CUMBERLAND
RESOURCES LTD.

MEADOWBANK GOLD PROJECT

PROJECT ALTERNATIVES REPORT

JANUARY 2005

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

DESCRIPTION OF SUPPORTING DOCUMENTATION

Cumberland Resources Ltd. (Cumberland) is proposing to develop a mine on the Meadowbank property. The property is located in the Kivalliq region approximately 70 km north of the Hamlet of Baker Lake on Inuit-owned surface lands. Cumberland has been actively exploring the Meadowbank area since 1995. Engineering, environmental baseline studies, and community consultations have paralleled these exploration programs and have been integrated to form the basis of current project design.

1. The Meadowbank project is subject to the environmental review and related licensing and permitting processes established by Part 5 of the Nunavut Land Claims Agreement. To complete an environmental impact assessment (EIA) for the Meadowbank Gold project, Cumberland followed the steps listed below:

2. Determined the VECs (air quality, noise, water quality, surface water quantity and distribution, permafrost, fish populations, fish habitat, ungulates, predatory mammals, small mammals, raptors, waterbirds, and other breeding birds) and VSECs (employment, training and business opportunities; traditional ways of life; individual and community wellness; infrastructure and social services; and sites of heritage significance) based on discussions with stakeholders, public meetings, traditional knowledge, and the experience of other mines in the north.

3. Conducted baseline studies for each VEC and compared / contrasted the results with the information gained through traditional knowledge studies (see Column 1 on the following page for a list of baseline reports).

4. Used the baseline and traditional knowledge studies to determine the key potential project interactions and impacts for each VEC (see Column 2 for a list of EIA reports).

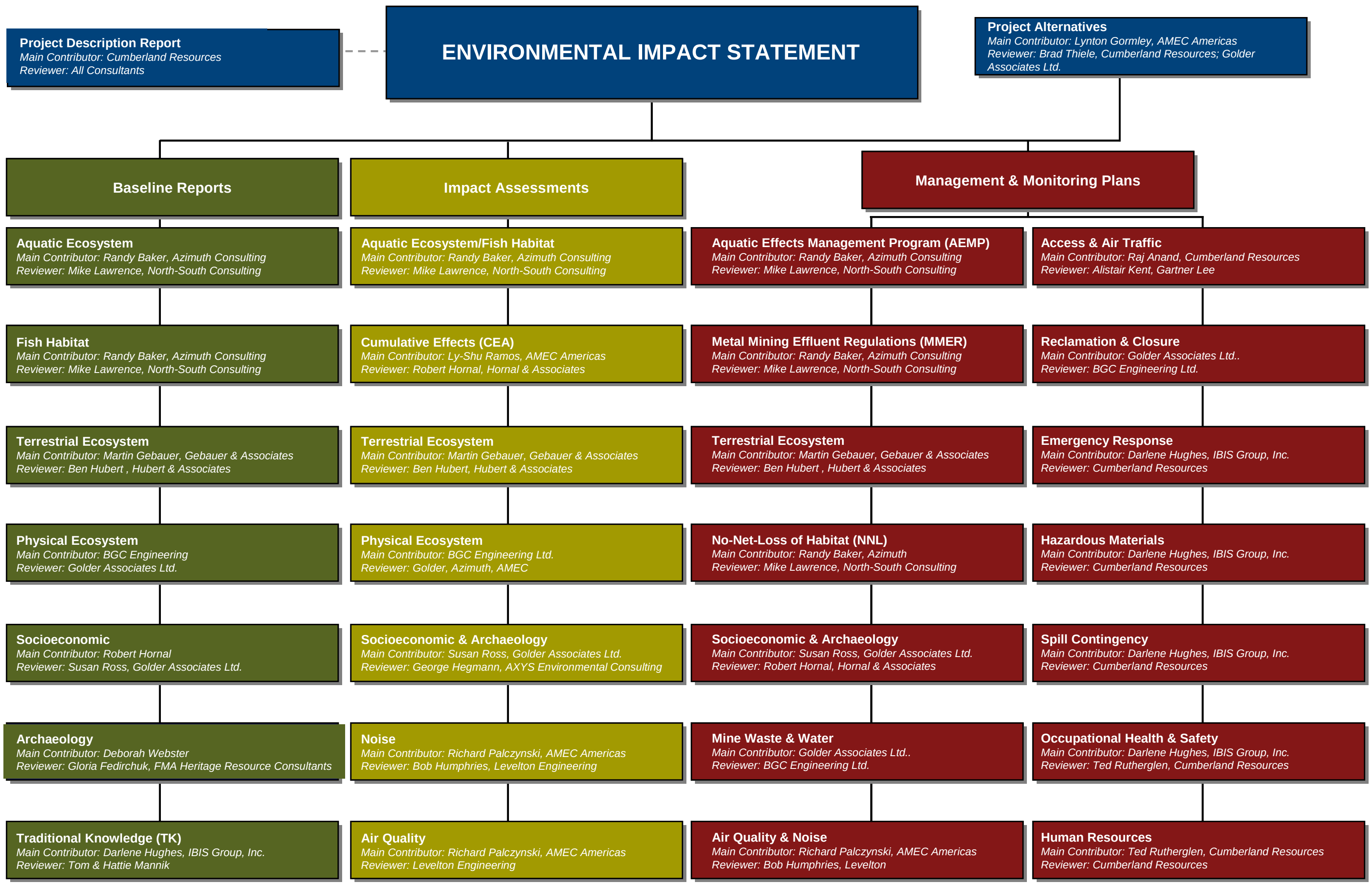
5. Developed preliminary mitigation strategies for key potential interactions and proposed contingency plans to mitigate unforeseen impacts by applying the precautionary principle (see Column 3 for a list of management plans).

6. Developed long-term monitoring programs to identify residual effects and areas in which mitigation measures are non-compliant and require further refinement. These mitigation and monitoring procedures will be integrated into all stages of project development and will assist in identifying how natural changes in the environment can be distinguished from project-related impacts (monitoring plans are also included in Column 3).

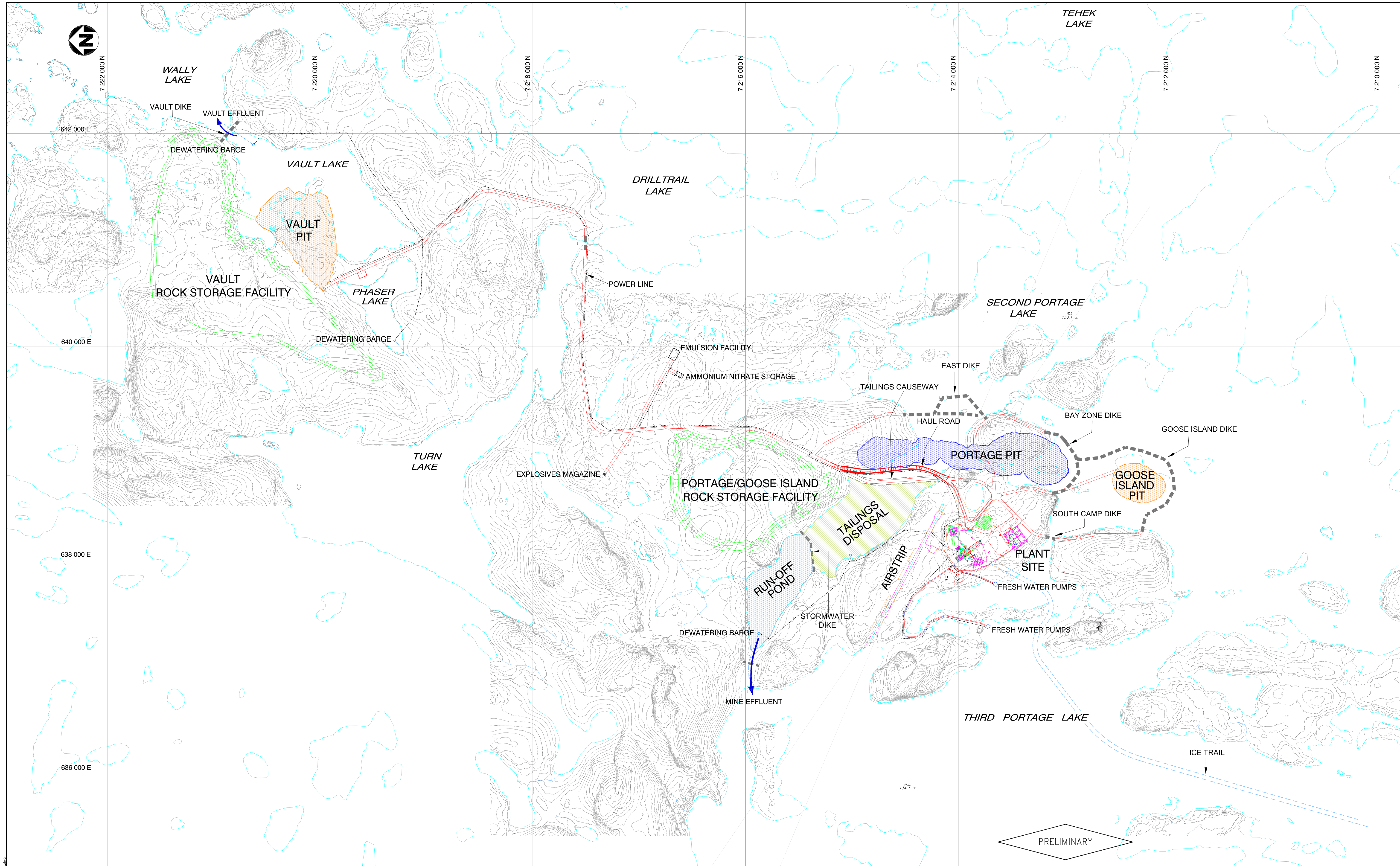
7. Produce and submit an EIS report to NIRB.

