



REPORT

Reclamation, Closure and Monitoring Plan

Tuktoyaktuk Base Remediation, Inuvialuit Settlement Region, Northwest Territories

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Inuvialuit Land Administration

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1.0 INTRODUCTION

Imperial Oil Resources Limited (Imperial) is proposing to undertake Site Remediation (the Project) at the former Tuktoyaktuk Exploration Logistics Base Camp (Tuk Base or the Site) approximately 1.5 kilometres (km) southeast of the Hamlet of Tuktoyaktuk, Northwest Territories (NWT; Figure 1).

The Reclamation, Closure and Monitoring Plan (RCM Plan) outlines the reclamation, closure and monitoring activities to be carried out at Tuk Base. This RCM Plan was developed for the Project based on the Remedial Action Plan (RAP) developed for the Site (Advisian 2019; Golder 2019). The RAP was submitted to the Inuvialuit Water Board (IWB) in March 2019 (Advisian 2019; Golder 2019), approved in July 2019 and amended in May 2020 (Golder 2020).

The RCM Plan provides additional detail on methodologies proposed to be implemented during the Project. Some of these details were not available at the time the RAP was completed. It should be noted that the Project in itself is to remediate and reclaim the Site. Therefore, reclamation and closure activities described in the RCM Plan will describe the Project as it is planned.

1.1 Site Location and History

The Site is at 69°25'35"N latitude and 132°57'20"W longitude on the Beaufort Sea coast approximately 1.5 km southeast of Tuktoyaktuk, NWT (Figures 1 and 2). The Site is on a lease (ILA85TJ079) held by Imperial from the Inuvialuit Land Administration (ILA). Tuk Base began operations in 1970 and operated as a staging and storage area for oil and gas exploration in the Arctic. In 1980, decommissioning of the Site began. Between 2001 and 2013 almost all major infrastructure on site was decommissioned and removed (Advisian 2019). As of 2018, the only notable features remaining on site include two historic landfills, a sewage lagoon, north and south docks and concrete pads.

1.2 Site Description

The Site covers a land area of approximately 54 hectares and generally comprises the former Tuk Base Operation on the Upper Terrace, transitioning down to a Lower Terrace (created by infilling the low-lying natural topography with dredged ocean sediments) and the surrounding natural tundra (Figure 2).

The Site is bordered by tundra to the north and south, with the Mayogiak Inlet and Tuktoyaktuk Harbour bordering the Site to the east and west, respectively (Figure 2). The former Northern Transportation Company Limited (NTCL) tank farm/lease is located to the north of the Imperial lease on Saviktok Point.

1.3 Remediation and Reclamation Objectives

Imperial and prime contractor WSP Canada Inc. (WSP) are committed to complete pre- and post-construction, remediation, reclamation and monitoring activities associated with the Project in nature that minimizes the risk of negative impacts on the environment, terrestrial, aquatic and avian wildlife, and humans. The Tuktoyaktuk Community Conservation Plan (TCCP 2016) classifies the Site as Category C Lands "where cultural or renewable resources are of particular significance and sensitivity during specific times of the year. These lands and waters shall be managed so as to eliminate, to the greatest extent possible, potential damage and disruption. The RAP (Advisian 2019; Golder 2019, 2020) has been guiding the following Project tasks since 2019 and continuing until 2029.

- Surface debris (including the wood piles from the former wooden wharf) will be collected, removed and disposed of off site at an approved disposal facility.

- Hazardous material (stemming from historical operations) encountered on site will be temporarily stored, transported off site and disposed of at an approved disposal facility.
- Soil impacted with light-end petroleum hydrocarbons (PHCs) will be treated on site and used as backfill.
- Soil impacted with heavy-end PHCs will be treated on site and/or disposed of off site at an approved disposal facility.
- Soils impacted with metals or polychlorinated biphenyls will be excavated and transported to an approved disposal facility.
- The Former Sewage Lagoon will be dewatered, backfilled and regraded/revegetated (as directed by the ILA).
- The North Dock will be utilized for the Project and then will either be repurposed (pending negotiations with the ILA) or demolished.
- The South Dock will be demolished.
- The concrete pads will be transported off site for re-use or appropriate disposal.
- Site access for personnel and equipment will be via barge and crew boats from the Hamlet of Tuktoyaktuk during the summer field programs, and ice road during the winter field programs.
- Accommodation during the winter and summer field programs may be provided by the 802-barge camp or the Arctic Star barge camp, anchored either at the Site, or close to Tuktoyaktuk; the location of the camp may change between these two locations seasonally, depending on the number of personnel required for the Site.

After Project completion, the Site will be left in a condition that promotes long term geotechnical stability and positive drainage in all disturbed areas. The end land use will be “parkland” as defined by the Canadian Council of Ministers of the Environment (CCME 1999a and updates).

1.4 Site-Specific Reclamation Criteria

Reclamation criteria for the Site will meet the concept of “equivalent land capability”. This concept may be defined as “the ability of the land to support various land uses after conservation and reclamation that is similar to the ability that existed prior to an activity being conducted on the “land”. This concept is based on a clear understanding of what land use was prior to the disturbance, as well as understanding if the end land use will be the same or different from the original.

1.4.1 Physical Stability

Physical stability criteria for reclamation will be based on an overall assessment of the Site relative to the surrounding landscape specific to the following guiding parameters.

- Drainage – Site drainage will be consistent with original patterns, directions and capacity, and be compatible with the surrounding landscape. Contouring will be done such that there is no surface water pooling on site. Facilities or features left in place must not negatively impact overall drainage.
- Erosion – No visible evidence of erosion features such as gullies or blowouts will remain on the Site, similar to observable features on adjacent land.
- Stability – No visible evidence of slope movement, slumping or subsidence will be at the Site.

- Debris – No industrial or domestic debris will be present.

1.4.2 Chemical Stability

Chemical criteria have been outlined in the RAP submitted to the IWB in March 2019 (Advisian 2019, Golder 2019) and amended in May 2020 (Golder 2020). All previously impacted areas identified in the amended RAP will be remediated and be shown to meet these chemical criteria.

1.4.3 Ecological Stability

Ecological stability criteria are based on re-establishment of appropriate vegetation communities in areas of previous disturbance such that vegetation can be shown to be re-establishing in disturbed areas with similar communities (as directed by the ILA), to those on adjacent land.

1.4.4 Climate and Geographic Stability

The scope of the Project is localized and not expected to have any climatic or geographic effects. Criteria for these parameters have not been established. Established reclamation criteria outlined above are expected to return the Site to a state that existed prior to any activity being conducted on the land.

2.0 BACKGROUND

2.1 Site History

Site history and infrastructures were documented in the Phase I Environmental Site Assessment (WorleyParsons 2015). Prior to 1970, the Site was used by NTCL. Imperial began its operations at the Site in 1970, operating the Site as a staging and storage area that supported offshore oil exploration activities. A permanent camp facility was established on the Upper Terrace in 1974, which included worker barracks, cafeteria facilities, a power plant, a sewage lagoon, garages and a fuel storage tank farm. Dredged sediment from the Harbour was placed on the Lower Terrace in 1982, to raise the ground elevation in this area for use as a materials and equipment laydown and staging area.

Site decommissioning activities began in the late 1980s. All major above-ground infrastructure, with the exception of two concrete slabs, thermosyphons and some isolated debris, was removed from the Site by the end of 2001. There were no above-ground or underground natural gas, multi-use, oil or sewage lines found in the vicinity of the Site (WorleyParsons 2015). All Imperial product lines and underground utilities were subsequently removed as part of the site decommissioning completed in 2011 and 2013 (WorleyParsons 2013).

2.2 Regulatory Background

In addition to the Water Licence issued by the Inuvialuit Water Board pursuant to the Northwest Territories Waters Regulations (Waters Regulation) established under the Northwest Territories *Waters Act* (*Waters Act*), the Project required approval of a Project Description submitted to the Environmental Impact Screening Committee pursuant to the *Inuvialuit Final Agreement* (IFA), and a Land Use Permit from the ILA pursuant to the IFA as regulated under the Western Arctic (Inuvialuit) Claims Settlement Act. Additionally, approval was sought from Fisheries and Oceans Canada (DFO) to proceed without Authorization under the *Fisheries Act* to undertake the dewatering/backfilling of the Former Sewage Lagoon and the removal and repair of the two docks. A summary of permitting requirements and notifications is presented in Table A.

Table A: Permits, Licences and Authorizations

Permit/Licence/Authorization	Regulator	Reference Number/Expiry (if applicable)
Water Licence	Inuvialuit Water Board	N5L8-1841 30 September 2029
Land Use Permit	Inuvialuit Land Administration	ILA19TS018 20 June 2026 (new application in progress)
Land Lease	Inuvialuit Land Administration	ILA85TJ079 5 June 2029
Project Description	Environmental Impact Screening Committee	Registry File 03/19-01 September 2029
Confirmation that no Authorization under the <i>Fisheries Act</i> is required	Fisheries and Oceans Canada	22-HCAA-00817

3.0 ENVIRONMENTAL BASELINE

3.1 Physical Environment

3.1.1 Climate

The climate of the Tuktoyaktuk peninsula region is generally continental (long and very cold winters), with maritime-like climate present on the coast (slightly warmer winters and cooler summers) (Dyke 2000). Daylight hours vary from near total darkness during December and January, to 24 hours of daylight from approximately mid-May to mid-July. Tuktoyaktuk, at an elevation of approximately 18 metres above sea level (masl), experiences yearly temperature averages of -10.2 degrees Celsius (°C), with only the months of June to September reporting monthly averages above 0°C (Environment Canada 2019, internet site).

The Tuktoyaktuk area receives an average 139.3 millimetres (mm) of precipitation a year, approximately 50% of which falls as snow. Individual daily precipitation within Tuktoyaktuk is typically light, with only 12 days of the year having >5 mm of precipitation (Environment Canada 2019, internet site).

3.1.2 Terrain and Topography

The Site is within the Tuktoyaktuk Coastal Plain Ecoregion of the Southern Arctic Ecozone. This ecoregion covers the outer Mackenzie River Delta and Tuktoyaktuk Peninsula bordering the Beaufort Sea (ESWG 1995). Of the two main landscape types within the Tuktoyaktuk Coastal Plain Ecoregion, the Site is located in the region (Tuktoyaktuk Peninsula) consisting of many lakes and pingos (ESWG 1995). There is pingo on in proximity of the Site.

