



January 2011



REPORT

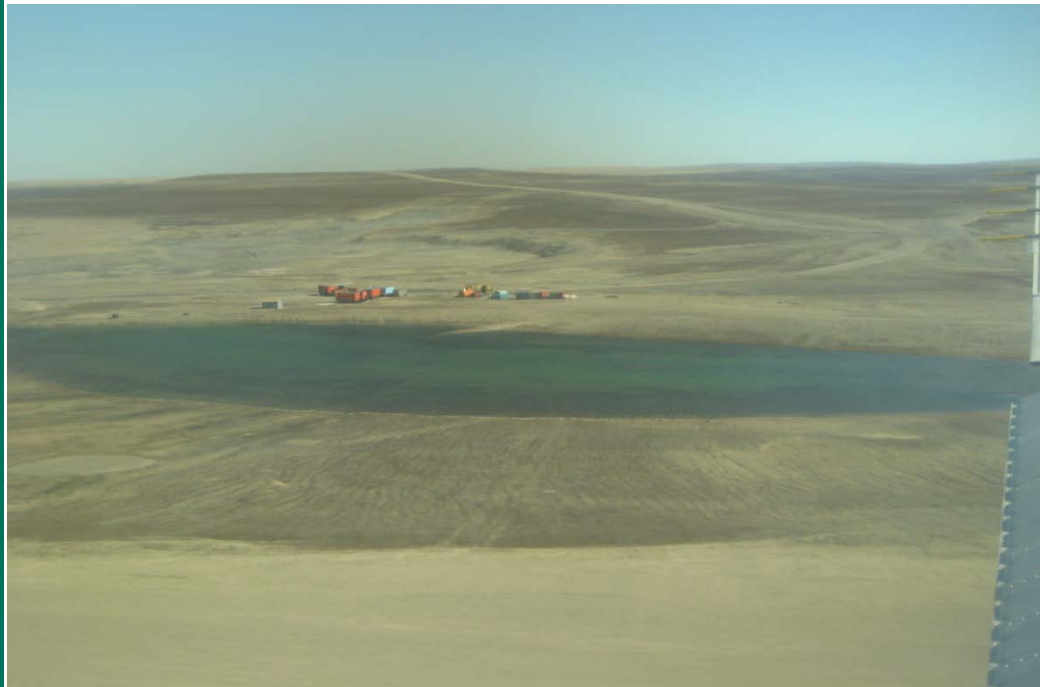


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# Polaris 2010 Geotechnical Inspection

## FORMER POLARIS MINE, NUNAVUT

**Submitted to:**  
Teck Resources Ltd.



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**Teck**





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## POLARIS 2010 GEOTECHNICAL INSPECTION

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Figure 1 Site Plan and Inspection Photograph Locations

### APPENDIX A

2010 Polaris Geotechnical Inspection Photographs



### 1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Teck Resources Ltd. (Teck) to conduct the 2010 post-closure geotechnical inspection of the former Polaris mine located on Little Cornwallis Island, Nunavut. The inspection was carried out by Mr. Darrin Johnson, P.Eng., on July 13 and 14, 2010 who was accompanied by Mr. Bruce Donald, P.Eng., from Teck.

The decommissioned Polaris mine site is located on Little Cornwallis Island approximately 120 km northwest of Resolute, Nunavut. Figure 1 presents the general arrangement of the decommissioned former Polaris mine site.

Current conditions were compared with conditions observed during previous post-closure geotechnical inspections. A summary of site conditions observed during the 2010 geotechnical inspection are presented in the following sections of this report. Photographs of current site conditions are presented in Appendix A.

The site has been sub-divided into eight areas to facilitate inspection and reporting as follows:

- Garrow Lake Area (including wave break structure and breached dam);
- Frustration Lake Jetty and Access Road;
- New Quarry Area;
- Subsidence Area;
- Operational Landfill;
- Little Red Dog Quarry Landfill;
- Mine Portals; and
- Marine Foreshore Adjacent to Former Dock.

The inspection was conducted in accordance with requirements under Section H (6) of the Water Licence and under the requirements of the Decommissioning and Reclamation Plan approvals.

### 2.0 BACKGROUND AND SITE HISTORY

The Polaris mine was operated by Teck between 1981 and 2002 and decommissioned in 2003 and 2004. Site facilities comprised an underground mine, concentrator plant, concentrate storage shed, dock, airstrip, tailings impoundment, freshwater intake on Frustration Lake, various site access roads, a limestone quarry, a shale quarry, and support infrastructure including fuel storage, camp, warehouse, etc. Decommissioning and reclamation of the site involved demolition of all structures and excavation of all soils contaminated by metals and hydrocarbons. All demolition waste and contaminated soil was either placed underground or in engineered landfills. Access roads between Garrow Lake, Frustration Lake and in the immediate vicinity of the previously active mining operations were decommissioned by rounding the shoulders of each road, removing culverts, and re-establishing natural drainage patterns. The airstrip was not decommissioned so that it could continue to be used for site access during the post-closure monitoring period. Little Cornwallis Island airstrip (referred to as LCI by local pilots) is also used occasionally by passing airplanes for emergency landings. For post-closure monitoring purposes, Teck has maintained a small portable camp adjacent to Loon Lake that will be removed



from the Site with all other remaining equipment in 2011. The existing general arrangement of the site is shown in Figure 1.

