
ADDENDUM TO:

DORIS NORTH PROJECT
“NO NET LOSS” PLAN
- REVISION 3 -



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“NO NET LOSS” PLAN – REVISION 3

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Cover Photo: Northwest side of Doris Lake overlooking the location for the proposed mill/camp site, 2004.

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1.0 INTRODUCTION

Miramar Hope Bay Limited (MHBL) proposes to construct and operate a new underground gold mine (“Doris North Project”) in the West Kitikmeot Region of Nunavut. The project is located 685 km northeast of Yellowknife and 160 km southwest of Cambridge Bay. The mine is on Inuit owned land, approximately 5 km south of the Arctic Ocean. The nearest communities are Umingmaktok, located 65 km to the west, and Bathurst Inlet located 110 km to the southwest.

As part of the Final Environmental Impact Statement (FEIS) for the Doris North Project, a “No Net Loss” Plan was submitted in November 2003. This plan was revised in May 2004 and was entitled “No Net Loss” Plan – Revision 3 (RL&L/Golder 2004). Following that, the Nunavut Impact Review Board (NIRB) hearings took place in July 2004. As part of the final submission to NIRB, Fisheries and Oceans requested supplemental information for the regulatory phase of the project (25 June 2004; NIRB File No. 177). The supplemental information requests included developing a conceptual contingency plan to the compensation plan outlined in the “No Net Loss” Plan – Revision 3, defining the duration of monitoring programs and key measures of success of the compensation plans, and finally, gathering additional information on culvert crossings. This addendum report provides this information.

2.0 COMPENSATION FOR TAIL LAKE

As specified under Fisheries and Oceans Canada “No Net Loss” policy (DFO 1986), compensation will be required for any project activities that cause Harmful Alteration, Disruption or Destruction (HADD) to fish habitat after mitigation measures are applied to their maximum potential. This policy was created to ensure that the productive capacity of fish habitat is maintained.

Once the Doris North Project is operational, Tail Lake will be taken out of biological production because this lake is the recipient waterbody for all process tailings and treated sewage. The quantity and quality of fish habitats in Tail Lake was documented in the FEIS Supporting Document F5 (RL&L/Golder 2003) using a modified Habitat Evaluation Procedure (HEP) (USFWS 1981). The results indicated that 34.8 Habitat Units (HUs) of fish habitat will be lost in Tail Lake. Compensation for this loss includes increasing fish access to Roberts Lake and stream enhancement in Roberts Outflow. Combined, these enhancements could potentially provide 132.85 HUs. This would result in a 1:3.8 ratio of habitat loss to habitat gain. In the revised version of the “No Net Loss” Plan (Revision 3), additional habitat compensation plans were incorporated, which included creating rearing habitat in Doris Lake and creating pool habitats in a tributary to Roberts Lake.

2.1 Contingency Plan to the Boulder Garden Enhancement

As outlined in Fisheries and Oceans Canada final submission to the Nunavut Impact Review Board on 25 June 2004 (NIRB File No. 177), Miramar has committed to developing a contingency plan in the event that the proposal to increase fish access to Roberts Lake is not successful. During the 2004 field season, an aerial reconnaissance within the vicinity of the Doris North Project was conducted on 10 and 11 August 2004.

During the reconnaissance flight, two potential enhancement options were located (Figure 1). One area is located approximately 30 km west of the Doris North Project (Site 1; UTM 13 W 0406635E 7551813N), and the other is located approximately 15 km west of the Doris North Project (Site 2; UTM 13 W 0420258E 7554046N).