Tuk Base has a maximum elevation of approximately 12 masl. A copy of the site survey plan, four cross-sections and a low elevation orthophoto from 2017 are provided in Appendix A.

Sea level is estimated to be rising at Tuktoyaktuk at a rate of ~2.5 millimetres per year (mm/year), predominantly based on estimates of vertical land motion (i.e., sinking land) rather than redistribution of meltwater from glaciers, ice caps and ice sheets, which is estimated to be +0.2 mm/year (Environment and Natural Resources [ENR 2015]). Much of the coast is erosional; typical long-term (multi-decade) retreat rates of unlithified coastal bluffs are

on the order of 1 to 2 metres per year. Locally, aggradation features (spits and bars) are formed by transport of eroded sand and gravel.

3.1.3 Permafrost Condition

The region is underlain by continuous permafrost with high ice content in the form of ice wedges, intra-sedimental sills and pingos (ESWG 1995). Permafrost at the Site has been observed through boreholes and test pits from 2007 to 2015 as follows.

- Upper Terrace: depths varying from 0.4 to 3.0 metres below ground surface (mbgs), with an average depth of 1.8 mbgs.
- Airstrip: depths of 1.4 and 1.5 mbgs.
- Lower Terrace depths range from 0.95 to 2.9 mbgs, with an average of 2.0 mbgs.
- Natural Tundra: depths ranging from 0.3 to 0.6 mbgs.

These depths are based on maximum active layer thickness measured in summer months.

It is noted that the depth to permafrost interfaces recorded during investigation are based on visual observations of auger soils cuttings, exposed soil faces (test pits) and equipment performance (e.g., difficult drilling or excavation). Accordingly, visual interpretation of the permafrost interface depth can be affected by many aspects such as groundwater presence, sloughing soils, discontinuous ice and surface organic layer. Details on the results of recent thermal monitoring using thermistors are in the RAP (Advisian 2019).

3.1.4 Surface Water Hydrology

There are three surface water bodies on or immediately adjacent to the Site; the larger of the three is the Former Sewage Lagoon. The Former Sewage Lagoon (~2,000 square metres [m²]) is on the eastern side of the lease. The lagoon was constructed by Imperial for the former camp facility in accordance with the permitting requirements applicable at the time. The other two surface water bodies are to the north of the lease where the original Imperial camp was located (WorleyParsons 2015). They are in the immediate area of the former Imperial construction camp landfill (the "North Landfill"). These two small ponds have a combined footprint of less than 100 m² and are approximately 50 m north of the northwestern lease boundary and are not connected to any watercourses.

3.1.5 Groundwater and Surface Water Quality

Shallow groundwater levels across the Site generally vary between ground surface and 1.0 mbgs on the Upper Terrace and between ground surface and 0.6 mbgs on the Lower Terrace. In general, there is a limited amount of groundwater at the Site as evident by the presence of dry monitoring well conditions and very slow groundwater flow in this permafrost environment. Detailed groundwater monitoring results were presented in Advisian (2017). Groundwater flow direction has not been verified to date.

The establishment of background water quality conditions at Tuk Base is complicated by the presence of an Upper Terrace (characterized by natural sediments) and a Lower Terrace (constructed with dredged marine sediment). Given there have been a limited number of groundwater monitoring events to date, there is currently insufficient data to complete statistical analysis. As such, results were compared to concentrations observed in the following inferred background monitoring wells:

- Lower Terrace: MW-L-05 and P01-2; and

- Upper Terrace: MW-BG-01 and P10-2.

Assumed background concentrations for the main groundwater parameters of concern are shown in Table B.

Table B: Background Groundwater Concentrations

Parameter		Background	
		Lower Terrace ¹	Upper Terrace ²
Applicability		>10 m from surface waterbody	
Benzene	(mg/L)	≤0.0004	≤0.0004
Toluene	(mg/L)	≤0.0004	≤0.0004
Ethylbenzene	(mg/L)	≤0.0004	≤0.0004
Xylenes (Total)	(mg/L)	≤0.0008	≤0.0008
PHC Fraction F1 (C6-C10)	(mg/L)	≤0.1	≤0.1
PHC Fraction F2 (C10-C16)	(mg/L)	≤0.1	≤0.1
PCBs	(mg/L)	n/a	n/a
Arsenic	(mg/L)	0.004	0.0012
Barium	(mg/L)	0.18	0.24
Cadmium	(mg/L)	0.0004	0.00036
Chromium (Total)	(mg/L)	0.02	0.01
Cobalt	(mg/L)	0.006	0.012
Copper	(mg/L)	0.004	0.007
Lead	(mg/L)	0.004	0.007
Mercury	(mg/L)	n/a	n/a
Nickel	(mg/L)	0.01	0.016
Zinc	(mg/L)	0.06	0.06

Notes:

¹ Lower Terrace Background Locations (MW-L05 and P01-2)

² Upper Background Locations (MW-BG-01 and P10-2)

All metals are dissolved.

m – metres; n/a – not applicable; PCB – polychlorinated biphenyl; ≤ – less than or equal to

All concentrations in mg/L (milligrams per litre) or parts per million) unless otherwise indicated.

3.2 Biological Environment

The Government of Canada's *Species at Risk Act* (SARA 2002) was enacted to prevent Canadian indigenous species, subspecies and distinct populations of wildlife from becoming extirpated or extinct, to provide for the recovery of endangered or threatened species, and to encourage the management of other species to prevent them from becoming at risk. The enactment established the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as an independent body of experts responsible for assessing and identifying species-at-risk. It provided that COSEWIC's assessments were to be reported to the Minister of the Environment and to the Canadian Endangered Species Conservation Council and it authorized the Governor in Council to establish the official list of species-at-risk based on that process. It required that the best available knowledge be used to define long and short-term objectives in a recovery strategy for endangered and threatened species and it provides for action plans to identify specific actions. The SARA (2002) created prohibitions to protect listed threatened and

endangered species and their critical habitat. Species can be listed under three schedules. Schedule 1 is the official list of species that are classified as extirpated, endangered, threatened and of special concern. Species listed in Schedule 2 are species that had been designated as endangered or threatened and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1. Species listed in Schedule 3 are species that had been designated as special concern and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1 (SARA 2024, internet site).

In addition to federal legislation, the GNWT established the NWT Species General Status Ranking Program which produces the General Status Ranks of Wild Species in the NWT (Working Group on General Status of NWT Species 2021). Under this program, species' ranks are reviewed and published every five years. The 2021 report present the general status ranks for 8,228 species known or expected to be present in the NWT. Species may be ranked as 'at risk' (have been assessed in detail and ranked by the NWT Species at Risk Committee [SARC] or COSEWIC as 'threatened' or 'endangered'), 'may be at risk' (may be at risk of extinction or extirpation and candidates for detailed risk assessments), 'sensitive' (may require protection to keep from becoming at risk), 'secure' (not at risk or sensitive), 'undetermined' (insufficient information to determine status), 'not ranked' (not ranked under program), 'alien' (introduced through human activities), 'extirpated / extinct' (no longer found in the NWT / world), 'vagrant' (infrequent and/or unpredictable occurrences outside normal distribution range) and 'presence expected' (species not yet recorded but expected to occur in the NWT) (Working Group on General Status of NWT Species 2021).

The NWT Species General Status Ranking Program provides species ranks to the NWT SARC, which was established under the *Species at Risk (NWT) Act* to assesses the biological status of species that may be at risk in the NWT, to identify threats and positive influences on species and their habitats, and to recommend whether a species should be added to the NWT List of Species-at-Risk (NWT SARC 2024, internet site).

The following sections include summaries of species potentially occurring in the Project area that are currently listed territorially and/or federally.

3.2.1 Vegetation

The Site is north of the tree line and has only sparse covering of low alder (*Alnus spp.*) and willow (*Salix spp.*) shrubs. In addition to low shrubs, mosses, lichen and cold-resistant vascular plants such as sedges (*Carex spp.*) and cotton grass (*Eriophorum spp.*) are the dominant vegetation.

The areas around the Former Sewage Lagoon and the two small ponds north of the lease area appear to have the most revegetation of the disturbed areas. The airstrip, Upper and Lower Terraces are mostly clear of any shrubs, but grasses have now established across the area. The small escarpment on the southwest edge of the Upper Terrace appears to have mostly shrub vegetation, with no previous major clearing of the slope evident from historical photographs.

The only vascular plant species currently listed by the NWT SARC is occurring in the ISR - the hairy braya (*Braya pilosa*). It is listed territorially as 'threatened', as 'endangered' under the federal SARA and COSEWIC. However, this species is endemic to Cape Bathurst, well east of the Site (NWT SARC 2024).

3.2.2 Freshwater Biota and Habitat

There is no waterbody at the Site except for the Former Sewage Lagoon. As part of the Project, it will be drained and backfilled with the original material currently serving as a berm around the perimeter. There are two small ponds approximately 50 m north of the Site; they are not connected to any watercourse.

3.2.3 Marine, Estuarine Habitats and Species

At least 20 species of fish are known to use the estuarine habitat in the general Tuktoyaktuk Harbour area. Species found include freshwater, anadromous and marine forms. Salinity in Tuktoyaktuk Harbour varies both seasonally and spatially. Under ice cover, freshwater from the Mackenzie River blocks the influx of saltwater into the harbour. By late spring, a freshwater layer up to 6 m deep overlies saline water at depth. During summer, winds mix the waters creating a more brackish environment (Bond 1982).

Given these variable conditions, species distribution varies seasonally and spatially, with freshwater species more predominant in the nearshore (fresher) habitat and marine species in the offshore habitat. As described by Bond (1982) and Hopky and Ratynski (1983), nearshore habitat such as adjacent to the Tuk Base docks was used predominately by least cisco or Iqalusaaq (*Coregonus sardinella*), Arctic cisco (*Coregonus autumnalis*), lake whitefish or Pikuktuuq (*Coregonus clupeaformis*) followed by broad whitefish or Aanaakliq (*Coregonus nasus*), rainbow smelt (*Osmerus mordax*), Arctic flounder (*Liopsetta glacialis*) and fourhead sculpin (*Myoxocephalus quadricornis*). In addition, Lacho (1991) determined through analyses of stomachs from 13 fish species obtained from catches in Tuktoyaktuk Harbour, the presence of Inconnu or Siigaq (*Stenodus leucichthys*), pacific herring or Piquaqtitaaq (*Clupea harengus*), saffron cod (*Eleginus gracilis*), starry flounder (*Platyichthys stellatus*), blackline prickleback (*Acantholumpenus mackayi*), eelpout (*Lycodes jugoricus*) and slender eelblenny (*Lumpenus fabricii*). These species of fish are not listed. The TCCP (2016) includes most of these species as important food sources used for subsistence fishing during spring, summer and fall.

