NEWMONT NORTH AMERICA

Appendix G – SRK Water Licence Amendments Supporting Memo

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Memo

To:	Chris Hanks	**Date:**	10 August 2012
Company:	Newmont Mining Company	**From:**	Tom Sharp
		Project #:	1CH008.065
Subject:	Rationale for Reducing Water License Monitoring Obligations during Care and Maintenance		

1 Introduction

The purpose of this memorandum is to provide a reasonable basis to reduce or eliminate monitoring requirements during the care and maintenance phase at the Hope Bay project. The Nunavut Water Board (NWB) Water License defines the current monitoring requirements. Lawson Lundell summarized these obligations and requested SRK evaluate some of these obligations. The objective of care and maintenance is to ensure that site conditions are protective of human health and the environment.

2 NWB Water License Monitoring Obligations

2.1 Part F. Item 4. Water Management Structure Inspections

This section of the water license requires regular inspections of water management inspections and maintaining records of the inspections.

Inspection of the water management structures will be undertaken as described in the Interim Water Management Plan (SRK 2012) when water is being actively managed.

2.2 Part G. Item 3. Sewage Treatment Plant Discharge Location

This section requires that treated sewage effluent be discharged to the Tailings Impoundment Area (TIA) once it is in operation.

During care and maintenance treated sewage effluent will not be discharged to Tail Lake. The discharge location for the sewage treatment plant will remain at the same location as during construction. The camp size during care and maintenance will be less than during construction. Therefore, the impact of discharging treated sewage effluent will be less than during construction.

2.3 Part G. Item 24. Operate TIA to Engineering Standards

This section requires that the TIA must be operated and maintained to engineering standards and requires weekly inspections to identify and remediate any seepage, cracking, and ponding of any structures associated with the TIA.

During care and maintenance, water management pipes and pumps to and from the TIA will be inspected daily during when water is actively managed as described in the Interim Water Management Plan (SRK 2012). The North Dam will be inspected weekly and records will be kept in a log book.

2.4 Part G. Item 26. Discharge from TIA Comply with Effluent Quality Limits

This section requires that discharge from the TIA comply with specific effluent limits.

SRK has evaluated if the discharge of runoff and underflow intercepted at site will impact water quality in Tail Lake and in Doris Creek when Tail Lake water is discharged (Attachment 1). The model results indicate that license water quality objectives will be met at both locations.

2.5 Part G. Item 31. Frequency of Water Balance and Water Quality Model Updates

This section requires that the water quality model be updated monthly.

During care and maintenance, the water balance model does not need to be updated because there is no need for a model to forecast water quality based on changing operations. SRK proposes that the reporting requirement should be reduced from monthly updates to an annual data summary report. This annual report will summarize water quality data at the compliance monitoring locations and volumes of water pumped to and from Tail Lake.

The model can be updated annually during care and maintenance and water quality predictions compared to actual data, if the observed data differs significantly from previous care and maintenance predictions (Attachment 1).

2.6 Part I. Item 7. Regular Inspections Fuel Storage and Containment and Other Areas

This section requires that fuel storage and containment areas, sumps, emergency dump basins, other fuel tanks and connectors are inspected for leaks and movement and that inspection records are kept.

SRK proposes that these inspections should be conducted weekly during care and maintenance when the site is occupied. Records of these weekly inspections will be maintained in a log book on-site.

2.7 Part J. Item 2. Flow Measurement in Doris Creek

This section requires that flow in Doris Creek is monitored on a real-time and continuous basis when ice conditions allow.

Rescan stated that this monitoring station is already installed in Doris Creek. SRK proposes that this station only be monitored during care and maintenance when water is being discharged from Tail Lake.

2.8 Part J. Item 12. Monthly Flow and Volume Measurements

This section requires that monthly measurements are made of the following:

- Potable water withdrawn from Doris Creek,
- Tonnages of unmineralized and mineralized wasterock stored on the wasterock pad,
- Volume of sewage sludge removed from the sewage treatment plant and the disposal location or method of the sludge, and
- Ice thickness in Tail Lake.

SRK proposes the following modification of these monitoring requirements for care and maintenance:

- Continue to monitor potable water volume extracted from Doris Lake monthly when the camp is occupied.
- The tonnage of mineralized and unmineralized wasterock stored on the pad will not change during care and maintenance. Monthly reporting is no longer needed. If wasterock is moved, the tonnage and location where it is moved will be recorded.
- The volume of sewage sludge removed from the treatment plant and its disposal location will be recorded when the plant is operating.
- Ice thickness in Tail Lake will not be measured. This measurement was made to calibrate the model and account for cryoconcentration. Now that the model will not be updated these data are unnecessary.

