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SOW Ref: 16.F.5.d

# **2021 ANNUAL NUNAVUT WATER BOARD REPORT FOR FOX-3 FOR THE North Warning System**

Contract # W8485-100224/001/NX

SOW Ref: 16.F.5.d

Document Number

NWB-F3-2021, Rev 2, 22-Mar-2022

**Prepared for  
North Warning System & Assoc. Projects**

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## EXECUTIVE SUMMARY

This 2021 Annual Report for the Nunavut Water Board (NWB) has been prepared by Raytheon Canada (RC) for the Department of National Defence in order to meet the requirements of the licence issued 08 June 2018, 8BC-FOD1828 – Type “B”, Part B “General Conditions”, paragraph 1 of its licence. This report covers 01 January to 31 December 2021.

RC is the Operations and Maintenance (O&M) Contractor for the North Warning System (NWS) including FOX-3, the unattended (unmanned) North Warning System radar site at Dewar Lakes, Nunavut. The site is visited quarterly by RC staff from FOX-M, Sanirajak (Hall Beach), Nunavut for preventive maintenance inspections and as required for other work.

A total of 126.2 cubic meters was drawn from the water lake. This is below the annual maximum of 1,440 cubic meters allowed by the licence.

As FOX-3 is a landlocked site, all hazardous waste, including waste oil, is transported to FOX-M before being shipped to an approved hazardous waste disposal site outside of Nunavut as required by the licence. A total of two crates and 49 drums of waste HAZMAT were shipped from FOX-3 in 2021.

Non-hazardous domestic solid waste was disposed of through a contract with the Hamlet of Sanirajak at the local landfill. RC has documented authorization from the community for receiving the waste.

In 2021, a monitoring program was implemented at FOX-3 as required by the water licence, Part I. Rain and melt water that accumulated in the berms of fuel storage facilities was tested with hydrocarbon test strips and confirmed to be within effluent quality limits before the water was pumped out of the berms.

There was one spill (unauthorized discharge) to the environment at FOX-3 in 2021.

- 05-Aug-21, NT-NU Spill # 2021-330: A leaking gasket on a fuel pump resulted in a spill of 10 L of Jet-A1. The impacted soil was excavated and backfilled with clean fill.

The Spill Contingency Plan was successfully implemented, and updated on 20-Jul-21

The landfarm was sampled and tested in 2021.



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## 1.0 INTRODUCTION

This 2021 Annual Report for the Nunavut Water Board (NWB) has been prepared by Raytheon Canada (RC) for the Department of National Defence (DND) in order to meet the requirements of the licence issued 08 June 2018, 8BC-FOD1828 – Type “B”, Part B “General Conditions”, paragraph 1 of its licence. This report covers 01 January to 31 December 2021.

RC is the Operations and Maintenance (O&M) Contractor for the North Warning System (NWS), including FOX-3. FOX-3 is an unattended (unmanned) North Warning System radar site located at Dewar Lakes, Nunavut. The site is visited quarterly by RC staff from FOX-M, Hall Beach, Nunavut for preventive maintenance inspections and as required for other work.

### 1.1 Report Details

Licensee: Department of National Defence, Government of Canada  
Licence: 8BC-FOD1828 – Type “B”  
Location: FOX-3 North Warning System Site, Dewar Lakes, Qikiqtani Region, Nunavut  
Report Prepared by: Alaina Leslie and reviewed by Don Beattie  
Raytheon Canada, 16-Mar-2022  
Time period covered: 01 January to 31 December 2021

## 2.0 WATER USE

A total of 126.2 m<sup>3</sup> of water was drawn from the supply lake in 2021. This is below the annual maximum of 1,440 m<sup>3</sup> allowed by the licence.

See Table 2-1 for the volume of water usage at FOX-3 each month in 2021.

