Pebble Project

NORTHERN DYNASTY MINES INC.

DRAFT ENVIRONMENTAL BASELINE STUDIES 2006 STUDY PLANS

CHAPTER 6. WATER QUALITY

JULY 2006

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6. WATER QUALITY

6.1 Mine Studies

Objectives/Study Area/Methods and Approach

For 2006 the water quality program for the mine studies has the same objectives (Section 6.1.1), study area (Section 6.1.2.1), and methods and approach (Section 6.1.2.2) as stated in the 2005 study plan. Tables 6.1-1 and 6.1-2 summarize activities and sampling, respectively, for surface water quality and sediment in 2004 through 2006. Figure 6.1-1 depicts the study areas for surface water quality for mine studies.

The same major activities as outlined in Section 6.1.2.3 of the 2005 study plan for stream locations, seeps, and groundwater will be done in 2006, with the following changes:

Field Studies, Surface Water Quality

Three new stations were added in 2005 and will be sampled again in 2006:

- SK124A—to provide flow and water quality data from a major tributary of the South Fork Koktuli River.
- SK100B1 and SK100B2—to provide flow and water quality data from the upwelling or springs area on the South Fork Koktuli River.

To complete a two-year baseline data set, samples will be collected from the following:

- 28 stations through spring breakup (see Table 6-9 in 2004 progress report for original site selection rationale).
- NK100B will be sampled through August 2006.
- SK100B1, SK100B2, and SK124A will be sampled through October 2006.

After the 2006 breakup event, preconstruction monitoring will begin at 17 locations:

- North Fork Koktuli—four locations (NK100A, NK100B, NK100C, and NK119A) selected to monitor water quality that may be affected by mining-related activities (such as Option G of the mine development concept [MDC] in NK1.190 and fugitive dust from road-building and truck transport during construction and operation) and because these sites are collocated with fish-tissue and macroinvertebrate monitoring sites.
- South Fork Koktuli—seven locations (SK100A, SK100B, SK100B1, SK100C, SK100D, SK119A, and SK124A) selected to monitor potential impacts to water quality related to MDC-25 and/or because these sites are collocated with fish-tissue and macroinvertebrate monitoring sites.

- Upper Talarik—six locations (UT100B, UT100D, UT100E, UT119A, UT119B, and UT141A) selected to monitor potential impacts to water quality related to MDC-25 (such as diversion channels into the Upper Talarik Creek) and/or because these sites are collocated with fish-tissue and macroinvertebrate monitoring sites.

Orthophosphate and separate analyses for nitrate and nitrite will be done by the analytical laboratory for all surface water quality samples and seep samples starting in May 2006.

Frying Pan Lake will be sampled at the inlets, outlet, and deepest part of the lake for water quality in the summer of 2006.

No samples will be collected in 2006 for analysis for volatile organic compounds, semivolatile organic compounds, or pesticides.

Field Studies, Sediment Sampling

Sediment samples will be collected from 12 locations in 2006 for analysis for total sulfur and for acid volatile sulfide simultaneously extractable metals. Sites were selected by Mark Stelljes of SLR and are sites where sediment was sampled in 2004 and 2005.

Sample sites to be sampled for sediment in 2006 are as follows:

- North Fork Koktuli—NK100A, NK100B, NK100C.
- South Fork Koktuli—SK100A, SK100B, SK100C, SK119A.
- Upper Talarik—UT100B, UT100D, UT100E, UT119A, UT141A.

No lake, seep, or pond sediments will be collected in 2006.

Field Studies, Groundwater Quality

For 2006 studies of groundwater quality, the objectives, study area, and methods and approach are the same as described in the 2005 study plan. The sampling points that were added in 2005 will continue to be sampled in 2006 unless NDM stipulates otherwise. Two groundwater sampling locations will be added in the area of the proposed pit during the 2006 field program, which starts approximately June 5. The new locations are depicted as Proposed Baseline Monitoring Wells A and B on Figure 5.1-1 in Chapter 5, Groundwater Hydrology. A summary of groundwater sampling for water quality during 2004, 2005, and 2006 is provided in Table 5.1-2 in Chapter 5, Groundwater Hydrology.