The marine foreshore area and slope in the vicinity of the former concentrate storage shed on the west side of the island now comprise relatively gentle uniform slopes that were graded as part of decommissioning. The graded slopes are interrupted by access roads and ramps. The area in the immediate vicinity of the former dock structure is almost flat. The shoreline has been restored to a consistent gently sloping area. Four portals for mine access and exploration activities have been sealed, backfilled and graded to match the surrounding slopes. The sideslopes of two small rockfill pads located at the south end of the marine foreshore area were regraded in 2006 and some slumping at the main portal was repaired in 2009.

Little Red Dog Quarry, located at the northwest end of the airstrip was backfilled partially with demolition debris and metals contaminated soils and subsequently capped with rockfill. The remnant quarry walls above the level of the capping layer are benched and serve to catch ravelling material as the slopes gradually weather. Safety berms extend around the quarry perimeter, and additional safety measures in the form of a ditch and a high berm exist at the end of the airstrip. Thermistors were installed through the rockfill capping layer into the underlying landfilled materials at Little Red Dog Quarry. The Operational Landfill, located at the south end of the former mine facility area, was regraded and capped with rockfill during decommissioning. Thermistors were initially installed in the Operational Landfill at four locations during operation of the mine. The existing thermistor installations were modified following closure of the landfill to monitor the new cap, however only two of the four installations were successfully modified in 2005. The following year all four thermistor installations were restored to full function along with improvements to the data collection system and insulation at ground surface. Thermistor data has been successfully downloaded annually from all four thermistor locations since 2007 and is reported by Teck under separate cover. Ground temperature data measured by thermistors installed at the Little Red Dog Quarry Landfill and Operational Landfill indicates that the landfilled waste is frozen and that permafrost has extended up into the overlying rockfill cover effectively encapsulating waste materials in ice as designed.

East of the airstrip, the main features of disturbance are the Subsidence Area and the New Quarry. The Subsidence Area is located over top of former underground mine workings and experienced significant settlement during mine operations. During decommissioning, the Subsidence Area was regraded and no further ground deformations have been detected since annual topographic survey monitoring commenced in 2004. Detailed topographic survey measurements of this area are carried out annually and reported on separately by Teck.

The New Quarry area was a source of shale for construction purposes. It has been reclaimed by regrading stripped materials and quarry faces. Much of the floor of the New Quarry remains as exposed shale bedrock. In 2006, two significant erosion gullies were repaired and lined with rip-rap to form an erosion resistant channel for drainage from Loon Lake.

Access roads across the site were decommissioned and culverts were removed to restore natural drainage crossings. The access roads continue to be used by All-Terrain-Vehicles (ATVs) for post-closure inspection and monitoring purposes.

A rockfill jetty remains at Frustration Lake that was constructed for the freshwater supply intake during operation of the mine. Freshwater pumps and piping were removed during decommissioning.



At Garrow Lake, the former tailings disposal area, the main impoundment dam and wave break structure were breached during decommissioning to return water levels to pre-development levels and to eliminate structures that could require long-term monitoring and maintenance. The central part of the main dam was removed and replaced with a rip-rap lined channel. Decommissioning of the main dam lowered the water level in Garrow Lake by approximately two and one half metres to its former (i.e., pre-development) level. The condition and stability of the reinstated Garrow Lake shoreline was monitored for several years after the dam was breached and appears to be stable. Since the site was decommissioned and pre-development water levels were reinstated, natural wave and ice processes have been depositing gravel along the south shore of Garrow Lake in front of the former wave break structure. Topographic survey measurements of the natural gravel berm near the former wave break structure have been carried out by annually and reported on separately by Teck.

### 3.0 OBJECTIVES AND LIMITATIONS OF GEOTECHNICAL INSPECTION

The primary objective of the geotechnical inspection is to assess the physical condition of decommissioned mine areas for evidence of slope instability, erosion or other landform instabilities that could present a safety hazard to either humans or wildlife. The stability of embankments and slopes was assessed by looking for visual indications of instability (i.e., tension cracks, slumping, etc). The stability of underground mine openings was not assessed. Where inspection comments in this report rely on information collected and reported by others (e.g., thermistor and topographic survey data), Golder cannot take responsibility for measurements taken by others.

Appendix A includes a series of annotated photographs taken during the 2010 geotechnical inspection. Photograph locations were recorded using a hand-held Global Positioning System (GPS) and are shown in plan on Figure 1. A summary of inspection photographs and approximate Northing and Easting coordinates are listed in Table 1. Conditions observed during the 2010 inspection were compared to photographs and report notes from previous annual inspections to identify if any changes have occurred. Where significant erosion was observed that appeared to be different from previous inspections, the maximum observed depth and width of the erosion gully was noted to facilitate assessment of the rate of progression. Only conditions that appear to have changed from previous inspections were described in detail. Where observed conditions appeared unchanged from previous inspections or decommissioning, a general comment noting such was documented.