The Beaufort Sea marine region (well offshore of the Tuktoyaktuk Peninsula) has a large summer feeding population of bowhead whales or Arviq (*Balaena mysticetus*) (TCCP 2016). Kugmallit Bay and Tuktoyaktuk Harbour are home to ringed seal or Natchiq (*Phoca hispida*) and bearded seals or Ugyuk (*Erignathus barbatus*). One of the world's largest summering stock of beluga whales or Qilalugaq (*Delphinapterus leucas*) move into ISR waters every summer and use the waters along the ISR (TCCP 2016). Their core habitat in Mackenzie River Delta and estuary in the Beaufort Sea is protected through the Tarrum Nirvutait Marine Protected Area, consisting of three individual areas called Niaqunnaq, Okeevik and Kittigaryuit. The Special Designated Lands area 712C (Beluga Management Zone 2) is recognized by the Inuvialuit as a major beluga travel corridor to move into, out of, and amongst bays of the Mackenzie estuary (TCCP 2016).

Polar bears or Nanuq (*Ursus maritimus*) belonging to the Southern and/or Northern Beaufort Sea subpopulations primarily occupy areas with large amounts of sea ice. Maternity dens and secondary winter habitat occur along the Beaufort Sea coastline (TCCP 2016).

Several of the marine species potentially occurring near the Site are listed federally and/or territorially (Table C).

Table C: Marine Mammal Species of Conservation Concern Potentially Occurring at the Site

Common Name	Scientific Name	NWT SAR ¹	COSEWIC ²	SARA ³
Bowhead whale (Bering-Chukchi-Beaufort population)	<i>Balaena mysticetus</i>	n/a	Special concern	Special concern
Grey whale (Northern Pacific Migratory population)	<i>Eschrichtius robustus</i>	n/a	Not at risk	Special concern
Polar bear	<i>Ursus maritimus</i>	Special concern	Special concern	Special concern
Ringed seal	<i>Pusa hispida</i>	n/a	Special concern	Under consideration

Notes:

¹Conference of Management Authorities. 2024. NWT List of Species at Risk. Species listed under the Species at Risk (NWT) Act.

²Species recommended by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) for listing under Schedule 1 of the federal *Species at Risk Act* (SARA).

³Species listed under Schedule 1 of the federal SARA.

n/a – not applicable

3.2.4 Terrestrial Wildlife and Habitat

Wildlife species are important to the communities for subsistence harvesting and for their spiritual and cultural values. Potential adverse effects on these species and their habitats are listed as being of concern in the TCCP (2016). The primary terrestrial mammals potentially occurring in the general Project area include barren-ground caribou (*Rangifer tarandus groenlandicus*), moose (*Alces alces*), grizzly bear (*Ursus arctos*), wolf (*Canis lupus*), wolverine (*Gulo gulo*), Arctic fox (*Vulpes lagopus*) and Arctic hare (*Lepus arcticus*; [TCCP 2016]).

Tuk Base is within a larger Special Designated Lands area for grizzly bear denning area (322C). This area is important for denning grizzly bears from October to May (TCCP 2016). However, the Site is relatively flat and does not offer eskers or slopes that offer denning habitat (Advisian 2019).

Species potentially occurring at Tuk Base that are listed either federally or territorially are summarized in Table D.

Table D: Terrestrial Mammals of Conservation Concern Potentially Occurring at the Site

Common Name	Scientific Name	NWT SAR ¹	COSEWIC ²	SARA ³
Barren-ground caribou	<i>Rangifer tarandus groenlandicus</i>	Threatened	Threatened	Under consideration
Grizzly bear (Western population)	<i>Ursus arctos</i>	No status	Special concern	Special concern
Wolverine	<i>Gulo gulo</i>	No status	Special concern	Special concern

Notes:

¹Conference of Management Authorities. 2024. NWT List of Species at Risk. Species listed under the *Species at Risk (NWT) Act*.

²Species recommended by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) for listing under Schedule 1 of the federal *Species at Risk Act* (SARA).

³Species listed under Schedule 1 of the federal SARA.

3.2.5 Avian Wildlife and Habitat

The vast majority of birds that are found in and around the Mackenzie Delta including the Tuktoyaktuk Peninsula are migratory and are present from May to October. The Inuvialuit harvest geese during summer in the Summer Goose Harvesting area (308C), and during fall in the Fall Goose Harvesting area (312C), which includes the Site (TCCP 2016). Harvested goose species include Cackling goose (*Branta hutchinsii hutchinsii*) white fronted geese or Kanguq (*Anser albifrons*) and snow geese or Nirliq (*Anser caerulescens*).

There are a large variety of waterfowl, raptors and songbirds potentially occurring at Tuk Base. Species potentially occurring at Tuk Base that are listed either federally or territorially are summarized in Table E.

Table E: Avian Species of Conservation Concern Potentially Occurring at the Site

Common Name	Scientific Name	NWT SAR ¹	COSEWIC ²	SARA ³
Bank swallow	<i>Riparia riparia</i>	n/a	Threatened	Threatened
Barn swallow	<i>Hirundo rustica</i>	n/a	Special Concern	Threatened
Harris's sparrow	<i>Zonotrichia querula</i>	n/a	Special Concern	Special Concern

Common Name	Scientific Name	NWT SAR ¹	COSEWIC ²	SARA ³
Horned grebe (western population)	<i>Podiceps auritus</i>	n/a	Special Concern	Special Concern
Hudsonian godwit	<i>Limosa haemastica</i>	n/a	Threatened	Under consideration
Lesser yellowlegs	<i>Tringa flavipes</i>	n/a	Threatened	Under consideration
Red-necked phalarope	<i>Phalaropus lobatus</i>	n/a	Special Concern	Special Concern
Rusty blackbird	<i>Euphagus carolinus</i>	No status	Special Concern	Special Concern
Short-eared owl	<i>Asio flammeus</i>	No status	Threatened	Special Concern

Notes:

¹Conference of Management Authorities. 2024. NWT List of Species at Risk. Species listed under the *Species at Risk (NWT) Act*.

²Species recommended by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) for listing under Schedule 1 of the federal Species at Risk Act (SARA).

³Species listed under Schedule 1 of the federal SARA.

3.3 Land Use

3.3.1 Hunting and Fishing

Tuk Base is on the following Special Designated Lands that consider aquatic and marine resources important to the Inuvialuit (TCCP 2016).

- Spring caribou harvesting (302C) – Key harvesting area for caribou in the spring.
- Spring fish harvesting (305C) – Key area for subsistence fishing during the spring.
- Spring Goose Harvesting Areas (304C) - Key area for subsistence goose harvest in the spring
- Summer caribou harvesting (306C) – Key area for subsistence harvesting of caribou during the summer.
- Summer fish harvesting (307C) – Key area for subsistence fishing during the summer.
- Summer goose harvesting (308C) – Key area for subsistence goose harvesting in the summer.
- Fall caribou harvesting (309C) – Key area for subsistence caribou harvesting in the fall.
- Fall fish harvesting (310C) – Key area for subsistence fish harvesting in the fall.
- Fall seal harvesting (311C) – Key area for subsistence seal harvesting in the fall.
- Fall goose harvesting (312C) – Key area for subsistence goose harvesting in the fall.
- Winter wolverine harvesting (314C) – Key area for subsistence wolverine harvesting in the winter.
- Winter caribou harvesting (315C) – Key area for subsistence caribou harvesting in the winter.
- Caribou Herd Winter Range (701E) - Key winter habitat for the Tuktoyaktuk Peninsula, Cape Bathurst, Bluenose-West caribou herds, which are valued for subsistence harvest year-round.
- Fish lakes and Rivers (704C) – Key fish habitat and important historic and present subsistence harvest area for people of Inuvik and Tuktoyaktuk.

3.3.2 Protected Areas and Archaeology

An archaeological impact assessment (AIA) was completed by Lifeways at Tuk Base in 2017 (Advisian 2019). This AIA surveyed the Imperial lease and immediately surrounding areas. The only archaeological site found is a campsite consisting of a hearth feature in the bank of the Mayogiak Inlet. Lifeways concluded that since the archaeological site is outside the probable remediation area, no impacts are expected, and no further assessment work was required. The recommendations within this AIA were reviewed by and agreed with by the Prince of Wales Northern Heritage Centre (Advisian 2019).

Even though the archaeological site is outside the work area, an exclusion zone will nonetheless be established during site remediation work.

3.3.3 Pre-Disturbance Site Conditions

There is no information describing the pre-disturbance conditions at the Site. It is assumed that prior to NTCL and Imperial activities in 1970s, the Site was undeveloped tundra, and the conditions were similar to those of the surrounding areas.

4.0 RECLAMATION AND CLOSURE MEASURES

4.1 Reclamation and Closure Approach

The overall objective of the Project is to return the Site to equivalent land capability and to be returned to its established end land use. The RAP outlines the objectives and approaches to remediating areas of contaminated soil and removing surficial and landfilled debris from the site (Advisian 2019; Golder 2019, 2020). Specific methodologies for these activities are further outlined in the following sections.

The reclamation approach for the Site will be to reclaim disturbed areas into gently sloped and free-draining areas that blend into the surrounding landscape. Natural vegetation will re-establish in these areas over time. Limiting surface water ponding is of particular importance to maintain integrity of the permafrost in these areas, as is limiting the effects of wind and water erosion in the reclaimed areas.

Site closure will involve a monitoring phase during which the success of remediation and reclamation efforts will be actively monitored by collecting data on contaminant levels and evaluating site conditions against the established remediation and reclamation criteria. Results of the monitoring will allow conclusions to be drawn about success of remediation and reclamation efforts and ultimately allow for site closure.

4.2 Re-contouring and Revegetation

Conceptually, reclamation of each disturbance area will include the following activities.

- Identifying and conserving any topsoil, peat and surface litter from all areas to be reclaimed for re-use (based on the information provided, the quantities of these materials available is expected to be minimal).
- Upon completion of remediation, re-contouring each area to ensure positive drainage and integration into the landscape. This work will be completed using a dozer or an excavator.
- Once the base contour is established for each area, creating a rough, random micro-contour in each area using a dozer, ripper or excavator. These micro-contours will create habitats for vegetation re-establishment.
- Spreading of any salvaged topsoil, peat or surface litter across the reclaimed area.

