Appendix V5-7C

Hope Bay Belt Project: 2010 Marine Baseline Report

Hope Bay Mining Limited

HOPE BAY BELT PROJECT
2010 Marine Baseline Report

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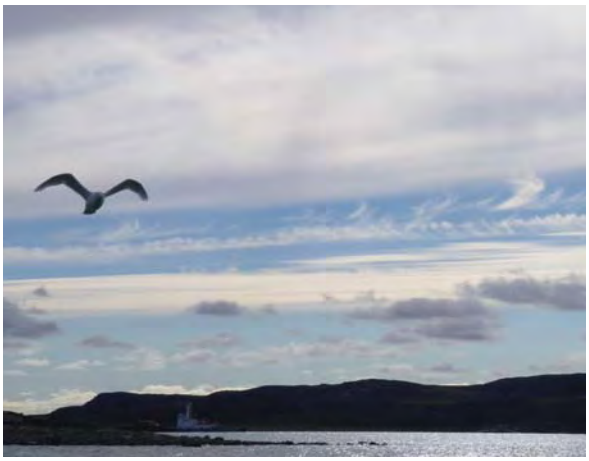



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HOPE BAY BELT PROJECT
2010 MARINE BASELINE REPORT

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Prepared by:

Rescan™ Engineers and Scientists

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Executive Summary

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Executive Summary

Environmental baseline studies were conducted by Rescan Environmental Services Ltd. (Rescan) in 2010, on behalf of Hope Bay Mining Ltd. (HBML), for the Hope Bay Belt Project. The Hope Bay Belt Property is located approximately 125 km southwest of Cambridge Bay, Nunavut, on the south shore of Melville Sound. The nearest communities are Omingmaktok (Bay Chimo; 75 km to the southwest of the property), Cambridge Bay, and Kingaok (Bathurst Inlet; 160 km to the southwest of the property).

This report presents the findings of the 2010 Marine Baseline Program. The primary objective of the 2010 marine program was to collect additional marine baseline data relevant to the planned Phase 2 Project to support permitting and project design. The Marine Baseline Program included the following components: the vertical structure and dissolved oxygen content of the water column, water and sediment quality, phytoplankton, and benthic invertebrates. Two distinct marine basins near the Project area were surveyed between April and October 2010: Roberts Bay and Reference Bay. Roberts Bay was included in the baseline sampling program as this area could potentially be influenced by future Project activities, and Reference Bay (east of Roberts Bay) was selected as a marine reference site. The following text provides a brief summary of the various components sampled as part of the 2010 program.

Water Column Structure and Dissolved Oxygen

In April, the water columns of Roberts Bay and Reference Bay underneath the snow and ice were vertically stratified. Surface salinity ranged from 24 to 26, and bottom water salinity approached 27.3. Winter water temperatures were approximately -1.4°C to -1.3°C at the surface and -0.7°C to -0.5°C in bottom waters. Dissolved oxygen concentrations ranged from 9.4 to 10.2 mg/L at the surface, and decreased to a minimum of 5.6 mg/L in deeper waters.

During summer, the surface layer in both bays was warmer and more brackish than in winter because of the increased solar radiation, ice melt, and enhanced riverine input during summer. Salinities typically ranged between 20 and 24 at the surface, and reached 27.4 at depth. Surface temperatures ranged between 7.9°C and 14.3°C in Roberts Bay and between 5.9°C and 10.3°C in Reference Bay, and approached -0.7°C at depth. Pycnocline depths in July and August were similar to those in the winter. Summer dissolved oxygen concentrations in the mixed layer ranged between 8.7 and 10.9 mg/L and were similar to April levels. Below the mixed layer, oxygen concentrations were substantially higher than in April.

During fall, sampling occurred during a period of very strong winds; therefore, Roberts and Reference bays were laterally well mixed and the thermohaline structure between inlets was very similar. Surface salinities ranged from 24.4 to 24.9, and surface temperatures ranged from 3.4°C to 3.9°C. Deep water temperature and salinity were very similar to those in the winter and summer, approaching -0.7°C and 27.5, Near the surface, oxygen was 12.4 to 12.7 mg/L at all sites. In bottom waters, dissolved oxygen concentrations ranged from 11.7 to 12.8 mg/L.

