

ITH EXPLOSIVES MANAGEMENT PLAN

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Table of Contents

	Page	
1	Introduction	3
2	Explosive Management Plan Objectives	3
3	Ammonia Nitrate	3
	3.1 Nitrate Loss Mechanisms	3
	3.2 Mitigation Strategy	4
4	Explosive Usage	4
	4.1 Explosive Material Ratios	4
5	Transport of Explosives	6
6	Explosive Storage	7
	6.1 Explosive Magazines (Off-Site Storage)	7
	6.2 Explosive Magazines (On-Site Storage)	8
7	Best Management Practices	8
	7.1 Personnel Training Program	8
8	Blasting Operations	9
	8.1 Blasting Safety Measures	9
	8.2 Spill Prevention	10
	8.3 Disposal of Explosives	11
	8.4 DFO Commitments	12
9	Internal Audit and Inspections	12

List of Tables

Table 4.0-1	Explosives – Hazard Class and Potential Impacts	5
Table 4.0-2	Explosives – Safe Handling Procedures	5
Table 4.0-3	Explosives – Personal Protective Equipment	6

Maps

Appendix 1	Construction Plan Overview Atlas	13 - 18
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1.0 INTRODUCTION

The Inuvik to Tuktoyaktuk Highway Project (ITH) is a 137 km highway which will require approximately 5.8 million in-place cubic metres of gravel (not including the Source 177 Upgrade) for embankment construction with 250,000 cubic metres of surfacing gravel. In order to quarry this material, explosives will be employed as a primary means of breaking the frozen material from designated sources. These designated sources are attached on Appendix A – Construction Plan Overview Atlas

2.0 EXPLOSIVES MANAGEMENT PLAN OBJECTIVES

The purpose of the Explosive Management Plan is to outline management practices employed on the ITH Project that are aimed to minimize the safety and environmental risks of handling ammonia nitrates, which are present in blasting agents. Specifically, methods used to minimize ammonia nitrate losses to the environment will be explained.

2.1 Legislation Compliance

The Blasting Contractor will operate and will be compliant under the following legislation:

- NWT Mines Act and Regulations
- WSCC Occupational Health and Safety Regulations
- ERD Federal and Territorial/Provincial Legislations and Guidelines

2.2 Environmental Management Plan

The Explosives Management Plan is a component of the ITH Project's Environmental Management Plan. Several of the plans within the Environmental Management Plan relate to spill management and water quality monitoring, and complement the best practices identified in the Explosives Management Plan:

- Spill Contingency Management Plan
- Fish and Fish Habitat Protection Plan

3.0 AMMONIA NITRATE MANAGEMENT

3.1 Nitrate Loss Mechanisms

Blasting is subject to regulations limiting ammonia, nitrate, and nitrite levels in quarry effluents released into the environment. The primary source of these nitrogen compounds is typically explosive used in blasting operations, as AN remains a significant component of most explosives used in the blasting industry. The amount of AN entering a local water drainage system is related to site conditions, explosives used, explosive handling, and blast efficiency.

The key mechanism by which AN is lost to the water drainage system are as follows:

- Spillage during blasthole loading or transportation to the blast site;
- Dissolution by standing or flowing water through the blasthole;
- Erosion of explosive from high flowing water through the blasthole; and,
- Leaching of undetonated explosive from the blasted muck.

3.2 Mitigation Strategy

In order to minimize potential impacts, an explosives management plan will be implemented as part of the construction start-up. In addition to what is included in this management plan, the explosives management strategy will include the following:

- An education program for all production employees that outlines the potential problem and appropriate mitigation techniques;
- A Spill Contingency Management Plan;
- A monitoring program that is integrated with baseline water quality information (Fish and Fish Habitat Protection Plan);
- A review of blasting operations early in production to determine efficiency levels.

4.0 EXPLOSIVE USAGE

Explosives use management will have the primary goal of limiting loss of ammonia nitrates to quarried material, pit areas, and water bodies, which could subsequently leach into runoff. Explosives storage will be controlled and runoff from storage areas contained although it is expected that all blasting activities will be completed during winter months prior to any freshet runoff.

The project proposes to use packaged ANFO (ammonium nitrate/fuel oil) to facilitate borrow source extractions. ANFO is a solid material that is a widely used bulk industrial explosive mixture. It consists of 94 percent ammonium nitrate (NH_4NO_3), (AN) that acts as the oxidizing agent and absorbent for the fuel and six percent number 2 fuel oil (FO).

The detonation of ANFO will produce gaseous byproducts. Complete detonation of ANFO produces H_2O , CO_2 and N_2 , which are harmless gases. Incomplete detonation of ANFO produces NO_2 , NO and CO which is toxic gases in high concentrations. Incomplete detonation can occur when blast holes contain water or if ANFO becomes wet. Since ANFO is hygroscopic and water soluble, the appropriate overall methodology for management is keeping it sealed and dry, which is consistent with blasting mid-winter and the overall low humidity in the region. Blast holes are not expected to contain any water during winter. Any spills are managed with the cleanup of the solid ANFO (as per the Spill Contingency Management Plan). Explosives will be

managed in accordance with the Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (DFO 1998). With the application of these practices, there is not expected to be a pathway for residue and/or gases to enter adjacent water bodies.

4.1 Explosive Material Ratios

- Hole size: 6 1/2"
- Average hole depth: 8 m
- Pattern: 4 meters x 5 m
- Powder Factor: .7 - 1 kg per m³

Products Utilized:

- Amex; 25 kg, double-lined bags
- 200 x 400 mm Power Pro; 20 kg boxes
- XT Det Cord; 15 kg cases
- Nonels; 9 m - 15 m lengths

Material hazard class, potential impacts, site handling and storage requirements, and recommended personal protective equipment are summarized in Tables 3.0-1 to 3.0-3.

