



**Abandonment and Restoration
Plan, Cambridge Bay Airport
Apron Land Treatment Unit,
Version 3**

Final Report

February 17, 2021

Prepared for:

Public Services and Procurement
Canada
Environmental Services – Western
Region
Suite 1650, 635 – 8th Ave SW
Calgary, Alberta, T2P 3M3

Prepared by:

Stantec Consulting Ltd.
100-2555 Ouellette Avenue
Windsor ON CA N8X 1L9

File No: 110220512

ABANDONMENT AND RECLAMATION PLAN, CAMBRIDGE BAY AIRPORT APRON LAND TREATMENT UNIT

This document entitled Abandonment and Reclamation Plan, Cambridge Bay Airport Apron Land Treatment Unit Version 3 was prepared by Stantec Consulting Ltd. ("Stantec") for the account of Public Services and Procurement Canada on behalf of Transport Canada (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by _____
(signature)

Cally Baxter, B.Sc., EPt

Prepared by _____
(signature)

Reid Smith, M.A.Sc., P. Geo.

Quality Reviewed by _____
(signature)

Tanya Shanoff, M.Sc., P. Geo.

Independently Reviewed
and Approved by _____
(signature)

Lindsay van Noortwyk, P. Geo.

**ABANDONMENT AND RECLAMATION PLAN, CAMBRIDGE BAY AIRPORT APRON LAND
TREATMENT UNIT**

Table of Contents

1.0	INTRODUCTION	1
1.1	SITE HISTORY	1
2.0	SITE DESCRIPTION AND LTU STATUS	2
2.1	ROLES AND RESPONSIBILITIES	3
3.0	REGULATORY REQUIREMENTS AND GUIDELINES.....	3
3.1.1	Nunavut Water Board.....	3
3.1.2	Federal Guidelines	5
3.1.3	Additional Considerations.....	5
4.0	FINAL CLOSURE APPROACH	6
4.1	LTU OPERATION AND SOIL SAMPLING PROGRAM.....	7
4.1.1	Sampling Plan	7
4.2	PHYSICAL DECOMMISSIONING ACTIVITIES	8
4.3	CONFIRMATORY SAMPLING OF SOILS BENEATH THE APRON LTU	8
4.4	FINAL GRADING	8
5.0	POST CLOSURE MONITORING	9
5.1	INSPECTION AND REPORTING	9
6.0	SCHEDULE.....	9
7.0	LIMITATIONS	10
8.0	REFERENCES.....	12

LIST OF FIGURES

Figure 1	Site Location Plan	Attachments
Figure 2	Site Plan of Apron LTU	Attachments
Figure 3	Site Plan of Cambridge Bay Airport LTUs	Attachments
Figure 4	As-Built of LTU.....	Attachments

LIST OF TABLES

Table 3-1	NWB Remediation Requirements (Water Licence 1BR-FTA1828)	4
Table 6-1	Summary of Schedule for Remediation and Closure Activities at the Apron LTU	10



ABANDONMENT AND RECLAMATION PLAN, CAMBRIDGE BAY AIRPORT APRON LAND TREATMENT UNIT

Introduction
February 17, 2021

1.0 INTRODUCTION

This updated Abandonment and Restoration Plan (ARP) has been prepared by Stantec Consulting Ltd. (“Stantec”) on behalf of Transport Canada for the Cambridge Bay Airport (CBA) Apron Land Treatment Unit (LTU) in Cambridge Bay, Nunavut (NU). This document has been prepared as a requirement of the Nunavut Water Board (NWB), under NWB Licence #1BR-FTA1828, issued to Transport Canada (TC) on May 17, 2018. The purpose of this updated ARP is to provide information regarding the status of the project and proposed decommissioning of the Apron LTU at the CBA and replaces the “Updated Abandonment and Restoration Plan” submitted by TC in August 2018. This discussion herein focuses only on the Apron LTU and does not include updated planning for the adjacent Fire Training Area (FTA) LTU which is captured under the same Water Licence.

1.1 SITE HISTORY

The CBA is located in Cambridge Bay, Victoria Island, NU and has been operational as an airport since the 1950s. The CBA contains an air terminal building, airline offices, fuel storage and distribution equipment, aircrafts and one runway. A site figure depicting the location is attached as Figure 1. The airport was transferred from TC to the Government of Northwest Territories in 1995, and from the Government of Northwest Territories to the Government of Nunavut in 1999. Under an airport operation transfer agreement between TC and the Government of Nunavut, the Apron area was identified as an area of environmental concern. The area of concern (CBA Apron) historically had three 100,000 L aboveground storage tanks (AST) that contained Avgas and Jet B Fuel. Although the ASTs were decommissioned and removed in 1992, no formal decommissioning procedures were documented. Soil sampling completed in 2009 indicated that there were exceedances of regulatory guidelines for petroleum hydrocarbon (PHC) identified in soil in the Apron area.

To address these impacts, a remedial action plan (RAP) was developed for the impacted soil at the Apron area that led to a recommendation for the construction of an on-site engineered land treatment unit (LTU). A permit was obtained from the Nunavut Water Board (NWB) in 2012, which allowed for the construction of the Apron LTU on the northwest corner of the CBA. In 2013, the Apron LTU was constructed and petroleum hydrocarbon impacted soil was excavated from the Apron area and placed in the LTU. The location of the Apron excavation area and the Apron LTU are shown in Figure 1 (attached). The Apron LTU covers an area of approximately 55 m by 143 m and contains approximately 4,000 m³ of soil. A site plan is attached as Figure 2.