2.9 Part J. Item 14. Thermal Monitoring Program Requirement

This section requires that a specific Thermal Monitoring Program is undertaken.

Our recommendation for thermistor monitoring is that there are two types of thermistors:

- Thermistor strings needed for compliance, and
- Remnant thermistor strings from the baseline characterization of the site.

During care and maintenance, all thermistors (with the exception of those installed at the North Dam) will be monitored once a year at the end of August when the active layer is at its maximum thickness. With the extensive database of thermistor readings available for the site a reduced monitoring program as proposed is warranted.

Thermistors at the North Dam will be monitored more frequently as described in Section 7 of the North Dam As-Built Report (SRK, in preparation, Attachment 2). These thermistors are to be equipped with data loggers and the data will be downloaded annually. Data will be reported in the annual geotechnical report submitted to the NWB.

2.10 Part J. Item 15. Continued Thermistor Monitoring at Various Locations

This section requires that thermistors between the TIA and Doris Lake and between Doris Lake the underground workings be monitored.

The revised thermistor monitoring described in the previous comment will be undertaken during care and maintenance.

2.11 Part J. Item 16. Thermistor Monitoring Surrounding the Underground Workings

This section requires that additional thermistors be installed around the underground workings.

SRK recommends that no additional thermistors need to be installed because the mine has not been developed far enough to warrant their installation. Existing thermistors will be monitored as described previously.

2.12 Part J. Item 20. Visually Monitor and Record During Periods of Discharge

This section requires daily inspection and recording of conditions at sumps, ponds, containment areas and the sewage treatment plant.

These areas will be monitored as described in the Interim Water Management Plan (SRK 2012) and Sewage Treatment Management Plan during care and maintenance when the site is occupied.

2.13 Part J. Item 21. Monthly Summary of Compliance Data and Model Updates and Daily Visual Inspections of Total Suspended Solids in the TIA

This section requires that a monthly monitoring reports including all data collected, operational assessments of the water balance and quality model, daily visual assessments of total suspended solids be submitted. The report should also assess the data to identify areas of non-compliance.

SRK propose that an annual data summary report of all monitoring data will be prepared. The water balance model will not be updated during care and maintenance because there is no need to make water quality predictions. Tail Lake will be visually inspected daily for TSS when personnel are on-site. Prior to discharge from Tail Lake, water quality sample results will be provided to the agencies for their approval. This submission will be a letter with the analytical results attached.

3 Closure

SRK trusts this memorandum adequately provides our rationale to support a reduction of the monitoring obligations for the Hope Bay Project.

4 References

SRK Consulting (Canada) Inc. 2012. Interim Water Management Plan, Doris North Project, Hope Bay, Nunavut, Canada. Report prepared for Hope Bay Mining Ltd. Project Number: 1CH008.047. November 2011.

SRK in preparation. North Dam As-Built Report, Doris North Project, Hope Bat, Nunavut, Canada. Report prepared for Hope Bay Mining Ltd. Project Number: 1CH008.058. May 2012

Attachment 1

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Memo

To:	Chris Hanks	**Date:**	November 30, 2011
Company:	Newmont	**From:**	Leslie Gomm and Tom Sharp
Copy to:	File, Maritz Rykaart, Bill Patterson, Michael McGurk, Kevin Mather, Angela Holzapfel	**Project #:**	1CH008.047
Subject:	Summary of Assessment of Pollution Pond Discharge to TIA		

1 Introduction

The Doris Water Balance and Water Quality Goldsim Model was run to provide an assessment of the potential discharge of water from the Pollution Pond to the TIA for a period of 5 years starting in 2012. Specifically the model was run to determine the following:

1. What is the predicted water quality in the TIA as a result of the discharge of the Pollution Pond water and specifically does it meet the discharge limits set out in Clause 26 of the current licence?
2. What is the predicted water quality in Doris Creek during discharge of water from the TIA and specifically does it meet the receiving environment standards set out in Clause 28 of the licence.

The model was run for a period of 5 years from October 2011 to November 2016 assuming the following:

- Water level elevation in the TIA on October 1, 2011 was 29.3 masl.
- The mine is on ongoing care and maintenance mode with no milling and discharge of tailings to the TIA.
- The only inflows to the TIA are that from the Pollution Pond and the TIA catchment area.
- There is discharge from the TIA during the open water season (June to October) as per the requirements of the current licence. Specifically the discharge rate from the TIA can't exceed 10% of the background flow in Doris Creek.
- The target water level in the TIA is 28.3 masl.
- The model was run assuming that all parameters behave conservatively (no degradation of nitrogen species).

