Pebble Project

NORTHERN DYNASTY MINES INC.

DRAFT ENVIRONMENTAL BASELINE STUDIES PROPOSED 2007 STUDY PLANS

CHAPTER 7.
TRACE ELEMENTS

DRAFT

SEPTEMBER 2007

TABLE OF CONTENTS

LIST OF TABLES (attached)

LIST OF FIGURES (attached)

7. TRACE ELEMENTS

7.1 Introduction

This document summarizes the proposed scope of work for the 2007 trace elements program for the Pebble Project. SLR Alaska (SLR) is the lead consultant for the trace elements program in 2007. Bristol Environmental and Engineering Services Corporation (BEESC) is performing sampling for the study in the transportation corridor.

The term "trace elements" refers to naturally occurring elements (mostly metals) that are analyzed for in various matrices. In Pebble Project documents, the term "trace elements" also is used to refer to the trace elements program. The trace elements program examines not only elements, but other naturally occurring compounds such as anions, cations, and biogenic hydrocarbons; the term "naturally occurring constituents" (NOC) is commonly used in this document to refer collectively to the analytical parameters included in the trace elements program.

The NOC studies in 2005 and 2006 are described in Chapter 7 of the study plans for those years (NDM, 2005 and 2006). The discussions in Sections 7.3 and 7.4 below indicate how the 2007 program differs from the studies in previous years.

7.2 Objectives

The objectives of the baseline study of NOC at the mine study area and along the transportation corridor are as follows:

- Continue collecting baseline data to characterize the natural levels of NOC existing in environmental media (i.e., terrestrial and aquatic vegetation, lake and pond sediment, surface soil), including their spatial and temporal variability, prior to mining operations.
- Provide environmental input to engineering design.
- Determine organic content in surface soils to support long-term site-monitoring objectives.
- Support the permitting process.
- Continue and update field procedures established in the 2004 study of NOC in surface soil and vegetation.

7.3 Mine Study Area

The study activities for 2004 through 2007 in the mine study area are summarized in Table 7.1-1. The sampling locations for the mine study area are presented on Figure 7.1-1. A record of sampling conducted at all locations in the mine study area in 2004 through 2006, and to be conducted in 2007, is presented in Tables 7.1-2a and b.

The 2007 study will characterize NOC in the following media:

- Terrestrial vegetation (includes lichens and mosses).
- Aquatic vegetation associated with lakes and ponds.
- Freshwater sediments associated with lakes and ponds.
- Surface soil (including soil bacteria).

The number of samples to be collected in 2007 is summarized by area and sample media in the 2007 field sampling plan for naturally occurring constituents in surface soil, sediment, and vegetation (NDM, In press2). The short-term goal of the sampling program is to collect data over two years at each location. Therefore, soil and terrestrial plant sampling in the area near the west deposit (Pebble West) will not be repeated except at sites where two years of data have not been collected. Sampling at Pebble West will occur in July and August and will target soil and terrestrial vegetation at the three sites (335011, 335081, and 335101) where only one year of sampling has been done, and sediment and aquatic vegetation from tundra ponds and lakes (Table 7.1-2a).

A new soil study to be conducted in Pebble West in 2007 will test the hypotheses of cyanogenic bacteria as a cyanide source in soil. Soil samples will be collected at 11 locations for bacteriological analysis focusing on the presence or absence of cyanide (HCN)-producing bacteria in native soils. In addition to vascular plants, mosses and lichens will be collected concurrently with and at the same location as each bacteriological soil sample. The 11 sample locations identified in Table 7-1.2a were selected based on previous analytical data that showed high levels of cyanide in soil and plants.

Sampling for the eastern deposit (Pebble East) is summarized in Table 7.1-2b. A total of 17 locations were sampled in 2006 as part of the Pebble East program. Surface soil, terrestrial and aquatic vegetation, and pond and lake sediments will be collected in 2007 from the same sites that were sampled in 2006 (Table 7.1-2 and Figure 7.1-1).

Additional aquatic vegetation samples will be collected in 12 small ponds in 2007 to complete two years of data collection which started in 2006. These samples will be collected from the same locations as in 2006. All aquatic vegetation sampling from these ponds will be coordinated with the water-quality team, which is collecting surface water and sediment samples, so that water, sediment, and aquatic vegetation samples are temporally and spatially collocated. The surface water and sediment sampling is described in Chapter 6 and in the 2007 field sampling plan for surface water quality, hydrology, and sediment (NDM, In press1).

