**Table 13: Estimated Construction Quantities – West Twin Outlet Channel**

| Excavation Volumes ($m^3$) | | Fill Volumes ($m^3$) | | |
|---|---|---|---|---|
| Overburden Excavation | Intact Bedrock | Rip rap (Type 1A) | Erosion Protection (Type 2) | Bedding (Type 3) |
| 1,300 | 10 | 300 | 200 | 100 |
| **TOTAL 1,310 $m^3$** | | **TOTAL 600 $m^3$** | | |

**Table 14: Design Flow Conditions – East Twin Diversion Channel**

| **Design Flow and Channel Geometry** | | |
|---|---|---|
| | 100-yr event | PMP event |
| Design Flow, $m^3/s$ | 13.2 | 50 |
| Channel Slope | 0.686% | 0.686% |
| Side Slope, V:H | 1:1.5 | 1:1.5 |
| Bottom width, m | 5.5 | 5.5 |
| Manning cofficient | 0.035 | 0.035 |
| | | |
| **Hydraulic Modelling Results (Manning's Equation)** | | |
| Channel Depth, m | 1.05 | 2.20 |
| Velocity, m/s | 1.95 | 2.89 |
| | | |
| **Median Stone Size Calculation** | | |
| $D_{50}$ mm | 130 | 284 |
| | | |
| | | |
| **Notes:** | | |
| Hydraulic Calculations by FlowMaster v.5.17 (Haestad Methods, Inc.) | | |
| $D_{50}$ - mean particle diameter | | |
| Median stone size calculated considering specific gravity = 2.65 | | |
| Reference: Smith (1995). | | |

**Table 15: Estimated Construction Quantities East Twin Diversion Channel Upgrading**

| Excavation Volumes ($m^3$) | Fill Volumes ($m^3$) | | |
|---|---|---|---|
| Overburden Excavation | Rip rap (Type 1) | Bedding (Type 2) | General Fill |
| 60 | 360 | 240 | 1,000 |
| TOTAL 60 $m^3$ | TOTAL 1,600 $m^3$ | | |

## Table 16: Summary of Water Quality Projections for Zinc

| Timeframe | Porewater Expulsion | | | | | Natural Runoff | | Reservoir Perimeter | | Polishing Pond Outflow | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Cell talik | | Test Cell talik | | % of | Conc. | % of | Conc. | % of | Conc. | Volume | Load | % of |
| | Volume | Conc. | Volume | Conc. | annual load | | Annual load | | Annual load | | (m3) | (kg) | annual load |
| Years 1-5 | 32400 | 0.025 | 18000 | 0.025 | 0.6% | 0.056 | 79% | 0.3 – 24 | 20% | 0.072 | 496,000 | 35 | 100% |
| Years 5-10 | 12960 | 0.033 | 9900 | 0.041 | 0.3% | 0.056 | 80% | 0.3 – 24 | 20% | 0.073 | 491,000 | 35 | 100% |
| Years 10-15 | 11160 | 0.051 | 3600 | 0.101 | 0.4% | 0.056 | 80% | 0.3 – 24 | 20% | 0.073 | 490,000 | 35 | 100% |
| Years 15-20 | 10440 | 0.141 | 0 | - | 0.9% | 0.056 | 79% | 0.3 – 24 | 20% | 0.073 | 489,500 | 35 | 100% |
| Years 20-25 | 2844 | 0.291 | 0 | - | 0.5% | 0.056 | 80% | 0.3 – 24 | 20% | 0.073 | 488,000 | 35 | 100% |

Notes: all concentrations in mg/L.
Volumes in $m^3$.

**Table 17: Testing Frequencies for Cover Materials**

| Item | Minimum Test Frequency | |
|---|---|---|
| | Shale | Twin Lakes sand and gravel |
| Grain Size Distribution | Every 10,000 $m^3$ | Every 10,000 $m^3$ |
| Moisture Content | Every 5,000 $m^3$ | Not Required |