Light penetration was high in both Roberts Bay and Reference Bay during summer and fall. The euphotic depth was generally deeper than 16 m and below the pycnocline, which suggests that net photosynthesis was possible throughout the upper water column in both bays.

Water Quality

Overall, water quality parameters were similar between Roberts Bay and Reference Bay. pH averaged 7.7 across all sites and depths in winter and 7.9 in summer. Winter concentrations of total suspended solids (TSS) ranged from below detection (<3 mg/L) to 10.3 mg/L. Summer and fall concentrations of TSS were generally higher and more variable, ranging from below detection to 24.4 mg/L. Turbidity levels were low at all sites during winter (averaging 0.2 NTU), but were higher and more variable in summer and fall (0.2 to 16 NTU). Near-shore sites in Roberts Bay had particularly high TSS and turbidity levels in late summer; this is likely attributable to sediment re-suspension due to wave activity at these shallow sites.

Some nutrients showed vertical concentration gradients, which were most dramatic during July and August. Nitrate, total phosphorus, orthophosphate, and silicate concentrations were generally lower at the surface than in deep waters. Vertical gradients of total organic carbon exhibited the opposite trend as the summer surface concentrations were usually slightly higher than at depth. Vertical gradients characterized by lower nutrients and higher total organic carbon at the surface than at depth are indicative of phytoplankton growth and biological nutrient uptake.

Roberts Bay and Reference Bay can be considered low-metal environments, as average concentrations of total and dissolved arsenic, cadmium, chromium, copper, iron, mercury, and zinc were generally below the detection limits for all sites in all sampling months. Exceptions to this tended to be from summer surface samples collected at shallow near-shore sites. Although manganese and molybdenum concentrations were usually above detection, few spatial or seasonal trends were apparent. Water quality parameters were generally below the Canadian Council of Ministers of the Environment (CCME) water quality guidelines for the protection of marine aquatic life. The only exception was total chromium in the September deep sample at site REF-4, which was slightly higher than the CCME guideline for hexavalent chromium.

Sediment Quality

Marine sediments were composed mainly of sand, with some silt and clay. Concentrations of several parameters co-varied with the fine particle composition of the sediment. Sites with higher proportions of silts and clays tended to contain the highest concentrations of total organic carbon, total nitrogen, available ammonium, and molybdenum. Conversely, the sand-dominated eastern basin of Roberts Bay contained the lowest concentrations of these parameters, and also had the lowest levels of available phosphate, aluminum, arsenic, chromium, copper, iron, manganese, molybdenum, nickel, and zinc. Concentrations of polycyclic aromatic hydrocarbons were below analytical detection limits for all sites. Concentrations of EPH19-32 (extractable petroleum hydrocarbons with a carbon range between 19 and 32) and HEPH (heavy extractable petroleum hydrocarbons) were above the detection limits at some Roberts Bay sites. All sediment parameters were below CCME interim marine sediment quality guidelines (ISQGs) and probable effects levels (PELs) for the protection of marine aquatic life.

Phytoplankton

Phytoplankton biomass (as chlorophyll *a*) was generally low at all sites (0.07 to 1.3 µg chl *a*/L), but reached approximately 7.0 µg chl *a*/L in the eastern basin of Roberts Bay in August. Phytoplankton abundance, biomass (as carbon), taxonomy, richness, and diversity levels were similar between Roberts Bay and Reference Bay, and showed similar seasonal trends. Average phytoplankton abundance and biomass as carbon were lowest in August and highest in September. In both Roberts and Reference bays, cryptophytes were numerically dominant in August, while diatoms were dominant in September. Despite being numerically dominant in August and abundant in September, cryptophytes represented a

relatively small proportion of phytoplankton biomass as carbon due to their small size. In comparison, diatoms and dinoflagellates made up a relatively large proportion of the total phytoplankton biomass.

