

**DRAFT ENVIRONMENTAL BASELINE STUDIES
2005 STUDY PLANS**

CHAPTER 1. INTRODUCTION

JUNE 2005

TABLE OF CONTENTS

TABLE OF CONTENTS 1-i

LIST OF TABLES 1-ii

LIST OF FIGURES (following document) 1-ii

ACRONYMS 1-iii

1. INTRODUCTION 1-1

 1.1 Purpose 1-1

 1.2 Background..... 1-1

 1.3 Goals and Objectives 1-1

 1.4 Project Description 1-2

 1.5 Approach 1-3

 1.6 Project Status 1-5

 1.6.1 Previous Work 1-5

 1.6.2 Current Status 1-6

LIST OF TABLES

Table 1-1, Pebble Project Environmental Baseline Studies Program 1-3

LIST OF FIGURES (following document)

Figure 1-1, General Project Location

Figure 1-2, Pebble Project Activity Flowsheet

Figure 1-3, Historical Cominco Surface Water, Meteorology, and Fish Sampling Stations, and Tundra Swan Observations

Figure 1-4, Baseline Study Area – Mine Site

Figure 1-5, Preliminary Access Routes and Port Options

ACRONYMS

AASHTO	American Association of State and Highway Transportation Officials
ABA	acid base accounting
ACHP	Advisory Council on Historic Preservation
ACLS	alternative cleanup levels
ADEC	Alaska Department of Environmental Conservation
agl	above ground level
AHRS	Alaska Heritage Resource Survey
APE	area of potential effect
ARD/ML	acid rock drainage/metal leaching
ASCI	Alaska Stream Condition Index
BEESC	Bristol Environmental & Engineering Services Corporation
BMR	baseline monitoring report
CC	comprehensive stations with continuous stage monitoring
CH2M	CH2M HILL, Inc.
CIR	color infrared
CWOC	comprehensive stations without continuous stage monitoring
DECD	Alaska Department of Economic and Community Development
DNR	State of Alaska Department of Natural Resources
DO	dissolved oxygen
DOT&PF	State of Alaska Department of Transportation & Public Facilities
DQOs	data quality objectives
EC	environmental consequences
EIS	environmental impact statement
EPA	Environmental Protection Agency
EBD	environmental baseline document
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FSP	field sampling plan
GIS	geographic information system
GPS	global positioning system
HGM	hydrogeomorphic
IM	initial monitoring station
mg/L	milligrams per liter
mm	millimeters

MRLs	method reporting limits
NDM	Northern Dynasty Mines Inc.
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOAA	National Oceanic & Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
ORP	oxidation reduction potential
PJD	preliminary jurisdictional determination
PSD	prevention of significant deterioration
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
SHPO	State Historic Preservation Officer
SOPs	standard operating procedures
SWANCC	Solid Waste Agency of Northern Cook County v. U.S. Army Corp of Engineers
SWE	snow-water equivalent
TPH	total petroleum hydrocarbons
USACE	United States Army Corp of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WMP	water monitoring plan

1. INTRODUCTION

1.1 Purpose

This Draft Environmental Baseline Studies document provides a description of the 2005 study plan for the Northern Dynasty Mines Inc. (NDM) Baseline Environmental Program for the Pebble Project. This study plan builds on the baseline work started in 2004 and is presented for agency and stakeholder review and comment, to ensure the planned program provides a comprehensive and thorough basis for baseline environmental characterization of the Pebble Project.

1.2 Background

The Pebble Project is a proposed open pit mine for a gold, copper, molybdenum, and silver deposit located in southwestern Alaska north of Lake Iliamna, as shown on Figure 1-1. NDM has commenced extensive study programs to collect the engineering, geological, environmental, and socioeconomic data necessary for a bankable feasibility study and the preparation of applications for state and federal permits.

The design of this project requires the planning and coordination of all aspects of the project from its initial stages through to the final design. In this context, responsibility for environmental stewardship over the project life is a fundamental ingredient to the engineering design and feasibility of the project.

NDM clearly recognizes that a feasible project is one that is both economically viable and environmentally and socially responsible. Therefore, NDM considers that there are three cornerstones to pursuing the development of the Pebble Project:

- Geology and exploration – definition of a mineral deposit that supports an economic mine.
- Engineering – sound and practical engineering that incorporates appropriate environmental and economic standards to give a robust and feasible project design.
- Environmental - diligent characterization of the existing conditions related to environmental and social values of the project area and their incorporation into the project design and operation.

