

Wolverine Project

**RECLAMATION AND CLOSURE PLAN
FOR FINAL CLOSURE**

ADVANCED EXPLORATION PHASE

Quartz Mining Land Use LQ00140: CONDITION 103

Type B Water Licence Approval QZ01-051: CONDITION 58

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1 Introduction

This Reclamation and Closure Plan for final closure (Closure Plan) has been prepared to meet the requirements under the Quartz Mining Land Use Approval LQ00140 (Condition 103) and Type B Water Licence Approval QZ01-051 (Condition 58). The licenses were issued in early 2005 to Yukon Zinc Corporation (YZC) for advanced exploration activities at the Wolverine Project site.

The Wolverine project is located 280 km east-northeast of Whitehorse, 170 km northwest of Watson Lake and 140 km east-southeast of Ross River in southeastern Yukon Territory. The site is in the Campbell Range on the northeast side of the Pelly Mountains. Elevations on the property range between 1200 and 1400 m a.s.l. Coordinates for the area are latitude 61°25' N, longitude 130°07' W on NTS map sheet 105G, Finlayson Lake.

This revised Closure Plan is an update to the *Decommissioning, Reclamation and Closure Plan* submitted in December 2005, and describes the activities pertaining to decommissioning and closure activities for the Advanced Exploration Phase based on site conditions at the end of 2006. The proposed activities will commence with a decision that does not advance the exploration project to mine production, and following a period of temporary closure. A *Temporary Closure Plan* was submitted in December 2005 and covered a period of site inactivity up to a five year duration.

As outlined in the *Temporary Closure Plan*, YZC intends to be a responsible steward of the site and demonstrate its commitment to re-opening the site by:

- continuing to have the site under the care and maintenance of an on-site caretaker
- implementing a monitoring program
- maintaining buildings and facilities

This Closure Plan is limited in scope to the underground mine (portal and workings), portal area (including sumps, buildings, equipment and fuel tanks), explosive magazines, waste rock pad, roads and camp area as they exist at the end of 2006. This Plan addresses waste and water management issues pertaining to the Advanced Exploration Phase, and provides a monitoring program for the closure period.

1.2 Final Closure Plan Objectives

The planned reclamation and closure activities will be undertaken to ensure that high environmental standards are achieved, while respecting all legal requirements and public interests. A principal approach followed in the development of this plan was to incorporate measures that will result in eventual passive closure. Decommissioning activities pertaining to final closure of this project include:

- Removal of site buildings and facilities

- Installation of hydraulic plugs and blockage of the underground opening
- Stabilization and revegetation in disturbed areas
- Removal of site runoff ditches and re-establishing pre-development flow paths
- Capping of the waste rock pad to mitigate the potential for metal leaching/ acid rock drainage

The decommissioning and closure plans described herein were guided by the following principles and objectives:

- Progressive reclamation measures will be implemented over the advanced exploration phase
- Post-closure land use will be commensurate with surrounding areas
- Closure will include environmental protection measures that prevent adverse environmental impacts
- Closure of the operation will ensure the protection of public health and safety
- Closure planning will incorporate and commit to a comprehensive site monitoring program to assess effectiveness of closure measures for the long term

Site specific monitoring and contingency plans will continue to be developed as necessary, and where possible, performance based criteria will be integrated into these plans.

It is important to note that it is unlikely that all areas will be reclaimed as the area is in a region of known metal resources. As such, this plan has been prepared with the intent of providing cost estimates for those entities that will be decommissioned and those that are unlikely to be decommissioned (such as the camp and site roads). This report assumes that exploration trails and drill site have been reclaimed and that the airstrip will remain after site closure; therefore, cost estimates are not included for these components. In addition, cost estimates for the Phase 1 winter access road are not included in this report as YZC will provide security commensurate with outstanding environmental liability as per conditions of the Quartz Licence.

The sections below document the requirements for the decommissioning and closure for all entities, and cost estimates have been separated into those activities that are deemed to be likely and unlikely.

2 Closure Phase Activities

Decommissioning and closure activities will commence following the cessation of the five year temporary closure period. As the area is in a location of known metal reserves, continued activity is likely and a five year period is a realistic time frame for temporary closure. Following decommissioning, the closure phase is proposed for a three-year period, but is ultimately dependent on achieving site-specific performance criteria designed to allow for eventual passive closure.

A three-year monitoring period is proposed as it provides sufficient time for monitoring closure activities pertaining to the primary areas of environmental risk: the underground workings and the waste rock pad. Based on observations in winter 2005-6, the underground workings will recharge in less than a half a year. The objective of placing an engineered soil cover on the waste rock pad is to prevent oxidation of the stockpiled material. YZC plans to transport ore stored on the waste rock pad to the underground workings prior to flooding, and monitor runoff from the site. Water quality from the site is not anticipated to deteriorate once the waste rock pile is capped and revegetated.

It is important to note that the length of the closure period will depend upon whether decommissioning, closure and reclamation objectives are met. Once closure and reclamation activities meet the respective objectives, the site will be declared as permanently closed.

2.1 Personnel Requirements

A number of personnel will be required onsite to implement the various decommissioning, closure and reclamation activities. The majority of these activities will need to be undertaken on a seasonal basis (May–October) and be directed by the onsite manager. The work force requirements for the decommissioning and closure phases are provided in Table 1.

Table 1. Closure Phase Work Force Requirements

Personnel	Decommissioning Period: Year 1	Closure Period: Years 2 to 4
Site Manager	1	-
Environmental Technician	1	1
Equipment Operators	3	1
Tradesman	2	-
General Labourers/Camp Staff	5	2
Total	12	4

2.2 Activities and Timelines

The activities outlined below summarize the requirements for the decommissioning of infrastructure and the reclamation of surface disturbances. All decommissioning, closure and reclamation activities will be properly supervised and documented to ensure that all works are completed according to design plans and as per industry practice and legal requirements. The timing of site closure is dependent on a number of factors including the purpose of the infrastructure and its future use and environmental considerations. Table 2 provides a list of activities that will be required during the one year decommissioning period and the three year closure period.

Table 2. Activities Associated with the Decommissioning and Closure Phases

Component	Decommissioning Activities (Year 1)	Closure Activities (Years 2 to 4)
Overall Environmental Site Assessment	Areas of suspected oil, chemical, or other contaminant spills will be tested to confirm locations and quantities requiring clean-up; undertake remediation of identified areas as required; relocate contaminated soils as per Contaminated Sites Regulations	Undertake remediation of identified areas as required; confirmatory sampling at remediated areas.
Mine Workings	Install hydraulic plugs in underground workings, seal opening and allow mine to flood	Assess the performance of closure measures.
Portal Area	Remove office and maintenance facility; decommission portal sumps; dispose of sump sediments in waste rock pad; backfill the sumps; reclaim disturbed areas; Assess power requirements and downsize as required	Performance monitoring of reclaimed areas; decommission water treatment sumps once measures for closure of the mine workings have proven effective; remove remaining gensets once all activities are complete
Waste Rock Pad	Transport 2430 m ³ of ore underground. Place engineered soil cover over the pad, and monitor runoff water quality and treat if necessary until concentrations below discharge criteria limits	Perform monitoring of reclamation measures; monitoring waste rock pad sump water quality as required; construct passive system if water quality unacceptable following first year of monitoring
Camp	In use; conduct remediation program; reclaim unused disturbed areas	Remove structures and reclaim areas not required to support ongoing activities
Exploration Trails and Onsite Roads (~9.12 ha)	Reclaim exploration trails and access roads no longer in use	Performance monitoring of reclaimed areas
Borrow Areas	Recontour and reclaim areas of disturbance; replace organic material to promote natural revegetation	Seed as required in areas where native species haven't naturally recolonized.