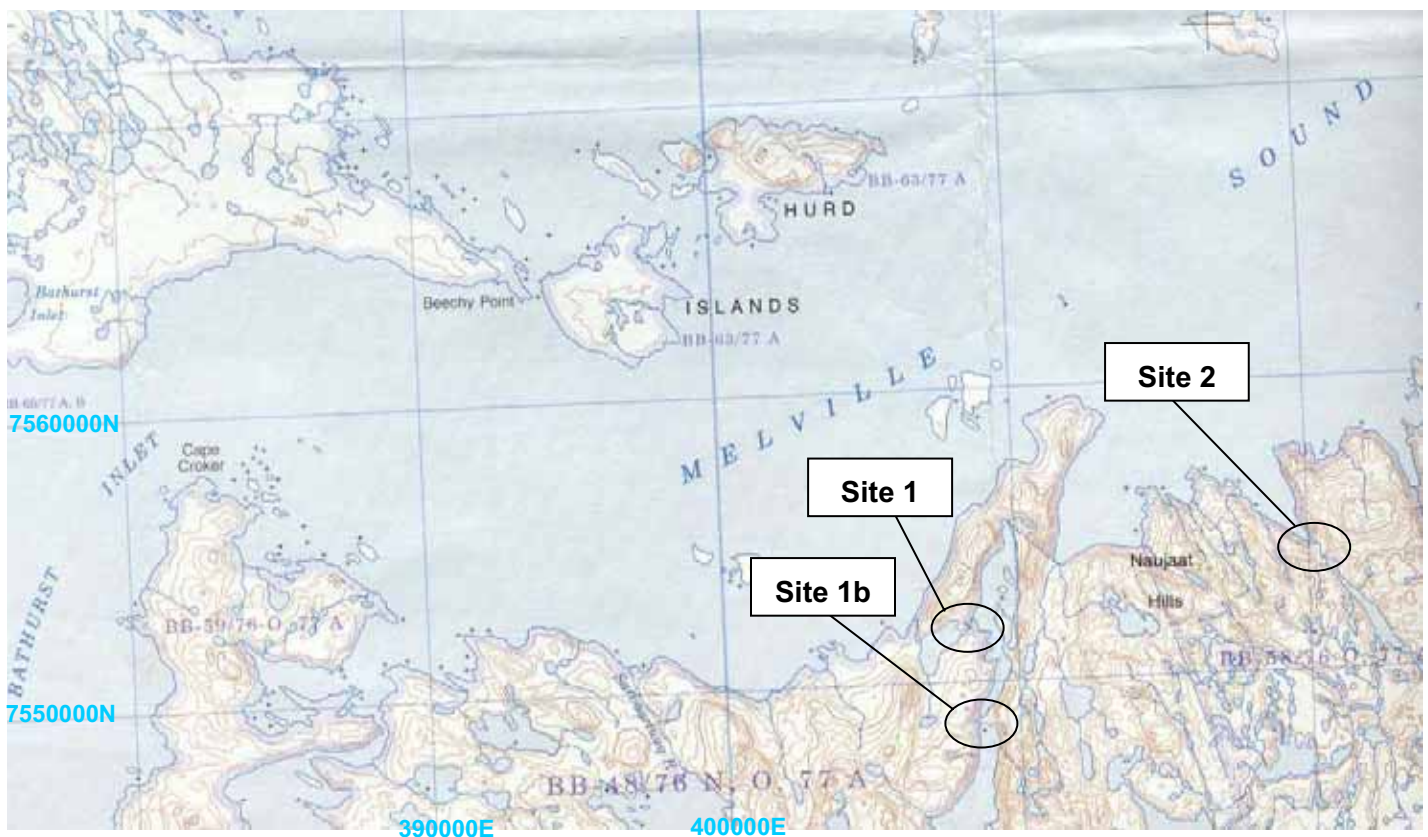


Figure 1 Location of proposed enhancement areas for the contingency to the “No Net Loss” Plan, Doris North Project.

Both sites are located along river systems where sets of waterfalls impede fish passage. The proposed contingency plans involve creating a series of steps and pools to allow increased fish passage through the waterfall areas.

Site 1 has a waterfall that is approximately 2 to 2.2 m in height (Plates 1 to 3). This waterfall is located between two lakes; the distance between the lakes is approximately 450 m. The downstream lake connects directly to the ocean. The inflow to the upstream lake also has an area where there is potential to improve fish passage through two sets of boulder gardens (Site 1b; Plate 4).