An additional LTU, the adjacent fire training area (FTA) LTU, was constructed in 2014 upgradient of the Apron LTU to receive impacted soils from the FTA excavation area (Figure 3). During the construction of the FTA LTU, a drum cache was discovered within the FTA LTU footprint. Approximately 560 m³ of impacted soil, originating from the FTA LTU excavation area, was stockpiled on the Apron LTU while the FTA LTU was being constructed. The drum cache material was spread out and mixed in with the existing Apron LTU soil in August 2015. In 2016, TC sampled soil and sump water from the Apron LTU for PFAS parameters. Following the identification of PFAS compounds in the Apron LTU soil and sump water, it was



ABANDONMENT AND RECLAMATION PLAN, CAMBRIDGE BAY AIRPORT APRON LAND TREATMENT UNIT

Site Description and LTU Status
February 17, 2021

recommended that until the risk associated with PFAS have been assessed, the sump water should not be discharged directly to the environment and, the practice of recirculating sump water was adapted as the water management strategy for the Apron LTU.

Since 2015, annual monitoring events for groundwater, soil and sump water have been conducted at the Apron LTU as a requirement of the NWB Licence 1BR-FTA1828 (Licence No. 1BR-FTA1217 renewed as Licence No. 1BR-FTA1828 in 2017), with the exception of 2020, where health and safety concerns arising from the COVID-19 pandemic restricted travel into/within Northwest Territories and Nunavut.

2.0 SITE DESCRIPTION AND LTU STATUS

The Apron LTU is located southwest of the northwest end of the CBA runway (Figure 2). The LTU is located in a developed area of the CBA which is restricted from public use. As the location of the Apron LTU is within the restricted area of the commercial/industrial property, the Apron LTU is not expected to impact the community, sensitive ecological areas or public and private water supplies. The area surrounding the airport is generally flat lying close to the roadside, with topography then sloping steeply towards the shoreline and West Arm of Cambridge Bay which is approximately 180 meters (m) south of the CBA.

The base of the Apron LTU was graded and covered with a 60-mil high-density polyethylene (HDPE) geomembrane liner to promote drainage of runoff and leachate towards the single sump location in the southwest corner and prevent infiltration of the contaminants from the soil into the groundwater. The liner was covered and compacted with a layer of granular material approximately 0.25 m thick. A berm, approximately 0.5 m above ground surface was constructed around the Apron LTU. Petroleum hydrocarbon (PHC) impacted soil was excavated from the Apron area and relocated to the Apron LTU in 2013. The impacted soil placed from the Apron excavation and residual material from the FTA LTU excavation has been spread uniformly across the Apron LTU liner at a depth of approximately 0.5 m. The as-built drawings of the Apron LTU are attached (Figure 4). At the time of construction, nine groundwater monitoring wells were installed surrounding the Apron LTU. Since 2014, landfarming activities including tilling, sump dewatering and recirculation, and soil sampling have been completed annually at the Apron LTU.

Ongoing water management is required to monitor that surface water continues to be contained with the LTU, the integrity of the berms are maintained, and conditions of the NWB license are met. Water management includes annual tilling of soils in the LTU to increase water capacity and pumping of water from the sumps over the tilled soil.

Tilling and aeration of impacted soils has been the primary treatment method for PHC in the soils in the LTU to date. Monitoring for PFAS concentrations in perimeter groundwater wells is completed annually (with the exception of 2020, as noted above), and additional soil samples were collected for analyses of PFAS parameters in 2016, 2018 and 2019.



ABANDONMENT AND RECLAMATION PLAN, CAMBRIDGE BAY AIRPORT APRON LAND TREATMENT UNIT

Regulatory Requirements and Guidelines
February 17, 2021

2.1 ROLES AND RESPONSIBILITIES

Since 1999, the CBA has been owned by the Government of Nunavut and used as an airport that services southern Victoria Island, NU. Although the CBA is now territorially owned, TC holds the responsibility for the Apron LTU until the soil reaches the acceptable criteria, as outlined in the NWB Licence (1BR-FTA1828).

3.0 REGULATORY REQUIREMENTS AND GUIDELINES

3.1.1 Nunavut Water Board

3.1.1.1 Abandonment and Reclamation Plan Contents

The NWB requires the preparation and implementation of an ARP for the Type 'B' Water Licence. As outlined in Part I of the Water Licence (1BR-FTA1828), the following conditions need to be met by the ARP:

- Annual review of the approved ARP.
- Modify the ARP as necessary to reflect changes in operations and/or technology.
- Conduct progressive reclamation for any components of the project no longer required for operations.
- Notify the NWB of intention to proceed with final abandonment of the Apron LTU at least six months prior to the planned dates of closure.
- Backfill and restore, all temporary containment sumps, to the pre-existing natural contours of the land.
- Stabilize and re-vegetate all disturbed areas, as required, upon completion of work and restore as practically as possible to a pre-disturbed state.

Although the NWB does not have published guidance for the content of ARPs, in January 2020 the Mackenzie Valley Land and Water Board (MVLWB) released their *Guidelines for the Design, Operation, Monitoring, Maintenance and Closure of PHC-Contaminated Soil Treatment Facilities in the NWT*. This ARP is considered to meet the recommendations outlined for closure planning with the MVLWB document.

3.1.1.2 Closure Criteria

The Nunavut Water Board has issued a type 'B' Water Licence (1BR-FTA1828) to Transport Canada related to water use and waste disposal for the Apron and FTA LTUs. The Water Licence allows "For the deposit of waste during remediation activities at the Cambridge Bay Airport".