Terrestrial vegetation sampling will include specific mosses and lichens that were relevant to other mine projects in Alaska. These vegetative types were first collected for the Pebble studies in 2006. Additional moss and lichen samples will be collected in 2007 in both Pebble East and Pebble West.

7.4 Transportation Corridor

The study activities for 2004 through 2007 for the trace elements study in the transportation corridor are summarized in Tables 7.2-1a and b. The sampling locations for the transportation corridor are presented on Figure 7.2-1. Table 7.2-2 presents a summary of sampling at each sample location throughout the

project. The number of samples of each sample medium proposed for 2007 in the transportation corridor is summarized in the 2007 field sampling plan for naturally occurring constituents (NDM, In press2). In 2007, sampling will be conducted only in the portion of the transportation corridor located in the Cook Inlet drainages.

The 2007 study will characterize NOC in the following media:

- Surface soil.
- Terrestrial vegetation.
- Aquatic vegetation associated with lakes and ponds.
- Pond and stream sediments.
- Stream surface water.

The study program for the transportation corridor will be conducted as outlined in Section 7.2 of the 2005 and 2006 study plans (NDM, 2005 and 2006). The 2007 season will focus on achieving a second year of sampling in the portion of the transportation corridor east of Summit Lake and will include a minimum of 12 locations (Figure 7.2-1).

7.5 References

Northern Dynasty Mines Inc. (NDM). In press1. Draft Environmental Baseline Studies; 2007 Field Sampling Plans; Surface Water Quality, Hydrology, and Sediment; Mine Study Area.

———. In press2. Draft Environmental Baseline Studies; 2007 Field Sampling Plans; Naturally Occurring Constituents in Surface Soil, Sediment, and Vegetation.

———. 2006. Draft Environmental Baseline Studies, 2006 Study Plan. July.

———. 2005. Draft Environmental Baseline Studies, 2005 Study Plans. November.

TABLES

TABLE 7.1-1
Pebble Project Environmental Studies
Study Summary for Trace Elements, Mine Study Area, 2004-2007
Consultant: SLR Alaska

Discipline	2004 (completed by CH2M Hill)	2005 Data Collected or Tasks	2006 Data Collected or Tasks	2007 Tasks To Be Completed
Trace Elements	**Mine Study Area**			
	Information gathering	Information gathering	Information gathering	Information gathering
	Scope, schedule, field sampling plan	Scope, schedule, field sampling plan	Scope, schedule, field sampling plan	Scope, schedule, field sampling plan
	2004 study plan	2005 study plan	2007 study plan summary	2007 study plan summary
	Soil sampling (Aug/Sep)	Soil sampling (July and August)	Soil sampling (July)	Bacteriological soil, lichens and moss sampling (July)
				Surface soil sampling (July)
	Vegetation sampling (Aug/Sep--leaves and berries)	Vegetation sampling (July--leaves; Aug--leaves and berries)	Terrestrial vegetation sampling (July--leaves only; Aug--leaves and berries)	Terrestrial vegetation sampling (July--leaves only; Aug--leaves and berries)
		Aquatic plant sampling (August)	Aquatic plant sampling	Aquatic plant sampling (coordinated with HDR; August)
		Mercury/methylmercury fish-tissue data analysis	Fish-tissue data analysis	Fish-tissue data analysis
			Pond sediment sampling	Pond/lakes sediment sampling (August)
			Stream-sediment and surface-water data analysis	Stream-sediment and surface-water data analysis
			Coordination with HDR and BEESC	Coordination with HDR and BEESC
			Draft environmental baseline document	Draft environmental baseline document
		Coordination with NDM & agencies, monthly reporting	Coordination with NDM, agency meetings, monthly reporting	Coordination with NDM, agency meetings, monthly reporting
		Communication and data management	Communication and data management	Communication and data management
		Data entry and analysis	Data analysis	Data analysis
	QAPP review	QAPP update	QAPP update: aquatic species	
		2004 progress report		

TABLE 7.1-2a
Pebble Project
Sample Site Period-of-Record Index
Trace Elements, Pebble West Area Mine Studies