Field Studies, Seep Water Quality

Twenty-four seeps throughout the study area that were selected by WMC and sampled in 2005 by HDR will be sampled in 2006 for water quality and flow in March (winter low-flow event), May (spring breakup event), and July or August (summer low-flow event) and for flow in October (fall precipitation event). Other seep activities will include the following:

- Measuring total and ferrous iron using a Hach colorimeter 890 during the 2006 seep water quality sampling events to provide an estimate of redox conditions.
- A seep reconnaissance to survey seeps that are persistent and flowing when groundwater levels are low prior to spring breakup in May 2006.
- A seep reconnaissance of areas not surveyed in 2005 will be completed in June 2006and will include the mineralized area, South Fork Koktuli springs area (near SK100B1 and SK100B2), and NK1.190/Option G. Other activities that will be included in the June seep event include the following:
  - A one-time precipitate sampling protocol for seeps will be established with SRK.
  - Precipitate samples will be analyzed to determine their elemental and mineralogical composition.
  - Field parameters will be measured in seeps in the mineralized area to identify low-pH and high-conductivity seeps.
  - A reconnaissance of seeps near old Cominco well sites will be performed to identify whether the wells or boreholes have created unnatural seeps.
  - Additional seeps to sample will be identified from the mineralized area, South Fork Koktuli springs area, and NFK 1.190 for the July/August and October 2006 field events.

6.2 Transportation Corridor Studies

Baseline data on water quality were collected for the transportation corridor in 2004 and 2005 as described in Sections 6.2 (groundwater) and 6.3 (surface water) of the respective study plans for those years. A summary of the tasks performed during the water quality study for the transportation corridor is presented in Tables 6.2-1a (groundwater) and 6.2-1b (surface water). A summary of sampling conducted in 2004 and 2005 is presented in Table 6.2-2. Sample locations for groundwater quality are shown on Figure 6.2-1, and locations for surface water quality and sediment are on Figure 6.2-2.

No additional data are being collected in 2006. The baseline data on water quality along the transportation corridor will be presented in the environmental baseline document prior to filing of permit applications.

Table 6.1-1
Pebble Project Surface Water Quality and Sediment Studies Summary, Mine Studies, 2004-2006
Consultant: HDR Alaska
Date: 05/05/06

Field Studies - Water Quality	2004 Study Tasks	2005 Study Tasks	2006 Study Tasks
		Mine Studies Area	
Surface Water Quality	29 surface water stations - 7 sampling events (April-October)	32 surface water stations - 8 sampling events (January, March, May-October)	*To complete 2-year baseline study:*
			28 surface water stations - 3 sampling events (Jan/Feb., March and May)
			NK100B sampled through August; and SK100B1, SK100B2 and SK124A sampled through Oct. 2006
			For pre-construction monitoring:
			17 surface water stations - 5 sampling events (June-October)
			Frying Pan Lake sampled for water quality in June
Sediment Sampling	18 streams in July and September	15 streams in June, 13 sites in July, and 5 sites in September	12 streams in June
		6 lakes once in summer 2005	
		5-7 seeps in July and October	Precipitate sampling in seeps in June
Seep Water Quality	Water quality from 9 seeps in May and September	Flow measured from 9 seeps in March	Flow and water quality from 8 of 24 seeps in March (others were buried)
		Flow and water quality from 23 seeps in July	Flow and water quality from 24 seeps in May and July
		Flow from 24 seeps in August	Flow from 24 seeps in August
		Flow and water quality from 24 seeps in October	Flow from 24 seeps in October
		Reconnaissance in January, June, and July	Reconnaissance in May and June

Table 6.1-2

Pebble Project

Sample Site Period-of-Record Index

Surface Water Quality and Sediment, Mine Studies

Period Of Record By Discipline

Hydrology[2]