**Table 18: Performance Monitoring of Reclamation Works**

| COMPONENT | MONITORING COMPONENT | MONITORING METHODS | DETERMINATOR | PURPOSE/ IMPACT |
|---|---|---|---|---|
| **Talik Freezeback** | Surface Cell and Test Cell Taliks | Thermistors and Thermocouples | Ground Temperatures | Slower (or faster) than anticipated talik freezeback. |
| | | Vibrating wire piezometers | Pore Pressures | Could lead to pingo formation, dike instability or transport of tailings or pore water to surface. |
| | | Monitoring wells | Water Quality | Pore water expulsion and cryoconcentration of solutes could have impact on Reservoir water quality |
| | Surface Deformation | Visual monitoring<br>Topographic surveys | Frost Heave and Pingo/Frost Mound Formation | Cracking and deformation of cover would allow for release of talik pore water, release of tailings and damage to the cover. |
| | West Twin Dike | Visual monitoring<br>Topographic surveys<br>Vibrating wire piezometers<br>Thermistors and thermocouples | Dike Instability<br>• Heave deformations<br>• Cracking<br>• Pore pressures<br>• Thawing at depth | Dike instability may release talik pore water and tailings into the Reservoir. |
| **Reclamation Covers** | Armour Layer | Visual monitoring | Erosion | Could lead to erosion of underlying shale |
| | | | Settlement | Standing water on surface |
| | | | Frost effects | Displaced surface fragments |
| | | | Break down of particles | More erosion of underlying shale |
| | Shale Layer | Visual monitoring | Erosion | Exposure of underlying tailings<br>Reduction of insulating thickness |
| | | Visual monitoring and survey monuments | Settlement | Interrupts surface drainage and may results in standing water<br>Reduction of insulating thickness |
| | | Thermistors and frost gauges | Insulation for permafrost aggradation | Thaw into tailings may result in poor quality of runoff water, or initiate oxidation of tailings |
| | | Drilling, sampling and testing for bulk density and moisture content of shale and underlying tailings | Moisture content retained in void space<br>(controls oxygen entry) | Must check that moisture retention is being achieved to verify limiting of oxygen entry into underlying tailings |
| | | Shallow monitoring wells | Poor water quality from surface drainage | May have negative impact on water quality in Reservoir |
| | | Visual monitoring<br>Shallow monitoring wells | Tailings displaced into shale | May result in poor quality surface drainage |
| | Drainage Swales | Visual monitoring | Erosion | Exposure of underlying tailings<br>Reduction of insulating thickness |
| | | Visual monitoring and survey of swale grades | Settlement/ heave of the swale | Standing water |

**Table 18: Performance Monitoring of Reclamation Works Continued**

| COMPONENT | MONITORING COMPONENT | MONITORING METHODS | DETERMINATOR | PURPOSE/ IMPACT |
|---|---|---|---|---|
| West Twin Dike Spillway | Spillway Inlet | Visual Inspection | Frost Heave/ Thaw Settlement<br>Ice and Snow Blockage | May reduce discharge capacity and/or create ponding |
| | Channel | Visual Inspection | Channel erosion due to flow and/ or slumping and/or settlement of channel side walls due to flow erosion or thawing of permafrost. | May reduce discharge capacity.<br>Potential for progressive degradation. |
| | Spillway Outlet | Visual Inspection | Permafrost degradation.<br>Erosion of tailings in Reservoir. | Assess if plunge pool and discharge element are appropriate. |
| | Rip Rap | Visual Inspection | Integrity of rip rap | Assess rip rap integrity for the long-term. |
| | Spillway Water Level | Visual Inspection | Water depth in channel during high flow conditions | Confirm depth of rip rap protection. |
| Reservoir Shoreline Erosion Protection | Natural Shoreline | Visual Inspection | Erosion<br>Suspended sediment<br>Thermal degradation | Assess wave action during open water season. Assess stability of surfical slopes. |
| | Rip Rap | Visual Inspection | Displacement, erosion, physical deterioration due to freeze/ thaw and wetting/ drying effects | Assess effects of wave and ice action following ice break up an open water season. |
| | Ice Cover | Visual Inspection | Plucking and displacement of rip rap<br>Tailings entrainment<br>Ice debris blocking outlet | Check during ice break-up period to assess conditions. |
| | Water Quality | Visual/ Sampling and Testing | Suspended sediment<br>Re-suspension of tailings | Check that water cover and shoreline protection elements are sufficient to maintain low levels of suspended sediment in the water to be discharged. |