Table 4.0-1 Explosives – Hazard Class and Potential Impacts

Material	Hazard Class	Potential Impact
Ammonium Nitrate	5.1	Water & Soil Contamination
High Explosive Detonators	1	Negligible
Blasting Caps	1	Negligible

Table 4.0-2 Explosives – Safe Handling Procedures

Material	Safe Handling Procedures
Ammonium Nitrate	Keep away from heat and sources of ignition. Do not ingest or breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin and eyes. Store in a cool, well-ventilated area separate from acids, alkalies, reducing agents and combustibles.

High Explosive Detonators	Store under dry conditions in a cool, well ventilated magazine in closed containers. Keep away from heat, sparks, and flames.
Blasting Caps	Store under dry conditions in a cool, well ventilated magazine

Table 4.0-3 Explosives – Personal Protective Equipment

Material	Personal Protective Equipment		
	Eyes	Skin	Respiration
Ammonium Nitrate	Safety goggles	Nitrile or rubber gloves; protective clothing	NIOSH/MSHA approved respirator
High Explosive Detonators	Safety goggles	Nitrile or rubber gloves; protective clothing made from cotton	None usually required
Blasting Caps	Safety goggles	Nitrile or rubber gloves; protective clothing made from cotton	None usually required

5.0 TRANSPORT OF EXPLOSIVES

The handling of explosives to the site and on the site will be carried out by the supplier and blasting contractor under a license to conduct such work.

Transportation of explosives from the explosive supplier to the quarry areas will be conducted in such a manner as to safeguard human health and prevent impacts on the environment. The transfer will be arranged so that:

- delays between the points of transfer are minimized
- explosives are not left at any location other than designated locations
- explosives are not left unattended during transportation

Transportation of explosives will be undertaken according to the requirements of applicable regulations including the Canada - *Explosives Act and Regulations; Transport of Dangerous*

Goods Act and Regulations; National Fire Code of Canada. The explosives contractor and personnel are responsible for ensuring compliance to these regulations.

Explosives transported from the explosives supplier to the site will be transported by fully licensed and certified transport carriers; always utilizing a double-driver system. These carriers will be fully compliant with applicable Federal, Provincial and Territorial legislation regarding explosives hauling and transport and applicable TDG guidelines and compliance. These operators or transport drivers will be fully versed in their 'specific' companies' Emergency Response Procedures for TDG and explosives transport.

Associated risks or possible emergency situations associated with transport could include:

- Motor vehicle accident (MVA) requiring simple transfer of explosives to alternate vehicle designed for transporting explosives
- MVA with or without injuries, where explosives have been spilled on roadbed
- Motor vehicle breakdown (mechanical); delay in transport
- MVA with fire and potential for detonation, and finally in a worst case scenario,
- MVA with a detonation

Mobile equipment used for transporting explosives onsite will:

- be kept in sound mechanical working condition
- be provided with orange diamond-shaped placards and with clearly visible signs marked "EXPLOSIVES" in letters not less than 150 mm in height when carrying explosives
- not be used to transport other goods or materials at the same time as explosives are transported
- be equipped with a type 20-ABC fire extinguisher
- not be loaded with explosives in excess of 80% of its rated carrying capacity
- have explosives secured or fastened so as to prevent any part of the load from becoming dislodged
- only be operated by an authorized person who is in attendance at all times
- carry only those persons necessary for handling explosives
- not be refueled if explosives or detonators are on board except where the mobile equipment is designed and used solely for transportation of bulk blasting agents
- have its engine shut off and its parking brake engaged while loading or unloading explosives, except where the vehicle uses an engine-powered device for loading and unloading

6.0 EXPLOSIVES STORAGE

Packaged ANFO, detonators, and primers, will be shipped to site as explosives and be stored in site magazines.

6.1 Explosive Magazines (Off-Site Storage)

Explosives magazines to be fully licenced, equipped with security reader system and proper locking system as per ERD Federal and Provincial/Territorial regulations

- Explosives (Powder) magazine registered to contain 30,000 kgs of product
- Detonator (Cap) magazine registered to contain 20,000 units
- As security precaution and to monitor magazine access and as per ERD Federal regulations, electronic monitoring of magazines will be completed by the Blaster(s) upon each entry into magazines utilizing the electronic fob reader provided
- Signage will be clearly posted at magazines, as required, warning of potential danger, safe distances and hazards in storage vicinity
- Blaster(s) to monitor magazine(s) inventory by continually updating products added/taken in the blasthole logbooks, provided in each magazine
- Magazine inspections to be completed by Blaster(s) on a weekly basis

6.2 Explosive Magazines (On-Site Storage)

Explosives (Amex), will be situated near the worksite, when required. Each pallet will contain 50 bags of Amex, which, will be shrink-wrapped. Explosives stored on-site would be placed in designated work area under constant (24 hour) watch/supervision. Explosives will never be left unattended, at any time.

- Explosives (Powder) stored in powder trucks: 1,500 to 2,000 bags per truck
- Explosives (Detonators) stored in powder trucks: 300 to 400 units (or 6 to 8 boxes) per truck

Locations of the magazines will be site specific and will follow the guidelines below:

- a minimum of 500 metres away from camps or any structures that frequently house personnel
- a minimum of 500 metres away from quarrying activities
- set on flat terrain to reduce the risk of spillage
- area around magazines to be flagged with required signage

7.0 BEST MANAGEMENT PRACTICES

Only trained and certified persons will work with explosives. The explosives personnel will undertake formal training and on-the-job training to ensure compliance with legislation. Internal audits and inspections of all components related to the explosives management will be conducted

on a regular basis by qualified personnel, and the results recorded according to quality and safety standard operating procedures. All recommendations and orders made by regulators and inspectors will be responded to and acted upon accordingly.

