Closure and Reclamation Plan

Inuvik Hydrocarbon Contaminated Soil Treatment Facility

Gwich'in Land and Water Board

G17L1-002 Type "B" Licence

Closure and Reclamation Plan

Prepared By:

KBL Environmental Ltd.
Version 1.1

May 2022

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PLAIN LANGUAGE SUMMARY

This plan outlines how KBL will close the hydrocarbon contaminated soil treatment facility (Facility) once it stops operating. Specifically, this document outlines when the facility will stop receiving contaminated soil, water, and snow, and how the facility will be decommissioned. This Plan also describes the steps that will be taken to ensure the facility has not impacted the surrounding environment.

Plan Revisions

This Closure and Reclamation Plan will be reviewed annually and revised whenever there is an operational change at the Facility that affects this Plan, changes to contact personnel, or as otherwise required by the Gwich'in Land and Water Board.

Date of Revision	Document Version	Title, Section#, Page#, or Revised Sections	Summary of Changes

Notice to Readers

For further information, please contact:

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1.0 INTRODUCTION

KBL Environmental Ltd. (KBL) and the Town of Inuvik (the Town) have agreed to allow KBL to construct and operate a petroleum hydrocarbon contaminated soil treatment facility (the Facility) to receive and treat soil, snow, and water contaminated with petroleum hydrocarbons (PHCs). The Facility is located within the existing Town of Inuvik Solid Waste Disposal Facility (SWDF), operated under Gwich'in Land and Water Board (GLWB) license G17L3-001.

Project Location:

Town of Inuvik Solid Waste Disposal Facility
Lot 65, Group 1355, CLSR 61339
Inuvik, Northwest Territories
Coordinates: (N) 7582173.14; (E) 554308.00

The Inuvik SWDF is located on the east side of the Dempster Highway (locally referred to as Airport Road), approximately 1.56 km east of the Mackenzie River. The Facility is accessed through the SWDF, which is gated. A security fence surrounds the Facility, which acts as a secondary access restriction. The Facility operating hours mirror those of the Inuvik SWDF operating hours. Facility operating hours may be adjusted based upon project needs with approval from the Town. The Town of Inuvik and KBL have an agreement to share the main gate access.

The Facility is designed to treat soil contaminated with petroleum hydrocarbons. Contaminated soils are delivered to the Facility and stored in a linear low-density polyethylene (LLDPE) lined cell surrounded by a berm (soil treatment pad). The Facility also includes a water retention pond engineered to collect runoff from precipitation; the pond can also accommodate contaminated water and snow.

The effective date for the *Closure and Reclamation Plan* (the Plan) is once the plan is approved by the GLWB. This Plan will be reviewed and updated on an annual basis as required to ensure it remains current.

2.0 BACKGROUND

The Facility is located within the Town of Inuvik Solid Waste Disposal Facility (SWDF) limits on an existing lease in an established industrial area. No land was disturbed during the construction and operation of the Facility.

Environmental impacts associated with soils biotreatment, water treatment and effluent discharge, as described below, are anticipated to be negligible based on facility design, implementation or mitigation measures and adherence to monitoring plans. Baseline studies, mitigation measures and monitoring plans, as well as quality assurance/quality control (QA/QC) planning for the surveillance network program (SNP) sampling are presented in the *Operations and Maintenance Plan, Environmental Management Plan, Waste Management Plan and Spill Contingency Plan* that are associated with this approval.

3.0 PURPOSE AND SCOPE

The purpose of this Plan is to outline the methodology for closure and reclamation of the Facility. This will be required to confirm site conditions at the end of operations, and/or to facilitate transfer of the site to a subsequent lessee, which is expected to be the Town of Inuvik. The scope of this Plan includes closure and reclamation of the Facility. The site was previously used for the disposal (i.e., landfill) of a variety of waste material and will be returned to a condition that permits continued industrial use. The Plan is focused on addressing the Facility, which consists of the biotreatment facility, water treatment facility, equipment, a storage shed, and traffic areas used by vehicles accessing the Facility.

KBL will manage the program activities responsibly and will comply will all licences, permits, and applicable regulations related to facility closure and reclamation. The following table lists regulations and guidelines that will be applied and referenced for the Facility closure in Inuvik.

Table 3-1: Regulations and Guidelines Relevant to Closure and Reclamation of the Inuvik STF

Jurisdiction	Regulation or Guideline
Gwich'in Land and Water Board	Type B Water Licence
Government of the Northwest Territories (GNWT)	*NWT Environmental Protection Act (EPA), 2017*
GNWT Ministry of Environment and Natural Resources	Guideline for Contaminated Site Remediation, 2003
Canadian Council for Ministers of the Environment	Canadian Environmental Quality Guidelines – Water Quality Guidelines for the Protection of Aquatic Life, 2014
Federal Contaminated Sites Action Plan	Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites, 2016

In accordance with the Water Licence, the Closure and Reclamation Plan addresses:

a. A description of existing conditions, including photographs;
b. A summary compilation of pre-existing conditions, including assessments of soil, water and permafrost;
c. Final removal, transportation, and disposal of treated and untreated soil;
d. Final removal of synthetic liner system, Water Retention Pond, and Water Holding Tanks;
e. A schedule for the periodic monitoring of contaminants of concern (including benzene, toluene, ethylbenzene, and xylenes (BTEX); volatile organic compounds (VOCs); F1 to F4hydrocarbon fractions; polycyclic aromatic hydrocarbons (PAHs); and total metals);
f. Plans to minimize the potential for leachate to contaminate groundwater and surface runoff;
g. Consideration of altered drainage patterns;
h. Consideration of climate change effects;
i. Contaminated site remediation;
j. Type and source of cover materials;
k. Future area use;
l. A post-closure monitoring plan;
m. An implementation schedule; and
n. Maps delineating all disturbed areas, borrow material locations, and site facilities including hydrological features and elevation contours.

4.0 WATER TREATMENT AND WASTE DISPOSAL SITES & FACILTIES

The Facility is operating as a long-term facility in Inuvik, NT under a Type B Water Licence issued by the GLWB. The design and operation of the facility is summarized in subsequent sections of this document.