Current soil remediation criteria are outlined in NWB Licence No. 1BR-FTA-1828, Part J, Table 1 (updated October 31, 2018). The soil remediation criteria were derived from the Canadian Council of Ministers of the Environment (CCME) 2008 Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil (CWS) and the Government of Nunavut 2009 Environmental Guideline for Site Remediation (GN-EGSR). As outlined in the NWB Licence, the soil analytical results are compared to the criteria for industrial land use and coarse-grained soil. As groundwater at the CBA is not used as a potable water source, the guidelines for protection of potable groundwater were excluded. The remediation requirements outlined in the NWB Licence are



ABANDONMENT AND RECLAMATION PLAN, CAMBRIDGE BAY AIRPORT APRON LAND TREATMENT UNIT

Regulatory Requirements and Guidelines
February 17, 2021

presented in Table 3-1 below. The NWB Water Licence (1BR-FTA1828) and 2009 GN-EGSR do not include guidelines or criteria for PFAS in any environmental media.

Table 3-1 NWB Remediation Requirements (Water Licence 1BR-FTA1828)

Parameter	Soil Texture	Agricultural Land Use	Residential/Parkland Land Use	Commercial Land Use	Industrial Land Use
PHC Fraction 1	Fine	210 (170 ^a)	210 (170 ^a)	320 (170 ^a)	320 (170 ^a)
	Coarse	30 ^b	30 ^b	320 (240 ^a)	320 (240 ^a)
PHC Fraction 2	Fine	150	150	260 (230 ^a)	260 (230 ^a)
	Coarse	150	150	260	260
PHC Fraction 3	Fine	1300	1300	2500	2500
	Coarse	300	300	1700	1700
PHC Fraction 4	Fine	5600	5600	6600	6600
	Coarse	2800	2800	3300	3300
Benzene	Fine	0.0068	0.0068	0.0068	0.0068
	Coarse	0.03	0.03	0.03	0.03
Toluene	Fine	0.08	0.08	0.08	0.08
	Coarse	0.37	0.37	0.37	0.37
Ethylbenzene	Fine	0.018	0.018	0.018	0.018
	Coarse	0.082	0.082	0.082	0.082
Xylene	Fine	2.4	2.4	2.4	2.4
	Coarse	11	11	11	11
Lead	Fine	70	140	260	600
	Coarse				
Polychlorinated biphenyls	Fine	0.5	1.3	33	33
	Coarse				

Notes: All values are in parts per million (ppm)

(a) – where applicable, for protection of potable groundwater

(b) - assumes contamination near residence

In 2018, the NWB directed TC to use the Ontario Ministry of the Environment, Conservation and Parks (MECP) 2011 Site Condition Standards (Under Ontario Regulation 153/04) for evaluation of parameter concentrations in groundwater. Per Ontario Regulation 153/04 (Section 35(3)), properties are considered non-potable when the property, and all other properties located in whole, or in part, within 250 m of the boundaries of the properties are supplied by a municipal drinking water system and have no wells installed. As there are no potable water wells within 250 m of the site boundary, the site is considered non-potable. As such, the Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Groundwater Condition (Table 3 SCS) were considered applicable to the Site. The Table 3 SCS are not dependent on land use.



ABANDONMENT AND RECLAMATION PLAN, CAMBRIDGE BAY AIRPORT APRON LAND TREATMENT UNIT

Regulatory Requirements and Guidelines
February 17, 2021

3.1.2 Federal Guidelines

Environment and Climate Change Canada (ECCC) has developed Federal Environmental Quality Guidelines (FEQG) for Perfluorooctane Sulfonate (PFOS) (May 2018) in soil. In addition to the ECCC guidelines, Health Canada has developed soil screening values (HC SSVs) for 11 select PFAS parameters. The soil screening values are used to determine if detected concentrations are likely to be of concern to human health. PFAS concentrations in soil were compared to the 2019 Updates to the Health Canada Soil Screening Values for Perfluoroalkylated Substances (PFAS) (HC SSVs). Detectable concentrations of PFAS parameters were indicated in the select soil samples collected with the 2018 monitoring event, however results were one to five orders of magnitude below the applicable HC SSVs.

The following federal guidelines are also applicable to PFAS in groundwater:

- Health Canada April 2019 Drinking Water Screening Values: Perfluoroalkylated Substances (HC DWSV)
- Health Canada April 2019 Guidelines for Canadian Drinking Water Quality for PFOS and perfluorooctanoic acid (PFOA) (HC Guidelines).

Because the Site is considered non-potable, the HC DWSV and HC Guidelines are not applicable to the groundwater samples collected at the Site. In the absence of applicable PFAS guidelines / standards, the HC DWSV and HC Guidelines have been referenced in annual monitoring reports prepared for the Apron LTU for information purposes only. The NWB Water Licence has included the ECCC FEQG (2018) for PFOS for surface water, fish tissue, wildlife diet, and bird egg as the criteria for discharge of water collected in the LTU sump.

3.1.3 Additional Considerations

Although measured concentrations in soil, sump water and groundwater at the Apron LTU are below available and applicable guidelines for PFAS parameters, there are recognized gaps in the existing regulatory framework. To better understand the environmental risks associated with the existing concentrations of PFAS compounds, a Preliminary Quantitative Ecological Risk Assessment (PQERA) for Apron LTU soils should be considered. A PQERA could be completed as a desktop exercise, based on existing soil quality data collected in 2019 and earlier, focus on PFAS as well as the co-contaminant present, PHCs. PFAS is felt to be tractable within the context of a PQERA study, because of the low concentrations and limited range of individual chemicals detected in soil sampling results at the Apron LTU to date. Receptors of concern would be based on professional opinion augmented by discussions with local knowledgeable persons (e.g., selected airport staff and community members), but are likely to include soil microbes, herbaceous plants, and selected avian/mammalian receptors. These receptors are appropriate for COPCs that do not biomagnify, and where effects on receptors are likely to be dominated by direct ingestion of contaminated soil. Larger herbivores and higher trophic level receptors (such as caribou, arctic fox, or falcons) would be excluded from the risk assessment based on the rationale that the area of concern is small (approximately 1.5 ha), current land use is an active airstrip area (i.e., a deterrent to exposure), and that large herbivores and predators in the Arctic require much larger foraging ranges in order to survive. Therefore, their exposure to the site would be at a low level and/or intermittent. If required, the PQERA



ABANDONMENT AND RECLAMATION PLAN, CAMBRIDGE BAY AIRPORT APRON LAND TREATMENT UNIT

Final Closure approach
February 17, 2021

could include site data collection during future monitoring events to focus on areas of uncertainty and to validate key assumptions, such as the statistically-calculated exposure point concentration (EPC) values for contaminant concentrations in soil.