Teck contracted a land surveyor again in 2010 to carry out topographic surveying of the subsidence area and the Garrow Lake wave break structure to document any changes over time. Teck also downloaded ground temperature data from the thermistor dataloggers at the Operations Landfill and Little Red Dog Quarry Landfill. Topographic survey and thermistor data are reported under separate cover by Teck.

### 4.0 OBSERVED CONDITIONS

#### 4.1 Garrow Lake Area

##### 4.1.1 Garrow Lake Wave Break Structure

The wave break structure was originally constructed to reduce the fetch of the lake and protect the face of the Garrow Lake dam from wave action. During decommissioning a section of the wave break structure was excavated in the area of the original creek channel to return the lake water level to its original elevation. Since decommissioning, a ridge of gravel has been accumulating across the breached wave break outlet channel. The ridge or berm of gravel across the breached outlet appears to be increasing in size (i.e., elevation and width) each year as a result of additional gravel accumulation. The lake water level and gravel berm elevation are



surveyed annually to quantify any changes in lake level and/or outlet elevation (reported by Teck under separate cover).

The size of the gravel berm at the time of the July 2010 inspection is documented in a panoramic view of the downstream side of the gravel berm (Photographs 1, 2 and 3). Photograph 4 illustrates the crest width of the gravel berm. The mechanism creating the ridge of gravel is considered to be ice and wave action that relocates gravel from the shallow water near the south shore of Garrow Lake. This appears to be a natural process that likely also occurred prior to mine site development. The relatively coarse nature of the gravel permits a steady flow of water through the gravel ridge from the lake into the creek channel during the summer. However, the gravel ridge appears to be retaining some water and may be influencing the lake water level. At the east end of the wave break structure, seepage through the gravel berm and wave break rockfill has caused some settlement (Photograph 6). At the time of the July 2010 inspection, Garrow Lake was mostly ice covered (Photograph 7).

### 4.1.2 Garrow Lake Dam

The sideslopes of the Garrow Lake Dam breach were observed to be free of erosion or indications of slope instability during the July 2010 inspection. Photographs 8, 9, 10 create a panoramic view of the dam breach and channel facing upstream towards Garrow Lake. Rip-rap at the base of the breach slopes appears to be in good condition and effectively protecting the breach slopes from channel erosion (Photographs 11 and 12). The condition of the dam crest and breach slopes during the July 2010 inspection is documented in Photographs 11 through 15.

## 4.2 Frustration Lake Area

### 4.2.1 Jetty

To support mine operations, a rockfill jetty was constructed out into Frustration Lake for the freshwater supply pump station. The pump house and associated water lines were removed during site decommissioning but the jetty remains. Displacement of some jetty rockfill due to ice being pushed up onto the end of the jetty was observed during the July 2010 inspection (Photograph 16). Photographs 17 and 18 document the condition of the jetty crest and edges at the time of the inspection. Lake water around the jetty was observed to be clear during the July 2010 inspection (Photograph 19). Photograph 20 is a view of the jetty from the access road to Frustration Lake. Erosion and displacement of jetty rockfill due to wave and ice action is a natural process and does not appear to be negatively impacting water quality in Frustration Lake.

### 4.2.2 Access Road

Photograph 21 is a view of the access road down to the jetty at Frustration Lake. The Frustration Lake access road remains in good condition, with some localised erosion at drainage crossings that appear to be self-armouring and stable. Erosion gullies that were repaired in 2006 by regrading slopes, placing gravel/rip-rap and constructing water bars were all observed to be stable during the July 2010 inspection and should not require further attention. Photograph 22 illustrates a typical road drainage crossing that has been resistant to erosion since improvements were made in 2006.





### 4.3 New Quarry Area

#### 4.3.1 Backfilled Perimeter Sideslopes

A panoramic view of the New Quarry (Photographs 23, 24 and 25) illustrates the observed condition of the New Quarry area during the July 2010 inspection. Backfilled perimeter sideslopes have not changed significantly from previous post-closure inspections (Photographs 26 through 30). Previously observed settlement and sink holes on backfilled slopes were generally unchanged from previous inspections. Settlement of backfilled slopes is likely the result of buried snow and ice that has melted and is not considered problematic. Photograph 31 illustrates a typical slope tension crack in the New Quarry that may progress into a slump. Photographs 32 and 33 illustrate typical erosion gully development on perimeter sideslopes of the New Quarry. Photograph 34 is a previously observed slump at the south end of the New Quarry (Photograph 56 in 2009 Geotechnical Inspection Report). Minor erosion and slumping of slopes is a normal process in the arctic as slopes reach a state of equilibrium. Minor slumping of the backfilled sideslopes around the perimeter of the New Quarry is not considered problematic and does not pose a safety hazard to humans or wildlife.

#### 4.3.2 Drainage Ditches

Access road ditches that convey drainage from Loon Lake and the temporary camp area to the southwest corner of the New Quarry were stabilized in 2006 by regrading and rip-rap placement. The rip-rap lined drainage ditches and slopes have been performing well and should not require further attention (Photographs 79 through 82).