The Facility includes:

- One constructed engineered, bermed storage and treatment cell (75 m x 36 m) for the receipt, storage and treatment of petroleum hydrocarbon contaminated soil;
- One engineered retention pond designed for the storage of up to 205 m^3 of petroleum hydrocarbon contaminated water and snow; and
- Two 63,000 L water holding tanks (SNP 0037-2).

Please refer to Appendix A for Facility Map and Drawings.

The entire footprint of the Facility is within the SWDF limits.

4.1. Biotreatment Facility

The Facility is designed to treat petroleum hydrocarbon contaminated soil. Materials received at the site for biotreatment treatment include soil from off-site sources including residential, commercial and industrial properties where a hydrocarbon spill or leak has occurred. Prior to receipt on-site, contaminated soil is profiled by sampling and analysis to determine suitability for treatment. Soil meeting acceptance criteria is deposited into the biotreatment pad.

Once the bioremediation process has been given adequate time, soil is sampled to confirm it meets beneficial

re-use criteria. Soil meeting re-use criteria is transported off-site for local beneficial re-use at the Inuvik landfill. Potential end users other than the Town of Inuvik Landfill are reviewed by KBL and discussed with the GLWB on a case by case basis. Soil not meeting beneficial re-use is hauled off-site for disposal at an appropriate facility.

4.2. Retention Pond

The Facility is designed to treat water and snow contaminated with petroleum hydrocarbons. An engineered retention pond is utilized to accept petroleum hydrocarbon contaminated water and snow from off-site sources including residential, commercial, and industrial properties where a petroleum hydrocarbon spill or leak has occurred. All snow and water transported to site requires results of analytical testing and/or SDS and suitable movement document prior to receipt on-site. If materials do not meet the acceptance criteria, they are not received into the facility and remain the responsibility of the generator. Water and snow meeting acceptance criteria are deposited into the pond. Effluent generated at the biotreatment pad is directed to the retention pond.

Snow and water remain in the pond until snow has melted, at which time the meltwater is either: tested to determine if it meets discharge criteria or re-use criteria as a soil amendment on the biotreatment pad; directed to an aboveground storage tank (ASTs) for storage; or directed to the on-site package water treatment plant (WTP).

The treatment plant is designed to remove particulate matter, suspended solids and petroleum hydrocarbons. Treated water may be stored in one of the above ground storage tanks where it is sampled to confirm it meets discharge criteria. Water meeting discharge criteria can be used as a soil amendment on the biotreatment pad or released to the environment at the drainage ditch (SNP 0037-3). Water not meeting discharge or re-use criteria is transported off site to an appropriate facility.

4.3. Water Treatment Plant

The WTP is a package treatment plant consisting of a bag filter train with a granular activated carbon vessel and an organoclay bed designed for removal of particulate matter and organic constituents such as petroleum hydrocarbons. Filter cloth is affixed to the pump intake screen to minimize solids entering the treatment plant.

4.4. Effluent Discharge

Treated water is collected in the AST, downstream of the WTP. Once it is confirmed that water meets the guidelines set forth by GN and NWB in the license, representatives from DOE and INAC will be provided with analytical water quality results. 10 days prior to discharge, disposal or reuse of water from the ASTs or retention pond notice of intent to discharge will be given.

4.5. Groundwater Monitoring

Groundwater Monitoring is completed in accordance with Type “B” Licence G17L1-002 and the Environmental Monitoring Plan.

4.6. Pre-Existing Conditions

Soil

The area of the lease contracted to KBL is above a historic landfill cell as reported by the Town's Director of Public Services. In 2016, KBL commissioned the excavation of three test pits within the boundary of the proposed STF (October 2016) and then completed additional boreholes in August of 2017. The Site is underlain by silt, clay, sand, and organic soils consistent with quaternary deposits, to a maximum investigative depth of 7.5 meters below ground surface (mbgs). Garbage was noted at surface in 4 out of 10 field logs from the August 2017 investigation and extended to a maximum depth of 6.1 mbgs.

Baseline soil monitoring was conducted in 2017 and the following exceedances were detected:

Sample ID		BH2-01	BH2-02	BH2-03	BH2-04	BH3-01	BH3-02	BH3-03	BH3-04	BH4-01	BH4-02	BH4-03	BH7-01	BH7-02	BH7-03
Sample Depth (mbgs)		1.1	1.3	0.8											
Analytical Parameter	Criteria (mg/kg)														
Arsenic, total	12	**38**	**26**	**24**	**32**	**39**	**18**	**59**	**36**	**43**	**32**	**18**	**96**	**67**	**31**
Copper, total	91									**230**					
Nickel, total	50	**53**	**51**							**240**	**77**		**51**	**53**	
Zinc, Total										**22,000**					

*Government of the Northwest Territories, Environmental Guideline for Contaminated Site Remediation, November 2003, assumes coarse-grain soil

The complete analytical baseline analysis is attached in Attachment D.

With the low likelihood of off-site migration of contaminants from the STF via surface or groundwater, the construction of the soil treatment pad using clean fill will lend itself to monitoring of the soil if there is any release of material outside of containment for potential contaminants of concern (specifically, BTEX and F1 to F4 petroleum hydrocarbon fractions). Monthly facility and liner inspections will occur during the operation of the STF, please refer to the Operations and Maintenance Plan for more details regarding facility inspections. At the time of facility decommissioning, soil sampling will be required to examine soil quality beneath the former STF for comparison against pre-construction data.

Water

Baseline sample to assess groundwater conditions have been ongoing and are scheduled for completion in the fall of 2023. Results will be tabulated and incorporated into the Environmental Monitoring Plan and then submitted to the GLWB for approval.

Permafrost

KBL completed a drilling program to confirm the depth to permafrost beneath the site. Based on the borehole program completed in the summer of 2017 the measured permafrost depths in the area of the of the STF varied between 3.5 to 7.1 mbgs, with an *apparent* active layer (indicated as moist/wet soils) averaging approximately 2 meters above the permafrost layer. After a review of the borehole data, and the

determination that both the apparent active layer and permafrost was at an sufficient depth, it was decided that the engineered design of the STF did not require additional mitigation in order to account for the possibility of permafrost impacts. In other words, the permafrost layers were at sufficient depth and the STF design was robust enough, to negate the need for permafrost protection measures.

