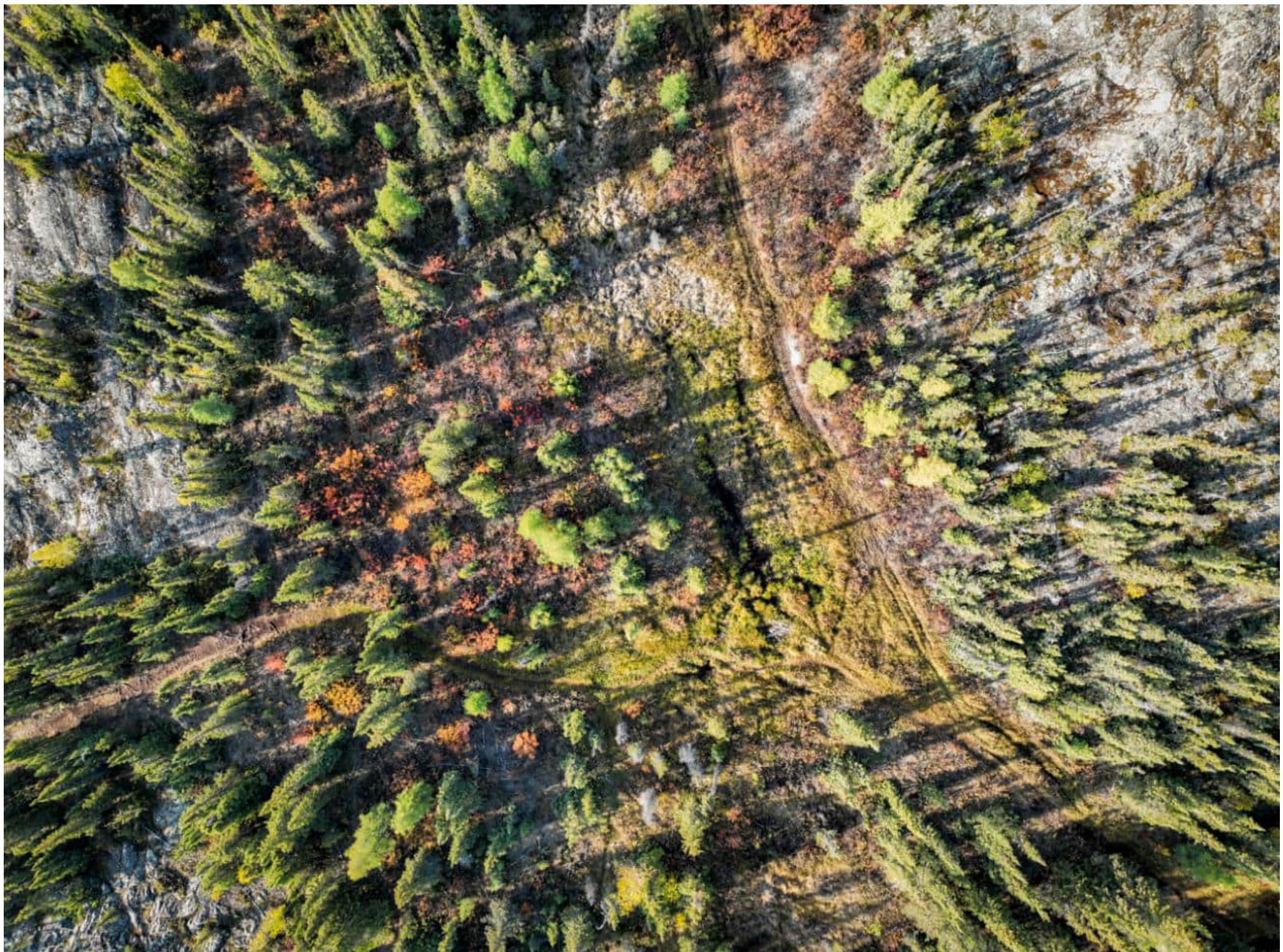
View of boardwalk constructed over marshy area