If approved by the NWB and completed, results of this PQERA would be used to inform the existing treatment requirements for PHCs in LTU soil and recommend an approach for PFAS impacted soil. Screening for human health risks would be completed following the PQERA. The PQERA and human health screening is a preliminary step to assess risk management as a potential closure approach, it will not include the development of site specific threshold levels (SSTLs) but will include recommendations for site closure.

4.0 FINAL CLOSURE APPROACH

The objectives of the ARP are to re-establish pre-disturbance terrain conditions and restore the area occupied by the Apron LTU to a condition that is compatible with future land use. Following LTU reclamation, the area will continue to be used as an operational airport and land use will remain industrial. The following closure criteria will be considered for determining timing of the LTU closure:

- LTU soils have met one of the following:
 - PHC concentration outlined in the NWB Remediation Requirements for outlined in Water Licence 1BR-FTA1828 (Table 3-1), and PFAS screening values outlined in the HC SSV or relevant standards/guidelines available at the time.
 - Alternative criteria approved by the NWB (none are proposed at this time); or,
 - Recommendations of a PQERA and human health screening suggest the PHC and PFAS concentrations in LTU soils do not present an unacceptable risk to ecological receptors and/or human health .
- LTU sump water (if present) is within allowable discharge limits outlined in Part E, Condition 5 of the Water Licence 1BR-FTA1828, relevant updated standards/guidelines available at the time of closure, or sump water is containerized for off-site disposal at an approved facility.

Following decommissioning of the LTU facility, successful abandonment will be considered achieved based on the following criteria:

- Non-native materials associated with the LTU facility (e.g., liner) have been removed from the area;
- Regrading of the area has been completed to tie into surrounding topography to allow for suitable drainage and to prevent/eliminate concerns for settlement and/or ponded water. Monitoring of the footprint should be observed for a three-year period to confirm suitable drainage and lack of settlement; and,
- Stable or decreasing concentrations of PHCs, Polycyclic Aromatic Hydrocarbons (PAH), PFAS and BTEX in monitoring well samples for a three-year period, and monitoring wells have been decommissioned.

Specific closure activities planned to achieve the above criteria are described below.



ABANDONMENT AND RECLAMATION PLAN, CAMBRIDGE BAY AIRPORT APRON LAND TREATMENT UNIT

Final Closure approach
February 17, 2021

4.1 LTU OPERATION AND SOIL SAMPLING PROGRAM

Current LTU operations include annual tilling of LTU soils with a ripper or disc-harrow attachment, sump dewatering and application to LTU soils, a one-time nutrient amendment, and annual soil sampling to monitor treatment performance. Tilling is typically completed by local subcontractors once per year, prior to soil and groundwater sampling and sump dewatering activities. Tilling activities have entailed the use of backhoe with disk harrow attachment being dragged across the LTU three times in a circular pattern to a depth ranging from approximately 0.25 to 0.45 mbgs. Tilling of the Apron LTU was completed in 2015, 2017, 2018, and 2019 to promote water infiltration, aeration of soils, volatilization of light end PHC fractions, and increase overall biodegradation rates for PHCs. The disc-harrow was used from 2015 to 2018 which had limited depth penetration of approximately 0.30 mbgs. The ripper attachment that was recently used in 2019 was able to till the soil to a depth of 0.55 mbgs. At this time, activities associated with PFAS parameters detected in LTU soils, sump water and perimeter groundwater wells are limited to monitoring at this time.

Reductions in LTU soil PHC concentrations have been measured during operations, and PHC treatment criteria may be reached in select areas and/or throughout the LTU soils as early as the next five years if existing operations and monitoring trends continue.

4.1.1 Sampling Plan

The annual sampling program includes soil and groundwater sampling, and will continue in accordance with the NWB Water Licence (1BR-FTA1828). Sumps will continue to be dewatered as necessary, and the sump water will be discharged over the Apron LTU as the water management strategy until the risk associated with PFAS have been assessed. At this time, if sump water continues to be compliant with Licence discharge criteria and the PQERA has not identified unacceptable risks from sump water release to the environment, then sump water will be discharged to ground outside the Apron LTU with applicable erosion and sedimentation controls in place.

Once analytical results for LTU soils have reached the approved closure criteria (See Section 4.0), recommendations to decommission the Apron LTU will be provided to the NWB. This will be delivered in order to provide the required six month notice to the NWB prior to commencing decommissioning.

The LTU sampling plan for evaluation of Apron LTU soils is prescribed in the NWB Licence, and divides the LTU into six sections consisting of approximately 1,250 square meters (m²) per section. There is approximately 4,000 m³ of impacted soil contained in the Apron LTU and a discrete soil sample is collected from each of the six sections, or every 667 m³ of impacted soil. In 2018, additional sampling was completed and soil was collected from 18 locations, three in each section of the LTU. To evaluate LTU closure, a final sampling event including six composite samples comprised of four discrete sample locations within each section of the LTU is recommended. The four discrete sample locations should include two from 0.1 - 0.3 mbgs and two from 0.3 - 0.55 mbgs. Monitoring data compiled to date has provided a valuable dataset from discrete locations for consideration, however, composite sampling will provide a more accurate representation of the overall LTU soil mass for comparison against closure criteria (Section 4.0).