The STF is sited entirely within the footprint of the Inuvik Solid Waste Landfill, which has been in operation for decades without monitoring of permafrost depths or impacts due to operations. It appears that the former landfill cell that the STF will be sited on has already influenced the depth of permafrost (with offsite controls showing permafrost at shallower depths of 1.5 m) and has caused variability in the measured depth to permafrost across the site. This is a previously disturbed footprint, and should not be considered as natural or back ground conditions. There is not yet enough data to determine a defensible baseline (starting point) permafrost depth in order to monitor potential changes caused by the STF over time, or to determine whether changes in depth are attributable to the existing landfill, the STF's operation, or climate change. KBL has engineered the facility to mitigate its impact to the permafrost (i.e. using a light-coloured liner for the water pond), which is outlined in the Water Licence application.

The importance of maintaining a shallow permafrost depth, although vistal for maintaining landscape and infrastructure stability across much of the arctic, is negated at the STF site due to pre-existing impacts and influences from the landfill. As previously noted, there is little risk to the integrity of the STF due to changes in permafrost depths.

Groundwater levels in the piezometers may provide an indication of changes in the active layer over time, since the landfill would be considered an unconfined aquifer (and therefore the water level in the piezometer is the level of the water table, which is in turn likely associated with the active layer – if the permafrost and active layer were driven deeper, the water level in the piezometer should also drop, all other factors negated). However, this assumption is a bit premature at this time.

5.0 CLOSURE AND RECLAMATION

The following outlines the steps required to close and reclaim the Facility after it has been decided that the facility will be closed. The site was previously occupied by an industrial landfill and will be returned to a condition that permits continued industrial use.

Upon Closure of the Facility, the following steps will be taken:

1) The facility will stop accepting contaminated soil, snow and water for treatment.

2) Any stored snow or water will be tested, material requiring treatment will be treated through the WTP. Once the snow or water meet discharge criteria, it will be discharged to surface or re-used. If discharge criteria are not met water and snow will be sent off-site to an approved facility for treatment and/or disposal.

3) Soil on the biotreatment pad will be treated. After treatment, soil will be tested to confirm it meets soil re-use criteria and will be used as daily cover at the Inuvik landfill. Soil treatment could take a year or more. On the off-chance that treated soil does not meet criteria it will be shipped off-site to an

approved facility for disposal.

4) Once soil and water has been removed from the site, the liners will be exposed and inspected for defects. Soil below any observed defects will be sampled and submitted for laboratory analysis for petroleum hydrocarbons.

5) The liners associated with the Facility will then be removed and disposed of at the Inuvik landfill. The underlying soil will be inspected for staining. Soil samples will be collected from any stained areas and submitted for laboratory analysis of petroleum hydrocarbons. If no staining is observed, a minimum of five soil samples will be collected from beneath the biotreatment pad and five soil samples will be collected from beneath the retention pond. A further ten samples will be collected from the high traffic areas near the access ramps for a total of 20 soil samples.

6) If soil contamination is observed, step out sampling will occur, to delineate the extent of any contamination. Any soil contaminated by operation of the Facility will be removed and transported off-site to an approved facility.

7) After the soil quality has been confirmed, the site will be re-graded to restore drainage patterns present prior to construction of the facility.

8) All equipment and the storage shed will be removed from the site.

9) Two sets of groundwater samples will be collected from each monitoring well installed to monitor the STF. Water quality impacts will be judged based on a comparison to baseline conditions as outlined in the Environmental Management Plan. After confirmation that there are no on-going impacts to water quality arising from the Facility operation, the monitoring wells will be properly decommissioned using bentonite backfill, and the steel casing will be cut flush with ground surface.

10) The lease will expire, and the land will be returned to the owner (Town of Inuvik).

11) Closure and related monitoring activities will be reported in the Annual Report submitted to the GLWB.

Closure of each component of the Facility is discussed in more detail below.

5.1. Biotreatment Facility

Following termination of operations, the soil remaining within the facility will be tested to confirm that remediation is complete, and the re-use criteria outlined in the Water Licence have been met. Soil meeting re-use criteria will be used at the Inuvik landfill. Alternate end users will be reviewed by KBL and the GLWB and approved on a case by case basis. Material not meeting re-use criteria will be sent off site for disposal at an approved facility.

Once the biotreatment facility is empty, soil samples will be collected from the protective soil layer above the geotextile and submitted to a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory for analysis of petroleum hydrocarbon (F1 to F4), BTEX, PAHs, and total metals. Soil meeting re-use criteria will be removed and used at the Inuvik landfill. Alternate end users will be reviewed by KBL

and GLWB and approved on a case by case basis. Material not meeting criteria will be transported off-site to an approved facility.

After the soil above the liner has been removed, the HDPE liner will be inspected for defects or damage that may have resulted in leaks or a loss of containment. The geotextile and HDPE liner will be removed and disposed of in the Inuvik landfill.

If defects or damage to the liner are found or suspected, one discrete sample of the upper 0.5 m of soil beneath each liner defect will be collected and submitted to an accredited laboratory for analysis of petroleum hydrocarbon (F1 to F4), BTEX, PAHs, and total metals. Any visually stained soil beneath adjacent high traffic areas associated with the STF will also be sampled (one sample per stained area) and submitted for analysis of petroleum hydrocarbon (F1 to F4), BTEX, PAHs, and total metals. If liner defects and stained soil are not observed, a minimum of five discrete confirmatory samples will be collected from beneath the STF liner and analyzed for the parameters listed above. If the soil meets soil re-use criteria, it will be used at the Inuvik landfill. If the soil does not meet the re-use criteria, it will be sent to an approved facility. The extent of any contamination will be defined by collecting step out samples as needed.

Step out sampling involves collection of surficial soil samples 7 m in each direction (north, south, east, and west) surrounding any sampling location where an exceedance was observed. Step out sampling will continue at this rate until the contamination has been delineated. The depth extent of any soil contamination will be limited by the presence of shallow bedrock (<1.5 m). Therefore, surficial soil sampling is considered sufficient to define any contamination arising from operation of the STF.

As part of the sampling program associated with determining the extent of any contamination realized at closure, both analytical testing and field screening tools such as head space testing, will be used to assist with identification of any hydrocarbon contaminated area. Any soil contaminated by operation of the STF will be removed and sent to an approved facility.

Following laboratory confirmation of acceptable soil quality beneath the facility, the ground surface will be contoured to promote surface drainage consistent with pre-development conditions. No additional cover material will be used as part of the reclamation plan.