The following infrastructure and equipment will remain operational onsite to support the closure phase:

- Onsite roads to the camp
- Light duty vehicle(s) and ATV
- Water treatment infrastructure (pumps, pipelines, reagent storage)

- Power generating facility with adequate capacity for pumping systems and camp
- Small maintenance workshop
- Communication system

2.3 Site Environmental Assessment

Prior to undertaking closure activities, areas of suspected oil, chemical, or other contaminant spills will be tested to confirm locations and quantities requiring clean-up. In the event the assessment finds contamination, the material will be isolated and appropriate remediation measures will be implemented. The contaminated soils will be removed from the local area and transported offsite by an authorized carrier to an appropriate facility as per *Yukon Environment Act Special Waste* and *Contaminated Sites Regulations* requirements.

2.4 Water Management and Treatment

Details pertaining to water management and treatment are outlined in the previously submitted report entitled *Water Management and Treatment Plan Advanced Exploration Phase* (YZC, October 2006). The treatment process currently used involves the addition of ferric sulfate, and this process has been effective in treating the underground discharge for the 2006 season, permitting discharge to the Go Creek watershed.

A water treatment plant (WTP) with its own pumping and power capabilities is onsite to be used as an alternative process for treating underground mine and waste rock sump water. After consideration of numerous alternatives, including high density sludge, lime neutralization, reverse osmosis, activated silica gel, biological treatment and activated carbon, activated carbon was chosen as the treatment method of choice following numerous lab bench scale tests.

Further contingency measures such as passive treatment options for water treatment from either the waste rock pad or mine will be developed following the completion of lab testing. Monitoring as per the B Licence of the Surveillance Network Monitoring stations will continue during the decommissioning and closure phases as described in Section 6.

2.5 Waste Management

Salvageable material will be sold and removed from the site if feasible. Material without any marketable value, which are non hazardous, such as piping, wood, and concrete, etc., will be disposed of onsite, at a proposed landfill site. Prior to disposal of the material on site, all of the materials will be examined to ensure that all hazardous materials have been removed and disposed of in an approved manner. Scrap wood will be stockpiled and burned.

A landfill will be required during the decommissioning phase for the disposal of non-hazardous debris from the portal and camp areas. YZC will apply for an amendment to Mining Land Use

Approval LQ00140 prior to constructing this facility. At the end of the closure phase, the landfill will be eventually decommissioned in an environmentally sound manner.

2.5.1 Industrial Reagents and Hazardous Products

Apart from hydrocarbon products, shotcrete, and water treatment supplies, there are limited chemicals on site. Any remaining materials will be removed from the site and returned to the original supplier for credit and reuse, or sold to a third party user subject to the appropriate regulatory requirements. Unused specialized products such as water treatment chemicals (flocclulants and coagulants) will be disposed of through a licensed waste disposal firm. It is anticipated that such material will be small in volume at the time of closure.

2.6 Mine Openings and Workings

The two closure considerations that apply to the mine openings and workings at the Wolverine Project include preventing the discharge of groundwater from the underground workings and ensuring public safety and protection of wildlife.

2.6.1 Underground Hydraulic Barriers

Preventing the potential for discharge of groundwater from the mine workings is an important focus of the Wolverine Project closure plan. While most of the underground mine workings will be shotcreted, it will be necessary to install hydraulic plugs at two locations within the main access ramp to minimize the potential for groundwater discharge to surface. Detailed engineering of these plugs has not occurred to date as final designs will depend largely upon rock conditions at the targeted locations. These designs are currently being developed. Initial concepts include the use of engineered concrete/paste plugs, buttressed by a rebar net, which has been drilled and sealed into mine walls.

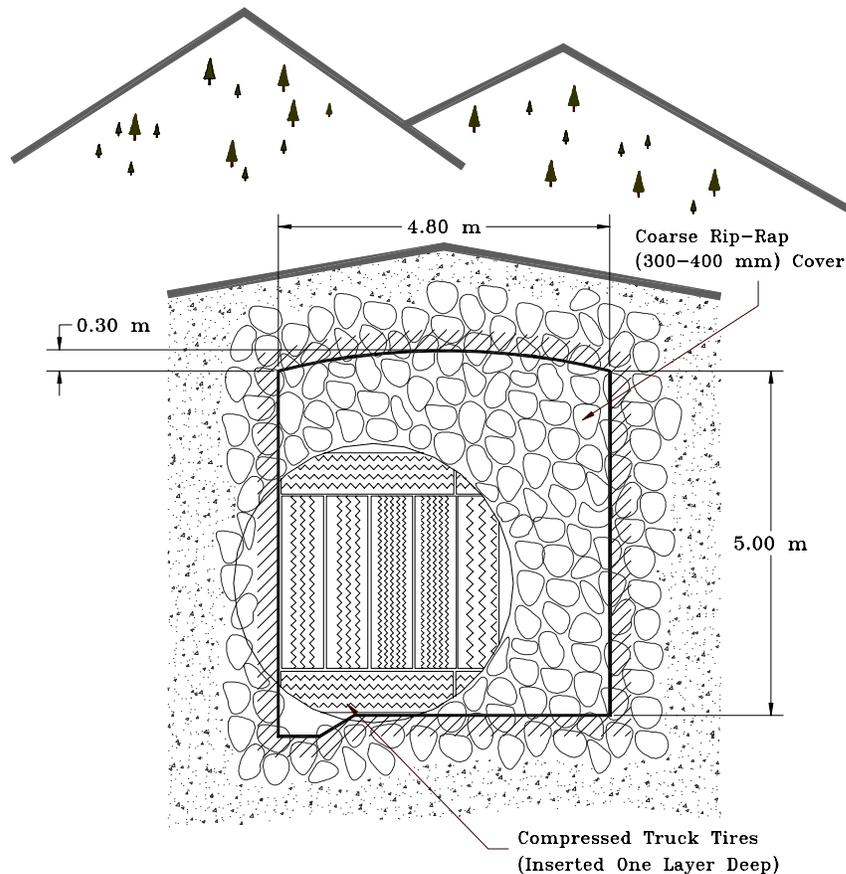
2.6.2 Portal Barrier

To ensure public safety, the portal will be sealed off by a barrier constructed of tires and course riprap to prevent access by the public and wildlife, as shown in Picture 1. It is proposed to construct the barriers of used heavy machinery tires, a technique used in Alberta and British Columbia. The tires would be compressed by an excavator equipped with a thumb attachment and wedged into the opening.

This type of portal barrier has several advantages:

- in the absence of sunlight, the rubber will degrade very slowly
- compression of the tires ensures the tires are locked tight against the rock wall of the portal

- If, over time these rock wall surfaces loosen, the tires will have some expansion to maintain the tight fit
- the configuration of tires (placed on edge) has enough gaps to ensure that it is permeable without permitting access by people or wildlife



Picture 1. Tire and Rock Composite Portal Barrier

2.7 Portal Area

Closure issues related to the portal area include public health and safety, site stabilization, aesthetics, and restoration of disturbed lands. Buildings and exploration support infrastructure will be decommissioned in stages, with the water treatment supporting infrastructure removed last.

Equipment with marketable value will be sold, and the remaining assets will be disposed of through demolition and salvage contracts. In the event that it is uneconomical to remove non-hazardous materials from the site, such material will be buried in the landfill as described in Section 2.5.

The portal area contains a maintenance shop and office, generators, laydown areas, water storage and treatment sumps, two diesel fuel tanks, and various consumables. Additional supporting

infrastructure for underground activities includes the waste rock pad (see Section 2.8) and the explosive magazines.



Picture 2. Status of the upper and lower portal areas in October 2006

Closure related activities for infrastructure within the portal area include removal of buildings, decommissioning and removal of gensets and diesel storage tanks, removal of explosive magazines, site stabilization, and restoration of disturbed lands.