- Re-vegetation by native species to accelerate the natural environment will be achieved using a combination of live staking of willows (by harvesting live stakes from the surrounding area), seeding of native species and natural revegetation. Natural revegetation is frequently the preferred option as it limits the introduction of invasive plant species that may be included in seed mixes. If seeding is required (e.g., to limit the potential for erosion), native seed mixes approved by the ILA will be used to avoid the establishment of invasive species.

4.3 Water Course Crossings

No watercourses are present at the Site. No watercourse crossings are required as a part of the work.

4.4 Borrow Sources

As outlined in the RAP, most of the soil being excavated on site will be treated to reduce PHC concentrations to below the applicable guidelines, and once verified, will be replaced into the existing excavations. Some soil will be required to be moved from place to place on site to meet the reclamation criteria described above for physical stability and to ensure success of reclamation objectives.

The former airstrip has been identified as an area requiring re-grading, where surface fill appears to have been imported in the past to raise the overall grade, so it could properly fulfill operational requirements as an air strip. The grade in the former air strip area will be lowered to better tie into the surrounding landscape, and the excess material will be used to regrade other parts of the Site that require it. There is no intent to open any new borrow areas on site.

4.5 Soil Excavation, Treatment and Disposal

4.5.1 Excavation and Treatment of Contaminated Soil

The proposed contaminated soil excavation areas are outlined in the RAP (Advisian 2019; Golder 2019, 2020; Tables 1 and 2). Soil in these areas will be excavated and prepared for soil treatment. Soil treatment on site will consist of the following.

- A passive biopile will be used to treat Type B soil (as defined in Table F). Biopiles will consist of windrows with a cross-sectional profile approximately 10 m across. Windrows will be bermed with sufficient freeboard to ensure that any leachate is retained within the berm. A 150 mm layer of granular fill obtained from the Site will be placed as a base layer to provide a visual break so that mixing with the excavator will not result in encroachment into the natural soil present below the treatment cell.
- Any rain or snow water will be directed to one or more collection sumps, which will be located in low-lying areas of the treatment cell. Historical climate data indicate a historical maximum snow depth of 76 centimetres (cm) (roughly equivalent to 76 mm of water), an average precipitation of 76 mm between October and June (the period of time when the windrows would be unattended) and a historical maximum daily precipitation of 29.5 mm (Environment and Natural Resources 2015). The water retention capacity of the windrow berms will be constructed to meet these expected values. Based on the profile of the windrows and the data cited, a water retention capacity of a minimum of 1 cubic metre (m³) of storage capacity per linear metre of windrow will be used.
- Water treatment equipment consisting of pumps, tankage, oil-water separator, particulate filter and carbon filter will be present on site to manage water within the windrow berms during summer months. Moisture content of the windrows will be monitored, and leachate water can be re-applied to the soil if it is drying out.

- The biopile design will allow for treatment of 18 m³ of soil per running metre of windrow. Based on this design, approximately 670 linear metres of windrow will be required to be constructed. The intent is to use the former camp and warehouse areas in the upper terrace for biopile construction; however, additional areas of the Site may need to be required for this purpose.
- The passive biopile design will not use aeration piping or a cover. To create a system with the least amount of complexity that can be left unattended during winter months, aeration will be conducted on a regular basis (every 30 to 60 days during Site operations) by turning with an excavator. Bioremedial activity in the windrows is expected to be minimal during winter months, limiting usefulness of aeration piping during this time. The dry climate and relatively coarse texture of the soil makes saturation and development of anaerobic conditions in soil unlikely. Use of a cover was considered; however, the open area of the site and high expected wind conditions would make it difficult to place and maintain. As noted above, soil pile moisture will be supplemented by leachate as required. Blowing dust from piles will be managed by water addition and by sufficient packing using the excavator bucket during mixing events. The surface of the pile is expected to be frozen from October to May, limiting dust release during this time.
- Windrows will be mixed and aerated in place using an excavator with an Allu, or other, mixing bucket. All windrows will have fertilizer amendments applied and mixed in to promote biodegradation of light hydrocarbons.
- Prior to demobilization, the soil treatment areas will be decommissioned. The soil underlying the treatment area will be inspected for any potential spills/releases that may have occurred during treatment and if contamination is suspected, sampled to confirm that no impacts are present. The area will then be re-graded to integrate with the surrounding landscape, and if appropriate, will be seeded to native species to allow for natural reclamation of the area.
- Any material that meets applied guidelines for contaminants as outlined in Table F and RAP (Advisian 2019, Section 3) after sampling will be used as on-site backfill material. Any material that does not meet the applied guidelines for those contaminants, will be segregated by type of impact (Type A, Type B, Metals/Other; Table E) and separated for off-site disposal.
- Contaminated soils will be separated and bagged or stockpiled during the summer season and staged for transportation during the winter months.
- The Bulk Bags used for soil disposal will be UN rated shipping containers designed to hold various substances from soils to sludges, made of two layers of 390 grams per m² UV treated uncoated polypropylene, with a weight capacity of 1,350 kilograms (kg). The bags have 56 cm, 2,500 kg polypropylene lifting loops for easier material handling.

Table F: Soil Guidelines

Parameter		Concentration ¹ (mg/kg)
Petroleum Hydrocarbons		
	Type A (F3 + F4) ²	20,000
	Type B ^{3,4} (F1+F2+F3; within 30 m of a surface waterbody)	
	F1	1,290

Parameter		Concentration ¹ (mg/kg)
	F2	330
	Type B 3,4 (F1+F2+F3; more than 30 m from a surface waterbody)	
	<0.5 mbgs	2,500
	>0.5 mbgs	5,000
Metals ⁵		
	Arsenic	30
	Barium ⁶	750/250/10,000
	Cadmium	5.0
	Chromium	250
	Cobalt	50
	Copper	100
	Lead ⁷	200
	Mercury	2.0
	Nickel	100
	Zinc	500
PCBs ⁷		1.0
PAHs	APEC – Specific	CCME Parkland Soil Quality Guidelines

Notes:

¹ - all concentrations in mg/kg ([milligrams per kilogram] or parts per million)

² - Type A: Soils containing lower mobility PHC Fractions (C16 to C50)

³ - Type B: Soils containing higher mobility PHC Fractions (C6 to C34)

⁴ - Background F3 concentrations should be considered in calculation of Type B guideline

⁵ - Default to background concentrations, where applicable

⁶ - Barium: 750 = total barium/250 = extractable barium/10,000 = true total (fusion).

⁷ - Tier 1

APEC: area of potential environmental concern

F1, F2, F3, F4: petroleum hydrocarbon fractions 1, 2, 3 and 4

PAHs: Polycyclic Aromatic Hydrocarbons

4.5.2 Excavation of On-Site Landfill Areas

There are two former landfill areas on site, which are known to contain metallic and non-metallic debris as well as other possible materials that require re-excavation, sorting, and if necessary, off-site disposal. These landfills are described as South Landfill and North Landfill in the RAP (Advisian 2019, Section 4.2.2 and 4.2.3) The approach for excavation of the landfills is as follows.

- Establishment of materials processing areas (MPA) and engineered soil staging areas (ESSA). For the South Landfill, the MPA will be established in the lower terrace near the South Landfill location. For the North Landfill, the MPA will be situated on a previously disturbed area near the north lease boundary of the Site.

- Landfill excavation will progress using an excavator to remove and separate larger items from the landfill using a thumb attachment. Remaining soil will be placed in thin lifts in the MPA for secondary sorting. Excavation will take place to permafrost depth or until there is no visual evidence of former landfill material. Any waste materials found to be frozen into permafrost will be left in place at the base of the landfill and covered with fill. Surface water and/or leachate present in the landfill areas will be sampled, and if found to be impacted, will be treated using on-site water treatment equipment (pumps, tankage, oil water separator, particulate filter, carbon filter) prior to discharge.
- Landfill excavation surfaces will be sampled for contamination parameters.
- Secondary sorting will take place in the MPA using excavators and skid steer loaders to remove and segregate items greater than 0.03 m³ from the soil. Hand sorting, only if necessary, will take place using labourers in a separate sub-area within the MPA.
- During excavation and sorting, any items identified as potentially hazardous, regardless of size (barrels, batteries, painted metals, piping or insulation, etc.) will be mechanically segregated and placed on a lined, bermed sub-area within of the MPA for further assessment, sampling and processing. Barrels will be managed as per the Abandoned Military Site Remediation Protocol (AMSRP) guidelines and the Indian and Northern Affairs Canada (INAC) Barrel Protocol and Table 5.2 of those guidelines (INAC 2008). Empty barrels will be crushed and disposed of as non-hazardous waste. Drum overpacks and sorbent materials will be available on site to facilitate the safe handling of drums. Any liquids will be contained, sampled and staged for disposal based on the analyses.
- Sorted soil will be stockpiled and sampled for potential contaminants. If the soil meets the applied guidelines, it may be used as backfill for the landfill excavation. Treatable Type B soil may be added to the windrows for treatment as outlined above. All other soil will be classified for disposal, bagged and staged for hauling off site by truck during the winter season.
- Decommissioning of the MPA will take place upon completion of the South Landfill excavation and sorting and will follow the requirements of the Job Specification with regards to verification soil sampling and re-grading.
- The former landfill areas will be re-graded to integrate into the surrounding landscape and reclaimed.

4.5.3 Excavation and Reclamation of Former Sewage Lagoon

The Former Sewage Lagoon water will be sampled for water quality parameters to confirm there are no exceedances of applied guidelines. Upon analytical confirmation, the water will be pumped off to the land at a minimum of 30 m away from the nearest waterbody and 100 m away from the nearest fish bearing waters.

The remaining berms will be used as fill to backfill and re-contour the lagoon area to integrate into the surrounding landscape.

The reclaimed lagoon area will then be re-vegetated using a combination of live staking of willows, by harvesting live stakes from the surrounding area, seeding of native species and natural revegetation, as approved by the ILA to avoid the establishment of invasive species.

4.6 Dismantling and Removal of Temporary Camps and Fuel Storage Area

4.6.1 Temporary Camps

Historical temporary camp areas on site have undergone soil and groundwater assessments and will be addressed as part of the soil remediation and reclamation activities described in the RAP and in Section 4.5.

Accommodation during the winter and summer field programs may be provided by a barge camp, anchored either at the Site, or close to the Hamlet of Tuktoyaktuk; the location of the camp may change between these two locations seasonally, depending on the number of personnel required for the Site. No land-based camp will be used. Once the work is complete, the barge camp will demobilize from the Site.