Sample Site	Year[a]	Period-of-Record by Discipline																																		Notes
		Vegetation												Soil												Sediment												
	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	
235271	2004																																				
	2005							X	X											X																	
	2006							X	X											X																	
	2007							X												X																	Bacteriological Soil Study
235281	2004																																				
	2005							X	X											X																	
	2006							X	X											X																	
	2007																																				
235361	2004								X												X																
	2005							X	X											X																	
	2006																																				
	2007							X												X																	Bacteriological Soil Study
235281	2004																																				
	2005								X											X																	
	2006								X											X																	
	2007																																				
235282	2004																																				
	2005								X																													Tundra pond
	2006								X																								X				Tundra pond
	2007								X																								X				Tundra pond
236221	2004																																				
	2005								X																													Tundra pond
	2006								X																								X				Tundra pond
	2007								X																								X				Tundra pond
236271	2004																					X															
	2005																			X																	
	2006																																				
	2007																																				
236272	2004																					X															
	2005																			X																	
	2006																																				
	2007																																				
236273	2004																					X															
	2005																			X																	
	2006																																				
	2007																																				
236281[b]	2004								X												X																
	2005																																				
	2006																																				
	2007																																				
236351	2004								X												X																
	2005																			X																	
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236352	2004																																				
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	2006																			X																	
	2007																																				
236353	2004																																				
	2005							X	X											X																	
	2006							X	X											X																	
	2007							X												X																	Bacteriological Soil Study
335021	2004								X												X																
	2005							X	X											X	X																
	2006																																				
	2007																																				
335031	2004																					X															
	2005																			X																	
	2006																																				
	2007																																				
335032	2004																					X															
	2005																			X																	
	2006																																				
	2007																																				
335051	2004																																				
	2005								X																													Tundra Pond
	2006								X																								X				Tundra Pond
	2007								X																								X				Tundra Pond
335091	2004																					X															
	2005																			X																	
	2006																																				
	2007																																				
335092	2004																					X															
	2005																			X																	
	2006																																				
	2007																																				
335093	2004																					X															
	2005																			X																	
	2006																																				
	2007																																				
335131	2004																					X															
	2005																			X																	
	2006																																				
	2007																																				
335132	2004																					X															
	2005																			X																	
	2006																																				
	2007																																				
335161	2004																					X															
	2005																			X																	
	2006																																				
	2007																																				
335162	2004																					X															
	2005																			X																	
	2006																																				
	2007																																				

Sample Site	Year[a]	Period-of-Record by Discipline																																		Notes
		Vegetation												Soil												Sediment												
	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	
335163	2004																					X															
	2005																			X																
	2006																																				
	2007																																				
335171	2004																					X															
	2005																			X																
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335172	2004																					X															
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335173	2004																					X															
	2005																			X																
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335174	2004																					X															
	2005																			X																
	2006																																				
	2007																																				
335175	2004																					X															
	2005																			X																
	2006																																				
	2007																																				
335176[b]	2004																					X															
	2005																																				
	2006																																				
	2007																																				
335191	2004																					X															
	2005							X												X																
	2006																																				
	2007																																				
335192	2004																					X															
	2005																			X																
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	2007																																				
335193	2004								X													X															
	2005							X	X											X																
	2006																																				
	2007																																				
335201	2004																					X															
	2005																			X																
	2006																																				
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335231	2004																																				
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	2007																																				
335232	2004																																				
	2005																			X																
	2006																			X																
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335261	2004							X													X															
	2005							X	X											X																
	2006																																				
	2007																																				
335281	2004																					X															
	2005																			X																
	2006																																				
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335282	2004																					X															
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335283	2004																					X															
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335284	2004																					X															
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	2006																																				
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335301	2004																					X															
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	2006																																				
	2007																																				
335302	2004																					X															
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335311	2004																					X															
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335321	2004																					X															
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	2006																																				
	2007																																				
335322	2004																					X															
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	2006																																				
	2007																																				
336011	2004								X												X															
	2005							X	X											X																
	2006																																				
	2007							X												X																Bacteriological Soil Study
336012	2004																																				
	2005																			X																
	2006																			X																
	2007																																				