As part of this assessment the model run was run assuming average precipitation and evaporation conditions: 229.3 mm annual rainfall and 220 mm annual evaporation.

2 Assumptions

The following highlight the key assumptions that have been incorporated into the model for these scenarios.

a) Initial Water Level and Lake Volume

The model run starts on October 1, 2011 at which time the lake elevation is 29.3 masl and the corresponding volume is 3,400,603 m^3. In subsequent years the discharge from the TIA is designed to lower the water level in the TIA to its natural elevation of 28.3 masl. The TIA is predicted to reach, and stabilize, at this elevation after the first two years of discharge.

b) Precipitation and Runoff

The annual precipitation used in the model run was 229.3 mm. For runoff from land area in Tail Lake catchment area, a runoff coefficient of 0.6 was applied to the annual precipitation value used in each scenario. This land runoff coefficient is based on that used by Golder in their GoldSim water balance model of the major waterbodies in the project area (Golder 2009).

c) Evaporation

A mean annual evaporation of 220 mm was used for the scenarios. This is based on the value used in the original model.

d) Pollution Pond Discharge Volume

The Pollution Pond is assumed to discharge to the TIA during the open water season (June to October) with a total annual discharge volume of 39,364 m^3 based on the information provided by SRK as part of the post-mortem assessment of the recent performance of the Pollution Pond. This assessment assumed a 1:20 precipitation year along with a 1:25 year 24-hour storm event. Furthermore it is assumed that 80% of the annual snowfall is removed from the Doris North Mine Area pads and 95% of the runoff from the undeveloped portion of the watershed north of the Doris North Mine Area is diverted. The corresponding monthly inflows to the TIA are provided in Table 1.

Table 1 Summary of Monthly Pollution Pond Inflows

Month	Discharge (m^3)
June	7,955
July	9,424
August	16,819
September	4,474
October	592

e) Pollution Pond Discharge Water Quality

The Pollution Pond discharge water quality is assumed to be characterized by the water quality sample collected from the pond on May 24, 2011 for all parameters except nitrate and nitrite (Table 2). Nitrate and Nitrite concentrations assumed in the model were from a water quality sample collected from the pond on May 29, 2011. The model was then used to predict the water quality in the TIA and Doris Creek during discharge for those parameters which had pollution pond concentrations provided.

Table 2 Pollution Pond Water Quality (mg/L) – May 24, 2011

Parameter	**Concentration**
Total Suspended Solids	**27**
Chloride	795
Total Cyanide	0.056
Ammonia-N	15.400
Nitrate-N	45.0
Nitrite-N	1.5
Total Aluminum	0.64
Total Antimony	0.00
Total Arsenic	0.0004
Total Barium	0.0618
Total Beryllium	0.001
Total Boron	0.194
Total Cadmium	0.00005
Total Calcium	334
Total Chromium (VI)	0.0172
Total Cobalt	0.0033
Total Copper	0.006
Total Iron	1.45
Total Lithium	0.16
Total Magnesium	20.1
Total Manganese	0.80
Total Mercury	0.0001
Total Molybdenum	0.005
Total Nickel	0.011
Total Lead	0.00022
Total Selenium	0.002
Total Silver	0.0001
Total Sodium	83.2
Total Thallium	0.0001
Total Tin	0.05
Total Titanium	0.023
Total Uranium	0.0004
Total Vanadium	0.0066
Total Zinc	0.007

3 Results

For each scenario, the model was run on monthly time step from October 1, 2011 for a period of 5 years until November 2016. Starting with a water level elevation of 29.3 masl in October 2011, the predicted water level in the TIA is predicted to return to its natural elevation of 28.3 masl after the second season of discharge (Fall 2013).

The minimum and maximum predicted concentrations in the TIA discharge over the 5-year period are presented in Table 3 along with the corresponding licence discharge limits. During the 5-year model period, the water quality in the TIA is predicted to be well below the limits set out in Clause 26 of the current water licence.

The minimum and maximum predicted concentrations in Doris Creek over the 5-year period are presented in Table 4 along with the corresponding licence receiving water quality limits. Similarly, during the 5-year model period, the water quality in Doris Creek during periods of discharge is predicted to be well below the limits set out in Clause 28 of the current water licence.

