



2019 ANNUAL NUNAVUT WATER BOARD REPORT FOR BAF-3 FOR THE North Warning System

Contract # W8485-100224/001/NX
SOW Ref: 16.F.5.d

Document Number
NWB-B3-2019, Rev 1, 18-Mar-2020

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EXECUTIVE SUMMARY

This 2019 Annual Report for the Nunavut Water Board (NWB) has been prepared by Raytheon Canada Limited (RCL) for the Department of National Defence in order to meet the requirements of Part B "General Conditions", paragraph 1 of its licence. Water licence 3BC-BAF0919 was in effect from 01 January until it was replaced with licence 8BC-BAF1929 on 01-Sep-2019. This report covers 01 January to 31 December 2019.

RCL is the Operation and Maintenance Contractor for the North Warning System (NWS), including BAF-3, the unattended (unmanned) North Warning System radar site located on Brevoort Island, Nunavut. The site is visited quarterly by RCL staff based out of Iqaluit, Nunavut for preventive maintenance inspections and as required for other work.

A total of 838.5 cubic meters was drawn from the water supply lake. This is below the annual maximum of 1,750 cubic meters allowed by the current licence.

Fuel tanks within the berms were demolished in 2012 and 2013, and the berms were intentionally breached in 2012 and 2015. No effluent (berm water) samples were taken in 2019. This monitoring point was discontinued in licence 8BC-BAF1929.

Hazardous waste, including waste oil, was sent to an approved hazardous waste disposal facility 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. The hazardous waste shipped from BAF-3 in 2019 consisted of 50 drums and 4 crates of waste batteries.

Non-hazardous domestic solid waste was flown out to the Logistics Support Site in Iqaluit and disposed of at Iqaluit's landfill. RCL has documented authorization from the community for receiving the waste.

One outdoor spill occurred at BAF-3 in 2019. NT-NU Report Number 19-399. On 26-Sep-2019, while offloading a genie lift from a barge, the lift fell on the shore tipping on its side and spilling approximately 2 L of hydraulic fluid. The genie lift was set upright and removed from the beach. Staff scraped up the oil impacted sand from the beach, placing it in a bucket for disposal off site.

The Spill Contingency Plan was updated on 29-Mar-2019.

Groundwater monitoring activities of the 2015 Jet A1 spill continued in 2019.



TABLE OF CONTENTS

Executive Summary	3
Table of Contents	4
List of Tables	4
List of Figures	4
1.0 Introduction	5
1.1 Report Details	5
2.0 Water Use	5
3.0 Hazardous Waste and Waste Oil Disposal	5
4.0 Non-Hazardous Solid Waste Disposal	6
5.0 Monitoring Program	7
6.0 Spills (Unauthorized Discharges)	7
7.0 Revisions to the Spill Contingency Plan	7
8.0 Progressive Reclamation Work UnderTaken	8
9.0 Acronyms	8
Annex A: Hazardous Waste and Waste Oil Disposal in 2019	9
Annex B: Location of Landfill with Coordinates	12
Annex C: Sewage Effluent Outfall (BAF-2) Location with Coordinates	13
Annex D: Analysis of Discharged Sewage Effluent	14
Annex E: Analysis of Berm Water	15
Annex F: Monitoring Activities	16

LIST OF TABLES

Table 2-1: Monthly Raw Water Usage at BAF-3 in 2019	5
Table 3-1: Hazardous Waste and Waste Oil Sent for Disposal from BAF-3 in 2019	6
Table 4-1: Non-hazardous Domestic Solid Waste Sent for Disposal from BAF-3 in 2019	6
Table 6-1: Unauthorized Discharges at BAF-3 in 2019	7
Table 9-1: Acronyms	8

LIST OF FIGURES

Figure 1: Movement Document 2539187-1	9
Figure 2: Movement Document 2539188-9	10
Figure 3: NWS Shipping Manifest TCN-40363	11



1.0 INTRODUCTION

This 2019 Annual Report for the Nunavut Water Board (NWB) has been prepared by Raytheon Canada Limited (RCL) for the Department of National Defence in order to meet the requirements of Part B “General Conditions”, paragraph 1 of its licence. Water licence 3BC-BAF0919 was in effect from 01 January until it was replaced with licence 8BC-BAF1929 on 01-Sep-2019. This report covers 01 January to 31 December 2019.