**Table 18: Performance Monitoring of Reclamation Works Continued**

| COMPONENT | MONITORING COMPONENT | MONITORING METHODS | DETERMINATOR | PURPOSE/ IMPACT |
|---|---|---|---|---|
| **Polishing Pond Outlet Channel And Overflow Weir** | Concrete weir wall | Visual Inspection | Deformation cracking<br>Spalling<br>Chemical reactions | Ensure physical stability of structure and concrete integrity. |
| | Seepage | Visual Inspection | Water seeping around or under the weir wall | Assess effectiveness of foundation grouting and abutment seal. |
| | Rip Rap | Visual Inspection | Displaced or deteriorated rip rap | Erosion of channel and abutments may affect integrity of concrete weir wall. |
| | Blockages | Visual Inspection | Ice or debris in channel upstream or downstream of structure | Ensure that design channel capacity is maintained during open water period. |
| **East Twin Lake Diversion Dam And Channel** | Diversion Dam | Visual Inspection | Erosion/ degradation of rip rap<br>Settlement<br>Cracking | Integrity of Diversion Dam is required to prevent runoff from East Twin Lake from entering the Reservoir. |
| | Channel erosion protection | Visual Inspection | Displaced or degraded rip rap | Erosion protection is required to ensure uniform flow in vicinity of dam. |
| | Diversion channel slopes | Visual Inspection | Erosion of slope or channel bottom<br>Displaced or deteriorated rip rap | Ensure stability of channel during flood flow events. |

**Table 19: Reclamation Period Monitoring Schedule**

| Monitoring Method | Year of Reclamation Activities | |
|---|---|---|
| | 1 | 2 |
| **Thermistors and Thermocouples** | Monthly | Monthly |
| **Vibrating Wire Piezometers** | Monthly | Monthly |
| **Monitoring Wells (Water Quality Samples)** | Twice in Summer Period | Twice in Summer Period |
| **Visual Inspections (by site or local staff)** | Weekly (June - October)<br><br>Every Two Weeks (November - May) | Weekly (June - October)<br><br>Every Two Weeks (November - May) |
| **Geotechnical Inspections** | Twice/year (Spring/ Fall) | Twice/year (Spring/ Fall) |
| **Topographic Survey** | Twice/year (of selected points) | Twice/year (of selected points) |

### Table 20: Closure Period Monitoring Schedule

| Monitoring Method | Year Following Completion of Reclamation Activities | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| **Thermistors and Thermocouples** | Quarterly | Quarterly | Quarterly | Quarterly | Quarterly |
| **Frost Gauges** | Every Two Weeks (June – September) | Every Two Weeks (June – September) | Every Two Weeks (June – September) | Only if Required | Only if Required |
| **Vibrating Wire Piezometers** | Quarterly until Frozen | Quarterly until Frozen | Quarterly until Frozen | Quarterly until Frozen | Quarterly until Frozen |
| **Monitoring Wells (Water Quality Samples)** | Once per Summer | Once per Summer | Once per Summer | Once per Summer | Once per Summer |
| **Visual Inspections (by site or local staff)** | Every two weeks (June - October)<br>Monthly (November - May) | Every two weeks (June - October)<br>Monthly (November - May) | Every two weeks (June - October)<br>Monthly (November - May) | None | None |
| **Geotechnical Inspections** | Twice/ year (Spring/ Fall) | Once/year pending suitable performance | Once/year pending suitable performance | Once/year pending suitable performance | Once/year pending suitable performance |
| **Topographic Survey of selected points** | Once/year | Once/year | Once/year | None | None |