2.7.1 Power Generation Infrastructure

During decommissioning, power requirements will be reduced and only those generators required for ongoing activities will remain operational to support decommissioning and

monitoring activities. The excess gensets will be deactivated and removed from the site, and power distribution lines no longer in use will be salvaged.

At the end of the closure phase when power is no longer required, the remaining gensets will be removed from the site, and the distribution lines will be re-spooled for salvage.

2.7.2 Explosives and Magazines

Unused explosives and detonation devices will be checked for condition and either returned to the supplier for credit, shipped to another third party user, or destroyed through appropriate procedures. In all cases the explosives will be handled, transported and disposed of in compliance with the *Explosive Act*. The explosives magazines will be returned to the supplier or to a third party.

2.7.3 Fuel Storage Tanks

Diesel fuel will be required until all decommissioning activities cease. All tanks will be emptied of their contents in accordance with the *Yukon Environment Act*, and transported offsite for either re-use or salvage.

2.7.4 Sumps

The portal sumps will be decommissioned at the onset of mine flooding. Sediments will be emptied and disposed of underground. The sumps were constructed in summer 2006 (refer to *Water Management and Treatment Plan Advanced Exploration Phase* (YZC, October 2006)) and it is estimated that sumps will have a combined sediment volume of 10 m³. Liners will be removed and kept for emergency application during the closure phase. Once it has been established that the liners would no longer be needed, the liners will be disposed of at an offsite location. The sumps will then be backfilled with till and reclaimed.

2.7.5 Equipment

The majority of the mobile equipment and fixed equipment at the portal belongs to the mine contractor; the contractor will have demobilized the equipment during the temporary closure phase as per the contractual agreement with YZC.

All fixed equipment (owned by YZC) with marketable value will be removed from the site and sold. Equipment that cannot be sold will be disposed of in a proper manner.

2.8 Waste Rock Pad

The waste rock pad is located to the southeast of the portal. The site preparation during construction included removal of trees and shrubs, grading, placement of imported engineered soil and compaction. The compacted till-like foundation layer was further augmented by a 30 mil Enviro Liner to prevent the infiltration of water into the foundation subsoil. Two layers of

geotextile (above and below the Enviro Liner) provide liner protection. A collection sump located at the southern end of the pad collects drainage from the pad (Picture 3).



Picture 3. Lined Phase 1 Waste Rock and Ore Storage Area (looking west).

Approximately 2400 m³ of ore will be relocated from the waste rock pad to the underground prior to flooding of the mine. The remaining volume of waste rock on the pad is estimated at 15,500 m³. The waste rock has potential to generate acid and mitigative measures are required to minimize environmental impacts.

Reclamation of the waste rock pad will include installation of a soil cover and frost protection layer, followed by re-vegetation. Berms and/or lined runoff channels will be constructed to minimize infiltration and erosion. To minimize the generation of future acid rock drainage, the soil cover has to be a low infiltration and low oxygen diffusion cover.

Prior to the placement of the capping material, the waste rock pad would be re-shaped to a dome shape with a final grade of 3H:1V on the side slopes (Figure 1). The waste rock would be compacted and the surface smoothed by a heavy equipment to facilitate shedding of surface water. The contours in Figure 1 represent the final anticipated contours. The footprint of that waste rock pad is approximately 3,200 m². The sloped areas will be approximately 50 m x 60 m

on the south facing slope and a combined total of 165 m x 20 m on the west, north and east facing slopes.

The pad would then be capped with a low permeability and low oxygen diffusion cover system consisting of a 1 m thick compacted clay layer covered with a frost protection layer (~ 2 m of till), and topsoil (0.15-0.3 m) and a vegetation layer.

Test pitting revealed that suitable clay material for this cover is available in the immediate vicinity of the waste rock pad (e.g. test pit hole TP05-012; YZC and Klohn Crippen, 2005). Compaction should achieve at least 90% of maximum Modified Proctor density. The clay should be compacted at the optimum to 2% wet of optimum water content for compaction. To protect the clay layer from freeze-thaw effects (e.g. development of vertical shrinkage cracks), a frost protection layer would be required. It is anticipated that the frost protection layer would have to be 2 m thick. It could consist of the locally abundant till material. Finally, the stockpiled topsoil and organic material would be spread over the capped pad. The surface of the organic material would then be seeded with a site appropriate seed mix to re-establish a vegetation cover.

All surface water draining towards and from the waste rock pad engineered cover system would be collected in perimeter ditches (Figure 2). The perimeter ditches would discharge by gravity into the existing natural drainage just east of the waste rock pad. The total length of the perimeter ditches would be approximately 250 m.

Reclamation would also include the installation of passive sediment retention systems such as hay bales or activated carbon to ensure there are no sediment or metal releases to the local streams. A water management plan will be implemented to ensure the success of the passive system. The management plan will include inspections of the waste rock pad and its appurtenances during scheduled site inspections for three years after decommissioning and reclamation.