Table 2-1: Monthly Raw Water Usage at FOX-3 in 2021

Month	Raw water usage (m <sup>3</sup> )
January	0
February	0
March	0
April	0
May	0
June	15.1
July	18.1
August	49.7
September	43.3
October	0
November	0
December	0
<b>TOTAL</b>	<b>126.2</b>



### 3.0 HAZARDOUS WASTE AND WASTE OIL DISPOSAL

As FOX-3 is a landlocked site, all hazardous waste, including waste oil, is transported to FOX-M (Sanirajak) before being shipped to an approved hazardous waste disposal site outside of Nunavut as required by the licence. The hazardous waste was shipped to Qikiqtaaluk Environmental, through their subcontractor Veolia, 2630, boul. Industriel, Chambly, QC J3L 4V2.

See **Annex A** for the shipping documents including the completed movement documents for waste regulated under the Transportation of Dangerous Goods Regulations (TDGR) and NWS Manifests for non-regulated waste. A total of 49 drums and two crates of waste HAZMAT were shipped from FOX-3 in 2021.

**Table 3-1: Hazardous Waste and Waste Oil Sent for Disposal from FOX-3 in 2021**

Description	TDG shipping name	Manifest # (TCN)	Quantity
Waste oily rags	Waste Solids Containing Flammable Liquid, N.O.S. (Fuel, Aviation, Turbine Engine)	43753,43907	4 Drums
Waste tank bottom water/tank cleaning effluent	Waste Fuel, Aviation, Turbine Engine Mixture	43908,43909,43910,43911,43912,43913	24 Drums
Waste Fuel, Aviation, Turbine Engine	Waste Fuel, Aviation, Turbine Engine**	43745,43749	8 Drums
Waste batteries, wet, non-spillable	Waste Batteries, Wet, Non-Spillable	43760,43763	2 Crates
Waste aerosols (flammable)	Waste Aerosols***	43762	1 Drum
Waste Asbestos-containing Material	Not Regulated	43762	3 Drums
Waste oil filters	Not Regulated	43753	1 Drum
Waste oil	Not Regulated	43750,43751	8 Drums
Notes: * A piece of electrical equipment was documented on the shipper's declaration as Waste Polychlorinated Biphenyls (PCBs), Solid. However, it was not actually shipped off site in 2021 and was put into storage at FOX-3 to be shipped off site in 2022 on TCN 43758. ** 2 additional drums of waste fuel were included on the shippers declaration in error *** 1 drum of waste aerosols was not included on the shipper's declaration in error but was included on the Manifest. Refer to TCN 43762.			

### 4.0 NON-HAZARDOUS SOLID WASTE DISPOSAL

Non-hazardous domestic solid waste was disposed of through a contract with the Hamlet of Sanirajak at the local landfill. RC has documented authorization from the community for receiving the waste.

See **Table 4-1**, below, for the quantity of waste generated.

The FOX-3 landfill still exists, but no new materials have been landfilled in the reporting period. See **Annex B** for it location on-site.

**Table 4-1: Non-hazardous Domestic Solid Waste Sent for Disposal from FOX-3 in 2021**

Month	Waste Generated (kg)
January	0
February	0

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Month	Waste Generated (kg)
March	0
April	0
May	0
June	0
July	68
August	4574
September	0
October	0
November	0
December	0
<b>TOTAL</b>	<b>4,642</b>

## 5.0 MONITORING PROGRAM

In 2021, a monitoring program was implemented at FOX-3 as required by the water licence, Part I. The monitoring program included the following:

1. Volume of raw water drawn from the Water Supply Lake (FOD-1). The information from monitoring water use is shown in **Section 2.0 Water Use**. The water drawn was within the limit stated in the water licence.
2. Quality of sewage discharged from the final discharge point of the sewage disposal facility. The location of the sewage effluent outfall is shown in **Annex B**. A sump for the sewage outfall was constructed in 2010. The sewage outfall sump was not discharged in 2021 and therefore **Annex C** is left blank.

Monitoring Station FOD-2 was discontinued in water licence 8BC-FOD1828.

3. Accumulated rain and melt water contained in the berms of fuel storage facilities was analyzed using hydrocarbon test strips and confirmed within the effluent quality limits listed in the water licence, Part D prior to discharge (FOD-3). The coordinates and the results of the analysis are shown in **Annex D and Annex E**. All samples met the effluent requirements of the water licence, Part D.
4. Final Discharge Point from the Landfarm (FOD-4). Samples were collected from water in the landfarm, however, results were not obtained in time to discharge the facility.