4.6.2 Temporary Fuel Storage Areas

Historical fuel storage areas on site have undergone soil and groundwater assessments and will be addressed as part of the soil remediation and reclamation activities described in the RAP and in Section 4.5.

Fuel storage for the project will consist of a 100,000 litre (L) double walled “Enviro-Tank” and two 2,200 L double-walled tanks. The Enviro Tank has integrated complete secondary containment. It will be placed on a portion of the site that prevents the flow of any potential fuel spills or leaks into water bodies. Strict fuel handling procedures will be followed when filling and emptying the tank, with an emphasis on spill prevention, containment and response. The designated fuel storage and refueling area will be at least 30 m away from the closest identifiable waterbody, secondary containment and spill kits and will be available at the designated refueling area. Drip trays will be used during refueling and will be placed under vehicles and equipment when not in use (i.e., for more than 2 hours). In addition, it is proposed to create a soil berm around the tank for partial tertiary containment. The fuel tank and any remaining fuel will be demobilized from the Site at the end of the project and prior to final site closure.

4.7 Removal of Site Infrastructure and Surface Debris

Remaining infrastructure at the Site includes the North and South Docks as well as some surficial debris and two concrete pads. Their removal is described in the following paragraphs.

4.7.1 Removal of Docks

There are two docks associated with Tuk Base. The North Dock has experienced erosion on its south side (upstream), which requires repair. Pending further discussions with the ILA, the repaired North Dock will either be transferred to the ILA and remain in place or be removed as part of the Project. The South Dock will be removed as part of the Project. Removal of either dock will follow the same basic approach. Surficial fill from within the dock will be removed to expose tie-backs and cross-ties attached to the sheet pilings. Any coping or cross tie/anchor members will be cut and removed using cutting torches and an excavator with a thumb attachment. A large (35 tonne) excavator with a vibratory extractor will be used to grasp remaining bollards as well as individual sheet piling sections and extract them vertically. Piling removal will progress toward shore until all the piling sections are removed. All metallic and wooden debris associated with the docks will then be removed from the Site. The Tuk Base Dock Repair and Removal Monitoring Plan (provided to the IWB in March 2019) is to monitor effects from the work on water quality in Tuktoyaktuk Harbour.

4.7.2 Surface Debris Removal

A detailed survey of the surface of the Site identified numerous items of surficial debris on site. Using this survey data, this debris will be collected for disposal either by hand or using low ground pressure equipment such as a

tracked skid steer loader. Surface debris deemed hazardous from all areas will be collected and stockpiled in the MPA of the South Landfill. Material will be bagged into Bulk Bags (UN Rated) and/or shipping containers and made ready for transport off site and disposal to a licensed facility. Remaining non-hazardous concrete demolition debris will be utilized as inert fill.

4.7.3 Demolition of Concrete Pads

Two concrete slabs remain on site in addition to a number of stockpiled slabs. The Hamlet of Tuktoyaktuk and/or the ILA would prefer that these slabs be transported to the Hamlet for future use by the community as shore protection. In order to meet this request, the slabs would need to be cut into manageable pieces. A large walk-behind concrete saw will be used to cut the slabs into manageable pieces. Any dust generated during cutting will be managed with small volumes of water. They will then be temporarily blocked up and removed from site.

Polystyrene foam is known to underlie one and possibly both concrete pads. The foam insulation will be removed, bagged, and staged for off-site disposal. A debris fence will be erected, if required, to contain wind-blown foam pieces. Any voids created by the removal of these concrete structures will be re-graded to meet the overall reclamation objectives.

4.8 Schedule of Reclamation and Closure Activities

The timeline and summary of activities that were completed as part of the Project between 2019 and 2025 are as follows.

- July 2019 to September 2019: Began soil and landfill excavation activities, on-site soil treatment in the engineered Soil Treatment Cells, stripped and regraded the former airstrip, dewatered top metre of the Former Sewage Lagoon, retrieved and stockpiled concrete pads.
- January 2020 to March 2020: Completed ice road construction and maintenance, contaminated soil transportation for off-site disposal at Tervita Northern Rockies Landfill in British Columbia, scrap metal transportation for off-site disposal at the Inuvik Solid Waste Disposal Facility, transported salvaged concrete pads to Tuktoyaktuk for re-use.
- July 2020 to September 2020: Continued soil and landfill excavations, on-site soil treatment in the engineered Soil Treatment Cells, dewatered and partly backfilled the Former Sewage Lagoon, dewatered and backfilled the North Landfill ponds, removed surface soil and graded the South Dock, completed test pitting and constructed the ESSA 1, 2 and 3.
- March 2021: Completed ice road construction and maintenance, hauled-in clean backfill material (from the ISR), and completed repairs on the exterior of the North Dock.
- July 2021 to September 2021: Completed soil excavations, except the South Landfill, northeast concrete slab salvage, partial Former Sewage Lagoon decommissioning, North Dock repair, North Dock foreshore stabilization, partial South Dock removal, surface debris removal and test pitting at the South Landfill to confirm the extent.
- October 2021 to June 2022: No activities.
- July 2022 to September 2022: Maintained and repaired site to meet the conditions of the IWB Water Licence, completed South Dock sheet pile removal, treated the soil piles in the Soil Treatment Cell, completed Former Sewage Lagoon decommissioning, collected permafrost depths from 69 test pits in the South Landfill, and initiated site reclamation at select areas of the Site.

- October 2022 to June 2023: No activities.
- July 2023 to September 2023: Maintained and repaired site to meet the conditions of the IWB Water Licence, including maintenance of ESSAs and engineered Soil Treatment Cell and monitoring and maintenance of the water management structures associated with these areas.
- October 2023 to June 2024: No activities.
- July 2024 to September 2024: Maintained and repaired site to meet the conditions of the IWB Water Licence, including maintenance of ESSAs and engineered Soil Treatment Cell and monitoring and maintenance of the water management structures associated with these areas.
- October 2024 to June 2025: No activities.
- July 2025 to September 2025: Maintained and repaired site to meet the conditions of the Water Licence, including maintenance of ESSAs and engineered Soil Treatment Cell and monitoring and maintenance of the water management structures associated with these areas.
- October 2025 to June 2026: No activities.

The scope of work to complete the Project consists of the following remedial activities between June 2026 and September 2029.

- June 2026 to October 2026: Complete South Landfill excavation, sample the ESSA 1, backfill and grade the Former Sewage Lagoon, remove steel and wood pilings, repair or decommission select groundwater monitoring wells and thermistors, excavate soil and geotextile from the Former South Dock, assess debris identified downslope (off lease) from the North Landfill, maintain and repair Site as needed.
- December 2026 to April 2027: Ice road construction, from the Hamlet of Tuktoyaktuk across Tuktoyaktuk Harbour to the Site, to allow site access for the crew and equipment and off-site transport of contaminated soil and debris/other waste and surplus materials for disposal at an approved facility. Removal of wood wharf piles with a drill rig or excavator.
- June 2027 to October 2027: Site access for personnel and equipment via barge and crew boats. Concrete pad removal, baseline soil sampling, scraping and stockpiling of contaminated soil and/or debris/waste (if work not completed in Summer 2026 season), reclamation/grading.
- December 2027 to April 2028: Ice road construction, from the Hamlet of Tuktoyaktuk across Tuktoyaktuk Harbour to the Site, to allow site access for the crew and equipment and off-site transport of contaminated soil and debris/other waste and surplus materials for disposal at an approved facility.
- June 2028 to October 2028: Site access for personnel and equipment via barge and crew boats. Baseline soil sampling, scraping and stockpiling of contaminated soil and/or debris/waste (if work not completed in Summer 2027 season), reclamation/grading.
- December 2028 to April 2029: Ice road construction, from the Hamlet of Tuktoyaktuk across Tuktoyaktuk Harbour to the Site, to allow site access for the crew and equipment and off-site transport of contaminated soil and debris/other waste and surplus materials for disposal at an approved facility.
- June 2029 to September 2029: Site access for personnel and equipment via barge and crew boats. Final baseline soil sampling below areas where contaminated soil was located during winter hauling; scraping

and disposal of soil by barge (if required), final site grading, demobilization by barge, initiation of monitoring program as per the Reclamation, Closure and Monitoring Plan.

5.0 MONITORING PLAN

5.1 Monitoring During Remediation

The scope of monitoring during remediation activities will follow the terms and conditions of the IWB Water Licence N5L8-1841 issued for the Project.

5.1.1 Visual Inspections

The visual inspection will be completed on an annual basis up to year 2029, as per Part H, item 4 of IWB Water Licence N5L8-1841. The purpose of the visual inspection is to confirm the physical integrity of the Site, identify erosion and settlement, evaluate surface water drainage patterns and surface vegetation re-establishment. The visual inspection will include the collection of relevant site photographs to determine overall site condition and completion of a site inspection checklist.

5.1.2 Groundwater Sampling

As described in Section 3.1.5, there is a limited amount of groundwater at site. As the Site is in permafrost environment with a limited active layer, groundwater monitoring wells are often frozen, dry or contain insufficient water volume. The existing groundwater monitoring wells outside the excavation footprint will be monitored and sampled on a biannual basis until 2029.

5.1.3 Seepage and Runoff Sampling

If any seepage or runoff water is encountered during remediation, the post-construction visual inspection and subsequent annual inspection, water samples will be collected for analysis as per Annex 1 of the IWB Water Licence N5L8-1841. Water samples will be analyzed for potential contaminants of concern associated with the specific area as shown in the RAP (Advisian 2019, Table 1).

5.1.4 Soil Sampling

During the excavation program, confirmatory soil sampling will be completed to ensure that excavation surfaces and backfill materials contaminant of concern (CoC) concentrations are below the Site remediation guidelines for the specific excavation area. Confirmatory sampling of the excavation will be completed as per a predetermined grid density detailed in Section 5 of the RAP (Advisian 2019). The location of soil samples will be recorded during sampling.

Excavated soil will be segregated into Type A, Type B and metals/other soils using visual evidence, field screening and laboratory analytical data. Confirmed Type A and metals/other soils will be placed into designated lined bags and stored in the staging area or stored in an ESSA for eventual off-site disposal. Confirmed Type B soil will be placed in windrows for treatment. Segregation of Type B soil will be based on residual PHC concentrations.

Soil placed in the windrow treatment cell for on-site remediation will be sampled to establish the rate of PHC decomposition and the remediation rate. Soil samples will be collected at a predetermine frequency for field screening and a minimum of four samples for every 200 m³ of soil in the windrow will be confirmed via laboratory analysis. Confirmed treated soil may be re-used for backfill on site. Soil that required further treatment will be remixed and left in windrows over the winter.