### 4.4 Subsidence Area

There were no apparent visual changes to the mine subsidence area observed during the July 2010 geotechnical inspection. Photograph 67 is a previously observed small thaw settlement area about 10 m by 10 m. Photographs 68 and 69 are views of ponded surface water on the backfilled subsidence area from the east and north, respectively. Previously observed tension cracks around the perimeter of the subsidence area were up to 0.3 m wide and appear unchanged from previous inspections (Photographs 70 and 71). No features were observed in the subsidence area during the July 2010 inspection that present a risk to either humans or wildlife.

Teck retained Focus Engineering again in 2010 to conduct a topographic survey of the subsidence area (reported under separate cover by Teck). Annual topographic surveying has not detected any settlement in the subsidence area during the post-closure monitoring period.

### 4.5 Operational Landfill

No indications of slope instability or exposed waste were observed at the Operational Landfill during the July 2010 inspection. No tension cracks or settlement depressions were observed on the landfill crest (Photographs 36 through 41). No indications of erosion or slope instability were observed on the landfill slopes from the toe of the landfill (Photographs 42 through 49). No significant seepage was observed from the toe of the Operational Landfill during the July 2010 inspection.

Ground temperature versus depth through the rockfill cover and waste is monitored at the Operational Landfill by thermistor strings installed at four locations on the landfill crest. The purpose of the thermistors is to monitor ground temperature in the landfilled waste and cover material to confirm that permafrost has migrated up through the waste into the rockfill cover. Ground temperature data measured by the thermistors indicates that





the active (i.e., seasonally thawed) layer is within the rockfill cover and that all waste is encapsulated in permafrost. Ground temperature data are reported by Teck under separate cover.

A small (i.e., 0.3 m diameter) thaw settlement area was observed on the access road above the Operational Landfill (Photograph 35). The thaw settlement may have been caused by melting of frozen ice or snow or alternatively a concentration of drainage across the road and is not considered problematic.

### 4.6 Little Red Dog Quarry Landfill

No protruding waste, tension cracks or settlement depressions were observed on the Little Red Dog Quarry Landfill cover during the July 2010 inspection. Photographs 73 through 78 document the condition of the Little Red Dog Quarry Landfill cover during the July 2010 inspection.

Ground temperature versus depth through the rockfill cover and waste is monitored at the Little Red Dog Quarry Landfill by thermistor strings installed at four locations. The purpose of the thermistors is to monitor ground temperature in the landfilled waste and cover material to confirm that permafrost has migrated up through the waste into the rockfill cover. Ground temperature data measured by the thermistors indicates that the active (i.e., seasonally thawed) layer is within the rockfill cover and that all waste is encapsulated in permafrost. Ground temperature data are reported by Teck under separate cover.

### 4.7 Mine Portals

The Polaris Mine was an underground mining operation. There were four portals used to access the mine and/or to convey ore out of the mine. During mine decommissioning, the portals were sealed and covered with rockfill to prevent access to the underground mine workings. One of the objectives of the annual geotechnical inspection is to look for evidence of settlement, erosion, or slope instability at the closed mine portals that might present a safety risk to humans or wildlife.

All four portals were observed to be in good condition and free of any signs of instability or erosion during the July 2010 inspection (Photographs 61, 62, 63, 64, and 72). The slope in front of the main portal that was regraded and flattened in 2009 to repair a slope failure was observed to be in good condition (i.e., as repaired in 2009).

### 4.8 Marine Foreshore Adjacent to Former Dock

The shoreline and slopes adjacent to the former dock structure were observed to be stable with no significant erosion during the July 2010 geotechnical inspection. Photographs 50 through 53 document the condition of the south end of the foreshore area during the July 2010 inspection. Thaw settlement and the formation of gravel bars in response to ocean wave and ice action has been observed along the shoreline. Photographs 54 and 58 document the current size of two thaw settlement areas at the central and north ends of the foreshore area, respectively. Photographs 55 through 60 document the condition of the north end of the foreshore area during the July 2010 inspection. Photographs 65 and 66 are an elevated view of the north end of the foreshore area from the exploration portal. No active erosion features discharging sediment were observed in the foreshore area during the July 2010 inspection. The water adjacent to the shoreline has been clear during the current and previous geotechnical inspections indicating that discharge of sediment from the reclaimed foreshore area to the ocean does not appear to be a concern. Overall the foreshore area appears to be stable and is not expected to require further attention.



### 5.0 DISCUSSION

Conditions observed during the July 2010 geotechnical inspection have not changed significantly from previous post-closure geotechnical inspections. Previously identified minor erosion appears to be stable, unchanged from previous inspections and self-armouring. The slope in front of the main portal that was repaired in 2009 was observed to be stable during the 2010 inspection. During the 2010 inspection there were no observed indications of slope instability or problematic erosion that could be expected to present a safety hazard to either humans or wildlife. Overall the site appears to be stable and should not require ongoing maintenance. The following is a summary of the current status of each area inspected.

#### 5.1 Garrow Lake Area

The breached slopes of the decommissioned Garrow Lake Dam appear to be stable after several years of post-closure inspections. The rip-rap on the lower slopes of the dam breach also appear to be stable and have resisted flows experienced in the channel since decommissioning (i.e., post-closure inspections have not observed movement or erosion of the rip-rap).

