Stantec Consulting Ltd.
102-40 Highfield Park Drive, Dartmouth NS B3A 0A3

November 1, 2019
File: 111475026

Attention: Richard Dwyer
Manager of Licensing
Nunavut Water Board (NWB)
P.O. Box 119, Gjoa Haven, NU X0B 1J0

Dear Mr. Dwyer,

Reference: Iqaluit Lot 512 Remedial Excavation – Approval to Proceed without a Licence Request

Stantec Consulting Ltd. (Stantec) was retained by Public Services and Procurement Canada (PSPC) on behalf of Transport Canada to prepare the documentation needed to obtain regulatory approval to complete the remedial excavation program at Lot 512 in Iqaluit, Nunavut (herein referred to as the "Site", as presented on the attached Figure 1). The Site currently consists of limited vegetation and does not contain water bodies. Historical assessment and remedial planning have been completed for Lot 512. It is proposed that a remedial excavation be completed to address the petroleum hydrocarbon soil impacts at the Site. The intent is to eliminate the human health and environmental liabilities associated with the contaminants of concern present at the Site and allow for the construction of a residential building. The proposed remediation program is anticipated to take place during a one to two-week period between Spring and Fall 2020, upon receipt of applicable permits and approvals.

The proposed remediation activities include remedial excavation with the installation of an impermeable liner on the resulting excavation perimeter. It is proposed that the excavation be extended to the full property boundary and the depth of permafrost, which will simplify the remedial approach and future development of the Site. The focus will be to maintain the integrity of the permafrost for future development with consideration of a potential vapour barrier and/or passive vapour extraction system beneath the future building if needed. These various components would consequently limit long-term liability and reduce residual risk.

Please see the attached application to obtain approval to proceed without a licence. Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

Regards,

Stantec Consulting Ltd.

Scott Coughtrey B.Env.Sc. EPt
Phone: (204) 928-7612
Mobile: (204) 807-3958

Attachment: Application for Approval for the Use of Water or Deposit of Waste Without a Licence
Remedial Action Plan for Lot 512, Iqaluit, Nunavut dated September 12, 2019

c. Matthew Irvine, PSPC
Ryan Shields, Transport Canada

bl https://stantec.sharepoint.com/teams/n60-sir/shared documents/pspc - lot 512 rap, specs, cost estimate/regulatory approvals/final/nwb/let_iqaluit_lot512_nwb_submittal_20191101.docx

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYIT
OFFICE DES EAUX DU NUNAVUT

APPLICATION FOR APPROVAL FOR THE USE OF WATER OR DEPOSIT OF WASTE WITHOUT A LICENCE

Refer to the *Guide to the Approval for the Use of Water or Deposit of Waste Without a Licence* (Guide) in completing this Application.

APPLICATION NO:
(for NWB use only)

1. APPLICANT CONTACT INFORMATION (name, address)

Ryan Shields
Transport Canada
200 Cornet Private
Ottawa, ON K1V 9B2

Phone: __(613) 991-5198_____
Fax: __(613) 991-0365_____
e-mail: __Ryan.Shields@tc.gc.ca_____

2. APPLICANT REPRESENTATIVE CONTACT INFORMATION if different from Block 1 (name, address)

Scott Coughtrey
Stantec (on behalf of Public Services Procurement Canada [PSPC])
500–311 Portage Avenue
Winnipeg MB R3B 2B9

Phone: __(204) 928-7612_____
Fax: __(204) 453-9012_____
e-mail: __Scott.Coughtrey@stantec.com___
(See attached letter)

3. NAME OF THE OWNER OF THE LAND THAT WILL BE USED IN RELATION TO THE WATER TO BE USED OR THE WASTE TO BE DEPOSITED

Transport Canada (Ryan Shields) as landowner; Stantec (Scott Coughtrey) completing work on behalf of PSPC (Matthew Irvine)

4. NAME OF PROJECT (consistent with the name of the project issued by other regulatory agencies)

Iqaluit Lot 512 Remedial Excavation

5. LOCATION OF UNDERTAKING

Project Extents (decimal degree format)

NW	63.75025	68.52774
NE	63.75042	68.52727
SE	63.75024	68.52703
SW	63.75007	68.5274

Camp Location(s) (decimal degree format) **N/A**

_____ _____

Name of the Water Management Area in which the Undertaking is located. (Please see Appendix D of the Guide):
Frobisher Bay Watershed (#53)

_____

6. **Previous Approvals or Licences Associated with Undertaking** ("Type A", "Type B" or Approval Without a Licence)

☒ **NA *or***

Previous Licence/Approval Number:_____

The Board reminds the Applicant that as stated in s. 46 of the NWNSRTA, the expiry or cancellation of any previous licence does not relieve the holder from any outstanding obligations imposed under the licence.

7. **CLASSIFICATION OF UNDERTAKING -** Indicate the classification of undertaking by checking one of the following boxes.

☐ Industrial
☐ Mining
☐ Conservation
☐ Municipal
☐ Agricultural
☐ Recreational
☐ Power
☒ Other: Residential

_____

See Appendix C of the Guide for descriptions of classifications of undertakings.

8. **DESCRIPTION OF UNDERTAKING AND EQUIPMENT USED –** Provide a brief description of the undertaking including a description of any equipment that will be used in using water or depositing waste.

Lot 512 is located at the intersection of Al Woodhouse Street and Iglulik Drive in Iqaluit, Nunavut, (herein referred to as the "Site", as presented on the attached Figure 1). The Site currently consists of limited vegetation and does not contain water bodies. It is proposed that a remedial excavation be completed to address the petroleum hydrocarbon (PHC) soil impacts at the Site. The intent is to reduce to acceptable levels the human health and environmental liabilities associated with the contaminants of concern (COCs) present at the Site and allow for the construction of a residential building. The remedial excavation program is not expected to result in any significant environmental effects as it is focused on the removal of impacted soil from the Site using an excavator. The quantity of water involved with this undertaking will be minimal, extracted only if encountered during excavation. Various types of equipment (mainly excavator and dump trucks) are expected to be required to consolidate, transport, and dispose of the wastes present at the Site. Diesel fuel and gasoline may be required during the remediation program to support heavy equipment and Site operations. If needed, it is assumed that minimal fuel will be used on-site with proper storage and handling measures. When parked and not in use, any equipment will be properly secured with drip trays. It is expected that the majority of fuel storage and refueling will occur at an off-site location. Refueling will follow established procedures. Following the remedial activities, site restoration activities will include backfilling and associated contouring to original grade. Waste material and equipment will be removed from the site to

restore original site conditions and aesthetics.