Table 21: Contingency Plans for Undesirable Performance of Reclamation Works

| COMPONENT | ISSUES | CONSEQUENCES | MITIGATION APPROACH |
|---|---|---|---|
| **Talik Freezeback** | Slower than anticipated freezeback of talik | • Freezeback has not progressed at rate predicted by geothermal modelling. | • Review of physical conditions and geothermal data by geotechnical engineer to recalibrate the model.<br>• Continue to monitor freezeback rate beyond current anticipated closure monitoring period, with consideration of potential impacts. |
| | Elevated pore pressures in talik | • Could lead to pingo formation, dike instability or transport of tailings or tailings to surface. | • Increase frequency of data collection and review.<br>• Review of physical conditions and piezometric data by geotechnical engineer to identify root cause of pressures.<br>• Install relief wells into high pore pressure areas. |
| | Poor water quality talik that impacts Reservoir water quality | • Cryoconcentration of solutes related to pore water expulsion during freezeback of the taliks may have a negative impact on the Reservoir water quality. | • Increase water quality monitoring frequency.<br>• Review of physical conditions and geothermal and water quality data to quantify volumes, water quality and expected duration.<br>• Treat Reservoir water prior to release to environment. |
| | Formation of pingo or frost mound | • Cracking or deformation of cover possibly allowing release of tailings or water.<br>• Possible interference with surface drainage grades. | • Review of physical conditions and geothermal data by geotechnical engineer to identify root cause of deformation.<br>• Pressure relief wells into pingo or frost mound to reduce surface deformations.<br>• Maintenance and repair of cover to achieve design specifications. |
| **West Twin Dike** | West Twin Dike Instability | • Potential to release talik pore water and/or tailings into the Reservoir. | • Review of physical conditions and geothermal and piezometric data to identify root cause of observations noted.<br>• Pressure relief wells to reduce pore pressures if appropriate.<br>• Maintenance and repair of dike crest and slope if appropriate.<br>• Continued vigilant monitoring. |
| **Reclamation Cover** | Erosion of armouring layer | • Reduction in Twin Lakes sand and gravel and shale thickness<br>• Reduction in insulation thickness<br>• Potential poor quality run-off | • Enlarge the surface particle size.<br>• Flatten surface grades.<br>• Supplement layer with additional armour. |
| | Settlement of cover interrupts surface drainage | • Allows for standing water that may leave thermal impacts | • Localized repair of settled area to correct surface grade. |
| | Excessive depth of active layer thaw | • Sub-surface thawed tailings may cause poor surface water quality runoff | • Need to determine if cause is climatic conditions (warm) and/or thermal properties of the cover shale and/or sand and gravel armour.<br>• If excessive thaw depth occurs in localized areas, need to determine if surface water quality impacts are significant and/or if oxidation may be initiated.<br>• If impacts are significant, determine if cover layer can be thickened, if moisture content can be increased or if grade can be reduced to enhance moisture retention in the cover. |
| | Surface water runoff quality becomes poor | • Potential impacts on Reservoir water quality | • Assess and attempt to mitigate root causes with respect to the cover and the underlying tailings.<br>• Potential treatment of water in the Reservoir prior to discharge to the environment. |
| | Heaving of cover results in open cracking | • Infiltration of water/oxygen<br>• Oxidation of tailings<br>• Poor quality surface runoff | • Localize repair of cracked areas by contouring or supplement with additional material. |

**Table 21: Contingency Plans for Undesirable Performance of Reclamation Works Continued**

| COMPONENT | ISSUES | CONSEQUENCES | MITIGATION APPROACH |
|---|---|---|---|
| **West Twin Dike Spillway** | Frost Heave | • May reduce discharge capacity | • Excavate heaved material, replace with non-frost heave susceptible material to design grade. |
| | Frost Settlement | • Creates ponding, thermal impacts | • Grade surface and/or place compacted material to re-establish grade and eliminate depression(s). |
| | Blockage by Ice and Snow | • Ponding on top of cover, reduces freeboard on dam, thermal impacts, reduced spillway discharge capacity | • Remove ice and snow accumulation before spring melt.<br>• Assess causes and mitigate. |
| | Channel – erosion and/or settlement of slopes | • Degradation of slopes, permafrost, increased sedimentation in channel, reduced discharge capacity. | • Regrade areas due to thaw settlement.<br>• Flatten slopes to stable angle.<br>• Remove debris in channel.<br>• Replace or place rip rap. |
| | Channel – erosion/ scour of channel bottom | • May lead to undermining of slopes<br>• Flow concentration and accelerating erosion<br>• Thermal degradation<br>• Increased sedimentation downstream<br>• Affects discharge capacity | • Check flows, gradients and velocities.<br>• May require local weirs to dissipate energy.<br>• Replace with rip rap sized for local velocities. |
| | Outlet – energy dissipation - scour | • May lead to undermining of slopes<br>• Flow concentration and accelerating erosion<br>• Thermal degradation<br>• Increased sedimentation downstream<br>• Affects discharge capacity | • Increase size/depth of plunge pool and/or outlet area.<br>• Replace rip rap with larger sizes. |
| | Rip Rap Integrity | • Progressive erosion of slope<br>• Increased sedimentation<br>• Reduced discharge capacity<br>• Possible thermal degradation | • Assess velocities during periods of seasonal/ extreme flow.<br>• Replace rip rap with larger size.<br>• Consider flattening slopes. |
| | Inadequate Freeboard | • Potential for overtopping of dam | • Remove blockages in channel.<br>• Assess causes.<br>• Mitigate condition to prevent future occurrence. |
| | High Spillway Water Level | • Increased potential for ponding upstream in Surface Cell<br>• Reduced discharge capacity<br>• Erosion of Channel | • Review hydraulic design parameters.<br>• Inspect channel and remove blockages and constrictions.<br>• May need to increase channel capacity by altering grade or by excavating wider or deeper. |