5.2. Retention Pond

Following decommissioning of the biotreatment facility, any water or snow in the retention pond will be treated and the pond will be emptied. Treated water meeting release criteria will be used as dust suppressant in the landfill or released to the environment, as approved by the GLWB. Remaining water not meeting release criteria will be shipped offsite to an approved facility for further treatment and/or disposal.

Once empty, the pond liner will be inspected for defects. The pond liner will be removed and disposed of in the Inuvik landfill. If defects or damage to the liner are found or suspected, or staining to the underlying soil observed, one discrete sample of the upper 0.5 m of soil beneath each liner defect will be sampled and submitted to an accredited laboratory for analysis of petroleum hydrocarbons (F1 to F4), BTEX, PAHs, and total metals. Any visually stained soil beneath the liner will also be sampled (one sample per stained area) and submitted for analysis of petroleum hydrocarbons (F1 to F4), BTEX, PAHs, and total metals. If liner defects and stained soil are not observed, a minimum of five discreet confirmatory samples will be collected

from beneath the water treatment pond liner and analyzed for the parameters listed above. If the soil does not meet re-use criteria, it will be treated or disposed of at an approved facility. The extent of any contaminated will be defined by collecting step out samples within the operational area of the Facility. Step out sampling will occur as described in Section 7a of the Plan.

Following laboratory confirmation of acceptable soil quality beneath the facility, the ground surface will be contoured to promote surface drainage consistent with pre-development conditions. No additional cover material will be used as part of the reclamation plan.

5.3. Equipment

The water treatment plant is a package treatment plan that discharges treated effluent to an above ground storage tank. Upon completion of closure and reclamation activities, all equipment will be emptied and removed from the site. Any temporary or portable fuel storage tanks associated with the water treatment plant or general site use will be removed and inspected for integrity. Spent filter media from the water treatment plant will be disposed of at an approved facility. The storage shed will be removed from the site. Any visually stained soil found beneath the storage shed or water treatment plant will be sampled, analyzed and treated or disposed of as required, according to the methodology outlined in preceding sections of this document.

5.4. Climate Change

Based on the facility location in an existing landfill, the effects of climate change such as warmer temperatures, increased rain fall events, and rising sea levels are not anticipated to affect the closure and reclamation of the site.

6.0 POST-CLOSURE MONITORING AND REPORTING

KBL is committed to monitoring the facility after closure for a period of one year, or until the Inuvik landfill advances over the facility, whichever happens first. Post-closure monitoring will involve collection of two complete sets of groundwater samples during the first summer season after the facility has stopped accepting soil, snow, and water. Groundwater samples will be submitted for analysis of petroleum hydrocarbons (F1 to F4), BTEX, oil and grease, extractable petroleum hydrocarbons, chemical oxygen demand, dissolved metals, total metals, and general chemistry. Groundwater quality results will be compared to baseline conditions to determine if the underlying groundwater has been impacted by operation of the STF. The post-closure monitoring will follow the sampling protocol outlined in the Environmental Management Plan.

After confirming that groundwater quality in the vicinity of the Facility has not degraded relative to baseline conditions, the groundwater monitoring wells will be decommissioned by backfilling the boreholes and monitoring wells with bentonite and cutting the steel casing flush with the ground surface.

Closure, related monitoring activities, and results will be reported in the Annual Report submitted to the GLWB.

7.0 SCHEDULE

It is anticipated that the majority of closure activities will take place during summer months and can likely be

completed within two years after the soil treatment facility has stopped accepting soil, snow, and water. The approximate schedule provided in Table 7.1 assumes that one full summer is required to treat hydrocarbon impacted soil prior to closure.

Table 7-1: Approximate Schedule of Closure Activities

Activity	Pre-Closure (Year 1)		Biotreatment (Year 2)				Facility Closure (Year 3)			
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Stop receiving soil	■									
Stop receiving water and snow							■			
Biotreatment of soil		■	■	■	■	■	■			
Facility closed							■			
Confirm remediation/treatment criteria met								■		
Remove treated soil and treat/release water								■		
Inspect liners for defects									■	
Remove and dispose of liners and equipment									■	
Step out soil sampling									■	
Contaminated soil removal as needed									■	
Site re-grading									■	
Post-closure groundwater sampling								■		■
Groundwater well closure										■
Lease terminated										■

8.0 RECLAMATION COSTS

A detailed closure cost estimate has not been prepared. In accordance with the Water Licence, a security deposit in the amount of $450,116 has been posted with the Minister pursuant to section 35 of the *Waters Act.*

9.0 SUMMARY

The following table summarizes how this Closure and Reclamation Plan has addressed the project elements outlined in the Water Licence:

Table 9-1: Table of Concordance

Requirement	Location in Closure and Reclamation Plan
A description of existing conditions, including photographs;	Sections 4.0, Appendix A and B
A summary compilation of pre-existing conditions, including assessments of soil, water and permafrost;	Section 4.6
Final removal, transportation, and disposal of treated and untreated soil;	Section 5.1
Final removal of synthetic liner system, Water Retention Pond, and Water Holding Tanks;	Sections 5.1, 5.2 and 5.3
A schedule for the periodic monitoring of contaminants of concern (including benzene, toluene, ethylbenzene, and xylenes (BTEX); volatile organic compounds (VOCs); F1 to F4hydrocarbon fractions; polycyclic aromatic hydrocarbons (PAHs); and total metals);	Section 4.5
Plans to minimize the potential for leachate to contaminate groundwater and surface runoff;	Introduction
Consideration of altered drainage patterns;	Sections 5.1, 5.2 and 5.3
Consideration of climate change effects;	Section 5.4
Contaminated site remediation;	Sections 5.1, 5.2 and 5.3
Type and source of cover materials;	Sections 5.1, 5.2 and 5.3
Future area use;	Section 3.0
A post-closure monitoring plan;	Section 6.0
An implementation schedule; and	Table 7-1
Maps delineating all disturbed areas, borrow material locations, and site facilities including hydrological features and elevation contours	Appendix A

10.0 REFERENCES

Northwest Territories Waters Act (S.C. 1992, c. 39)

Environmental Protection Act, RSNWT (Nu) 1988, c E-7

Canadian Council for the Ministers of the Environment. 2014. Canadian Environmental Quality Guidelines, Water Quality Guidelines for the Protection of Aquatic Life. Accessed in December 2014.