The ridge of gravel being deposited across the breached wave break structure outlet appears to be increasing in size each year as a result of gravel deposition from ice and wave action. The coarse gravel permits seepage of water through the berm during the summer months, however the gravel berm appears to be retaining some water and may be influencing the lake water level. As the gravel berm increases in height, it appears that the lake outlet may naturally relocate towards the east end of the wave break structure. However, the wave break structure is constructed of rockfill which is more resistant to erosion from overtopping than the gravel berm being deposited by wave and ice action. Overtopping of the gravel berm could result in some displacement of gravel downstream of the breached lake outlet. The formation of a gravel berm at the lake outlet is considered a natural process and is not expected to be problematic or require attention.

#### 5.2 Frustration Lake Jetty and Access Road

The lake water around the jetty has been clear during all post-closure inspections indicating that suspended sediment as a result of jetty erosion is not impacting water quality in Frustration Lake.

Repaired drainage crossings and water bars across the Frustration Lake access road have been performing well and should not require any further attention.

#### 5.3 New Quarry Area

Previously repaired erosion gullies crossing an access road south of the New Quarry appear to be performing well. Previously observed settlement and sink holes at the bottom of backfilled slopes have not changed during recent inspections. Minor slumping that was previously observed in 2009 appears to be unchanged and does not pose a safety hazard to humans or wildlife. Minor erosion and slumping of slopes is a normal process as slopes reach a state of equilibrium and is not considered problematic.

#### 5.4 Subsidence Area

No new features in the subsidence area were observed during the July 2009 inspection that present a risk to either humans or wildlife. There does not appear to be any apparent visual changes from previous inspections.



Furthermore, annual topographic surveying has not detected any settlement in the subsidence area during the post-closure monitoring period.

### 5.5 Operational Landfill

No exposed waste, significant erosion or indications of slope instability were observed on the landfill crest or slopes of the Operational Landfill during the July 2010 inspection. No significant seepage was observed from the toe of the Operational Landfill during the July 2010 inspection. In general, post-closure visual inspections carried out since the Operational Landfill was closed during decommissioning indicate that the Operational Landfill slopes are stable.

### 5.6 Little Red Dog Quarry Landfill

The rockfill cover at the Little Red Dog Quarry Landfill continues to show no indications of instability or settlement. No waste was observed to be protruding through the rockfill cover. A small stockpile of waste and debris collected during the post-closure monitoring period will be buried beneath rockfill cover in accordance with the landfill design in 2011 prior to removing all remaining equipment from the site.

### 5.7 Mine Portals

All four portals were observed to be in good condition and free of any signs of instability or erosion during the July 2010 inspection. A slope failure at the main portal that was first observed in August 2008 was repaired in July 2009 by pushing rockfill from the surrounding foreshore area up against the main portal slope with a bull dozer. The repaired slope at the main portal was observed to be in good condition during the July 2010 inspection (i.e., as repaired in 2009). The lower half of the main portal slope that was repaired in 2009 is flatter than the upper slope so there may be some future unravelling of the steeper slope above the main portal (i.e., above the repaired area). However, the flatter lower half of the slope should resist large scale slope failures in front of the sealed main portal. Minor slumping of backfilled slopes in front of the sealed mine portals will not expose the mine seals or allow access into the underground mine workings.

### 5.8 Marine Foreshore Adjacent to Former Dock

Previously observed gravel bar formation and thaw settlement along the former dock area shoreline appears to be an ongoing response to natural processes including ocean wave and ice action. The water adjacent to the shoreline has been very clear during post-closure geotechnical inspections indicating that the decommissioned foreshore area is not actively discharging sediment to the ocean. Overall the foreshore area appears to be stable and should not require further attention.

## 6.0 REFERENCES

AECOM (2009), "Report on Post-Closure Geotechnical Inspection of Polaris Mine Site in 2009", Report Number 112986, Submitted to Teck Metals Ltd., dated December 2009.