As shown on the following page, this report is part of a documentation series that has been produced during this six-stage EIA process.

EIA DOCUMENTATION ORGANIZATION CHART



PROJECT LOCATION MAP



Datum: UTM NAD83 Zone 14

Proposed Mine Site Layout

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SOURCE: AMEC drawing 100-c000c.dwg

SECTION 1 • INTRODUCTION

Cumberland is committed to developing a mine that maximizes benefits and minimizes or eliminates negative impacts. This approach ensures that all issues are weighed and considered before final design decisions are made. Examples of alternatives that have been identified and explored for the project include the following:

- location of the tailings impoundment and other on-site facilities
- milling process
- permanent versus winter access road
- power supply at Baker Lake or at site, barge-mounted or on land.

It should be recognized that project development is ongoing and issues may arise that require the consideration of new alternatives or the re-evaluation of concepts previously rejected. Most major project decisions will be made on completion of the feasibility study, before the commencement of detailed design. Other items, such as blast designs, can be modified during operations as experience is gained during mining and processing activities.

The ensuing sections discuss the main alternatives being considered for the project at this time. Other than the “No-Go” alternative, each issue is described according to service requirements, other selection criteria such as environmental impact, and the ability of the selected option to best meet Cumberland’s objectives.

SECTION 2 • THE "NO-GO" ALTERNATIVE

In the "No-Go" alternative, the Meadowbank mine project would be terminated. None of the potential impacts from project development would occur, and the natural conditions would remain essentially the same. No other currently foreseeable factors would affect the resources.

Possible reasons for implementing the "No-Go" alternative include regulatory denial of one or more of the permits necessary for project development; and/or Cumberland deciding to abandon the project either due to unsatisfactory project economics (higher development and production costs, lower gold prices) or in order to direct its mine development resources elsewhere.

Under this scenario, all existing site facilities would be decommissioned. All buildings, structures, and non-native materials would be removed, and disturbed land would be reclaimed. The test trenches in the Third Portage and Vault areas and adjacent trails would be backfilled to encourage native plant growth and preclude erosion and sediment transport. Contaminated soils would be collected and, if practical, remediated on site.

SECTION 3 • SITE & FOOTPRINT

This section describes the sites and footprints considered during the prefeasibility and feasibility phases for major elements of the project: the process plant, open pits and dewatering dikes, waste rock piles, tailings storage impoundment, airstrip, and Vault haul road. The selected locations for these facilities are shown in Figure 3.1.

3.1 PLANT SITE OPTIONS

The plant site area will include the process facilities, service complex, camp complex, power plant, and fuel storage and distribution facility. Four plant site locations were assessed: Site 1, on the eastern end of the island currently used for the exploration camp; Site 2, on a small isthmus east of Goose Island; Site 3, immediately west of the Third Portage deposit, on the isthmus between the arms of Second and Third Portage lakes; and Site 4, at the northwest end of the same isthmus as Site 3 (see Figure 3.2)

The following criteria were used to evaluate these potential plant sites:

- proximity to ore resources
- flat/gentle grades with good foundation and drainage conditions
- compatibility with future access requirements.

Mill Site 3 was selected for the following reasons:

- central location between the Third Portage, North Portage, and Goose Island deposits
- proximity to the tailings disposal site
- relatively large area of flat, though elevated, terrain, providing enough room for the proposed facilities and permitting the airstrip to be conveniently located immediately to the northwest
- competent rock at or close to surface for good foundation conditions
- remote from culturally sensitive areas
- best opportunity for water management and spill containment
- least overall land disturbance.

Mill Site 1 was rejected because of its greater distance than the other sites from the Third and North Portage deposits and consequent higher ore haulage costs. Site 2 encroaches into an area of possible cultural sensitivity. Site 4 is less central than Site 3 and offers no other advantages.