Sample Location	Year[1] / Month	J	F	M	A	M	J	J	A	S	O	N	D
KC100A	2004					I	I	I	C	C	C		
	2005	I		I	C	C	C	C	C	C	C		
	2006	I		I	C	C	C	C	C	C	C		
KR100A	2004				I		I	I	I	I	I		
	2005			I			I	I	I	I	I		
	2006	I		I		I							
NK100A (USGS)	2004						I	I	C	C	C		
	2005	I		I	C	C	C	C	C	C	C		
	2006	I		I	C	C	C	C	C	C	C		
NK100B (Orig. Location)	2004				I								
	2005												
	2006												
NK100B	2004								I	I	I		
	2005	I		I		I	I	I	I	I	I		
	2006	I		I		I	I	I	I	I	I		
NK100C	2004				I	I		I	C	C	C		
	2005	I		I		C	C	C	C	C	C		
	2006	I		I	C	C	C	C	C	C	C		
NK119A	2004				I		I	I	C	C	C		
	2005	I		I		C	C	C	C	C	C		
	2006	I		I	C	C	C	C	C	C	C		
NK119B	2004				I	I	I	I	I	I	I		
	2005	I		I		I	I	I	I	I	I		
	2006	I		I		I							
SK100A	2004				I		I	I	C	C	C		
	2005	I		I	C	C	C	C	C	C	C		
	2006	I		I	C	C	C	C	C	C	C		
SK100B (USGS)	2004				I		I	I	C	C	C		
	2005	I		I	C	C	C	C	C	C	C		
	2006	I		I	C	C	C	C	C	C	C		
SK100B1	2004												
	2005									I	I	C	C
	2006	C	C	C	C	C	C	C	C	C	C	C	C
SK100B2	2004												
	2005					I	I	I	I	I	I		
	2006	I		I		I	I	I	I	I	I		
SK100C	2004						I	I	C	C	C		
	2005	I		I		C	C	C	C	C	C		
	2006	I		I	C	C	C	C	C	C	C		
SK100D	2004						I	I	I	I	I		
	2005	I		I		I	I	I	I	I	I		
	2006	I		I		I	I	I	I	I	I		
SK100F	2004					I	I	I	C	C	C		
	2005	I		I		C	C	C	C	C	C		
	2006	I		I	C	C	C	C	C	C	C		
SK100G	2004				I	I	I	I	C	C	C		
	2005	I		I	C	C	C	C	C	C	C		
	2006	I		I	C	C	C	C	C	C	C		
SK119A	2004				I	I	I	I	C	C	C		
	2005	I		I	C	C	C	C	C	C	C		
	2006	I		I	C	C	C	C	C	C	C		
SK124A	2004												
	2005	I		I		C	C	C	C	C	C		
	2006	I		I	C	C	C	C	C	C	C		
SK131A	2004				I	I	I	I	I	I	I		
	2005	I		I		I	I	I	I	I	I		
	2006	I		I		I							
SK133A	2004				I	I	I	I	I	I	I		
	2005			I		I	I	I	I	I	I		
	2006	I		I		I							
SK134A	2004				I	I	I	I	I	I	I		
	2005	I		I		I	I	I	I	I	I		
	2006	I		I		I							
SK136A	2004				I	I	I	I	I	I	I		
	2005	I		I		I	I	I	I	I	I		
	2006	I		I		I							
SK136B	2004				I	I	I	I	I	I	I		
	2005	I		I		I	I	I	I	I	I		
	2006	I		I		I							
UT100A	2004					I			I	I	I		
	2005	I		I		I	I	I	I	I	I		
	2006	I		I		I							
UT100B (USGS)	2004					I	I	I	C	C	C		
	2005	I		I	C	C	C	C	C	C	C		
	2006	I		I	C	C	C	C	C	C	C		
UT100C	2004				I	I							
	2005												
	2006												
UT100D	2004				I	I	I	I	C	C	C		
	2005	I		I		C	C	C	C	C	C		
	2006	I		I	C	C	C	C	C	C	C		
UT100E	2004				I	I	I	I	C	C	C		
	2005	I		I	C	C	C	C	C	C	C		
	2006	I		I	C	C	C	C	C	C	C		
UT119A	2004				I	I	I	I	C	C	C		
	2005	I		I	C	C	C	C	C	C	C		
	2006	I		I	C	C	C	C	C	C	C		
UT119B	2004				I	I	I	I	I	I	I		
	2005	I		I		I	I	I	I	I	I		
	2006	I		I		I	I	I	I	I	I		
UT135A	2004				I	I	I	I	I	I	I		
	2005	I		I		I	I	I	I	I	I		
	2006	I		I		I							
UT138A	2004				I	I	I	I	I	I	I		
	2005	I		I		I	I	I	I	I	I		
	2006	I		I		I							
UT141A	2004				I	I	I	I	I	I	I		
	2005			I		I	I	I	I	I	I		
	2006	I		I		I	I	I	I	I	I		
UT146A	2004				I	I	I	I	I	I	I		
	2005	I		I		I	I	I	I	I	I		
	2006	I		I		I							
Black Lake	2004												
	2005												
	2006												
Big Wiggly	2004												
	2005												
	2006												
Frying Pan Lake	2004												
	2005												
	2006												
Chiquita Lake	2004												
	2005												
	2006												
Lake No. 2	2004												
	2005												
	2006												
Mud Lake (Near Lily Lake)	2004												
	2005												
	2006												
Seeps	2004												
	2005												
	2006												