## **Report Signature Page**

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# TABLES

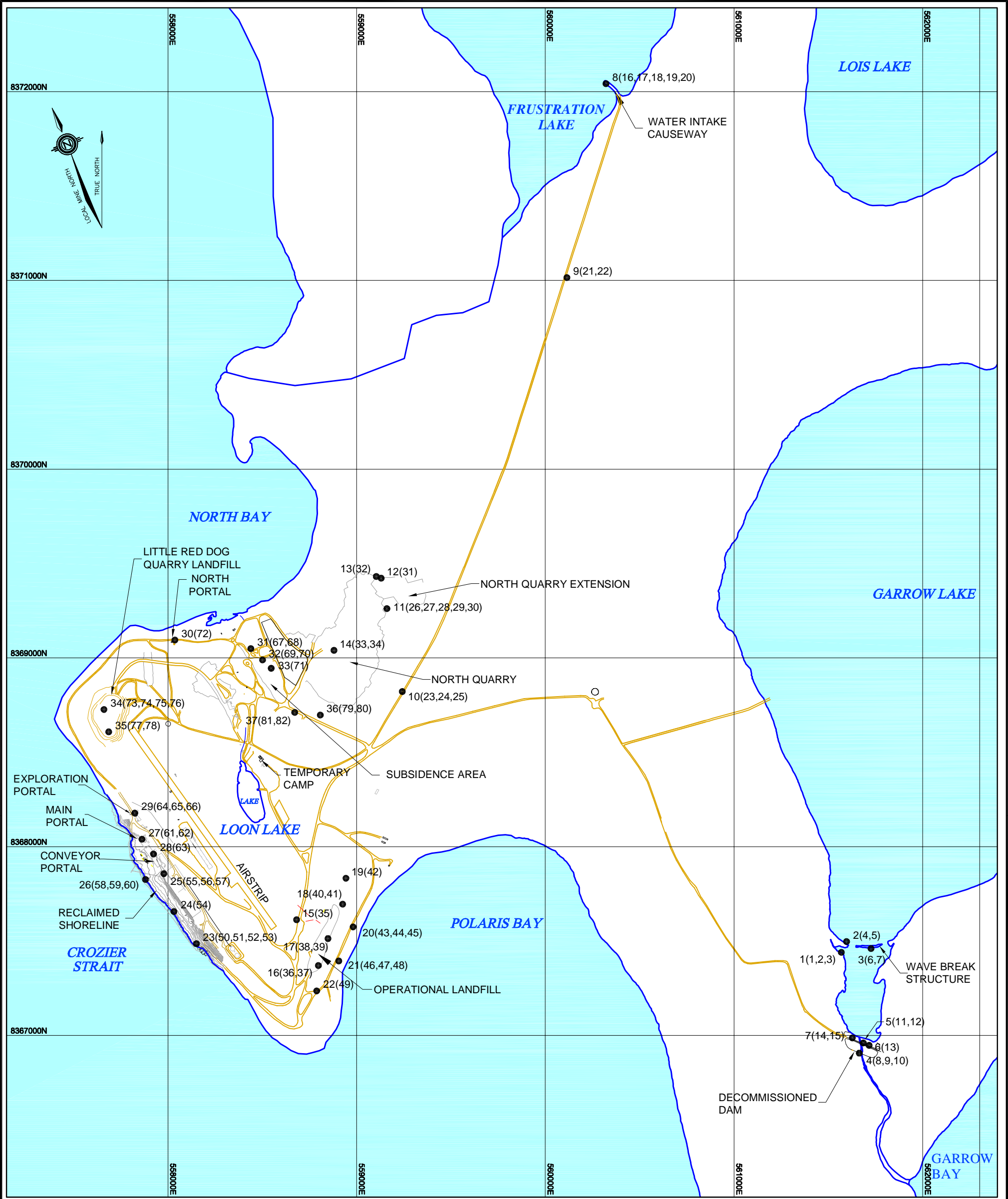
**Table 1 - Summary of 2010 Polaris Geotechnical Inspection Photographs**

| Location # | Area                   | Description                 | Photograph #         | Northing (m) | Easting (m) | Elevation (m) |
|------------|------------------------|-----------------------------|----------------------|--------------|-------------|---------------|
| 1          | Garrow Lake Wave Break | Berm Facing Upstream        | Panoramic (1,2,3)    | 8,367,440    | 561,569     | 22            |
| 2          | Garrow Lake Wave Break | Crest and Facing Downstream | 4,5                  | 8,367,497    | 561,596     | 18            |
| 3          | Garrow Lake Wave Break | East End and Shoreline      | 6,7                  | 8,367,460    | 561,726     | 12            |
| 4          | Garrow Lake Dam        | Dam Breach                  | Panoramic (8,9,10)   | 8,366,906    | 561,664     | 14            |
| 5          | Garrow Lake Dam        | East Abutment               | 11,12                | 8,366,960    | 561,685     | 18            |
| 6          | Garrow Lake Dam        | Crest of West Abutment      | 13                   | 8,366,947    | 561,716     | 24            |
| 7          | Garrow Lake Dam        | West Abutment               | 14,15                | 8,366,987    | 561,627     | 24            |
| 8          | Frustration Lake       | Jetty                       | 16,17,18,19,20       | 8,372,042    | 560,321     | 7             |
| 9          | Frustration Lake       | Road Drainage Crossing      | 21,22                | 8,371,015    | 560,114     | 53            |
| 10         | New Quarry             | View From Road Above        | Panoramic (23,24,25) | 8,368,822    | 559,242     | 42            |
| 11         | New Quarry             | Quarry Slopes               | 26,27,28,29,30       | 8,369,261    | 559,160     | 7             |
| 12         | New Quarry             | Minor Tension Cracks        | 31                   | 8,369,422    | 559,130     | 15            |
| 13         | New Quarry             | Minor Erosion Gully         | 32                   | 8,369,431    | 559,104     | 16            |
| 14         | New Quarry             | Minor Erosion and Slumping  | 33,34                | 8,369,040    | 558,880     | 14            |
| 15         | Access Road            | Small sinkhole on road      | 35                   | 8,367,613    | 558,682     | 54            |
| 16         | Operational Landfill   | South Crest                 | 36,37                | 8,367,370    | 558,797     | 29            |
| 17         | Operational Landfill   | Central Crest               | 38,39                | 8,367,513    | 558,848     | 34            |
| 18         | Operational Landfill   | North Crest                 | 40,41                | 8,367,695    | 558,926     | 35            |
| 19         | Operational Landfill   | North Slope                 | 42                   | 8,367,833    | 558,943     | 22            |
| 20         | Operational Landfill   | North End of East Toe       | 43,44,45             | 8,367,575    | 558,981     | 9             |
| 21         | Operational Landfill   | South End of East Toe       | 46,47,48             | 8,367,394    | 558,905     | 8             |
| 22         | Operational Landfill   | South Slope                 | 49                   | 8,367,236    | 558,788     | 17            |
| 23         | Foreshore              | South End                   | 50,51,52,53          | 8,367,486    | 558,151     | 1             |
| 24         | Foreshore              | Central Thaw Settlement     | 54                   | 8,367,656    | 558,032     | -2            |
| 25         | Foreshore              | North End                   | 55,56,57             | 8,367,857    | 557,978     | 2             |
| 26         | Foreshore              | North End                   | 58,59,60             | 8,367,826    | 557,881     | 4             |
| 27         | Mine Portals           | Main Portal                 | 61,62                | 8,368,039    | 557,862     | 2             |
| 28         | Mine Portals           | Conveyor Portal             | 63                   | 8,367,961    | 557,923     | 2             |
| 29         | Mine Portals           | Exploration Portal          | 64,65,66             | 8,368,178    | 557,824     | 18            |
| 30         | Mine Portals           | North Portal                | 72                   | 8,369,095    | 558,037     | 4             |
| 31         | Subsidence Area        | Thaw Settlement Area        | 67,68                | 8,369,049    | 558,439     | 16            |
| 32         | Subsidence Area        | Ponded Water and Cracks     | 69,70                | 8,368,989    | 558,501     | 17            |
| 33         | Subsidence Area        | Tension Cracks              | 71                   | 8,368,945    | 558,547     | 20            |
| 34         | Little Red Dog Quarry  | North End                   | 73,74,75,76          | 8,368,727    | 557,661     | 35            |
| 35         | Little Red Dog Quarry  | South End                   | 77,78                | 8,368,608    | 557,686     | 32            |
| 36         | Drainage Ditches       | Rip-Rap Lined Ditch         | 79,80                | 8,368,697    | 558,807     | 24            |
| 37         | Drainage Ditches       | Rip-Rap Lined Ditch         | 81,82                | 8,368,711    | 558,672     | 23            |