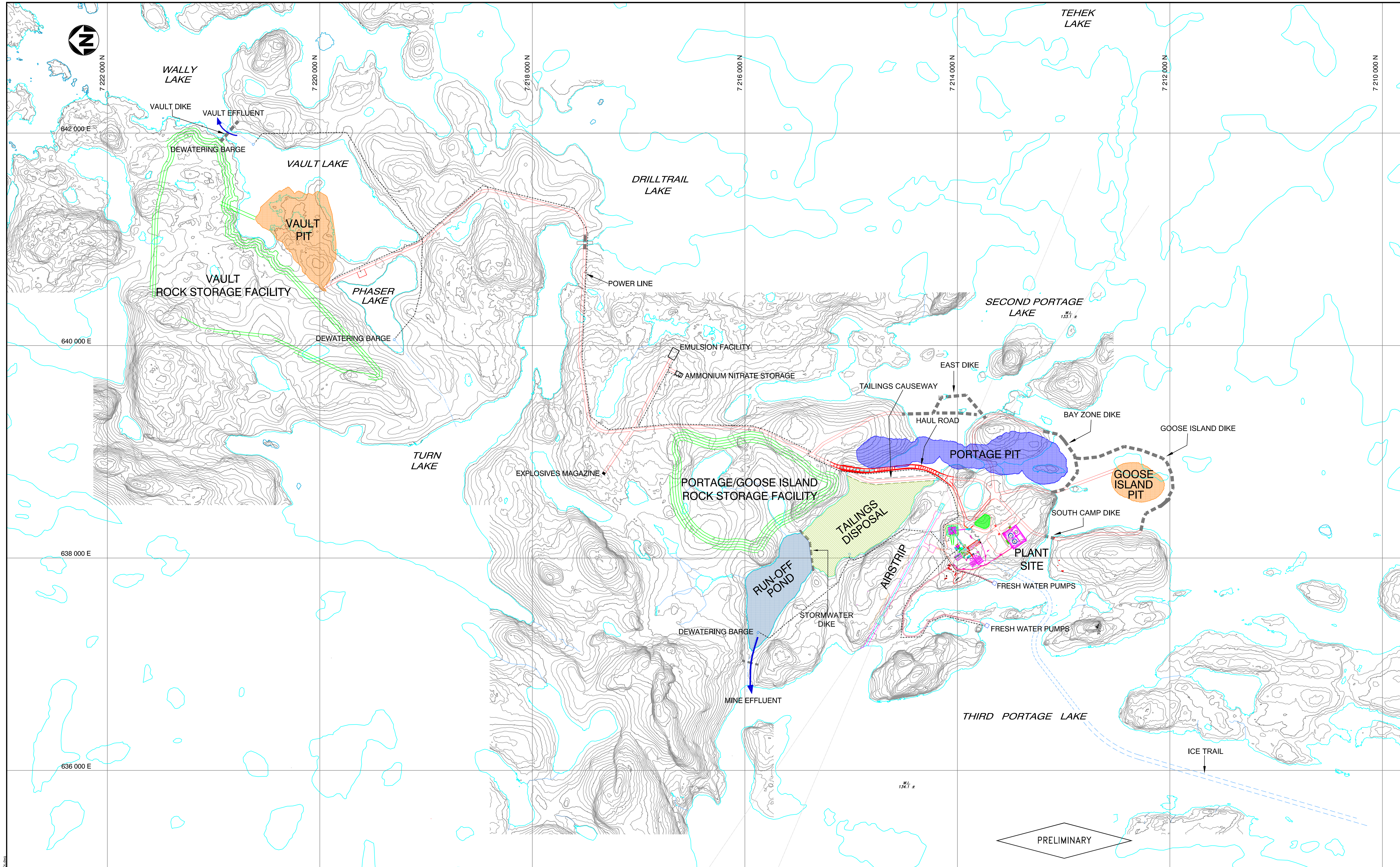

Figure 3.1
General Site Plan

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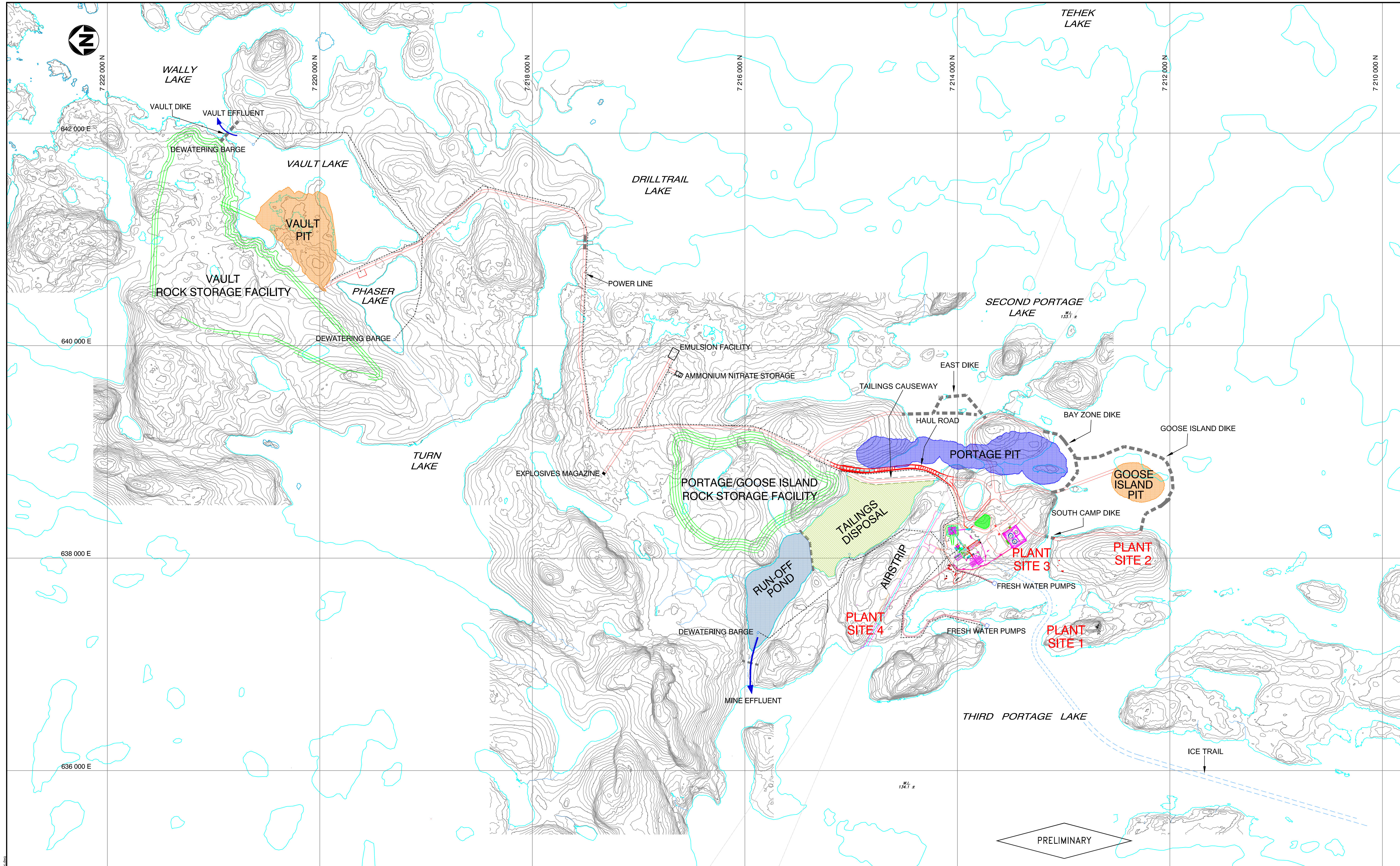

Figure 3.2
Location of Plant Site Options

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3.2 OPEN PIT LIMITS & DEWATERING DIKE LOCATION

The footprint of the Portage open pit has expanded since the Meadowbank Prefeasibility Study was completed, as additional reserves have been identified. The currently defined pit will extend across the entrance to the northwest arm, completely isolating it from the rest of Second Portage Lake (Figure 3.1). The alignment of the dewatering dikes around the Goose Island deposit has also been adjusted to reflect the more precisely defined pit boundaries and additional bathymetric and geotechnical data. As far as practical, dike alignment seeks to minimize water depths while maintaining a nominal setback distance of 80 m from the toe of the dike to the pit crest to simplify construction and minimize costs.

Diking options are considered in Section 5.

3.3 MINE ROCK STORAGE

Waste rock storage facilities will be developed in both the Portage and the Vault mining areas.

3.3.1 Portage Rock Storage Facility

Four areas on the north side of Second Portage Lake were considered as potential waste rock storage sites:

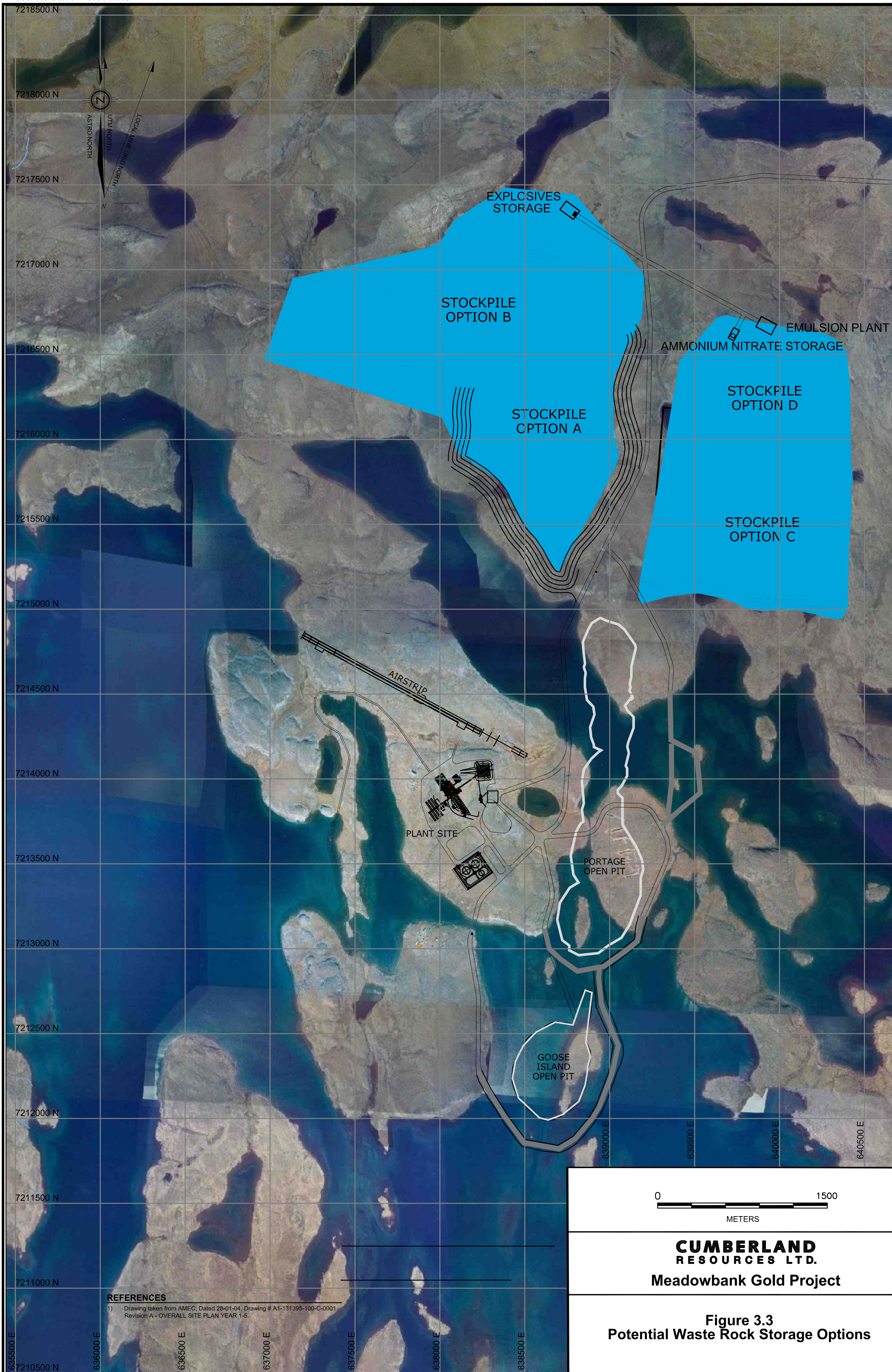
- Option A, north from Second Portage Lake – small footprint
- Option B, northwest from Second Portage Lake – large footprint
- Option C, east from Vault haul road – small footprint
- Option D, east from Vault haul road – large footprint.

These four areas are shown on Figure 3.3.

Site selection criteria included the following:

- the potential for long-term environmental impacts, including ARD generation, metal leaching, and seepage to the underlying groundwater regime
- ease of water management during operation
- ease of decommissioning/closure
- impact on lakes and catchment areas
- visual impact
- suitable footprint to reduce the volume of affected runoff
- potential for geotechnical hazards, such as slope instability and response to seismic activity
- haulage costs.

Source: Golder Associates.



REFERENCES
1) Drawing taken from AMEC, Dated 28-01-04, Drawing # A1-131395-100-C-0001 Revision A - OVERALL SITE PLAN YEAR 1-5.

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Figure 3.3
Potential Waste Rock Storage Options

The options were evaluated using a decision matrix where individual sub-indicators within three key categories—environmental, operational, and cost considerations—were assigned “weight” values based on subjective estimates of their relative importance. In this exercise, overall weighting factors of 50% are assigned to environmental considerations, 30% to operational considerations, and 20% to cost factors for each option.

The options were then allocated a score for each of the evaluation criteria listed above to show the relative difference between options. Weighted scores were derived by multiplying the allocated scores by the individual sub-indicator weighting values and summing the totals. The highest score indicates the most desirable option. On this basis, the preferred location for the rock storage facility in the Portage area is Option A, north of Second Portage Lake with a small footprint.