9. **SCHEDULE** – Applicants are advised that approvals without a licence are issued for a one year term.

Proposed Start Date: __01/01/2020_____ (Day/Month/Year) Proposed Completion Date: __01/01/2021_____ (Day/Month/Year)

10. **TYPE OF USE OF WATER WITHOUT A LICENCE PROPOSED -** Check the box that applies to the type of water use proposed. If none of the water uses listed below applies to the proposed water use, an application for a water licence will be required. See the NWB's *Guide 4 – Completing and Submitting a Water Licence Application for a New Licence*.

☐ For an undertaking other than a Power undertaking and for a use of water related to the construction of a structure across a watercourse that is less than 5 metres wide at the ordinary high water mark at the point of construction.

☐ For an undertaking other than a Power undertaking and for a use of water related to the training of an intermittent watercourse.

☐ For an undertaking other than a Power undertaking and for a use of water related to the training of a watercourse that is less than 5 metres wide at the ordinary high water mark at the point of training.

☐ For an undertaking other than a Power undertaking and for a use of water related to the training of a watercourse that involves the infilling of the watercourse, if the watercourse has no inflow or outflow and a surface area of less than 0.5 hectares.

☐ For an undertaking other than a Power undertaking and for a use of water related to the training of a watercourse that involves removal or placement of less than 100 m^3 of material.

☐ For an undertaking other than a Power undertaking and for a use of water related to the construction of a temporary structure in a watercourse for the purpose of flood control.

☐ For an undertaking other than a Power undertaking and for any use of water related to the storage of 2,500 m3 or less.

☒ For an undertaking other than a Power undertaking and for any use of water less than 50 m^3 per day.

11. **QUANTITY AND QUALITY OF WATER INVOLVED -** For each type of water use indicated in Block 10, provide the source of water, the estimated quantity to be used in cubic metres per day, and the periods during which water will be extracted.

Type of Water Use indicated in Block 10	Name of water source	Estimated quantity of water to be used in cubic metres per day	Periods during which water will be extracted
Water encountered during remedial excavation (if any)	N/A	Expected to be minimal (5 m^3 per day is the max. expected)	One to two-week period during the remedial excavation

12. TYPE OF DEPOSIT OF WASTE PROPOSED - Check the box that applies to the type of deposit of waste proposed. If none of the deposits of waste listed below apply to the proposed deposit of waste, an application for a water licence will be required. See the NWB's *Guide 4 – Completing and Submitting a Water Licence Application for a New Licence*.

☐ For an Industrial undertaking, for an activity related to hydrostatic testing or cleaning of storage tanks and pipelines, and for any deposit of waste resulting from hydrostatic testing or cleaning of unused storage tanks or pipelines.

☐ For an Industrial undertaking, for an activity related to quarrying and gravel washing, and for any deposit of waste that is not deposited to surface water and that results from quarrying or gravel washing above the ordinary high water mark.

☐ For a Mining undertaking, for an activity related to exploratory work, any deposit of sewage to a sump.

☐ For a Power undertaking, any deposit of sewage to a sump.

☐ For an Agricultural undertaking, any deposit of sewage to a sump.

☐ For a Conservation undertaking, any deposit of sewage to a sump.

☐ For a Recreation undertaking, any deposit of sewage to a sump.

☒ For any Other type of undertaking not listed above, other than Municipal, any deposit of sewage to a sump.

13. QUANTITY AND QUALITY OF WASTE INVOLVED – For each type of waste indicated in Block 12, describe the quantity in cubic metres/day, measures to avoid or mitigate adverse impacts, and periods of deposition.

Type of Waste indicated in Block 12	Quantity to be deposited in cubic metres per day	Measures to avoid or mitigate any adverse impacts	Periods during which waste will be deposited
Waste water (if any)	Expected to be minimal (5 m^3 per day is the max. expected)	If water appears to be impacted, it will be disposed and/or treated off-site appropriately	One to two-week period during the remedial excavation

14. SIGNATURE

I, _____ (print name), certify that the information given on this form is, to the best of my knowledge, correct and complete.

☐ Yes ☐ No

OR

I, Scott Coughtrey (print name), as an authorized representative of the Applicant, Transport Canada, certify that the information given on this form is, to the best of my knowledge, correct and complete.

☒ Yes ☐ No

I certify that the Nunavut Planning Commission's land use planning requirements under Article 11 of the Nunavut Land Claims Agreement have been met.

☒ Yes ☐ No

I certify that the Nunavut Impact Review Board's development impact review requirements under Article 12 of the NLCA have been met.

☒ Yes ☐ No

I certify that the proposed water use is of a type set out in column 2 of Schedule 2 of the Regulations that is further specified by column 3, in respect of an undertaking set out in column 1. See list in Block 10.

☒ Yes ☐ NA ☐ No

I certify that the proposed deposit of waste is an activity that is set out and then further specified in columns 2 and 3 of Schedule 3 of the Regulations, in respect of an undertaking that is set out in column 1 of Schedule 3. See list in Block 12.

☒ Yes ☐ NA ☐ No

I certify that the proposed water use or deposit of waste will not substantially affect the quality, quantity or flow of the watercourse whose waters are used.

☒ Yes ☐ No

I certify that the proposed water use or deposit of waste will not substantially affect the quality, quantity or flow of waters flowing through Inuit Owned Lands.

☒ Yes ☐ No

I certify that the proposed water use or deposit of waste will not affect the use of waters by a person who would be entitled to compensation under sections 58 or 60 of the *Nunavut Waters Nunavut Surface Rights Tribunal Act* (Act) if their use of these waters were to be adversely affected by an applicant for a licence.