7.1 Personnel Training Program

Only trained and certified persons will work with explosives. The explosives personnel will undertake formal training and on-the-job training to ensure compliance with legislation. Training requirements will include (but not be limited to):

- Specific fire procedures as per the *Federal Explosives Act*;
- First Aid;
- Transportation of Dangerous Goods (TDG);
- Blasting Certificate; and
- Workplace Hazardous Materials Information System (WHMIS).

8.0 BLASTING OPERATIONS

Blasting will be carried out by a certified blasting contractor following blasting regulations and safety protocols and under the supervision of General Contractor. A revised detailed Explosives Management Plan will be developed by the blasting contractor and reviewed by the General Contractor.

Blasting operations on the ITH Project will involve a qualified and licensed explosives contractor responsible for all blasting operations. The explosives contractor will be responsible for the inspection of all explosives facilities and the safe operation of all explosives equipment. Weekly reports to the General Contractor detailing total explosives consumption, inventory of ammonium nitrate onsite, other explosives, and safety concerns or incidents will be required. Transport of ANFO and detonators will only be done by trained personnel on controlled roads under rigorous supervision. All explosives transport must comply with the *Canadian Explosives Act & Regulations* (1985).

The drilling of blast holes will be completed by the blasting contractor. Appropriate precautions will be taken to secure the area prior to blasting to ensure the safety of personnel. As well, precautions will be taken to minimize damage from flyrock.

8.1 Blasting Safety Measures

Blasting safety procedures on frozen material are described below for blasting on quarry operations:

- No unauthorized person is allowed inside a posted blast area whether the holes have been loaded or not;

- The Blasting Supervisor and the Blaster are responsible for the safe handling, loading and connection of a blast;
- The Shift Supervisor is responsible for the evacuation of all personnel and equipment from the blast area and the guarding of the blast;
- The Project Superintendent is responsible for notifying the appropriate personnel, aerodromes, and other departments and personnel who may be affected by a particular blast;
- Guards will be posted prior to blast time, and must remain guarding until they are told verbally by the Shift Supervisor that they can leave their position;
- Once guards are posted, the blast area must be inspected by the shift supervisor to ensure that no personnel or equipment remain inside the blast area;
- One half hour prior to a blast, the Shift Supervisor will instruct the Wildlife and Environmental Monitor to inspect with their snowmobiles a 500 metre perimeter for any personnel or wildlife and report back immediately to the supervisor that all is clear
- A blast-warning siren will be sounded for one (1) minute; three (3) minutes after this, the blast will be fired;
- The blaster will only fire the blast when given a direct verbal order to do so by the shift supervisor;
- Before firing a shot, the blaster must ensure the immediate area is clear (i.e. aircraft, etc.); and radio silence is maintained
- The Shift Supervisor and blaster will inspect the fired shot for indications of any problems such as misfires or cut-offs;
- After the blast, the Shift Supervisor will instruct the Wildlife and Environmental Monitor to inspect with their snowmobiles a 500 metre perimeter for any personnel or wildlife and report back immediately to the supervisor that all is clear
- Areas in which charged holes are awaiting firing shall be guarded or posted against unauthorized entry;
- Vehicles containing explosives shall not be taken to the repair shop or any other building for any purpose; no open flames or welding are to be used for field repairs unless explosives are first removed;
- Downhole initiation lines must be attached to a stake planted in the cuttings on all holes;
- All loaded patterns, in addition to being marked with blasting signs, shall be clearly delineated to outline the pattern;
- Redrills shall be marked with a plastic cone and be designated by a member of the blasting crew; the plastic drill cone shall be firmly implanted in the cuttings of the hole to be redrilled; the cone should be removed by the driller before drilling and inverted in the hole after drilling for pickup by the blasting crew;
- Where redrills are required on loaded patterns, the drill must be guided by the Blasting Supervisor, or Blaster or a responsible person designated by them; and
- Service vehicles and fuel trucks are not allowed on a loaded pattern; the drill must pull well clear of the loaded holes before work be done on it; where the drill cannot be moved and service is required, it may be done only under the direct supervision of the Blast Supervisor or designate and all loaded holes must be covered.

8.2 Spill Prevention

Protecting water-soluble products from rain, snow and the elements is of great consideration. This is primarily an environmental concern to avoid run off of the soluble product which, could adversely affect any streams or other fish bearing waters, waterways accessed by local wildlife or areas of vegetation. There potential for spills to occur when handling packaged ANFO. Other incidents such as fire or explosion are also a risk. Detailed work instructions will be provided in the revised Explosives Management Plan that will be developed by the explosives contractor. In general, the following procedures will be implemented to prevent or mitigate incidents involving spills, fire, or explosion:

- Amex bags are double-lined
- Pallets are all shrink-wrapped
- If a spill occurs, follow the Spill Contingency Management Plan
- All spills to be reported immediately
- All spills to be cleaned up immediately, if/when upon occurrence
- A spill report form will be completed, documenting the spill
- Caution to be used while loading holes to ensure all poured product (Am ex) goes into blasthole and all Amex surrounding blasthole to be swept into blasthole when loading is complete; prior to blasthole stemming
- Caution to be used while carrying Amex bags during loading process on pattern
- Pallets to be sheltered from weather by tarps, until product is used
- Explosives not immediately utilized to be stored in proper explosives magazine(s)
- All blastholes containing water will be loaded utilizing blasthole liners to prevent seepage of product into rock and underground waterways. The use of blasthole liners in wet blastholes also, results in maintaining desired rock quality for the shot.
- Ensure that fire extinguishers are provided both inside and outside the facility so that if extinguishers inside could not be used in an incident, outside ones are available. Fire extinguishers must be compatible with flammable materials (water-based where ammonium nitrate is involved).
- Used ANFO bags should be emptied completely and stored outside the facility at a safe distance from explosives to reduce the fire hazard risk.
- Any spills will be cleaned up and removed immediately to appropriate disposal facility. The spill will be reported and investigation of cause may be required.
- A “NO SMOKING” sign will be posted on visible walls of the facility.
- Ensure that lighters, matches, mobile phones, or radio transmitters or any item that might conduct electricity is not used at the explosives storage area.
- Follow all transportation, storage, use, and handling procedures outlined in this Plan.

- Report incidents of “near-miss” and actual accidents to appropriate personnel. Incidents will be investigated to help identify trends and reduce future reoccurrence.

8.3 Disposal of Explosives

Explosives and explosive materials can be disposed of by burning, detonation, dissolution in water or solvent, or by chemical destruction. The selected disposal method will depend on the type of explosive, quantity, condition, and specifications from the manufacturer. All destruction of explosives will be carried out by licensed blasting personnel.

Destruction of large quantities of explosives will be carried out at a designated location at least 500 m from any building that could be damaged by the detonation. Personnel and other property damage will be avoided by sheltering the detonation area. Small quantities of explosives may be added to production charges in blast-holes for destruction.

Blasting personnel will adhere to the following procedures:

- Only a licensed person, or a person under the supervision of a licensed person, is allowed to dispose of or destroy explosives.
- Use a method of disposal that provides the greatest degree of safety to humans and protection of property and the environment. Take adequate precautions to protect against injury or damage to property.
- Ensure that the method of disposal is appropriate to the type and condition of explosives.
- Follow recommended disposal method indicated by manufacturer or responsible authorities.
- Unused explosives and explosive waste must be removed and disposed of under the supervision of or by the blasting contractor.

8.4 DFO Commitments

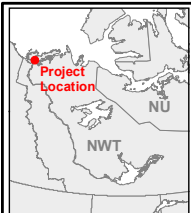
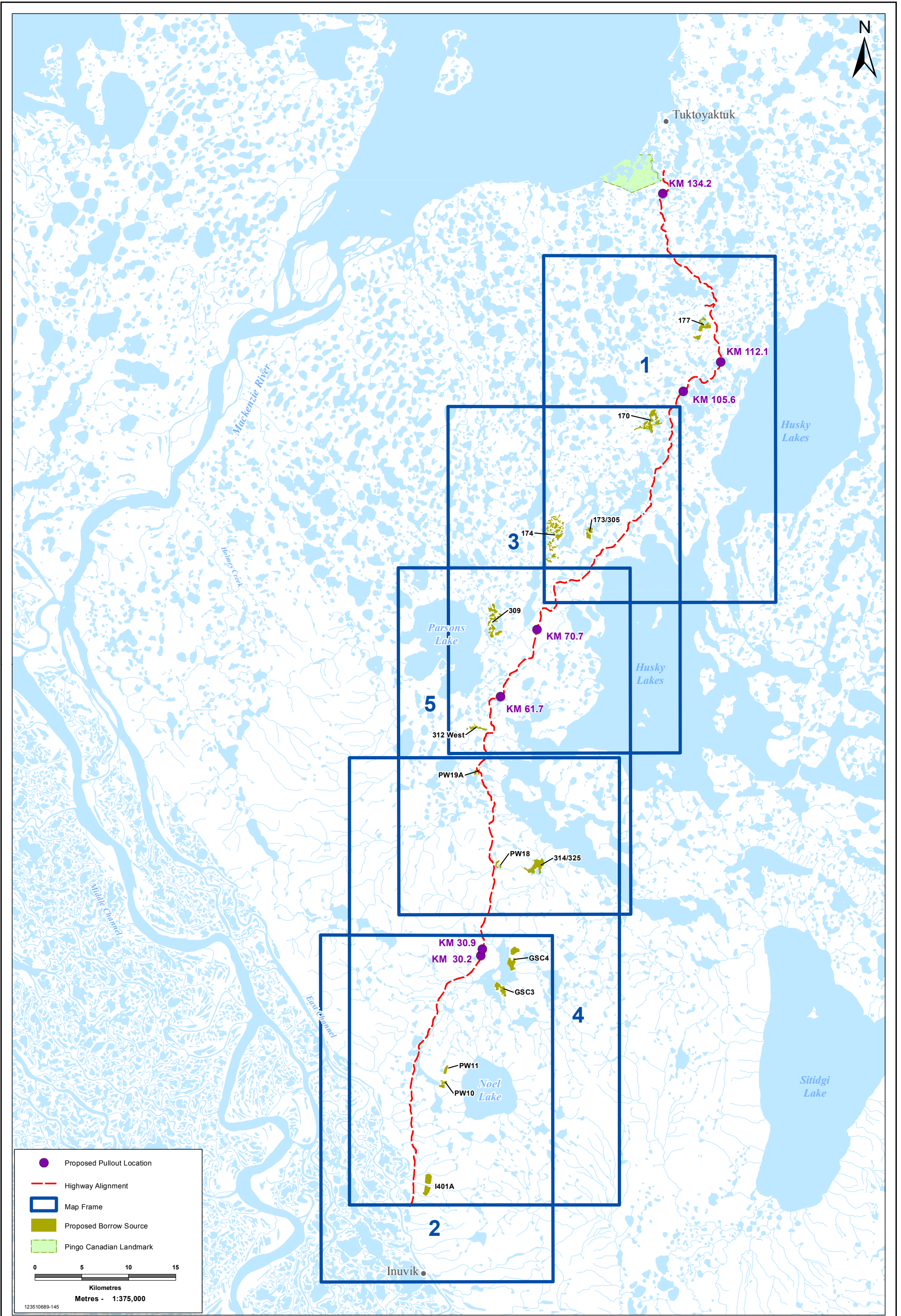
It is the intent of this plan to follow the Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters as follows:

- Instantaneous Pressure Change (IPC)
If blasting is required within 500 meters of a fish bearing water body, monitoring systems will be in-place to meet the 50 kpa criteria
- Blasting techniques will be revised to minimise water pressure and seismic forces

9.0 INTERNAL AUDIT AND INSPECTIONS

Internal audits and inspections of all components related to the Explosives Management Plan will be conducted as required by the regulation. Inspections will be done on a regular basis by qualified personnel for physical condition and serviceability, and the results recorded according to quality and safety standard operating procedures. Qualified personnel will perform regular inspections the magazines storing the boosters, caps and explosives to ensure that inventory is documented.

All recommendations and orders made by Natural Resources Canada (NRC) Explosives Branch Inspectors, Fire Marshals and Insurance Inspectors will be responded to and acted upon accordingly.



INUVIK - TUKTOYAKTUK GEOTECHNIOCAL INVESTIGATIONS PROGRAM

Construction Plan Overview Atlas Index

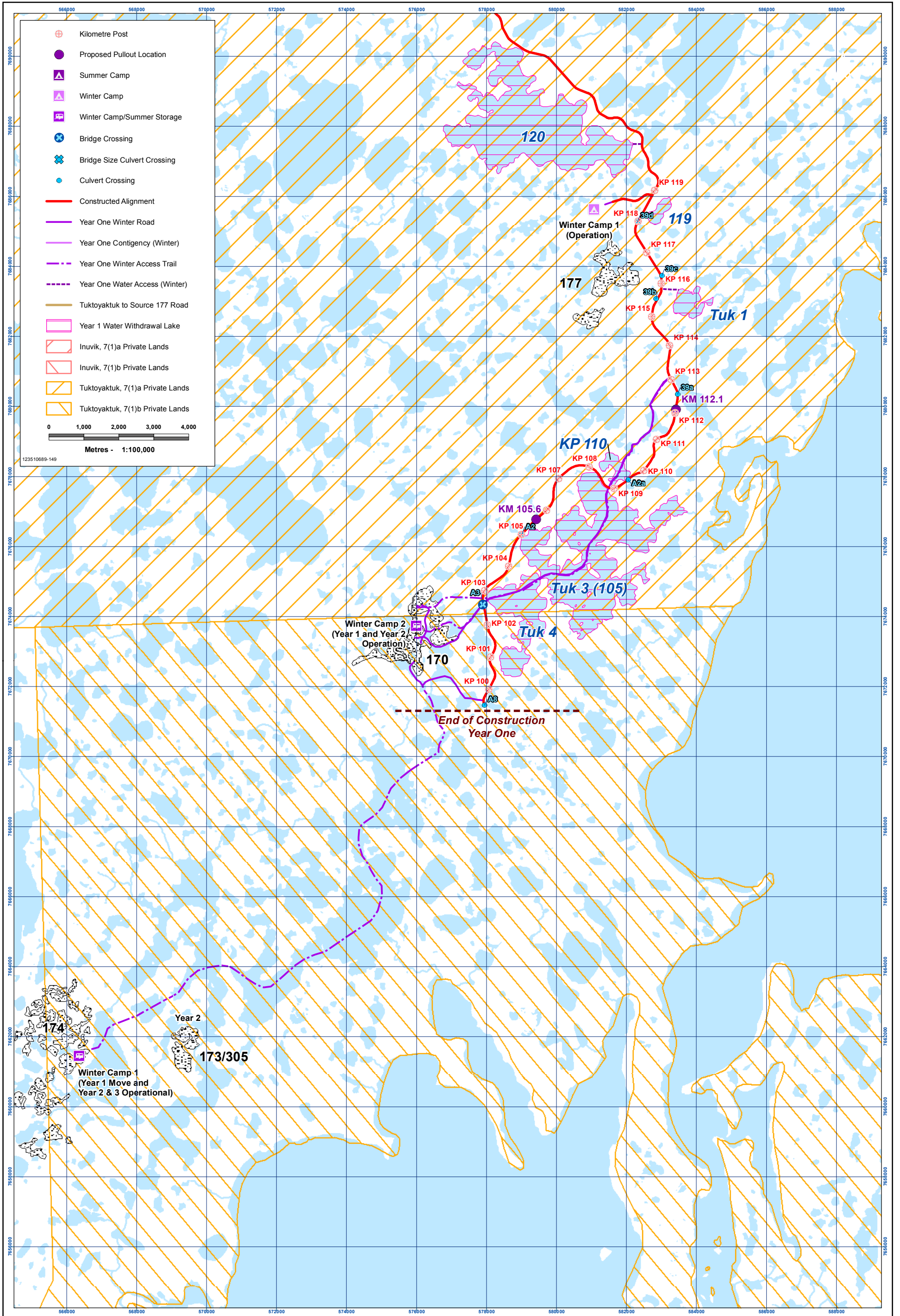
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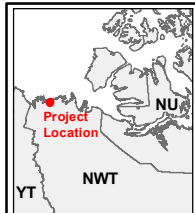
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INUVIK - TUKTOYAKTUK HIGHWAY CONSTRUCTION PLAN

