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PROTECTING OUR ARCTIC ENVIRONMENT

# OPERATIONS AND MANAGEMENT PLAN

# PPD BAKER LAKE LANDFARM

January 8, 2026

Nunatta Environmental Services Project 25-29

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## FIGURE

Figure C-01: Civil Site Plan.....Following Text

# 1 INTRODUCTION

## 1.1 Background

The Petroleum Products Division (PPD) of the Government of Nunavut's Department of Community and Government Services (CGS) is responsible for the purchase, transportation, storage and distribution of all petroleum products in Nunavut. PPD's headquarters is in Rankin Inlet, where it also maintains the tank farm and other fuel infrastructure.

After a spill at the Baker Lake Tank Farm in 2021, Nunatta and others excavated and segregated impacted soil in a lined containment cell south of the Tank Farm. Since the time of the spill, some soil has been bioremediated and is ready for re-use, but it is likely that some soil remains impacted with petroleum hydrocarbons.

PPD has proposed to construct a landfarm to treat this remaining soil and possibly other impacted soil in the community. The Hamlet of Baker Lake has selected an area northwest of the built-up area and north of the airport for the landfarm.

A parcel of land (Lot 454, Plan 4945 – see Figure C-01) has been surveyed to use as the landfarm site. Because the lot is owned in fee simple by the Hamlet, no additional paperwork is required to have the survey registered at the Land titles office. Once the titles are carried over, the Hamlet will issue an equity lease to the Commissioner of Nunavut for Lot 454 to be used for a land farm that will be administered by PPD.

Nunatta submitted the project to the Nunavut Planning Commission (NPC). The NPC reviewed the project and determined that it conforms to the Keewatin Regional Land Use Plan.

## 1.2 The Landfarm

The proposed landfarm is located northwest of the hamlet of Baker Lake, in the Kivalliq Region of Nunavut. The geographical coordinates of the site are

| Latitude | Longitude |
|---|---|
| 64.321680° N | 96.092068°W |

The landfarm will be constructed from gravel and sand with an impermeable membrane that limits the transmission of impacts from the landfarm to the surrounding area. The plan is for the landfarm to accept only soil contaminated with hydrocarbons in which the primary petroleum is fuel oil and/or diesel fuel and/or gasoline.

## 2 ORGANIZATION AND RESPONSIBILITIES

### 2.1 Management

PPD will be responsible for the management of the landfarm.

Day to day management may be contracted to an environmental consultant or contractor, depending on the work required.

Field personnel from PPD, the consultant and the contractor or any of these in combination may fulfill the requirements of this plan.

### 2.2 Laboratory

PPD will ensure that its consultants and contractors use laboratories certified by the Canadian Association for Laboratory Accreditation Inc. (CALA). CALA accreditation is a formal recognition that laboratories are competent, impartial and independent.

For an environmental laboratory to attain accreditation, it must meet both the management and technical requirements of ISO/IEC 17025. Specific application of requirements in ISO/IEC 17025 as they relate to the area of environmental testing are detailed in CALA's requirements. These include specific requirements for resources, processes, management systems and structures.

Laboratories are reassessed every two years to ensure their continued conformance with requirements. Laboratories accredited by CALA are also required to participate in proficiency testing programs between reassessments.

## 3 HEALTH AND SAFETY

A standalone Health and Safety Plan (HASP) will be prepared by the consultant or contractor before maintaining, sampling or otherwise operating the landfarm. Employees of PPD, the consultant and/or contractor will receive appropriate training before work at the site. Because the landfarm site is away from the hamlet of Baker Lake and will be fenced, PPD does not expect that members of the public will be exposed to impacts from site operations.

The HASP will include consideration of relevant exposure pathways and appropriate mitigations for site workers, including:

- Inhalation,
- Ingestion, and
- Direct contact with impacted soils.

The HASP will also include consideration of potential migration of contaminants via dust or water runoff, and include plans for mitigation. Such plans may include limitations on work in high-wind conditions.