ABANDONMENT AND RECLAMATION PLAN, CAMBRIDGE BAY AIRPORT APRON LAND TREATMENT UNIT

Final Closure approach
February 17, 2021

4.2 PHYSICAL DECOMMISSIONING ACTIVITIES

Decommissioning of the LTU will include the following activities:

- Treated soil will be removed from the Apron LTU and temporarily stockpiled alongside the LTU on ground surface. As the geomembrane liner becomes exposed, the integrity will be visually inspected at discrete locations (as practical) to assess potential transport of PHCs/PFAS parameters into the underlying soil. The location of any damages to the geomembrane liner will be recorded.
- The geomembrane liner will be removed and sent for disposal in the community landfill (pending approval), or to an approved off-site facility.
- The sump area and berms will be leveled out to reflect surrounding topography.
- Backfill and regrade the Apron LTU area with the treated soil.
- Stabilize and promote the natural revegetation of disturbed areas to restore as practically as possible to a pre-disturbed state.
- Erosion and sediment controls will be implemented if required during earthworks to prevent movement (water, wind) of soil/sediments/runoff out of the restoration area.
- Following the post-closure monitoring phase, TC will decommission groundwater monitoring wells (MW13-1 through MW13-9) adhering to the Yukon Groundwater Environment Act – Protocol for Contaminated Sites Regulation - Groundwater Monitoring Well Installation, Sampling and Decommissioning procedure for plugging and abandonment of monitoring wells.

4.3 CONFIRMATORY SAMPLING OF SOILS BENEATH THE APRON LTU

Once the Apron LTU soil has been removed and the geomembrane liner has been dismantled and removed from the Apron LTU, confirmatory soil samples will be collected from the footprint of the LTU. Surface soil samples (0.0 to 0.15 m bgs) will be collected in a grid pattern, every 10 - 20 m across the LTU footprint and submitted to an off-site laboratory for BTEX, PHCs (F1-F4) and PFAS analyses. If visual indicators (e.g. staining) or soil-vapor screening suggests PHC impacts, additional sampling will be completed at depth (0.5 m bgs) in an effort to delineate. If impacted soil associated with LTU operations is encountered above applicable closure criteria it would be delineated, excavated, and placed in the FTA LTU. Should detectable levels of PFAS parameters be found in underlying soils, these areas will be assessed against relevant screening guidelines available at the time. Any excavation areas will be backfilled and graded with native fill.

4.4 FINAL GRADING

The berms and sump area of the Apron LTU area will be leveled following the removal of the liner. Treated soil from the Apron LTU will be backfilled and used to restore the LTU area. The area will be graded to match surrounding topography and drainage, and support natural revegetation processes. No active revegetation is proposed (e.g. fertilizer application, application of commercial seed mix, etc.).



ABANDONMENT AND RECLAMATION PLAN, CAMBRIDGE BAY AIRPORT APRON LAND TREATMENT UNIT

Post Closure Monitoring
February 17, 2021

5.0 POST CLOSURE MONITORING

Following the decommissioning and restoration of the Apron LTU, the site will enter a post closure monitoring phase. This phase will include visual inspection and collection of groundwater samples in accordance with TC's guidelines for PHCs and PFAS, then submitted for laboratory analysis in accordance with the requirements outlined in the effective NWB Water Licence.

A groundwater monitoring program will be conducted annually in accordance with the existing NWB Licence requirements, and adapted based on analytical results and summary findings. If the groundwater meets closure criteria (Section 3) and exhibits stable or decreasing trends in indicator parameters for three consecutive years, then restoration of the Apron LTU will be considered complete. Physical inspection will be completed to assess the stability of final grading.

The post closure monitoring schedule and exit criteria are presented in Table 6-1.

5.1 INSPECTION AND REPORTING

A site inspection of the disturbed areas associated with the LTU will be conducted prior to final closure of the site. The site inspection will include recording and photographing locations of disturbed areas and preparing a description of the final condition. A final closure and restoration report will be prepared using the information gathered during post closure monitoring activities and the final site inspection. The final report will be submitted to the NWB and other regulatory agencies, as required.

6.0 SCHEDULE

Transport Canada plans to decommission the Apron LTU once the LTU soils have met closure criteria (Section 4.0). Table 6-1 below provides a summary of the Apron LTU schedule for remediation and closure activities. The estimated schedule is reliant on many factors such as weather conditions, concentration levels, completion of landfarming remediation activities (e.g. tilling frequency), and potential updates to the NWB approved closure criteria. As no active treatment methods are being implemented for PFAS impacted soils at the Apron LTU, the schedule below has been developed to reflect timelines associated with estimated PHC treatment performance. An updated schedule reflecting management of PFAS impacted material may be required following completion of the PQERA.

Overall, the operation of the LTU since 2014, has resulted in substantial decreases to PHC concentrations, and if existing trends and treatment activities continue as planned, it is assumed that soil could meet NWB Licence remediation criteria for PHC parameters within approximately five years.