☒ Yes ☐ No

I certify that a licence is not required for another use of water, or deposit of waste in respect of the proposed undertaking.

☒ Yes ☐ No

I have read and agree to comply with the following conditions outlined in sections 4(3), 5(4), 5(5) and 6 of the *Nunavut Waters Regulations*:

1. In the case of an applicant who has a mineral right and who intends to use waters or deposit waste in relation to that right, the applicant shall respect the priority conferred on Inuit by section 62 of the *Act* as if that applicant had a licence for the use or deposit.

2. Measures must be taken prior to using water to minimize any alteration to the bed or banks of a watercourse whose waters are to be used, and the measures shall be maintained during the operation of the undertaking.

3. No waste is to be deposited to surface water or within 31 metres of the ordinary high water mark of any body of water.

4. The waste shall not contain more than 15 milligrams per litre of petroleum or petroleum product and must not have a visible hydrocarbon sheen.

5. Prior to the closure or abandonment of the undertaking or end of the period authorized for the use of water or deposit of waste without a licence, whichever occurs first, the site shall be restored — to the extent practicable — to the state in which it was before the water was used or the waste was deposited.[a]

6. An applicant who is authorized under the Regulations to use waters or deposit waste without a licence shall:
    a. maintain accurate and detailed books and records of:
        i. the quantity of water, in cubic metres, used each day,
        ii. the quantity, in cubic metres, of waste deposited each day,
        iii. the type of waste deposited each day,
        iv. where the waste is deposited,
        v. the concentration of the substance, or substances, in the deposited solid or liquid that has the effect of making the deposit waste,
        vi. the methodology used to calculate or determine the information referred to in items (i) to (iv), and
        vii. the measures that were taken to avoid or mitigate any adverse impacts of the deposit of waste.
    b. keep the books and records on the site of the undertaking during the period of its operation and make them available during that period to an inspector on request;
    c. submit to the Board a report containing a summary description and supporting photographs of the restoration of the site of the undertaking within 30 days after the earliest of (i) the day on which the undertaking is closed or abandoned, and (ii) the last day of the period authorized for the use or deposit without a licence;[b] and
    d. keep the books and records for two years after submitting the report describing the restoration of the site of the undertaking.

    Notes:
    a) A site need not be restored prior to the end of the period authorized for the water use or deposit of waste without a licence, as required by Item 5, if the Board issues a licence for the use of water or deposit of waste on that site prior to the end of that period.

    b) An applicant need not submit the report referred to in Item 6 (c), to the Board if the applicant obtains the Board's approval for a use of water or deposit of waste without a licence, or a licence for a use of water or deposit of waste, on the same site within thirty (30) days after the last day of the period authorized for the use or deposit.

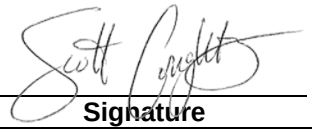
☒ Yes ☐ No

I understand that any approval granted by the Board for the use of water or deposit of waste without a licence will be authorized for a period of one year after the day on which the Board approves the Application. The use or deposit is not authorized until the Board approves the Application and it is only valid as long as the applicant is in compliance with the conditions set out in the declaration above.

☒ Yes ☐ No

I understand that if I have answered "No" to any of the above statements a water licence is required from the Nunavut Water Board prior to the use of water or deposit of waste.

☒ Yes ☐ No

Scott Coughtrey	Project Manager		October 31, 2019
Name (Print)	**Title (Print)**	**Signature**	**Date**

Remedial Action Plan for Lot 512, Iqaluit, Nunavut

FINAL REPORT

September 12, 2019

Prepared for:

Matt Irvine, Environmental Specialist
Public Services and Procurement Canada
Environmental Services
100 – 167 Lombard Avenue
Winnipeg, MB R3C 2Z1

Prepared by:

Stantec Consulting Ltd.
500-311 Portage Avenue
Winnipeg, MB R3B 2B9

Project No. 111475026

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1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was contracted by Public Services and Procurement Canada (PSPC), on behalf of Transport Canada, to complete a Remedial Action Plan (RAP) of the property identified as Lot 512 located at the intersection of Al Woodhouse Street and Iglulik Drive in Iqaluit, Nunavut, (herein referred to as the "Site", **Figure 1** in **Appendix A**). The purpose of the RAP is to develop a plan to remediate the petroleum hydrocarbon (PHC) soil impacts at the Site. The intent is to eliminate the human health and environmental liabilities associated with the contaminants of concern (COCs) present at the Site and allow for the construction of a residential building. The RAP also considers Site access, logistics, Site infrastructure, federal/territorial regulations, remediation criteria, risk management techniques, control measures and contingency plans required for the implementation of remediation.

1.1 SITE DESCRIPTION AND FUTURE USE

The Site is undeveloped; however, four shipping containers are present on the central portion of the Site. At the time of the field program for the Limited Phase II ESA in August 2018, the ground surface at the Site was a mix of grassed areas and bare (sandy/gravel) soil areas. Drainage ditches are present along the Site boundaries with Iglulik Drive and Al Woodhouse Street. For the purposes of this RAP, a project north has been defined as shown on **Figure 2** in **Appendix A**. Directions discussed herein are with reference to the project north.

The Site is an irregular square shape bounded to the north by Iglulik Drive followed by multi-unit residences, by Al Woodhouse Street followed by commercial buildings to the east, commercial buildings then Mivvik Street to the south, and commercial and residences then Ikaluktuutiak Drive to the west. The Site and surrounding areas appear to be generally flat and regional surface drainage (anticipated direction of shallow groundwater flow) appears to be to the west to Carney Creek, located approximately 260m west of the Site. It does not appear that groundwater at or near the Site is used as a source of potable water as the properties surrounding the Site are provided water by the City of Iqaluit that is delivered either by truck or by utilidor system.

Stantec understands that the Site is being considered for future residential development. As such, for the purposes of remedial planning, Stantec has assumed remedial objectives would be to Canadian Council of Ministers of the Environment (CCME) residential/parkland guidelines.