The HASP will also include requirements for personal protective equipment at the site.

# 4 SOIL TRANSFER

## 4.1 Soil Transfer

PPD will only import soils from areas where contamination has been delineated and characterized. Only soils primarily impacted by diesel, heating oil, gasoline, aviation gas, jet fuel or associated fuels, will be transferred.

Soil will be transferred to the landfarm in vehicles that allow soil to be transferred safely and without nuisance. The vehicles used to transfer the will be leakproof and covered (where necessary) to prevent the emission of odours and the release of dust.

Records will be kept of the source and volume of all soils accepted at the landfarm. These records will include:

- the source location of the soil,
- the date and time the soil was loaded for transportation,
- the quantity of excess soil in the load, and
- the nature of the contaminants.

The hauler is required to confirm the intended destination for the final deposit of excess soil with the project leader of the site at which the excess soil is being loaded and add this information to the hauling record. They are also required to confirm contingency measures if a deposit location cannot be used for various reasons. For example, if a deposit site is not open to receive the excess soil, the hauler should confirm an alternate location that is approved by the site that provided the excess soil or return the excess soil to that site. In that situation, the agreed upon alternate location may be a waste processing site, or the originating site. If the excess soil is denied at a deposit location due to concerns regarding its quality, it should not be taken to an unplanned deposit site. Any alternate site at which excess soil is deposited must be reflected on the hauling record.

## 4.2 Screening and Separation

Impacted soils will enter the landfarm at the access ramp. At this point, a blended fertilizer with the correct ratios will be added to the incoming soil and if available old soil will be mixed with incoming soil to inoculate the bacteria which create the enzymes that break down hydrocarbons into harmless components. The soil is then put through a screening plant to remove cobbles and rocks will be screened out of the incoming soils. A screener will separate all material greater than 20 mm.

Rocks and cobbles will be segregated in a stockpile. The rock stockpile will be retained over the winter months to allow for  weather to remove adhering hydrocarbon soils. Freeze-thaw action and wetting, drying action as well as movement of air will expel soils and hydrocarbons from the stones.

Soils will be screened again at a later date to mix soils, add air and to make sure non if it remains frozen. If required add additional fertilizer to maintain the Carbon to Nitrogen ratio. All rocks removed from soil will be rescreened prior to removal from the land farm. These will be sampled and if confirmed clean will go to the hamlet aggregate crushers to be used in gravel for road building.

### 4.3 Placement

After screening, impacted soils will be placed in the landfarm cell to a depth of approximately 0.30 metres to allow for equipment movement across the landfarm with out damage to the liner.

PPD will maintain a minimum depth of 0.30 metres in all areas during the operation of the landfarm to allow a safety margin between the liner and heavy equipment.

After this base layer is in place, PPD will ensure that soil is placed in stockpiles or windrows to allow for bioremediation. Soils will be placed in a manner that allows for easy access by equipment and give the maximum amount of surface area. The idea of windrows is maximum surface area and the ability to scrape down the sides of the pile to expose the frozen core and this in turn aid in mixing the soil and distributing the fertilizers and bacteria through out the pile.

# 5 LANDFARM MAINTENANCE AND MONITORING

A few times annually, PPD will ensure that the landfarm is maintained and secure. The annual work will include aeration, addition of amendments (if required), sampling soil and water in spring and fall and water management.

## 5.1 Aeration

The typical bioremediation process that breaks down petroleum hydrocarbons in soil is aerobic. This means that microbes in soil must receive adequate oxygen to process impacted soils. Mechanically introducing air into the soil is important for reducing the concentrations of contaminants in a timely manner. The more often soil is aerated the faster the remediation.

Mechanical aeration methods such as screening will be employed at routine intervals to facilitate aeration and mixing of the soil. Aeration should be repeated as often as weather, logistics and time permit. It has been found that two aerations per annum can reduce contamination to guideline levels in five years regardless of concentrations when soil was delivered to facility

A rotary screen is best to aerate soil. The screening process breaks up lumps and delivers soil to the pile by belt and the drop from the belt adds a lot of air to the pile much better than a bucket delivery.