ABANDONMENT AND RECLAMATION PLAN, CAMBRIDGE BAY AIRPORT APRON LAND TREATMENT UNIT

Limitations
February 17, 2021

Table 6-1 Summary of Schedule for Remediation and Closure Activities at the Apron LTU

Activities	Anticipated Timeframe	Comments	Assumptions
Landfarming Operation and PQERA	Ongoing for 5 -10 years	Includes annual LTU treatment activities completed during thawed conditions. This includes annual monitoring and reporting. PQERA may be completed to inform final closure plans.	Proceed following current remedial approach. Renewal license is granted from NWB, if required.
Decommissioning and Restoration Activities	One Field Season, commencing the year after soil has been treated to approved levels	Completed during one field season. Includes LTU decommissioning, confirmatory sampling of underlying soil, and regrading activities.	Approval provided by NWB to commence decommissioning.
Post Closure Monitoring	Following completion of decommissioning, three years of stable or decreasing concentrations of COCs (PHC/PFAS parameters) in groundwater.	Major activities include groundwater monitoring completed annually during thawed conditions and visual inspection of final grading and drainage.	Monitoring wells are located downgradient of the FTA LTU and some may be left in place to provide additional monitoring points for this facility following Apron LTU decommissioning.
Final Site Inspection and Final Closure Report	Site activities completed in conjunction with final year of Post-Closure Monitoring.	Final Reporting will be done in conjunction with annual monitoring report.	Groundwater trends meet closure criteria.

7.0 LIMITATIONS

This plan documents work that was performed in accordance with generally accepted professional standards at the time and location in which the services were provided. No other representations, warranties or guarantees are made concerning the accuracy or completeness of the data or conclusions contained within this report, including no assurance that this work has uncovered all potential liabilities associated with the identified property.

This plan provides an evaluation of selected environmental conditions associated with the identified portion of the properties that were assessed at the time the review was conducted and is based on information obtained by and/or provided to Stantec at that time. There are no assurances regarding the accuracy and completeness of this information. All information received from the client or third parties in the preparation of this report has been assumed by Stantec to be correct. Stantec assumes no responsibility for any deficiency or inaccuracy in information received from others.



ABANDONMENT AND RECLAMATION PLAN, CAMBRIDGE BAY AIRPORT APRON LAND TREATMENT UNIT

Limitations

February 17, 2021

Conclusions made within this plan consist of Stantec's professional opinion as of the time of the writing of this report and are based solely on the scope of work described in the report, the limited data available and the results of the work. They are not a certification of the property's environmental condition. This report should not be construed as legal advice.

This plan has been prepared for the exclusive use by PSPC and TC and any use by any third party is prohibited. Stantec assumes no responsibility for losses, damages, liabilities or claims, howsoever arising, from third party use of this report.

This plan is limited by the following:

- Data as reported in the previous assessment and monitoring reports completed at the CBA Project sites by various authors.

The locations of any utilities, structures, and property boundaries illustrated in or described within this report, if any, including surface or sub-surface structures are not guaranteed. Before starting work, the exact location of all such structures should be confirmed and Stantec assumes no liability for damage to them.

The conclusions are based on factors such as areas of potential concern identified in previous studies, site conditions (e.g., utilities), site components, etc. Due to the nature of the investigation and the limited data available, Stantec does not warrant against undiscovered environmental liabilities. As the purpose of this report is to identify site conditions which may pose an environmental risk; the identification of non-environmental risks to structures or people on the Site is beyond the scope of this assessment.

Should additional information become available which differs significantly from our understanding of conditions presented in this report, Stantec specifically disclaims any responsibility to update the conclusions of this report.



ABANDONMENT AND RECLAMATION PLAN, CAMBRIDGE BAY AIRPORT APRON LAND TREATMENT UNIT

References

February 17, 2021

8.0 REFERENCES

Arcadis Canada Inc. 2017. 2017 Environmental Monitoring Program at Cambridge Bay Airport Apron LTU, Cambridge Bay Airport, NU. December 1, 2017

Canadian Council of Ministers of the Environment. 2008. Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil.

Canadian Council of Ministers of the Environment. 2016. 2014. Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment. Volume 1 Guidance Manual.

CCME. 2016. Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment. Volume 4 Analytical Methods.

Dillon Consulting. 2015. 2014 Apron Groundwater and LTU Soils Monitoring Report, Cambridge Bay Airport – Victoria Island, Nunavut. March 4, 2015

Dillon Consulting. 2016. 2015 Apron Groundwater and LTU Soils Monitoring Report, Cambridge Bay Airport – Victoria Island, Nunavut. January 2016

Environment and Climate Change Canada. February 2017. Federal Environmental Quality Guidelines for Perfluorooctanoic Sulfonate (PFOS).

Government of Canada. 2006. Federal Contaminated Sites Action Plan (FCSAP). Federal Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils. Accessed online at https://www.canada.ca/content/dam/eccc/migration/fcs-scf/B15E990A-C0A8-4780-9124-07650F3A68EA/Landfarming_en.pdf

Government of Nunavut, Department of Environment. December 2014. Environmental Guideline for the Management of Contaminated Sites.

Health Canada. 2019. Drinking Water Screening Values: Perfluoroalkylated Substances. April 2019.

Health Canada. 2019. Guidelines for Canadian Drinking water Quality for PFOS and PFOA, dated April 2019.

Health Canada. 2019. Updates to Health Canada Soil Screening Values for Perfluoroalkylated Substances (PFAS). May 2019.

Nunavut Water Board. 2018. NWB Water Licence No. 1BR-FTA1828 (updated October 31, 2018).

Stantec Consulting Ltd. 2019. 2018 Site Remedial Activities Supervision and Environmental Monitoring Program – Cambridge Bay Airport, Apron Land Treatment Unit and Excavation Area, Amendment 1. March 2019.



ABANDONMENT AND RECLAMATION PLAN, CAMBRIDGE BAY AIRPORT APRON LAND TREATMENT UNIT

References

February 17, 2021

Stantec Consulting Ltd. 2020. 2019 Site Remedial Activities Supervision and Environmental Monitoring Program – Cambridge Bay Airport, Apron Land Treatment Unit and Excavation Area, Addendum. March 2020.