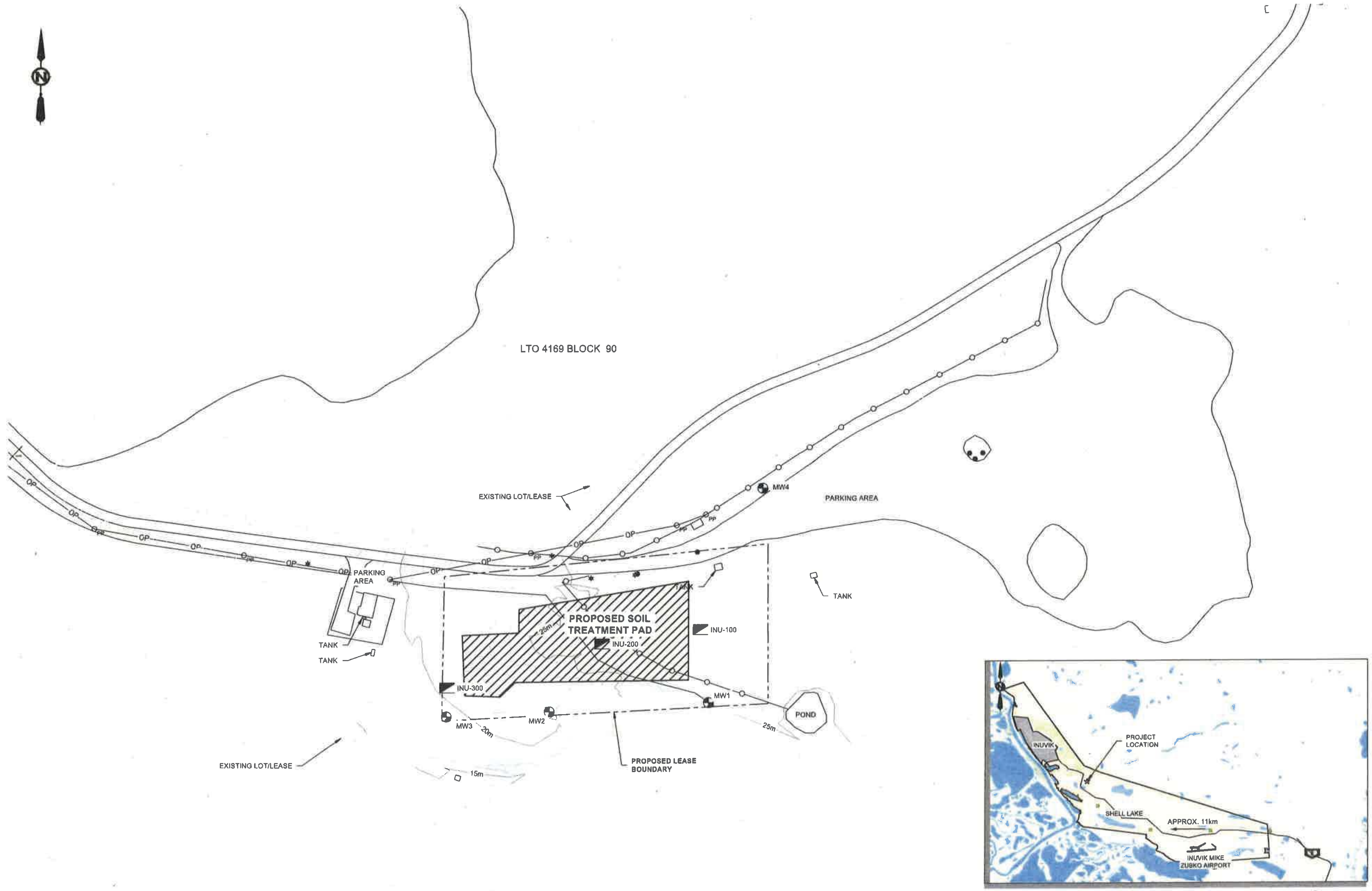
Environment and Climate Change Canada (ECCC). 2016. Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites.

Government of Northwest Territories, 2003. Environmental Guideline of Contaminated Site Remediation, Department of Environment and Natural Resources.

Gwich'in Land and Water Board, Type B Water Licence: G17L1-002.

APPENDIX A

Facility Maps and Diagrams



PLAN 1:2000
OVERALL SITE

PLAN NTS
KEY

REGISTERED PROFESSIONAL ENGINEER
S.M. BARTSCH
LICENSEE
Sept 8/17
NT/NU

LEGEND

28 m	TOPOGRAPHIC MAJOR CONTOUR CONTOUR INTERVAL = 5.0m
	TOPOGRAPHIC MINOR CONTOUR
	TREES
	EXISTING FENCE
OP	EXISTING OVERHEAD POWER LINE
	PROPOSED LEASE BOUNDARY
PP	EXISTING POWER POLE
	EXISTING LIGHT
	EXISTING TANK
MW4	EXISTING MONITORING WELL
INU-100	EXISTING TEST PIT LOCATION
	PROPOSED WORK AREA

NOTES:

1. DATUM: UTM NAD83 ZONE 8.
2. CONTOURS PROVIDED BY KBL.
3. BOLD LINES & TEXT REFERS TO NEW CONSTRUCTION.

No.	DATE	REVISION	BY	APP
0	2017SEP08	ISSUED FOR CONSTRUCTION	NAR	BJ

PROJECT No.	20173924-00	INITIALS
DRAWN BY	J HUBERT	
DESIGNED BY	S BARTSCH / B JARDINE	
SCALE	AS SHOWN	

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
Signature
Date 11 Sept 2017
PERMIT NUMBER: P 554
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU

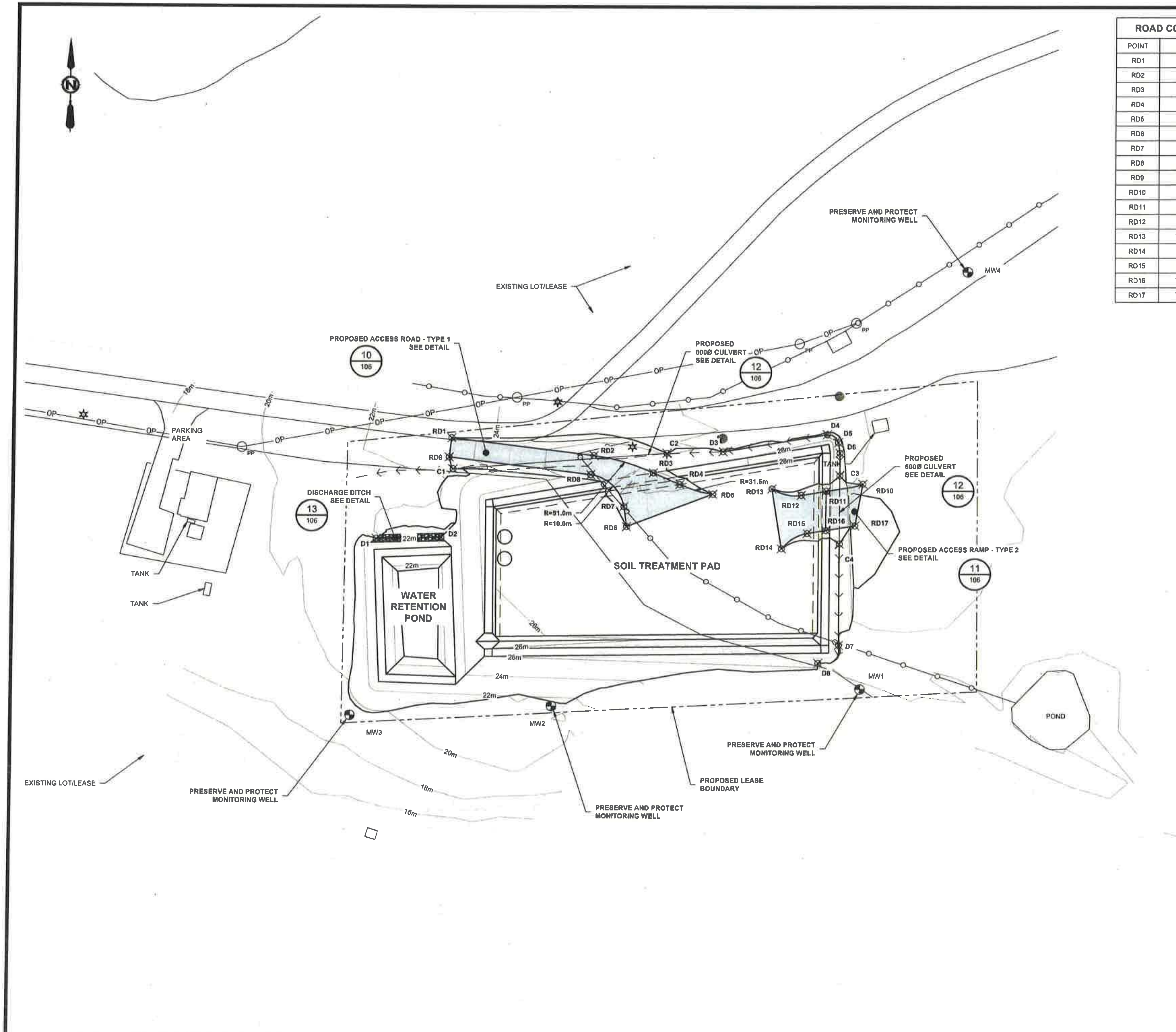
NLR/AE CONSULTANTS

CLIENT
KBL

PROJECT
INUVIK
SOIL TREATMENT FACILITY

TITLE
OVERALL SITE PLAN /
KEY PLAN

DRAWING NUMBER	REV. NO.
3924-00-101	0



ROAD COORDINATE AND ELEVATION TABLE			
POINT	NORTHING	EASTING	ELEVATION
RD1	7582206.33 ±	554255.66 ±	23.31 ±
RD2	7582203.80	554292.17	27.34
RD3	7582199.40	554307.41	24.59
RD4	7582196.43	554314.27	28.23
RD5	7582193.93	554322.66	27.39
RD6	7582185.51	554300.67	26.87
RD7	7582190.88	554299.98	27.65
RD8	7582198.86	554291.36	27.32
RD9	7582203.37 ±	554255.05 ±	23.31 ±
RD10	7582196.59 ±	554361.15 ±	28.09 ±
RD11	7582194.74	554351.73	29.01
RD12	7582193.69	554345.32	28.37
RD13	7582195.33	554337.81	27.88
RD14	7582179.85	554340.30	27.45
RD15	7582183.82	554346.93	28.36
RD16	7582184.60	554351.69	28.84
RD17	7582185.82 ±	554359.16 ±	28.15 ±

DITCH COORDINATE AND ELEVATION TABLE			
POINT	NORTHING	EASTING	ELEVATION
D1	7582182.273	554236.671	21.848
D2	7582182.615	554253.161	22.000
D3	7582204.891	554325.216	26.883
D4	7582209.324	554351.909	27.387
D5	7582207.268	554354.785	27.387
D6	7582204.590	554355.196	27.387
D7	7582154.933	554355.175	26.518
D8	7582150.308	554349.927	26.463

CULVERT COORDINATE AND ELEVATION TABLE			
POINT	NORTHING	EASTING	ELEVATION
C1	7582200.333	554256.037	22.308
C2	7582204.453	554310.905	25.832
C3	7582198.744	554355.193	27.285
C4	7582181.121	554355.186	26.976

LEGEND

- 28 m — TOPOGRAPHIC MAJOR CONTOUR, CONTOUR INTERVAL = 2.0 m
- TOPOGRAPHIC MINOR CONTOUR
- TREES
- EXISTING FENCE
- OP — EXISTING OVERHEAD POWER
- PP — EXISTING POWER POLE
- EXISTING LIGHT
- EXISTING TANK
- PROPOSED ROAD AREA
- DRAINAGE DIRECTION
- PROPOSED CULVERT
- PROPOSED LEASE BOUNDARY
- MW4 — EXISTING MONITORING WELL
- RD1 — DESIGN COORDINATE POINT
- RIP RAP

NOTES:

1. DATUM: UTM NAD83 ZONE 8.
2. CONTOURS PROVIDED BY KBL.
3. BOLD LINES & TEXT REFERS TO NEW CONSTRUCTION.
4. MONITORING WELLS EXACT LOCATION TO BE DETERMINED ON SITE.