Because soil aeration processes can disturb or damage the liner, they should be conducted by an experienced operator.

## 5.2 Addition of Amendments

Adequate microbial growth requires specific ratios of carbon, nitrogen and phosphorus. This ratio is typically between 100:1:0.5 and 100:10:1 for carbon, nitrogen and phosphorus respectively.

Nutrients can be supplied to the soil in either liquid or solid form. Typically, nutrients will be added directly to the soil when the soil is mixed prior to placement in the landfarm or during tilling events during operation.

PPD plans to use commercial agricultural fertilizers to supply the required nutrients.

## 5.3 Soil Sampling

To assess the performance of the landfarm, PPD will sample soils twice annually in the spring and again before freeze up.

Samples will be collected from each stockpile/area in the landfarm. In general, samples will be analyzed for the same contaminants as the site restoration criteria shown in Table 2.

Sample locations will be chosen to ensure uniformly distributed and representative sampling collection throughout the stockpile or area.

Samples will not be collected from the surface of a stockpile. Instead, a hole will be excavated to at least 30 cm below the surface to ensure that conditions are representative.

Sample frequency will be based on the volume of soil estimated to be in the landfarm. Frequency is shown in Table 1 below.

**Table 1: Samples Indicated for Landfarm**

| Landfarm Soil Volume ($m^3$) | Number of Samples |
|---|---|
| ≤ 130 | 3 |
| > 130 to 220 | 4 |
| > 220 to 320 | 5 |
| > 320 to 430 | 6 |
| > 430 to 550 | 7 |
| > 550 to 670 | 8 |
| > 670 to 800 | 9 |
| > 800 to 950 | 10 |
| > 950 to 1100 | 11 |
| > 1100 to 1250 | 12 |
| > 1250 to 1400 | 13 |
| > 1400 to 1550 | 14 |
| > 1550 to 1700 | 15 |
| > 1700 to 1850 | 16 |
| > 1850 to 2050 | 17 |
| > 2050 to 2200 | 18 |
| > 2200 to 2350 | 19 |
| > 2350 to 2500 | 20 |
| > 2500 to 2700 | 21 |
| > 2700 to 2900 | 22 |
| > 2900 to 3100 | 23 |

| Landfarm Soil Volume ($m^3$) | Number of Samples |
|---|---|
| > 3100 to 3300 | 24 |
| > 3300 to 3500 | 25 |
| > 3501 to 3700 | 26 |
| > 3700 to 3900 | 27 |
| > 3900 to 4100 | 28 |
| > 4100 to 4300 | 29 |
| > 4300 to 4500 | 30 |
| > 4500 to 4700 | 31 |
| > 4700 to 5000 | 32 |
| > 5000 | N = 32 + (V − 5000) ÷ 300 where N is the minimum number of samples, and V is the volume of soil in the landfarm. |

### 5.4 Water Management

The perimeter berms of the landfarm will allow for rain and snowmelt to be contained inside the landfarm. PPD will allow a minimum of 0.5 metres of freeboard at the downgradient end of the landfarm to ensure that impacted water does not overtop the berms.

Accumulated water typically evaporates under sun and wind action. Water in the cells also aids in the bioremediation process and controls dust.  It has been found that contaminated water can be stripped of hydrocarbons by pumping it into holes in the soil pile

If water exceeds the freeboard level, PPD will ensure that water in the landfarm is pumped to temporary storage (e.g., in totes, drums or temporary tanks). PPD will sample the temporary water storage and assess the potential for on-land disposal of water.

Where water concentrations are above CCME freshwater aquatic life guidelines or other relevant guideline (see below), PPD will filter and treat the water before disposal. Typically, this process will include a sand filter and activated carbon. Water will be re-tested for hydrocarbons and when acceptable levels are reached, PPD will consult with the Nunavut Department of Environment and/or Water Board representatives at Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) at least 15 days in advance to obtain permission for on-land disposal.