A waterfall and a cascade are present at Site 2 (Plates 5 to 8). The waterfall is approximately 1.5 m in height and is a barrier to fish passage. The cascade is not a fish barrier. During the field survey, wildlife were sited feeding on fish at a pool below the water fall (Plate 8 indicates the location of the pool).

As discussed, the waterfalls located at each of the sites likely pose a barrier to fish migration. It is anticipated that with the development of a step-pool configuration at each of these waterfall locations, anadromous fish could gain access to spawning and/or rearing habitat that was previously inaccessible at these sites. The step-pool sequence will be based on the principle that water is forced to pool up within the creek channel for a short distance, then drop over a lip or through a constricted opening, thereby causing backwatering into the upstream pool environment. This configuration is based on Rosgen (1996), who developed an approach known as a “vortex rock weir”, for creating step-pool conditions in high gradient bedrock-controlled streams typically applied in moderate sloped channels ranging from 2 to 4%. The Rosgen (1996) design incorporates large boulders into the creek channel banks and bottom in a chevron shape, pointing upstream and deflected downwards with gaps, scouring the centre of the channel below the weir and creating staging pools for migrating fish, above and below the structure. These conditions create a series of cascades of higher velocity water that steps the water levels down over a desired distance and into a downstream pool. The “vortex rock weir” approach will be modified as required for each site.