1.3 Goals and Objectives

The primary goal of this study plan is to provide a description of NDM's baseline environmental programs for the purpose of agency and stakeholder review. Agency and stakeholder feedback on this study plan is solicited to ensure that it will produce a comprehensive and thorough basis for baseline characterization of the Pebble Project.

This document describes the scope of the 2005 study plan for comprehensive characterization of the baseline environmental and social conditions existing in the project area. This characterization is more than a compilation of data documenting baseline conditions. These baseline environmental studies are also focused on compiling and analyzing the information that will be incorporated into the sound

environmental design of the project, into assessing and managing project impacts, and for the rigorous project review and permitting.

The specific objectives of this document are to:

- Define and describe the study plan for characterization of the baseline conditions.
- Ensure that this study plan will provide a sound technical basis both for project design and permitting, and for ongoing evaluation of environmental effects during mine operation and closure.
- Define the methods and approach for data gathering and analysis for review by others.
- Define the specific objectives of each component of the study plan and the deliverables such that they can be incorporated into the relevant engineering tasks and feasibility analyses.

1.4 Project Description

Pebble is a gold-copper porphyry deposit. In early 2004 the inferred resource of the Pebble Deposit was 2.7 billion tonnes. A new resource estimate published in March 2005 showed a measured and indicated resource of 3.0 billion tonnes containing 31.3 million ounces of gold, 18.8 billion pounds of copper, and 993 million pounds of molybdenum, with lesser amounts of silver. Resource estimate work to date is based on 70,719 m of drilling in 2002, 2003, and 2004 by NDM, combined with 19,245 m in 118 holes completed by Cominco American Incorporated up to 1997. Current assessments of the optimum milling capacity for the Pebble Project contemplate 220,000 short tons per day. The current mine plan foresees processing approximately 2.5 billion tons of ore over a mine life of approximately 30 years.

To date, the geologic and metallurgical data indicate that conventional open pit mining and crush-grind-flotation processing methods can be used to recover the primary ore minerals of gold, copper, molybdenum, and silver. The key mine design considerations and alternatives to be considered include:

- The deposit is a gold-copper porphyry with the primary mineralization occurring as copper iron sulfides with associated gold values.
- The porphyry deposit size, grade, and configuration are consistent with a bulk tonnage open pit operation and would not be economically mineable as an underground mine.
- The primary process for recovering the ore would be to produce a sulfide concentrate(s) from a crushing, grinding, and flotation process.
- The major components of the milling process that require storage would be flotation tailings and associated process water.
- Access for construction, operation, and concentrate shipping would be required. Upgrades to existing infrastructure and/or a new port or ship docking facility will be required for concentrate handling and shipping.
- Concentrate(s) produced from the mine must be conveyed to port/markets.
- The potential for oxidation and metal leaching must be considered for all mine rock components.
- Tailings pond water will be recycled to the process plant.

- The estimated stripping ratio is relatively low, but some permanent mine rock storage must also be considered in the major facilities.

1.5 Approach

There are a wide variety of environmental and cultural values in the project area that require the contributions of experts from a variety of disciplines. Accordingly there has been coordinated integration of the project's environmental and engineering teams to incorporate environmental design considerations into the project design.

NDM's approach to the integration of the environmental and socioeconomic science and the engineering programs for this study plan, and the steps to achieve the ultimate goals of project feasibility and permitting, are shown schematically in Figure 1-2 Project Activity Flowsheet. In this figure, three colors are used to indicate the primary responsibility for each team; green indicates the activities that are the primary responsibility of the environmental team, blue indicates those activities that are the primary responsibility of the engineering team, and gold indicates activities that are the responsibility of both teams.

This schematic represents the approach developed by NDM and its consultants based on experience with other projects. Four elements of this figure are fundamental to NDM's approach to this baseline environmental characterization study plan and the ultimate project permitting needs:

- Acquisition of comprehensive data sets that support evaluation of mine development concepts.
- Staged evaluation of options based on engineering and project feasibility considerations; followed by:
 - Incorporation of environmental and socioeconomic considerations into options assessment and project design.
 - Progressive evaluations of environmental and socioeconomic data to allow technical assessment of environmental impacts, compensation, and mitigation.