**Table 2: Site Restoration Criteria**[1]

| Analyte | Concentration (µg/L) |
|---|---|
| Benzene | 370 |
| Toluene | 2 |
| Ethylbenzene | 90 |
| Xylenes | 30 |
| | |
| PHC F1 | 150 |
| PHC F2 | 110 |
| PHC F3 | NA |
| PHC F4 | NA |
| | |
| Lead | 1 |

Environment and Climate Change Canada has developed a hazard index approach for benzene, toluene, ethylbenzene and xylenes (BTEX) contaminants that will also be considered when disposing of water.[2]

## 5.5 Decontamination

PPD will ensure that its maintenance contractor decontaminates its equipment before leaving the site.

A separate area of the landfarm will be used for decontamination. Large soil chunks will be removed mechanically with shovels or other equipment.

Access roads will be maintained by the contractor free from contaminated soil. Other areas will also be maintained to comply with federal, territorial, and local fire and safety laws, ordinances, codes, and regulations.

[1] Guidelines above are obtained from CCME Water Quality Guidelines (benzene, toluene, ethylbenzene) or Alberta's Environmental Quality Guidelines for Alberta Surface Waters (all others).
[2] Environment and Climate Change Canada. 2024. *Canadian Environmental Protection Act, 1999* - Federal Environmental Quality Guidelines - Benzene, Toluene, Ethylbenzene, Xylene (BTEX). Guidelines for parameters other than ethylbenzene are higher than those in the site restoration criteria, but the hazard index approach (i.e., the sum of the ratio of the concentrations to the guidelines for each BTEX parameter) may indicate a problem.

# 6 INSPECTION

PPD will arrange for the inspection of the landfarm every year. The purpose of the inspection is to ensure that the landfarm is functioning in accordance with the design and that all regulatory requirements are met.

Inspections will include the following elements:

## 6.1 Berms

The berm condition will be inspected. PPD or its representative will make notes of the following items on all areas of the berms.

- Settlement,
- Erosion,
- Frost action,
- Animal burrows,
- Vegetation,
- Seepage points,
- Exposed debris, or
- Staining.

Where any of these elements are observed, PPD or its representative will measure the feature, determine its location on the berm, and collect photos.

## 6.2 Liner

The landfarm should be examined for any signs of problems with the liner. Any of the following indications should be noted, described and photographed during the inspection.

- Exposed liner (except at the edges of the landfarm on the downgradient side of berms),
- Indications of water leakage from landfarm,
- Rips or tears in liner,
- Any other indications of seepage.

## 6.3 Fencing

During the annual inspection, PPD or its representative will assess the condition of the fence surrounding the landfarm.

Areas of interest during the inspection will include:

- Completeness: has any area of the fence been removed?
- Damage: is any part of the fence damaged? Make specific reference to the following elements:
    - Caps,
    - Mesh,
    - Tension wire/tension bar,
    - Posts.
- Posts: are the posts secure in their base? Do they move in the ground? Are they in alignment?
- Orientation: does the fence lean?
- Access restriction: are there any other reasons that unauthorized personnel could access the site?
- Gate: is the gate locked? Does allow access to the site for the relevant vehicles and personnel?

### 6.4 Site Vicinity

PPD or its representative will also make notes on conditions in the site vicinity. Any site infrastructure not listed here will be inspected for presence and function. The area around the site will be inspected for any other signs of leaching or dust migration. General conditions of the nearby ecosystem health will also be observed – plants, animals and any other indicators.

## 7 REFERENCES


Canadian Council of Ministers of the Environment (CCME), 2023. Canadian Environmental Quality Guidelines. Updates to December 2023. Link.

Government of Alberta, 2018. Environmental Quality Guidelines for Alberta Surface Waters. Water Policy Branch, Alberta Environment and Parks. Edmonton, Alberta. Link.

Government of Nunavut Department of Environment, 2014. Environmental Guideline for the Management of Contaminated Sites. Most recent revision: December 2014. Link.

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## FIGURE