5.1.5 Thermal Monitoring

Six thermistors were installed at the Site in 2015 to monitor permafrost condition. The location of the thermistors is described in Section 2.1.9 of the RAP (Advisian 2019) as well as in the Permafrost Monitoring Plan. The soil remediation and demolition activities require the decommissioning of two existing thermistors. Thermistor TM-K-01, at the south landfill and TM-S-01, east of the Former Sewage Lagoon will need to be removed prior to excavation activity, therefore installation of new thermistors may be required.

Thermal monitoring of the existing thermistors will be completed on an annual basis in conjunction with the visual inspections.

5.2 Contingency

Any deviation from the monitoring plan will be submitted to the IWB for approval prior to proceeding. This may include weather delays, limited accessibility to specific locations and other unforeseen circumstances.

The IWB will be informed of any soil and water quality issues, identified at the Site. An updated monitoring schedule will be developed to address these issues (if required) and submitted to the IWB for approval.

5.3 Schedule of Monitoring Activities

The monitoring activities will be completed on an annual basis until 2029 unless otherwise instructed by the IWB as part of the IWB Water Licence N5L8-1841.

6.0 REFERENCES

Literature Cited

- Advisian. 2017. 2015-2016 Phase II Environmental Site Assessment – Tuk Base, Tuktoyaktuk, NT. Prepared for Imperial. Ref. 407074-00293.500. 25 May 2017.
- Advisian. 2019. Tuk Base: Remediation Action Plan. Prepared for Imperial. Ref. 407074-00293.701 19 March 2019.
- Bond, W.A. 1982. A study of the fish resources of Tuktoyaktuk Harbour, southern Beaufort Sea coast, with special reference to life histories and anadromous coregonids. Can. Tech. Rep. Fish. Aquat. Sci. 1119: vi
- CCME (Canadian Council of Ministers of the Environment) 1999a and updates. Canadian Environmental Quality Guidelines: Soil Quality Guidelines for the Protection of Environmental and Human Health.
- Dyke, L.D., 2000. Climate of the Mackenzie River Valley. In: The Physical Environment of the Mackenzie Valley, Northwest Territories: A Base Line for the Assessment of Environmental Change. Dyke, L.D. and G.R. Brooks eds. Geological Survey of Canada Bulletin 547. pp.21-30.
- ESWG (Ecological Stratification Working Group), 1995. A National Ecological Framework for Canada. Agriculture and Agri-Food Canada, Research Branch, Centre for Land and Biological Resource Research and Environment.
- ENR (Environment and Natural Resources), 2015. NWT State of the Environment Report. 1.7 Projected trends in Beaufort Sea-levels, Updated June 3, 2015. Department of Environment and Natural Resources, Government of Northwest Territories, Yellowknife, NT. Available at <http://www.enr.gov.nt.ca/en/state-environment/17-projected-trends-beaufort-sea-levels>.
- Golder (Golder Associates Ltd.). 2019. Re: Remediation Action Plan for Tuk Base. 25 March 2019.
- Golder. 2020. Re: Remediation Action Plan for Tuk Base. 8 May 2020.
- Hopky, G.E., and R.A. Ratynski. 1983. Relative abundance, spatial and temporal distribution, age, and growth of fishes in Tuktoyaktuk Harbour, N.W.T., 28 June to 5 September, 1981. Can. Manuscr. Rep. Fish. Aquat. Sci. 1713: v.
- INAC (Indian and Northern Affairs Canada). 2008. Abandoned Military Site Remediation Protocol. Volume II - Technical Supporting Documentation. December 2008.
- Lacho, G. 1991. Stomach content analyses of fishes from Tuktoyaktuk Harbour, N.W.T., 1981. Can. Data Rep. Fish. Aquat. Sci. 853: iv + 10 p.
- SARA (*Species at Risk Act*). 2002. Species at Risk Act, Canada Gazette, Part III, Vol. 25, no. 3.
- TCCP (Tuktoyaktuk Community Conservation Plan). Tuktuuyaqtuum Angalatchivingit Niryutiniq. 2016. Prepared by the Tuktoyaktuk Hunters and Trappers Committee, Tuktoyaktuk Community Corporation, The Wildlife Management Advisory Council (NWT), The Fisheries Joint Management Committee and the Joint Secretariat. Inuvik, 2017.
- WorleyParsons (WorleyParsons Canada Services Ltd.), 2013. 2011 Tuk Base Demolition, Tuktoyaktuk Base Camp - Draft. Prepared for Imperial Oil. 26 July 2013.

WorleyParsons. 2015. Phase I Environmental Site Assessment – Tuktoyaktuk Base Camp. Prepared for Imperial Oil. 21 April 2015.

WorleyParsons Komex. 2008. 2007 Assessment and Decommissioning Activities, Tuktoyaktuk Base Camp. Prepared for Imperial Oil Limited. Ref. C54600200. 8 April 2008.

Working Group on General Status of NWT Species. 2021. NWT Species 2021-2025 – General Status Ranks of Wild Species in the Northwest Territories, Department of Environment and Natural Resources, Government of the Northwest Territories, Yellowknife, NT. 396 pp.

Internet Sites

Conference of Management Authorities. 2024. NWT List of Species at Risk. Available at:
<https://www.nwt-species-at-risk.ca/CMA/SarList>. Accessed: February 2024.

Environment Canada (Canadian Environmental Protection Act, 1999), 2019. Canadian Climate Normals: Tuktoyaktuk, NWT. Available at
http://climate.weather.gc.ca/climate_normals/results_e.html?searchType=stnName&txtStationName=tuk&searchMethod=contains&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=1700&dispBack=0&month1=0&month2=12

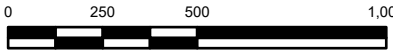
NWT SARC. 2024. Species at Risk Committee. Available at:
<https://www.nwt-species-at-risk.ca/SARC#:~:text=The%20Species%20at%20Risk%20Committee,to%20species%20and%20their%20habitats>. Accessed February 2024.

SARA (*Species at Risk Act*). 2024. Species at Risk Public Registry. Available at:
<https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html>. Accessed: July 2024.

Figures



LEGEND
 LEASE BOUNDARY


1:20,000 METRES

NOTE(S)
1. ALL UNITS ARE IN METRES UNLESS OTHERWISE NOTED.
2. COORDINATE SYSTEM IS UTM ZONE 8 NAD 83.

REFERENCE(S)
1. BASE MAP: VANTOR

CLIENT
IMPERIAL OIL LIMITED

PROJECT
TUKTOYAKTUK BASE REMEDIATION, INUVIALUIT SETTLEMENT
REGION, NORTHWEST TERRITORIES

TITLE
SITE LOCATION

CONSULTANT	YYYY-MM-DD	2026-03-09
	DESIGNED	J.REDSTONE
	PREPARED	J.REDSTONE
	REVIEWED	V.ANDERSON
	APPROVED	B.SUEN

PROJECT NO. CA-GLD-18105460	YEAR/DOC 2026/IWB	REV. 0	FIGURE 1
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LEGEND
— CURRENT ROAD EDGE

0 50 100 200
1:3,250 METRES

NOTE(S)
1. ALL UNITS ARE IN METRES UNLESS OTHERWISE NOTED.
2. COORDINATE SYSTEM IS UTM ZONE 8 NAD 83.

REFERENCE(S)
1. PRE-CONSTRUCTION SURVEY CONDUCTED BY INUKSHUK GEOMATICS INC. DATED: AUGUST 25-29, 2015.
2. RECORD SURVEY CONDUCTED BY INUKSHUK GEOMATICS INC., SUMMARIZING CONSTRUCTION ACTIVITIES UP TO AUGUST 10, 2022. PROVIDED BY GOLDER, RECEIVED: OCTOBER 13, 2022.
3. AERIAL IMAGERY SUPPLIED BY INUKSHUK AND COLLECTED ON AUGUST 26, 2024 BY THE PLEIADES SATELLITE CONSTELLATION.