1.2 SUMMARY OF LIMITED PHASE II ESA FINDINGS

Stantec's Limited Phase II ESA, dated November 9, 2018, was completed to determine the presence and extent of PHC impacts at the Site. A total of 11 test pits were advanced at the Site. In seven of the 11 test pits completed, concentrations of PHC fractions F1, F2, and, F3 (PHC F1, F2, and F3) exceeded CCME guidelines for a residential/parkland land use (**Figure 2** in **Appendix A**).

Based on the results of the Limited Phase II ESA, lateral delineation of the identified soil impacts at the Site appear to have been fully attained on-site; however, the source of the soil impacts remains unknown.

Due to the presence of permafrost beneath the Site, that is conservatively estimated to occur at a depth of approximately 1.5 m, the soil impacts were not delineated vertically; however, the permafrost is likely to act as a barrier to limit vertical movement of impacts.

Based on the parameters identified (predominantly PHC F2/PHC F3), the contaminant source is likely related to a release of diesel, fuel/furnace oil, or gas oil. The extent of soil impacts off-site has not been delineated as the scope of work did not include any off-site investigation.

1.3 REGULATORY FRAMEWORK

The regulatory framework that provided guidance in the Limited Phase II ESA, in the determination of soil impacts, consisted of:

- Canadian Council of Ministers of the Environment (CCME). Canadian Environmental Quality Guidelines (CEQG) for the Protection of Environmental and Human Health for residential land use, online summary.
- Canadian Council of the Ministers of Environment (CCME), Canada Wide Standards (CWS) for PHCs, January 2008.

The CCME CEQGs and CWS provide limits for contaminants in soil (and water) and are intended to maintain, improve, and/or protect environmental quality and human health in general. These criteria include numerical values for the assessment and remediation in the context of agricultural, residential/parkland, commercial, and industrial land uses and have been derived using toxicological data to determine the threshold level to key receptors.

Based on stratigraphy encountered during the completion of the test pits during the Limited Phase II ESA and the particle size analysis completed, the soils at the Site are predominantly coarse-grained. Given that the proposed future development for the Site is residential land use and that the surrounding land use consists of additional residential land use, the residential/parkland guidelines were considered appropriate for the Site. As such, the residential/parkland guidelines for coarse-grained soils were applied in the evaluation of the soil analytical results.

Potable water for the area is known to be supplied via a municipal distribution system and/or trucked water supply from the City of Iqaluit that obtains its water from Geraldine Lake. Therefore, it is assumed that groundwater is not used as a source of potable water on or near the Site and the protection of potable groundwater guidelines would not apply to the Site. Accordingly, the CCME guidelines for the protection of potable groundwater have not been applied in the evaluation of the soil analytical results.

This regulatory framework will be maintained as the target remediation criteria for the RAP. The guidelines were applied for remedial planning purposes and will also be considered during remedial sampling.

2.0 REMEDIAL ACTION PLAN

2.1 REMEDIAL OBJECTIVES

The following remedial goals were considered when assessing potential remedial options:

- Reduce, and where possible eliminate, the risk to the environment and human health
- Effectively reduce federal financial liability associated with this Site using cost effective solutions
- Reduce residual risks with the goal of Site closure
- Promote socio-economic benefits to Aboriginal people and other northerners
- Balance the consequential impacts of remediation with the benefits of reducing human and environmental risk

Each of the potential remedial options described in the section below were assessed with consideration of these objectives to identify the most viable option for the Site.

2.2 REVIEW OF POTENTIAL REMEDIAL OPTIONS

Based on the available Site information, Stantec previously completed a preliminary evaluation of three remedial options as part of a Remedial Option Analysis (ROA) for the Site. These remedial options included:

- **Option 1: Remedial Excavation** – This would involve the excavation of the PHC impacted soil identified at the Site thereby removing the identified COCs. Excavated areas would be backfilled with imported material. Excavated material would be disposed of in an off-Site landfill. The impact that the excavation and exposure of the permafrost would have on melting deeper permafrost at the Site as well as to the surrounding properties must be considered. As the off-site soil impacts have not been fully delineated and the remedial excavation would likely be limited to the Site area, the installation of an impermeable liner to prevent the migration of off-Site contaminants back into the imported backfill would also have to be considered.
- **Option 2: Installation of Hydrocarbon Resistant Vapour Barrier Beneath Future Building** – This would involve the installation of a hydrocarbon resistant vapour barrier on the ground surface at the Site beneath the future building that would be used to limit the intrusion of hydrocarbon vapours from the impacted soils. The installation of the barrier in conjunction with the likely future building foundation construction (off the ground on stilt supports) is expected to limit the exposure of vapours resulting from soil impacts to building occupants.
- **Option 3: Human Health and Ecological Risk Assessment** – This would entail the completion of a Human Health and Ecological Risk Assessment (HHERA) based on current Site conditions, future use of the Site, as well as potential for exposure of workers during construction at the Site. The HHERA would also include the development of site-specific risk management measures and possible property use restrictions depending on the outcome of the HHERA. The risk assessment would be completed in accordance with the accepted risk assessment methodologies and guidance published and endorsed by CCME and Health Canada.

As part of the evaluation of these options, consideration was given to the logistics of implementation, the probability of achieving the remediation objectives (CCME Canadian Environmental Quality Guidelines [CEQG] for coarse-grained soils and residential/parkland land use), acceptance by stakeholders, schedules, and cost.

Refer to the ROA prepared by Stantec, and dated December 20, 2018, for additional details associated with the remedial options. The ROA previously suggested a hybrid approach between the three options above with focus on an initial HHERA. However, through further correspondence in 2019, it was determined that the preferred approach was primarily remediation which would eliminate potential risk as much as possible.