Water Quality

Sample Location	Year[1] / Month	J	F	M	A	M	J	J	A	S	O	N	D
KC100A	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q							
KR100A	2004				Q	Q	Q	Q	Q	Q	Q		
	2005			Q			Q	Q	Q	Q	Q		
	2006	Q		Q		Q							
NK100A (USGS)	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
NK100B (Orig. Location)	2004				Q	Q							
	2005												
	2006												
NK100B	2004								Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
NK100C	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
NK119A	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
NK119B	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q							
SK100A	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
SK100B (USGS)	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
SK100B1	2004												
	2005									Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
SK100B2	2004												
	2005						Q	Q	Q	Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
SK100C	2004				Q	Q	Q	Q			Q		
	2005	Q				Q	Q	Q		Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
SK100D	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
SK100F	2004					Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q							
SK100G	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q							
SK119A	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
SK124A	2004												
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
SK131A	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q							
SK133A	2004				Q	Q	Q	Q	Q	Q	Q		
	2005					Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q							
SK134A	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q							
SK136A	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q							
SK136B	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q							
UT100A	2004				Q	Q			Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q		Q		
	2006	Q		Q		Q							
UT100B (USGS)	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
UT100C	2004				Q	Q							
	2005												
	2006												
UT100D	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
UT100E	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
UT119A	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
UT119B	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
UT135A	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q							
UT138A	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q							
UT141A	2004				Q	Q	Q	Q	Q	Q	Q		
	2005			Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q	Q	Q	Q	Q	Q		
UT146A	2004				Q	Q	Q	Q	Q	Q	Q		
	2005	Q		Q		Q	Q	Q	Q	Q	Q		
	2006	Q		Q		Q							
Black Lake	2004												
	2005												
	2006												
Big Wiggly	2004												
	2005												
	2006												
Frying Pan Lake	2004												
	2005												
	2006						Q						
Chiquita Lake	2004												
	2005												
	2006												
Lake No. 2	2004												
	2005												
	2006												
Mud Lake (Near Lily Lake)	2004												
	2005												
	2006												
Seeps	2004					X				X			
	2005							X			X		
	2006		X			X		X	X		X		

Fisheries

Sample Location	Year[1] / Month	J	F	M	A	M	J	J	A	S	O	N	D
KC100A	2004								W				
	2005								W				
	2006												
KR100A	2004												
	2005												
	2006												
NK100A (USGS)	2004								W				
	2005								W				
	2006												
NK100B (Orig. Location)	2004								W				
	2005								W				
	2006												
NK100B	2004												
	2005												
	2006												
NK100C	2004								W				
	2005								W				
	2006												
NK119A	2004								W				
	2005								W				
	2006												
NK119B	2004												
	2005												
	2006												
SK100A	2004								W				
	2005								W				
	2006												
SK100B (USGS)	2004								W				
	2005								W				
	2006												
SK100B1	2004												
	2005												
	2006												
SK100B2	2004												
	2005												
	2006												
SK100C	2004								W				
	2005								W				
	2006												
SK100D	2004												
	2005												
	2006												
SK100F	2004								W				
	2005								W				
	2006												
SK100G	2004								W				
	2005								W				
	2006												
SK119A	2004								W				
	2005								W				
	2006												
SK124A	2004												
	2005												
	2006												
SK131A	2004												
	2005												
	2006												
SK133A	2004												
	2005												
	2006												
SK134A	2004												
	2005												
	2006												
SK136A	2004												
	2005												
	2006												
SK136B	2004												
	2005												
	2006												
UT100A	2004												
	2005												
	2006												
UT100B (USGS)	2004								W				
	2005								W				
	2006												
UT100C	2004								W				
	2005								W				
	2006												
UT100D	2004								W				
	2005								W				
	2006												
UT100E	2004								W				
	2005								W				
	2006												
UT119A	2004								W				
	2005								W				
	2006												
UT119B	2004												
	2005												
	2006												
UT135A	2004												
	2005												
	2006												
UT138A	2004								W				
	2005								W				
	2006												
UT141A	2004												
	2005												
	2006												
UT146A	2004												
	2005												
	2006												
Black Lake	2004												
	2005								T				
	2006								T				
Big Wiggly	2004								T				
	2005								T				
	2006												
Frying Pan Lake	2004								T				
	2005								T				
	2006												
Chiquita Lake	2004												
	2005												
	2006												
Lake No. 2	2004												
	2005								T				
	2006								T				
Mud Lake (Near Lily Lake)	2004												
	2005												
	2006												
Seeps	2004												
	2005												
	2006												