CLIENT
IMPERIAL OIL LIMITED

PROJECT
TUKTOYAKTUK BASE REMEDIATION, INUVIALUIT SETTLEMENT REGION, NORTHWEST TERRITORIES

TITLE
SITE PLAN

	CONSULTANT	YYYY-MM-DD	2026-03-09
	DESIGNED	J.REDSTONE	
	PREPARED	J.REDSTONE	
	REVIEWED	V.ANDERSON	
	APPROVED	B.SUEN	

PROJECT NO.	YEAR/DOC	REV.	FIGURE
CA-GLD-18105460	2026/IWB	0	2

APPENDIX A

Site Survey Plan

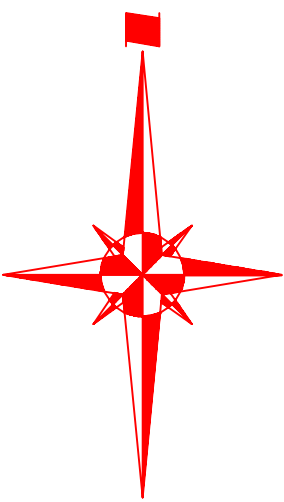
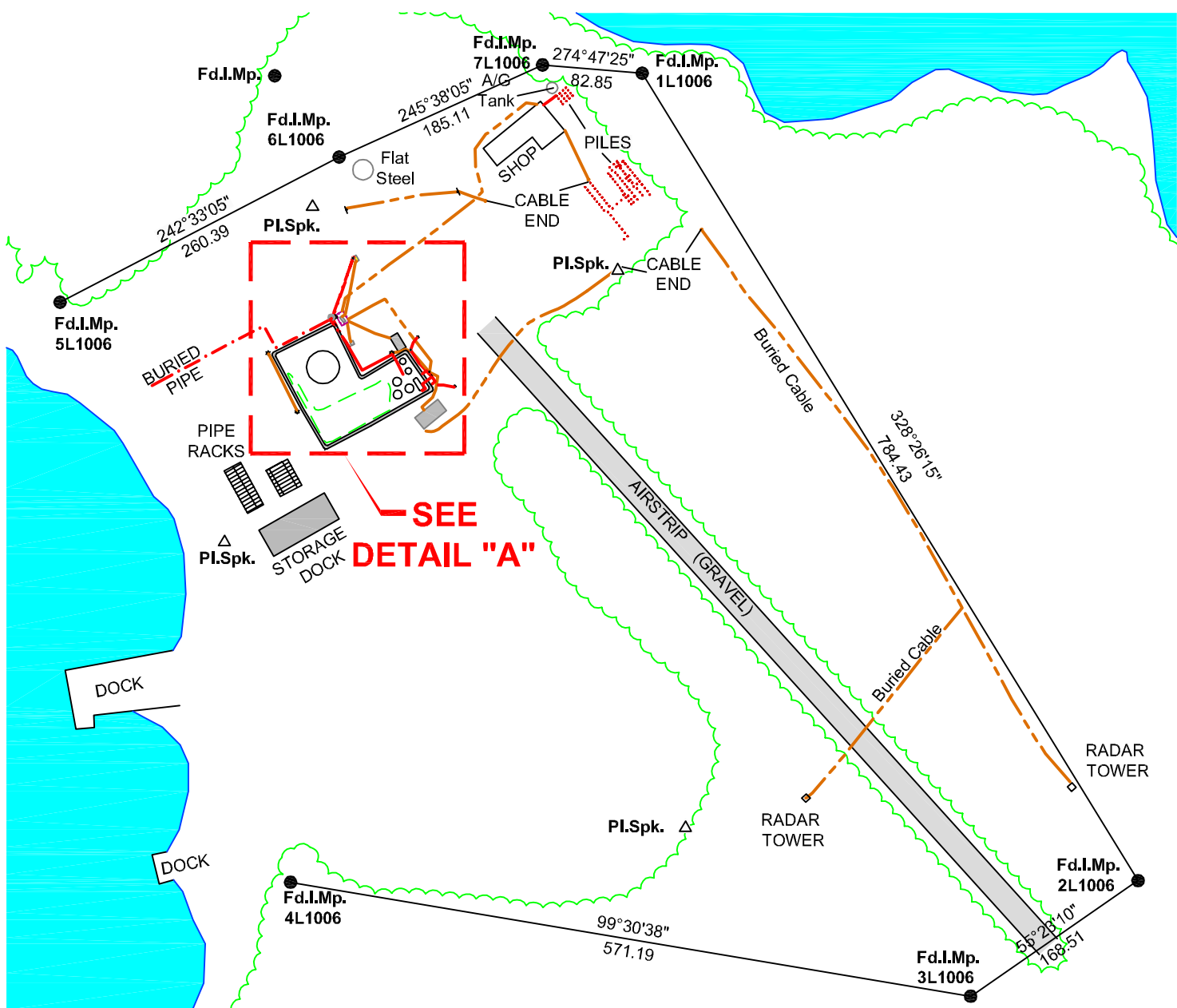


TABLE OF CO-ORDINATES				
PNT#	NORTHING	EASTING	ELEV	DESCRIPTION
1	7704516.587	578604.365	5.78	TUKT - calc
301	7703376.229	579926.219	4.54	FDIMP 5L1006
302	7703572.621	580325.919	10.084	FDIMP 7L1006
304	7703496.253	580157.295	12.253	FDI 6L1006
305	7703565.702	580408.475	5.623	FDIMP 1L1006
306	7702897.317	580819.073	11.802	FDIMP 2L1006
307	7702801.598	580680.393	13.019	FDIMP 3L1006
308	7702895.976	580117.054	3.756	FDIMP 4L1006

LEGEND & NOTES :

- STATUTORY IRON POSTS FOUND SHOWN THUS ●
- LAMP POSTS SHOWN THUS ☀
- SIGNS SHOWN THUS ⚡
- PILES SHOWN THUS ●
- BURIED PIPE SHOWN THUS - - - - -
- BURIED CABLE SHOWN THUS - - - - -
- ABOVE GROUND PIPE SHOWN THUS - - - - -

NOTES:

Distances are in metres and decimals thereof.

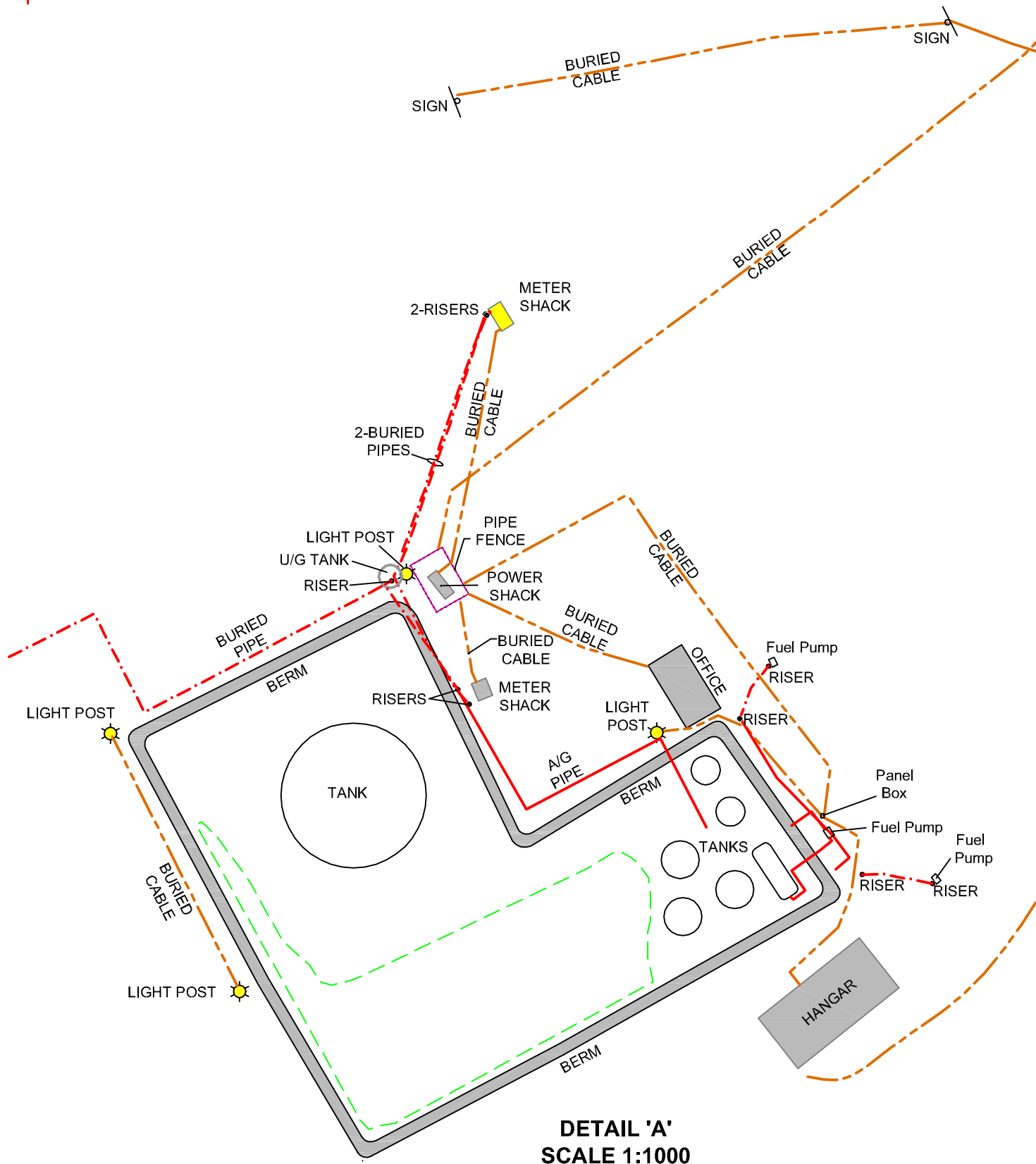
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Elevations are referred to ACP TUKT (M039007)



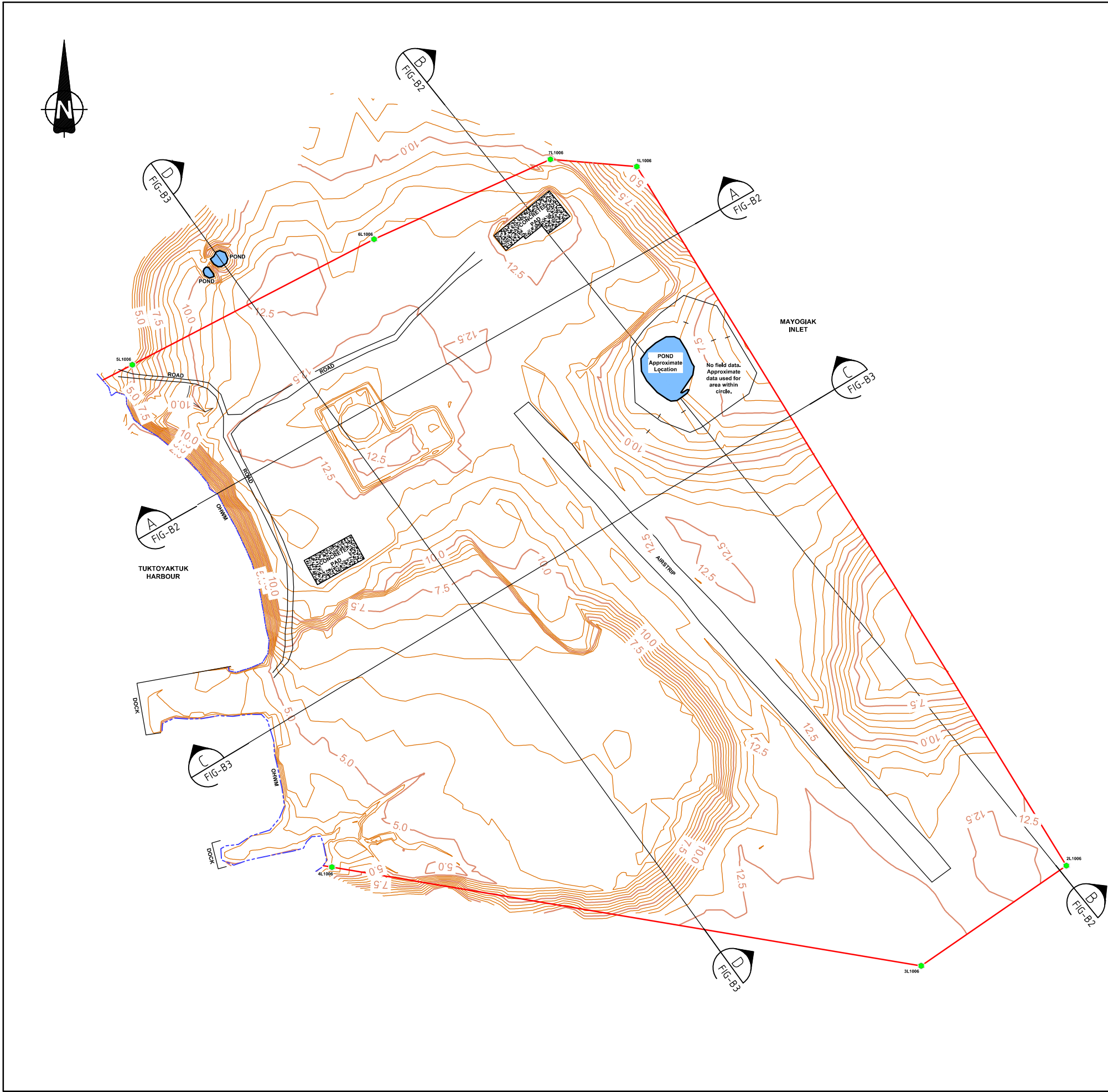
PLAN SHOWING
SITE SURVEY
OF
LOT 1006
QUAD 107C/8
PLAN _____