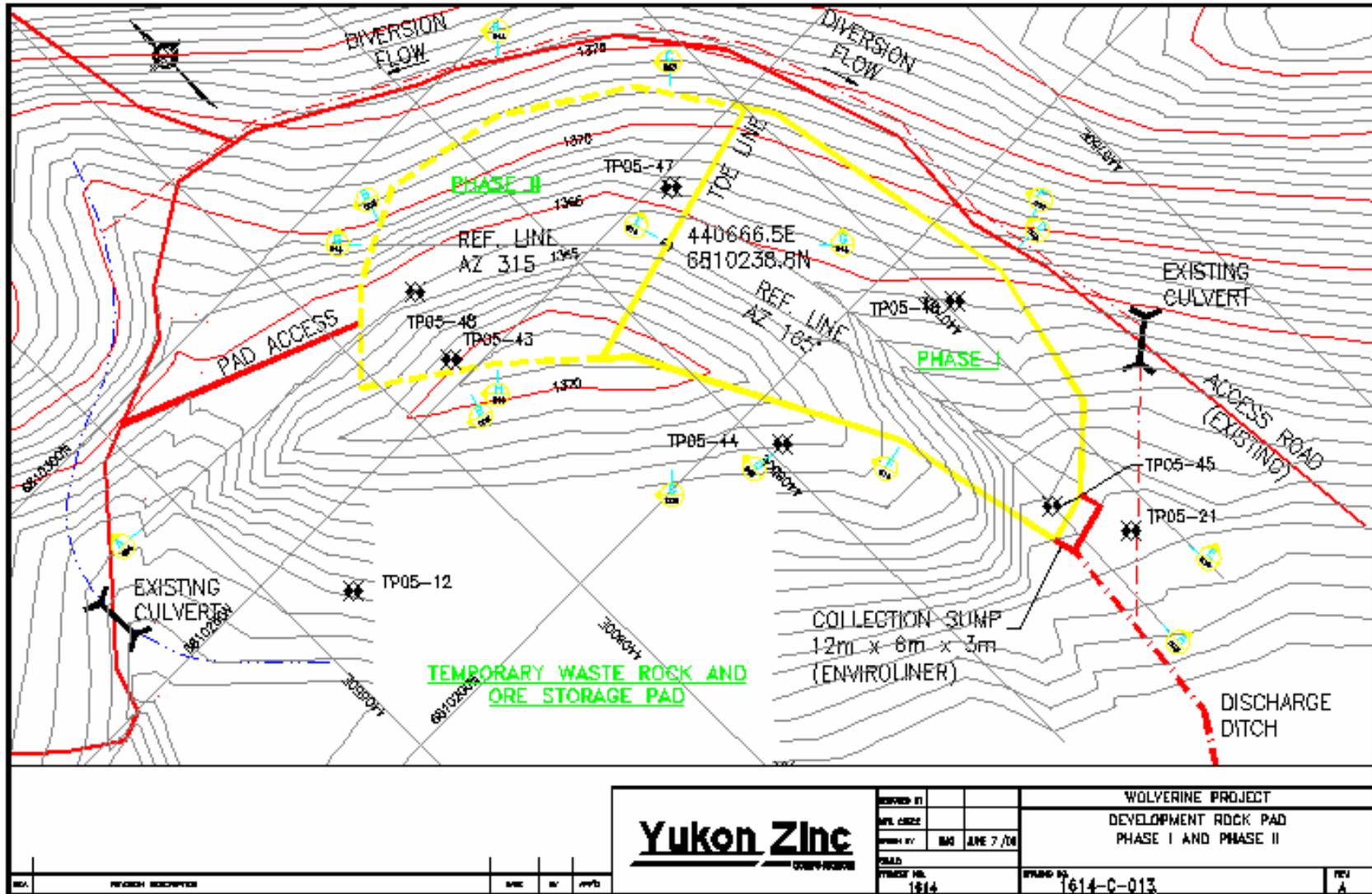


Figure 1. Original Contours in the Phase I and Phase II Waste Rock Pad Area

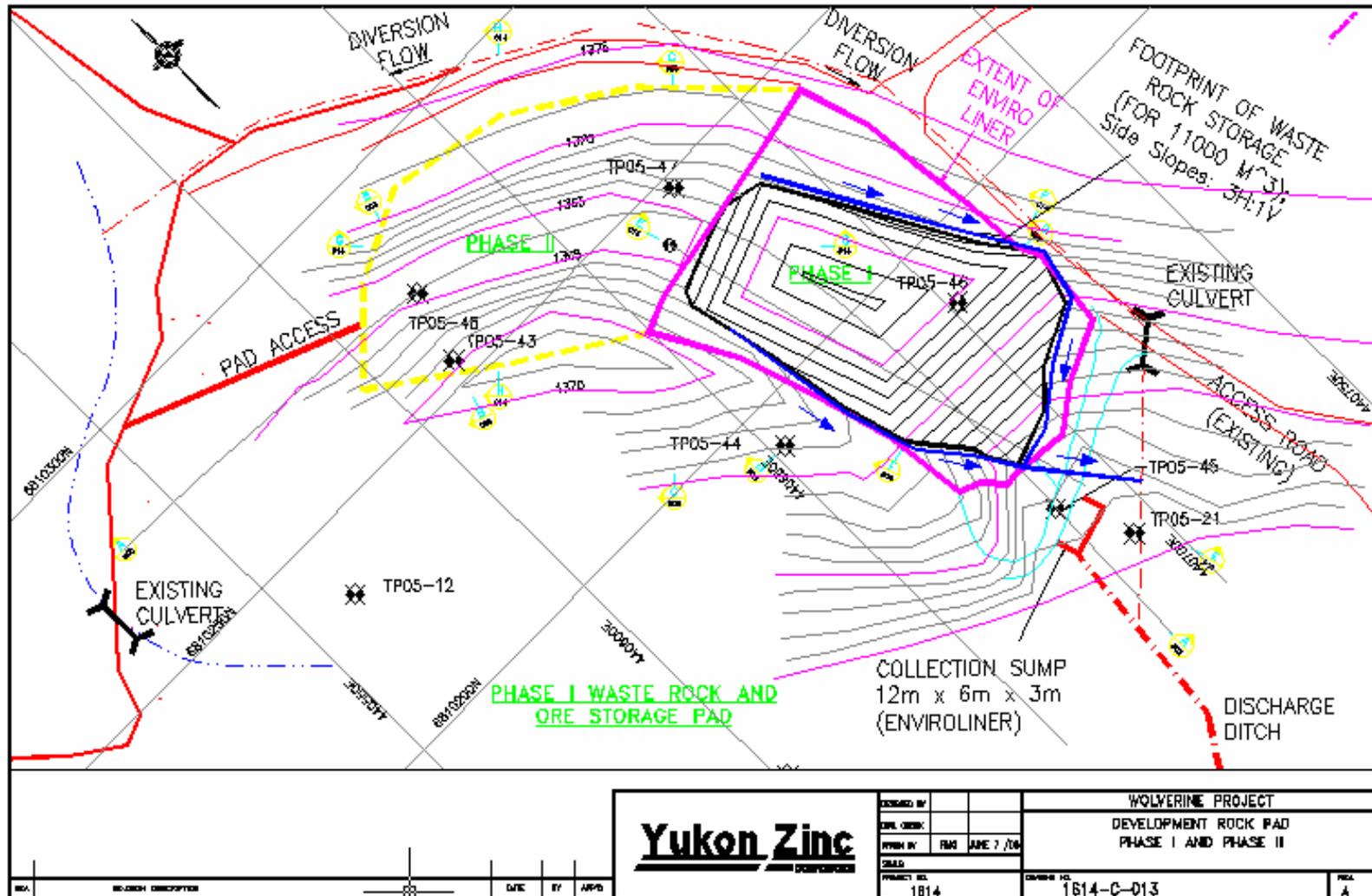


Figure 2. Closure Contours for Phase I Waste Rock Area

2.9 Exploration Camp Site

The exploration camp consists of sleeping quarters, offices, kitchen and mess hall, shop, core storage areas, tool shed, camp fuel cache, garbage incineration drums, generators, helipad, dry, outhouses and recreation center. The overall footprint of the camp area is 2.7 ha; however, once all the infrastructure and buildings are removed, the actual disturbed area is 1.6 ha. All buildings are made out of wood with no foundations.

It is also important to note that it is unlikely that the camp would be decommissioned as the area is in a region of known metal resources. Nevertheless, cost estimates for decommissioning of the structures and reclamation of the area are provided herein. The camp facilities may be downsized and the structures not required demolished progressively. Any scrap wood will be stockpiled and burned on site.

Power supply systems will be kept until they are no longer required and at the end of the closure phase, they will be removed from site.

2.10 Roads and Borrow Areas

2.10.1 Site Roads

Due to the metal resources in the area, decommissioning of the main site roads is unlikely as they will be required to support future activities between the exploration camp and the airstrip. However, cost estimates have been provided based on the assumption that once frequency of access around the site areas is reduced to a point where vehicle access is no longer required, the roads will be decommissioned. This will consist of removing culverts and replacing them with cross-ditches or swales, ripping the road surface, and replacing stockpiled organic material from the roadside to promote natural revegetation. Access will remain for ATVs or similar transport for monitoring and inspections and with minimal effort vehicle access could be re-established.

2.10.2 Borrow Areas

The borrow areas that were used to generate material for the construction of site components such as the temporary waste rock pad cover material (see Picture 3) will be re-contoured to allow for native seed stock to establish, and subsequently seeded if required.

3 Site Reclamation

The primary objectives of land reclamation and re-vegetation for the advanced exploration at the Wolverine property will be to provide short and long-term erosion control and to ensure that end land use is compatible with surrounding lands. The overall goal is to prepare the site so the area is a self-supporting ecosystem with vegetation returning to a state as near as possible to that in existence prior to mining activities.

During closure, areas will be re-contoured to ensure adequate drainage and prevent pooling of water on surface. Seeding after ground preparation works with the Wolverine custom seed mixture (in Table 3) will be used for the reclamation of disturbed lands if vegetation does not establish naturally.