Stantec Consulting Ltd. 2020. 2020 De-Watering Activities, Apron Land Treatment Unit, Cambridge Bay Airport, Cambridge Bay, Nunavut (Water License No. 1BR-FTA-1828\). October 26, 2020.

Transport Canada. 2017. Per-and Polyfluoroalkyl Substances (PFAS) Field Sampling Guidance.



ATTACHMENTS

Figures



001-c200\workgroup\110220512\gis\figures\2020_apron_abandonment_and_reclamation\fig_1_site_location_plan.mxd Revised: 2020-12-02 By: MKuhl



Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Data Sources: Geogratis, ©Department of Natural Resources Canada, All rights reserved.
3. Background: © 2020 Microsoft Corporation © 2020 Maxar ©CNES (2020) Distribution Airbus DS

- Site Feature
Land Parcel

0 400 800 metres
(At original document size of 8.5x11)
1:30,000



Project Location
Cambridge Bay
Nunavut

Prepared by MKuhl on 2020-10-27
TR by CBaxter on 2020-12-02

Client/Project
Public Services and Procurement Canada (PSPC) for
Transport Canada, Cambridge Bay Airport Apron LTU
Abandonment and Reclamation Plan

Figure No.

1

Title

Site Location Plan

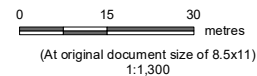
\\cd1001-c200\workgroup\1102\active\110220512\gis\figures\2020_apron_abandonment_and_reclamation\fig_2_site_plan_apron_ltu.mxd Revised: 2020-12-02 By: MKuhl



Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Data Sources: Geogratis, ©Department of Natural Resources Canada, All rights reserved.
3. Background: © 2020 Microsoft Corporation © 2020 Maxar ©CNES (2020) Distribution Airbus DS

- Approximate LTU Limits
- Monitoring Well Location (Others 2013)
- LTU Land Treatment Unit



Project Location
Cambridge Bay
Nunavut

Prepared by MKuhl on 2020-10-27
TR by CBaxter on 2020-12-02

Client/Project
Public Services and Procurement Canada (PSPC) for
Transport Canada, Cambridge Bay Airport Apron LTU
Abandonment and Reclamation Plan

Figure No.

2

Title

Site Plan of Apron LTU

\\cd1001-c200\workgroup\1102\active\110220512\gis\figures\2020_apron_abandonment_and_reclamation\fig_3_site_plan_apron_fta.mxd
Revised: 2020-12-02 By: MKuhl



Notes

1. Coordinate System: NAD 1983 UTM Zone 13N
2. Data Sources: Geogratis, ©Department of Natural Resources Canada, All rights reserved.
3. Background: © 2020 Microsoft Corporation © 2020 Maxar ©CNES (2020) Distribution Airbus DS

Approximate LTU and Excavation Location
LTU Land Treatment Unit

0 30 60 metres
(At original document size of 8.5x11)
1:3,000



Project Location
Cambridge Bay
Nunavut

Prepared by MKuhl on 2020-10-27
TR by CBaxter on 2020-12-02

Client/Project
Public Services and Procurement Canada (PSPC) for
Transport Canada, Cambridge Bay Airport Apron LTU
Abandonment and Reclamation Plan

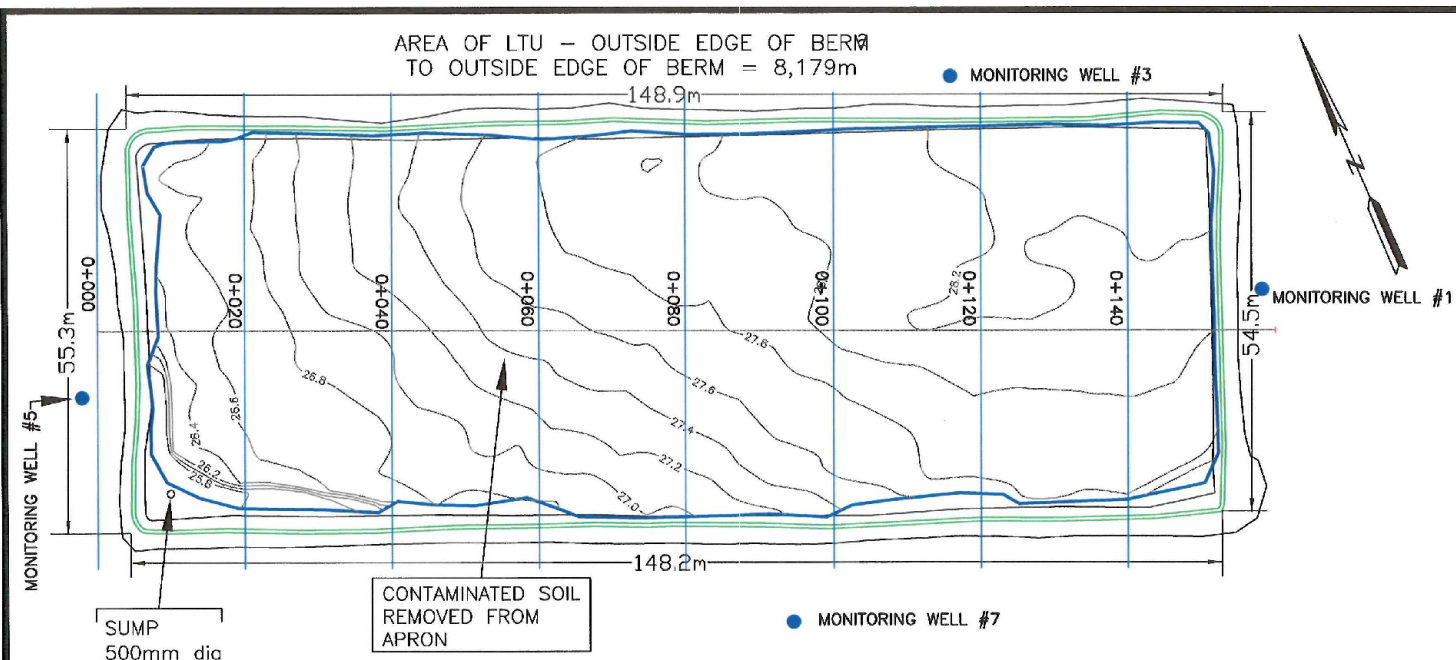
Figure No.