Sample Site	Year[a]	Period-of-Record by Discipline																																		Notes
		Vegetation												Soil												Sediment												
	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	
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	2005																			X																	
	2006																			X																	
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336041	2004									X												X															
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336042	2004																					X															
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336043	2004																																				
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336131	2004								X												X																
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	2006																																				
	2007							X												X																	Bacteriological Soil Study
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336261	2004								X	X											X																
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336281	2004																					X															
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336282	2004																					X															
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435062	2004																					X															
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435161	2004																					X															
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435162	2004																					X															
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435221	2004								X	X											X																
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435222	2004																																				
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	2006																				X																
	2007																																				

Sample Site	Year[a]	Period-of-Record by Discipline																																		Notes
		Vegetation												Soil												Sediment												
	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	
435223	2004																																				
	2005																				X																
	2006																				X																
	2007																																				
435301	2004								X												X																
	2005							X	X											X																	
	2006																																				
	2007							X												X																	Bacteriological Soil Study
435302	2004									X											X																
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435341	2004																					X															
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436041	2004									X											X																
	2005							X	X											X																	
	2006																																				
	2007							X												X																	Bacteriological Soil Study
436221	2004								X	X											X																
	2005							X	X											X	X																
	2006																																				
	2007							X												X																	Bacteriological Soil Study
436222	2004																																				
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436223	2004																																				
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436361	2004																					X															
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535051	2004																					X															
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535052	2004																					X															
	2005																			X																	
	2006																																				
	2007																																				
536051	2004																																				
	2005								X																												Tundra Pond
	2006								X																												Tundra Pond
	2007								X																												Tundra Pond
335011	2004																																				
	2005																																				
	2006							X	X											X																	
	2007							X	X											X																	
335081	2004																																				
	2005																																				
	2006							X	X											X																	
	2007							X	X											X																	
335101	2004																																				
	2005																																				
	2006							X	X											X																	
	2007							X	X											X																	
WL-P01	2004																																				
	2005																																				
	2006								X																												Pond Study
	2007								X																												Pond Study
WL-S04D	2004																																				
	2005																																				
	2006								X																												Pond Study
	2007								X																												Pond Study
28B1	2004																																				
	2005																																				
	2006								X																												Pond Study
	2007								X																												Pond Study
28B2	2004																																				
	2005																																				
	2006								X																												Pond Study
	2007								X																												Pond Study
TPS1	2004																																				
	2005																																				
	2006								X																												Pond Study
	2007								X																												Pond Study
TPS2	2004																																				
	2005																																				
	2006								X																												Pond Study
	2007								X																												Pond Study
TPS3	2004																																				
	2005																																				
	2006								X																												Pond Study
	2007								X																												Pond Study
TPS4	2004																																				
	2005																																				
	2006								X																												Pond Study
	2007								X																												Pond Study
TPS5	2004																																				
	2005																																				
	2006								X																												Pond Study
	2007								X																												Pond Study
TPS6	2004																																				
	2005																																				
	2006								X																												Pond Study
	2007								X																												Pond Study