3.3.2 Vault Waste Rock Storage Facility

There are few suitable locations for a waste rock storage facility near the Vault pit owing to the presence of numerous lakes adjacent to Vault Lake and the lack of topographical relief in the immediate area, which limits the height to which a rock storage facility could be constructed without becoming visible at great distance from the site. In addition, placing waste rock in areas south of Vault Lake would affect a sub-watershed that does not drain toward the Vault open pit.

The area to the north and west of the Vault open pit was selected for a waste rock storage facility.

3.4 TAILINGS STORAGE

Geochemical testing has shown that the tailings will have the potential to generate acidic solutions and to leach metals at neutral pH. Consequently, subaqueous or subaerial deposition, or a combination of the two, is the most suitable method for storage of the tailings in the Arctic environment to encourage permanent freezing. Several potential sites were considered for tailings storage (see Figure 3.4):

- Option A, Second Portage Arm and North Portage pit – subaqueous slurry
- Option B, Second Portage Arm – subaerial paste or drystack
- Option C, Second Portage Arm – subaerial/subaqueous slurry
- Option D, Third Portage Lake – subaqueous slurry
- Option E, east from Vault haul road – subaerial slurry
- Option F, north of Second Portage Arm – subaerial slurry
- Option G, north of Second Portage Arm – subaerial paste or drystack.

The following selection criteria were used to evaluate the potential tailings storage sites:

- sufficient volume to store the planned volume of tailings over the mine life
- ability to accommodate needs for future mine expansion, if required
- catchment drains toward the open pits
- configuration allows the collection and control of supernatant.

Source: Golder Associates

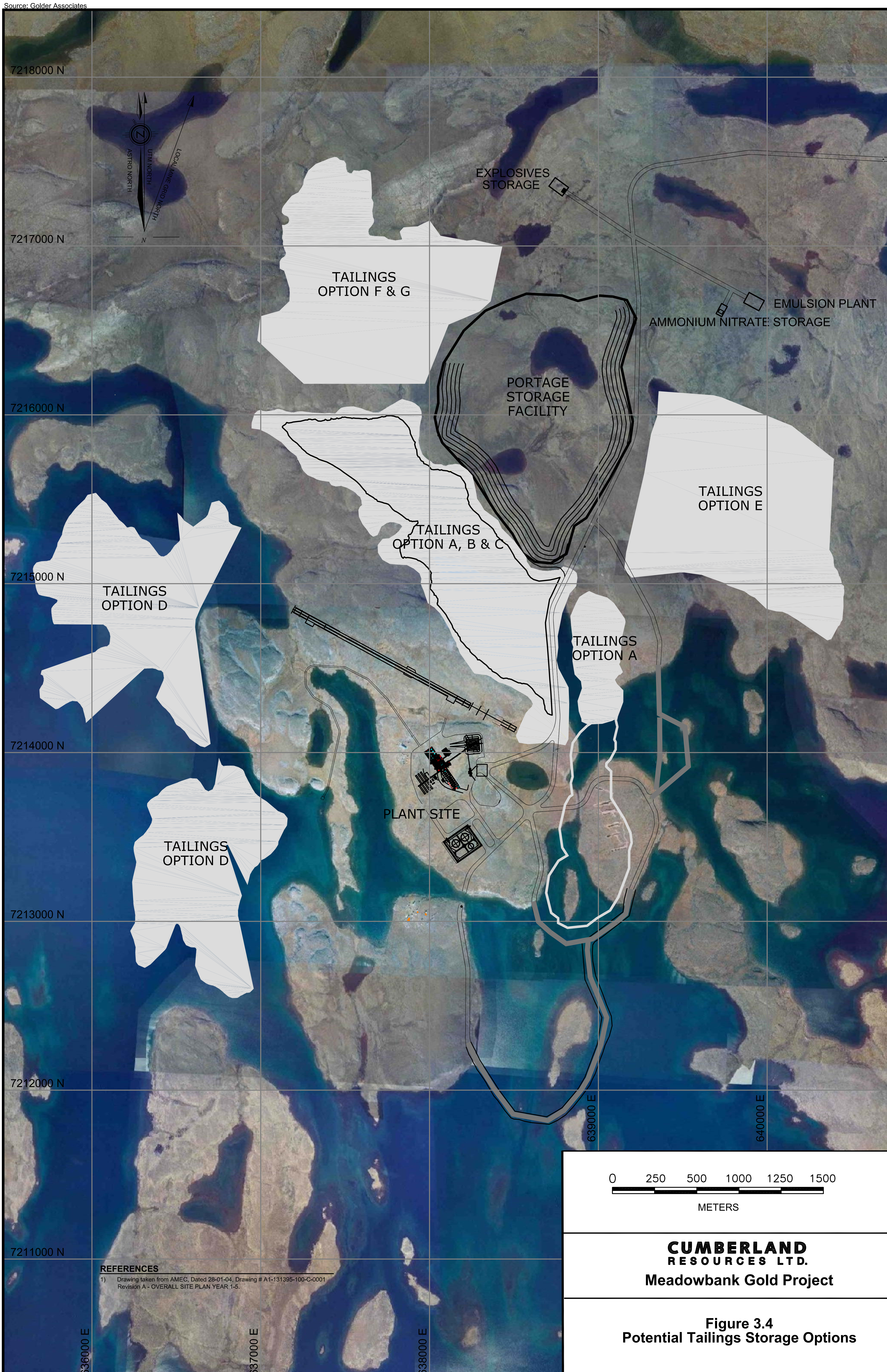

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Figure 3.4
Potential Tailings Storage Options

Similar to the alternatives for the Portage waste rock storage facility, the tailings storage options were evaluated using a decision matrix based on environmental, operational, and cost factors. Options A, D, and E were eliminated initially for not achieving all of the key selection criteria. Of the other alternatives, Option C, slurry disposal in Second Portage Arm, was selected. Option C presents the following main advantages:

- reduced potential for ARD/ML generation
- ease of closure
- ease of operation in the harsh arctic climate
- lowest relative capital cost.

Preliminary thermal modelling indicates that the tailings will eventually freeze completely to the base of the storage impoundment when tailings deposition is complete. The modelling also indicates that permafrost will aggrade into the open talik below Second Portage Arm. Over time, the talik will freeze, which will reduce the potential for long-term seepage to the regional groundwater system.

3.5 AIRSTRIP

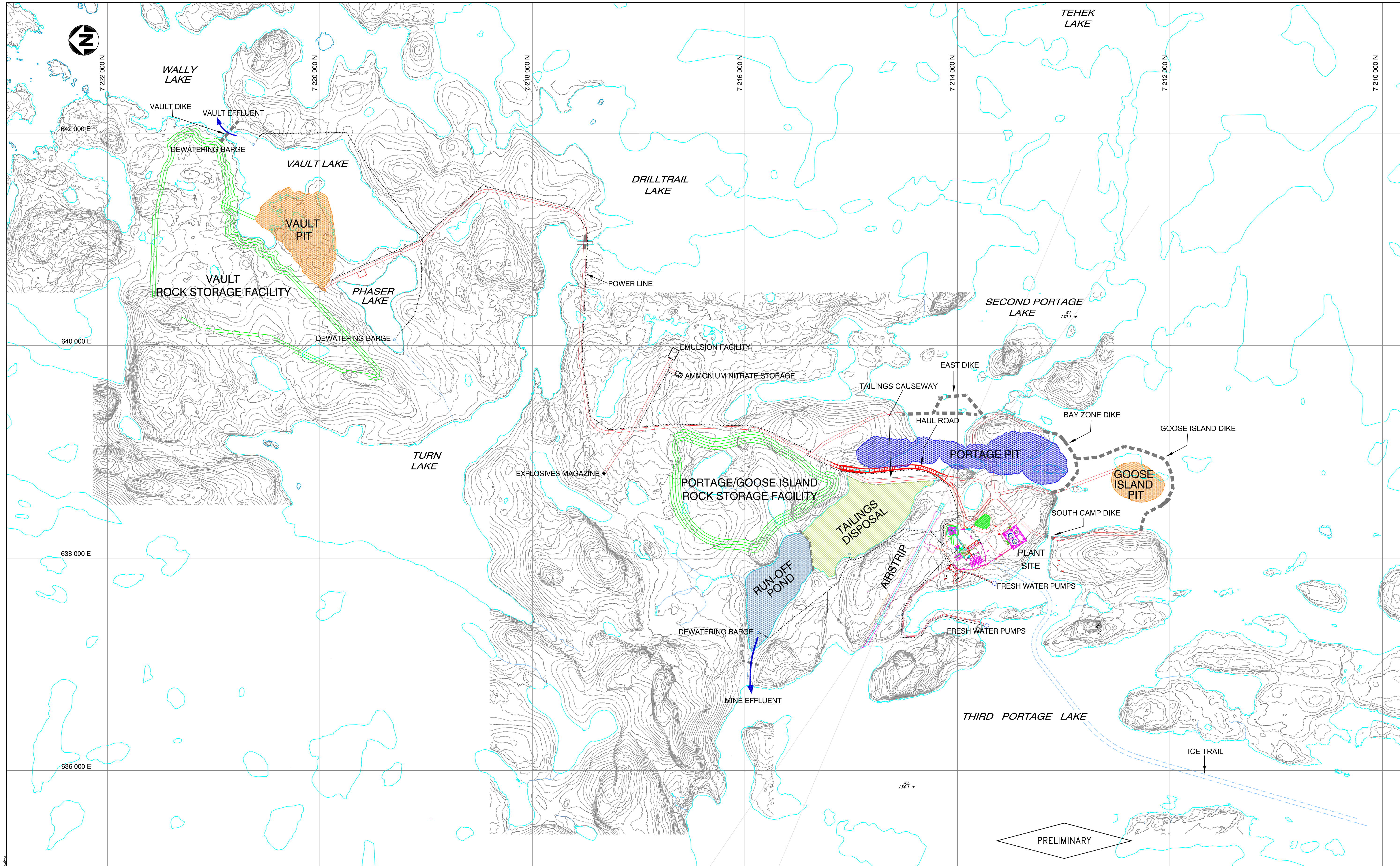
A gravel-surfaced airstrip nominally 1,100 m long x 35 m wide will be required for use by aircraft such as the HS 748 during the first year of development. To accommodate Hercules and 737 aircraft for heavier loads, the strip will be extended to about 1,525 m in length in the second year of construction.