No.	DATE	REVISION	BY	APP
0	2017SEP08	ISSUED FOR CONSTRUCTION	NAR	BJ

PROJECT No.	20173924-00	INITIALS
DRAWN BY	J HUBERT	
DESIGNED BY	S BARTSCH / B JARDINE	
SCALE	1:1000	

PERMIT TO PRACTICE
ASSOCIATED ENGINEERING (B.C.) LTD.
Signature [signature]
Date 11 Sept 2017
PERMIT NUMBER: P 554
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU

REGISTERED PROFESSIONAL ENGINEER — S.M. BARTSCH — LICENSEE — Sept 8/17 — NT/NU

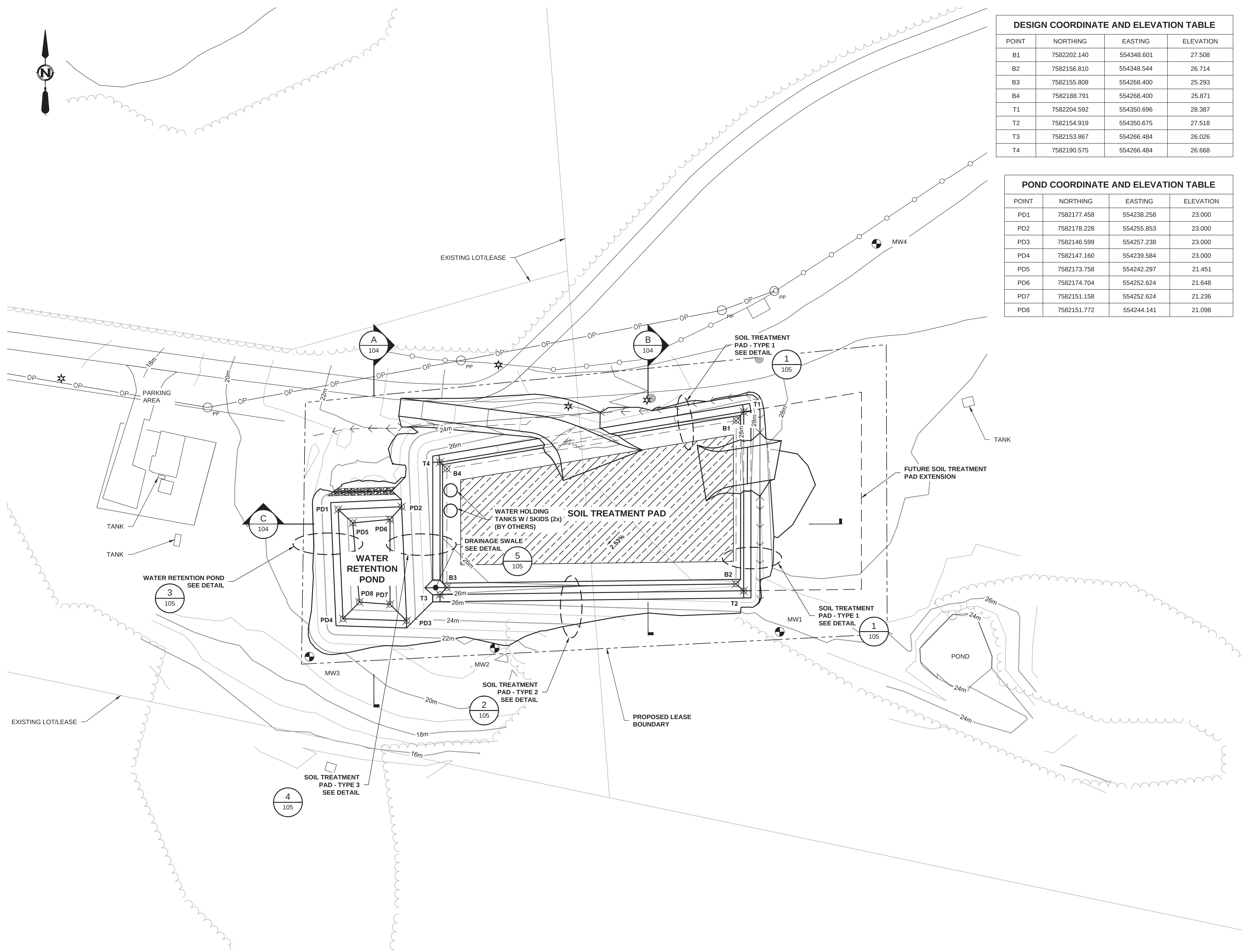
NLR/AE CONSULTANTS

CLIENT: KBL

PROJECT: INUVIK SOIL TREATMENT FACILITY

TITLE: ROAD LAYOUT PLAN

DRAWING NUMBER: 3924-00-102 | REV. NO. 0



DESIGN COORDINATE AND ELEVATION TABLE

POINT	NORTHING	EASTING	ELEVATION
B1	7582202.140	554348.601	27.508
B2	7582156.810	554348.544	26.714
B3	7582155.808	554268.400	25.293
B4	7582188.791	554268.400	25.871
T1	7582204.592	554350.696	28.387
T2	7582154.919	554350.675	27.518
T3	7582153.867	554266.484	26.026
T4	7582190.575	554266.484	26.668

POND COORDINATE AND ELEVATION TABLE

POINT	NORTHING	EASTING	ELEVATION
PD1	7582177.458	554238.258	23.000
PD2	7582178.228	554255.853	23.000
PD3	7582146.599	554257.238	23.000
PD4	7582147.160	554239.584	23.000
PD5	7582173.758	554242.297	21.451
PD6	7582174.704	554252.624	21.648
PD7	7582151.158	554252.624	21.236
PD8	7582151.772	554244.141	21.098

LEGEND

- 28m — TOPOGRAPHIC MAJOR CONTOUR, CONTOUR INTERVAL = 2.0m
- TOPOGRAPHIC MINOR CONTOUR
- TREES
- EXISTING FENCE
- OP — EXISTING OVERHEAD POWER
- PP — EXISTING POWER POLE
- EXISTING LIGHT
- EXISTING TANK
- WASTE COVERAGE AREA
- DRAINAGE DIRECTION
- PROPOSED CULVERT
- PROPOSED LEASE BOUNDARY
- MW4 — EXISTING MONITORING WELL
- T1 — DESIGN COORDINATE POINT
- RIP RAP

NOTES:

1. DATUM: UTM NAD83 ZONE 8.
2. CONTOURS PROVIDED BY KBL.
3. BOLD LINES & TEXT REFERS TO NEW CONSTRUCTION.
4. MONITORING WELLS EXACT LOCATION TO BE DETERMINED ON SITE.
5. PRESERVE AND PROTECT EXISTING MONITORING WELLS.