Sample Site	Year[a]	Period-of-Record by Discipline																																		Notes
		Vegetation												Soil												Sediment												
	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	
TPS7	2004																																				
	2005																																				
	2006								X																												Pond Study
	2007								X																												Pond Study
TPS8	2004																																				
	2005																																				
	2006								X																												Pond Study
	2007								X																												Pond Study
Section 3, Grid 10[b]	2004																				X												X				
	2005																																				
	2006																																				
	2007																																				
Section 2, Grid 5[b]	2004																				X																
	2005																																				
	2006																																				
	2007																																				
Section 3, Grid 4[b]	2004																				X																
	2005																																				
	2006																																				
	2007																																				
Section 36, Grid 20[b]	2004																				X																
	2005																																				
	2006																																				
	2007																																				
Section 32, Grid 16[b]	2004																				X												X				
	2005																																				
	2006																																				
	2007																																				
Section 27, Grid 28[b]	2004																				X																
	2005																																				
	2006																																				
	2007																																				
Section 17, Grid 106[b]	2004																																X				
	2005																																				
	2006																																				
	2007																																				
Section 34, Grid 72[b]	2004																																X				
	2005																																				
	2006																																				
	2007																																				
Section 32, Grid 76[b]	2004																																X				
	2005																																				
	2006																																				
	2007																																				
Section 28, Grid 81[b]	2004																																X				
	2005																																				
	2006																																				
	2007																																				
Section 21, Grid 91[b]	2004																																X				
	2005																																				
	2006																																				
	2007																																				
Section 3, Grid 128[b]	2004																																X				
	2005																																				
	2006																																				
	2007																																				
Section 12, Grid 120[b]	2004																																X				
	2005																																				
	2006																																				
	2007																																				
Section 27, Grid 142[b]	2004																																X				
	2005																																				
	2006																																				
	2007																																				
Section 22, Grid 158[b]	2004																																X				
	2005																																				
	2006																																				
	2007																																				
Section 11, Grid 53[b]	2004																					X												X				
	2005																																				
	2006																																				
	2007																																				
Section 4, Grid 67[b]	2004																					X												X				
	2005																																				
	2006																																				
	2007																																				
Section 26, Grid 23[b]	2004																					X												X				
	2005																																				
	2006																																				
	2007																																				
Section 23, Grid 39[b]	2004																					X												X				
	2005																																				
	2006																																				
	2007																																				
Section 16[b]	2004																																X				
	2005																																				
	2006																																				
	2007																																				
Section 12, Grid 54[b]	2004																					X																
	2005																																				
	2006																																				
	2007																																				
Section 19, Grid 35[b]	2004																					X												X				
	2005																																				
	2006																																				
	2007																																				
Section 28[b]	2004																																X				
	2005																																				
	2006																																				
	2007																																				

NOTES:

a. Work for 2007 is shown as planned, but not yet completed.

b. Site removed from program after 2004.

TABLE 7.1-2b
Pebble Project
Sample Site Period-of-Record Index
Trace Elements, Mine Study Area, Pebble East

Monitoring Site	Year[a]	Period-of-Record by Discipline																																Notes
		Vegetation												Soil												Sediment										
	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	
335245	2004																																					
	2005																																					
	2006							X	X											X																		Lowland wet graminoid moss meadow habitat
	2007							X	X											X																		
335244	2004																																					
	2005																																					
	2006							X	X											X																		Riverine willow scrub habitat
	2007							X	X											X																		
335246	2004																																					
	2005																																					
	2006																			X																		Riverine willow scrub habitat
	2007																			X																		
335141	2004																																					
	2005																																					
	2006							X	X											X																		Upland dwarf, low & tall scrub habitat
	2007							X	X											X																		
335142	2004																																					
	2005																																					
	2006							X	X											X																		Upland dwarf, low & tall scrub habitat
	2007							X	X											X																		
335143	2004																																					
	2005																																					
	2006							X	X											X																		Upland dwarf, low & tall scrub habitat
	2007							X	X											X																		
335144	2004																																					
	2005																																					
	2006							X	X											X																		Upland dwarf shrub habitat
	2007							X	X											X																		
335132	2004																																					
	2005																																					
	2006																			X																		Upland dwarf shrub habitat
	2007																			X																		

Monitoring Site	Year[a]	Period-of-Record by Discipline																																	Notes
		Vegetation												Soil												Sediment											
	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	
335145	2004																																				
	2005																																				
	2006							X	X											X																	Upland dwarf shrub habitat
	2007							X	X											X																	
335233	2004																																				
	2005																																				
	2006							X	X											X																	Subalpine dwarf & low scrub habitat
	2007							X	X											X																	
335234	2004																																				
	2005																																				
	2006							X	X											X																	Subalpine dwarf & low scrub habitat
	2007							X	X											X																	
335235	2004																																				
	2005																																				
	2006																			X																	Subalpine dwarf & low scrub habitat
	2007																			X																	
335243	2004																																				
	2005																																				
	2006							X	X											X																	Alpine rock & dwarf shrub habitat
	2007							X	X											X																	
335242	2004																																				
	2005																																				
	2006							X	X											X																	Alpine rock & dwarf shrub habitat
	2007							X	X											X																	
335131	2004																																				
	2005																																				
	2006							X	X											X																	Alpine rock & dwarf shrub habitat
	2007							X	X											X																	
335241	2004																																				
	2006																																				
	2007							X	X											X																	Alpine rock & dwarf shrub habitat
	2006							X	X											X																	
335133	2004																																				
	2005																																				
	2006								X																							X					Tundra Pond
	2007								X																							X					Tundra Pond

NOTES:

a. Work for 2007 is shown as planned, but not yet completed. No sampling was done in this area in 2004 or 2005.