In coordination with the selection of the plant site, two options were considered for the site of the airstrip: one along the isthmus between the northwest arm of Second and Third Portage lakes, and the other along the southwest side of Third Portage Lake. Although the more southern routing requires less cut and fill, it would involve the construction of a roadway crossing over a narrow section in Third Portage Lake. The selected northern alternative, northwest of the plant site, is better aligned with the prevailing wind direction from the northwest and will permit the development of a more compact site with less overall disturbance.

The original alignment of the northern airstrip proposed in the prefeasibility study has been altered somewhat to reduce the amount of cut and fill required. With the current alignment, the initial 1,100 m long strip can be built without impact to Third Portage Lake. To achieve the full length of 1,525 m, however, approximately 198,000 m^3 of fill will to be placed at the west end of the strip, extending into the lake. The design allows the use of PAG mine rock from the Portage pit in airstrip construction. A permanent capping of non-PAG rock from the Portage pit will be placed over the mine rock fill.

3.6 VAULT ROAD ALIGNMENT

The Vault pit is approximately 8 km distant from main project facilities in the Portage area and will be connected to them by a haul road. Road route selection was based on minimizing impacts on waterbodies and avoiding aboriginal burial sites. As such, any alignments requiring a major crossing of Turn Lake were rejected early in the study. The selected route, shown in Figure 3.5, crosses Turn Lake at its narrowest outlet at a point approximately 4.5 km from the plant site, where the water is less than 6 m deep. Other than this crossing, the route avoids major drainages and requires only minor culvert crossings at other watercourses.



0 250 500 750 1000 1250 1500 1750 2000m

Datum: UTM NAD83 Zone 14

Figure 3.5
Vault Road Alignment

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SOURCE: AMEC drawing 100-c000c.dwg

SECTION 4 • MINING METHODS

The prefeasibility study considered a total mining rate of 2,000 t/d from both open pit and underground mining at the Portage and Goose Island deposits. This concept was found to be marginally economic. After further exploration and inclusion of the Vault deposit in the mine plan, throughput was increased to 5,500 t/d for the current feasibility study. Of this amount, the Vault pit will contribute between 1,200 and 1,500 t/d.

Only open-pit mining is contemplated at this time because the reserve grades do not support economical underground development. To ensure the safety of underground mine operations, crown pillars of ore would have to be left in place, resulting in poor resource utilization. Depending on the results of additional exploration, underground mining may be an option for future extraction from deeper sections of the Goose Island and Vault deposits.

The selected size and type of mining equipment take into account the variability of the deposits and the need for flexibility to achieve a steady supply of ore from the various sources. Because of the need for trailing cable and greater difficulty in manoeuvring, electric-powered equipment was rejected in favour of diesel-powered. Diesel-driven equipment is more flexible and is especially suited to the double-bench mining that may be required for operating efficiency in some areas.

For explosives, Cumberland expects to use 50/50 emulsion/ANFO, although this ratio could range from 70/30 to 30/70 depending on the water resistance required. Early conceptual design considered proportions of emulsion as low as 10%, but final design will need to ensure adequate blasting performance while considering the advantages of waste reduction and preservation of water quality (reduced contribution of nitrates to the runoff water).

An assessment of blast-induced vibration (peak particle velocity) and instantaneous pressure change was carried out to estimate the effects of blasting with various charge weights and how they relate to recommended guidelines by the Department of Fisheries and Oceans (DFO). The assessment indicated that, with the exception of a short segment of the Third Portage pit wall and some sections at the south end of the realigned Goose Island dike, conventional blast designs can be used without exceeding the peak particle velocity guideline. Where the guideline would be exceeded, the blast design could be modified or additional fill materials placed along the shoreline or upstream face (lake side) of the dike for more protection. As an alternative, 3 m high benches with 76 mm blastholes could be used for both ore and waste rock in sensitive areas or within an ore zone where grade control is essential. While this would result in lighter charge weights and hence lower vibration levels, more blasts would be required each day to move the required amount of material to meet the plant feed tonnage.

With regard to threshold damage levels for structures, the blasting assessment determined that blast design modification could successfully reduce vibration levels as necessary where the guidelines would otherwise be exceeded.

Instantaneous pressure change along the upstream face of the dikes is predicted to be less than the DFO guideline for all charge weights currently being considered for the Meadowbank project.

It should be noted that the Vault dike was not considered in these analyses. The Vault dike lies about 750 m from the nearest crest of the Vault pit. Consequently, the proposed bench configurations and charge weights will not exceed the guidelines for blast-induced vibration or instantaneous pressure change.

SECTION 5 • PIT DEWATERING DIKES

The Portage, Goose Island, and Vault deposits are all partially overlain by lakes, and perimeter water-retaining dikes must be constructed to permit mining operations. Dike configurations have evolved as the pit limits have become better defined. For the most part, dike alignments have been selected to minimize dike height by connecting shallow sections of lake floor. More recent study has shown that additional shallow diking will be required around the south end of the Portage pit as mining extends into that area.

Similar to the other dikes, the Goose Island dike will generally be constructed in water depths of 4 to 6 m, though in deeper water along the east-southeast segment of the dike, reaching up to 20 m at the lake-side toe of the dike and about 16 m at the dike centreline. Maximum water depths along the west-southwest segment will reach water depths of up to about 12 m. Dewatering dike locations are shown in Figure 5.1.

Construction in areas of deeper water will be deferred until experience with materials and techniques has been acquired in the initial years. Construction of the deeper dike sections is scheduled over several years to ensure that the types of rock material required are available from the open pits.

The prefeasibility designs for the dewatering dikes endeavoured to use available mine waste rock and considered various alternatives for seepage control, such as the use of glacial till soil (available in limited supply across the pit area), geosynthetic clay liners, and slurry or sheet-pile cutoff walls. Various embankment geometries suited to the depth of water and combination of materials were evaluated.

It was concluded that a till core combined with a soil-bentonite cutoff wall would be both effective and economical compared to a crushed rock core with slurry cutoff wall. The preferred option makes use of available stripped material and eliminates the need for crushing and quarrying. The recommended configuration is two parallel rockfill embankments with a core of glacial till, with a soil-bentonite cutoff wall excavated through the till core and foundation materials to bedrock.

