SECTION 2 • PROJECT DESCRIPTION

2.1 PROJECT LOCATION, RESOURCES & ACCESS

2.1.1 Location

The Meadowbank Gold project is located approximately 70 km north of the Hamlet of Baker Lake, Nunavut, in the District of Kivalliq. Proposed mining facilities are located at latitude N65°01'11" and longitude W96°04'00" on National Topographic Series map 66H/1 (UTM = Zone14 637815E, 7212850N, NAD 27). These proposed mine facilities are situated on a peninsula between Second and Third Portage Lakes, approximately 3 km west of the western shores of Tehek Lake (see Figure 2.1). The project resources include five known gold deposits, of which four deposits—North Portage, Third Portage, Bay Zone, and Goose Island are located within 2 km of the proposed mine facilities. A fifth gold deposit, called Vault, is located approximately 5 km north of the proposed mine facilities.

Mineral tenure covers 28,888 ha and includes ten grandfathered Federal mining leases and three exploration concessions from Nunavut Tunngavik Inc. (NTI). Cumberland is the sole owner and operator of the project

2.1.2 Resources & Reserves

A Prefeasibility Study completed by MRDI Canada in May 2000 estimated 2.07 million ounces gold hosted in the four closely spaced deposits located on the on the Federal mining leases. Subsequently, the 2000 exploration program discovered an additional deposit, the Vault, on NTI exploration concession BL14-99-01 near Third Portage Lake (see Figure 2.2). The discovery of the Vault deposit increased the total estimated resources by approximately 50% to 3.08 million ounces and allowed Cumberland to increase the planned mine size and throughput. A summary of 2002 resources is shown in Table 2.1.

Table 2.1: 2002 Meadowbank Resources (all deposits)

Resources*		Contained Ounces of Gold
Measured & Indicated	7,775,000 t grading 5.79 g/t	1,447,300
Inferred	10,937,000 t grading 4.44 g/t	1,561,200

*All resources estimated by MRDI Canada (see March 2000 release NR00-02 and October 2001 release NR01-06). Classification conforms to CIM Standards on Mineral Resources and Reserves (August 2000). Mineral resources that are not reserves do not have demonstrated economic viability.

Cumberland anticipates both increases and improved quality of resource will result from extensive drilling activities (150 drill holes in 16,000 m) completed in 2003. Revisions to resource estimates are expected to be completed in April 2003.

Prefeasibility studies, completed in May 2000, identified a significant portion of the Meadowbank resources to have suitable confidence and economic constraints to satisfy the conditions for a mineral

Figure 2.1: Meadowbank Project Location within Nunavut

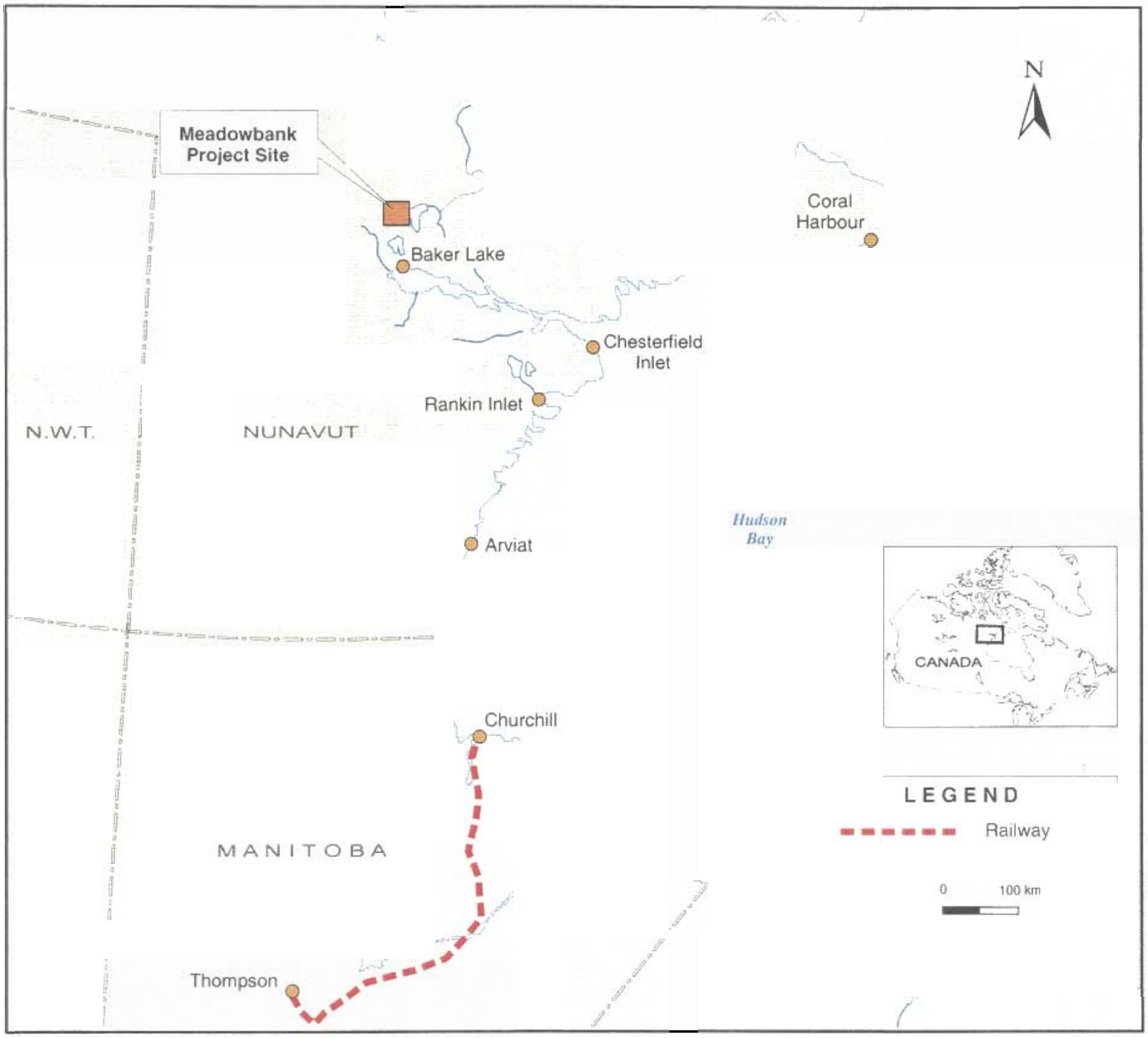
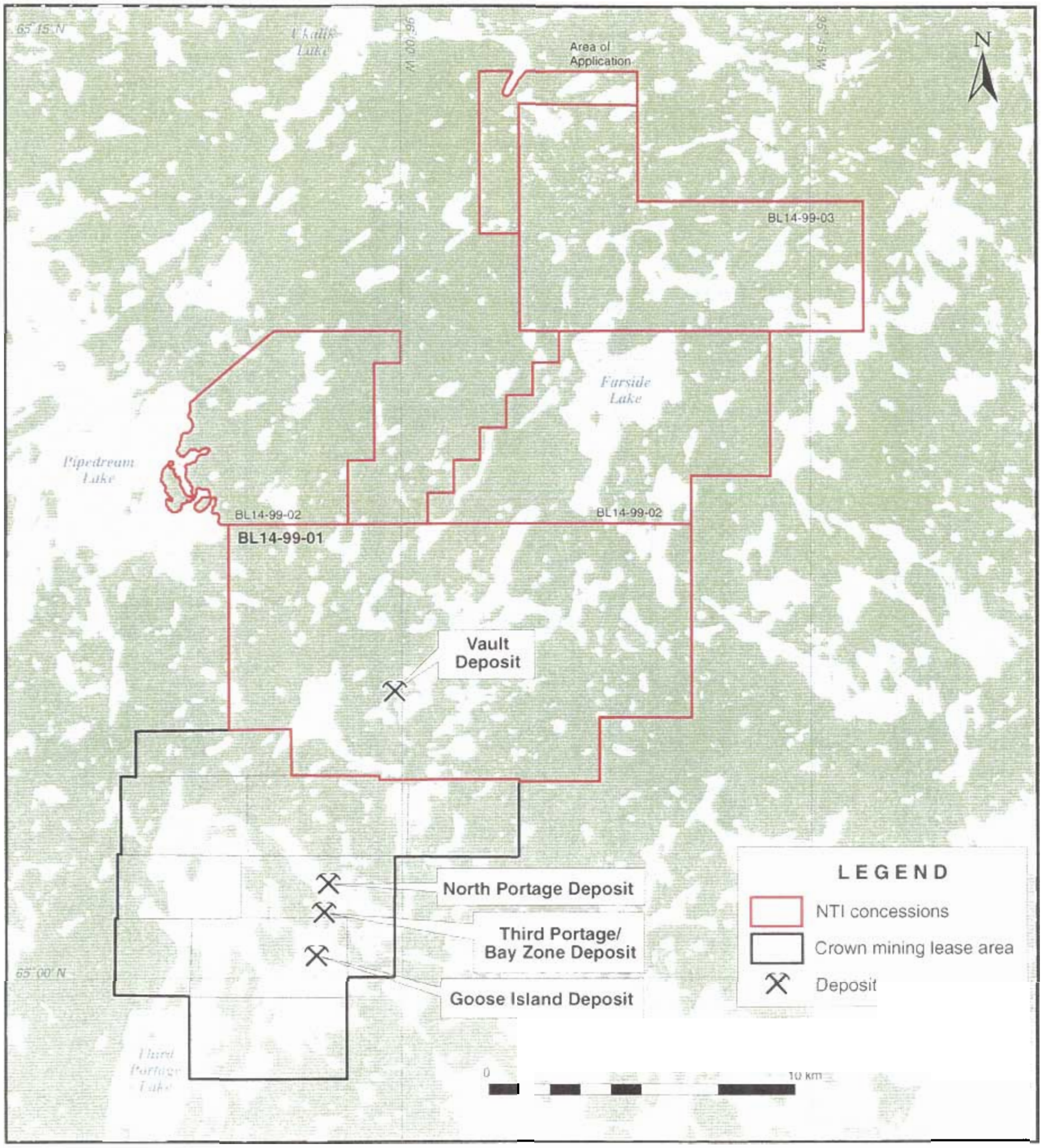