2.3 CONTAMINATED SOILS AND REMEDIAL EXCAVATION

The lateral delineation of the identified soil impacts at the Site appears to have been fully attained on-site; however, the extent of soil impacts off-site has not been delineated as the scope of work did not include any off-site investigation. Due to the presence of permafrost beneath the Site, the soil impacts were not delineated vertically; however, the permafrost is likely to act as a barrier to limit vertical movement of impacts. Based on the georeferenced lot plan, data available, and assumed average depth of excavation of 1.5 m based on a conservative estimate of permafrost depth, an approximate area of 485 m^2 and volume of 725 m^3 of PHC impacted soil was identified at the Site (aerial extent on **Figure 2** in **Appendix A**). However, full property remediation has been considered appropriate as it would remain aligned with the remedial goal of substantial reduction of potential risk such as re-contamination of the Site. Based on the data available and assumed average depth of excavation of 1.5 m, full property remediation would result in an approximate excavation area of 765 m^2 and volume of 1,145 m^3 (aerial extent on **Figure 2** in **Appendix A**).

2.4 PROPOSED REMEDIATION APPROACH

Based on the information available at this time and adjusted prioritization of remedial objectives, it is recommended that the remedial excavation option be completed with the installation of an impermeable liner on the surrounding excavation perimeter (approximately 110 m). The excavation will be extended to the full property boundary and the depth of permafrost, which will simplify the remedial approach and future development of the Site. The focus will be to maintain the integrity of the permafrost for future development with consideration of a potential vapour barrier and/or passive vapour extraction system associated with the future building. These various components would consequently limit long-term federal liability and reduce residual risk. The following provides a summary of each component of the proposed remedial approach:

- **Remedial Excavation** – Removal of soils with concentrations of PHC F1-F3 greater than the applicable CCME guidelines with subsequent backfilling to match the surrounding material. To maximize the protection of human and ecological health on-site, the remedial excavation will extend to the property boundaries. However, soils in excess of the CCME guidelines may remain at the property boundaries.
  - The excavation is expected to be able to be completed within a relatively short timeframe as it would be relatively standard without substantial complexities.
  - Excavation activities and associated sequencing should consider the protection of permafrost to maintain its integrity (e.g., small strip excavations of property by sections, short excavation turnaround with instantaneous backfilling, etc.).
  - The impacted and excavated soils will be transported off-site and are expected to be treated at the local landfarm facility in Iqaluit.

- **Perimeter Impermeable Liner** – Following the remedial excavation and prior to backfilling, installation of liner on the perimeter walls of the excavation, along the property boundary. The liner is intended to mitigate risks associated with re-contamination of backfill material from potential off-site contaminant sources. It will also address remaining exceedances that may remain at the property boundaries.
  - The installation of the liner should be completed as quickly as possible following the remedial excavation and approval for liner installation followed by backfilling (i.e., may be based on results of remedial monitoring).
  - The sequencing of the liner installation should follow the excavation activities, with contingency for the supply and installation of the impermeable liner should additional time or material be needed (e.g., pre-design the liner with exact dimensions, weld sections of liner on-site, etc.).
  - Sand and/or cloth material may also be needed to reduce potential damage to the liner from backfill material typical of that available in Iqaluit (i.e., relatively sharp).
- **Vapour Barrier and/or Passive Vapour Extraction System** – Based on the results of the remedial monitoring, there is potential that the Site may benefit from a vapour barrier and/or passive extraction system associated with the future building. As further detailed in Section 3.5 below, residual impacts may remain after the remedial excavation. In this scenario, soil vapour testing would be warranted to determine if a vapour barrier should be considered during the construction of the building as the primary mitigation measure (mainly due to effectiveness for relatively low cost). Although it is unlikely that a passive vapour extraction system would be required, additional soil vapour monitoring could be completed following the placement of a vapour barrier to determine if a passive vapour extraction system would be beneficial as an additional mitigation measure. The need for vapour mitigation measures cannot currently be determined with certainty and associated details would be specific to the building development plans; however, these components would nevertheless provide additional precautionary measures.

3.0 CONCEPTUAL REMEDIAL PROGRAM

The following components outline the considerations associated with the conceptual remedial program for the Site:

- Regulatory Approvals
- Site Access
- Equipment and Material Requirements
- Conceptual Remedial Schedule
- Remedial Monitoring Activities
- Post-Remedial Activities

These items are further discussed below.

3.1 REGULATORY APPROVALS

Based on the proposed remediation program, the expected regulatory approval requirements are outlined herein. The regulatory approvals to implement the RAP are intended to consider the following Territorial agencies:

a) Nunavut Water Board (NWB)

b) Nunavut Planning Commission (NPC)

c) Nunavut Impact Review Board (NIRB)

d) Nunavut Department of Environment (NDE)

Although the level of involvement and requirements will depend on the remedial option selected, the regulatory approvals have been conservatively assumed as follows:

- NWB for Water License (WL): Assume Type B WL application requirement although NWB Authorization may be sufficient; Type A Water License not anticipated to be required.
- NPC advise on Project Proposal/Description and Land Use Permit (LUP): Assume Type A LUP application requirement through Nunavut Department of Community and Government Services; NPC to advise and determine if screening required by NIRB.
- Substantial involvement from NIRB and NDE is not anticipated to be required.

3.2 SITE ACCESS

As the Site is located in a relatively central area of Iqaluit, the property is readily accessible by ground transport. The Site can be accessed by Igulik Drive or Al Woodhouse Street. Prior to remediation activities, the Site should be fenced to avoid pedestrian access and limit risk to the public. The Site's shipping containers should also be taken off-site to allow for ease of movement on-site during remediation activities.

Any trucks or other equipment associated with remediation should park on-site to mitigate disruptions to traffic. Activities requiring substantial use or time involving the rights-of-way should be completed during time periods with minimal traffic (e.g., early morning or late evening) or consider the use of traffic control. This should especially be considered if the area for material storage becomes limited on-site or during the transportation of substantial quantities of materials (e.g., impacted soil and backfill).

Prior to commencing work on-site for excavation activities, surveying of Lot 512 should be completed to confirm boundaries of the Site. Furthermore, underground and aboveground utilities should be identified by a qualified locator with consideration of public and private utilities.