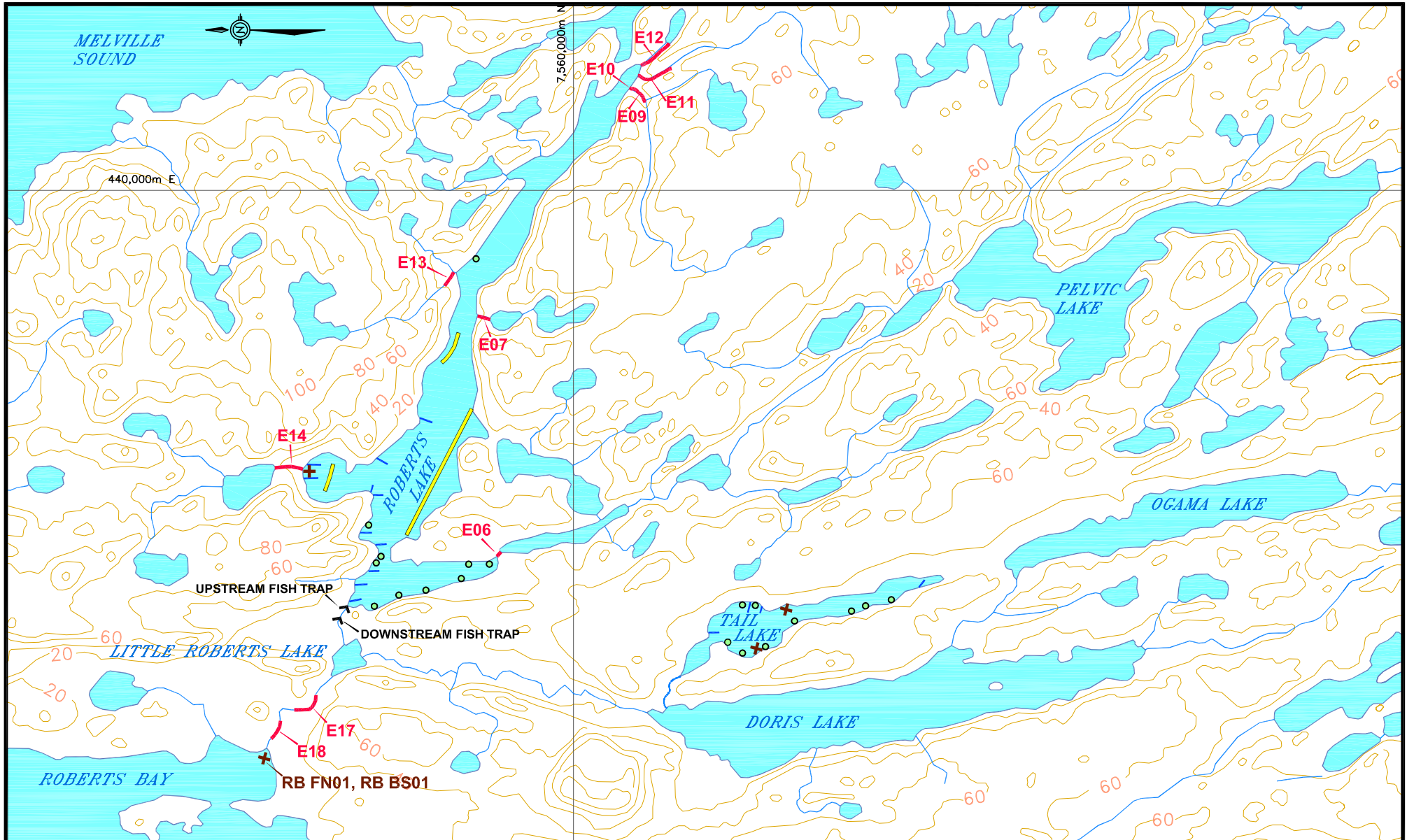
2.2 Stream Habitat Enhancement







During the 2003 field season, juvenile Arctic char were utilizing the lowermost sections of tributaries to Roberts Lake. Previous studies have also documented young char invading small tributary streams to feed on plankton and insects and face reduced predation pressures (Hunter 1976). Based on this, the “No Net Loss” Plan – Revision 3 proposed that additional pool habitat be created in the lower portion of a small tributary to Roberts Lake.

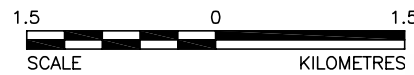
During the 2004 field season, all of the tributaries to Roberts Lake ($n=7$) were investigated for suitability of creating pool habitat. Only two of the streams had enough water present to sustain fish (Streams E14 and E9; Figure 2). Of those two streams, Stream E14 (13 W 0436824E, 7563107W) was the most suitable for stream enhancement.

Although the “No Net Loss” Plan – Revision 3 proposed to excavate an area of a stream to create a new pool, the 2004 field season confirmed that this enhancement would only be successful in higher flow years (which was the case in 2003). Thus, an alternative option is now being proposed. Stream E14 has a series of pools along its length (Plates 9 to 11). The first pool is utilized by Arctic char; however, access to the second pool is hindered by a lip at the edge of the pool. Modifying this section of stream to allow fish passage into the upstream pool (while maintaining the structure of the downstream pool) would increase stream habitat, regardless of flow. Previous studies have demonstrated that young-of-the-year char use these slow water velocity areas in streams during development (Heggberget 1984); the use of stream habitats in the Roberts Bay system by young-of-the-year and juvenile Arctic char for rearing was confirmed during studies in 2003. Therefore, providing access to the upstream pool environment will result in the creation of additional preferred char rearing habitat.

The final design will be prepared in consultation with a stream engineer to ensure structural integrity. The final design will be submitted to DFO and KIA for approval during the permitting phase of the project.

**LEGEND**

-  FISH TRAP
-  FYKE NET (FN)
-  GILL NET (GN)
-  BACKPACK ELECTROFISHING
-  MINNOW TRAP (GT), BEACH SEINE (BS)
-  ANGLING (AN)



NOTE : CONTOUR INTERVAL 20 m

**REFERENCE**

BASE MAP PROVIDED BY RESCAN, JANUARY 22, 2001.

TITLE

FISH SAMPLING SITES IN THE DORIS NORTH PROJECT AREA, 2004



PROJECT 04-1373-002.1000			FILE No. Fish_SampSites-2004		
DESIGN	AS	24/11/04	SCALE	AS SHOWN	REV. 1
CADD	PSR	18/02/05	FIGURE : 2		
CHECK	AS	18/02/05			
REVIEW	AS	18/02/05			