The baseline programs are designed to characterize the disciplines listed in Table 1-1.

TABLE 1-1
Pebble Project Environmental Baseline Studies Program

Discipline	Consulting Firm
Meteorology	Hoefler Consulting Group
Noise	Michael Minor & Associates
Surface Water Hydrology	Mine — HDR Alaska, Inc. Road/Port — Bristol Environmental & Engineering Services
Groundwater Hydrogeology	Mine — Water Management Consultants / SLR Alaska, Inc. Road/Port — Bristol Environmental & Engineering Services
Water Chemistry	Mine — HDR Alaska, Inc. Road/Port — Bristol Environmental & Engineering Services
Introduction	1-3

Discipline	Consulting Firm
Trace Elements	Mine — SLR Alaska, Inc. Road/Port — Bristol Environmental & Engineering Services / SLR Alaska, Inc.
Geochemical Characterization and Acid Rock Drainage/Metal Leaching (ARD/ML)	Steffen Robertson and Kirsten (Canada) Inc.
Terrestrial Wildlife and Habitats	ABR, Inc. — Environmental Research & Services
Wetlands	Mine — Three Parameters Plus Road/Port — Three Parameters Plus / HDR Alaska, Inc.
Fish And Aquatic Habitat	Buell & Associates HDR Alaska, Inc. Northern Ecological Services
Marine Habitat	ABR, Inc. — Environmental Research & Services Bristol Environmental & Engineering Services PENTEC Environmental RWJ Consulting
Subsistence	Stephen R. Braund & Associates
Cultural Resources	Stephen R. Braund & Associates
Recreation	Kevin Waring & Associates
Land Use	Kevin Waring & Associates
Socioeconomics	Kevin Waring & Associates McDowell Group
Visual	Land Design North
Data Management and Geographic Information System (GIS)	Resource Data Inc.

Biophysical and cultural resources are characterized through detailed surveys and mapping, followed by analysis of these data. The site conditions, such as meteorology and hydrology, are defined through site installations and regular monitoring programs. These data are used to develop site models of the existing environment and, as engineering proceeds, of the sites of potentially viable project development concepts. Mine development concept evaluation and optimization continue as the project engineering develops and as the assessments of the baseline data are available. In this way, environmental considerations are incorporated into the evaluation of options for the various project components and ultimately the identification of the preferred mine development concept.

This use of baseline data to develop site models, followed by assessment of potential impacts from the predicted conditions for mine development concept locations/designs, and the iteration with project design is shown in Figure 1-2. This document focuses on the baseline study programs, the majority of which were initiated in 2004 and will continue in 2005. While the activities related to environmental assessment are not discussed in this document, they are mentioned briefly in the context of the environmental baseline study plan.

1.6 Project Status

1.6.1 Previous Work

The geologic resource definition and engineering studies completed by Cominco provided the basis for the initial NDM scoping level project assessment. The results of this scoping lead NDM to its 2002/2003 drilling program. The analysis of those results, reported early in 2004, led to the commissioning of a detailed infill drilling program and commencement of an engineering feasibility study in 2004. NDM also commissioned the environmental baseline studies in 2004, which are being continued in 2005 as described in this document.

NDM initiated these detailed work programs on the Pebble Project to collect the geological, engineering, environmental, and socioeconomic data needed for completion by end of 2005 of a feasibility study, with applications for permits for construction and operation of an open pit mine to follow in mid-2006. The work builds on exploration, preliminary design, and environmental studies initiated in the 1990s by Cominco. The locations where data were collected by Cominco are shown in Figure 1-3. The Cominco baseline environmental studies included:

- Hydrometeorology
 - Miscellaneous stage discharge data for 10 stations (Cominco Data, 1991-1993)
 - Additional continuous and hourly stage data for Talarik Creek and South Fork Kuktuli River (1991-1993)
 - Long-term regional climate stations at Iliamna (46 years) and Port Alsworth (34 years) plus 1993 weather station data for the mine site and Iniskin Bay
 - Long-term USGS stream flow stations (Tanalian, Tazimina, and Newhalen Rivers)
- Aquatic/Marine Fisheries
 - Kuktuli River Float Survey reports (1977, 1981, 1982, 1983, 1984, 1986, 1987, 1988)
 - Lower Talarik Creek rainbow trout report (1997)
 - Baseline Fisheries Investigations reports (1991 & 1993)
 - Miscellaneous water quality sampling (1991-1993)
 - Williamsport Marine Baseline and EIS report (USACE/Kenai Peninsula Borough, 2001)
- Terrestrial/Marine Wildlife Reports
 - Caribou Use of Pebble Mine Site (1992, ADF&G)
 - Status and Seasonal Movements of Caribou Near Pebble Mine Site (1992-93, van Daele)
 - Moose/Caribou Observations (1991, ADF&G)
 - Wildlife Reconnaissance Assessment (1990 & 1991, Terra Nord)
 - Mulchatna Caribou Management Report (1992-1994, ADF&G)
 - Caribou Radio tracking report (1993, Cominco)

- Investigation of Wildlife Use and Harvest at Pebble Mine (1993)
- Bear Den Survey Report (1992)
- Moose Survey Report (1992)
- Caribou Survey reports (1991 & 1992)
- Marine Biota and Habitat Surveys (Williamsport EIS)

1.6.2 Current Status

In addition to continuing the environmental baseline studies initiated in 2004, NDM is in the process of evaluating a range of options for development of the various components of mine site facilities and infrastructure. The initial approach was to define potential options for the individual components that comprise an open pit mine, and then to identify the reasonable combinations of mine, mill, tailings, water, and mine rock storage facilities that represent mine development concepts, including:

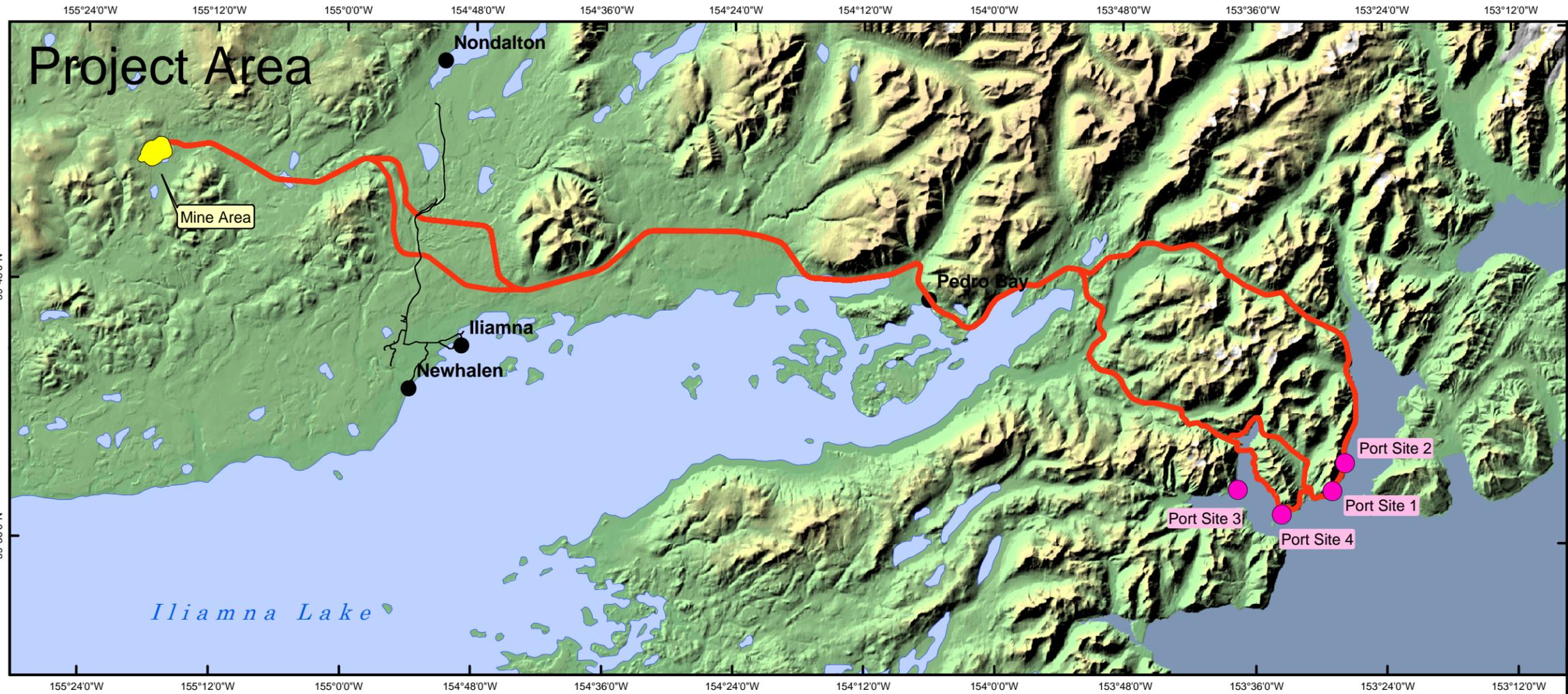
- Deposit location and mining methods
- Mill site locations
- Milling circuit options
- Tailings facility locations
- Mine rock storage locations
- Concentrate handling and shipping options
- Project access and power options

