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January 2, 2001

TeckCominco Ltd.
Bag 2000
Kimberly, BC
V1A 3E1

Attention: Bruce Donald
Reclamation Superintendent

Dear Mr. Donald,

Re: Response to Environment Canada Letter re Post-Closure Monitoring

This memorandum responds to the comments made by Lawrence Ignace of Environment Canada, Environmental Protection Branch on page 3 of the letter addressed to Dionne Filiatrault of the Nunavut Water Board on October 26, 2001.

Background to Marine Studies

The results of analyses of sediment collected from Garrow Bay 1999 and comparisons to 1981 and 1984 data indicate that Garrow Bay has not been impacted by potential sources of metal contamination (Tables 8.4 and 8.5, Polaris Mine Decommissioning and Reclamation Plan, Volume III). Two of the three sediment samples collected from Polaris Bay (stations 3B and 3C on Figure 15, Volume III) contain zinc levels above the CCME probable effects level (PEL) and one of these (3B) contain lead levels above the CCME PEL. These results cannot be compared to baseline conditions as no pre-operational samples were collected here. Lead and zinc levels at these sites are higher than those at an upcurrent site farther from the shoreline (3A). Lead and zinc concentrations in soft tissue collected from station 3C were higher than levels in upcurrent station 3A (Table 8.6 Volume III). It is difficult to compare this data to pre-operational data collected in 1975 and 1978 as the locations sampled in these years are not clear.

While there is no information to suggest or to dismiss that the metals levels in the sediments of Polaris Bay are related to the effects of the adjacent landfill, the Closure Plan proposes isolation of the landfill that eliminates the potential for migration of metals contamination into the sediments.

All of the seven sediment samples collected from Crozier Strait in 1999 contain cadmium, lead and zinc levels above the corresponding CCME PEL. These results cannot be compared to baseline conditions as no pre-operational samples were collected here. As the area up-current from the dock and shoreline operations (station 4A) also contains these metals at high levels (above the PEL), it is possible to attribute these results to a naturally occurring dyke of mineralization associated with the Polaris ore body. Levels of cadmium, lead and zinc in soft tissue are elevated in samples collected from this area in 1984 and 1999. While there is no information to suggest or to dismiss that the metals levels in the sediments of Crozier Straight are related to the effects of the adjacent mine operations, the Closure Plan proposes remediation of the contaminated soil that eliminates the potential for migration of metals contamination into the sediments.

Environment Canada commented that in the marine environment, attempts of remediation of contamination may cause more problems than it solves and has recommended that "further monitoring [of the marine environment] should occur to determine if there is continued contamination into the future." This recommendation has been incorporated into the post closure monitoring plan outlined below.

Post Closure Monitoring - Phase I

Environment Canada requested a more detailed monitoring program including the location of stations, parameters and frequency of sampling/observations. In response, the Phase I program is described below and clearly outlined in Table 1. In general, the Phase I program refers to monitoring conducted during the decommissioning and reclamation of the site from mid 2002 to October 2004.

Dock Removal and Shoreline Grading

During the dock removal and shoreline re-contouring, best management practices will be followed to minimize impacts to marine habitat and life. This work is temporary in nature with the final result being improved shoreline habitat. A TeckCominco staff member will be assigned to monitor the shoreline work from an environmental perspective. This will include ensuring that:

- Work is done "in the dry" as much as possible;
- Deleterious substances are stored in a designated area away from the shoreline (50 m);
- Refueling of equipment is conducted away from the shoreline;
- Equipment to be used in the water is free of leaks and in good working order;
- Sediment-laden water is kept isolated from marine water as much as possible by physical barriers or by pumping it to settling locations;
- The mitigative measures outlined in the work plans (including dock removal process, refrigerant handling, blasting and timing) are followed; and
- Contingency measures are in place to deal with accidents including a written emergency response plan, presence of spill kits and workers trained in these procedures.

Confirmatory Sampling for Excavation of Metals and Hydrocarbons in Soil

An excavation plan has been prepared that is based on analysis of soil samples from test pits and boreholes as compared to the soil quality remediation objectives (SQRO's). However, it is likely that the depth of excavation will vary from this design in some areas due to localized effects. A contaminant concentration confirmation procedure will be implemented that will ensure that the remedial objectives are achieved in an efficient and timely manner. During remediation of the areas indicated on Figure 19 of Volume I for lead and zinc and the areas indicated on Figure 20 in Volume I for petroleum hydrocarbons, on-site screening and confirmatory sampling will be conducted. The objective will be to capture at least 95% of soils containing contaminants in excess of the SQRO's in each remediation area. Contaminant concentrations in any residual soils will not exceed twice the SQRO's. This objective provides a realistic recognition of our experience in soil remedial work.