3.3 EQUIPMENT AND MATERIAL REQUIREMENTS

Heavy equipment including trucks, excavators, loaders, dozers, skid steers, flat decks and/or water trucks may be required to consolidate, transport, and dispose of the wastes present at the Site. Diesel fuel and gasoline may be required during the remediation program to support heavy equipment and Site operations. It is assumed that minimal fuel will be staged at a central location on-site with proper storage and handling measures. When parked and not in use, any equipment should be properly secured with drip trays.

The impermeable liner and backfill material should be sourced as specified by the engineering specifications, which will likely assume a level of contingency for the quantities. Additional liner material should be used for any staging such as fuel storage or impacted soil storage on-site. If water is required for dust suppression or if impacted water is encountered during excavation activities, water storage tanks may be required on-site. Depending on the remediation contractor, on-site storage such as via trailer may be preferred. Erosion control measures and other contingency measures associated with the remedial

activities should be adequately considered based on the detailed execution plan of the remediation contractor.

3.4 CONCEPTUAL REMEDIAL SCHEDULE

The following provides an outline of the conceptual schedule associated with the remediation program. Note that this remediation scenario is one of a large number of possible scenarios and should not be considered prescriptive – it is provided to illustrate the necessary steps required to complete the proposed remediation program.

- **Fall 2019** – Regulatory approvals, including consultation correspondence and community considerations.
- **Fall/Winter 2019** – Planning for remediation program, including engineering specifications and cost estimate.
- **Winter 2020** – Preparation for remediation program, including tender process for award to remediation contractor and securing other contracts.
- **Spring 2020 to Fall 2020** – Execution of remediation program, including excavation, liner installation, and backfilling.
  - Iqaluit's northern climate typically allows for a maximum window of three summer-like months (June, July and August) for optimal execution of excavation activities.
  - Excavation activities prior to or following the summer months can be considered to minimize potential water encountered, although this would also result in more challenging excavation conditions due to frozen ground.
  - It is expected that July would be the ideal period for the remediation activities as the ground would be partially thawed to allow for ease of physical excavation with relatively minimal water infiltration. However, the actual execution plan should be detailed by the remediation contractor.
  - The following conceptual schedule is expected to be possible given an ideal scenario for the remediation program:
    - Site preparation and mobilization: 1-2 days
    - Excavation, liner installation, and backfilling: 4-5 days
    - Site grading, clean-up, and demobilization: 1-2 days
    - Total expected approximate timeframe for the remediation program: 1-1.5 weeks
  - The schedule may change depending on the contractor's execution plan, equipment/material availability, seasonality, etc.
  - Unpredictable factors such as weather and excavation water management requirements may cause delays.
    - It would be beneficial to plan ahead to have equipment, liner, backfill, disposal location, and other project requirements secured as early as possible based on the preferred schedule.

The application of a vapour barrier and/or passive vapour extraction system will be dependent on the future development plan and schedule, as well as the results of samples obtained during the remediation program.

3.5 REMEDIAL MONITORING ACTIVITIES

During remediation, confirmatory soil samples will be collected after impacted soil is removed to assess if residual concentrations along the property boundary are less than the applicable criteria. The samples should be collected at select distance and depth intervals along the excavation perimeter at the property

boundary. For example, samples every 5-10 m along the excavation perimeter at approximately 0.3-0.6 m depth intervals are typically reasonable. Such sampling, as well as visual monitoring observations, would support the characterization of contaminant concentrations in contact with the impermeable liner following installation and also support the understanding of applicability of a vapour barrier and/or passive extraction system associated with the future development.

As the excavation is planned to extend to the depth of permafrost, sampling is not expected to be required at the base of the excavation. Although some areas of impacted soil may remain in crevices between permafrost, the effort required to remove the residual soil without impacting the integrity of permafrost may be extensive relative to the risk posed. Therefore, removal of approximately 95% of the impacted soil can be considered the threshold where remediation efforts will no longer continue. If notably large areas of impacted soil cannot be removed from the base of the excavation, it may be sampled for characterization purposes to understand potential residual risk. Such sampling, as well as visual monitoring observations, would support the understanding of applicability of a vapour barrier and/or passive extraction system associated with the future development.

Samples of impacted soil removed may also be collected to characterize concentrations of COCs prior to off-site treatment at the local landfarm facility in Iqaluit. However, the current understanding is that the landfarm facility does not require characterization sampling and that the landfarm completes any required sampling or monitoring in accordance with their WL and/or LUP.

Baseline sampling of any temporary constructions works (staging areas, laydown areas, etc.) areas may also be required. Additionally, during remediation, testing may be required as per the conditions of the WL and/or LUP.

Visual monitoring and recording observations should be on-going throughout the remediation program. Field personnel will use field logs (and templates if needed) to record sampling details such as date, field personnel, weather, site component, GPS coordinates, observations, photographs taken, and other relevant information. A photograph log should also be maintained to identify photographs taken and the components they document.

In addition to characterizing soil concentrations and visual monitoring, testing may be conducted to confirm material quality prior to backfilling. The testing would be conducted to determine if the backfill material is in accordance with the specifications for the remediation, including COC concentrations below applicable guidelines. This will should also consider the material requirements for the future building development and associated geotechnical engineering requirements. The grade following backfilling activities should be surveyed for record of baseline elevations for the future development plan.

Note this is not an extensive list of activities to be conducted during remediation. These will be specified in the detailed design of the remediation program.

3.6 POST-REMEDIAL ACTIVITIES

The post-remedial activities for the Site will be relatively limited and expected to include the following:

- Visual monitoring of backfill material to confirm no substantial settlement or erosion. Backfill monitoring may become more of a focus during development planning and may include surveying in comparison to baseline recordings.
- Visual observations of the Site, including possible weathering of visible liner, frost action, vegetation, leachate, and/or staining.
- Land use monitoring of surrounding properties to identify potential sources of impacts as well as to plan for the future development of the Site.

These post-remedial activities would be beneficial for information purposes (especially for development planning); however, do not require a committed monitoring frequency.