# FIGURES





**LEGEND:**  
● 16(36,37) LOCATION NUMBER (PHOTOGRAPH NUMBER)

- REFERENCES:**
- GRID IS REFERENCED TO NAD83 ZONE 17.
  - SITE PLAN PROVIDED BY TECK RESOURCES LTD.

# Teck

|  |                     |        |               |  |
|--|---------------------|--------|---------------|--|
| <br>Mississauga, Ontario, Canada |                     | SCALE  | AS SHOWN      | TITLE  |
|  |                     | DATE   | Sep. 17, 2010 |  |
|  |                     | DESIGN | DCJ           |  |
|  |                     | CAD    | TDR           |  |
| FILE No.   | 1011180019AA001.dwg | CHECK  | DCJ           | TECK RESOURCES LTD. - 2010 POLARIS GEOTECHNICAL INSPECTION |
| PROJECT No.  | 10-1118-0019        | REVIEW | IW            |  |
|  |                     |        |               | FIGURE<br><b>1</b>   |



# **APPENDIX A**

## **2010 Polaris Geotechnical Inspection Photographs**

## Appendix A - Polaris 2010 Geotechnical Inspection



Photos 1,2,3 (Panoramic), Garrow Lake Wave Break, Gravel Berm Facing Upstream



Photo 4, Garrow Lake Wave Break, Crest of Gravel Berm Facing East

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 5, Garrow Lake Wave Break, Facing Downstream Towards Garrow Lake Dam



Photo 6, Garrow Lake Wave Break, Thaw Settlement at East End



## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 7, Garrow Lake Wave Break, Ice Cover at South Shoreline



Photos 8,9,10 (Panoramic), Garrow Lake Dam, Dam Breach Facing Upstream

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 11, Garrow Lake Dam, Channel Rip-Rap on East Breach Slope



Photo 12, Garrow Lake Dam, West Breach Slope

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 13, Garrow Lake Dam, East Dam Crest



Photo 14, Garrow Lake Dam, Channel and Breach Slopes from West Crest



## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 15, Garrow Lake Dam, West Dam Crest



Photo 16, Frustration Lake, Ice Pushed up onto End of Jetty

## Appendix A - Polaris 2010 Geotechnical Inspection

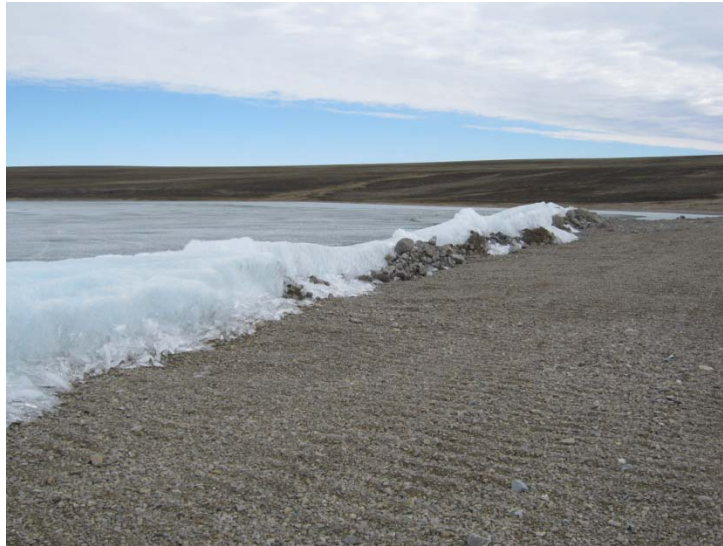


Photo 17, Frustration Lake, Ice Pushed up onto Northeast Side of Jetty Facing Shore