Year One (North)



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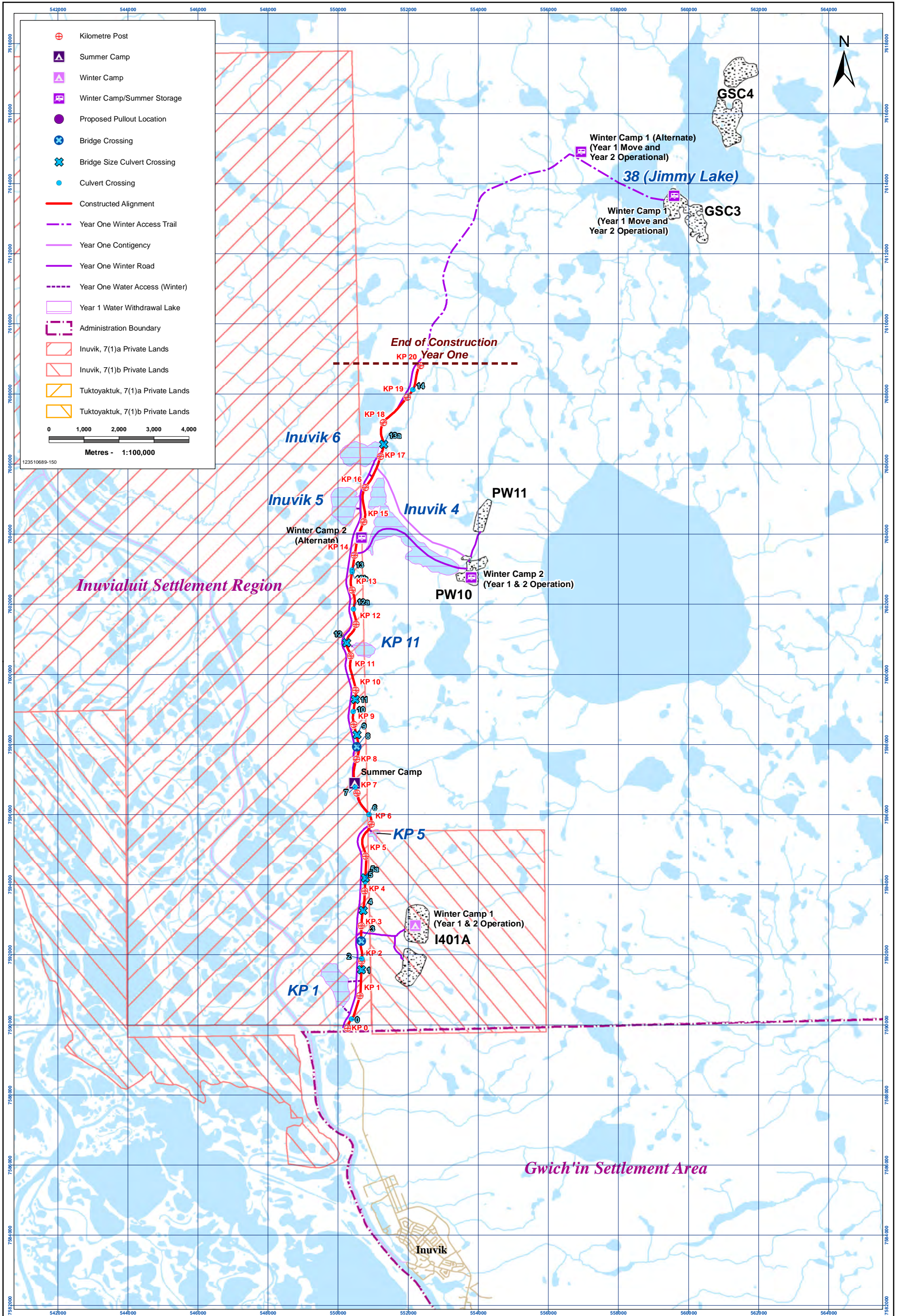
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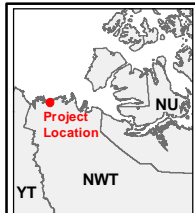
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01 of 05

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Year One (South)