## 6.0 SPILLS (UNAUTHORIZED DISCHARGES)

One spill to the environment occurred at FOX-3 in 2021. Table 7-1, below, describes the spill (unauthorized discharge) details.

The Spill Contingency Plan was successfully implemented.



Table 6-1: Unauthorized Discharges at FOX-3 in 2021

Date, NT-NU Spill #	Product	Quantity	Cause and follow-up action	On-site location
05-Aug-2021, Spill # 2021-330	Jet-A1	10 L	<p>On 05-Aug-2021, personnel on-site were conducting fuel transfer from the fuel bladder in the C-130 when the gasket on their portable pump broke resulting in a 10L spill of Jet-A1. A drip tray was in place however the fuel sprayed beyond the drip tray. The technicians shut off the pump as soon as they noticed the spill. The spill contaminated an area of 1m2.</p> <p>The contaminated gravel was shoveled and transferred into a containment drums for off-site disposal. The gasket on the pump was replaced and a larger drip tray will be in place for subsequent transfers.</p>	Airstrip (Fuel transfer pump for C-130 bladder) (68°37'23.60"N, 71° 7'59.41"W)

## 7.0 REVISIONS TO THE SPILL CONTINGENCY PLAN

The Spill Contingency Plan was updated on 6-Jul-2021. An updated copy of the Spill Contingency Plan has been submitted to the NWB with this annual report.

## 8.0 PROGRESSIVE RECLAMATION WORK UNDERTAKEN

The landfarm was sampled in 2021. A summary of the work completed in 2021 is included in **Annex F**.

## 9.0 ACRONYMS

Table 9-1: Acronyms

Acronym	Definition
BTEX	benzene toluene ethylbenzene xylene
CCME	Canadian Council of Ministers of the Environment
DCC	Defence Construction Canada
DND	Department of National Defence
n.o.s.	not otherwise specified
NWB	Nunavut Water Board
NWS	North Warning System
O&M	Operations and Maintenance
PCB	Polychlorinated Biphenyl
PHC CWS	Canada-Wide Standards for Petroleum Hydrocarbons
RC	Raytheon Canada
SQG	Soil Quality Guidelines
TDGR	Transportation of Dangerous Goods Regulations
QA/QC	Quality Assurance/Quality Control





## **ANNEX A. HAZARDOUS WASTE AND WASTE OIL DISPOSAL**

The 2021 Shippers Declaration for TDG Regulated waste and NWS Manifests for non-TDG Regulated waste (as previously described Table 4-1) are included in the following pages.

The following documents are enclosed.

1. Shipper's Declaration for Dangerous Goods – 28-Jul-2021
2. NWS Manifest 43750
3. NWS Manifest 43751
4. NWS Manifest 43753
5. NWS Manifest 43762



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**SHIPPER'S DECLARATION FOR DANGEROUS GOODS**  
**DÉCLARATION DE L'EXPÉDITEUR DE MARCHANDISES DANGEREUSES**

Shipper / Expéditeur: **KAYTHEON CANADA LTD.**  
**FOX-3**  
**DEWAR LAKES, NU**

Air Waybill No. / No de L.T.A.:  
Page 1 of 1 Pages  
Page 1 de 1 pages  
Shipper's Reference Number (optional) / N° de référence de l'expéditeur (facultatif):

Consignee / Destinataire: **KAYTHEON CANADA LTD.**  
**FOX-3**  
**HALL BEACH, NU**  
**X0A 0K0**

Two completed and signed copies of this Declaration must be handed to the operator.  
Deux copies de cette déclaration dûment remplies et signées doivent être remises à l'exploitant.