Figure 2.2: Land Position including the Vault Deposit



reserve. The mineral reserves presently outlined at Meadowbank are entirely within the prefeasibility open pit mine designs at the Third Portage/Bay Zone deposits and the Goose Island Deposit and are thus classified as open pit reserves. Given the current planned production profile of approximately 250,000 ounces gold per year, reserves presently outlined will provide sufficient ore for approximately 3.2 years of production (based on a 2000 reserve estimate prepared by MRDI wherein proven and probable reserves were estimated to be 5.502 Mt at a grade of 5.44 g/t for 963,000 contained ounces of gold). Additions to project reserves as a result of 2002/2003 drilling initiatives will be a concluding component of the Feasibility Study.

2.1.3 Access

The Meadowbank project is located in a remote northern location. As such, the project is planned as a "fly-in/fly-out" mining operation, similar to other northern mines such as Lupin, Diavik, Ekati, and Polaris, with on-site accommodations for 250 persons and bi-weekly rotations. Personnel will be transported to and from site by air service. The community of Thompson, Manitoba is currently considered as a point of origin for southern personnel and 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. A 1,650 m long x 50 m wide airstrip will be built at the site to accommodate aircraft such as the Hawker Siddley 748.

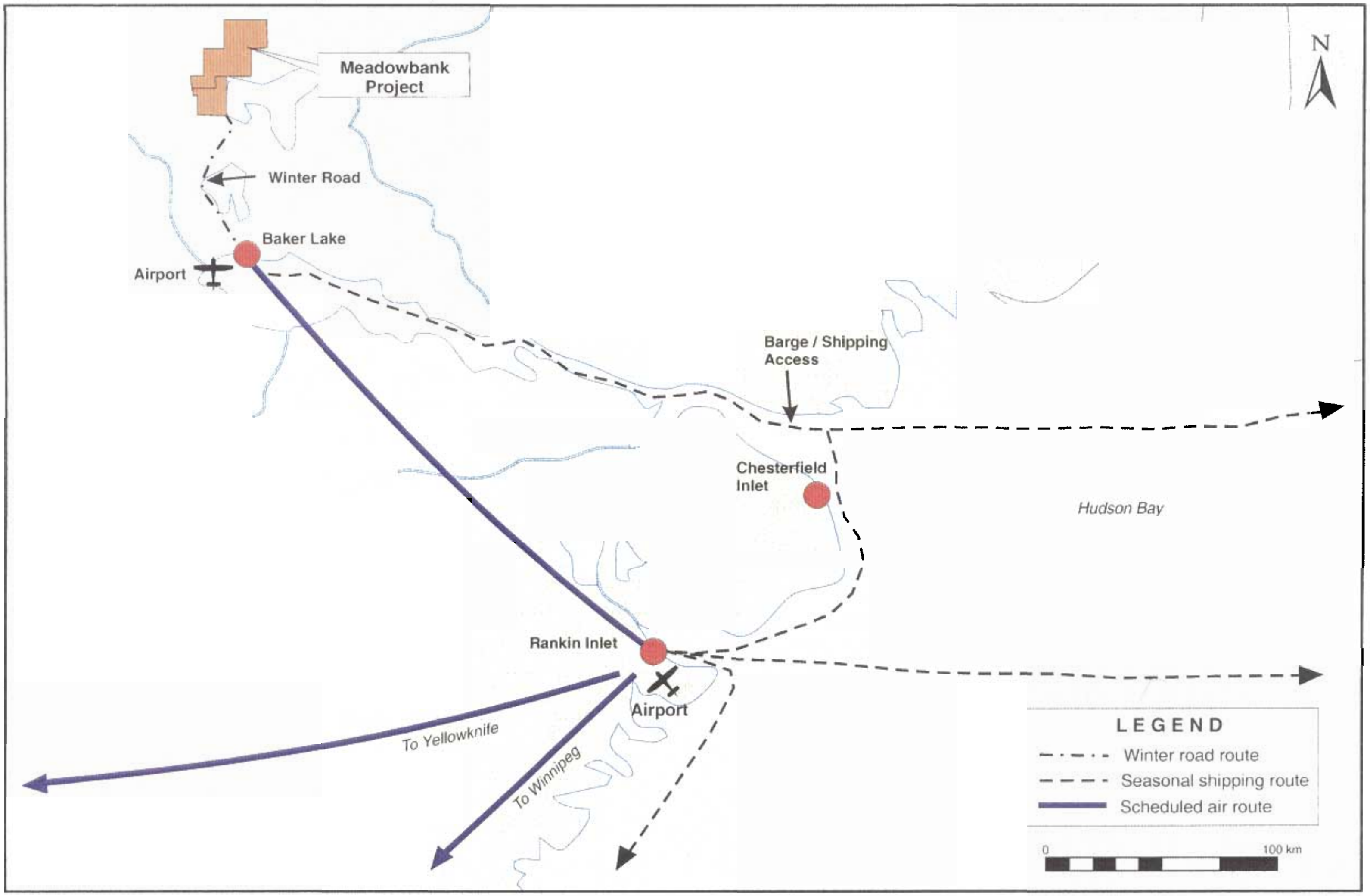
The site will be accessible by land during the winter months only. A planned 92 km long winter haulage route will begin at the storage compound in Baker Lake (for more information on Baker Lake, see Section 4.3) and enter the site southeast of the mine facilities. The winter haulage route will be required for use approximately two months of each year, however, up to four months may be available, depending on seasonal conditions.

Materials and supplies will be barged to Baker Lake, for marshalling and storage until transported to the site over the winter haulage route. Cumberland is currently considering two methods of winter haulage including a typical winter road using highway haulers (similar to those operated by the diamond and gold mines in the Northwest Territories) and the use of all-terrain freight haulers currently in use at Baker Lake. Both transportation considerations will utilize the same planned winter haulage route.

Unlike highway haulers, all-terrain freighters run with large, low ground pressure tires on top of the snow. The land disturbance associated with portage preparation for typical winter road construction is not necessary with all terrain freight carriers, nor are graders and dozers required to maintain the road and remove drifting snow. There will consequently be minimal impact and minimal reclamation associated with this style of transportation infrastructure. Trade-off analysis of both methods of transportation is an integral part of the feasibility study

Site access routes are shown on Figure 2.3. Permanent, on-site mine access roads will be constructed of suitable materials. The roads will connect the open pit areas with the plant, water retention dykes, freshwater pump station, tailings line and discharge point, explosives storage and manufacturing plant, designated waste storage areas, and the airstrip. A 7 km long, two-lane wide haul road will be built to connect the Vault deposit with the process plant and main mining facilities. Roads will not be bermed to minimize snow drifting problems.