On-site screening of soil samples for contaminant concentrations will be conducted. This approach will prevent the delays and increased costs that would be encountered by the exclusive use of an off-site laboratory for on-site control. The on-site screening procedure will utilize analytical instruments that are designed for this purpose.

In areas where the design depth of excavation is 1.0 metres or less, the full design depth will be excavated prior to screening analysis. In areas where the design depth of excavation is greater than 1.0 metres, screening analysis will take place at the design depth and then at approximately 0.5 metre depth increments.

Excavation floor sampling will take place on a 25 metre grid (25 m by 25 m) wherein the area is divided into four quadrants. One discrete sample will be collected from each of the four quadrants and the four samples will be mixed together to form a composite for analysis. Excavation wall sampling will take place by each 25 metre wall length. One composite sample will be created from four discrete samples collected every 6.25 metre wall length at approximately 0.25 metres from the floor. One discrete sample will also be analysed for approximately every five composites to verify the representation of the composite method. The sample collection details may be modified slightly in the field based on the professional judgement of the field technician where this is necessary to maintain rigorous control in unique field conditions.

A screening analysis will be conducted on each sample collected. For screening analyses of metal concentrations, an instrument similar to the NITON 700 Series Multi-Element Analyzer might be utilized. The NITON instrument is a hand held analyzer that utilizes a radioisotope source (^{109}Cd) to analyze for 15 metals (including lead and zinc) and that is specifically designed for this type of application. The instrument is factory calibrated and reads bulk soil samples (i.e. no sample preparation required). The instrument must be licensed with the Atomic Energy Control Board of Canada because of the radioisotope source, which is a standard procedure. NITON information quotes detection limits of less than 150 mg/kg for zinc and less than 70 mg/kg for lead. For screening analyses of hydrocarbon concentrations, a photo ionization detector (PID) as well as visual and olfactory observations might be used.

Other field analytical instruments are available and could be utilized that operate in a similar manner to those described above. The detection limits and accuracy of analysis for the selected instruments would be confirmed prior to utilization at the mine site. This procedure will compare duplicate analyses of a suite of soil samples provided from the mine site utilizing the field analyzer and a professional, accredited laboratory. The duplicate suite of samples will attempt to be representative of soil types on the mine site and will consist of at least 25 soil samples.

A dedicated field technician will conduct the field screening analyses. A complete technical log of all sample analyses and locations will be maintained on the site by the technician. Sample locations will be ascertained by tape/chain survey.

Excavation of contaminated soils will proceed until the on-site screening procedures indicate that the excavation objectives have been achieved. At that time, a suite of confirmatory soil samples will be collected according to the sampling method described above for the field screening analyses. The confirmatory samples will be analyzed at an accredited off-site laboratory. Backfilling of excavated areas or other similar work in the areas of excavation will proceed only subsequent to the receipt of favourable results from the off-site laboratory.

Garrow Lake Water Quality

TeckCominco proposes to conduct routine monitoring at Garrow Lake from mine closure to 2004 based on a modified Water License Surveillance Network Program (SNP, to expire December 31, 2002). Note that the plan assumes that the dam will be decommissioned in 2004 and that the current monitoring associated with the input of tailings to the lake will not be required, as this operation will be discontinued in 2002. This routine monitoring includes:

- Measuring the water level of the lake (at the lake centre, station 262-3) during break-up and prior to freeze-up;
- Measuring the height of the tailings pile at station 262-2 on a monthly basis, when not prohibited by ice until deposition of tailings ceases in late summer 2002;
- Collection of water samples from station 262-3 three times a year during mid-winter, maximum ice thickness and maximum ice melt. Water will be collected from depths of 3, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22 and 40 m during mid-winter and maximum ice thickness and from depths of 0, 1.5, 3, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22 and 40 m during open water. Analyses of each sample will be for total lead, total zinc, pH, temperature and conductivity;
- Collection of water samples from station 262-3 three times a year during mid-winter, maximum ice thickness and maximum ice melt from depths of 3 and 10 m during mid-winter and maximum ice thickness and from 0, 1.5 m, 3 and 10 m depths during open water. Analyses of each sample will be for total copper, cyanide, cadmium, antimony, nickel, arsenic and mercury;
- Collection of water samples from station 262-3 three times a year during mid-winter, maximum ice thickness and maximum ice melt from a depth of 1.5 m for analysis of total suspended solids;
- Visual inspection to note stability of the Garrow Lake shoreline weekly between ice break-up and freeze-up;
- Collection of water samples from station 262-7 (the water discharge siphons at the dam) every 7 days during periods of discharge for analysis of total lead, total zinc and pH; and
- Daily measurements of effluent volume during discharge at station 262-7.

Landfill Temperatures

Monitoring of the temperatures at the Operational Landfill will continue on a monthly basis except during placement of the engineered cover. Once the cover is completed, three monitoring holes will be maintained (or re-established, if damaged) so the thermal conditions of the engineered cap and the landfill can be monitored on a monthly basis during Phase I. Monthly monitoring of the temperatures at the LRD Landfill will begin following placement of the engineered cap by establishing three monitoring holes.

Metals in Vegetation

During the summer of 2004, a vegetation sampling program similar to that conducted in 2000 (an expansion of the 1974 and 1999 programs) to determine metal levels in vegetation in areas around the mine site will be conducted. The year 2000 program included collection of up to four discrete vegetation samples:

1. the entire vegetative body of lichen (*Thamnolia subuliformis*);
2. the current season's growth of leaves and stalk from the Arctic willow (*Salix arctica*);
3. the current season's growth of leaves and stalk from grass (*Alopecurus alpinus*); and
4. cleaned roots of the Arctic willow.

Where these species are present at each of 13 sites (B, C, D, E, G, H, I, J, K, L, M, N, O, Figure 3 of Volume IV), analysis of each discrete dry sample (up to 4) at each site will be undertaken for lead and zinc concentrations. This data will be compared to previous results from 1975, 1999 and 2000 to note any changes in metal levels.

Metals in Marine Sediment

A marine sediment sampling program will be conducted from the ice in May or early June of 2004 to monitor the status of lead and zinc sediment concentrations. Samples will be collected from station 3B (offshore from the Operational Landfill) in Polaris Bay and from stations 4A and 4C in Crozier Straight (Figure 15, Volume III). At each of these sites, three samples will be collected and composited for analyses of metals and other relevant parameters. These three sampling locations represent an up-current "control" site and locations with current lead and zinc concentrations that exceed federal guidelines.

Post Closure Monitoring - Phase II

The Phase II program involves measurements, analyses and visual inspections following the mine closure through until 2011. The program is described below and clearly outlined in Table 2.

Garrow Lake

At station 262-3 on Garrow Lake, a vertical profile of temperature, salinity and conductivity is to be completed while the ice is still on the lake (May or June) during 2005, 2006, 2008 and 2011. At the same time, water samples are to be collected from each of the surface layer, the halocline and the deep water layer for analyses of total lead and total zinc. A water sample will be collected from a depth of 1.5 m for TSS analysis.

Wind speeds will be monitored at the climate station on Resolute Bay from late July to freeze-up from 2005 to 2011. During open water, if a wind event occurs that could result in the mixing of the top 1 m of Garrow Lake (see Figure 3 in Section 3 of Volume II) a vertical conductivity profile of the lake is to be taken at station 262-3 and water samples collected here at the surface and from the halocline for total zinc analysis. This work will be done prior to freeze up, if it is safe to do so.

Surface Water

Brief inspections (1 to 2 days) are planed to occur in late July/early August of 2005, 2006, 2007, 2009 and 2011. During these visits, if surface water is present at the discharge point from Garrow Lake, a water sample will be collected and analyzed for pH, total lead, total zinc and TSS. Water samples will be collected from the Loon Lake outlet creek and analyzed for pH, total lead and total zinc. Where surface water is present on the site samples will be collected and analyzed for pH, total lead, total zinc and if required, hydrocarbons.