**TRANSPORT DETAILS**  
**RENSEIGNEMENTS SUR LE TRANSPORT**

This shipment is within the limitations prescribed for: (delete non-applicable)  
Cette expédition est dans les limites autorisées pour: (biffer la mention inutile)

PASSENGER AND CARGO AIRCRAFT / AÉRONEF-PASSENGERS ET-CARGO  
CARGO AIRCRAFT ONLY / AÉRONEF CARGO SEULEMENT

Airport of Departure: / Aéroport de départ: **DEWAR LAKES, NU**

Airport of Destination: / Aéroport de destination: **HALL BEACH, NU**

Shipment type: (delete non-applicable) / Type d'envoi: (biffer la mention inutile)  
NON-RADIOACTIVE / NON-RADIOACTIF  
RADIOACTIVE / RADIOACTIF

**NATURE AND QUANTITY OF DANGEROUS GOODS / NATURE ET QUANTITÉ DE MARCHANDISES DANGEREUSES**

UN or ID No. / N° UN ou ID	Proper Shipping Name / Désignation exacte d'expédition	Class or Division (Subsidiary Risk) / Classe ou division (risque subsidiaire)	Packing Group / Groupe d'emballage	Quantity and type of packing / Quantité et type d'emballage	Packing Inst. / Instructions d'emballage	Authorization / Autorisation
UN 1863	WASTE FUEL AVIATION TURBINE ENGINE	3	III	10 drums X 2050 L	366	
UN 2794	WASTE BATTERIES, WET FILLED WITH ACID	8		1 CRATE X 771 kg	870	
UN 2800	WASTE BATTERIES, WET NON-SPLIABLE	8		1 CRATE X 272 kg	872	
UN 3432	POLYCHLORINATED BIPHENYLS, SOLID	9	II	1 CRATE X 90 kg	956	
UN 1863	WASTE FUEL AVIATION TURBINE ENGINE	3	III	24 drums X 4920 L	366	

Additional Handling Information/ Renseignements complémentaires concernant la manutention

For emergency contact: 24-hour No.: / Pour urgence: Numéro 24 heures: **CANUTEC: 1-613-996-6666**

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.  
I declare that all of the applicable air transport requirements have been met.

Je déclare par la présente que la désignation exacte d'expédition ci-dessus décrit avec précision et exactitude le contenu de cette expédition, qui est classifiée, emballée, marquée, étiquetée ou dotée d'une plaque-étiquette de danger et à tous égards en bon état pour le transport conformément à la réglementation internationale ou nationale applicable.  
Je déclare que toutes les prescriptions requises pour le transport aérien ont été respectées.

Name/Title of Signatory / Nom/Titre du Signataire: **JERRY PIALLO**  
**WAREHOUSE PERSON**

Place and Date / Lieu et Date: **HALL BEACH, NU** **28-JUN-2021**

Signature: **[Signature]**  
(See warning above) (Voir avertissement ci-dessus)

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# SHIPPING MANIFEST

Suite 3000, 400 Cooper Street, Ottawa, ON K2P 2H8

**NON NEGOTIABLE**

Filled By: <b>JPIALLAQ</b>	Date: <b>Jul 16, 2021, 1:08 PM</b>	Project ID:	Task ID: <b>TCN-43750</b>
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Ship To: LSS-F/FOX-M, HALL BEACH, DND Storeroom Raytheon Canada Limited, LSS Hall Beach: P.O. Box 46 Hall Beach, NU, X0A 0K0 867-928-8987	From: FOX-3, DEWAR LAKES, DND Storeroom Raytheon Canada Limited, NWS LSS Hall Beach, P.O. Box 46 Hall Beach, NU, X0A 0K0 867-928-8987	Priority <b>0</b>
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Attention:		Attention:		
Carrier:	Routing:	Waybill #:	Total Pcs.	Total Weight:
			1	1600 LBS

QTY Order	Type	Line Weight	Item	Description	WO or PO	B/Code or S/N	Remarks
4			2002406	WASTE - OIL, 45 GAL	PALLET # 3		ASSET # 359314, 359315, 359316, 359317 48" x 47" x 40" F3-021-03