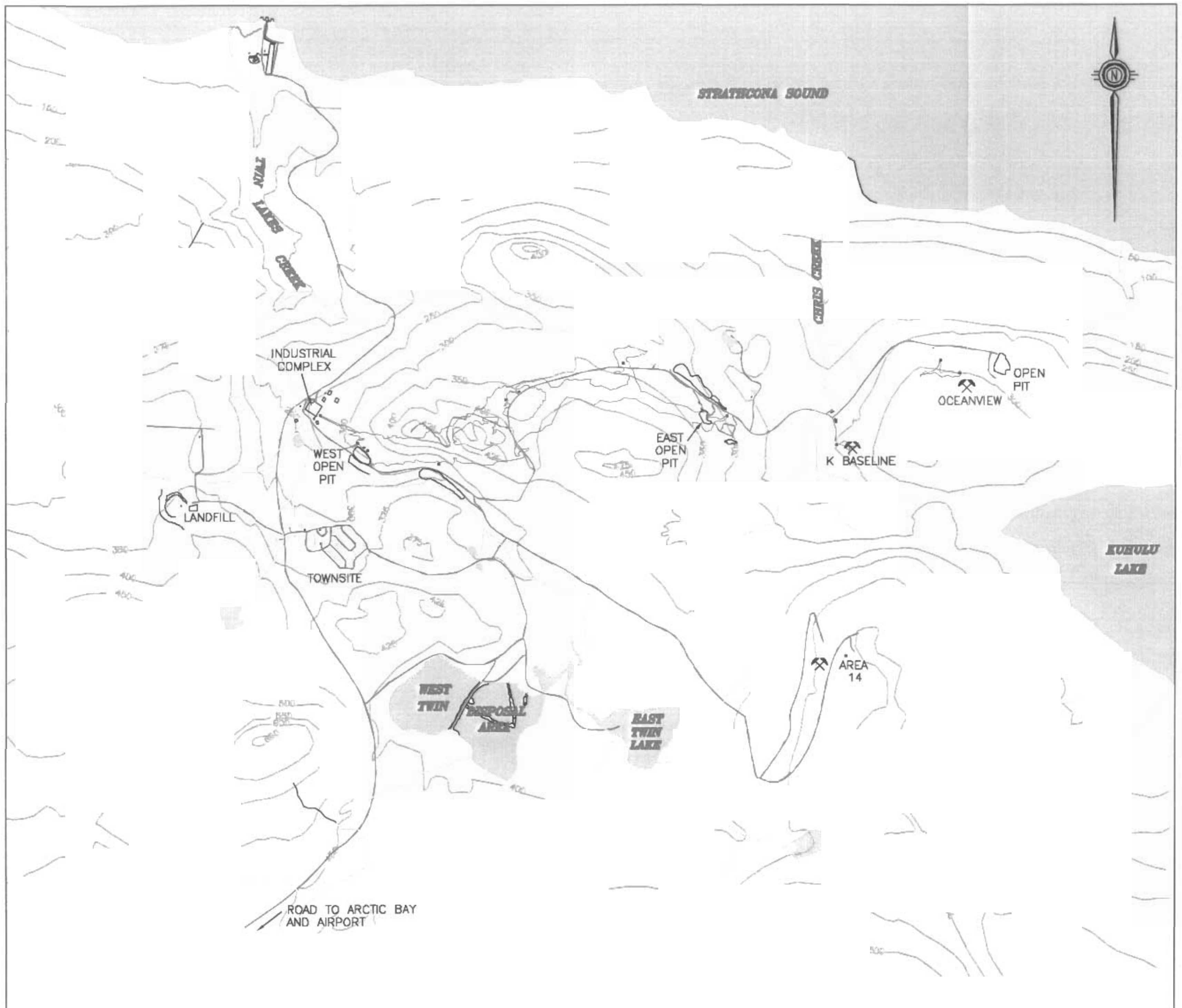
Table 21: Contingency Plans for Undesirable Performance of Reclamation Works Continued