RCL is the Operations and Maintenance Contractor for the North Warning System (NWS), including BAF-3, the unattended (unmanned) North Warning System radar site located on Brevoort Island, Nunavut. The site is visited quarterly by RCL staff based in Iqaluit for preventive maintenance inspections and as required for other work.

1.1 Report Details

Licensee:	Department of National Defence, Government of Canada
Licence:	3BC-BAF0919 – Type “B” from 01-Jan-2019 until it was replaced on 01-Sep-2019 with 8BC-BAF1929 – Type “B”
Location:	BAF-3 North Warning System Site, Brevoort Island, Qikiqtani Region, Nunavut
Report Prepared by:	Raytheon Canada Limited, 18-Mar-2020
Time period covered:	01 January to 31 December 2019

2.0 WATER USE

A total of 838.5 cubic meters was drawn from the water supply lake. This is below the annual maximum of 1,750 cubic meters allowed by the current licence. See Table 2-1 for the volume of water drawn at BAF-3 in 2019.

Table 2-1: Monthly Raw Water Usage at BAF-3 in 2019

Month	Raw water usage (m ³)
January	0
February	0
March	0
April	0
May	0
June	0
July	0
August	838.5
September	0
October	0
November	0
December	0
TOTAL	838.5

3.0 HAZARDOUS WASTE AND WASTE OIL DISPOSAL

Hazardous waste, including waste oil, from BAF-3 were sent to an approved hazardous waste disposal facility outside of Nunavut as required by the licence. The hazardous waste was shipped to Qikiqtaaluk Environmental, through their subcontractor Veolia. See Table 3-1 for the list of items sent for disposal.



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See Annex A for the shipping document including the completed movement documents for waste regulated under the Transportation of Dangerous Goods Regulations (TDGR) and NWS Manifests for non-regulated waste. The hazardous waste shipped from BAF-3 in 2019 consisted of 50 drums and 4 crates of waste batteries.

Table 3-1: Hazardous Waste and Waste Oil Sent for Disposal from BAF-3 in 2019

Description, TDG shipping name	Quantity	Movement Document or Manifest #
Waste batteries, wet, filled with acid	1 Crate	Movement Document 2539187-1
Waste batteries, wet, non-spillable	3 Crates	Movement Document 2539187-1
Waste Jet A1 fuel soaked sorbent	9 Drums	Movement Document 2539187-1
Waste solids containing flammable liquids, n.o.s (fuel, aviation, turbine engine)		
Waste Jet A1 fuel soaked rags	1 Drum	Movement Document 2539187-1
Waste solids containing flammable liquids, n.o.s (fuel, aviation, turbine engine)		
Waste Jet A1 fuel and water mixture	33 Drums	Movement Document 2539188-9
Waste fuel, aviation, turbine engine mixture		
Waste contaminated soil - Non-regulated	2 Drums	Movement Document 2539188-9
Not TDG Regulated		
Waste activated carbon, water mix	1 Drum	Movement Document 2539188-9
Waste Activated Carbon Mixture		
Waste oil	3 Drums	NWS Manifest TCN40363
Not TDG regulated		
Waste cooking oil	1 Drum	NWS Manifest TCN40363
Not TDG Regulated		

4.0 NON-HAZARDOUS SOLID WASTE DISPOSAL

Non-hazardous domestic solid waste was flown out to the Logistics Support Site in Iqaluit and disposed of at Iqaluit's landfill. RCL has documented authorization from the community for receiving the waste.

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

Table 4-1: Non-hazardous Domestic Solid Waste Sent for Disposal from BAF-3 in 2019

Month	Waste Generated (kg)
January	36
February	91
March	0
April	340
May	136
June	295
July	227

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Month	Waste Generated (kg)
August	680
September	204
October	145
November	0
December	0
TOTAL	2,154

5.0 MONITORING PROGRAM

In 2019, a monitoring program was implemented at BAF-3 as required by the water licence, Part J. The monitoring program included the following:

1. Volume of raw water drawn from the water Supply Lake (BAF-1). The information gathered from this requirement is shown in **Section 2.0 Water Use**. The volume of 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 (BAF-2). The location of the sewage effluent outfall is shown in **Annex C: Sewage Effluent Outfall (BAF-2) Location with Coordinates**. A sump for the sewage outfall was constructed in 2010. The sewage outfall sump was not sampled in 2019 because the sewage sump was not pumped out. **Annex D: Analysis of Discharged Sewage Effluent** has been left blank.
3. Final Discharge Point from the Landfarm Facility (BAF-3). No samples were taken in 2019.
4. Final Discharge Point of the Bulk Fuel Storage Facility (BAF-4). Fuel tanks within the berms were demolished in 2012 and 2013, and the berms were intentionally breached in 2012 and 2015. As there are no intact berms, sampling location BAF-4 has been discontinued in licence 8BC-BAF1929. **Annex E: Analysis of Berm Water** has been left blank.
5. Groundwater monitoring activities (BAF-5) of the 2007 Jet A1 spill ended in 2015 as per the recommendation by Stantec Consulting Ltd. Groundwater monitoring of the 2015 Jet A1 spill continued in 2018. A summary of the work completed in 2019 is included in **Annex F: Monitoring Activities**.

6.0 SPILLS (UNAUTHORIZED DISCHARGES)

Table 6-1: Unauthorized Discharges at BAF-3 in 2019

Date, NT-NU Spill #	Product	Quantity	Cause and follow-up action	On-site location
26-Sep-2019, Spill # 19-399	Hydraulic fluid	2 L	On 26-Sep-2019, while the barge operator was offloading a genie lift from a barge, the lift tipped over falling approximately 3 feet from the ramps to the beach. The lift fell on the shore tipping on its side and spilling approximately 2 L of hydraulic fluid. The genie lift was set upright and removed from the beach. Staff scraped up the oil impacted sand from the beach, placing it in a bucket for disposal off site.	Beach (63°19'09.6"N 64°08'24.7"W)

7.0 REVISIONS TO THE SPILL CONTINGENCY PLAN

The Spill Contingency Plan was updated on 29-Mar-2019. An updated copy of the Spill Contingency Plan has been submitted to the NWB with this annual report.



8.0 PROGRESSIVE RECLAMATION WORK UNDERTAKEN

2019 was the fifth year of clean-up following the 19-Mar-2015 fuel spill. Environmental staff mobilized to the site from 17-Aug-2019 to 22-Aug-2019. A summary of the work completed in 2019 is included in **Annex F: Monitoring Activities**.

9.0 ACRONYMS

Table 9-1: Acronyms

Acronym	Definition
MW	Monitoring Well
NAPL	Non-Aqueous Phase Liquids
NWB	Nunavut Water Board
NWS	North Warning System
NWSO	North Warning System Office
PHC	Petroleum Hydrocarbons
RCL	Raytheon Canada Limited
RW	Recovery Well
SVE	Soil Vapor Extraction
TDGR	Transportation of Dangerous Goods Regulations
TPH	Total Petroleum Hydrocarbons
VOC	Volatile Organic Compounds



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ANNEX A: HAZARDOUS WASTE AND WASTE OIL DISPOSAL IN 2019

The 2019 Movement Documents for TDG Regulated waste and NWS Manifests for non-TDG Regulated waste described in Table 3-1 are below.

MOVEMENT DOCUMENT / MANIFEST DOCUMENT DE MOUVEMENT / MANIFESTE

This Movement document/manifest conforms to all federal and provincial transport and environmental legislation.
Ce document de mouvement/manifeste est conforme aux législations fédérale et provinciale sur l'environnement et le transport.

2539187-1

Movement Document / Manifest Reference No.
N° de référence du document de mouvement/manifeste