The tailings facility was identified as one of the critical design components, having the largest footprint and potentially most demanding water management requirements of the mine facilities. Initial engineering studies showed that some of these tailings management options were critically flawed due to inadequate storage capacity considerations or were impractical from an engineering/construction perspective. These engineering studies identified potential locations for on-land tailings management that would be situated in the vicinity of or adjacent to the ore deposit. A separate mine development concept examined the potential for deep-water disposal of tailings in Iliamna Lake. Consideration of important environmental constraints related to the main drainage areas in the vicinity of the mine development site is also being given to those mine development concepts that are considered feasible and practicable from an engineering perspective. Consideration of these initial environmental constraints on possible facility locations resulted in a decision that it will not be appropriate to place tailings in Iliamna Lake, nor to develop on-land tailings management options that eliminate substantial tracts of fish habitat in the Upper Talarik and North Fork Kaktuli drainages.

The integration of these preliminary engineering and environmental studies has resulted in NDM deciding that the preferred mine development concept will most likely be contained within the general area delineated on Figure 1-4. Figure 1-5 illustrates the road access routes and port sites currently under consideration by the State of Alaska Department of Transportation and Public Facilities (DOT&PF). As a result of these preliminary findings, the current environmental study programs have been designed to ensure that appropriate baseline data are collected only in those areas that might be affected by proposed

development which are predominantly confined to the South Fork of the Kaktuli River (with some study effort in the North Fork of the Kaktuli), and along the access route corridors.

FIGURES



Northern Dynasty Mines Inc.