| COMPONENT | ISSUES | CONSEQUENCES | MITIGATION APPROACH |
|---|---|---|---|
| **Reservoir Shoreline Erosion Protection** | Erosion of natural shoreline | • Suspended sediment<br>• Slope instability<br>• Thermal degradation | • Assess physical conditions.<br>• Place rip rap and/or thawed cover over affected area. |
| | Rip Rap degradation | • Loss of erosion protection<br>• Increased suspended sediment<br>• Re-suspension of tailings<br>• Thermal degradation<br>• Test Cell cover instability | • Assess causes – i.e. ice plucking, wave energy, physical deterioration.<br>• Replace with larger rip rap or more durable material. |
| | Water quality degradation | • Release of non-compliant water from Reservoir | • Assess sources: sedimentation, re-suspension of tailings, ARD/ metals leaching from waterline area.<br>• Improve rip rap cover in areas subject to erosion.<br>• Increase shale/ rip rap cover to a greater depth thickness.<br>• Manage and treat (if required) reservoir water. |
| **West Twin Outlet Channel and Overflow Weir** | Deformation or cracking of concrete wall | • Inability to maintain reservoir at design water level<br>• Increased gradient in outlet channel<br>• Wall failure | • Check foundation conditions.<br>• Assess concrete quality.<br>• Undertake concrete repairs and reinforce structure/ foundation. |
| | Concrete spalling or chemical reactions | • Long term deterioration of structure<br>• Potential lowering of Reservoir pond level | • Assess concrete quality.<br>• Assess reservoir water quality.<br>• Repair concrete and cover with chemical resistant concrete or other coating. |
| | Seepage around or under concrete wall | • Depending on location and rate of flow, may affect Reservoir levels.<br>• May cause erosion of embankment slopes around structure. | • Assess volumes and location during open water season.<br>• Remove, replace, and re-compact abutment materials along seepage path.<br>• Additional grouting may be required in bedrock foundation. |
| | Damaged Rip Rap | • Increased erosion<br>• Increased suspended sediment<br>• Long term thermal degradation | • Assess causes.<br>• Increase rock sizes and replace – may require regarding and re-sloping of bank.<br>• May require more durable rock if rock particles are deteriorating. |
| | Blockages | • Reduced discharge capacity<br>• Increased Reservoir level<br>• Increase in shoreline erosion | • Remove blockages.<br>• Mitigate conditions causing blockage. |

Table 21: Contingency Plans for Undesirable Performance of Reclamation Works Continued

| COMPONENT | ISSUES | CONSEQUENCES | MITIGATION APPROACH |
|---|---|---|---|
| **East Twin Lake Diversion Dike and Channel** | Erosion or degradation of rip rap on dam or channel slopes. | • Increased erosion<br>• Degradation of dam and channel<br>• Increased suspended sediment | • Assess causes.<br>• Repair damaged areas with new rip rap – larger particle size and/ or better quality rock. |
| | Scour of channel bottom | • May affect rip rap protection on adjacent slopes | • Armour channel bed with suitable sized rip rap. |

# FIGURES





800m 0 800m 1.6km 2.4km

CLIENT: NANISIVIK MINE, A DIVISION OF CANZINCO LTD.

**LEGEND**

- ROAD
- GROUND CONTOUR (50 m INTERVAL)
- CREEKS, DRAINAGE, STREAMS, SHORELINE
- EXTENT OF UNDERGROUND WORKINGS



| REV. | DATE | REVISION NOTES | DRAWN | CHECKED | APPROVED |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

| | |
|---|---|
| SCALE: | AS SHOWN |
| DATE: | FEB 2004 |
| DRAWN: | CJT |
| DESIGNED: | GKC |
| CHECKED: | JWC |
| APPROVED: | JWC |