Figure 2.3: Site Access & Transportation Options



2.2 PROJECT HISTORY

1987	Prospectors first discover gold occurrences at Meadowbank.
1995	Cumberland purchases a 60% interest in the project from Asamera Minerals and becomes the operator of a 60/40 joint venture with Comaplex Minerals Corp. Exploration drilling, baseline environmental studies and geotechnical, metallurgical and mine engineering studies begin.
1997	Extensive drilling in 1997 and 1998 increased the resources on the property from 200,000 ounces of gold to 1.5 M oz. Cumberland acquires Comaplex Minerals' 40% interest in the project and becomes the sole owner/operator of the project. Geotechnical, metallurgical and environmental studies continue.
1998	Prefeasibility engineering and environmental studies continue through 1998 and 1999. Diamond drilling and surface "trench" style excavations of the Third Portage deposit is completed.
1999	Additional diamond drilling continues to expand resources. A regional prospecting program is conducted to reassess the area to the north of the known deposits. This confirms the existence of two mineralized trends.
2000	Cumberland acquires three mineral exploration concessions within IOL parcel BL-14. These concessions are contiguous with the original crown leases that host the original three gold deposits.
	A prefeasibility study and independent resource evaluation identifies a resource of 11.24 Mt grading 5.73 g/t, including proven/probable open pit reserves of 5.5 Mt grading 5.44 g/t (933,000 oz). Projected total cash costs average US$196/oz Au, with resources sufficient for approximately eight years of production at 160,000 oz/a. The study concludes that either additional resources or an increase in gold price is required for economic viability.
	Continued exploration results in the discovery of the Vault deposit, which is further expanded by drilling in 2001. An independent evaluation returns an inferred resource for the deposit of 7.47 Mt grading 3.90 g/t, based on 6,158 of drilling in 42 holes.
2001	By the end of 2001, the total resource for the Meadowbank project stands at 3.01 M ounces gold. An economic study is initiated to assess the impact of the 50% resource addition represented by the Vault deposit. This study projects a total cash operating cost of US$168/oz, with current resources sufficient for 8.3 years of production at 246,000 oz/yr using a long-term gold price of US$300.
2002	In 2002, 16,000 m of diamond drilling, a reverse-circulation drill program of 411 holes, and continued geological mapping and prospecting is completed. Environmental, metallurgical and geotechnical programs are advanced towards feasibility levels. Diamond drilling during 2002 focused on expanding and further defining the existing deposits at Meadowbank, and targeting areas outside the known deposits with exploration drilling. A total of 150 diamond drill holes were completed. Feasibility studies commenced in January 2003.

2.3 PROJECT SCHEDULE

Completion of feasibility studies and the regulatory approval process in a timely fashion is crucial to project scheduling, financing, and development. They directly influence not only when the project can proceed into construction, but also the logistics and activities required prior to construction start-up. Due to the lack of infrastructure and the seasonal access to the proposed site, timely procurement of supplies and services, and efficient shipping and handling of equipment and supplies is required. The detailed scheduling of all construction and preproduction activities will be essential to ensure a successful project without major delays and additional cost.

Project milestones are shown in Table 2.2 and Figures 2.4 and 2.5. A brief description of the major schedule components follows.

Table 2.2: Milestone Schedule

Milestone	Date
Feasibility study	Jan 2003 to Dec 2003
Permitting	Jan 2003 to May 2004
Procurement	Jun 2004 to Jun 2006
Construction	Mar 2005 to Dec 2006
Pre-stripping (construction of roads, airstrip, dykes)	Mar 2005 to Dec 2006
Mining/Processing begins	
- Portage pit ore & waste	Dec 2006 to Dec 2016
- Vault pit ore & waste	Jan 2007 to Dec 2009
- Goose Island pit ore & waste	Jan 2007 to Dec 2013
- Goose Island underground development	Jan 2007 to Jun 2007
- Goose Island underground ore	Jun 2007 to Jun 2009
- Vault underground ore	Jan 2010 to Dec 2016
Decommissioning & Closure	2017 to 2018

Feasibility & Permitting – In December 2002, Cumberland awarded AMEC the contract to complete a feasibility study for the Meadowbank project. It is anticipated the feasibility study will be completed in late 2003. Concurrent with the feasibility study, Cumberland plans to pursue permitting, lease arrangements, and project financing, aiming for completion of all aspects in early 2004. This schedule would allow construction decisions and arrangements to be made in time for the July 2004 barge shipping season.

Procurement – Immediately following permit approval, the tendering and awarding of long-lead process and electrical equipment will be carried out to obtain the vendor information required to continue with detailed engineering. The engineering design philosophy will be to maximize the use of modular designs to reduce on-site labour requirements as well as capital costs and scheduling. This will allow engineering to advance and critical contracts to be tendered in a timely fashion.

Construction – Once approval to start construction has been received, activities will begin to complete the major portion of the civil work and advance the major buildings prior to the onset of the 2005/2006 winter. Process equipment can continue to be installed indoors during the winter months, leading to substantial completion by late 2006.

Figure 2.4: Proposed Construction Plan & Schedule

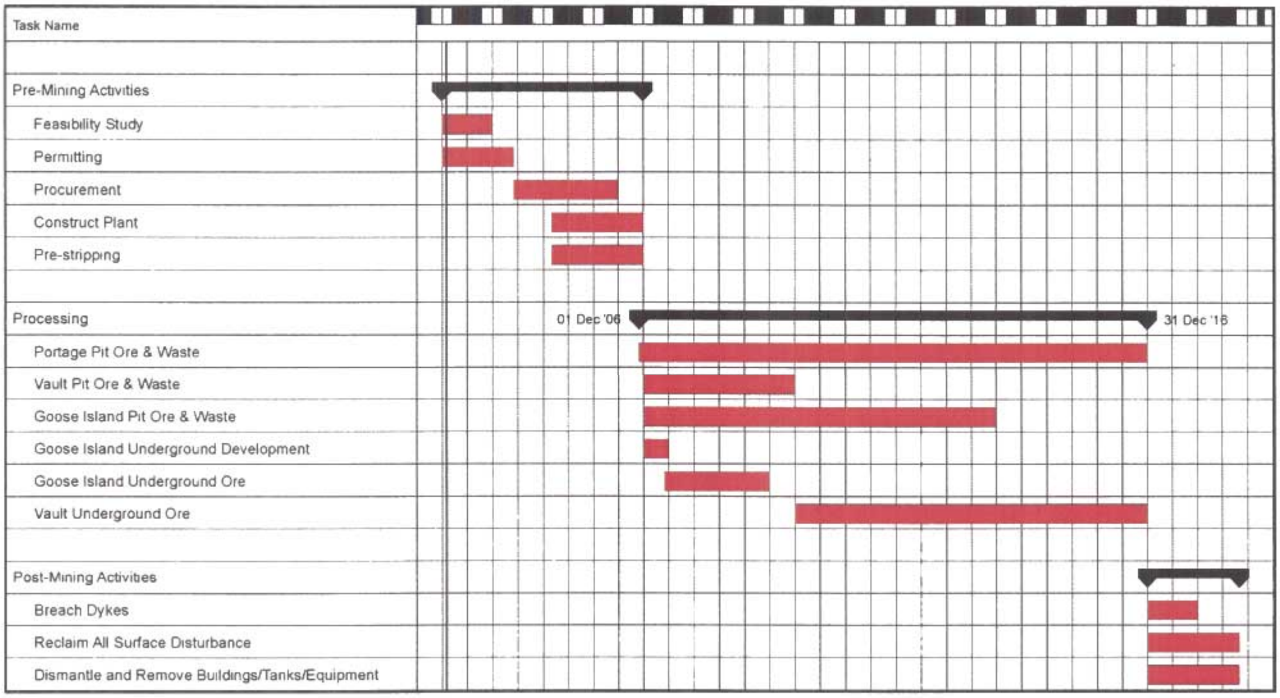
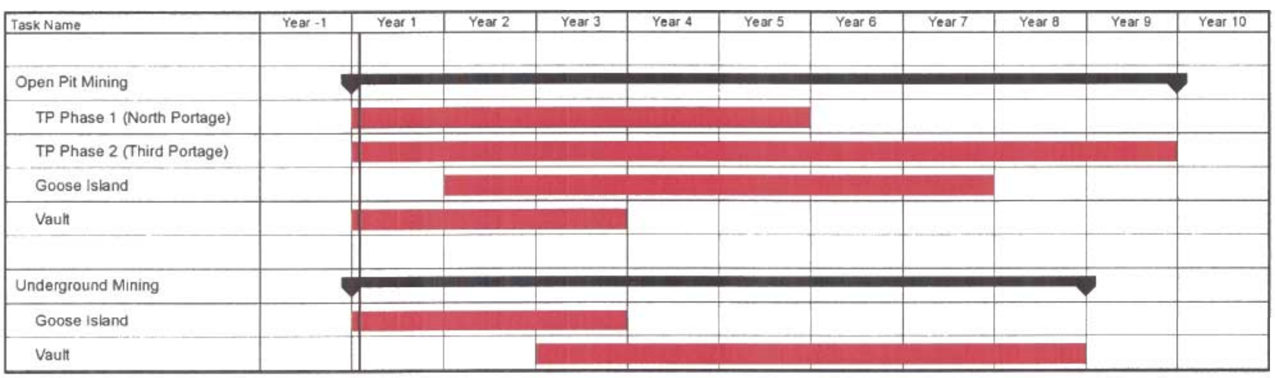