2.3 Monitoring

2.3.1 Creation of Rearing Habitat in Doris Lake

As part of the project's compensation for the Harmful Alteration, Disruption or Destruction (HADD) to fish habitat, the creation of six shallow near-shore rearing areas in Doris Lake were proposed in the "No Net Loss" Plan – Revision 3. The key measures of enhancement success for these proposed rearing areas are to demonstrate that these areas have established primary and secondary productivity similar to that in non-enhanced rearing areas of Doris Lake (i.e., control areas). Following one complete open-water season post-construction, a monitoring program will be established to assess the quantity and extent of periphyton growth and benthic macroinvertebrate use in these newly created rearing habitats (i.e., treatment areas). "Control" areas will be sampled for comparison with "treatment" areas. There will be two types of control areas sampled. One type of control area will consist of habitats that are similar to the existing habitat before treatment and the second type of control areas will consist of similar habitats to the treatment areas. Most proposed treatment areas will be placed in shallow areas with sandy substrate. After enhancement, the treatment areas will consist of primarily boulder/rock substrate in shallow waters.

This portion of the monitoring program will be similar to that of a control/impact (CI) design, in which an impacted area (i.e., treatment = "newly constructed rearing habitats") is compared to one or more control areas (i.e., control = "existing shallow water rearing areas"). The use of at least three control sites is similar to the requirements of a "before/after control/impact" design summarized by Minns et al. (1995).

This monitoring will continue annually during the operation of the mine (two years) and will be monitored again in Year-1 and Year-5 from decommissioning. Although the main benchmark of success is establishing suitable primary and secondary productivity, fish sampling would also be conducted to assess use of these areas by juvenile fish, in particular lake trout. Fish sampling methods would include snorkeling and backpack electrofishing.

2.3.2 Creation of Rearing Habitat in a Tributary to Roberts Lake

As part of the project's compensation, rearing habitat will be created in a tributary to Roberts Lake (Stream E14). The key measure of enhancement success is to provide access to the newly created rearing habitat. To determine whether unrestricted access for char species has been provided, backpack electrofishing surveys in Stream E14 will be conducted annually during the operational period of the mine (two years). This monitoring will also be conducted again in Year-1 and Year-5 from decommissioning.

2.3.3 Boulder Garden Enhancement in Roberts Outflow

The main premise behind the proposed enhancement of the boulder garden in Roberts Outflow is to increase accessibility to Roberts Lake for fish migrating to and from the ocean. This boulder garden restricts fish passage in low to moderate flow years. Revision 3 of the “No Net Loss” plan (RL&L/Golder 2004) indicated that in four years out of six, there were extended periods of time when fish migration was hindered. Increasing access through the boulder garden would result in increased availability of rearing, feeding, and spawning habitat, as well as critical overwintering habitat for species such as Arctic char. The key measure of success will therefore be the provision of near unrestricted access to Roberts Lake through the boulder garden.

Fish fences have been used to monitor fish migration through the Roberts Outflow boulder garden from 2002 to 2004; these fences will continue to be installed annually at the upstream and downstream ends of the boulder garden during the operational period of the mine (two years) and will also be monitored again in Year-1, Year-5, and Year-10 from decommissioning. This proposed monitoring program will aid in determining the number of fish utilizing the system and the number of fish that are able to migrate through the boulder garden in a given year, thereby validating (or invalidating) the key measure of success, which is to provide near unrestricted access to Roberts Lake.

A secondary measure of success is the increase in the number of fish returning in a run. It is difficult to allocate a benchmark of success for this due to the low fidelity of Arctic char (Gyselman 1994), thus the benchmark of success is increasing run size over time. Long-term monitoring would be required to observe an increase in run size due to the life history of Arctic char. Young Arctic char spend the first four to five years rearing in freshwater before beginning their annual downstream migrations to the sea and fall migration back to freshwater. Although there will likely be an increase in fish migrating through once the stream enhancement is completed, the largest increase in the run size will likely start to occur in Year-6 or Year-7 once the offspring of the first migratants through the enhancement begin to return to Roberts Lake.

A fish sampling program would also be conducted in Roberts Lake during years where the fish fence is operational; however, given the size of the lake, it would be very difficult to demonstrate that an increase in productivity occurred. Catch-per-unit-effort (CPUE) will be compared to historical baseline data. Fish sampling methods would include gill nets for adult fish and modified Arctic fyke nets, beach seines and backpack electrofishers for juvenile fish. Tributaries to Roberts Lake would also be sampled using backpack electrofishers to sample for young-of-the-year fish seeking forage areas and shelter from predators.