Landfill Temperatures and Visual Observations

Additional monitoring tasks to be completed during the late July/early August of 2005, 2006, 2007, 2009 and 2011 scheduled visits includes:

- Recording temperature readings from the three thermistor strings at the Operational Landfill and from the three thermistor strings at the LRD Quarry Landfill;
- Visual observations to confirm stability of the physical features of the site, primarily related to erosion, including at:
  - Garrow Lake and Garrow Creek - surrounding slopes
  - Operational Landfill - surface
  - LRD Quarry Landfill - surface

- Site roadways - surface and side slopes
- Marine shoreline - along the length of the decommissioned area
- New quarry area - ground surface
- Underground mine workings - ground surface above this area
- Mine subsidence area - confirm that there is no significant ground movement that would present a public safety hazard; and

- Visual inspection of the integrity of the seals at each mine entrance.

Metals in Vegetation

During the summer of 2011, a vegetation sampling program will be completed similar to that conducted in 2000 and 2004 (an expansion of the 1974 and 1999 programs) to determine metal levels in vegetation in areas around the mine site. The year 2000 program included collection of up to four discrete vegetation samples:

1. the entire vegetative body of lichen (*Thamnolia subuliformis*);
2. the current season's growth of leaves and stalk from the Arctic willow (*Salix arctica*);
3. the current season's growth of leaves and stalk from grass (*Alopecurus alpinus*); and
4. cleaned roots of the Arctic willow.

Where these species are present at each of 13 sites (B, C, D, E, G, H, I, J, K, L, M, N, O on Figure 3 of Volume IV) an analysis of each discrete dry sample (up to 4) at each site will be undertaken for lead and zinc concentrations. This data will be compared to previous results from 1975, 1999, 2000 and 2004 to note any changes in metal levels.

Metals in Marine Sediment

A marine sediment sampling program will be conducted from the ice in May or early June of 2011 to monitor the status of lead and zinc sediment concentrations. Samples will be collected from station 3B (offshore from the Operational Landfill) in Polaris Bay and from stations 4A and 4C in Crozier Straight (Figure 15, Volume III). At each of these sites, three samples will be collected and composited for analyses of metals and other relevant parameters. These three sampling locations represent an up-current "control" site and locations with current lead and zinc concentrations that exceed federal guidelines. This data would be compared to previous results, including the results of the 2004 sampling program, to identify significant trends.

We hope that the marine sediment comments and post closure monitoring plan outlined above provides the information required. Please contact the undersigned at (403) 262-4299 with any questions.

Yours truly,
GARTNER LEE LIMITED

S.R. Morison, Manager Northern Canada and Alberta

Table 1. Outline of Post Closure Monitoring - Phase I

Area	Station Locations	Parameter(s)	Frequency	Duration
Dock and shoreline	dock removal and shoreline grading	visual environmental monitoring	daily	Through period of excavation
Metal contaminated soils	see Figure 19 in Volume I of Polaris Closure Plan	lead, zinc	screening and confirmatory sampling during remediation	Until remedial objectives achieved
Hydrocarbon contaminated soils	see Figure 20 in Volume I of Polaris Closure Plan	petroleum hydrocarbons	screening and confirmatory sampling during remediation	Until remedial objectives achieved
Garrow Lake	262-3 (lake centre)	water level	during break-up and prior to freeze-up	mid 2002 to October 2004
Garrow Lake	262-2 (above tailings discharge point)	height of tailings pile	monthly, when not prohibited by ice	mid 2002 to late summer 2002 when tailings deposition ceases
Garrow Lake	262-3 (lake centre) at water depths of 3, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22 and 40 m and also at 0 and 1.5 m during open water	total lead, total zinc, pH, temperature, conductivity	3 times per year (mid-winter, maximum ice thickness and max ice melt)	mid 2002 to October 2004
Garrow Lake	262-3 (lake centre) at water depths of 3 and 10 m and also at 0 and 1.5 m during open water	total copper, cyanide, cadmium, antimony, nickel, arsenic, mercury	3 times per year (mid-winter, maximum ice thickness and max ice melt)	mid 2002 to October 2004
Garrow Lake	262-3 (lake centre) - at water depth of 1.5 m.	TSS	3 times per year (mid-winter, maximum ice thickness and max ice melt)	mid 2002 to October 2004
Garrow Lake	perimeter of lake shoreline	visual observation for stability of shoreline	weekly between break-up and prior to freeze up	mid 2002 to October 2004
Garrow Lake Dam	262-7 (water discharge siphons at dam)	total lead, total zinc, pH	every 7 days during periods of discharge	mid 2002 to October 2004
Garrow Lake Dam	262-7 (water discharge siphons at dam)	volume of effluent	daily during periods of discharge	mid 2002 to October 2004
Frustration Lake		water volume	monthly total pumped in m^3	mid 2002 to October 2004
Garrow Lake Dam	dam core	temperature	monthly	mid 2002 to October 2004
Operational Landfill	3 monitoring holes	temperature	monthly	mid 2002 to October 2004
LRD Quarry Landfill	3 monitoring holes	temperature	monthly, following capping	mid 2002 to October 2004
Vegetation	B, C, D, E, G, H, I, J, K, L, M, N, O on Figure 3 of Volume IV of Polaris Closure Plan	lead and zinc in dry Arctic willow roots, Arctic willow shoots, grass shoots and whole lichen body	once	Summer of 2004
Marine sediment sampling	stations 3B, 4A, 4C on Figure 15 of Volume III	lead and zinc in sediment	once	May/June 2004