TABLE 7.2-1a
Pebble Project Environmental Studies
Study Summary for Trace Elements, Transportation Corridor, 2004-2007
Consultant: SLR Alaska

Discipline	2004 Data Collected or Tasks	2005 Data Collected or Tasks	2006 Data Collected or Tasks	2007 Tasks to be Completed
Trace Elements	**Transportation Corridor**			
	None	Information Gathering	Information Gathering	Information Gathering
			Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Plan
		BEESC Study Plan Review	2006 Study Plan Summary	2007 Study Plan Summary
			Coordination with HDR and BEESC	Coordination with HDR and BEESC
		Coordination with NDM & Agencies	Coordination with NDM and Resource Agencies, Monthly Reporting	Coordination with NDM and Resource Agencies, Monthly Reporting
		Data Analysis	Data Entry and Analysis	Data Entry and Analysis
		2004 Progress Report	Prepare Preliminary Environmental Baseline Document	Prepare Preliminary Environmental Baseline Document

TABLE 7.2-1b
Pebble Project Environmental Studies
Study Summary for Trace Elements in Vegetation and Sediment, Transportation Corridor, 2004-2007
Consultant: BEESC

Discipline	2004 Data Collected or Tasks	2005 Data Collected or Tasks	2006 Data Collected or Tasks	2007 Tasks to be Completed
Trace Elements, Vegetation	**Transportation Corridor**			
	Information Gathering	None	Information Gathering	Information Gathering
	Scope, Schedule, Field Sampling Plan		Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Plan
	Field Sampling--August		Field Sampling--August	Field Sampling--August
	Communication and Data Management		Communication and Data Management	Communication and Data Management
	Coordination with local communities for observers		Coordination with local communities for observers	Coordination with local communities for observers
	Prepared presentation		Data Compilation	Data Compilation
	Report Writing		Report Writing	Report Writing
Trace Elements, Sediment	**Transportation Corridor**			
	Information Gathering	Information Gathering	Information Gathering	Information Gathering
	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Plan
	Field Sampling--July, Sept.	Field Sampling--May, July, Sept.	Field Sampling--August	Field Sampling--August
	Communication and Data Management	Communication and Data Management	Communication and Data Management	Communication and Data Management
	Coordination with NDM	Coordination with NDM	Coordination with NDM	Coordination with NDM
	Coordination with local communities for observers	Coordination with local communities for observers	Coordination with local communities for observers	Coordination with local communities for observers
	Prepared presentation	Data Compilation and Analysis	Data Compilation and Analysis	Data Compilation and Analysis
	Report Writing	Report Writing	Report Writing	Report Writing

TABLE 7.2-2
Pebble Project
Sample Site Period-of-Record Index
Trace Elements, Transportation Corridor

Sample Location	Year[a]	Period-of-Record by Discipline																																Comment
		Sediment												Vegetation												Soil										
	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							F		F																										
	2005					F		F		F																										
	2006																																			
	2007																																			
GS20	2004							F		F																										
	2005							F		F																										
	2006																																			
	2007																																			
GS20A	2004							F		F																										
	2005																																			
	2006																																			
	2007																																			
GS18A	2004							F		F																										
	2005																																			
	2006																																			
	2007																																			
GS17A	2004							F		F																										
	2005					F		F		F																										
	2006																																			
	2007																																			
GS14A	2004							F		F																										
	2005																																			
	2006																																			
	2007																																			
GS14B	2004							F		F																										
	2005					F		F		F																										
	2006																																			
	2007																																			
GS12A	2004							F		F																										
	2005																																			
	2006																																			
	2007																																			
GS11A	2004							F		F																										
	2005					F		F		F																										
	2006																																			
	2007																																			
GS8A	2004							F		F																										
	2005					F		F		F																										
	2006																																			
	2007																																			