3.0 STREAM CROSSINGS

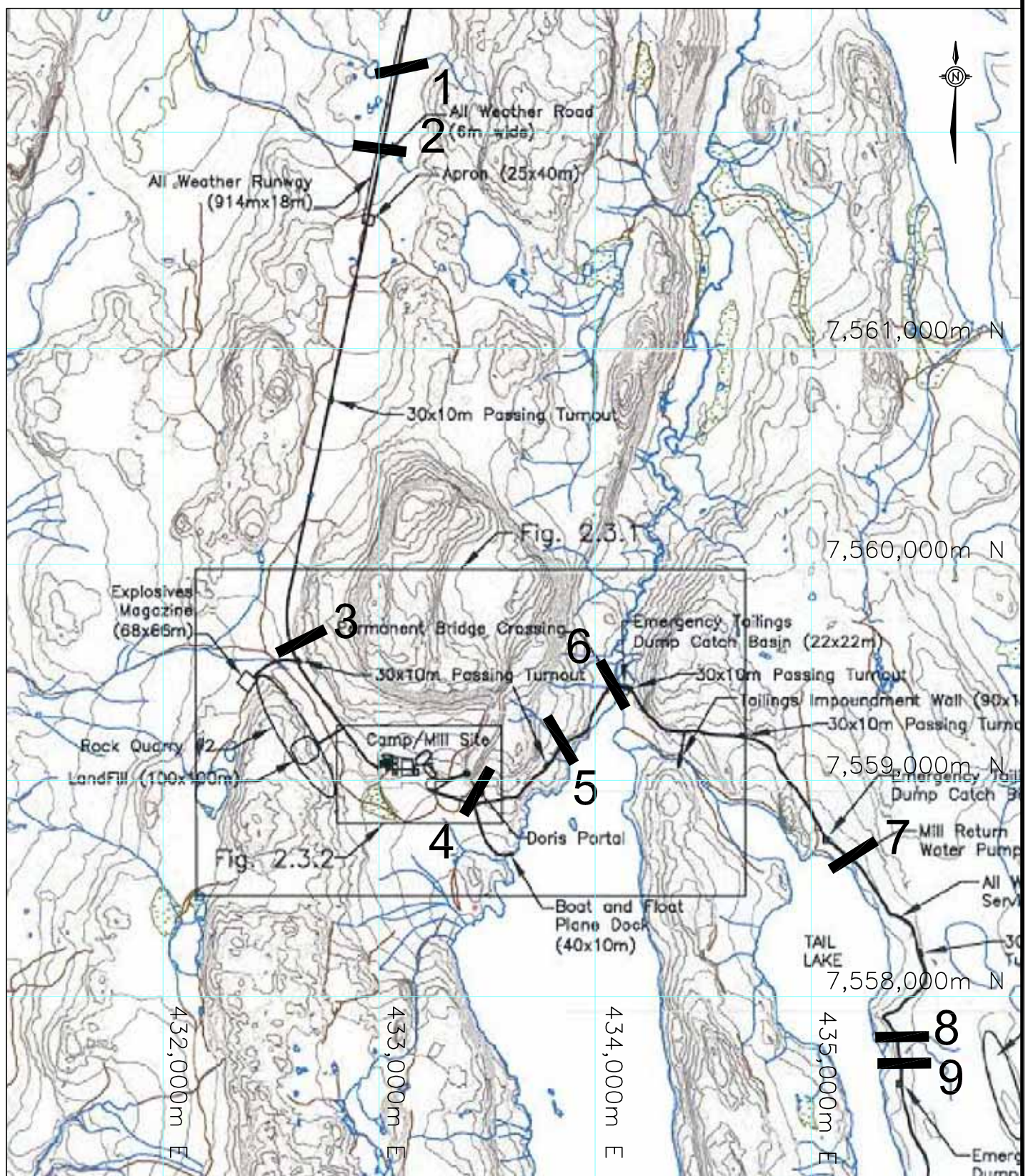
As part of the project design, culverts will be installed along the all-weather roads in areas of small stream crossings or to ensure proper cross-ditch drainage during periods of snowmelt. The only bridge proposed for the project is at Doris Outflow. Details of this bridge crossing are provided in the “No Net Loss” Plan – Revision 3.