4.0 CONCLUSIONS

Based on the information available at this time and adjusted prioritization of remedial objectives, Stantec's RAP recommends that PSPC, on behalf of Transport Canada, complete the remedial excavation option with the installation of an impermeable liner on the surrounding excavation perimeter. The excavation will be extended to the full property boundary and the depth of permafrost, which will simplify the remedial approach and future development of the Site. The focus will be to maintain the integrity of the permafrost for future development with consideration of a potential vapour barrier and/or passive vapour extraction system associated with the future building. These components would consequently limit long-term federal liability and reduce residual risk. The RAP outlines a conceptual remedial program, including regulatory approvals, Site access, equipment and material requirements, conceptual remedial schedule, remedial monitoring activities, and post-remedial activities. The information contained in this RAP is considered sufficient to prepare the engineering specification and cost estimate for the remediation.

5.0 LIMITATIONS

This report 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 report provides an evaluation of selected environmental conditions associated with the identified portion of the property that was assessed at the time the work 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.

The opinions in this report can only be relied upon as they relate to the condition of the portion of the identified property that was assessed at the time the work was conducted. Activities at the property subsequent to Stantec's assessment may have significantly altered the property's condition. Stantec cannot comment on other areas of the property that were not assessed.

Conclusions made within this report 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 report has been prepared for the exclusive use of the client identified herein 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 report is limited by the following:

- Our understanding of the future intended land use of the property (i.e., residential).
- Stantec does not guarantee the opinions of remedial execution presented herein. The actual execution will be determined through the tendering and contracting processes.

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

The conclusions are based on the Site conditions encountered by Stantec at the time the work was performed at the specific testing and/or sampling locations, and conditions may vary among sampling locations. Factors such as areas of potential concern identified in previous studies, Site conditions (e.g., utilities) and cost may have constrained the sampling locations used in this assessment. In addition, analysis has been carried out for only a limited number of chemical parameters, and it should not be inferred that other chemical species are not present. Due to the nature of the investigation and the limited data available, Stantec does not warrant against undiscovered environmental liabilities nor that the sampling results are indicative of the condition of the entire Site. 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 in this report.

6.0 STANTEC QUALITY MANAGEMENT PROGRAM

This report, entitled **Remedial Action Plan for Lot 512, Iqaluit, Nunavut** prepared for Public Services and Procurement Canada, dated September 12, 2019, and was produced by Stantec Consulting Ltd.

This report was written by the following individuals:

Laya Bou-Karam, B.Eng., P.Eng.
Environmental Engineer

Digitally signed by Laya Bou-Karam
Date: 2019.09.12 15:10:23 -03'00'

Signature

This report was reviewed by the following individuals:

Jill Peters-Dechman, B.Eng., P.Eng.
Senior Associate – Environmental Services

Digitally signed by Jill Peters Dechman, P.Eng.
Date: 2019.09.12 14:40:53 -04'00'

Signature

Karen Mathers, M.Sc., P.Geo. FGC, PMP
Principal – Environmental Services

Karen Mathers

Digitally signed by Karen Mathers
Date: 2019.09.12 13:54:39 -05'00'

Signature

Appendix A FIGURES

Stantec

Legend

- Site Location
- Minor Road
- Local Road

0 100 200 metres

1:4,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 19N
2. Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