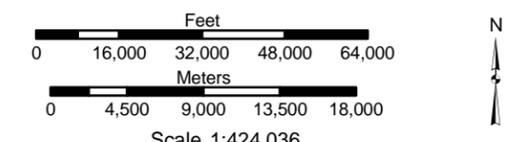
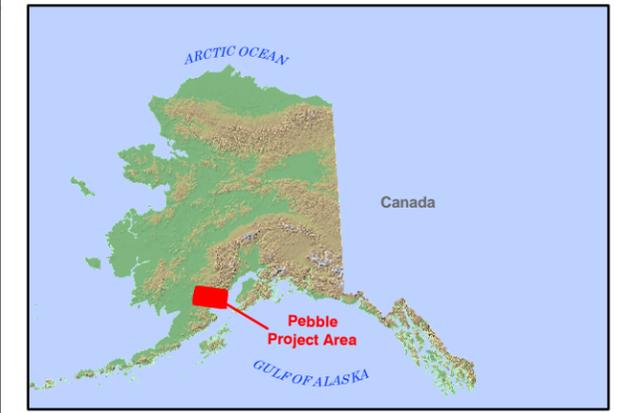
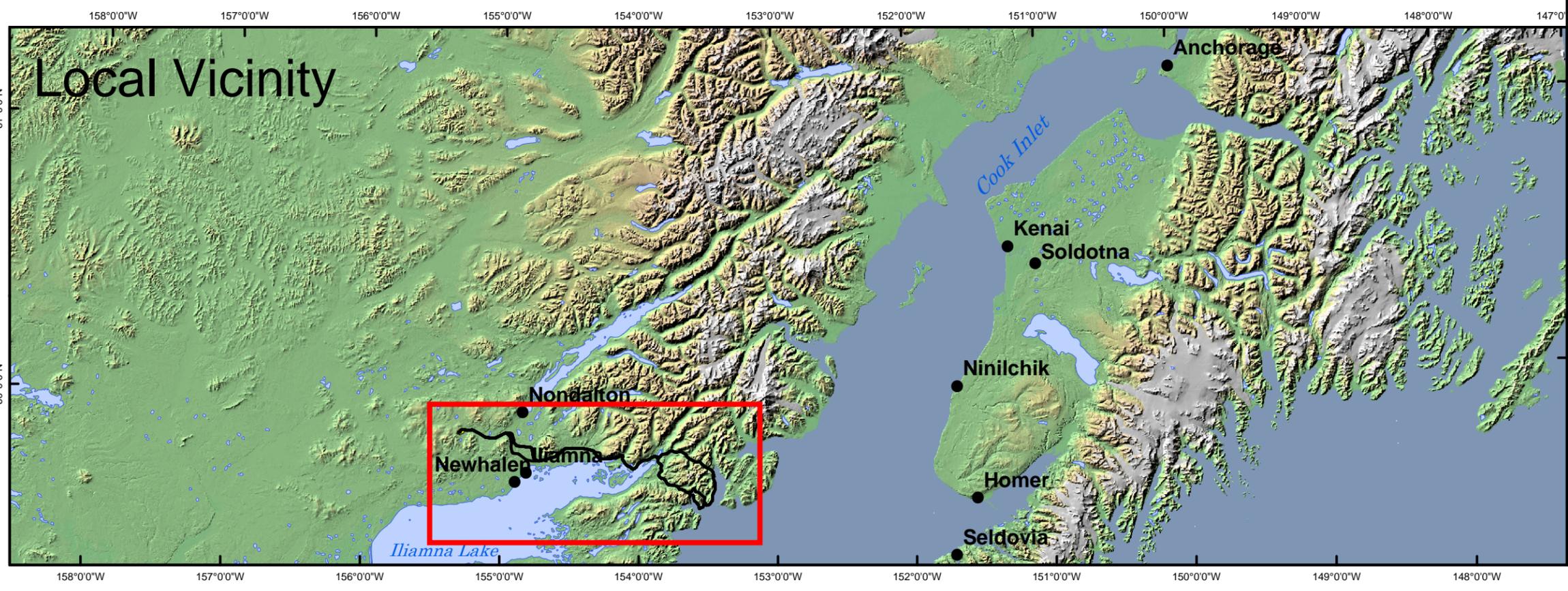
Pebble Project
General Project Location
Figure 1.1