**NOTE: All claims related to this shipment have to be filled with Raytheon within 45 hours of receipt.**

Received By:	Date
Received By:	Date



# SHIPPING MANIFEST

Suite 3000, 400 Cooper Street, Ottawa, ON K2P 2H8

**NON NEGOTIABLE**

Filled By: <b>JPIALLAQ</b>	Date: <b>Jul 16, 2021, 1:18 PM</b>	Project ID:	Task ID: <b>TCN-43751</b>
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Ship To: LSS-F/FOX-M, HALL BEACH, DND Storeroom Raytheon Canada Limited, LSS Hall Beach: P.O. Box 46 Hall Beach, NU, X0A 0K0 867-928-8987	From: FOX-3, DEWAR LAKES, DND Storeroom Raytheon Canada Limited, NWS LSS Hall Beach, P.O. Box 46 Hall Beach, NU, X0A 0K0 867-928-8987	Priority <b>0</b>
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Attention:		Attention:		
Carrier:	Routing:	Waybill #:	Total Pcs.	Total Weight:
			1	1800 LBS

QTY Order	Type	Line Weight	Item	Description	WO or PO	B/Code or S/N	Remarks
4			2002406	WASTE - OIL, 45 GAL	PALLET # 4		ASSET # 352133, 352036, 354117, 352924 51" X 48" X 43" F3-021-04

**NOTE: All claims related to this shipment have to be filled with Raytheon within 45 hours of receipt.**

Received By:	Date
Received By:	Date



# SHIPPING MANIFEST

Suite 3000, 400 Cooper Street, Ottawa, ON K2P 2H8

**NON NEGOTIABLE**

Filled By: <b>JPIALLAQ</b>	Date: <b>Jul 16, 2021, 1:37 PM</b>	Project ID:	Task ID: <b>TCN-43753</b>
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Ship To: LSS-F/FOX-M, HALL BEACH, DND Storeroom Raytheon Canada Limited, LSS Hall Beach: P.O. Box 46 Hall Beach, NU, X0A 0K0 867-928-8987	From: FOX-3, DEWAR LAKES, DND Storeroom Raytheon Canada Limited, NWS LSS Hall Beach, P.O. Box 46 Hall Beach, NU, X0A 0K0 867-928-8987	Priority <b>0</b>
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Attention:		Attention:		
Carrier:	Routing:	Waybill #:	Total Pcs.	Total Weight:
			1	1000 LBS

QTY Order	Type	Line Weight	Item	Description	WO or PO	B/Code or S/N	Remarks
1			2002356	WASTE - OIL FILTERS	PALLETT # 5		ASSET # 352491
3			2002505	WASTE - OILY RAGS	PALLET # 5		ASSET # 345760, 352493, 359324 54" X 54" X 44" F3-021-05

**NOTE: All claims related to this shipment have to be filled with Raytheon within 45 hours of receipt.**

Received By:	Date
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Received By:	Date
--------------	------



## SHIPPING MANIFEST

Suite 3000, 400 Cooper Street, Ottawa, ON K2P 2H8

**NON NEGOTIABLE**

Filled By: <b>JPIALLAQ</b>	Date: <b>Jul 16, 2021, 2:21 PM</b>	Project ID:	Task ID: <b>TCN-43762</b>
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Ship To: LSS-F/FOX-M, HALL BEACH, DND Storeroom Raytheon Canada Limited, LSS Hall Beach: P.O. Box 46 Hall Beach, NU, X0A 0K0 867-928-8987	From: FOX-3, DEWAR LAKES, DND Storeroom Raytheon Canada Limited, NWS LSS Hall Beach, P.O. Box 46 Hall Beach, NU, X0A 0K0 867-928-8987	Priority <b>0</b>
---	--	----------------------

Attention:		Attention:		
Carrier:	Routing:	Waybill #:	Total Pcs.	Total Weight:
			1	150 LBS

QTY Order	Type	Line Weight	Item	Description	WO or PO	B/Code or S/N	Remarks
3			4004961	WASTE - Asbestos Containing Ma	PALLET # 7		ASSET # 359327, 359328, 359329 54" X 54" X 45" F3-021-14
1			2002345	WASTE - AEROSOLS, FLAMMABLE (D	PALLET # 7		ASSET # 352515

**NOTE: All claims related to this shipment have to be filled with Raytheon within 45 hours of receipt.**

Received By:	Date
Received By:	Date



## ANNEX B. LOCATION OF EFFLUENT OUTFALL AND LANDFILL WITH COORDINATES



Figure B-1: Coordinates of landfill: 68° 39' 1.50"N, 71° 14' 35.00"W



Figure B-2: Coordinates of Sewage Outfall Location: 68° 39' 6.38"N, 71° 14' 6.44"W

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## **ANNEX C. ANALYSIS OF DISCHARGED SEWAGE EFFLUENT**

Monitoring Station FOD-2 was discontinued in water licence 8BC-FOD1828. The sewage outfall sump was not discharged in 2021 and therefore sampling was not required.