Table 3. Wolverine Project – Custom Seed Mixture

Use	Common Name <i>Species</i>	% in Mixture	Application Rate	Cost
Roadside	Violet wheat grass <i>Agropyron violaceum</i>	33.30	30kg/ha	\$25.50/kg \$765/ha
	Slender wheat grass <i>Agoropyron pauciflorum</i>	33.30		
	Tickle Grass <i>Agrostis scabra</i>	3.30		
	Sheep Fescue <i>Festuca ovina</i>	30.00		
Slope	Violet wheat grass <i>Agropyron violaceum</i>	37.50	40kg/ha	\$29.50/kg \$1,180/ha
	Slender wheat grass <i>Agoropyron pauciflorum</i>	37.50		
	Tickle Grass <i>Agrostis scabra</i>	2.50		
	Tufted Hair Grass <i>Deschampsia caespitosa</i>	2.50		
	Sheep Fescue <i>Festuca ovina</i>	20.00		

A summary of projected spatial disturbances for the project is provided in Table 4. The total disturbed footprint is estimated to be approximately 17 ha. The re-vegetated areas will be subject to periodic inspections that will include the assessment of native plant colonization, and the evaluation of plant growth.

The preferred approach to return the site to a productive state is to conduct progressive reclamation throughout the life of the project. The selection criteria for candidate areas for progressive reclamation initiatives will take into account the current use of the sites and the inherent risk to the receiving environment. Areas that may be considered for progressive reclamation include laydown areas, footprints were temporary structures and redundant components were located, and borrow sites. Success of the re-vegetation program will be determined by measuring a number of aspects including growth, survival, density and diversity of perennial species. Monitoring locations will include randomly located plots within areas representative of the reclaimed lands.

Once all reclamation program objectives have been met and external reviews are complete, YZC will submit an application for a Certificate of Closure.

Table 4. Summary of Disturbed Areas and Reclamation Activities

Component	Estimated Area (ha)
Portal area	2.3
Waste Rock Pad Area (Cover on Waste Pad area = 0.32 ha, remaining area = 0.35 ha)	0.7
Borrow areas – Current areas and areas that will be created during the closure and post closure phases	2.0
Roads	9.1
Camp	2.7
Total Disturbed Area	16.8

4 Monitoring

The surface water monitoring program for the advanced exploration and closure phases includes the monitoring of hydrologic flows and water quality at strategic locations and has been designed to meet the following objectives:

- Continue to provide stream flow data specific to the mine site activities focusing on Go Creek and Wolverine Creek watersheds
- Document water quality in the receiving environment and to verify compliance
- Provide data to update predictions of water quality impacts, and to support ongoing review of mine water and waste management strategies during operations and at closure.

4.1 Surface Water Hydrology

A surface water hydrology monitoring network has been established for the Wolverine Project that provides continuous stream flow data for watercourses in the immediate vicinity of mine site operations as well as more regional coverage (Figure 3). As per the B Licence, flow monitoring is required quarterly for W9 and W12 and monthly for W16. Dataloggers continue to log flows at these locations as well as at W80 on Go Creek (instead of at W16 so that flows are characterized further downstream for future surveillance purposes in Go Creek).

Stations will receive at least two annual inspections, once immediately prior to freshet and again in the late summer fall prior to winter low flow conditions. During inspections, equipment will be calibrated.

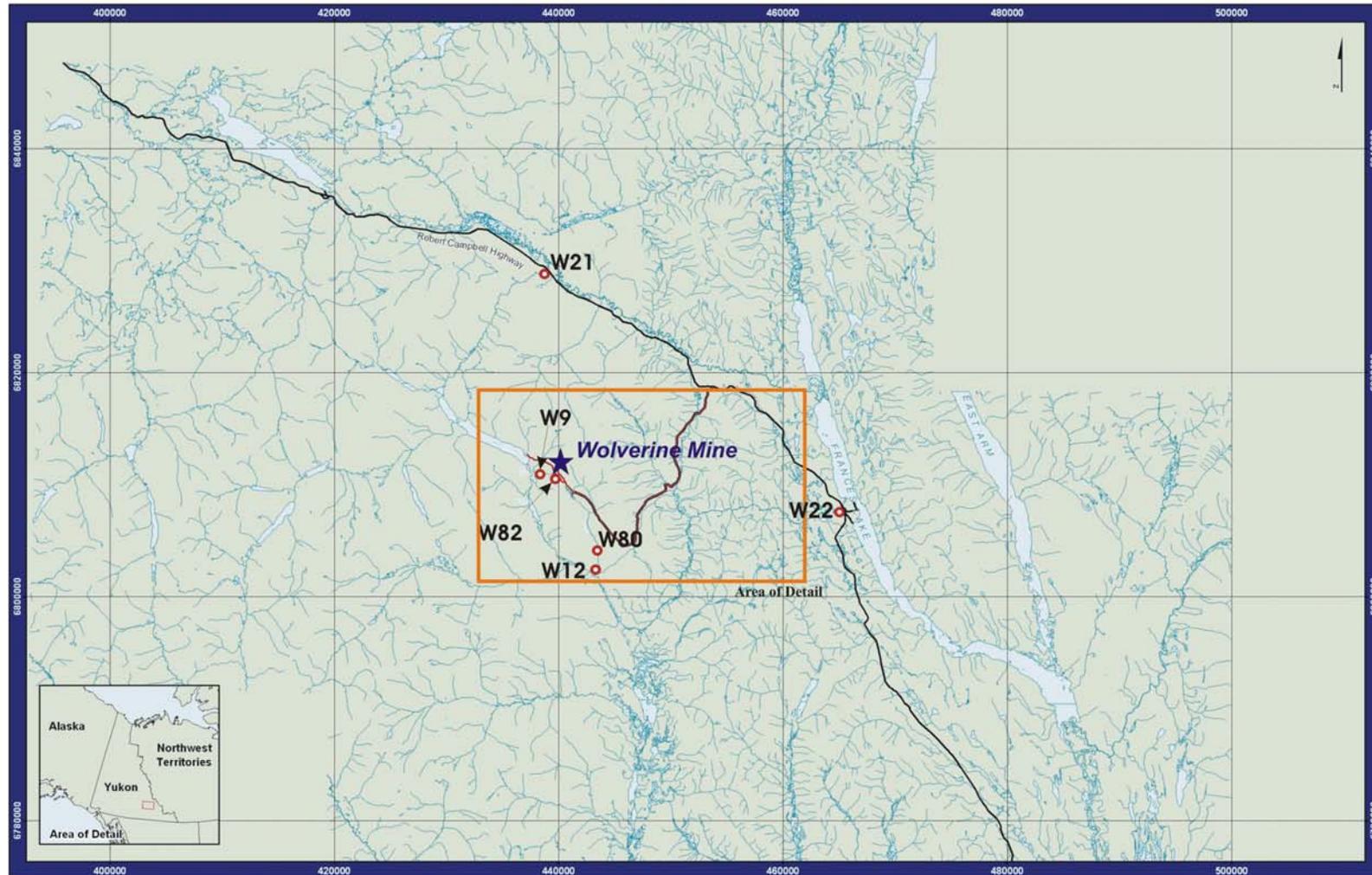


Figure 3. Detail of Continuous Hydrology Monitoring Stations in the Immediate Vicinity of Wolverine Project Operations and Regional Stations

4.2 Surface Water Quality

Surface water monitoring programs are essential to the overall objective of obviating environmental impacts to the receiving environment and maintaining compliance with water quality objectives in Go Creek. Water quality monitoring at key locations along the road route will also be maintained.

The intent of the Surveillance Network Monitoring (SNM) Program outlined in the B Licence is to monitor changes to the receiving environment compared to baseline conditions. A baseline characterization program commenced in October 1995 and the frequency has increased to monthly sampling since May 2005 and includes water sampling of three SNM creek sites (W9, W16 and W12). Water samples are analyzed for physical parameters, dissolved and total metals, total suspended solids, as well as dissolved organic carbon for creek sampling locations.

SNM station locations and water quality sampling frequency as required in the Licence are summarized below, and details are provided in the *Water Management and Treatment Plan Advanced Exploration Phase* (YZC, October 2006).