Macroinvertebrates

Sample Location	Year[1] / Month	J	F	M	A	M	J	J	A	S	O	N	D
KC100A	2004						D		D				
	2005												
	2006												
KR100A	2004						D		D				
	2005												
	2006												
NK100A (USGS)	2004						D		D				
	2005						S						
	2006												
NK100B (Orig. Location)	2004						D		D				
	2005												
	2006												
NK100B	2004												
	2005												
	2006												
NK100C	2004						D		D				
	2005						S						
	2006												
NK119A	2004						D		D				
	2005												
	2006												
NK119B	2004												
	2005												
	2006												
SK100A	2004						D		D				
	2005												
	2006												
SK100B (USGS)	2004						D		D				
	2005						S						
	2006												
SK100B1	2004												
	2005												
	2006												
SK100B2	2004												
	2005												
	2006												
SK100C	2004						D		D				
	2005												
	2006												
SK100D	2004												
	2005												
	2006												
SK100F	2004						D		D				
	2005												
	2006												
SK100G	2004						D		D				
	2005												
	2006												
SK119A	2004						D		D				
	2005												
	2006												
SK124A	2004												
	2005												
	2006												
SK131A	2004												
	2005												
	2006												
SK133A	2004												
	2005												
	2006												
SK134A	2004												
	2005												
	2006												
SK136A	2004												
	2005												
	2006												
SK136B	2004												
	2005												
	2006												
UT100A	2004												
	2005												
	2006												
UT100B (USGS)	2004						D		D				
	2005						S						
	2006												
UT100C	2004						D		D				
	2005												
	2006												
UT100D	2004						D		D				
	2005						S						
	2006												
UT100E	2004						D		D				
	2005												
	2006												
UT119A	2004												
	2005												
	2006												
UT119B	2004												
	2005												
	2006												
UT135A	2004												
	2005												
	2006												
UT138A	2004						D		D				
	2005						S						
	2006												
UT141A	2004												
	2005												
	2006												
UT146A	2004												
	2005												
	2006												
Black Lake	2004												
	2005												
	2006								P				
Big Wiggly	2004								M				
	2005						M						
	2006								P				
Frying Pan Lake	2004								M				
	2005						M						
	2006								P				
Chiquita Lake	2004												
	2005												
	2006								P				
Lake No. 2	2004												
	2005												
	2006												
Mud Lake (Near Lily Lake)	2004												
	2005												
	2006												
Seeps	2004												
	2005												
	2006												

Sediment

Sample Location	Year[1] / Month	J	F	M	A	M	J	J	A	S	O	N	D
KC100A	2004							F		F			
	2005						F	F					
	2006												
KR100A	2004							F					
	2005												
	2006												
NK100A (USGS)	2004							F		F			
	2005						F	F					
	2006						F						
NK100B (Orig. Location)	2004												
	2005												
	2006												
NK100B	2004												
	2005						F	F		F			
	2006						F						
NK100C	2004							F		F			
	2005						F	F		F			
	2006						F						
NK119A	2004												
	2005												
	2006												
NK119B	2004							F		F			
	2005						F	F					
	2006												
SK100A	2004						F						
	2005						F	F					
	2006						F						
SK100B (USGS)	2004							F		F			
	2005						F	F					
	2006						F						
SK100B1	2004												
	2005												
	2006												
SK100B2	2004												
	2005												
	2006												
SK100C	2004							F		F			
	2005						F	F					
	2006						F						
SK100D	2004									F			
	2005												
	2006												
SK100F	2004							F		F			
	2005						F						
	2006												
SK100G	2004							F	F	F			
	2005						F	F					
	2006												
SK119A	2004							F		F			
	2005						F						
	2006						F						
SK124A	2004												
	2005												
	2006												
SK131A	2004							F		F			
	2005												
	2006												
SK133A	2004												
	2005												
	2006												
SK134A	2004												
	2005												
	2006												
SK136A	2004												
	2005												
	2006												
SK136B	2004												
	2005												
	2006												
UT100A	2004									F			
	2005												
	2006						F						
UT100B (USGS)	2004							F	F	F			
	2005						F	F		F			
	2006						F						
UT100C	2004						F						
	2005												
	2006												
UT100D	2004							F		F			
	2005						F	F		F			
	2006						F						
UT100E	2004							F		F			
	2005						F						
	2006						F						
UT119A	2004							F		F			
	2005						F						
	2006						F						
UT119B	2004												
	2005							F					
	2006												
UT135A	2004												
	2005												
	2006												
UT138A	2004							F		F			
	2005												
	2006												
UT141A	2004							F		F			
	2005								F				
	2006						F						
UT146A	2004							F		F			
	2005												
	2006												
Black Lake	2004												
	2005								F				
	2006												
Big Wiggly	2004												
	2005							F					
	2006												
Frying Pan Lake	2004												
	2005							F					
	2006												
Chiquita Lake	2004												
	2005									F			
	2006												
Lake No. 2	2004												
	2005								F				
	2006												
Mud Lake (Near Lily Lake)	2004												
	2005									F			
	2006												
Seeps	2004												
	2005							7			5		
	2006												