TOWN OF TUKTOYAKTUK
MACKENZIE DELTA
NORTHWEST TERRITORIES



Drawn by: KP	Scale: 1:5000	Drawing: 35038 - SS
Checked by: RR	Date: Sep 14, 2007 - 3:49pm	
No. Description:	Date: --/--	By: --
0		

INUKSHUK
Geomatics Inc.
300-6940 FISHER ROAD S.E.
CALGARY, ALBERTA T2H 0W3
PH: (403) 253-8101
WWW.CHALLENGERGEOMATICS.COM
Email: calgary@challengergeo.com



LEGEND & NOTES:

LEASE BOUNDARY SHOWN THUS

OHWM SHOWN THUS

CLS 77 POST SHOWN THUS

Contour Interval = .5m

Distances are in metres and decimals thereof

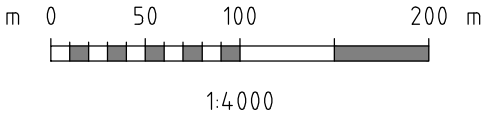
Bearings are UTM grid (NAD 83, Zone 8) and are referred to the central meridian 135°W

Elevations are referred to ACP TUKT (M039007) and are orthometric

“OHWM” indicates Ordinary High Water Mark

SURVEY SOURCE: INUKSHUK GEOMATICS INC. DRAWING 35109-TOP0.

Surveyed Dates: August 25-29, 2015



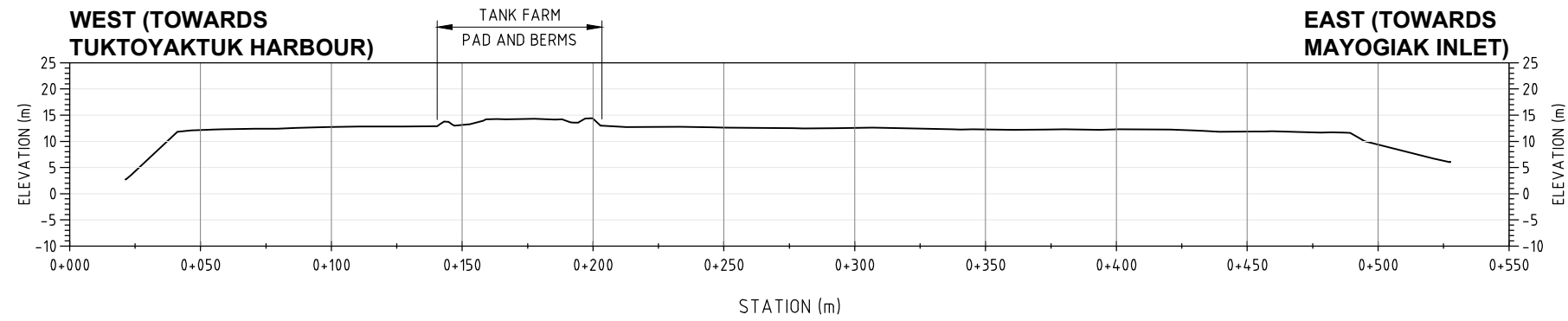
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GEOTECHNICAL DESKTOP STUDY
TUKTOYAKTUK BASE, NT

SITE SURVEY
PLAN VIEW

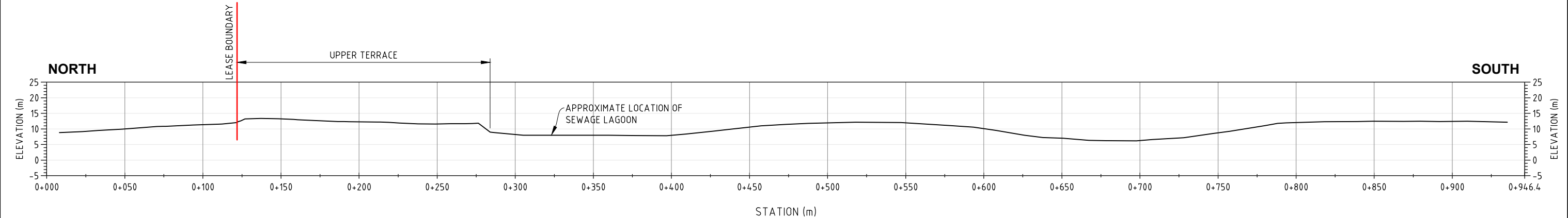


Date: 16 -NOV-2017	Drawn by: FY	Edited by:	App'd by:
WorleyParsons Project No.		407074-00293	
FIG No		FIGURE C1	
REV		2	

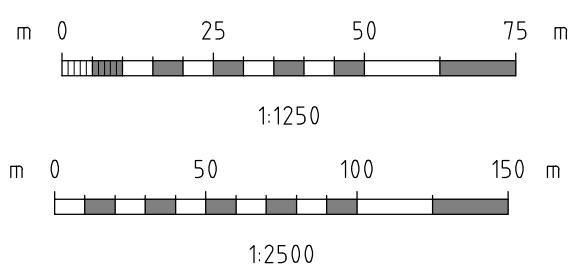
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WorleyParsons Canada Services Ltd. assumes no liability to any other party for any representations contained in this drawing.



SECTION A
H 2500 V 1250
FIG-B1



SECTION B
H 2500 V 1250
FIG-B1



IMPERIAL OIL RESOURCES VENTURES LTD.
GEOTECHNICAL DESKTOP STUDY
TUKTOYAKTUK BASE, NT

SITE SURVEY
CROSS SECTION A & B

Date: 16 -NOV-2017

Drawn by: FY

Edited by:

App'd by:

Advisian

WorleyParsons Group

WorleyParsons Project No.
407074-00293

FIG No
FIGURE C2

REV
2

Oneway

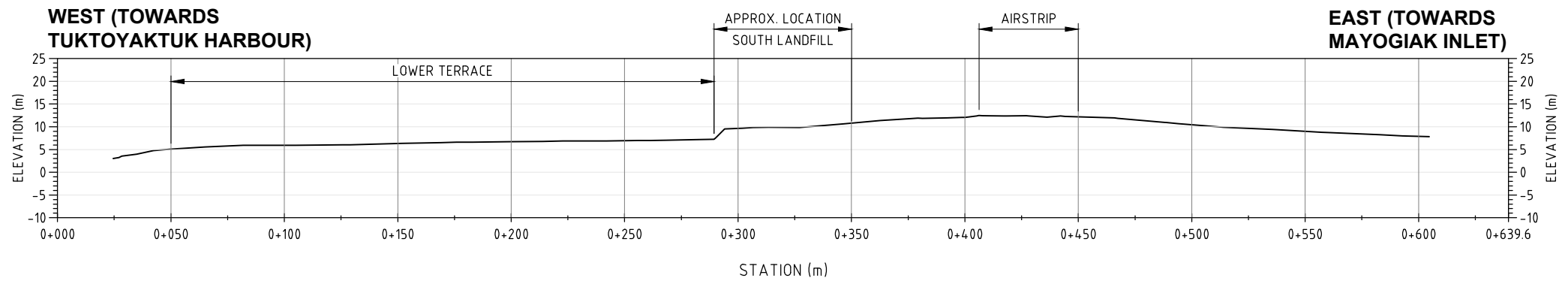
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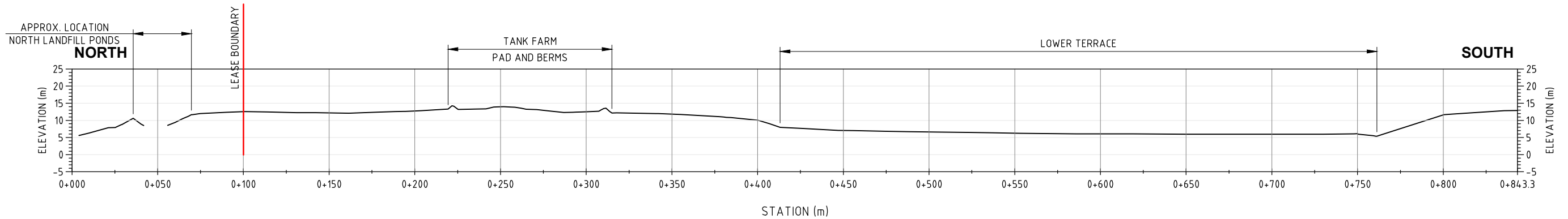
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WPC-B-754
REVISED: 2017-04-05

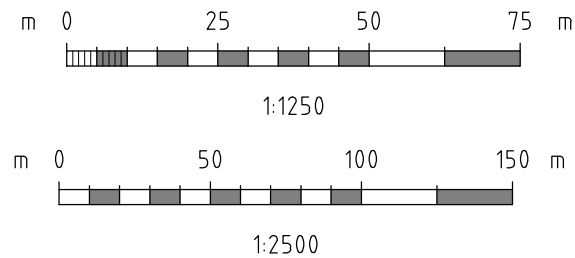
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SECTION **C**
H 2500 V 1250
FIG-B1



SECTION **D**
H 2500 V 1250
FIG-B1



IMPERIAL OIL RESOURCES VENTURES LTD.
GEOTECHNICAL DESKTOP STUDY
TUKTOYAKTUK BASE, NT

**SITE SURVEY
CROSS SECTION C & D**

Oneway



Date: 16 -NOV-2017	Drawn by: FY	Edited by:	App'd by:
WorleyParsons Project No. 407074-00293			
FIG No. FIGURE C3			REV 2

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