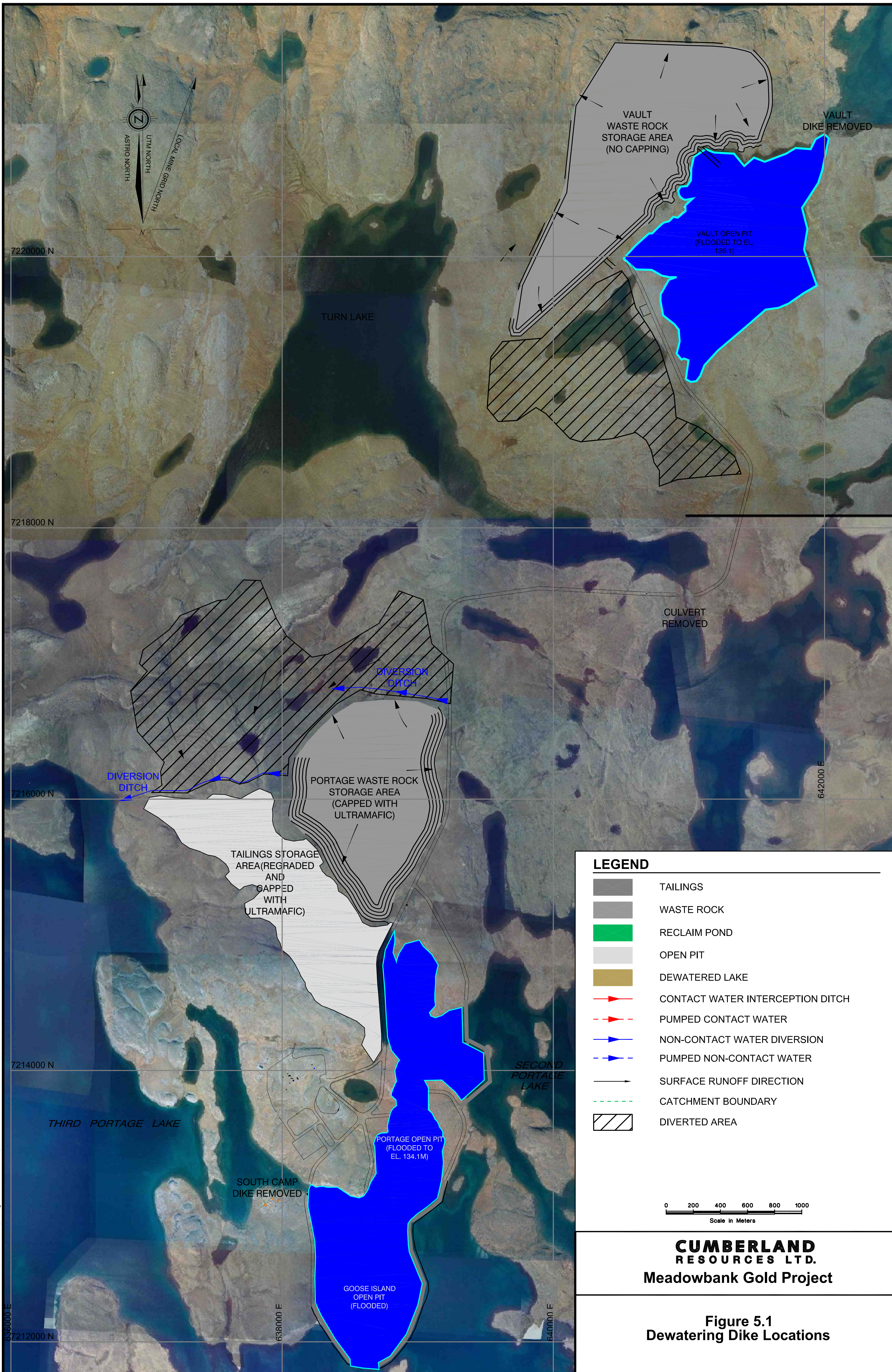

Figure 5.1
Dewatering Dike Locations

SECTION 6 • PROCESS SELECTION

6.1 GOLD RECOVERY

Comparative scoping level capital cost estimates were developed for three process flowsheet options based on a plant throughput of 5,500 t/d:

- Base Case – whole ore leaching
- Option 1 – flotation concentrate leach
- Option 2 – flotation concentrate and tailings leach.

The trade-off study indicated that the Meadowbank deposits are more economically amenable to whole ore cyanidation than to the more-complex bulk sulphide flotation and concentrate cyanidation flowsheet used in the prefeasibility study. Subsequently, whole ore cyanidation was selected as the basis for the current feasibility study. A simplified flow diagram is shown in Figure 6.1.

The selected gold recovery process uses a traditional cyanide leach process, which generates a cyanide concentration of approximately 200 mg/L cyanide in solution, following the recovery of precious metals. The cyanide content of the process solutions will be reduced to approximately 2 to 5 mg/L using a patented INCO SO_2/air process. Because of the short- to mid-term residual reactivity resulting from the destruction process, solutions from cyanide destruction cannot be recycled immediately. The process solutions must be aged for complete cyanide destruction and to reduce chemical oxygen demand. The aging process is expected to require up to two months in a natural setting, a timeframe consistent with those at other gold processing operations that use this approach. The large inventory of solution will also provide a form of “chemical inertia” to the recirculating process water chemistry and reduce the impact of variable sulphide mineralogy within the mined ores. It has been shown that changes in solution chemistry can affect the overall extraction of gold from the ores, owing to the presence of oxidation products from the sulphide mineral phase when present in high concentrations.

6.2 TAILINGS DISPOSAL

Three scenarios were considered for the deposition and storage of ground tailings from the gold recovery and cyanide recovery processes:

- filtering out the process tailings solids and stacking the resulting filter cake into tailings piles
- thickening/filtering the tailings slurry to a very high density, disposing of the resulting slurry without solution recovery, and recycling the filtrate solutions
- directly placing the tailings slurry either subaerially or subaqueously within an impoundment to permit solids to settle and process solutions to decant for re-use.

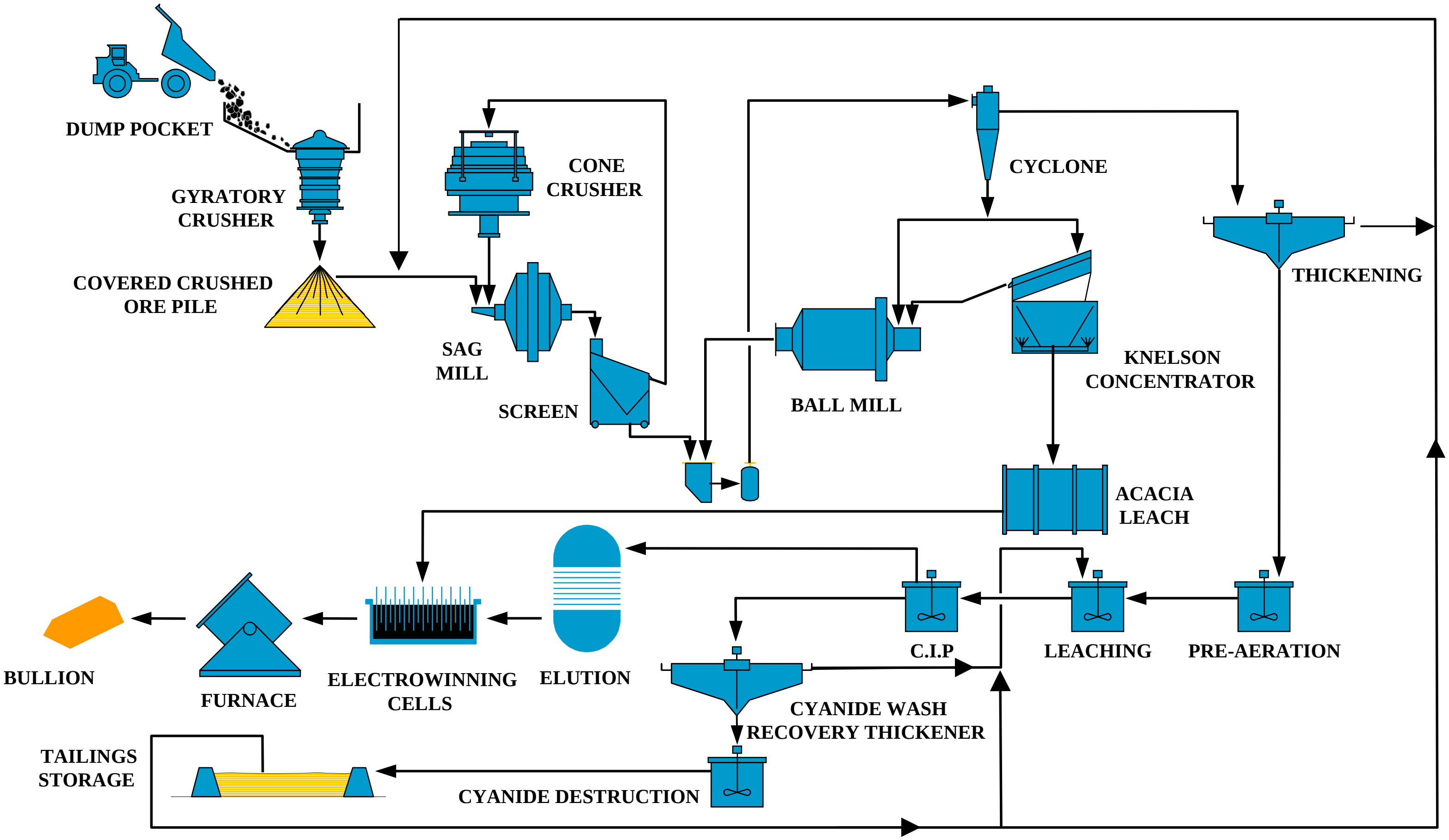

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Figure 6.1
Process Flowsheet

In all three scenarios, a pond of process solution would need to be maintained to provide sufficient aging and volumes of stored process water. In the third option, process solids and process solutions would be stored within the same facility. In the first two options, the solids would be placed and stored separately from the process solutions; the impact on closure would be far greater than for the combined placement concept in option 3 because of the space required for the separate types of storage.

The option of combined tailings solution and solids placement has been selected for the feasibility study. The process would operate at a solids concentration of 45% to 55% (by weight), which corresponds to the product stream from the gold recovery plant. Recycling the solutions will allow for management of water quality within the process and minimize the impact of any process solution spillage on the surrounding surface and groundwater.

SECTION 7 • WATER MANAGEMENT & TREATMENT

A staged water management strategy has been designed for the Meadowbank project (central Portage mining area). The strategy is based on the use of Second Portage Arm (see Figure 7.1) for the tailings storage facility. Initially, the eastern end of Second Portage Arm will be used for tailings discharge, the central area will serve as a reclaim pond, and the western end will be used as a stormwater attenuation pond. By about Year 5 of mining, the eastern end will have become filled with tailings and deposition will advance to the centre, leaving the western section for the combined storage of both stormwater and tailings reclaim water for the rest of the mine life.