Figure 2.5: Proposed Mine Production Schedule

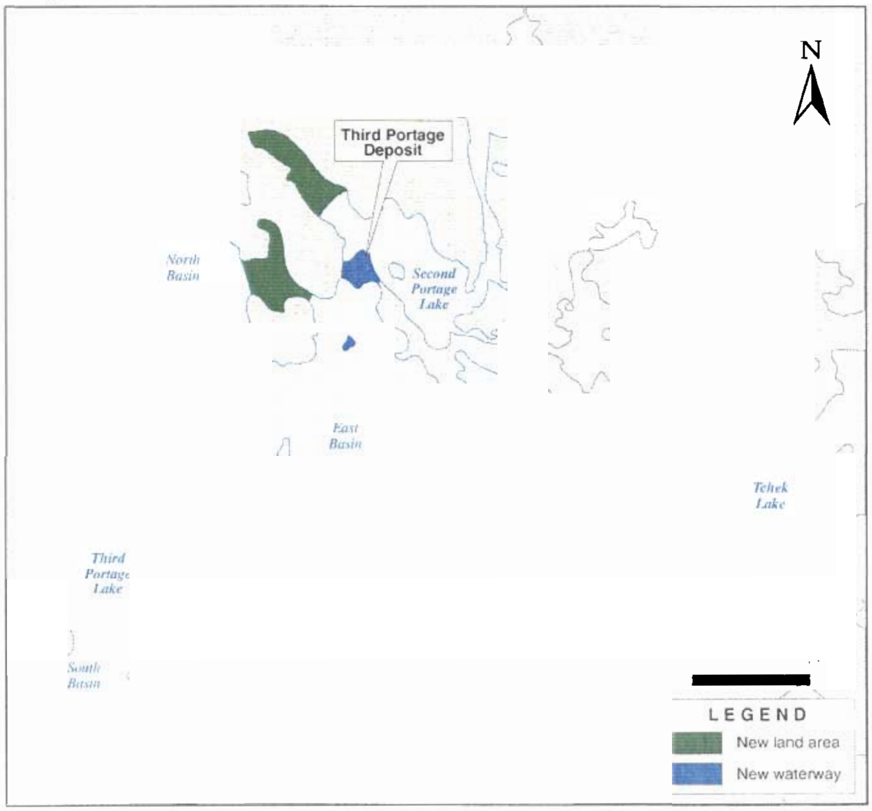


Pre-stripping – Concurrent with construction, pre-stripping activities will begin by removing overburden, exposing primary ore and associated waste. The overburden and other acceptable mine rock will be stockpiled for use in constructing the roads, airstrips, dykes, and pads. The primary ore will be stockpiled for plant start-up.

Processing & Mining – The process plant will be commissioned in late 2006, and will enter full production in early 2007. The Portage open pit will provide the primary ore supply for the process plant throughout the life of mine, with lesser amounts being supplied by the Goose Island and Vault open pits and underground mines. The Goose Island underground resource will be mined early in the schedule, as it contains the highest ore grade. Access to the underground resources of the Vault deposit will be provided from the bottom of the Vault open pit. The final mining sequence will be reassessed during the feasibility study phase.

Decommissioning & Closure – The Meadowbank project will be designed and built to minimize the area of surface disturbance, stabilize disturbed land surfaces against erosion, and return the land to a post-mining use for traditional pursuits and wildlife habitat. Cumberland's objective is to ensure the environment is not unduly influenced after mining operations cease, and that any materials that could potentially cause degradation to the land and/or waters of the project area are stabilized, removed, and/or mitigated. The proposed site after closure is shown in Figure 2.6.

Figure 2.6: Site After Closure



A mine decommissioning plan will be developed and outlined in the EIS. This plan will guide all aspects of closure and ensure conformance with all regulations concerning the environment. As necessary, this plan will be updated to reflect any changes to the design and/or operation of the facility. Specifically, the plan will describe the approach to, and/or decommissioning of, the following:

- planned shutdown
- temporary shutdown
- closure plan
- removal of buildings facilities and equipment
- fuel and chemical storage areas
- open pits and underground operations
- tailings containment structures
- mine rock and overburden
- roads and airstrip
- solid waste management
- land rehabilitation program
- watercourses

2.4 MINE PLAN

Both open pit and underground mining has been selected for the Meadowbank project. These are described below. A proposed site plan is shown in Figure 2.7. A preliminary mine production schedule is shown in Table 2.3.

Surface or open pit mining will occur in three separate open pits. The Portage open pit is expected to be the largest pit, measuring 1,600 m in length, 500 m in width, and 175 m deep. The Goose Island open pit is less than a 500 m in diameter and 120 m deep, while the Vault open pit is approximately 500 m long, 300 m wide, and 85 m deep. No underground mining is currently anticipated for the Portage open pit as the known ore is contained completely within the planned open pit.

2.4.1 Open Pit Mining

Open pit mining will account for approximately 87% of the ore produced. The primary source of open pit production will be from the Portage pit, which encapsulates the North Portage, Third Portage, and Bay Zone deposits. The Portage pit will be mined in two phases. This staged approach will allow the mill feed grade and strip ratio to be optimized early in mine life. Production from the Goose Island open pit will begin in Year 2 and finish in Year 7. The Vault open pit will be mined from Years 1 to 3.

2.4.1.1 Mine Rock

A classification system will be used to identify the appropriate use and storage for all mine rock. Specifically, this system will identify potentially acid-generating (PAG) or non-PAG rock types, as well as those with potential for metal leaching capacity. PAG mine rock will be stored in designated storage areas designed for long-term stability with minimal environmental and aesthetic impact.

As mine scheduling permits, mine rock material may be stored in mined-out pit areas or used as cover for the tailings area. Overburden material that is geotechnically and environmentally suitable for use in constructing the airstrip and site facilities will be stockpiled separately until required. Some overburden material may also be used as low-permeability central core material in constructing the dewatering dykes (see Section 2.4.1.3 for construction details). Current plans do not require any dykes to be constructed at the Vault open pit.