A Generator / consigneur Producteur / expéditeur Registration No. / Provincial ID No. N° d'immatriculation - d'id. provincial Nug 100003 Company name / Nom de l'entreprise Dept of National Defense c/o ECL Mailing address / Adresse postale 22 Wing Bldg 109 Hornell Heights Rd City / Ville Hornell Province Ontario Postal code / Code postal L7S 4R4 E-mail / Courriel électronique 705-494-2011		B Carrier Transporteur Registration No. / Provincial ID No. N° d'immatriculation - d'id. provincial Company name / Nom de l'entreprise Mailing address / Adresse postale City / Ville Province Postal code / Code postal E-mail / Courriel électronique Tel. No. / N° de tél. Vehicle / Véhicule Trailer - Rail car No. 1 1 st emergency - wagon Trailer - Rail car No. 2 2 nd emergency - wagon Registration No. / N° d'immatriculation Prov. Port of entry Point d'entrée International use only Port of exit Point de sortie International use only Carrier Certification: I certify that I have received waste or recyclable material from the generator / consigneur for delivery to the receiver / consignee as set out in Part A and that the information contained in Part B is complete and correct. Attestation du transporteur: J'atteste avoir reçu les déchets ou matières recyclables du producteur / expéditeur en vue de leur livraison au récepteur / destinataire, tels qu'ils figurent à la partie A et que les renseignements inscrits à la partie B sont exacts et complets. Name of authorized person (print) Nom de l'agent autorisé (caractères d'imprimerie) Signature Date Year / Année Month / Mois Day / Jour Signature Date Year / Année Month / Mois Day / Jour		C Receiver / consignee Récepteur / destinataire Registration No. / Provincial ID No. N° d'immatriculation - d'id. provincial Receiver / consignee information same as in Part A. Les renseignements du récepteur / destinataire est la même qu'à la Partie A. <input type="checkbox"/> Yes / Oui <input type="checkbox"/> No, complete the box below / Non, remplir la case ci-dessous Company name / Nom de l'entreprise Mailing address / Adresse postale City / Ville Province Postal code / Code postal E-mail / Courriel électronique Tel. No. / N° de tél. Receiving site address / Adresse du lieu de destination Date received / Date de réception Year / Année Month / Mois Day / Jour Time / Heure A.M. <input type="checkbox"/> P.M. <input type="checkbox"/> If waste or recyclable material to be transferred, specify intended company name / Si les déchets ou matières recyclables doivent être transférés, préciser le nom du destinataire Registration No. / Provincial ID No. N° d'immatriculation - d'id. provincial	
Provinc. code Code prov. Shipping name Appellation réglementaire Class / Classe Sub. class(es) Classif. sub. UN No. N° UN Packing / Pkg. gr. Gr. d'emballage du récipient Quantity shipped Quantité expédiée Units L or / ou Kg Units L or / ou Kg Packing / Contain. Codes Int.-nat. Codes Int.-nat. Phys. state État phys. Quantity received Quantité reçue Units L or / ou Kg Units L or / ou Kg Comments Remarques Handling Code / Code de manipulation Shipment / Envoi Accepted Refused Peak Veh. Count Veh. Count		If handling code "Other" (specify) Si code de manipulation « autre » (spécifier) Receiver / consignee certification: I certify that the information contained in Part C is correct and complete. Attestation du récepteur / destinataire: J'atteste que tous les renseignements à la partie C sont exacts et complets. Name of authorized person (print) Nom de l'agent autorisé (caractères d'imprimerie) Signature Date Year / Année Month / Mois Day / Jour Special handling / Manipulation spéciale <input type="checkbox"/> Attached / Joindre <input type="checkbox"/> As follows / Ci-joint Date shipped / Date d'expédition Year / Année Month / Mois Day / Jour Time / Heure A.M. <input type="checkbox"/> P.M. <input type="checkbox"/> Scheduled arrival date / Date d'arrivée prévue Year / Année Month / Mois Day / Jour			
Flash point 38°C 24 Hour Emergency Number 413-936-6666 Canytec Use in case of Dangerous Goods Emergency		Generator / consigneur certification: I certify that the information contained in Part A is correct and complete. Attestation du producteur / expéditeur: J'atteste que tous les renseignements à la partie A sont exacts et complets. Name of authorized person (print) Nom de l'agent autorisé (caractères d'imprimerie) Signature Date Year / Année Month / Mois Day / Jour			

MOE 04-1917 (07/07)

Retained by Consignor (Generator) - Gardée par l'expéditeur

Copy / Copie 2 (green / verte)

Figure 1: Movement Document 2539187-1

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MOVEMENT DOCUMENT / MANIFEST
DOCUMENT DE MOUVEMENT / MANIFESTE

This Movement document/manifest conforms to all federal and provincial transport and environmental legislation.
Ce document de mouvement/manifeste est conforme aux législations fédérale et provinciale sur l'environnement et le transport.