To examine alternatives and predict water quality in the various streams on site, a water balance simulation model was created for the property. The model recalculates the balance for each month of the project life by incorporating predicted changes in site conditions with season as well as those owing to the progress of mining and processing. The model is currently being used to assess the need to establish a water treatment plant for discharges from the combined attenuation and tailings reclaim water from Year 5 and onwards.

The type of treatment will depend on the quality of water to be discharged. Preliminary analysis indicates that levels of dissolved copper, zinc, and nickel may be elevated and need to be removed through a lime treatment process. Another possibility is to collect the storm runoff water separately and pump it to Third Portage Bay, west of the plant site, after Year 5 to serve as a settling pond. Having no contact with the tailings slurry or reclaim water, the runoff water may not need to be treated before discharge, reducing capital and operating costs. Further laboratory testing is required before design is finalized.

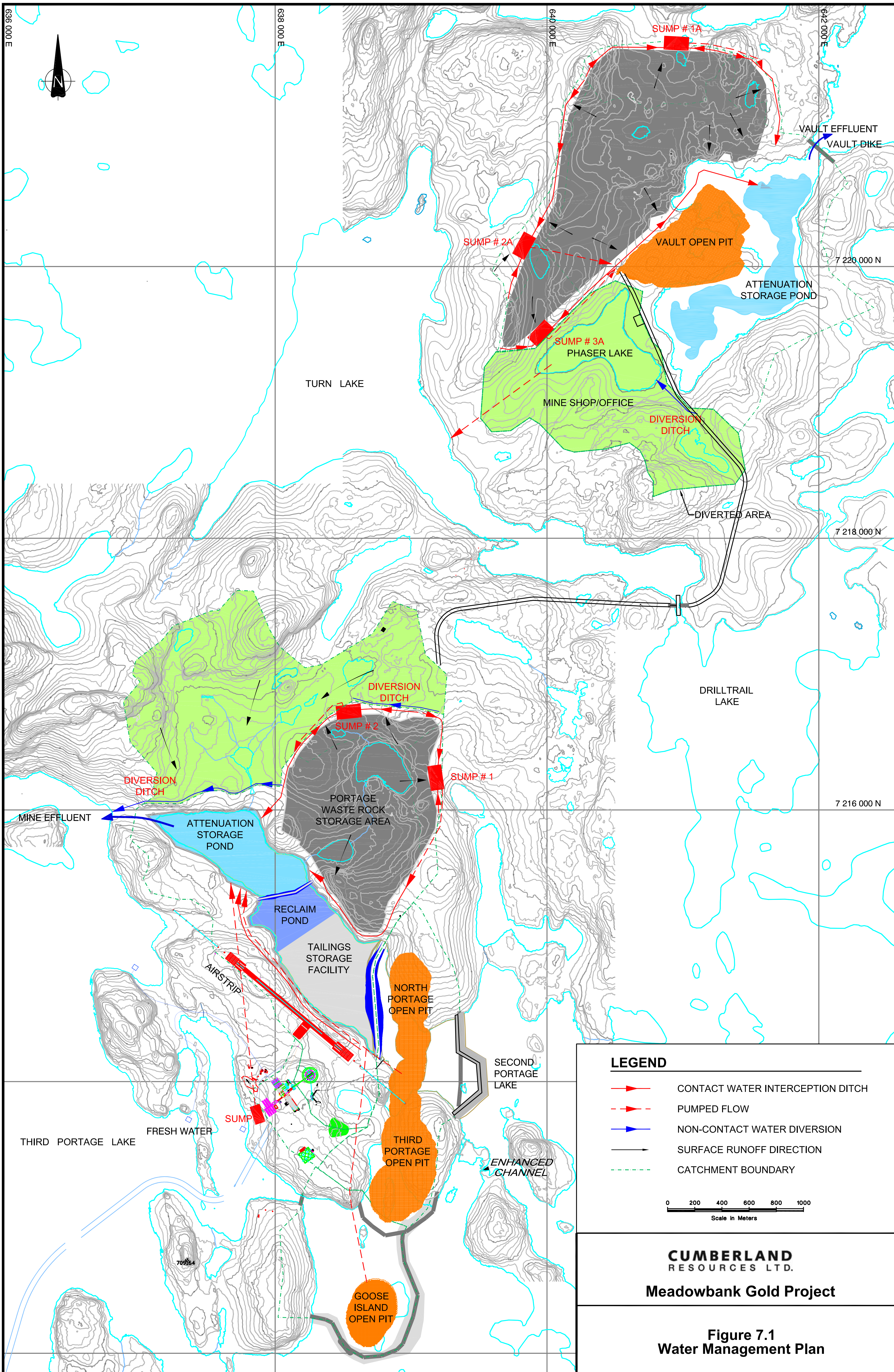


Figure 7.1
Water Management Plan

SECTION 8 • WORKFORCE CONSIDERATIONS

The Meadowbank project is being planned as a fly-in/fly-out mining operation, similar to other northern mines such as Lupin, Diavik, Ekati, and Polaris. On-site accommodations will be provided for approximately 250 people on bi-weekly rotations. Personnel will be transported to and from site by air service. The community of Thompson, Manitoba, is currently considered the point of origin for personnel based in the South and for air freight. Some smaller aircraft may be used to transport mine personnel residing in local northern communities where suitable commercial air service is not available.

Negotiations for the Inuit Impact and Benefit Agreement (IIBA) are ongoing and address some of the following opportunities:

- jobs
- training
- preferential hiring programs
- project financing
- new business and contract arrangements
- participation in monitoring activities and dispute resolution.

To the extent that workers can be hired from the local population, fly-in/fly-out arrangements could be scaled back. During the 2002 field season, Cumberland was one of the largest private employers in Baker Lake, with local residents comprising 54% of the project's workforce. Similar employment averages have been maintained since 1995, when exploration activities began.

SECTION 9 • ENERGY SOURCES

Typically and traditionally, remote northern mining projects use on-site, diesel-generated power for electrical supply unless they are close to a grid supply (within 100 km). This is usually based on considerations of proven technology, reliability, cost, and practicality. In the case of the Meadowbank project, the nearest grid is far to the south. Power for the community of Baker Lake itself is in fact supplied from diesel gensets.

Other recent projects in northern Canada have considered wind, solar, and hydrogen fuel cell technologies but have found them to be lacking, even as supplemental sources to reduce diesel consumption and attendant air emissions. Alternative energy sources are briefly discussed below.

9.1 WIND POWER

This technology generally involves relatively high capital costs and is only effective under very specific wind conditions. The key parameter is sustained average wind speed: speeds above 8 m/s are deemed excellent and those below 4 m/s unacceptable. Wind speed at the Meadowbank site is variable and averages 4.8 m/s annually to a height of 10 m above the ground and slightly greater above 10 m (note that "average" is not necessarily "sustained"). At Baker Lake, the average wind speed is 5.9 m/s.

Wind power offers no significant economic advantages for the Meadowbank project because the variable wind speeds would not meet the steady demand of the process plant and related facilities. The only gains would be small reductions in air emissions associated with a limited wind power installation to supplement diesel-based power generation.

9.2 SOLAR

Conversion of solar radiation to electrical power or for use in direct heat exchange tends to be expensive and to have minimal benefit in winter months. Some limited use of solar heat exchange for building heating may be feasible in the spring and fall. This could be investigated during detailed design if the other anticipated sources of waste heat prove to be unavailable or inadequate.

9.3 HYDROGEN

Although hydrogen fuel cells are emission free, the technology is not yet proven and the costs are very high, particularly for remote sites. In addition, an economic source of hydrogen would need to be identified.

9.4 HYDROELECTRIC POWER

In spite of the potential advantages to the project of this type of power supply, no suitable site has been identified for the establishment of hydroelectric power-generating facilities.

9.5 OPTIONS TO REDUCE POWER CONSUMPTION

The project is designed to limit power use, diesel consumption, air emissions, and costs. Design concepts to further these objectives are listed below.

- use glycol heat exchangers to convert heat extracted from the diesel generating sets for heating buildings
- heat the process plant complex with excess heat generated by the process equipment
- minimize power losses and waste by using automated power plant management controls
- generally use high-efficiency electric motors
- use high-efficiency lighting such as metal halide lamps
- monitor and control building heating.

These and other refinements will be adopted as detail design proceeds.

SECTION 10 • TRANSPORTATION

Cumberland has considered various options for shipping project consumables to site. These materials will consist predominantly of diesel fuel and process supplies such as steel and reagents. Transport alternatives all generally consist of shipping during summer months from southern ports to a location in the vicinity of Baker Lake, followed by overland forwarding to site during winter (see Figure 10.1).

10.1 SUMMER SHIPPING OPTIONS

The prefeasibility study evaluated shipping options from eastern ports and also from southern railheads. Four options were considered and compared:

- *Deception Bay* – Use nickel ore carriers from the Raglan project to backhaul supplies, with transshipment at Deception Bay and onward shipment by tug and barge to Baker Lake. This option was not deemed suitable by the shipping companies that were approached for options and pricing.

- *Rankin Inlet* – Use a deep-sea shipping service from eastern ports to a future common user dock and storage facility at Melvin Bay, with tug and barge shipment to Baker Lake. This option was discounted because there is no firm indication that the required facility would be built in time to service the project.