View of boardwalk constructed over marshy area



Looking southwest - view of the Subject Site trails



View of the Subject Site trails



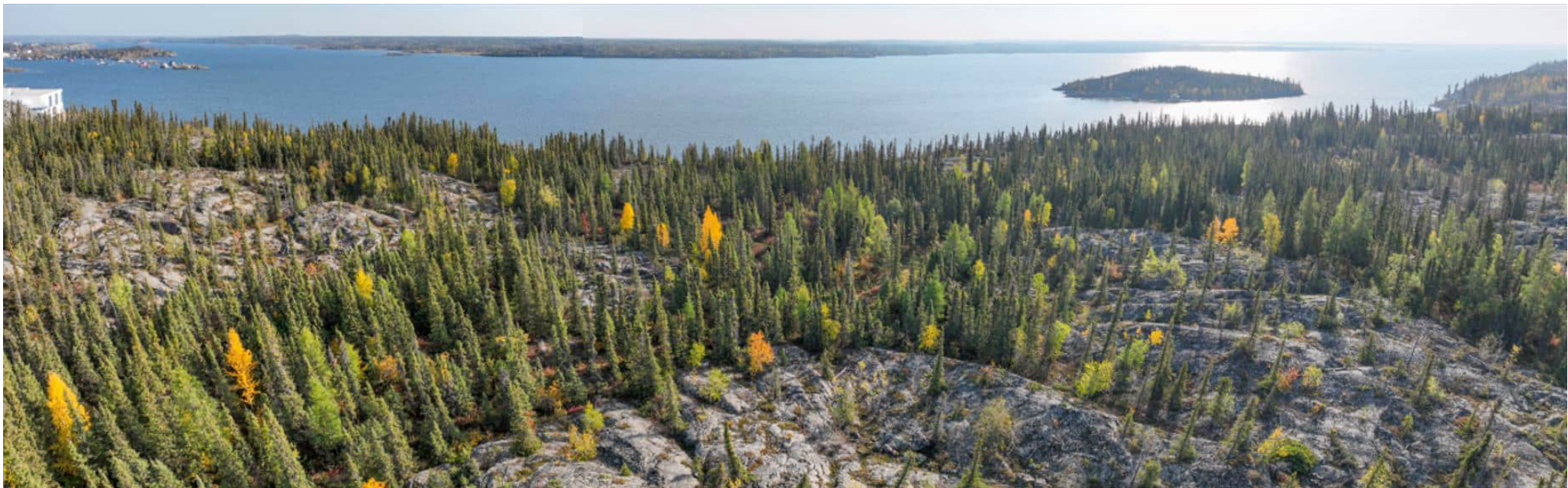
Looking northeast - view of the Subject Site towards Great Slave Lake and the City of Yellowknife



Looking west - view of the telecommunications tower adjacent to the Subject Site to the west



Looking east



Looking east

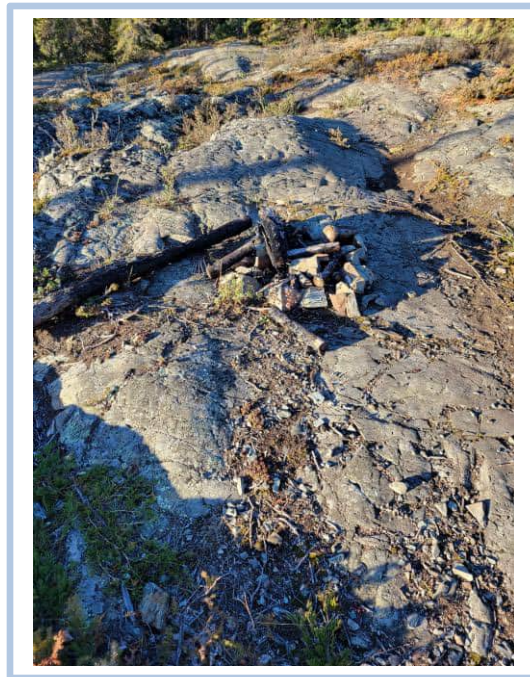


Looking north



View of recreational trails on the Subject Site

APPENDIX H - PHOTOGRAPHS



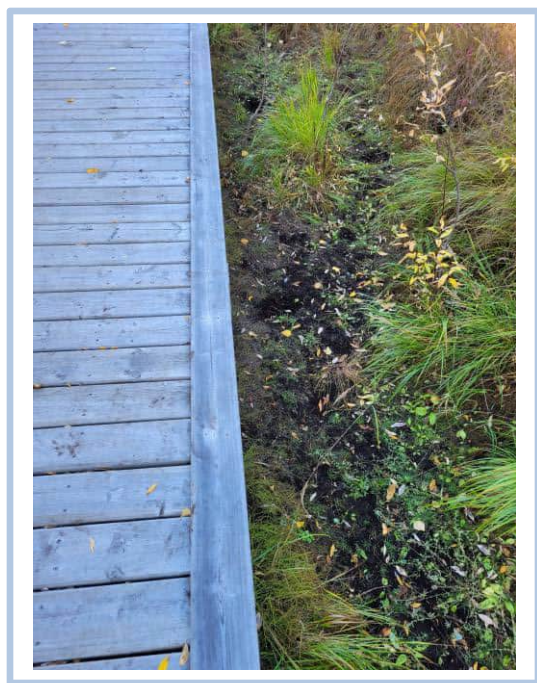
Photograph 1: Old Fire Pit on site (September 27, 2022).



Photograph 2: Old Melted Batteries on the Subject Site (September 27, 2022).



Photograph 3: *Damaged Drums/corrugated metal on the Subject Site (September 27, 2022).*



Photograph 4: *View of a marshy area adjacent to a boardwalk on the Subject Site (September 27, 2022).*



Photograph 5: *Litter on the Subject Site (September 27, 2022).*



Photograph 6: *Timber Planks the Subject Site (September 27, 2022).*



Photograph 21: View of the Yellowknife Wastewater Treatment Plant with an AST (Fuel Tank) to its left. View facing North. (September 27, 2022).