KEY:

C	Continuous stage/discharge hydrometric data collected in streams (gaged stations with dataloggers).
D	Macroinvertebrate sites were sampled with Drift nets AND ASCI methods; periphyton was collected with RBP and diatoms were assessed.
F	Sediment samples collected. Seep sediment samples show number of seeps sampled in 2005. Sediment symbol not shown on associated map.
I	Instantaneuous stream discharge measurements taken each month coincident with water quality (ungaged stations without dataloggers).
M	Macroinvertebrate samples from lakes were collected with a modified ASCI approach.
P	Plankton tows.
Q	Surface water quality samples collected for field and laboratory analyses.
S	Macroinvertebrate sites were sampled with Surber Sampler AND ASCI methods; periphyton was collected with DNR methods and chlorophyll a was assessed.
T	Fish tissue sample consisted of discrete muscle and liver samples from adult nothern pike.
W	Fish tissue sample consisted of discrete whole body juvenile fish .
X	Seep measurements/samples.

NOTES:

1 Work for 2006 is shown as planned, but not yet completed.

2 At stations where continuous hydrometric data are collected, continuous hydrographs will be estimated throughout winter months using standard hydrometric methods. Stream gages are reinstalled each spring as early as breakup conditions allow.

Table 6.2-1a
Pebble Project Environmental Studies
Study Summary for Groundwater Quality, Transportation Corridor, 2004-2006
Consultant: BEESC

Discipline	2004 Data Collected or Tasks	2005 Data Collected or Tasks	2006 Tasks to be Completed
Groundwater Quality	**Mine Studies Area**		
	Field Sampling October	None by BEESC	None by BEESC
	Coordination with NDM		
	Transportation Corridor		
	Information Gathering	Information Gathering	Data Compilation and Analysis
	Scope, Schedule, Field Sampling Plan	Scope, Schedule	Preliminary environmental baseline document
	Field Sampling - July & October	2005 Field Sampling Plan	
	Communication and Data Management	Field Sampling - March, July, and October	
	Coordination with NDM	Coordination with NDM	
	Coordination with local communities for observers	Coordination with local communities for observers	
	Presentation preparation	Data Compilation and Analysis	
	Report Writing	2004 Progress Report	

Table 6.2-1b
Pebble Project Environmental Studies
Study Summary for Surface Water Quality, Transportation Corridor, 2004-2006
Consultant: BEESC

Discipline	2004 Data Collected or Tasks	2005 Data Collected or Tasks	2006 Tasks to be Completed
Surface Water Quality	**Transportation Corridor**		
	Information Gathering	Information Gathering	Data Compilation and Analysis
	Scope, Schedule, Field Sampling Plan	Scope, Schedule	Preliminary environmental baseline document
	Field Sampling - July - October	2005 Field Sampling Plan	
	Communication and Data Management	Field Sampling - Feb, March, May - October	
	Coordination with NDM	Coordination with NDM	
	Coordination with local communities for observers	Coordination with local communities for observers	
	Presentation preparation	Data Compilation and Analysis	
	Report Writing	2004 Progress Report	

Table 6.2-2
Pebble Project
Sample Site Period-of-Record Index
Water Quality Studies, Transportation Corridor