- *Chesterfield Inlet (Schooner Harbour)* – Use deep-sea shipping to an anchorage in Schooner Harbour with lightering up Chesterfield Inlet by tug and barge. This would be less efficient and cost effective than direct barge shipment to Baker Lake because no trans-shipment facilities are available, and Chesterfield Inlet is distant (approximately 170 miles east) from Baker Lake.

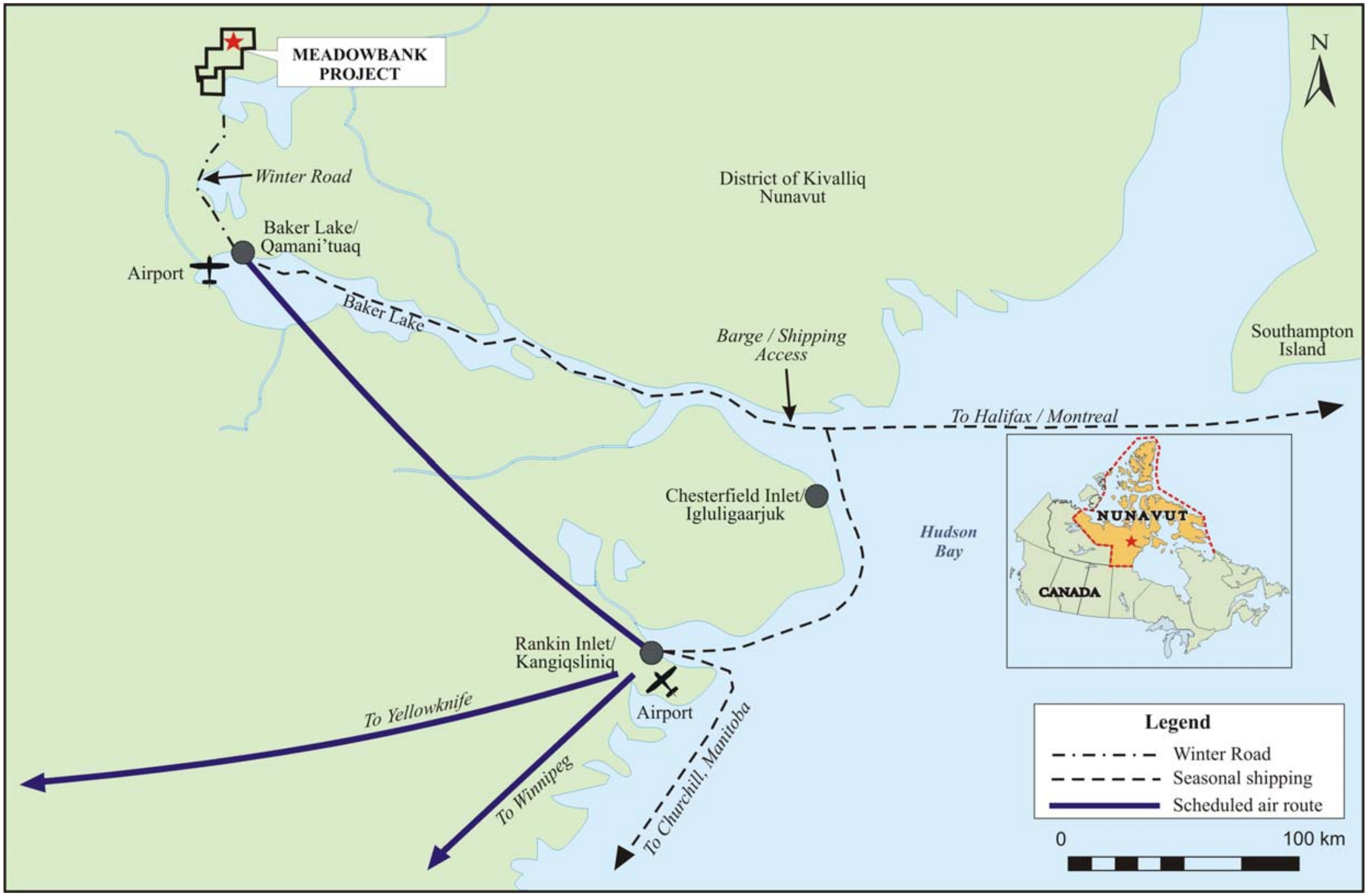
- *Direct Tug & Barge Service* – Use a 6,000 to 8,000 DWT barge from Montreal or Halifax through Chesterfield Inlet to Baker Lake. At high water, a barge should be capable of carrying about 6,000 tonnes of cargo safely through the most constrained part of the inlet. Chesterfield Inlet is a 124 mile long, salt-water channel typically used by shallow draft barges and small vessels but not by deep-sea vessels. Depending on the type of vessel used and whether it is ice-strengthened, the shipping season ranges from about 2.5 months to 4 months.

Based on the pricing and equipment availability enquiries conducted for the prefeasibility study, direct shipping using adapted tug and barge equipment is considered the best option for the project.

10.2 WINTER OVERLAND HAULAGE TO SITE

Annual re-supply requirements at the mine site are estimated to be 20,000 to 30,000 tonnes, including 10,000 to 15,000 tonnes of process and mining consumables (reagents, tires, lubricants, mill steel, explosives). Options for haulage during winter from temporary storage at Baker Lake were investigated by soliciting budget quotes from experienced northern logistics companies. Two fundamental options are evident:

Figure 10.1: Marine & Overland Transportation Options



- use of tractor-trailer units on a maintained ice road
- all-terrain tracked or low-pressure-tired equipment towing trailers or sleds.

Tractor-trailers have been used to haul large volumes of freight and fuel over ice roads to service several large during construction projects and operations. For example, Robinson Enterprises Limited hauled more than 100 ML of fuel and 20,000 tonnes of dry goods over ice roads in 1997. Conventional trucks have been used for winter road haulage out of centres such as Yellowknife for several decades; these haulage fleets demobilize each season for southern use.

In 1993 and 1994 an experimental winter road was constructed between Rankin Inlet and Arviat. Maintaining driveable conditions was found to be very difficult because of snow drifting. Consequently, concern has been expressed that winter road construction and operation between Baker Lake and the Meadowbank site may not be feasible given the commonly inclement winter conditions. Balloon-tired, all-terrain articulated trucks have been used successfully in the vicinity of Baker Lake for the last 20 years or so, and have the advantage of not requiring a cleared roadway. While these vehicles are slower and considerably more expensive to purchase, minimal additional equipment and effort is needed to form and maintain a trafficable trail.

Two transportation contractors provided detailed plans and pricing for operating tractor-trailers or a fleet of all-terrain trucks over a conventional winter road, both following the same route from Baker Lake to Meadowbank. In both cases the transportation fleet would remain captive at Baker Lake from year to year. The comparison is detailed in Table 10.1.

It has been concluded that winter transportation is feasible and can be performed by either method at comparable cost, similar to other northern projects. No environmental or other technical fatal flaws have been identified. Other factors such as the long-term benefit to the community through employment and training appear to favour the locally based proponent operating over a longer period with a larger workforce. However, it should be noted that non-local companies have stated their intention to work with local partners and labour to the maximum practical extent.

Selection of the ATV option would appear to commit Cumberland to a sustained effort of training and motivating the local workforce to perform at the assumed level of productivity. The community will undoubtedly benefit. Further consultation may be helpful to plan strategies for training and operations and to establish procedures for monitoring their performance during the 2004 winter haulage. Alternatively, the contract may call for maximizing use of the local labour force and long-term benefit to the community, without specifying the type of equipment to be used.

Table 10.1: Tractor-Trailer vs. All-Terrain Vehicle Operations – Winter Road

Aspect	Tractor-Trailer	All-Terrain Vehicle	Comment
Technical	28 day preparation and 75 day haulage	135 day haulage season	Tractor-trailer option requires support fleet, so shorter season is desirable to reduce operating costs
	Method well precedented at planned scale	Little precedent at planned scale	No fundamental reason for ATV not to succeed
	Experienced companies available and credible	Local operators need to build infrastructure and demonstrate management capability	2004 advanced exploration will test ATV and locally based operator further
Cost	Similar within 10%		Comparable to other projects/estimates
Environmental	Quote based on building snow/ice base over portages	Same approach	No permanent roadway construction across portages
	Risk of accidents and spills may be higher due to higher speed	Risk of mishaps/spills due to operation in poor visibility difficult to quantify but considered significant	Likely to be mitigated through good training and management for both options
	Shorter season may reduce effects on terrain	Longer period to mid-May may affect thaw and vegetation response	No reported effects of limited ATV operations in recent years
	Uses ½ the fuel of alternate	Uses 2 times the fuel of alternate	May be a significant difference in air pollution
	Wide roadway likely affects/influences fauna movements	Narrower, somewhat less distinct track may have less adverse impact on fauna	
Community	Fewer work-hours	More work-hours, longer period of winter operations	
	Smaller proportion of local labour hire	Relatively high use of local labour	Both depend on availability of trained staff
Regulatory	Likely more regulatory process required to permit	Local operator possesses permit for current level of ops; may be easier to scale up	CRL must verify PEL claim that sufficient permitting is in place for full scale operation
Overall Benefit	Less employment and less synergy with current methods of transport in region	Higher employment and more synergy	Assumedoverall cost is similar for both quotes at current level of accuracy