Project Location
Iqaluit, NU

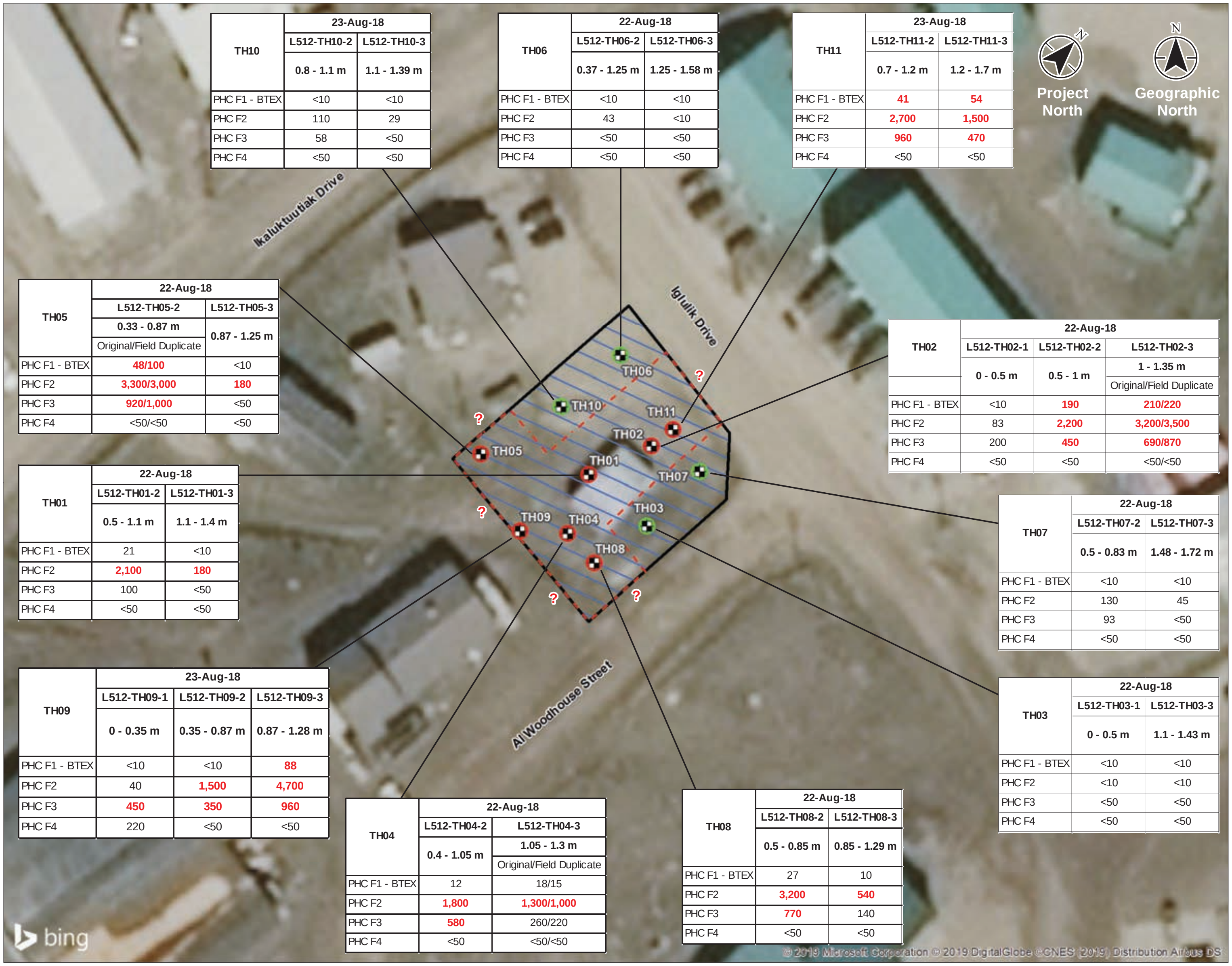
111475026

Prepared by ACampigotto on 2019-08-08
Technical Review by LBou-Karam on 2019-08-08

Client/Project
PUBLIC SERVICES AND PROCUREMENT CANADA
Remedial Action Plan
Lot 512, Iqaluit, NU

Figure No.
1

Title
Site Location Plan



TH10	23-Aug-18	
	L512-TH10-2	L512-TH10-3
	0.8 - 1.1 m	1.1 - 1.39 m
PHC F1 - BTEX	<10	<10
PHC F2	110	29
PHC F3	58	<50
PHC F4	<50	<50

TH06	22-Aug-18	
	L512-TH06-2	L512-TH06-3
	0.37 - 1.25 m	1.25 - 1.58 m
PHC F1 - BTEX	<10	<10
PHC F2	43	<10
PHC F3	<50	<50
PHC F4	<50	<50

TH11	23-Aug-18	
	L512-TH11-2	L512-TH11-3
	0.7 - 1.2 m	1.2 - 1.7 m
PHC F1 - BTEX	41	54
PHC F2	2,700	1,500
PHC F3	960	470
PHC F4	<50	<50

TH05	22-Aug-18	
	L512-TH05-2	L512-TH05-3
	0.33 - 0.87 m Original/Field Duplicate	0.87 - 1.25 m
PHC F1 - BTEX	48/100	<10
PHC F2	3,300/3,000	180
PHC F3	920/1,000	<50
PHC F4	<50/<50	<50

TH02	22-Aug-18		
	L512-TH02-1	L512-TH02-2	L512-TH02-3
	0 - 0.5 m	0.5 - 1 m	1 - 1.35 m Original/Field Duplicate
PHC F1 - BTEX	<10	190	210/220
PHC F2	83	2,200	3,200/3,500
PHC F3	200	450	690/870
PHC F4	<50	<50	<50/<50

TH01	22-Aug-18	
	L512-TH01-2	L512-TH01-3
	0.5 - 1.1 m	1.1 - 1.4 m
PHC F1 - BTEX	21	<10
PHC F2	2,100	180
PHC F3	100	<50
PHC F4	<50	<50

TH07	22-Aug-18	
	L512-TH07-2	L512-TH07-3
	0.5 - 0.83 m	1.48 - 1.72 m
PHC F1 - BTEX	<10	<10
PHC F2	130	45
PHC F3	93	<50
PHC F4	<50	<50

TH09	23-Aug-18		
	L512-TH09-1	L512-TH09-2	L512-TH09-3
	0 - 0.35 m	0.35 - 0.87 m	0.87 - 1.28 m
PHC F1 - BTEX	<10	<10	88
PHC F2	40	1,500	4,700
PHC F3	450	350	960
PHC F4	220	<50	<50

TH03	22-Aug-18	
	L512-TH03-1	L512-TH03-3
	0 - 0.5 m	1.1 - 1.43 m
PHC F1 - BTEX	<10	<10
PHC F2	<10	<10
PHC F3	<50	<50
PHC F4	<50	<50

TH04	22-Aug-18	
	L512-TH04-2	L512-TH04-3
	0.4 - 1.05 m	1.05 - 1.3 m Original/Field Duplicate
PHC F1 - BTEX	12	18/15
PHC F2	1,800	1,300/1,000
PHC F3	580	260/220
PHC F4	<50	<50/<50

TH08	22-Aug-18	
	L512-TH08-2	L512-TH08-3
	0.5 - 0.85 m	0.85 - 1.29 m
PHC F1 - BTEX	27	10
PHC F2	3,200	540
PHC F3	770	140
PHC F4	<50	<50

Stantec

Legend

- Test Pit Location
- Soil Parameters Tested Less than the CCME Guidelines
- Soil Parameters Tested Greater than the CCME Guidelines
- Approximate Aerial Extent of On-Site Soil Impacts (Off-Site Soil Impacts Not Delineated)
- Approximate Site Boundary
- Approximate Aerial Extent of Remedial Excavation

Parameter	CCME Guidelines (mg/kg)
PHC F1 (C6-C10 range) minus BTEX	30[C]
PHC F2 (>C10-C16 range)	150[C]
PHC F3 (>C16-C34 range)	300[D]
PHC F4 (>C34-C50 range)	2,800[D]

Notes

[C] - Canada Wide Standards for PHC in Soil - Residential Land Use-Coarse - Surface Soil (Revised Jan 2008), lowest guideline of all pathways, Vapour Inhalation (indoor, slab-on-grade)

[D] - Canada Wide Standards for PHC in Soil - Residential Land Use - Coarse - Surface Soil (Revised Jan 2008), lowest guideline of all pathways, Eco Soil Contact

0 10 20 metres

1:500 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 19N
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PUBLIC SERVICES AND PROCUREMENT CANADA
Remedial Action Plan
Lot 512, Iqaluit, NU

Figure No.
2

Title
Remediation Program Overview

G:\ GIS Project Folder\111475026 Iqaluit\ArcMaps\Figure2 SoilAnalyticalResults 20190808.mxd Revised: 2019-08-12 By: ACampigotto