3

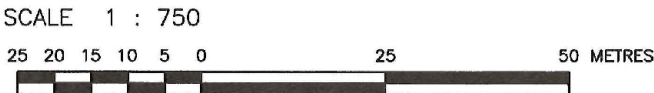
Title
**Site Plan of Cambridge Bay Airport
LTUs**

Page 01 of 01

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.



ASBUILT OF
LTU
CAMBRIDGE BAY AIRPORT
CAMBRIDGE BAY, NU



NOTES

DATE OF SURVEY, OCTOBER 2013.

DISTANCES AND ELEVATIONS ARE IN METRES.

COORDINATES ARE UTM ZONE 13, NAD83 (CSRS).

ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL (MSL).

CONTOUR INTERVAL IS 0.2 METRES.

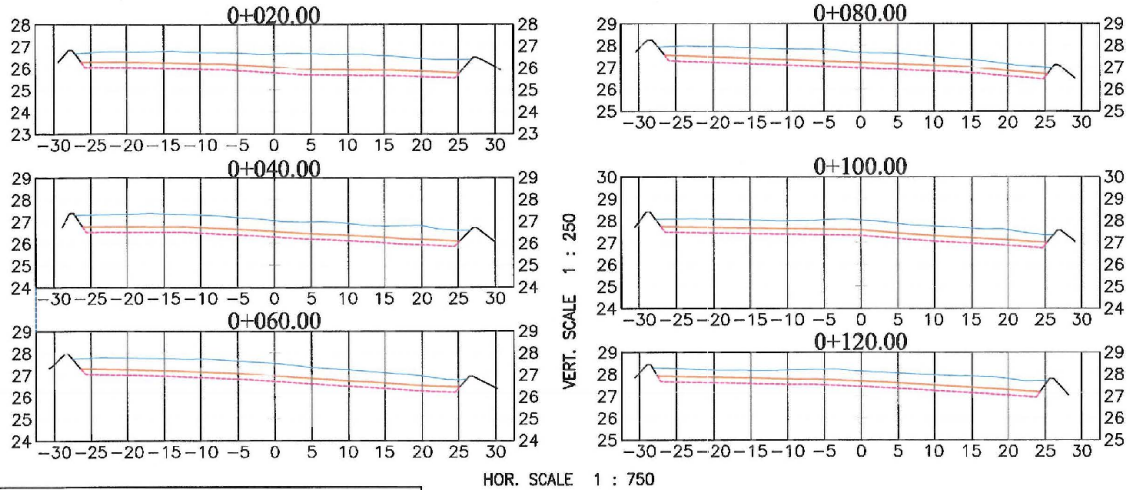
TOE OF BERM WAS SURVEYED ON 9-17-2013 "LTU ASBUILT" BY B. HOLTAMP.

- MONITORING WELL LOCATION
- TOP/EXTENT OF MATERIAL PLACEMENT ON LTU.
 - TOE OF BERM
 - CREST OF BERM
 - TOP OF GEOTECHNICAL BALLAST
 - TOP OF LINER

CERTIFIED CORRECT

CAMERON TWA, C.L.S.

Nov 21/2013
DATE



OLLERHEAD & ASSOCIATES LTD.
CANADA LANDS SURVEYORS
AND ENGINEERS

BOX 1169
YELLOWKNIFE, NT
X1A 2N8
PH: (867)873-9690
FAX: (867)669-6334

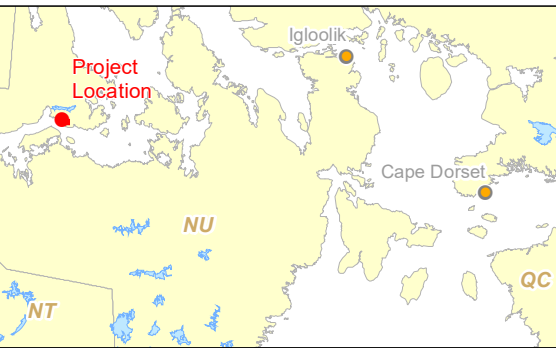
PROJECT NUMBER : 13-86-NP

WELL	NORTHING	EASTING	ELEVATION	
			TOP	BOTTOM
1	7666789.49	493500.98	28.19	27.02
3	7666832.94	493473.70	28.61	27.39
5	7666839.38	493347.98	26.52	25.30
7	7666772.92	493424.59	27.22	26.04
9	7666643.69	493401.45	12.11	11.08

Notes

1. Inset Map Data Sources: Geogratis, ©Department of Natural Resources Canada, All rights reserved.

2. Drawing Source: Ollerhead and Associates Ltd., Pr. No. 13-86-NP, Certified on Nov. 21, 2013.



Project Location
Cambridge Bay
Nunavut

Prepared by MKuhl on 2020-10-27
TR by CBaxter on 2020-12-02

Client/Project
Public Services and Procurement Canada (PSPC) for
Transport Canada, Cambridge Bay Airport Apron LTU
Abandonment and Reclamation Plan

Figure No.
4

Title
As-Built of LTU