The water quality parameters and detection limits to be used in the monitoring program of the receiving surface waters are shown in Table 5 and are similar to those used for previous baseline surveys. Particular attention has been paid to achieving the lowest possible detection limits for key parameters including cadmium and selenium. The list of parameters may be modified at a future date to reflect site-specific conditions of the project.

Surface water quality monitoring stations have been established in all key watersheds of the project area including the Wolverine Creek - Wolverine Lake watershed (stations W1, W21, L1, W8, W82 and W9); Go Creek watershed (stations W31, W16, W15, W81, W80 and W12); Money Creek watershed (stations W14, W22 and W40) and along the road route (stations W71, W72 and W73) (Figure 4). Table 6 provides a summary of the surface water monitoring program for the closure phase for stations in the Wolverine, Go Creek, Money Creek and road route watersheds.

Table 5. Surface Water Quality Monitoring Parameters and Detection Limits

Parameter	Symbol	Detection Limit	Units
Physical Parameters			
Conductivity		2	µS/cm
Hardness		0.5	mg/L
Total Suspended Solids	TSS	4	mg/L
Total Dissolved Solids	TDS	10	mg/L
pH	pH	0.1	pH
Turbidity	NTU	0.1	NTU
Major Anions			
Alkalinity-Total	CaCO ₃	0.5	mg/L
Bromide	Br	0.1	mg/L
Chloride	Cl	0.5	mg/L
Fluoride	F	0.02	mg/L
Sulphate	SO ₄	0.5	mg/L
Nutrient Parameters			
Ammonia Nitrogen	N	0.005	mg/L
Nitrate Nitrogen	N	0.005	mg/L
Nitrite Nitrogen	N	0.001	mg/L
Dissolved Ortho-Phosphate	P	0.005	mg/L
Total and Dissolved Trace Metals			
Aluminum	Al	0.001	mg/L
Antimony	Sb	0.0001	mg/L
Arsenic	As	0.0001	mg/L
Barium	Ba	0.001	mg/L
Boron	B	0.008	mg/L
Cadmium	Cd	0.000017	mg/L
Calcium	Ca	0.05	mg/L
Chromium	Cr	0.0005	mg/L
Cobalt	Co	0.001	mg/L
Copper	Cu	0.0002	mg/L
Iron	Fe	0.005	mg/L
Lead	Pb	0.00005	mg/L
Magnesium	Mg	0.05	mg/L
Manganese	Mn	0.001	mg/L
Molybdenum	Mo	0.001	mg/L
Nickel	Ni	0.0005	mg/L
Phosphorus	P	0.1	mg/L
Potassium	K	1	mg/L
Selenium	Se	0.0005	mg/L
Silicon	Si	0.05	mg/L
Silver	Ag	0.00001	mg/L
Sodium	Na	0.05	mg/L
Strontium	Sr	0.001	mg/L
Thallium	Tl	0.0001	mg/L
Vanadium	V	0.001	mg/L
Zinc	Zn	0.001	mg/L

Table 6. Summary of Surface Water Monitoring Program for Decommissioning and Closure

Site	Purpose	Decommissioning	Closure
<i>Wolverine Watershed</i>			
W1	Monitor water quality of Wolverine Lake	Quarterly	-
W21	Monitor water quality of Nougha Creek	Quarterly	-
W9	Monitor water quality of Wolverine Creek down slope of the mine site	Quarterly	Quarterly
<i>Go Creek Watershed</i>			
W16	Monitor upper Go Creek	Monthly	Seasonal
W12	Go Creek prior to Money Creek	Quarterly	Quarterly
<i>Money Creek Watershed</i>			
W40	Monitor water quality in Money Creek downstream of highway	Quarterly	-
<i>Road Route Monitoring</i>			
W72	Monitor water quality in Putt Creek	Quarterly	Quarterly
W73	Monitor water quality at Bunker Creek road crossing	Quarterly	-

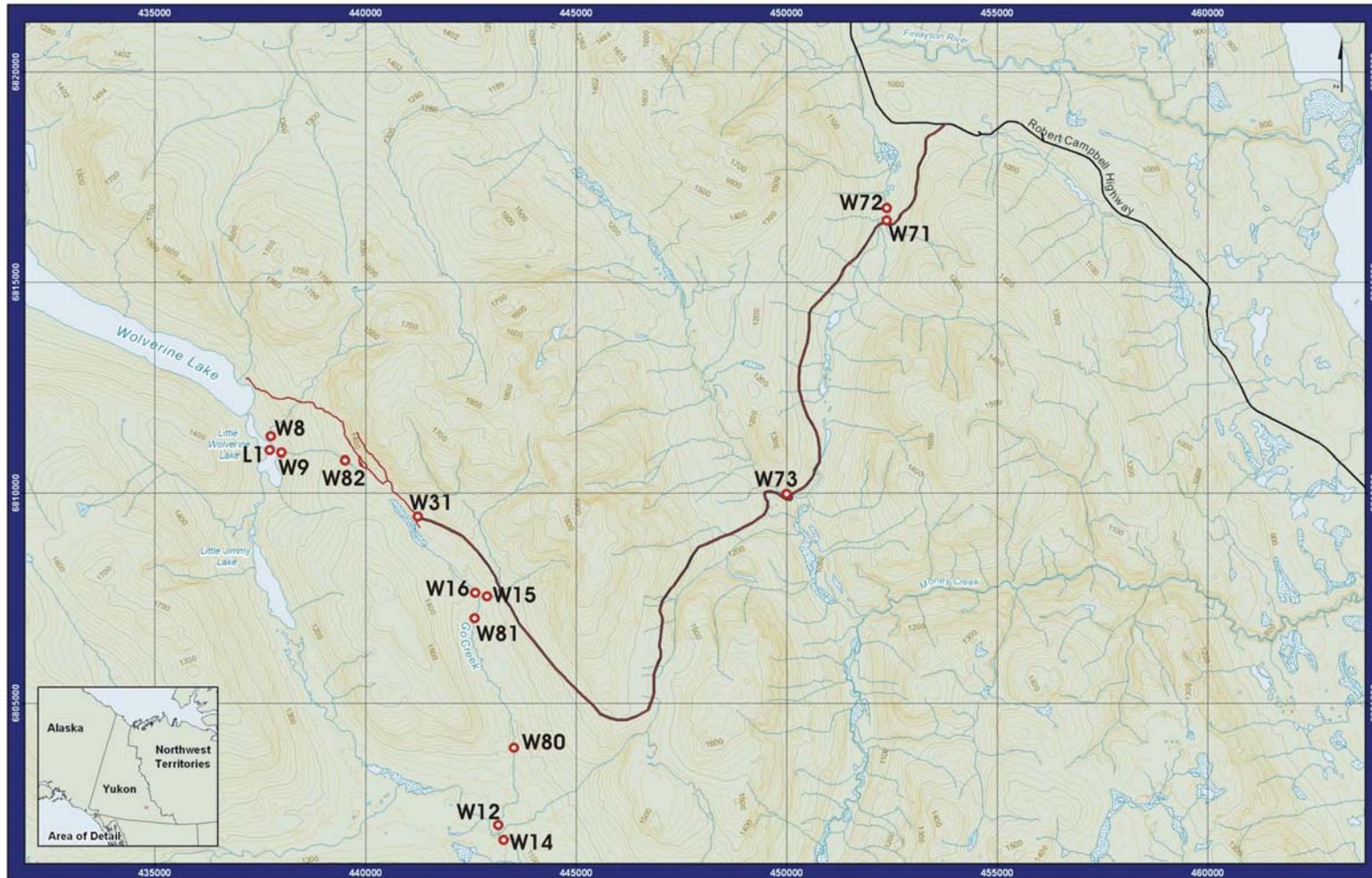


Figure 4. Detail of Surface Water Quality Monitoring Stations in the Immediate Vicinity of Wolverine Project and Along the Road Route

5 Closure Monitoring and Maintenance Programs

An onsite manager will oversee all decommissioning programs (Year 1) and an environmental technician will be responsible for all activities and environmental programs during the closure phase (Years 2-4).