Sample Location	Year[a]	Period-of-Record by Discipline																																Comment
		Sediment												Vegetation												Soil										
	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	
GS7A	2004																																					
	2005																																					
	2006																																					
	2007																																					
GS6A	2004							F		F																												
	2005																																					
	2006																																					
	2007																																					
GS4A	2004							F		F																												
	2005					F		F		F																												
	2006																																					
	2007																																					
GS4B	2004									F																												
	2005																																					
	2006																																					
	2007																																					
GS3A	2004								F	F																												
	2005					F		F		F																												
	2006																																					
	2007																																					
GS23	2004							F		F																												
	2005																																					
	2006								F																													
	2007																																					
GS22	2004																																					
	2005							F		F																												
	2006								F																													
	2007																																					
GS21	2004								F	F																												
	2005					F		F		F																												
	2006								F																													
	2007																																					
PSC	2004																																					
	2005							F																														
	2006																																					
	2007																																					
PSD	2004																																					
	2005							F																														
	2006																																					
	2007																																					
POND1	2004							F		F																												
	2005					F		F		F																												
	2006																																					
	2007																																					
POND2	2004							F		F																												
	2005					F		F		F																												
	2006																																					
	2007																																					

Sample Location	Year[a]	Period-of-Record by Discipline																																Comment
		Sediment												Vegetation												Soil										
	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	
POND3	2004							F		F																											
	2005					F		F		F																											
	2006																																				
	2007																																				
POND4	2004							F		F																											
	2005					F		F		F																											
	2006																																				
	2007																																				
POND5	2004							F		F																											
	2005					F		F		F																											
	2006																																				
	2007																																				
POND6	2004																																				
	2005																																				
	2006								F												V																
	2007								F												V																
TE01	2004																				V	V											S				
	2005																																				
	2006																																				
	2007																																				
TE02	2004																				V												S				
	2005																																				
	2006																																				
	2007																																				
TE03	2004																				V												S				
	2005																																				
	2006																																				
	2007																																				
TE04	2004																				V												S				
	2005																																				
	2006																																				
	2007																																				
TE05	2004																				V	V											S				
	2005																																				
	2006																																				
	2007																																				
TE06	2004																				V												S				
	2005																																				
	2006																																				
	2007																																				
TE07	2004																				V												S				
	2005																																				
	2006																																				
	2007																																				

Sample Location	Year[a]	Period-of-Record by Discipline																																Comment
		Sediment												Vegetation												Soil										
	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	
TE08	2004																				V	V											S					
	2005																																					
	2006																																					
	2007																																					
TE09	2004																				V												S					
	2005																																					
	2006																																					
	2007																																					
TE10	2004																				V												S					
	2005																																					
	2006																																					
	2007																																					
TE11	2004																				V												S					
	2005																																					
	2006																																					
	2007																																					
TE12	2004																				V	V											S					
	2005																																					
	2006																																					
	2007																																					
TE13	2004																				V												S					
	2005																																					
	2006																																					
	2007																																					
TE14	2004																				V												S					
	2005																																					
	2006																																					
	2007																																					
TE15	2004																				V												S					
	2005																																					
	2006																																					
	2007																																					
TE16	2004																				V												S					
	2005																																					
	2006																																					
	2007																																					
TE17	2004																				V	V											S					
	2005																																					
	2006																																					
	2007																																					
TE18	2004																				V												S					
	2005																																					
	2006																				V												S					
	2007																				V												S					

Sample Location	Year[a]	Period-of-Record by Discipline																																	Comment
		Sediment												Vegetation												Soil										
	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	
TE19	2004																				V												S				
	2005																																				
	2006																				V												S				
	2007																				V												S				
TE20	2004																				V												S				
	2005																																				
	2006																				V												S				New Loc: North Head - East
	2007																				V												S				
TE21	2004																				V												S				
	2005																																				
	2006																				V												S				New Loc: Knoll Head
	2007																				V												S				
TE22	2004																				V												S				
	2005																																				
	2006																				V												S				New Loc: Just west of Port Site 1
	2007																				V												S				
TE23	2004																																				
	2005																																				
	2006																				V												S				
	2007																				V												S				
TE24	2004																																				
	2005																																				
	2006																				V												S				
	2007																				V												S				
SWQ1[b]	2004																																				
	2005																																				
	2006								F																												
	2007								F																												
SWQ2[b]	2004																																				
	2005																																				
	2006								F																												
	2007								F																												
SWQ3[b]	2004																																				
	2005																																				
	2006								F																												
	2007								F																												
SWQ4[b]	2004																																				
	2005																																				
	2006								F																												
	2007								F																												

KEY:

F Sediment samples collected.
V Vegetation samples collected from various plant species.
S Soil samples collected.