No.	DATE	REVISION	BY	APP.
0	2017SEP08	ISSUED FOR CONSTRUCTION	NAR	BJ

PROJECT No.	20173924-00	INITIALS
DRAWN BY	J HUBERT	
DESIGNED BY	S BARTSCH / B JARDINE	
SCALE	1:1000	

NLR/AE CONSULTANTS

CLIENT

KBL

PROJECT
INUVIK
SOIL TREATMENT FACILITY

TITLE
DEVELOPMENT PLAN

DRAWING NUMBER	REV. NO.
3924-00-103	0

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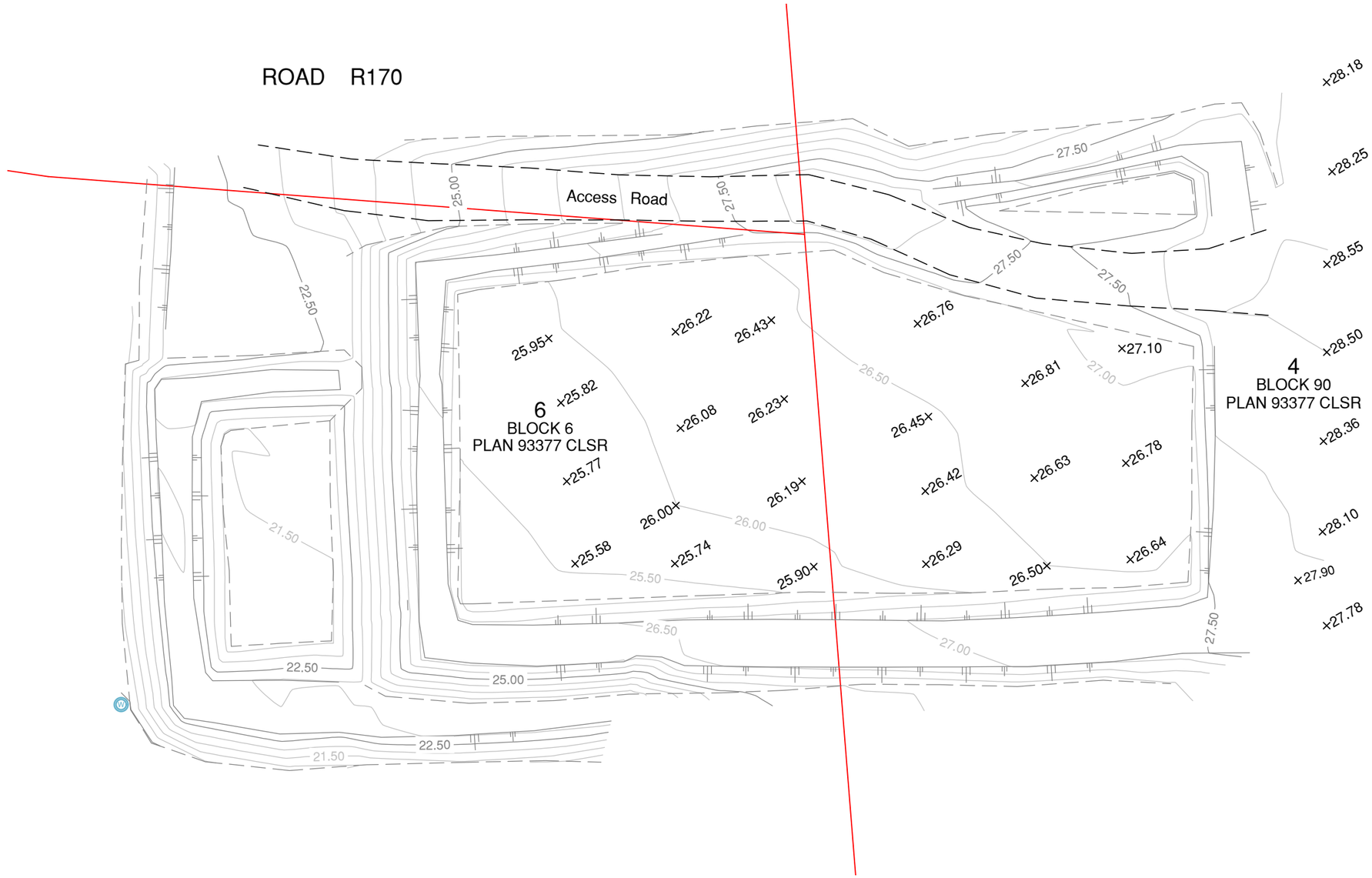

LEGEND

- denotes water well
- denotes top of bank
- denotes bottom of bank
- denotes edge of gravel
- x 5.21 denotes spot elevation
- denotes property line

Date of Field Survey: October 6, 2021.

Contour interval = 0.50 m.

Elevations shown are ellipsoidal, referenced to the WGS 84 Ellipsoid.

Lot boundaries shown hereon are derived CLSR online mapping and should not be used for detail design.

This plan represents the best information available at the time of survey. GeoVerra Surveys (BC) Limited Partnership and its employees take no responsibility for the location of any underground conduits, pipes, or other facilities whether shown on or omitted from this plan. All underground installations should be located by the respective authorities prior to construction.

Revision Table

No.	Revision	Date
0	PREPARED ORIGINAL PLAN	2021-11-03

Title:

INUVIK SOIL TREATMENT FACILITY

Drafted by: MLR Surveyed by: CW Checked by: MLE

MACKENZIE DELTA GEOMATICS

Mackenzie Delta Geomatics Ltd.
PO Box 2772
Inuvik, NT X0E 0T0
Phone: (867) 678-2980

Project: 21-01912-001

Date: 2021-11-03

Drawing No: TOPO

APPENDIX A

Facility Photographs

SITE PHOTOS

Photo 1: Constructed Facility, October 12, 2021

Photo 2: Facility ASTs, October 12, 2021