Photo 18, Frustration Lake, Southwest Side of Jetty Facing Shore

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 19, Frustration Lake, Clear Lake Water Beside Jetty



Photo 20, Frustration Lake, Road to Frustration Lake from Jetty

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 21, Frustration Lake, Facing Jetty from Road to Frustration Lake



Photo 22, Frustration Lake, Typical Road Drainage Crossing



## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 23,24,25 (Panoramic), New Quarry, View from Road Above Facing West



Photo 26, New Quarry, East Sideslopes Facing North

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 27, New Quarry, North Sideslopes Facing Northwest



Photo 28, New Quarry, West Sideslopes Facing West

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 29, New Quarry, West Sideslopes Facing Southwest



Photo 30, New Quarry, East Sideslopes Facing South



## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 31, New Quarry, Minor Tension Cracks on North Slope



Photo 32, New Quarry, Minor Erosion Gully on North Slope

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 33, New Quarry, Minor Erosion and Slumping on East Slope



Photo 34, New Quarry, Minor Slump Beneath Snow on East Slope

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 35, Access Road, Small Thaw Sinkhole on Road Above Operational Landfill



Photo 36, Operational Landfill, South Crest Facing North



## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 37, Operational Landfill, South Crest Facing South



Photo 38, Operational Landfill, Central Crest Facing North

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 39, Operational Landfill, Central Crest Facing South



Photo 40, Operational Landfill, North Crest Facing North

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 41, Operational Landfill, North Crest Facing South



Photo 42, Operational Landfill, North Slope Facing South

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 43, Operational Landfill, North End of East Toe Facing North



Photo 44, Operational Landfill, North End of East Toe Facing West



## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 45, Operational Landfill, North End of East Toe Facing South



Photo 46, Operational Landfill, South End of East Toe Facing North

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 47, Operational Landfill, South End of East Toe Facing West



Photo 48, Operational Landfill, South End of East Toe Facing South

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 49, Operational Landfill, South Slope Facing North



Photo 50, Foreshore, South End Facing North Along Shoreline

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 51, Foreshore, South End Facing South Along Shoreline



Photo 52, Foreshore, South End Facing Upslope to Northeast



## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 53, Foreshore, South End Facing Upslope to Southeast



Photo 54, Foreshore, Central Thaw Settlement Area



## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 55, Foreshore, Elevated Pad at North End Facing North



Photo 56, Foreshore, Elevated Pad at North End Facing West

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 57, Foreshore, Elevated Pad at North End Facing South



Photo 58, Foreshore, North End Facing North Along Shoreline

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 59, Foreshore, North End Facing South Along Shoreline



Photo 60, Foreshore, North End Facing East Towards Conveyor Portal

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 61, Mine Portals, Main Portal Facing East Towards Repaired Slope



Photo 62, Mine Portals, Main Portal Facing Southeast Across Repaired Slope



## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 63, Mine Portals, Conveyor Portal



Photo 64, Mine Portals, Exploration Portal



## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 65, Foreshore, Facing Northwest from Exploration Portal



Photo 66, Foreshore, Facing Southwest from Exploration Portal

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 72, Mine Portals, North Portal



Photo 67, Subsidence Area, Small Thaw Settlement Area (~10m x 10m)

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 68, Subsidence Area, Ponded Water and Regraded Area Facing West



Photo 69, Subsidence Area, Ponded Water and Regraded Area Facing South



## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 70, Subsidence Area, Previously Observed Tension Cracks (0.3 m max. width)



Photo 71, Subsidence Area, Previously Observed Tension Cracks (0.3 m max. width)

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 73, Little Red Dog Quarry, North End Facing Entrance



Photo 74, Little Red Dog Quarry, North End Facing North Wall



## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 75, Little Red Dog Quarry, North End Facing Centre



Photo 76, Little Red Dog Quarry, North End Facing East

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 77, Little Red Dog Quarry, South End Facing Entrance



Photo 78, Little Red Dog Quarry, South End Facing East

## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 79, Drainage Ditches, Rip-Rap Lined Slope Below Drainage Ditch



Photo 80, Drainage Ditches, Rip-Rap Lined Ditch Across Road Near Camp



## Appendix A - Polaris 2010 Geotechnical Inspection



Photo 81, Drainage Ditches, Rip-Rap Lined Slope Below Drainage Ditch



Photo 82, Drainage Ditches, Rip-Rap Lined Ditch Across Road Near Camp

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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