Figure 2.7: Proposed Site Layout

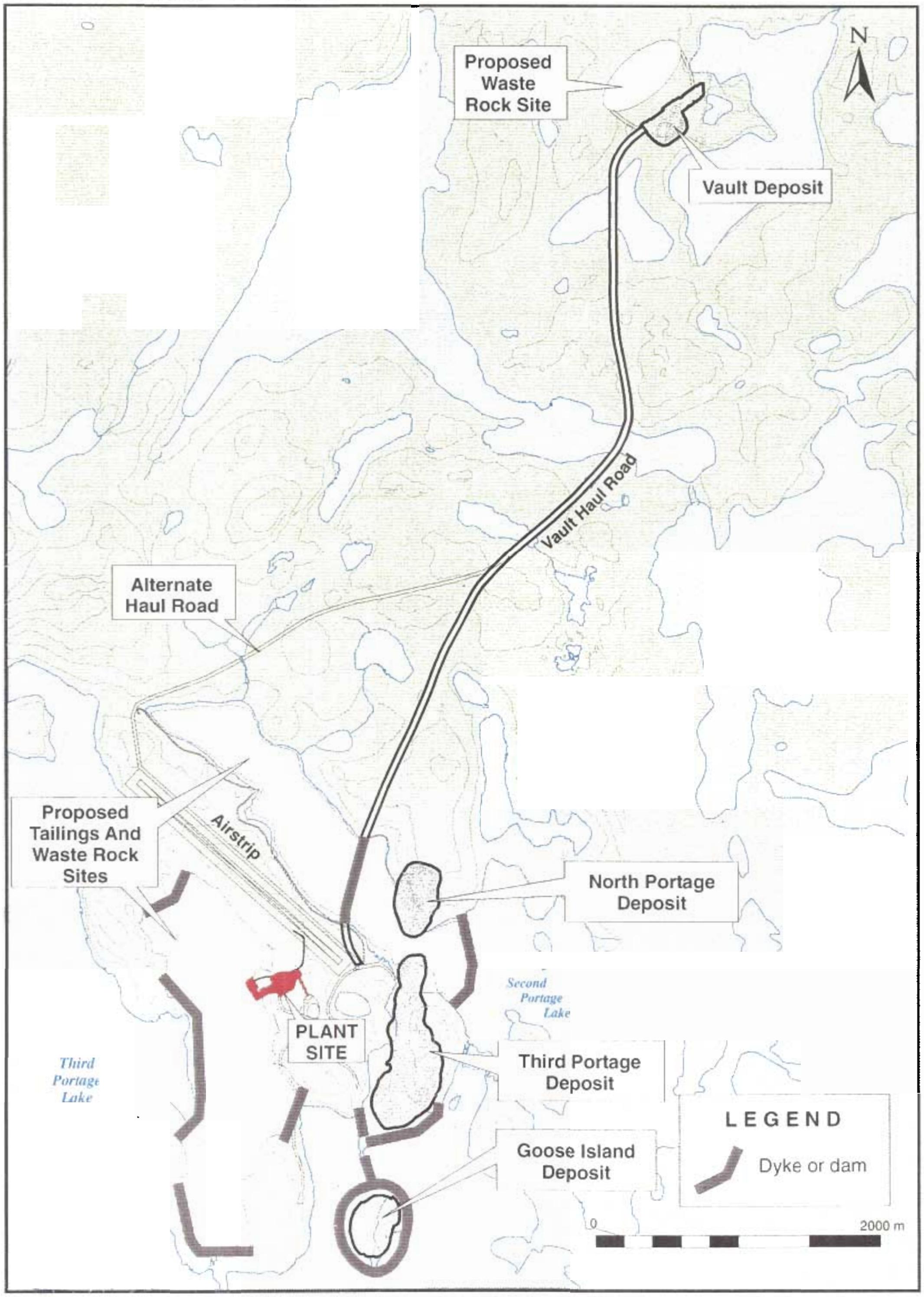


Table 2.3: Preliminary Mining Production Schedule (4,700 t/d)

	Year –1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
OPEN PIT												
Portage Pit Phase 1												
Ore (kt)	43.0	1,188.0	836.0	701.0	798.0	729.0						4,295.0
Grade (g/t)	5.46	5.80	5.11	4.66	4.48	4.76						5.05
Waste (kt)	2,262.0	5,870.0	3,713.0	2,298.0	2,925.0	1,309.0						18,377.0
Portage Pit Phase 2												
Ore (kt)	1.0	66.0	71.0	277.0	500.0	527.0	1,195.0	1,343.0	1,594.0	290.0		5,864.0
Grade (g/t)	0.87	2.51	2.70	2.86	3.26	3.35	3.86	4.11	4.82	7.05		4.16
Waste (kt)	2,153.0	6,094.0	4,391.0	7,402.0	7,633.0	6,725.0	8,245.0	6,674.0	4,936.0	472.0		54,725.0
Portage Pit Totals												
Ore (kt)	44.0	1,254	907	978	1,298	1,256	1,195	1,343	1,594	290		10159.0
Grade (g/t)	5.35	5.62	4.92	4.15	4.01	4.17	3.86	4.11	4.82	7.05		4.54
Total Waste (kt)	4,415.0	11,964.00	8,104.00	9700	10558	8034	8245	6674	4936	472		73,102.0
Goose Island												
Ore (kt)			119.0	140.0	147.0	189.0	250.0	102.0				947.0
Grade (g/t)			5.41	5.54	7.73	7.24	7.24	7.17				6.83
Waste (kt)			5,003.0	4,517.0	3,176.0	1,930.0	874.0	184.0				15,684.0
Vault												
Ore (kt)		307.0	405.0	354.0								1,066.0
Grade (g/t)		3.66	4.17	4.25								4.05
Waste (kt)	1,433.0	2,455.0	1,652.0	309.0								5,849.0
Total Open Pit												
Ore (kt)	44.0	1,561.0	1,431.0	1,472.0	1,445.0	1,445.0	1,445.0	1,445.0	1,594.0	290.0		12,172.0
Grade (g/t)	5.35	5.24	4.75	4.30	4.39	4.57	4.45	4.33	4.82	7.05		4.67
Total Waste (kt)	5,848.0	14,419.0	14,759.0	14,526.0	13,734.0	9,964.0	9,119.0	6,858.0	4,936.0	472.0		94,635.0
S.R.	132.91	9.24	10.31	9.87	9.50	6.90	6.31	4.75	3.10	1.63		7.77
Total Tonnes (kt)	5,892.0	15,980.0	16,190.0	15,998.0	15,179.0	11,409.0	10,564.0	8,303.0	6,530.0	762.0		106,807.0
Tonnes/Day	16.1	43.8	44.4	43.8	41.6	31.3	28.9	22.7	17.9	2.1		
UNDERGROUND												
Goose Island												
Ore (kt)		154.00	284.00	93.00								531.0
Grade (g/t)		9.61	9.29	9.32								9.39
Vault												
Ore (kt)				150	270	270	270	270	121			1,351.0
Grade (g/t)				5.30	5.30	5.30	5.30	5.30	5.30			5.30
Total Underground												
Ore (kt)		154.0	284.0	243.0	270.0	270.0	270.0	270.0	121.0			1,882.0
Grade (g/t)		9.61	9.29	6.84	5.30	5.30	5.30	5.30	5.30			6.45
Total Ore To Mill (kt)	**44.0**	**1,715.0**	**1,715.0**	**1,715.0**	**1,715.0**	**1,715.0**	**1,715.0**	**1,715.0**	**1,715.0**	**290.0**		**14,054.0**
Grade (g/t)	**5.35**	**5.63**	**5.50**	**4.66**	**4.53**	**4.68**	**4.58**	**4.48**	**4.86**	**7.05**		**4.91**
Recovered Oz.	**6,967**	**285,650**	**279,029**	**236,555**	**229,907**	**237,629**	**232,401**	**227,369**	**246,279**	**60,501**		**2,042,288**

A waste management plan will be developed for the EIS and will include details on all types of mine waste, including volume, handling considerations, disposal methods and alternatives for garbage, sanitary, sewage, brush and vegetation, overburden, mine rock, and tailings.

2.4.1.2 Equipment

The open pit mining fleet is listed in Table 2.4. Support equipment (track dozers, motor graders, and an excavator) will be used to maintain the road surfaces, dumps, and operating benches.

Table 2.4: Open Pit Mining Equipment Fleet

Type	Quantity
14 m^3 hydraulic shovel	4
10 m^3 wheeled loader	1
90 tonne rock trucks	10
6" drill	3
3" drill	3
400 hp dozer	3
Grader	3

2.4.1.3 Lake & Pit Dewatering

Water retention dykes will be constructed to allow the mining of the ore where it occurs beneath shallow lakes at the Portage and Goose Island pits. Water pumped from the open pits will enter the mine process water circuit. Seepage through the dykes will be collected in collection ditches and sumps. Construction of the dykes will utilize floating sediment curtains to prevent the release of fine-grained material into surrounding lake waters.