In total, there are nine proposed culvert locations throughout the project area (Figure 3). Representative photos of each of the culvert crossings were taken during the 2004 field season. All the streams with proposed culverts have narrow channels and are shallow; they are approximately 20 to 30 cm wide and approximately 5 to 10 cm deep (when water was present). Most of the streams did not have flowing water in July or August.

The stream crossings assessed did not provide suitable habitat for fish and therefore, no additional compensation should be required. However, mitigation measures will be taken to avoid downstream effects. Mitigation measures will include:

- culverts will be sized appropriately to accommodate high flows during the spring melt period;
- selection of suitable construction seasons (i.e., outside of spawning/incubation periods);
- avoiding in-stream activities whenever possible during construction;
- applying appropriate controls of surface runoff and, where required, the installation of sediment control devices (e.g., sediment traps, silt fencing);
- monitoring sediment concentrations during construction and removal of culverts;
- re-vegetating stream banks;
- all activities, including maintenance procedures, will be controlled to prevent the entry of petroleum products, or other deleterious substances into the watercourse. Vehicular refueling and maintenance will be conducted away from the water; and
- work will not be conducted when water levels are elevated due to local rain events.

R:\CAD\2004\1370-Edmonton\1373-ES-04\1373-002\1000\Fig 3 CULVERT LOCATIONS.dwg Feb 22, 2005 - 11:42am



LEGEND

 CULVERT LOCATION

REFERENCE

DRAWING PROVIDED BY SRK CONSULTING.



PROJECT

MIRAMAR HOPE BAY LTD.
DORIS NORTH PROJECT

TITLE

CULVERT LOCATIONS



PROJECT 04-1373-002.1000			FILE No.	Culvert Locations	
DESIGN	AS	02/12/04	SCALE	1:25000	REV. 0
CADD	PSR	22/02/05	FIGURE: 3		
CHECK	AS	22/02/05			
REVIEW	AS	22/02/05			

4.0 CLOSURE

The information in this report was prepared for the use of Miramar Hope Bay Ltd., the Nunavut Impact Review Board and participants in the NIRB review process relating to the Doris North Project. The material in it reflects Golder's best judgment in light of information available to us at the time of preparation. Any use of this report or any reliance on or decisions to be made based on it by any other third party, are the responsibility of such third party. Golder accepts no responsibility for damages, if any, suffered by any other third party as a result of decision made or action based on this report.

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PHOTOGRAPHIC PLATES



Plate 1 Site 1, *August 2004*. UTM 13 W 0406635E 7551813N. Upstream view of the waterfall.



Plate 2 Site 1, *August 2004*. Downstream view of the waterfall.



Plate 3 Site 1, *August 2004*. Upstream view above the waterfall.



Plate 4 Site 1b, *August 2004*. Boulder garden area flowing into the lake upstream of the Site 1.



Plate 5 Site 2, *August 2004*. UTM 13 W 0420258E 7554046N. Upstream view of waterfall. This waterfall is a barrier to fish passage. The cascade in the background is not a fish barrier.



Plate 6 Site 2, *August 2004*. Side view of waterfall.



Plate 7 Site 2, *August 2004*. Upstream view of waterfall, which is a barrier to fish passage. Note the cascade in the background.