2539188-9

Movement Document / Manifest Reference No.
N° de référence du document de mouvement/manifeste

A Generator / consigneur Producteur / expéditeur Registration No. / Provincial ID No. N° d'immatriculation - d'ID provincial Nug 100003 Company name / Nom de l'entreprise Dentel National Defense c/o RCL Mailing address / Adresse postale 221 Wing Rd, Hornell Heights, PA 16010 City / Ville Hornell Heights, PA 16010 Province PA Postal code / Code postal 16010 E-mail / Courriel électronique 705-494-2011 Shipping site address / Adresse du lieu de l'expédition 11155 ISS Igloolik (Brevet Island) BAF3 City / Ville Igloolik, NU Province NU Postal code / Code postal X0A 0H0		B Carrier Transporteur Registration No. / Provincial ID No. N° d'immatriculation - d'ID provincial Company name / Nom de l'entreprise Mailing address / Adresse postale City / Ville Province Postal code / Code postal E-mail / Courriel électronique Tel. No. / N° de tél. Vehicle / Véhicule Trailer - Rail car No. 1 Trailer - Rail car No. 2 Port of entry / Point d'entrée Port of exit / Point de sortie Carrier Certification: I certify that I have received waste or recyclable material from the generator / consigneur for delivery to the receiver / consignee as set out in Part A and that the information contained in Part B is complete and correct. Attestation du transporteur: J'atteste avoir reçu les déchets ou matières recyclables du producteur / expéditeur en vue de leur livraison au récepteur / destinataire, tels qu'ils figurent à la partie A, et que les renseignements inscrits à la partie B sont exacts et complets. Name of authorized person (print): Year / Année Month / Mois Day / Jour 19 / 10 / 21 Signature: Claudio		C Receiver / consignee Récepteur / destinataire Registration No. / Provincial ID No. N° d'immatriculation - d'ID provincial Receiver / consignee information same as in Part A Les renseignements du récepteur / destinataire sont la même qu'à la Partie A Yes / Oui No, complete the box below / Non, remplir la case ci-dessous Company name / Nom de l'entreprise Mailing address / Adresse postale City / Ville Province Postal code / Code postal E-mail / Courriel électronique Tel. No. / N° de tél. Receiving site address / Adresse du lieu de destination Date received / Date de réception Year / Année Month / Mois Day / Jour Time / Heure If waste or recyclable material to be transferred, specify intended company name / Si les déchets ou matières recyclables doivent être transférés, préciser le nom du destinataire Registration No. / Provincial ID No. N° d'immatriculation / d'ID provincial																									
Prev. code Code préc.		Shipping name Appellation réglementaire		Class / Classe Sub. class(es) Sous-classe(s)		UN No. N° ONU		Packing / Net gr. Gr. d'emballage de net		Quantity shipped Quantité expédiée		Units L or cu ft / Kg Unités		Packaging container Code(s) Emballage cont.		Phys. state État phys.		Quantity received Quantité reçue		Units L or cu ft / Kg Unités		Comments Commentaires		Handling Code / Code de manutention		Shipment / Envoi Accepted / Refused Accepté / Refusé		Receipt Pack. Veh. Reçu	
(1) waste-contaminated soil non-regulated drum				N/A		N/A		454		Kg		2		01		S													
(2) waste cooking oil				N/A		N/A		227		Kg		1		01		L													
(3) waste oil				N/A		N/A		315		Kg		7		01		L													
(4) waste-activated carbon soil (water) mixture				4.2		1368		3		227		Kg		1		01		L											
Flashpoint 38°C																													
24 hour Emergency Number 613-996-6666 Carleton Place																													
Use in case of Dangerous goods Emergency																													
Generator / consigneur certification: I certify that the information contained in Part A is correct and complete. Attestation du producteur / expéditeur: J'atteste que tous les renseignements à la partie A sont exacts et complets.		Name of authorized person (print) Nom de l'agent autorisé (paraphe d'impression): Beimlaren		Signature Signature: Beimlaren		705-494-2011																							

MOE 04-1917 (07/07)

Retained by Consignor (Generator) - Gardée par l'expéditeur

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Figure 2: Movement Document 2539188-9