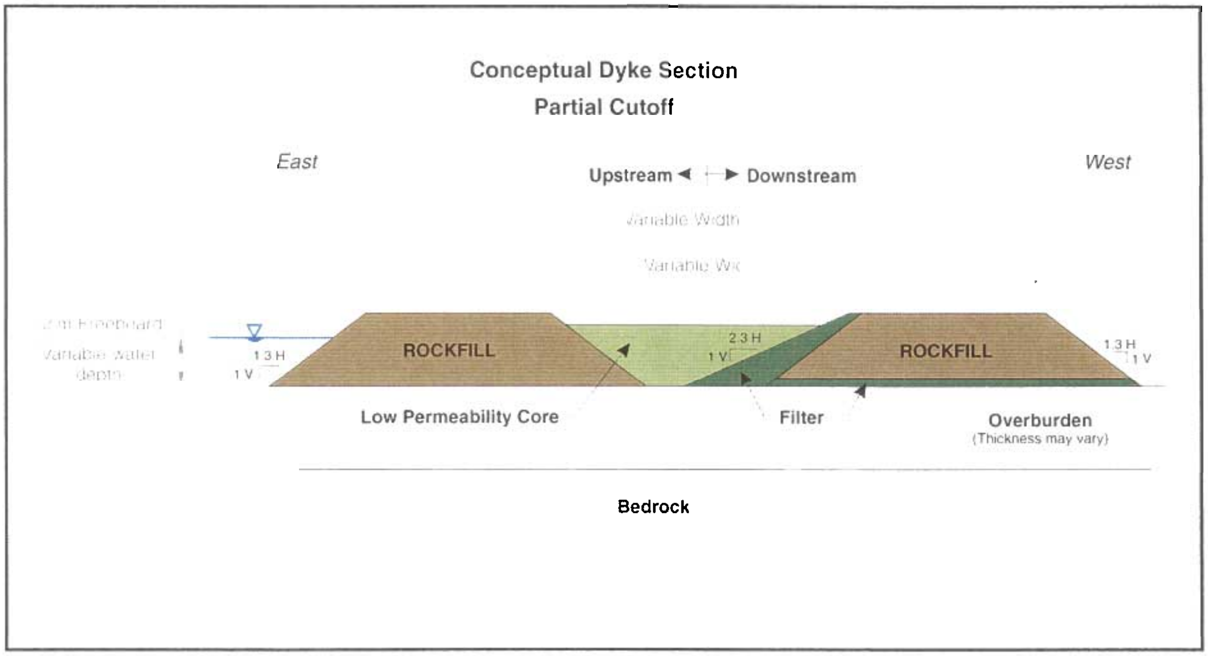
The engineered water retention dykes will be constructed using non-PAG waste materials that have been carefully selected and tested to ensure suitability. Two dyke designs are being considered (see Figure 2.8 for an illustration of dyke construction). Along the centreline of the dyke, a slot will be excavated down to bedrock for placement of an impermeable slurry wall. Any lake bottom sediments removed in the slot excavation will be stockpiled for later use as specialized materials (gravels, sands, reclamation covers, etc.). When the dykes are in place, fish in open pit lake segments and storage areas will be "live trapped" and placed in unrestrictive waters. The water will then be pumped out in preparation for mining. Final design and engineering will be included in the feasibility study and reviewed in the project EIS.

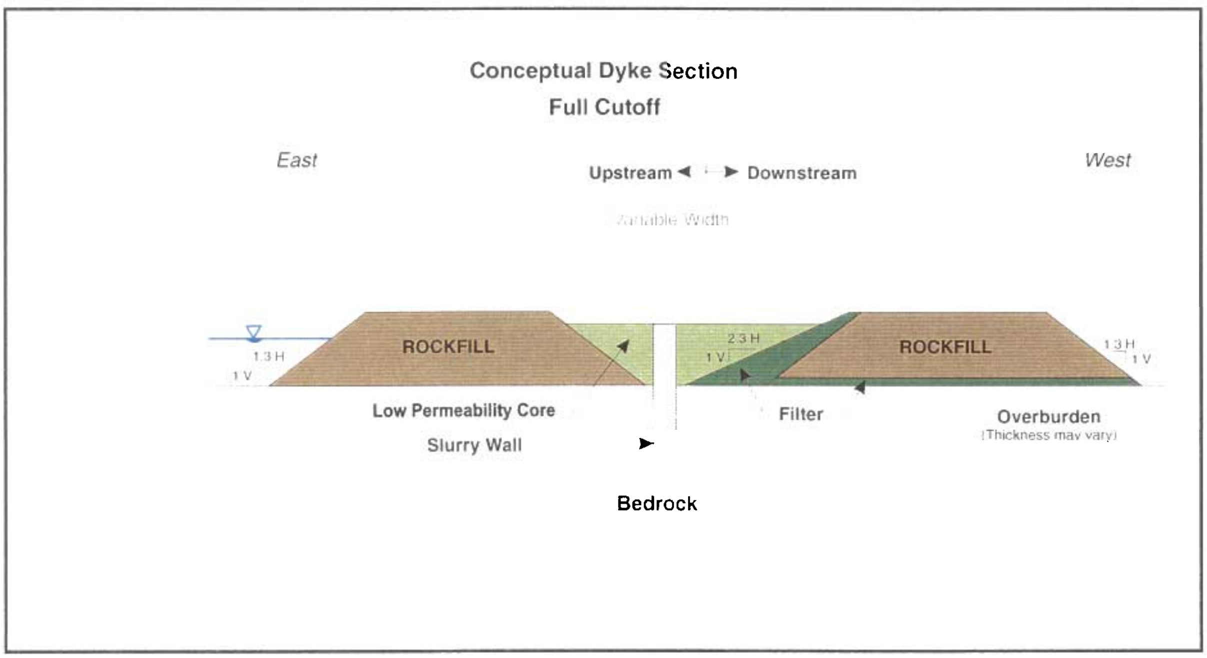
2.4.1.4 Explosives Use, Supply & Storage

Due to the presence of permafrost and the long winters, it has been assumed the ground will remain frozen for a large portion of the year and that water problems for blasting may be encountered during spring runoff and during periods of rainfall during the summer months. With this in mind, it is assumed that ammonium nitrate/fuel oil (ANFO) will be used 90% of the time and an emulsion would be used for the remaining 10%. Further geotechnical and hydrological work, a component of the feasibility study, is required to confirm this.

The ammonium nitrate will be stored at the mine site and loaded into the ANFO mixing truck as required. The emulsion, detonators, and accessories will be stored on-site in magazines, according to the regulations for the supply and storage of explosives. The explosives contractor will mix the ANFO and transport the explosives to the work site. Mine personnel will be responsible for loading, priming, and detonating the explosives.

Figure 2.8: Dyke Section – Partial & Full Cutoff





2.4.1.5 Mine Rock Geochemical Test Programs

In 1997, geochemical test programs were carried out to characterize mine rock, including rock that will be exposed in pit walls and underground workings, and stockpiled ore and mine rock piles. For short-term water quality, testing is in progress to evaluate the potential for:

- leaching of readily soluble minerals when rock is first exposed or mined
- release of fines (suspended solids)
- ongoing leaching of metals under near-neutral conditions
- net acid generation and metal leaching.

In the longer term, the main concerns are ongoing leaching under near-neutral conditions, and net acid generation and metal leaching.

To date, mine rock testing has consisted of:

- whole rock analysis on core and grab samples
- elemental solids analyses
- acid base accounting
- metal leaching (extraction) testing
- mineralogical testing
- kinetic testing (in progress).

Preliminary indications from static tests to date show that although some rock types do show potential for acid generation, this site would not be classified as a major acid producer. The potential for both net acid generation and metal leaching is not conclusive from static test data alone. Ongoing kinetic testing is required to assess the potential for either metal leaching or acid generation from mine rock.

An additional concern with any blasted rock is the potential for nutrients (e.g., nitrogen species) to be released during the blasting process. Standard methods have tended to overestimate this potential release of ammonia and nitrates, especially when controlled blasting practices are used. Experience at other operations has shown that these methods should be used, but then be calibrated with field monitoring data to produce truer values. To mitigate the potential for nutrient release, emulsion explosives can be used in lieu of dry ANFO—a mitigation measure that is proposed for the Meadowbank project.

2.4.1.6 Personnel Requirements

Personnel requirements are shown in Table 2.5. These requirements are derived from assumed operating activities and calculated productivities.