Legend

Routes of Interest

- Routes of Interest
- Orebody
- Existing Roads
- Port Sites

Received Access Routes AutoCAD file from PN&D, 6/7/2004



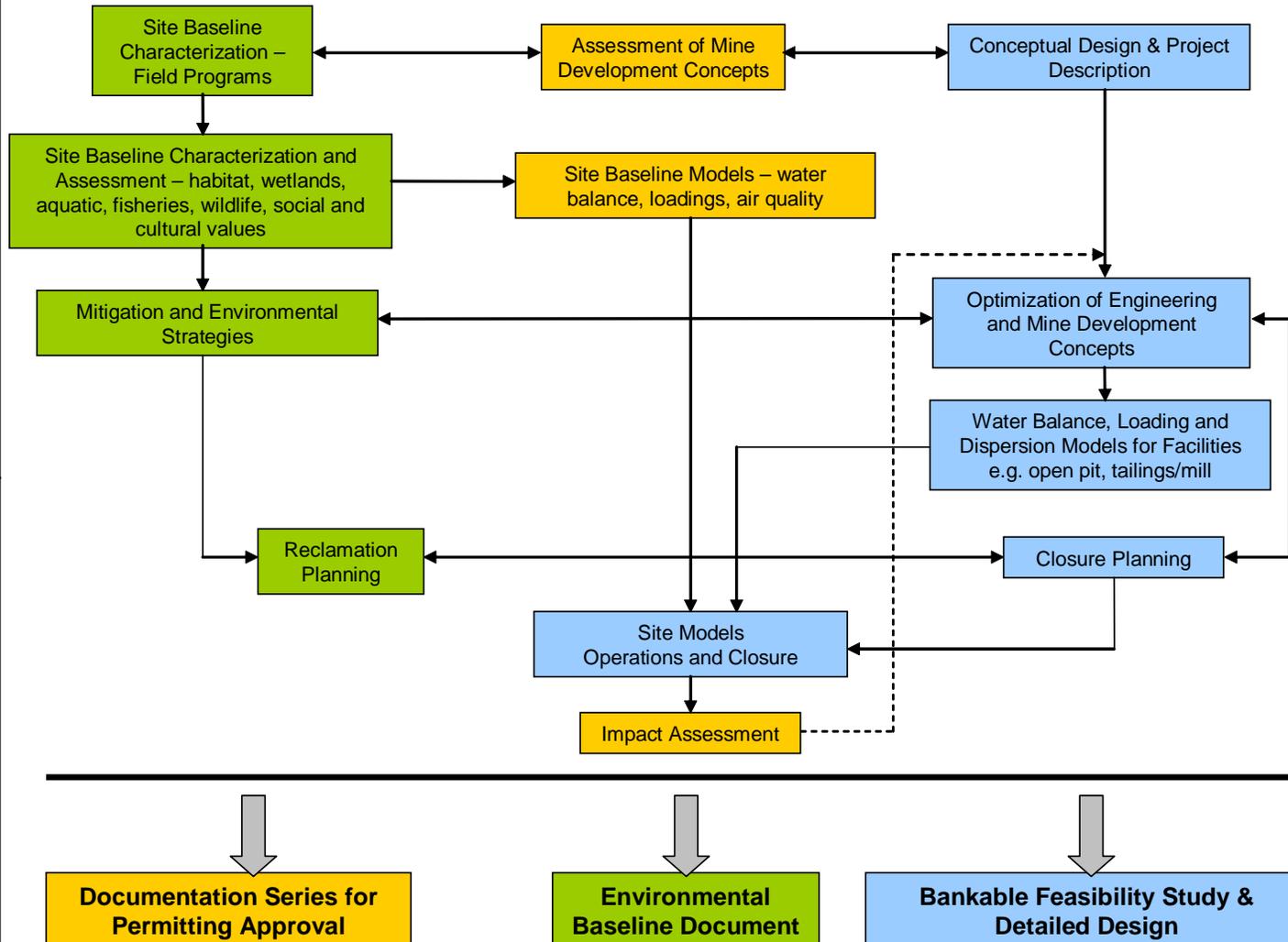
Scale 1:424,036
Alaska State Plane Zone 5 (units feet)
1983 North American Datum

File: RDI_ND_SPLAN1-1_11x17L_1of1.mxd	Date: June 28, 2004
Version: 2	Author: RDI-DWR