Table 2. Outline of Post Closure Monitoring - Phase II

Area	Station Locations	Parameter(s)	Frequency	Duration
Garrow Lake	262-3 (lake centre) at surface, halocline and deep layers	total lead, total zinc, pH, temperature, conductivity, salinity	annually during May/June	2005, 2006, 2008, 2011
Garrow Lake	262-3 (lake centre) - at water depth of 1.5 m	TSS	annually during May/June	2005, 2006, 2008, 2011
Resolute Bay	climate station	wind speed	annually from late July to freeze-up of Garrow Lake	2005 to 2011
Garrow Lake	262-3 (lake centre) at water depths of 3, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22 and 40 m	total lead, total zinc, pH, temperature, conductivity, salinity	following a wind event that could result in the minxing of the top 1 m of the lake (see Figure 3 in section 3 of Volume II)	during open water (late July to freeze-up) from 2005 to 2011
Garrow Lake	discharge point	pH, total lead and zinc, TSS	annually during July/August visit, if discharging	2005, 2006, 2007, 2009, 2011
Site surface water	any observed surface flows	pH, total lead and zinc, hydrocarbons	annually during July/August visit, if discharging	2005, 2006, 2007, 2009, 2011
Loon Lake outlet creek	at discharge to ocean	pH, total lead and zinc	annually during July/August visit, if discharging	2005, 2006, 2007, 2009, 2011
Operational Landfill	3 monitoring holes	temperature	annually during July/August visit	2005, 2006, 2007, 2009, 2011
LRD Quarry Landfill	3 monitoring holes	temperature	annually during July/August visit	2005, 2006, 2007, 2009, 2011
Garrow Lake and Garrow Creek	surrounding slopes	visual inspection of physical stability	annually during July/August visit	2005, 2006, 2007, 2009, 2011
Operational Landfill	surface	visual inspection of physical stability	annually during July/August visit	2005, 2006, 2007, 2009, 2011
LRD Quarry Landfill	surface	visual inspection of physical stability	annually during July/August visit	2005, 2006, 2007, 2009, 2011
Site roadways	surface and slopes	visual inspection of physical stability	annually during July/August visit	2005, 2006, 2007, 2009, 2011
Marine shoreline	area of decommissioning	visual inspection of physical stability	annually during July/August visit	2005, 2006, 2007, 2009, 2011
New quarry area	ground surface	visual inspection of physical stability	annually during July/August visit	2005, 2006, 2007, 2009, 2011
Underground mine workings	ground surface	visual inspection of physical stability	annually during July/August visit	2005, 2006, 2007, 2009, 2011
Mine subsidence area	ground	visual inspection of ground movement	annually during July/August visit	2005, 2006, 2007, 2009, 2011
Mine entrances	seals	visual inspection of integrity of seals	annually during July/August visit	2005, 2006, 2007, 2009, 2011
Vegetation	B, C, D, E, G, H, I, J, K, L, M, N, O on Figure 3 of Volume IV	lead and zinc in dry Arctic willow roots, Arctic willow shoots, grass shoots and whole lichen body	once	summer of 2011
Marine sediment sampling	stations 3B, 4A, 4C on Figure 15 of Volume III	lead and zinc in sediment	once	May/June 20011