Table 2.5: Total Personnel Requirements

Area	No. of Employees
Staff	
General administration	24
Mine/mill management	3
Mine engineering	8
Underground mine maintenance	1
Open pit mine maintenance	3
Underground mine operations	1
Open pit mine operations	5
Mill operations	7
Mill maintenance	6
Port & ice road maintenance	2
Subtotal	*60*
Hourly	
Underground mine maintenance	7
Open pit mine maintenance	60
Underground mine operations	22
Open pit mine operations	28
Mill operations	30
Mill maintenance	26
Port & ice road maintenance	20
Subtotal	*193*
Total Personnel	**253**

2.4.1.7 Sampling & Testing/Ore Control

Ore control will be based primarily on blasthole assay information with consideration given to visual geology assessment in the field. Blasthole samples will be collected and processed in an on-site assay facility, the results of which provide the determination of the ore/mine rock boundary. Geological technicians will closely supervise the ore control procedures in the open pit mining.

Subsequent sampling in the process plant will be reconciled with the open pit and underground blasthole assay results, and mining practices (ore mining bench heights, blasthole drill grids, additional face or muckpile sampling, etc.) may be altered to achieve ore control objectives.

2.4.2 Underground Mining

Underground mining will account for approximately 13% of planned production and is scheduled to occur below the Goose Island and Vault open pits. The production forecast requires that ore be provided from the underground portion of the Goose Island deposit prior to mining the open pit to any significant depth. This will prevent the need for an engineered crown pillar, but will require the careful placement of fill as underground mining approaches the planned open pit interface to ensure safety during the extraction of the bottom bench of the open pit.

Based on the continuity of structure and grade of the Vault deposit, six areas will be mined by room-and-pillar, while a seventh will be a drift-and-fill stope. The continuity of the ore zones is expected to allow the majority of development to be in ore.

2.4.2.1 Ventilation

Portals and vent raises will serve as ventilation conduits for underground operations. Air will flow out through the stopes and development headings to the main ramp system, from where it will flow up the ramp and out the portal to surface. Doors and curtains will be provided for underground vent control.

2.4.2.2 Underground Personnel Requirements

The underground crew requirement will peak at approximately 22 people, ramping up from an initial requirement of approximately 13 when the main ramp to Goose Island is being developed.

2.4.2.3 Underground Equipment

The proposed underground mining equipment fleet (Table 2.6) will initially be enough for a single crew to develop the main ramp, increasing as development expands to multiple headings and stope production begins. A typical development crew will utilize a two-boom jumbo, a 3.8 m^3 LHD and a scissor lift for ground support.

Table 2.6: Underground Fleet

Type	Quantity
2-boom electric hydraulic jumbo	3
3.8 m^3 LHD	3
2.7 m^3 LHD	1
40-tonne rock truck	2
Grader	1
Scissor Lift	2
Mancarrier	1

2.5 PROCESS DESCRIPTION

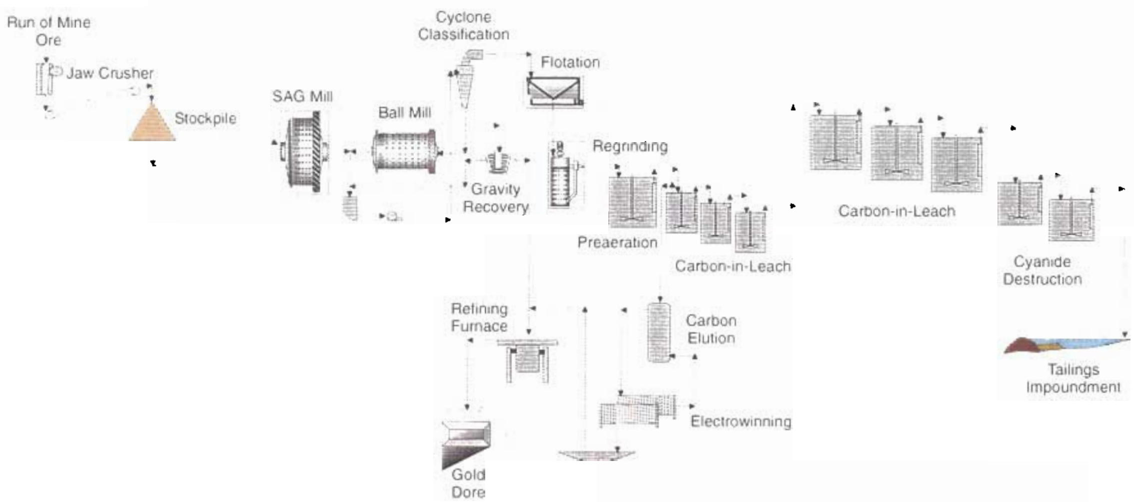
Exhaustive metallurgical studies are underway to develop the process flowsheet for the Meadowbank project. Two process options are in the final stages of evaluation for feasibility. Both options include standard crushing and grinding, gravity concentration, and carbon-in-pulp technology. One process option leaches total mill tonnage, while a second, and currently preferred, option considers the leaching of a flotation concentrate only. Both process options include cyanide leaching, cyanide destruction, and refining to doré bars.

The currently preferred process option consists of single-stage crushing, followed by two-stage grinding, gravity flotation, bulk sulphide flotation, cyanidation, and cyanide destruction. These stages are shown on Figure 2.9 and described briefly below.

2.5.1 Primary Crushing

Run-of-mine (ROM) ore will be hauled from the open pits and stockpiled or dumped directly into an ore hopper. From the hopper, an apron feeder will reclaim the ore and feed it directly into a primary jaw crusher to reduce it to 100% passing 230 µm. The primary crushing rate is expected to average 522 t/h to provide the mill feed requirements of 213 t/h. A conveyor will then convey the crushed material to a live covered coarse ore stockpile. Two belt feeders will reclaim the ore from the stockpile and discharge it onto a wide primary mill feed conveyor.

Figure 2.9: Process Flowsheet



2.5.2 Grinding & Gravity Concentration

The ore will be fed to a semi-autogeneous (SAG) mill, from where the pulp product will be pumped over a closed-circuit scalping screen. Screen oversize (8 mesh aperture) will be returned to the SAG mill, while screen underflow will drop into the cyclone feed pumpbox from where the slurry will be pumped to a bank of 250 mm diameter hydrocyclones. For treating potential critical size SAG mill product, a pebble crushing circuit may be required.

Hydrocyclone underflow product will report to a 3,358 kW ball mill. The closed ball mill circuit incorporates gravity concentration for the recovery of coarse free gold. The gravity concentrate from a single gravity concentrator unit will be upgraded on a shaking table. The gravity concentrator tailings will be combined with the ball mill discharge and pumped to the hydrocyclones. The cyclone overflow (80% passing 44 μm) will flow by gravity to a bank of primary rougher flotation cells.

2.5.3 Bulk Sulphide Flotation

The final grinding product from the cyclone overflow will flow to a single bank of five rougher mechanical flotation cells to provide a total retention time of approximately 35 minutes. Bulk rougher concentrate will be collected from all cells at a natural pH, and pumped to a two-stage cleaning circuit. Rougher flotation tailings will be pumped to a tailings thickener for thickening to 60% solids (by weight) prior to discharge to the tailings impoundment.

Rougher concentrate will be cleaned in a conventional two-stage cleaning circuit. The first cleaners will comprise a single bank of four 8.5 m^3 (effective volume) tank cells. All first cleaner concentrates collected at a pH range of 8.5 to 10.0 will gravity flow to the secondary cleaning stage, which will utilize mechanical flotation cells in a conventional closed-circuit configuration. First-stage cleaner tailings will be pumped back to the rougher cells feedbox.

Reagents to be used in the bulk sulphide flotation process circuit will include: MIBC, collectors 3418A and A208, potassium amyl xanthate (PAX), and lime reagent for alkalinity control in the cleaner flotation circuit.

Final sulphide concentrate will be pumped to the sulphide concentrate thickener prior to feeding the leach circuit for subsequent gold recovery.

2.5.4 Carbon-in-Pulp (CIP) Circuit

Thickened concentrate will be pumped to one of six leach tanks, which will provide up to 72 hours of contact time at a design processing rate of 55 m^3/h pulp. The pH of the pulp will be increased to 11 by the addition of milk-of-lime slurry. Fresh cyanide solution will also be added into the first leach tank.

In a carousel-type CIP circuit, the carbon will be forwarded by sequentially advancing the CIP feed and tailings positions through a piping/valving arrangement. The first CIP tank will be taken off-line and the loaded carbon will be pumped to the loaded carbon screen. The CIP circuit will operate at an average carbon density of 20 g/ℓ of slurry and carbon will be forwarded at a rate of 1.5 t/d.