Monitoring will include assessment of water quality, site re-vegetation, and physical stability. This will be undertaken during the first three years following site reclamation activities in Year 1.

An annual inspection of the site will be undertaken to evaluate revegetation success and identify any areas requiring additional remedial work. No further inspections and maintenance are planned beyond the post closure phase or beyond three years following the completion of the reclamation work. The plan assumes the access corridors, the waste rock pad, airstrip, the portal area and the camp would not require further reclamation work and therefore, there will be no long term liabilities associated with them.

6 Decommissioning and Reclamation Cost Estimates

The cost summaries provided below include costs associated with project shutdown, the decommissioning of facilities and support infrastructure, reclamation activities, and compliance and reclamation monitoring. The estimated costs are based on the following assumptions, rationale and information:

- Equipment demobilization costs at the end of the advanced exploration program will be borne by the contractor in a previous temporary closure phase and therefore, no cost estimates have been assigned.
- Decommissioning and closure phases are assumed to be phased out within a four year period. Decommissioning will occur in Year 1 and closure activities in Years 2 to 4.
- Following installation of hydraulic plugs, groundwater is not expected to discharge to surface from the portal when the mine floods. Nevertheless, as a contingency measure, infrastructure relating to water treatment will remain in place for the first year of closure to deal with potential mine water issues. Passive treatment systems continue to be evaluated and will be constructed in the event that monitoring determines that hydraulic plugs are not effective.
- ARD and metal leaching control methods for the waste rock pad will function as per design intent beyond a four year period (the post closure phase) without requiring any perpetual maintenance.

- The passive water treatment systems for the waste rock pad sump water will perform as designed and will produce effluent quality that meets the required criteria, therefore no funds have been allocated beyond the post closure phase.
- Approximately 2430 m³ of ore will be disposed of in the underground workings.
- Based on hydrological and water quality investigations undertaken and monitoring conducted in 2005 and 2006, the flooded underground workings are unlikely to carry contaminants to Wolverine Creek.
- Type B Water License water quality standards will be used to assess impacts during the decommissioning and closure phases.
- Non-acid generating fill, clay and till material will be available within the project area for the decommissioning and closure activities.
- Equipment mobilization and demobilization costs were not included in the closure cost analysis.
- Reclamation costs are based on the cost of having the work completed by a third party contractor.
- The custom seed mixes and application rates supplied for roadside and slopes were used to estimate seeding costs.

The estimated costs to implement the detailed reclamation and closure plans described above for both likely and unlikely activities are presented in Table 7. Based on the plans presented above, the total cost to restore the site to a productive state is estimated to be approximately \$ 850,860 (Table 7). This value assumes that the exploration camp, roads and airstrip remain operational for regional exploration programs, and are not decommissioned. All costs are reported in 2006 \$CDN with a 20% contingency added.

Appendix A provides detailed cost breakdowns with quantities and unit rates used to derive the estimates for various project components. The costs have been developed using unit rates for Yukon Territory and northern British Columbia construction projects and assumes that all work will be conducted by a third party contractor. Therefore, they include charges for overheads and profit.

There are a number of opportunities to reduce closure costs including:

- Developing borrow areas near the point of use (waste rock pad area, exploration camp and the portal area) to reduce haulage costs
- Engaging multi-skilled personnel to minimize the number of people required for closure. This will in turn reduce camp costs and other overhead costs
- Optimizing the construction schedule to efficiently implement the decommissioning, reclamation and closure plan

- Investigating the potential for shortening the decommissioning and reclamation program to reduce labour costs and camp costs
- Using equipment onsite for the exploration phase to close the site in order to eliminate mobilization and demobilization costs.

Table 7. Estimated Closure Cost to Execute Decommissioning, Reclamation and Monitoring Plans

Item No.	Work Item Description	Likely Activity	Cost
1	Mine Workings		
1.1	Underground Hydraulic Barriers	Yes	\$ 83,400
1.2	Portal Barrier	Yes	\$ 39,550
2	Waste Rock Pad		
2.1	Ore Relocation	Yes	\$ 24,300
2.2	Clay and Till Cover	Yes	\$ 110,050
3	Portal Area		
3.1	Maintenance Shop and Offices	Yes	\$ 17,600
3.2	Power and Water Supply Systems	Yes	\$ 7,400
3.3	Sump Decommissioning	Yes	\$ 3,800
3.4	Explosive and Cap Magazines	Yes	\$ 5,000
3.5	Waste Management	Yes	\$ 10,000
4	Exploration Camp		
4.1	Buildings	No	\$ 25,500
5	Reclamation and Revegetation		
5.1	Site Roads	No	\$ 26,827
5.2	Portal Area	Yes	\$ 22,744
5.3	Exploration Camp	No	\$ 5,192
5.4	Waste Rock Pad	Yes	\$ 14,603
5.5	Borrow and Magazine Areas	Yes	\$ 4,100
6	Decommissioning Admin and Compliance (Year 1)		
6.1	Administration	Yes	\$ 168,500
6.2	Environmental Assessment	Yes	\$ 16,000
6.3	Environmental Supervision	Yes	\$ 36,000
6.4	Compliance Monitoring and Reporting	Yes	\$ 5,000
7	Closure Phase Admin and Compliance (Years 2 to 4)		
7.1	Environmental Supervision	Yes	\$ 108,000
7.2	Environmental Monitoring	Yes	\$ 18,000
7.3	Maintenance	Yes	\$ 15,000
Total Cost of All Activities			\$ 766,566
Less Cost of Unlikely Activities			\$ 57,519
Subtotal			\$ 709,047
Contingency 20%			\$ 141,809
ESTIMATED COST OF CLOSURE			\$ 850,856

7 References

Quartz Mining Land Use Approval LQ0040

Type B Water License Approval QZ01-051.

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Yukon Zinc Corporation, 2005. *Temporary Closure Plan*, November 17, 2005

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Yukon Zinc Corporation and Klohn Crippen Consultants Ltd. 2005: *Wolverine Project – Temporary Waste Rock and Ore Storage Facility Report, Advanced Exploration Phase*, June 09, 2005.

Appendix A

Decommissioning and Closure Cost Tables for the
Various Project Components

Closure Cost Estimate for Mine Workings

Item No.	Work Item Description	Equipment / Labour	Units	Quantity	Unit Cost	Cost
1	Mine Workings					
1.1	Underground Hydraulic Barriers					
	<i>Design of hydraulic barriers</i>	Engineering	hrs	60	\$115	\$ 6,900
	<i>Misc. Supplies (most components onsite)</i>	Misc.				\$ 4,500
	<i>Installation of two underground barriers</i>	Mine Contractor	days	8	9000	\$ 72,000
					Sub-Total	\$ 83,400
1.2	Portal Barrier					
	<i>Used Tire Purchase and Shipping</i>			36	\$300	\$ 10,800
	<i>Plug portal with tires</i>	Cat 235 Hoe	hrs	35	\$190	\$ 6,650
	<i>Supply and place waste rock cap over tires</i>	Truck and Hoe	hrs	30	\$190	\$ 5,700
	<i>Labour to assist with placing tires & cap</i>	Labourer	hrs	80	\$40	\$ 3,200
	<i>Supervision</i>	Supervision	hrs	50	\$80	\$ 4,000
	<i>Design of passive water treatment contingency measure</i>	Engineering	hrs	80	\$115	\$ 9,200
					Sub-Total	\$ 39,550
	Total Estimated Cost					\$ 122,950