Phytoplankton genus richness and diversity were similar between Roberts and Reference bays. Genus richness averaged 12 in August and 13 in September in both areas. In August, average Simpson's diversity was 0.21 in Roberts Bay and 0.28 in Reference Bay, while in September, Simpson's diversity increased to 0.44 in Roberts Bay and 0.41 in Reference Bay. In general, taxonomic diversity was low to moderate.

Benthos

Average benthos density was highly variable, ranging from 959 organisms/m^2 at in the eastern basin of Roberts Bay to 29,900 organisms/m^2 in the western basin of Roberts Bay. Benthos density in Reference Bay was within range of the densities observed in Roberts Bay. Sites with highest benthos density tended to be dominated by polychaetes. The polychaete genus *Nepthys* was particularly abundant at these sites. Conversely, sites with lowest benthos density tended to be dominated by bivalves, particularly by the small Baltic clam (*Macoma balthica*).

Average benthos genus richness ranged from 3 in the eastern basin of Roberts Bay to 15 in the western basin of Roberts Bay. The pattern in genus richness closely followed benthos density, with sites with greater densities having correspondingly higher richness. Average Simpson's diversity levels ranged from 0.30 to 0.69. In general, taxonomic diversity was low to moderate.

Acknowledgements

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Acknowledgements

This report was prepared for Hope Bay Mining Ltd. (HBML) by Rescan Environmental Services Ltd. The 2010 marine fieldwork was conducted by Rescan scientists Mike Henry (Ph.D.), Katsky Venter (M.Sc.), Stephanie Lyons (M.Sc.), and Carol Adly (M.Sc.). The report was written by Mike Henry, David Timothy (Ph.D., M.Sc.), Fiona Hodge (M.Sc.), and Carol Adly, and reviewed by Mike Henry and Deborah Muggli (Ph.D., M.Sc., R.P.Bio.). The project was managed by Deborah Muggli.

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1. Introduction

The Hope Bay Belt Property is located approximately 125 km southwest of Cambridge Bay, Nunavut, on the south shore of Melville Sound (Figure 1-1). The nearest communities are Omingmaktok (75 km to the southwest of the property), Cambridge Bay, and Kingaok (Bathurst Inlet; 160 km to the southwest of the property).

The property consists of a greenstone belt running in a north/south direction, approximately 80 km long, with three main gold deposit areas. The Doris and Madrid deposits are located in the northern portion of the belt, and the Boston deposit is located in the southern end. The northern portion of the property consists of several watershed systems that drain into Roberts Bay, and a large river (Koignuk River) that drains into Hope Bay. Watersheds in the southern portion of the belt ultimately drain into the upper Koignuk, which drains into Hope Bay.

Hope Bay Mining Limited (HBML) is proceeding with the development of the Doris North Project. Required licences and permits are in place for the development of the Doris North Gold Mine, and construction of the project commenced in 2010.

HBML plans to develop additional deposits in the belt, and planning for this Phase 2 Project development has commenced. Baseline studies to support the permitting of the Phase 2 Project were carried out in 2009, and were continued in 2010. The environmental baseline program conducted in 2010 was intended to fill in information gaps in order to support the permitting process for the Phase 2 Project. The site layout options considered for the 2010 Phase 2 environmental baseline program (entire belt) are shown in Figure 1-2, and the site layout options considered for Roberts Bay are shown in Figure 1-3.

Results from the 2010 Phase 2 Project environmental baseline program are being reported in a series of reports, as follows:

- 2010 Hydrology Baseline Report;
- 2010 Freshwater Baseline Report;
- 2010 Freshwater Fish and Fish Habitat Baseline Report;
- 2010 Marine Baseline Report;
- 2010 Marine Fish and Fish Habitat Baseline Report;
- 2010 Terrain and Soils Baseline Report;
- 2010 Country Foods Baseline Report;
- 2010 Ecosystems and Vegetation Baseline Report; and
- 2010 Marine Wildlife Baseline Report.

Figure 1-1

Hope Bay Belt Project Location

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