PROJECT: WEST TWIN DISPOSAL AREA CLOSURE PLAN

TITLE: SITE LOCATION PLAN

| PROJECT No. | DWG No. | REV. |
|---|---|---|
| 0255-008-09 | 1 | 0 |

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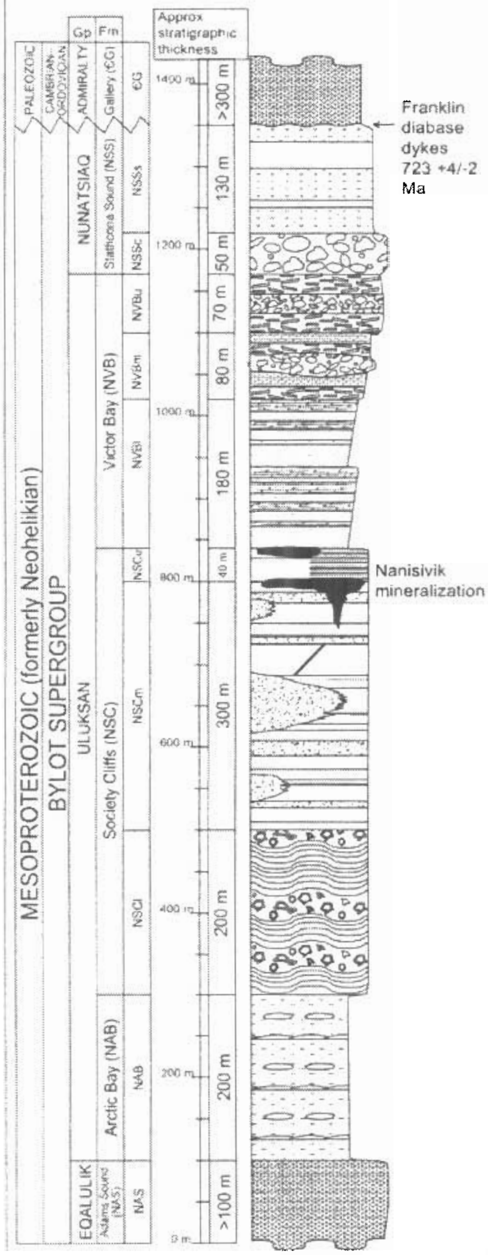
Calgary, AB Phone: (403) 250 5185

0255-008-09 001 FIGURE_01_REV1.dwg

# GENERALIZED STRATIGRAPHIC SECTION – NANISIVIK AREA




| UNIT | LITHOFACIES DESCRIPTION |
|---|---|
| Gallery Fm. | **Quartz arenite:** red and white, medium- to coarse-grained, friable<br>**Mudstone:** light green, common synaeresis cracks |
| Strathcona Sound (wacke and shale) | **Subarkose to shale:** grey to brown, coarse-grained, 1 to 2 m thick beds<br>**Quartz wacke:** dark green to grey, fine sand to mud |
| Strathcona Sound (conglomerate) | **Carbonate pebble to boulder conglomerate:** tan, silty dolostone clasts, olive-green sand to silt matrix |
| Upper Victor Bay | **Silty dolomitic mudstone:** light red to tan massive dolomitic mudstone<br>**Intraclast rudstone:** white, substratiform oriented, 3 to 15 cm, tabular dolostone clasts, 1m+ thick beds |
| Middle Victor Bay | **Dolomitic mudstone:** dark grey, friable, 1 to 20 cm beds interbedded with shale<br>**Intraclast floatstone:** white to grey, 5 to 15 cm tabular limestone +/- dolostone clasts |
| Lower Victor Bay | **Shale:** dark grey to black, fissile to unconsolidated, 2 to 4 mm thick laminae, organic-rich<br>**Dolomitic mudstone:** dark grey, 1 to 20 cm beds interbedded with shale |
| Upper Society Cliffs | **Laminated dolomitic mudstone:** medium grey to light brown, planar to undulating, <1 to 2 mm laminae |
| Middle Society Cliffs | **Doloarenite:** light grey to white, massive, matrix-supported, 1 to 3 mm angular to subrounded clasts, irregular lenses 1 to 35 m thick<br>**Sorted doloarenite:** planar, 3 to 30 cm thick, normal-graded beds, local crosslamination<br>**Dolomitic mudstone:** medium grey to brown, 3 to 30 cm beds, massive to laminated, locally graded |
| Lower Society Cliffs | **Microbially laminated dolomitic boundstone:** light grey to pink, 3 to 15 cm beds of crinkly, planar to domal, <1 mm laminations; <2 cm laterally linked hemispheroid stromatolites<br>**Clotted dolomitic boundstone:** Tan to light grey, 3 to 15 cm thick beds of amoeboid, holly-, or feather-shaped clots. Clots are rimmed by <1 mm thick isopachous cement |
| Arctic Bay | **Siltstone:** medium grey to brown, 1 to 2 cm thick beds, micaceous<br>**Shale:** dark grey, <1 cm thick beds, micaceous, fissile |
| Adams Sound | **Quartz arenite:** light orange to brown, 5 to 50 cm thick planar-bedded, medium to coarse sand with rare quartz-pebble conglomerate |

From: Patterson and Powis (2002)



| | | | |
|---|---|---|---|
| SCALE: | As Shown | DESIGNED: | MJM |
| DATE: | JAN 2004 | CHECKED: | MJM |
| DRAWN: | SLF | APPROVED: | JWC |

CLIENT: NANISIVIK MINE, A DIVISION OF CANZINCO LTD.