The CIP tailings will be screened on a vibrating carbon safety screen. The safety screen underflow will be directed to tailings treatment and recovered loaded carbon will pass to stripping. The screen undersize will flow back into the CIP circuit while the screened carbon will be delivered either to the acid wash column or an elution column.

2.5.5 Carbon Treatment & Gold Recovery

Under normal conditions, 1.5 tonne batches of loaded carbon will be stripped with hot barren solution consisting of 1.0% NaOH and 0.3% NaCN. The barren solution will be pumped through the elution column at a rate of two carbon bed volumes per hour. An inline solution heater and single heat exchanger will raise the solution temperature to 140°C. Hot pregnant solution exiting the top of the elution column will pass through one side of the plate and frame heat exchanger to the pregnant solution tank.

Operation philosophy will dictate the regularity for acid treatment of loaded carbon prior to stripping. Loaded carbon will be washed of foulants by a 3% HCl acid solution. Batches of eluted carbon will be transferred to a carbon dewatering screen located above the reactivation kiln storage tank. Carbon will be treated in a horizontal electric-fired thermal reactivation kiln. Carbon will be thermally reactivated at 750°C and water quenched in a conditioning tank.

This cooled solution will pass through two electrowinning cells in series, where gold will be recovered on stainless steel wool cathodes. Cathodes will be systematically removed from the cells, pressure washed with water, and removed of gold-laden sludge. The sludge will be pumped to a plate and frame filter press. Refining of the filter cake will be performed on-site in a crucible furnace. The oven-dried sludge will be fluxed to produce doré bullion. Gold concentrates from the gravity concentration circuit will be dried, fluxed and smelted separately in the furnace. All the doré bars produced will be stored in a secure concrete-walled vault that will be constructed within the refinery building.

2.5.6 CN Detoxification & Tailings Disposal

The unthickened CIP tailings stream will be pumped to a to a two-stage cyanide destruction circuit. A liquid sodium metabisulphite / compressed air mixture will be injected into the two agitated tanks to complex and neutralize free cyanide. The pH of the tanks will be controlled by the addition of milk-of-lime slurry. Copper sulphate solution will be metered into the reactors to act as a catalyst to oxidize both free cyanide and neutralize cyanide complexes. The discharge from the last cyanide destruction tank will be pumped to the tailings impoundment area.

A list of primary processing equipment is shown on Table 2.7

Table 2.7: Processing Equipment

Type	Qty
Grizzly/rock breaker	1
Apron feeder	1
Jaw crusher 42" x 48" 250 hp	1
Conveyors/chutes	1
SAG mill 22 x 11.5 ft @ 2,750 hp	1
Pebble cone crusher/conveyors	1
Secondary ball mill 16.5 x 27 ft @4,500 hp	1
Gravity concentrators	1
Sulphide flotation circuit	1
Cyanide leach circuit	2
Carbon treatment/gold recovery	1
Cyanide destruction circuit	1
Reagent handling/storage	1

2.6 SITE INFRASTRUCTURE

On-site infrastructure will include a process plant, power plant, maintenance facilities, tank farm, accommodations facility, water treatment plant, sewage treatment plant, and airstrip. Barge unloading facilities, a laydown area, and a tank farm will also be required in Baker Lake for storing and staging materials to be transported on the winter haulage route.

The implications of the cold climate have been taken into account in the design of the buildings, which will be supported on concrete foundations extending to bedrock. To allow heavy equipment and building foundations to bear directly on this rock, allowances will be made for pouring lean concrete and rock anchors will be used to stabilize foundations.

The foundations will be built at a suitable elevation to prevent frost damage and will be insulated to maintain the underlying permafrost. Building floors will consist of a concrete slab-on-grade placed on well-compacted structural fill. These assumptions about foundation conditions are subject to further geotechnical investigations in 2003.

Waste heat captured with heat exchangers will be used to heat the entire plant and camp building complex with a heated glycol/water mix. Other climate-driven features include heat-tracing of fuel lines, water pipelines, and tanks. Where needed, walkways and water/sewage distribution piping will be enclosed. Major site facilities and services are described briefly below.

2.6.1 Primary Plant Facilities

The *process plant* will be a pre-engineered steel structure that will house the main building complex, power plant, maintenance shops, and site offices. The buildings will be supported on concrete foundations extending to bedrock. The slab-on-grade building will be constructed on structural fill. All foundations will be insulated to maintain the underlying permafrost.

The *power plant* will be a diesel-fired 10 MW plant with multiple generator sets for electrical load bearing flexibility and efficiency. The circulation medium will be an ethylene glycol/water mixture recovering heat from water jackets, exhaust stacks and engine oil coolers. A separate mobile power plant at the Vault deposit will service a small surface shop, office, lunchroom facility, the pit dewatering pumps, underground ventilation fans, and equipment plug-ins.

Maintenance facilities for the large mobile mining equipment will be constructed as an integral part of the main process and power plant building structure complex. A temporary shop facility will also be provided at the Vault deposit for equipment maintenance.

2.6.2 Tank Farms

Diesel fuel will be delivered by barge to a 25 Mℓ vertical tank storage facility in Baker Lake consisting of several steel tanks and fuel transfer pumps. The tanks and pumps will be located within bermed containment areas lined with HDPE. The main fuel tanks will be un-insulated and designed to meet American Petroleum Institute specifications. From this tank farm, fuel will be trucked via the winter road from Baker Lake to a nearly identical facility on site.

2.6.3 Accommodations Complex

The permanent camp will be constructed of ATCO-style rigid wall modules that will be connected to the process plant, offices, service and warehouse buildings by Arctic corridors. Rooms will be single occupancy with centrally located washrooms and showers. Approximately 15% of the workforce may be female, for whom separate washroom facilities will be available. Facilities will include a lounge, television, recreation and games rooms. The complex will have an initial capacity of 350 persons, which will be reduced to 250 after completion of the construction phase.

2.6.4 Airstrip

An airstrip will be constructed immediately northwest of the mill site using suitable mine rock fill from open pit pre-stripping operations. The airstrip will be 1,650 m long x 50 m wide to accommodate aircraft such as the Hawker Siddley 748. It will be elevated to reduce problems with snow drifting, and oriented to minimize the effect of prevailing winds on landing aircraft. A compactor and grader will be used to maintain the landing surface year round.

2.7 UTILITIES & SERVICES

The *mine and camp water supply* will be pumped in heat-traced and insulated HDPE lines, from Third Portage Lake. The freshwater pump station will have a maximum capacity of 250 m^3/h to supply all water requirements in the event reclaim water for mine use is not available. During normal operations, reclaim water will reduce the fresh water requirement to 50% of the maximum capacity. The freshwater main insulated storage tank inside the plant (1,500 m^3 storage capacity) will provide firewater storage of 400 m^3, suitable for 1.6 hours' supply at 250 m^3/h.

Potable water will be drawn from the main storage tank and treated in a chlorination system prior to storage in an insulated water tank. The water will be distributed by steel pipe main to the service complex and process plant.

Sewage will be collected from the accommodations complex and changeroom facilities and pumped to a sewage treatment plant. A rotating biological contractor treatment system will be installed with the effluent meeting Nunavut guidelines for wastewater discharge into the tailings pond.

Solid waste from the accommodations camp, kitchen, shops, and offices will be burned in a waste incinerator. This will be diesel-fired and located downwind of the facilities. Waste will be transported by pickup truck and loaded into the incinerator.

Site security will be provided by appropriate lighting and fencing, uniformed personnel, CCTV (closed-circuit television), a card access control system, and an alarm system. These systems will be independent, stand-alone systems that will work interactively with each other. Product security will be assured by restricted access within the process mill and refinery, and through direct off-site transport by air to southern commercial mints. CCTV monitoring will also be used in critical areas such as the refinery.

The *communications system* will consist of two major components: a satellite telephone system and a local radio repeater system. The telephone system will accommodate two-way digital voice, fax, and data utilizing a satellite link. The radio repeater system will enable radio-to-radio communication within a 48 km radius of the Meadowbank camp area.

2.8 PREFERRED OPTIONS & ALTERNATIVES

Cumberland is committed to developing a mine that minimizes or eliminates any negative impacts and maximizes any positive benefits. This approach ensures that before any final design decisions are made, all issues are weighed and considered. Some examples of alternate options considered include: the location of tailings pond, milling process, and the access road option. A complete discussion of the preferred options and alternatives considered including the "no go" alternative will be included in the EIS.