Sample Location	Year	Period Of Record By Discipline																																					
		Surface Hydrology												Surface Water Quality												Groundwater Quality													
	Month	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D		
NHRIV	2004																			Q	Q	Q	Q																
	2005														Q	Q		Q	Q	Q	Q	Q	Q																
	2006																																						
GS20	2004							I	I	I	I									Q	Q	Q	Q																
	2005		I	I											Q	Q				Q	Q	Q	Q																
	2006																																						
GS20A	2004							I	I	I	I									Q	Q	Q	Q																
	2005		I	I											Q	Q																							
	2006																																						
GS18A	2004							I		I	I									Q	Q	Q	Q																
	2005		I	I											Q	Q																							
	2006																																						
GS17A	2004							I	I	I	I									Q	Q	Q	Q																
	2005		I	I		I	I	I	I	I	I				Q	Q		Q	Q	Q	Q	Q	Q																
	2006																																						
GS14A	2004							I	I	I	I									Q	Q	Q	Q																
	2005		I	I											Q	Q																							
	2006																																						
GS14B	2004							I	I	I	I									Q	Q	Q	Q																
	2005		I			I	I	I	I	I	I				Q	Q		Q	Q	Q	Q	Q	Q																
	2006																																						
GS12A	2004							I	I	I	I									Q	Q	Q	Q																
	2005		I	I											Q	Q																							
	2006																																						
GS11A	2004							I	I	I	I									Q	Q	Q	Q																
	2005		I	I		I	I	I	I	I	I				Q	Q		Q	Q	Q	Q	Q	Q																
	2006																																						
GS8A	2004							I	I	I	I									Q	Q	Q	Q																
	2005		I	I		I	I	I	I		I				Q	Q		Q	Q	Q	Q	Q	Q																
	2006																																						
GS7A	2004										I												Q																
	2005																																						
	2006																																						
GS6A	2004							I	I	I	I									Q	Q	Q	Q																
	2005		I	I											Q	Q																							
	2006																																						
GS4A	2004							I	I	I	I									Q	Q	Q	Q																
	2005		I			I	I	I	I		I				Q	Q		Q	Q	Q	Q	Q	Q																
	2006																																						
GS4B	2004									I	I											Q	Q																
	2005														Q	Q																							
	2006																																						
GS3A	2004								I	I											Q	Q	Q																
	2005		I												Q	Q		Q	Q	Q	Q	Q	Q																
	2006																																						
GS23	2004							I	I	I	I									Q	Q	Q	Q																
	2005																																						
	2006																																						
GS22	2004							I	I	I	I																												
	2005																			Q	Q	Q	Q																
	2006																																						
GS21	2004								I	I	I										Q	Q	Q																
	2005		I	I		I	I	I	I	I	I				Q	Q		Q	Q	Q	Q	Q	Q																
	2006																																						
PSC	2004																																						
	2005																			Q																			
	2006																																						
PSD	2004																																						
	2005																			Q																			
	2006																																						
NEWH2	2004																															Q			Q				
	2005																											Q				Q			Q				
	2006																																						
NONDA	2004																															Q				Q			
	2005																											Q				Q			Q				
	2006																																						
ILIWI	2004																															Q			Q				
	2005																											Q				Q			Q				
	2006																																						
PEDRO	2004																															Q			Q				
	2005																												Q			Q			Q				
	2006																																						

KEY:

I	Instantaneous stream discharge measurements taken each month coincident with water quality (ungaged stations without dataloggers).
Q	Water quality samples collected for field and laboratory analyses.

1,300,000 1,350,000 1,400,000 1,450,000

2,200,000 2,150,000 2,100,000

Black Lake
CR199A
Groundhog Mountain
Big Wiggly Lake
NK100C
NK100B (current site)
NK100B (original site)
NK119B
NK119A
UT100E
UT146A
UT141A
UT100D
UT138A
SK136B
SK136A
SK100G
UT135A
SK134A
SK133A
Frying Pan Lake
SK131A
KR100A
NK100A (USGS Station)
North Fork Koktuli River
SK100A
South Fork Koktuli River
SK119A
SK124A
SK100D
SK100F
SK100B2
SK100B1
SK100C
UT119B
UT119A
UT100C
SK100B (USGS Station)
Chiquita Lake
Pebble Claim Boundary
UT100B (USGS Station)
KC100A
Upper Talarik Creek
Koktuli River
Kaskanak Creek
UT100A
Lake #2

1,300,000 1,350,000 1,400,000 1,450,000

ASP 5 NAD 83

Pebble Project

NORTHERN DYNASTY MINES INC.

Figure 6.1-1
Hydrology, Surface Water, and Aquatic Resources Study Area (2004-2006 Mine Studies)

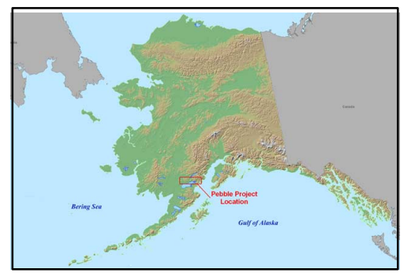
DRAFT

Legend

- Mine Development Concept Plan
- Ore Body
- Claim Boundary
- Sampling Location

Type of Sample Site

- Hydrology & Water Quality sample site with data logger
- Hydrology & Water Quality sample site without data logger
- Fish tissue sample site
- Macroinvertebrate & Periphyton sample site
- Seep water quality sample site



N

0 10,000 20,000 30,000 40,000 Feet

0 2,800 5,600 8,400 11,200 Meters

Scale 1:167,981

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

File: Figure 6.1-1.mxd	Date: June 02, 2006
Version: 2	Author: HDR-CEB, DW

Z:\200847 Northern Dynasty Minerals\All Disciplines\GIS\RD\Source\HDR\All Disciplines\DELIVERABLES\2006 Study Plan\V_2 All\Disc\MXD\2006studyplan_fig6.1-1v2