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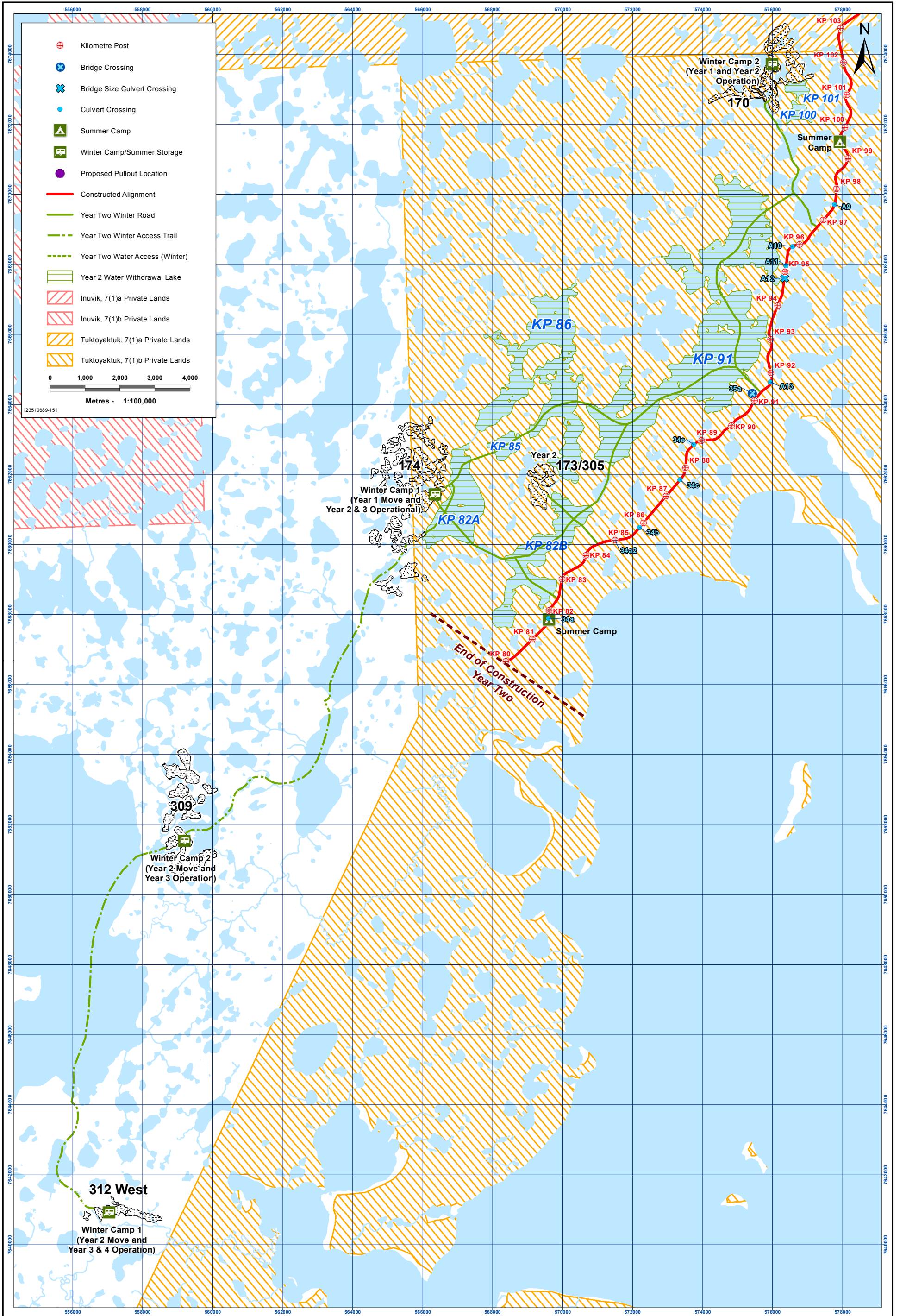
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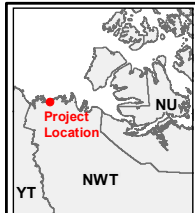
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Year Two (North)



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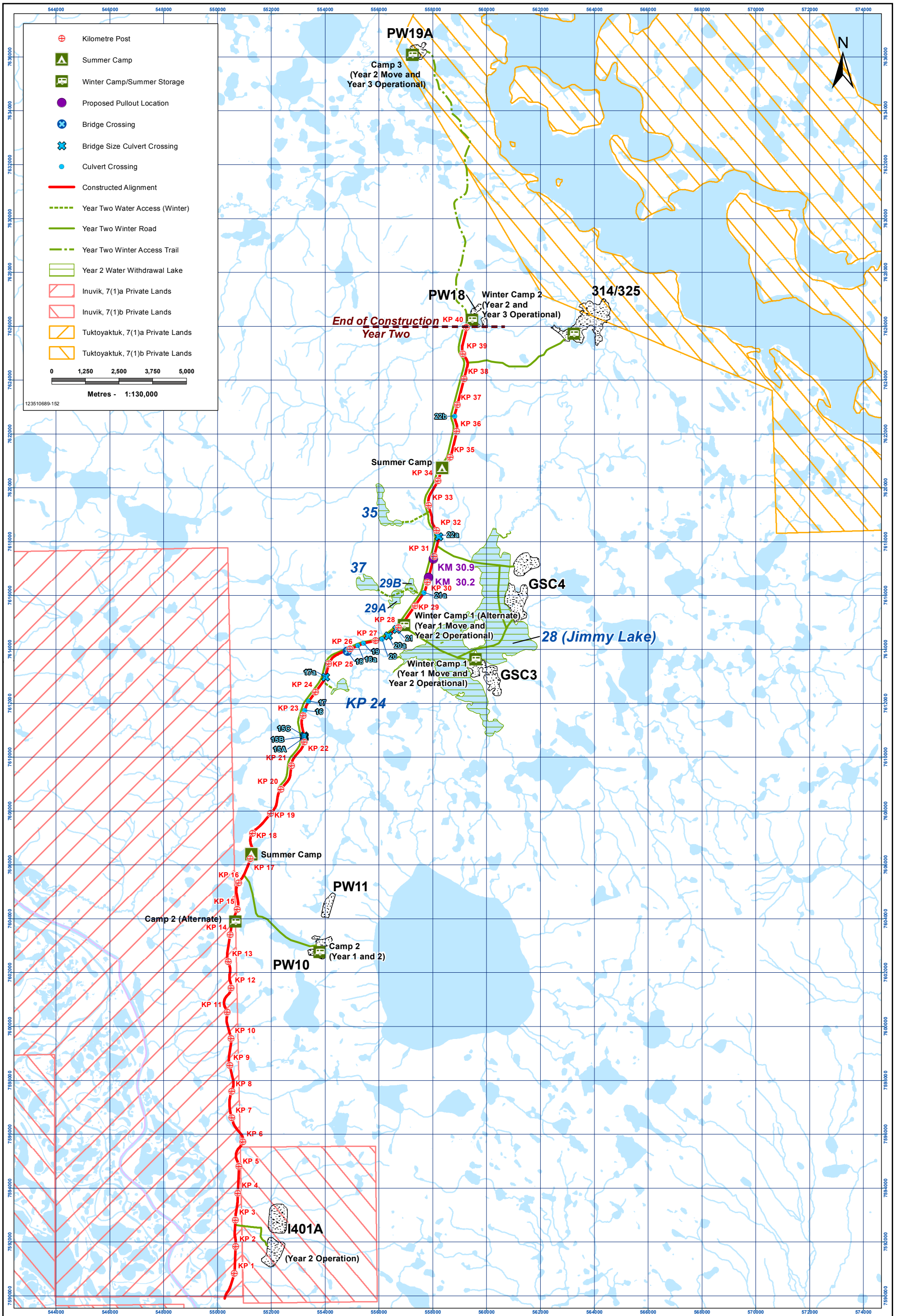
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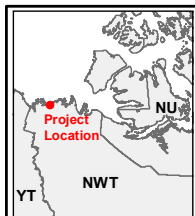
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03 of 05