PROJECT: WEST TWIN DISPOSAL AREA CLOSURE PLAN

TITLE: NANISIVIK GEOLOGY STRATIGRAPHIC COLUMN

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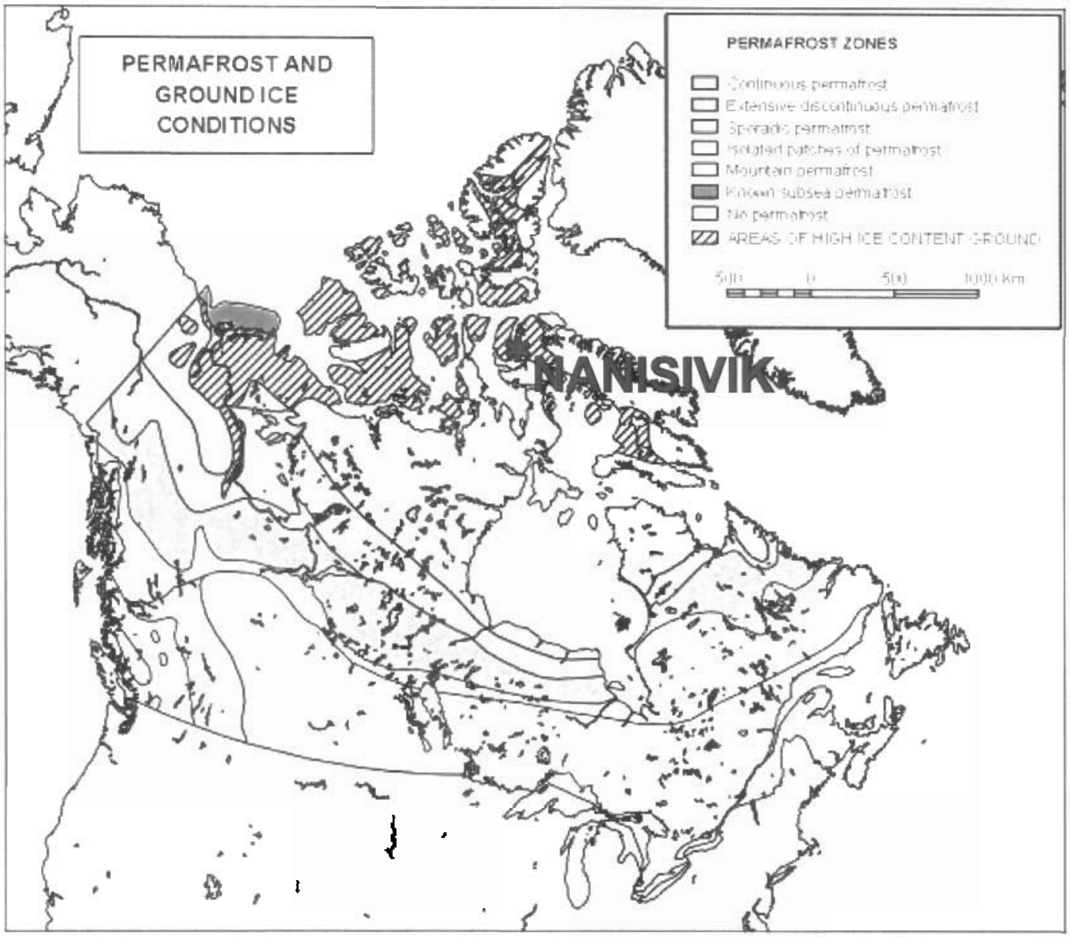
Calgary, Alberta. Phone: (403) 250-5185

| PROJECT No. | DWG. No. | REV. |
|---|---|---|
| 0255-008-09 | 2 | 0 |




Note: figure derived from Natural Resources Canada
Website: http://sts.gsc.nrcan.gc.ca/permafrost



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|---|---|---|---|
| SCALE: | AS SHOWN | DESIGNED: | GKC |
| DATE: | JAN 2004 | CHECKED: | JWC |
| DRAWN: | SLF | APPROVED: | JWC |

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PROJECT
WEST TWIN DISPOSAL AREA CLOSURE PLAN

TITLE
REGIONAL PERMAFROST MAP

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|---|---|---|
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