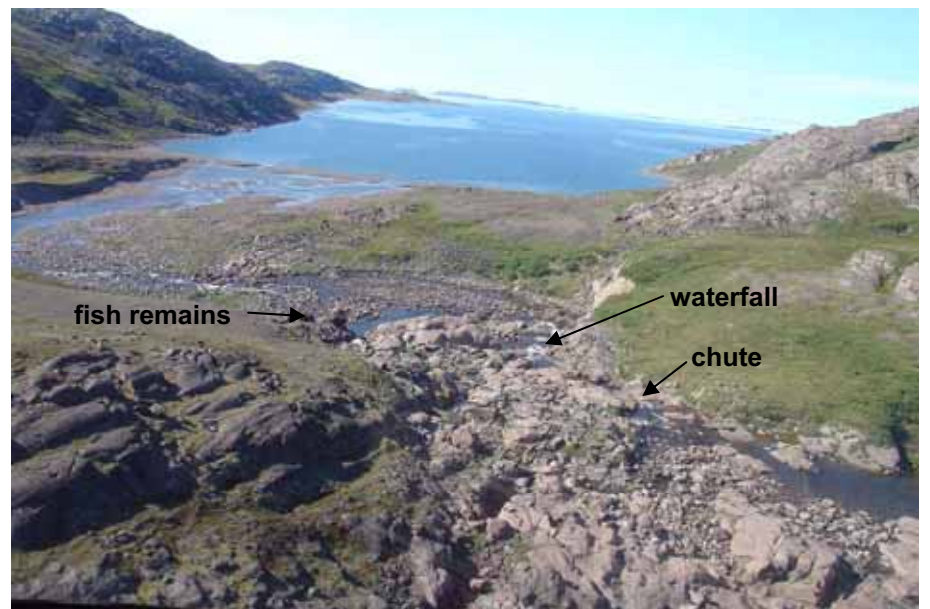


Plate 8 Site 2, *August 2004*. Aerial view of the cascading waterfall. The ocean is located in the background of the photo.



Plate 9 Stream E14, *August 2004*. Lower pool where young-of-the-year Arctic char were captured.



Plate 10 Stream E14, *August 2004*. Second pool upstream of Roberts Lake.



Plate 11 Stream E14, *August 2004*. Second pool upstream of Roberts Lake. Proposed enhancement would open up access for rearing Arctic char.



Plate 12. *21 July 2004.* Downstream view of Stream Crossing #1. Channel was 20-30 cm wide and dry.



Plate 13. *24 August 2004.* Downstream view of Stream Crossing #1 from east side of proposed road. Stream channel was dry.



Plate 14. *21 July 2004.* Downstream view of Stream Crossing #2. Channel was approximately 20 cm wide and 10 cm deep, with flowing water present.



Plate 15. *24 August 2004.* Upstream view of Stream Crossing #2 from west side of proposed road. Channel was dry.



Plate 16. *20 July 2004.* Upstream view of Stream Crossing #3. Channel was approximately 20 cm wide and 5 cm deep.



Plate 17. *24 August 2004.* Downstream view of Stream Crossing #3.



Plate 18. *20 July 2004.* Upstream view of Stream Crossing #4. Channel was approximately 20 cm wide and 10 cm deep and had stagnant water.



Plate 19. *24 August 2004.* Upstream view of Stream Crossing #4.



Plate 20. *21 June 2004.* Downstream view of Stream Crossing #5. The majority of the channel was dry in both June and July.



Plate 21. *24 August 2004.* Downstream view of Stream Crossing #5. The majority of the channel was dry.



Plate 22. *21 June 2004.* Downstream view of Stream Crossing #6. The channel had flowing water in June, but was dry in July and August.



Plate 23. *24 August 2004.* Downstream view of Stream Crossing #6. Channel was dry.



Plate 24. *21 July 2004.* Downstream view of Stream Crossing #7. There was no defined channel and no flowing water in either June or July.



Plate 25. *24 August 2004.* Downstream view of Stream Crossing #7. There was no defined channel and no flowing water.



Plate 26. *21 June 2004.* Upstream view of Stream Crossing #8. Flowing water was present in the channel during June, but dry in July and August.



Plate 27. *24 August 2004.* Downstream view of Stream Crossing #8. The stream channel was dry.



Plate 28. *21 July 2004.* Downstream view of Stream Crossing #9. Stream channel was undefined and dry.



Plate 29. *24 August 2004.* South view over Stream Crossing #9. Channel was dry.