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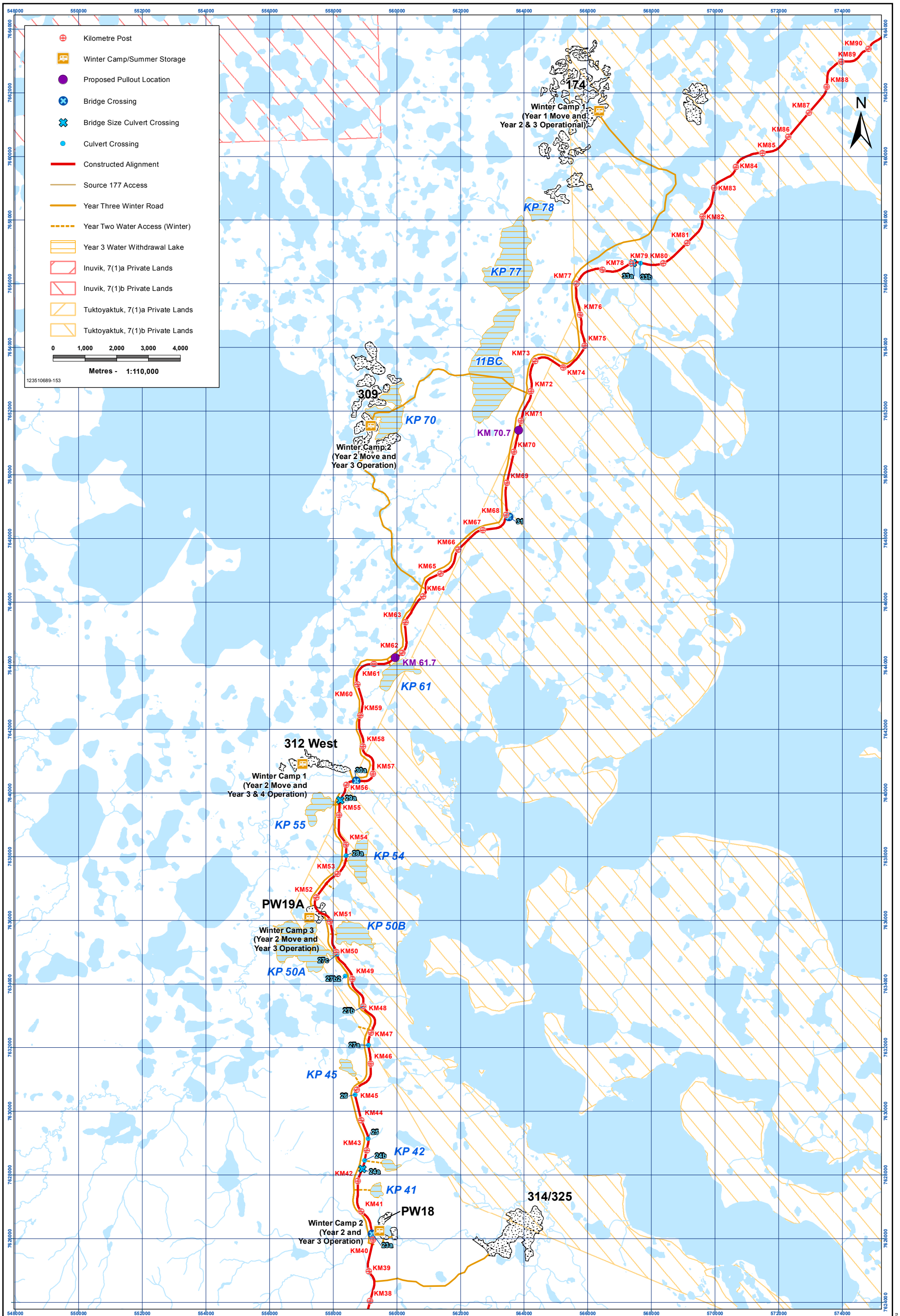
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04 of 05

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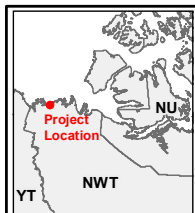


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05 of 05

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