NOTES:

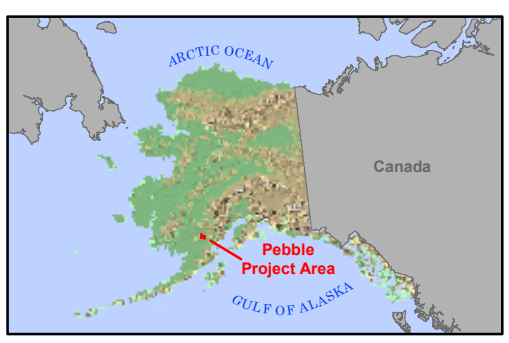
a. Work for 2007 is shown as planned, but not yet completed. This work will be conducted by BEESC.
b. Water-quality samples, as well as sediment, are being collected at these sites.

FIGURES

155°24'0"W 155°18'0"W 155°12'0"W

59°57'0"N 59°54'0"N 59°51'0"N 59°48'0"N

236221 235282 235271 TPS4 235361 236353 335051 336011 TPS3 TPS1 335011 335081 TPS2 335144 335132 335141 335142 335245 335246 335143 335145 335133 335131 335235 335233 335242 335243 335234 335241 335244 336131 336231 WL-P01 336261 28B2 28B1 336362 TPS7 436041 335101 TPS5 WL-S04D TPS6 TPS8 436221 435301 536051



Miles 0 1 2 3

Kilometers 0 1 2 3

N

Scale 1:80,000

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

Legend

- **Bacteriology Soil, Surface Soil, and Terrestrial Vegetation Sample Locations**
- **Surface Soil and Terrestrial Vegetation Sample Locations**
- **Surface Soil Sample Locations**
- **Aquatic Vegetation and Sediment Sample Locations**
- **Aquatic Vegetation (Small Pond Study) Sample Locations**
- Study Boundary
- General Pit Outline

Pebble Project
NORTHERN DYNASTY MINES INC.

DRAFT

Figure 7.1-1
2007 Study Plan;
Naturally Occurring Constituents;
Proposed 2007 Sampling Locations for Soil, Sediment, and Vegetation;
Mine Study Area

RDI_SLR_2007_StudyPlan_TE_Fig7.1-1_11x17P_v06.mxd	Date: August 8, 2007
Version: 6	Author: RDI-LS

153°55'0"W 153°50'0"W 153°45'0"W 153°40'0"W 153°35'0"W 153°30'0"W 153°25'0"W

59°45'0"N

59°40'0"N

59°35'0"N

Summit Lakes

TE18

Williamsport

SWQ-1

TE24

SWQ-2

TE19

TE23

Pond6

SWQ-3

TE22

TE21

TE20

SWQ-4

Iniskin Bay

Iliamna Bay

Cottonwood Bay

Cook Inlet

Pebble Project

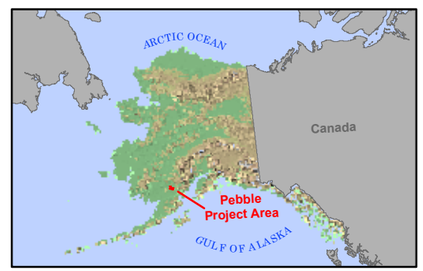
NORTHERN DYNASTY MINES INC.

DRAFT

Figure 7.2-1
2007 Study Plan;
Naturally Occurring Constituents;
Proposed 2007 Sampling Locations for Soil, Sediment, and Vegetation;
Transportation Corridor

Legend

- Surface Soil and Terrestrial Vegetation Sample Locations
- Sediment Sample Locations
- Creek Water and Sediment Sample Locations
- Possible Road Corridor



0 1 2 3 4 Miles

0 1 2 3 4 5 Kilometers

N

Scale 1:100,000

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

File: RDI_SLRStudyPlan_TE_Fig7.2-1_11X17L_D07.mxd	August 8, 2007
Version: 7	Author: RDI-MRA, LS