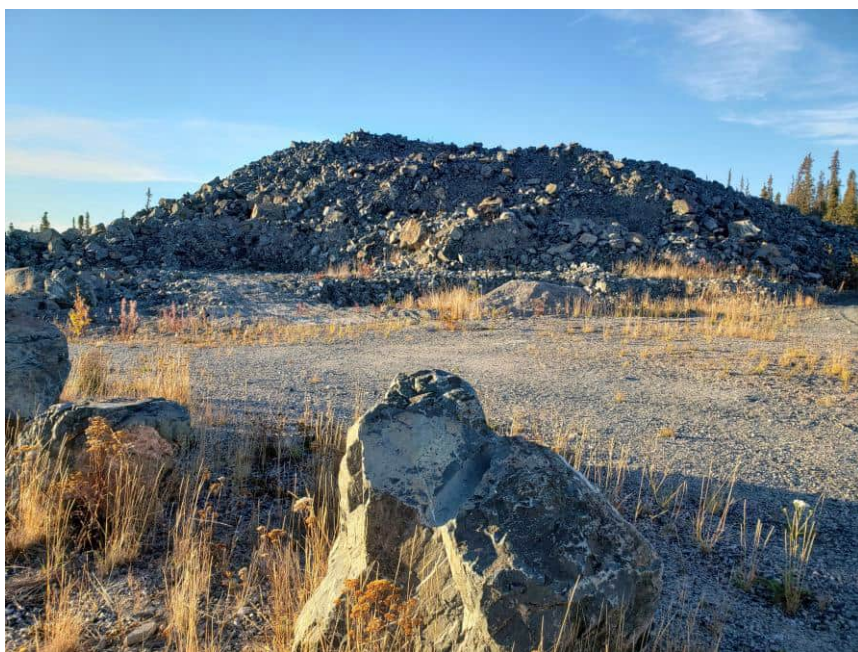
Photograph 22: View of the Yellowknife Wastewater Treatment Plant with an AST (fuel Tank) to its left. View facing Northeast. (September 27, 2022).



Photograph 23: View of AST (fuel tank) on the Subject Site to north (water treatment plant). (September 27, 2022).



Photograph 24: Closeup view of AST (fuel tank) the Subject Site (water treatment plant) (September 27, 2022).



Photograph 25: View of excavated stockpile soil removed for building facing East.
(September 27, 2022).



Photograph 7: View of a mast and satellite dishes looking West (September 27, 2022).



Photograph 8: View of a mast and satellite dishes looking North (September 27, 2022).



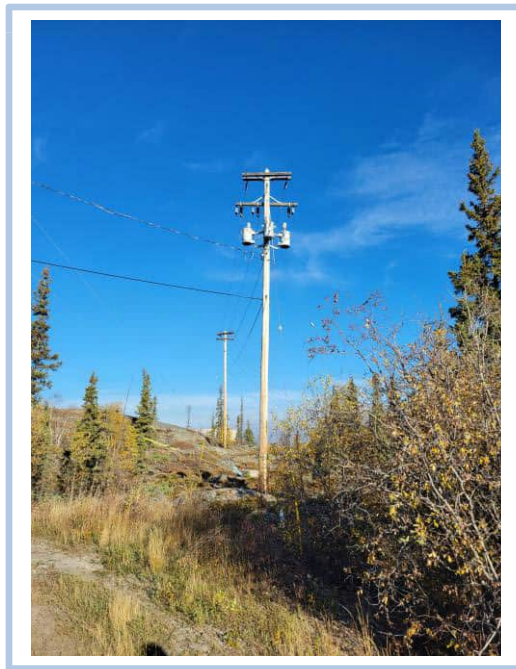
Photograph 9: View of a mast and satellite dishes looking East (September 27, 2022).



Photograph 10: View of a mast and satellite dishes looking South (September 27, 2022).



Photograph 11: View of satellite dishes looking East (September 27, 2022).



Photograph 12: View of Electric Transmission Lines adjacent to the site (September 27, 2022).



Photograph 13: View of Rat Lake facing Southwest (September 27, 2022).



Photograph 14: View of Rat Lake facing West (September 27, 2022).



Photograph 15: View of Rat Lake facing Northwest (September 27, 2022).



Photograph 16: View of exposed Bedrock on site with The Great Slave Lake in the East (September 27, 2022).



Photograph 17: View of a developed residential area adjacent to the site facing West (September 27, 2022)



Photograph 18: View of a developed residential area adjacent to the site facing West (September 27, 2022)



Photograph 19: View of a developed residential area adjacent to the site facing West (September 27, 2022)



Photograph 20 View of a developed residential area adjacent to the site facing West (September 27, 2022)