Table 3 Predicted Range of TIA Discharge Water Quality (mg/L) - 2012 to 2016

Parameter	Maximum Average Concentration in TIA Discharge (Clause 26 of Original Licence) (mg/L)	Average Precipitation Conditions	
		Minimum	Maximum
Total Suspended Solids	15	1	2
Total Cyanide	1.00	0.001	0.004
Ammonia-N	6.00	0.01	0.77
Total Arsenic	0.50	0.0002	0.0003
Total Copper	0.30	0.001	0.001
Total Nickel	0.50	0.001	0.001
Total Lead	0.20	0.00002	0.00004
Total Zinc	0.50	0.004	0.006

Table 4 Predicted Range of Doris Creek Water Quality (mg/L) during Discharge - 2012 to 2016

Parameter	Target Closure Concentration (Clause 28 of Original Licence) (mg/L)	Average Precipitation Conditions	
		Minimum	**Maximum**
Chloride	150	54	64
Free Cyanide	0.005	not predicted	
Total Cyanide	0.010	0.001	0.001
Ammonia-N	1.54 (pH 7.5 and T=20)	0.008	0.077
Nitrate-N	2.900	0.006	0.207
Nitrite-N	0.06	0.001	0.008
Total Aluminum	0.10	0.05	0.08
Total Arsenic	0.0050	0.0004	0.0005
Total Cadmium	0.000017	0.000002	0.000002
Total Chromium (VI)	0.0010	0.0002	0.0004
Total Copper	0.002	0.001	0.001
Total Iron	0.30	0.08	0.11
Total Mercury	0.000026	0.000001	0.000001
Total Molybdenum	0.073	0.0001	0.0002
Total Nickel	0.025	0.0004	0.0006
Total Lead	0.001	0.0000	0.0001
Total Selenium	0.001	0.001	0.001
Total Silver	0.0001	0.000001	0.000002
Total Thallium	0.0008	0.000003	0.000021
Total Zinc	0.03	0.0015	0.0031

Prepared by

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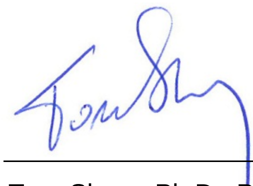
Reviewed by



Tom Sharp, Ph.D., P.E.

Principal Consultant

Attachment 2

7 Monitoring Requirements

7.1 Context

The North Dam has been designed as a water retaining structure and its successful performance is dependent on maintaining the integrity of the frozen core through preservation of permafrost in the dam foundation. As a result of the high salinity and variable ice content of the foundation soils, creep deformation is expected over the life of the structure, which coupled with the variable foundation soil type will manifest in differential settlement longitudinally and transversely across the dam. In order to track whether deformations are within the design limits for the dam, a rigorous monitoring program has been established as defined in this Chapter.

7.2 Approach

Responsibility for undertaking the monitoring program as presented here rests with HBML. It is however recommended that the monitoring be carried out under the guidance of either the Engineer-of-Record for the North Dam, or alternately an independent qualified licensed Geotechnical Engineer. As a minimum, the qualified individual should conduct an annual physical inspection of the dam under snow and ice free conditions (i.e. summer season), consistent with the Canadian Dam Association guidelines for surveillance of dams (CDA 2007). As part of this inspection the inspector should review and analyze all monitoring data to assess whether the dam is performing in accordance with its design criteria. This inspection should be culminated with the delivery of a formal Inspection Report that documents the inspection findings, including recommendations pertaining to remediation measures for the dam, its instrumentation, operation, and monitoring requirements. It is therefore expected that the monitoring requirements as specified in this report will be dynamic and may change over time.

In accordance with the Type “A” Nunavut Water Board (NWB) License 2AM-DOH0713, dated September 19, 2007 under which the North Dam has been approved for construction and operation, HBML is obligated under Part J, Items 18 and 19 to ensure that an annual geotechnical inspection be carried out by a Geotechnical Engineer. This Inspection needs to be carried out in accordance with the Canadian Dam Safety Guidelines (CDA 2007), and should include all major earthworks, including the North Dam. A report documenting the findings of this inspection must be submitted to the NWB within 60 days of the inspection which is to be carried out between July and September annually. It is anticipated that the North Dam inspection stipulated above, and the annual License compliance Inspection will be one and the same.