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SHIPPING MANIFEST

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

NON NEGOTIABLE

Filled By: MMCLAREN		Date: Sep 3, 2019, 11:11 AM		TCN-40363	
Ship To: QIKIQTAAALUK ENVIRONMENTAL (QE) C/O VEOLIA 2630, BOUL. INDUSTRIEL CHAMBLY, QC, J3L 4V2 1-866-634-6367		From: BAF-3, BREVOORT ISLAND, DND Storeroom Raytheon Canada Limited, NWS LSS Iqaluit, P.O. Box 1089 Iqaluit, NU, X0A 0H0 867-979-4818		Priority 0	
Attention:		Attention:			
Carrier: NEAS		Routing: Sealift		Waybill #: Total Pcs. Total Weight: 4 908 kg	
QTY Order	Type	Line Weight	Item	Description	WO or PO B/Code or S/N Remarks
1		227 kg	3006485	WASTE - COOKING OIL	ASSET #351732 WASTE COOKING OIL
1		227 kg	2002406	WASTE - OIL, 45 GAL	ASSET #350996 WASTE OIL
1		227 kg	2002406	WASTE - OIL, 45 GAL	ASSET #351760 WASTE OIL
1		227 kg	2002406	WASTE - OIL, 45 GAL	ASSET #351729 WASTE OIL
NOTE: All claims related to this shipment have to be filled with Raytheon within 45 hours of receipt.					
Received By:				Date	
Received By:				Date	

Figure 3: NWS Shipping Manifest TCN-40363

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ANNEX B: LOCATION OF LANDFILL WITH COORDINATES



Coordinates of Landfill Location: 63° 20' 30.00"N, 64° 10' 02.00"W



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ANNEX C: SEWAGE EFFLUENT OUTFALL (BAF-2) LOCATION WITH COORDINATES



Coordinates of Sewage Outfall Location (BAF-2): 63° 20' 21.40"N, 64° 09' 26.63"W

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ANNEX D: ANALYSIS OF DISCHARGED SEWAGE EFFLUENT

The sewage outfall sump was not sampled in 2019 and this annex has been left blank.



ANNEX E: ANALYSIS OF BERM WATER¹

Fuel tanks within the berms were demolished in 2012 and 2013, and the berms were intentionally breached in 2012 and 2015. As there are no intact berms, no effluent (berm water) samples (BAF-4) were taken in 2019 and this section has been left blank.

Sampling location BAF-4 was discontinued in licence 8BC-BAF1929.

¹ Effluent from bermed fuel storage facilities.



ANNEX F: MONITORING ACTIVITIES

A Jet A1 fuel release was discovered at the North Warning System BAF-3 radar station (Site) located on Brevoort Island, Nunavut, Canada on 19-Mar-2015. The tank involved in the release was immediately isolated by closing valves, an investigation was conducted to determine the extent of the release, and plans to address the release were prepared. Over the subsequent four summer field seasons of 2015 through 2019, extensive actions were taken to recover the released fuel, define the nature and extent of the release and remediate subsurface impacts.

Overall progress made to date has achieved several goals, including:

1. Completing an extensive additional soil, soil vapor, and water investigation to define the nature and extent of petroleum hydrocarbon impacts; this included establishing and completing on-site laboratory testing and analyses;
2. Ensuring minimal migration of non-aqueous phase liquid (NAPL) using engineering controls and booms in drainages;
3. Construction and operation of soil vapor extraction (SVE) systems in two distinct areas of the release;
4. Maximizing NAPL/fuel recovery, treatment, and analysis of recovered NAPL for reuse on-Site;
5. Conducting soil treatment pilot testing, treatment evaluations, and construction of the soil treatment pile; and
6. Construction, operation, and maintenance of a water treatment system to enable extracting subsurface water to mitigate potential fuel migration of fuel and enhance recovery while maintaining compliance of discharge limits in the Site Water License. To date, over 11,200 liters (L) of NAPL has been recovered and collection and over 2,410,678 L of petroleum hydrocarbon contaminated water has been collected and treated.

Progress made during the 2019 field season achieved several goals and bolstered the pathway to Site closure, including but not limited to:

- Completing soil and water monitoring to confirm continued attenuation of residual impacts and confirm the effectiveness of remediation programs implemented since the release in 2015;
- The deployment and application of additional hydrogen peroxide solutions in the RW-1 area, southern drainage, and northern drainage areas to remediate PHCs in place. An approximate volume of 6,000 L of hydrogen peroxide solution were injected and applied during the 2019 field season;
- Continued use of on-Site laboratory testing and analyses of soil allowing for real time delineation and monitoring of remediation programs; and
- Continued mitigation of potential NAPL migration using engineering controls and booms in drainages.

The findings of the work completed during the 2019 field season and documented in previous BAF-3 Summary Reports confirm the effectiveness of remediation programs implemented since the 2015 at reducing PHC concentrations. Significant gains have been made towards addressing closure pathway and molding future site activities towards monitoring operations geared towards site closure. The preliminary scope of activities for 2020 include continued monitoring of surface and sub-surface soil and water and application of remaining hydrogen peroxide stock at the site.