**ANNEX D. LOCATION OF BERMED FUEL STORAGE FACILITIES<sup>1</sup>**

Table D-1 contains the locations and sampling dates for the wastewater discharged from the bermed fuel storage facilities.

**Table D-2: Location of Bermed Fuel Storage Facilities and Date Sampled in 2021**

Berm	Location on-site	Discharge Latitude <sup>2</sup>	Discharge Longitude	Date
DEW W22A&B	Summit	68°39'05.43"N	71°14'03.23"W	8-Jul-2021
DEW W22C&D	Summit	68°39'03.67"N	71°13'49.97"W	8-Jul-2021
DEW W20D&E	Airstrip	68°37'24.90"N	71°08'05.62"W	8-Jul-2021

<sup>1</sup> Effluent from bermed fuel storage facilities.

<sup>2</sup> Final discharge point of bermed fuel storage facility

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## ANNEX E. ANALYSIS OF BERM WATER<sup>3</sup>

The berms at FOX-3 were sampled using hydrocarbon test strips as per the approved QA/QC Plan for Berm Water Sampling as stated in the water licence 8BC-FOD1929, PART D, Item 11. The photo log of the hydrocarbon test strips is included in pages, which follow.

The following documents are enclosed:

1. Hydrocarbon Test Strip Photo Log

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<sup>3</sup> Effluent from bermed fuel storage facilities.

## Photo Log of Hydrocarbon Test Strips



Photo E 1: Hydrocarbon test strips used in berm of tanks W22A & W22B (8-Jul-21)



Photo E 2: Hydrocarbon test strips used in berm of tank W22C (8-Jul-21)

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Photo E 3: Hydrocarbon test strips used in berm of tank W22D (8-Jul-21)



Photo E 4: Hydrocarbon test strips used in berm of tank W20D &amp; W20E (8-Jul-2021)



## ANNEX F. MONITORING ACTIVITIES

In December 2017, Canada assumed liability from the previous NWS O&M contractor for the spills resulting from a pipeline leak discovered in 2009 and a helicopter crash that occurred in 2013.

In summer 2018, Canada procured the services of Defence Construction Canada (DCC) to contract an environmental engineering firm to excavate both spill areas and treat the impacted soil in a land farm on site. The contractor mobilized to the site in late August 2018 and successfully excavated, backfilled, and compacted the spill areas and landfarmed the impacted soil. Confirmatory sampling from September 2018 showed that further tilling of the land farm is required.

In 2020, samples were taken but no tilling took place because of COVID-19 restrictions. Samples were compared to the Canadian Council of Ministers of the Environment (CCME) Soil Quality Guidelines (SQG) and the CCME Canada-wide Standard for Petroleum Hydrocarbons (PHC CWS) for coarse soil and commercial land-use. BTEX concentrations were below detection limits for all soil samples within the FOX-3 landfarm. All PHC concentrations were below guidelines with the exception of five soil samples that were above CCME PHC CWS for F2 (C10-C16) fractions.

The five soil sample results remaining above the guideline for PHC-F2 (C10-C16) indicated that further tilling and confirmatory sampling was recommended in order to close the FOX-3 landfarm. Tilling and sampling was planned for summer 2021. The goal was to reach the CCME SQG and CCME PHC CWS criteria for hydrocarbon remediation and decommission the landfarm by the end of summer.

In the summer of 2021 DCC requested that RC attempted to till the landfarm, however, high soil moisture levels prevented heavy equipment operation. The soil in the landfarm was sampled and found to be above CCME criteria.