Closure Cost Estimate for Waste Rock Pad

Item No.	Work Item Description	Equipment / Labour	Units	Quantity	Unit Cost	Cost
2	Waste Rock Pad					
2.1	Ore Relocation					
	<i>Haul and Placement - Underground</i>	Mine Contractor	m ³	2430	\$10	\$24,300
					Sub-Total	\$24,300
2.2	Clay and Till Cover					
	Site Preparation - Pad Footprint Compaction	D6 Dozer	hrs	15	\$ 130	\$1,950
	Clay Layer (1 m over 3200 m ²)	Truck&Excavator	m ³	3200	\$ 10	\$32,000
	Frost Protection Layer (2 m over 3200 m ²)	Truck&Excavator	m ³	6400	\$ 10	\$64,000
	Vegetative Cover (0.30 m for 3200 m ²)	Truck&Excavator	m ³	960	\$ 10	\$9,600
	Construction of Diversion Ditches - 250 m x 1m ²	Truck&Excavator	m ³	250	\$ 10	\$2,500
					Sub-Total	\$110,050
	Total Estimated Cost					\$134,350

Closure Cost Estimate for Portal Area

Item No.	Work Item Description	Equipment / Labour	Units	Quantity	Unit Cost	Cost
3	Portal Area					
3.1	Maintenance Shop and Offices					
	<i>Remove salvageable equipment</i>	Labour	hrs	80	\$40	\$3,200
	<i>Dismantle Building - Manpower</i>	Labour	hrs	60	\$40	\$2,400
	<i>Dismantle Building - Equipment</i>	Cat 235	hrs	10	\$190	\$1,900
	<i>Reslope and contour area</i>	Cat D8	hrs	20	\$190	\$3,800
	<i>Misc. Supplies & Tools</i>	Misc.	l.s.			\$5,000
	<i>Scrap haulage</i>	Truck D250E	hrs	10	\$130	\$1,300
					Sub-Total	\$17,600
3.2	Power and Water Supply Systems					
	<i>Remove salvageable equipment</i>	General Labour	hrs	160	\$40	\$6,400
	<i>Misc. Supplies & Tools</i>	Misc.	l.s.			\$1,000
					Sub-Total	\$7,400
3.3	Sump Decommissioning					
	<i>Remove Liners and backfill Sumps with Till</i>	Truck and Loader	hrs	20	\$190	\$3,800
					Sub-Total	\$3,800
3.4	Explosive and Cap Magazines					
	<i>Remove from site</i>	Misc.	l.s.			\$5,000
					Sub-Total	\$5,000
3.5	Waste Management					
	<i>Remove hazardous waste from site to licensed facility</i>	Misc.	l.s.			\$5,000
	<i>Remove contaminated waste from site to licensed facility</i>	Misc.	l.s.			\$5,000
					Sub-Total	\$10,000
					Total Estimated Cost	\$43,800

Closure Cost Estimate for Exploration Camp

Item No.	Work Item Description	Equipment / Labour	Units	Quantity	Unit Cost	Cost
4	Exploration Camp					
4.1	Buildings					
	<i>Demolish Buildings</i>	Cat 235 Hoe	hrs	50	\$190	\$9,500
	<i>Haul wastes to airstrip</i>	Truck&Excavator	hrs	60	\$190	\$11,400
	<i>General Labour</i>	Labour	hrs	115	\$40	\$4,600
					Sub-Total	\$25,500

Closure Cost Estimate for Reclamation and Revegetation

Item No.	Equipment / Labour	Units	Quantity	Unit Cost	Cost
5	Reclamation and Revegetation				
5.1	Site Roads				
	<i>Ripping to loosen the soil base</i>	Unit Cost Basis	per ha	9.12	\$ 720 \$6,566
	<i>revegetate - Seed</i>	Unit Cost Basis	per ha	9.12	\$ 765 \$6,977
	<i>revegetate - Fertilizer</i>	Unit Cost Basis	per ha	9.12	\$ 1,325 \$12,084
	<i>Application Labour</i>	Labour	hrs	30	\$ 40 \$1,200
				Sub-Total	\$26,827
5.2	Portal Area				
	<i>Apply 0.3 m of growth media/till for 16000 m²</i>	Unit cost Basis	m ³	4800	\$ 4 \$19,200
	<i>revegetate - seed</i>	Unit CostBasis	per ha	1.6	\$ 765 \$1,224
	<i>revegetate - fertilizer</i>	Unit CostBasis	per ha	1.6	\$ 1,325 \$2,120
	<i>application cost</i>	Labour	hrs	5	\$ 40 \$200
				Sub-Total	\$22,744
5.3	Exploration Camp				
	<i>Ripping - Half the area (Estimated)</i>	Unit Cost Basis	per ha	1.4	\$ 765 \$1,071
	<i>revegetate - seed</i>	Unit cost Basis	per ha	2.7	\$ 765 \$2,066
	<i>revegetate - fertilizer (Half the Area)</i>	Unit Cost Basis	per ha	1.4	\$ 1,325 \$1,855
	<i>application cost</i>	Labour	hrs	5	\$ 40 \$200
				Sub-Total	\$5,192
5.4	Waste Rock Pad				
	<i>revegetate - seed</i>	Unit cost Basis	per ha	6.7	\$ 765 \$5,126
	<i>revegetate - fertilizer</i>	Unit Cost Basis	per ha	6.7	\$ 1,325 \$8,878
	<i>application cost</i>	Labour	hrs	15	\$ 40 \$600
				Sub-Total	\$14,603
5.5	Borrow and Magazine Areas				
	<i>revegetate - seed</i>	Unit Cost Basis	per ha	5	\$ 756 \$3,780
	<i>application cost</i>	Unit Cost Basis	hrs	8	\$ 40 \$320
				Sub-Total	\$4,100
Total Estimated Cost					\$73,466

Closure Cost Estimate for Administration and Compliance Monitoring – Decommissioning and Closure

Item No.	Equipment / Labour	Units	Quantity	Unit Cost	Cost
6	Decommissioning Admin and Compliance (Year 1)				
6.1	Administration				
	<i>planning and project management</i>	Management	Monthly	3 \$ 8,800	\$26,400
	<i>camp cost (Effective Presence = 3 Months)</i>	labour	Pers Days	1157 \$ 100	\$115,700
	<i>General Labour (Camp)</i>	Labour	Monthly	6 \$ 3,000	\$18,000
	<i>light duty vehicles</i>	light truck	Monthly	6 \$ 1,000	\$6,000
	<i>miscellaneous office/supply costs</i>	miscellaneous	Monthly	6 \$ 400	\$2,400
				Sub-Total	\$168,500
6.2	Environmental Assessment				
	<i>site environmental assessment</i>	contract	I.s.		\$8,000
	<i>confirmatory sampling</i>	contract	I.s.		\$8,000
				Sub-Total	\$16,000
6.3	Environmental Supervision				
	<i>environmental monitoring</i>	Management	monthly	6 \$ 6,000	\$36,000
				Sub-Total	\$36,000
6.4	Compliance Monitoring and Reporting				
	<i>water quality monitoring and analytical costs</i>	Misc.	per year	1 \$ 5,000	\$5,000
				Sub-Total	\$5,000
7	Closure Phase Admin and Compliance (Years 2 to 4)				
7.1	Environmental Supervision				
	<i>environmental monitor</i>	Management	monthly	18 \$ 6,000	\$108,000
				Sub-Total	\$108,000
7.2	Environmental Monitoring				
	<i>WQ monitoring</i>	Miscellaneous	per year	3 \$ 6,000	\$18,000
				Sub-Total	\$18,000
7.3	Maintenance				
	<i>miscellaneous maintenance</i>	Miscellaneous	per year	3 \$ 5,000	\$15,000
				Sub-Total	\$15,000
Total Estimated Cost					\$366,500