7.3 Monitoring Elements

7.3.1 Thermal Monitoring

Ground Temperature Cables

The frozen core and the underlying foundation have been designed to remain frozen of the life of the structure. The core should at all times be at a temperature of at least -2oCm while the underlying foundation soils must be at a temperature of at least -8oC (SRK 2007). 13 horizontal ground temperature cables have been installed to monitor the core temperature, and 11 vertical ground temperature cables have been installed to monitor the foundation temperature (DN-ND-14 to DN-ND-16 in Appendix B). One of the horizontal ground temperature cable (ND-HTS-085-33.5) was damaged beyond repair during construction and a replacement could not be installed.

All ground temperature cables are connected to a single automated data logger (see Appendix XX for complete details) which would allow data collection at any frequency. As a minimum, during the initial year following construction, the collection frequency should be set to weekly.

Thermosyphon Monitoring

Horizontal sloped passive thermosyphons installed in the base of the key trench are designed to promote freezing conditions in the foundation soils. The thermosyphons are sealed pressure vessels and do not have moving parts that require service or maintenance. A thorough physical inspection for signs of corrosion are required as well as an annual check on whether they are functioning as designed. The Standard Operating Procedure (SOP) for monitoring the thermosyphon performance is presented in Appendix D, and should be carried out annually when the ambient air temperature is below -20oC.

7.3.2 Deformation Monitoring

Survey Monitoring

The North Dam is expected to undergo significant deformation as a result of creep over its design life, which includes differential longitudinal and transverse settlement. These settlements is expected to result in strains of less than 2% in the frozen core of the dam (SRK 2007). A total of 35 survey monitoring points were installed within the dam to track these deformations such that it can be confirmed that they are within the specified design limits.

The installed monitoring points are illustrated in ND-DN-30, in Appendix B, and include the following:

- Three deep settlement points, located on the downstream slope of the dam intended to track deformation of the foundation soils in close proximity of the shell;
- 18 surficial survey points, located on the downstream shell of the dam intended to track deformation of foundation soils at the location of maximum expected deformation; and
- 14 crest monitoring points, located along the crest of the dam intended to monitor differential settlement, as well as deformation of the upper part of the core.

For the first year following completion of construction, these points must be manually surveyed at least once a month to an accuracy of ±2 mm (horizontal and vertical).

Inclinometer Monitoring

Six inclinometers were installed on the downstream slope of the dam, along the zone of the dam expected to undergo the maximum amount of deformation, and thus subject to the maximum strain. For the first year following construction these instruments must be monitored manually on a monthly basis.

7.3.3 Water Balance Monitoring

An analysis of the thermal performance of the dam can only be properly done in conjunction with an accurate determination of the water level behind the dam, and measurement of any seepage emanating from the dam. Monitoring of the water level can be done by monthly survey measurements of the water level in conjunction with the survey monitoring points, or alternately through installation of a calibrated "LevelLogger".

Dam seepage is not expected; however if seepage is noted it must be monitored including making an estimate of the flow and collection of a water sample for testing to confirm its origin.

7.3.4 Visual Monitoring

A daily visual inspection must be carried out of the dam and all its components looking for obvious signs of distress. A comprehensive visual inspection must be carried out as part of the Annual Geotechnical Inspection.

7.4 Summary of Monitoring Requirements

A summary of the monitoring requirements and associated responsibility is listed in Table XXX. These monitoring requirements can be revised at any time under the direction of the North Dam Engineer-of-Record, or the qualified Licensed Geotechnical Engineer carrying out the annual inspection.

Table XXXX: Summary of Monitoring Requirements

Element	Item	Method	Responsibility	Frequency
Thermal	Ground Temperature Cables	Data Loggers	Newmont	Daily
	Thermosyphons	Manual	Newmont	Annually
Deformation	Crest Settlement	Manual	Newmont	Monthly
	Downstream Surface Settlement	Manual	Newmont	Monthly
	Downstream Deep Settlement	Manual	Newmont	Monthly
	Inclinometers	Manual	Newmont	Monthly
Water Balance	Water Level	Data Logger	Newmont	Daily
	Seepage Rate	Manual	Newmont	As Required
Visual	Walkover Survey	Manual	Newmont	Daily
	Annual Geotechnical Inspection	Manual	Independent Qualified Licensed Geotechnical Engineer	Annually

8 References

SRK Consulting (Canada) Inc. 2007. Design of the Tailings Containment Area, Doris North Project, Hope Bay, Nunavut, Canada. Report prepared for Miramar Hope Bay Ltd. Project Number: 1CM014.008.165. March 2007.

Canadian Dam Association (CDA). 2007. Dam Safety Guidelines, 2007.