DRAFT

1,400,000 1,450,000 1,500,000 1,550,000 1,600,000 1,650,000 1,700,000 1,750,000

2,250,000 2,200,000 2,150,000 2,100,000 2,050,000 2,000,000

LAKE CLARK A-7 LAKE CLARK A-6 LAKE CLARK A-5 LAKE CLARK A-4 LAKE CLARK A-3 LAKE CLARK A-2

NONDALTON

ILIAMNA D-7 ILIAMNA D-6 ILIAMNA D-5 ILIAMNA D-4 ILIAMNA D-3 ILIAMNA D-2 ILIAMNA

PEDRO BAY

ILIAMNA

NEWHALEN

ILIAMNA C-7 ILIAMNA C-6 ILIAMNA C-5 ILIAMNA C-4 ILIAMNA C-3 ILIAMNA C-2 ILIAMNA C-1

ILIAMNA B-7 ILIAMNA B-6 KAKHONAK ILIAMNA B-5 ILIAMNA B-4 ILIAMNA B-3 ILIAMNA B-2

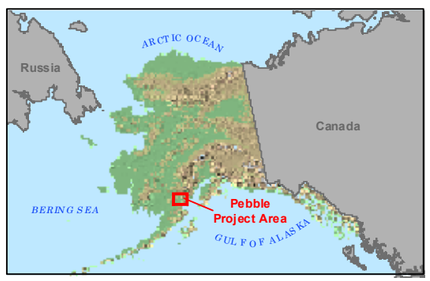
Pebble Project

NORTHERN DYNASTY MINES INC.

Figure 6.2-1
Groundwater Quality
Transportation Corridor
2004 and 2005 Sampling Locations

Legend

- Groundwater Quality
- Towns
- Proposed Transportation Corridor



Miles
0 4 8 12 16

Kilometers
0 4 8 12 16

N

Scale 1:363,852

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

File: 2006StyPlan_2_V04.mxd	Date: June 7, 2006
Version: 4	Author: BEESC-ME

DRAFT

1,400,000 1,450,000 1,500,000 1,550,000 1,600,000 1,650,000 1,700,000 1,750,000

2,250,000 2,200,000 2,150,000 2,100,000 2,050,000 2,000,000

LAKE CLARK A-7 LAKE CLARK A-6 LAKE CLARK A-5 LAKE CLARK A-4 LAKE CLARK A-3 LAKE CLARK A-2

NONDALTON

ILIAMNA D-7 ILIAMNA D-6 ILIAMNA D-5 ILIAMNA D-4 ILIAMNA D-3 ILIAMNA D-2 ILIAMNA

Pond 1 NHRIV Pond 2 GS-14b GS-11a GS-14a Pond 4 GS-12a GS-8a GS-20a GS-18a Pond 3 GS-17a PEDRO BAY GS-4a GS-4b GS-7a Pond 5 GS-20 ILIAMNA GS-3a GS-23 Pond 6 GS-22 SWQ2 SWQ4 SWQ3 SWQ1 PSC PSD GS-21

NEWHALEN

ILIAMNA C-7 ILIAMNA C-6 ILIAMNA C-5 ILIAMNA C-4 ILIAMNA C-3 ILIAMNA C-2 ILIAMNA C-1

KAKHONAK

ILIAMNA B-7 ILIAMNA B-6 ILIAMNA B-5 ILIAMNA B-4 ILIAMNA B-3 ILIAMNA B-2

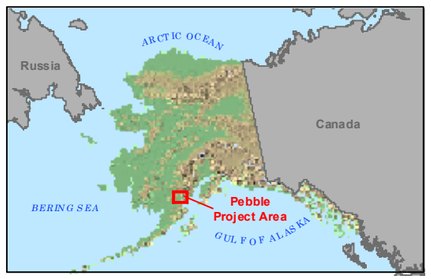
Pebble Project

NORTHERN DYNASTY MINES INC.

Figure 6.2-2
Surface Water Quality and Sediment
Transportation Corridor
Study Area and Sampling Locations

Legend

- Surface Water Quality/Sediment sampled in 2004 and 2005
- Surface Water Quality/Sediment sampled only in 2005
- Surface Water Quality/Sediment to be sampled in 2006
- Tundra Ponds sampled in 2004 and 2005
- Tundra Ponds to be sampled in 2006
- Towns
- Proposed Transportation Corridor



0 4 8 12 16 Miles

0 4 8 12 16 Kilometers

N

Scale 1:363,852

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

File: 2006StyPlan_3_V05.mxd	Date: June 7, 2006
Version: 5	Author: BEESC-ME