Pebble Gold-Copper Project

Pebble Project Activity Flowsheet
Figure 1.2



Legend



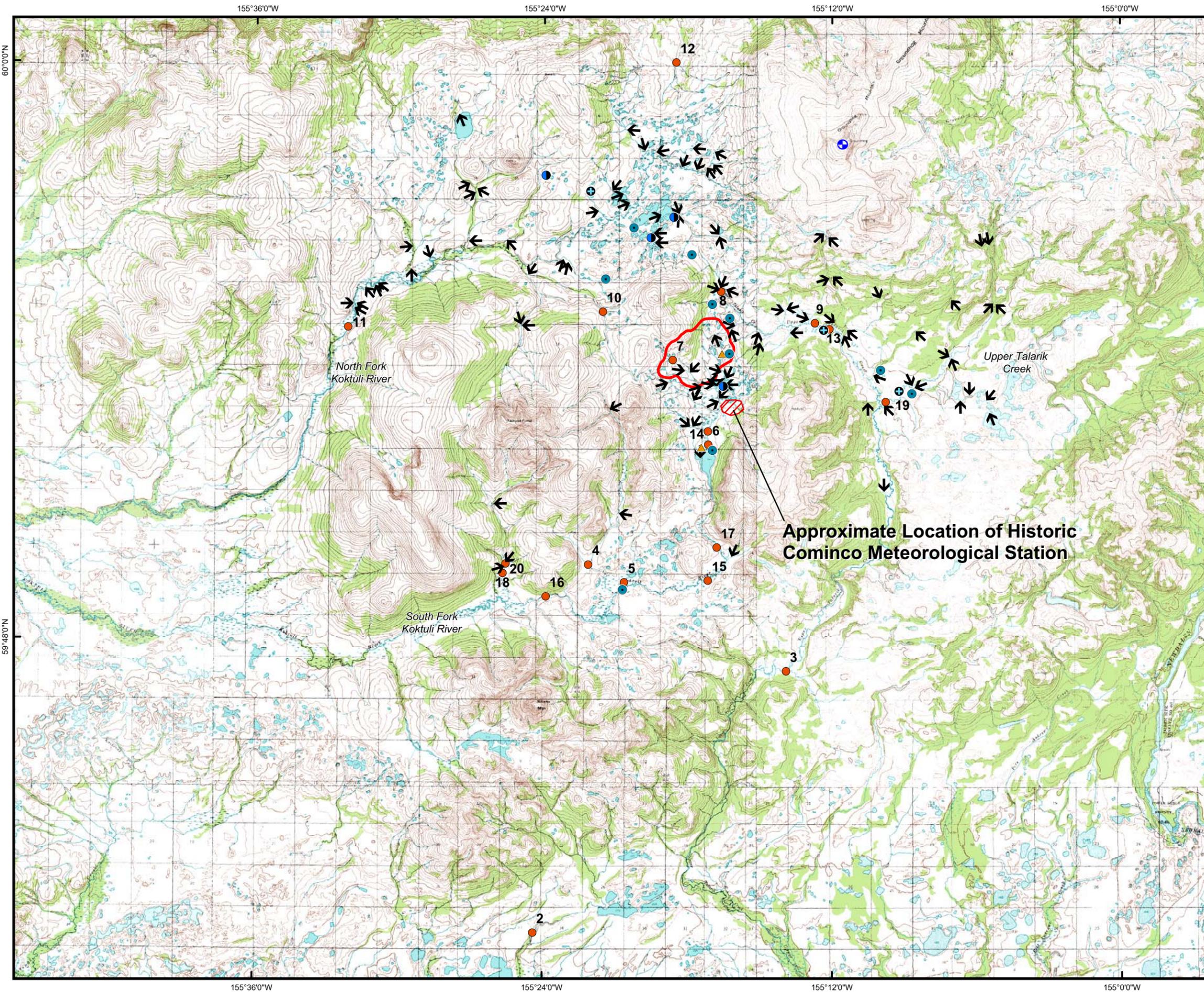
Primary responsibility of the engineering team.



Primary responsibility of the environmental team.



Shared responsibility between engineering and environmental teams.



Northern Dynasty Mines Inc.



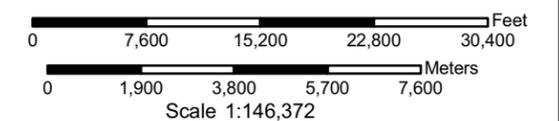
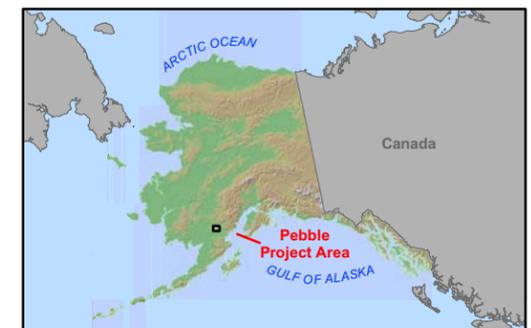
Pebble Gold-Copper Project

Historical Cominco Surface Water, Meteorology, and Fish Sampling Stations, and Tundra Swan Observations
Figure 1-3

Legend

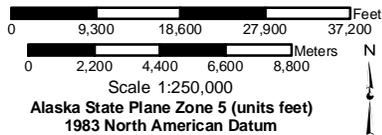
- Historical Surface Water Stations
- ↓ Fisheries Sampling Sites
- Mineral Deposit
- Historic Meteorological Station
- ⊕ Peregrine Falcon Sighting (approximate location)
- Tundra Swan Observations (approximate location)**
 - ▲ Adults/Cygnets, 1991
 - Adults/Cygnets, 1992
 - ⊕ Single Adult, 1992
 - Two Adults, 1992

Approximate Location of Historic Cominco Meteorological Station



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

File: RDI_CH2_Mine_Plan_11X17L_1of1_D01.mxd	Date: February 17, 2005
Version: 1	Author: CH - BMS



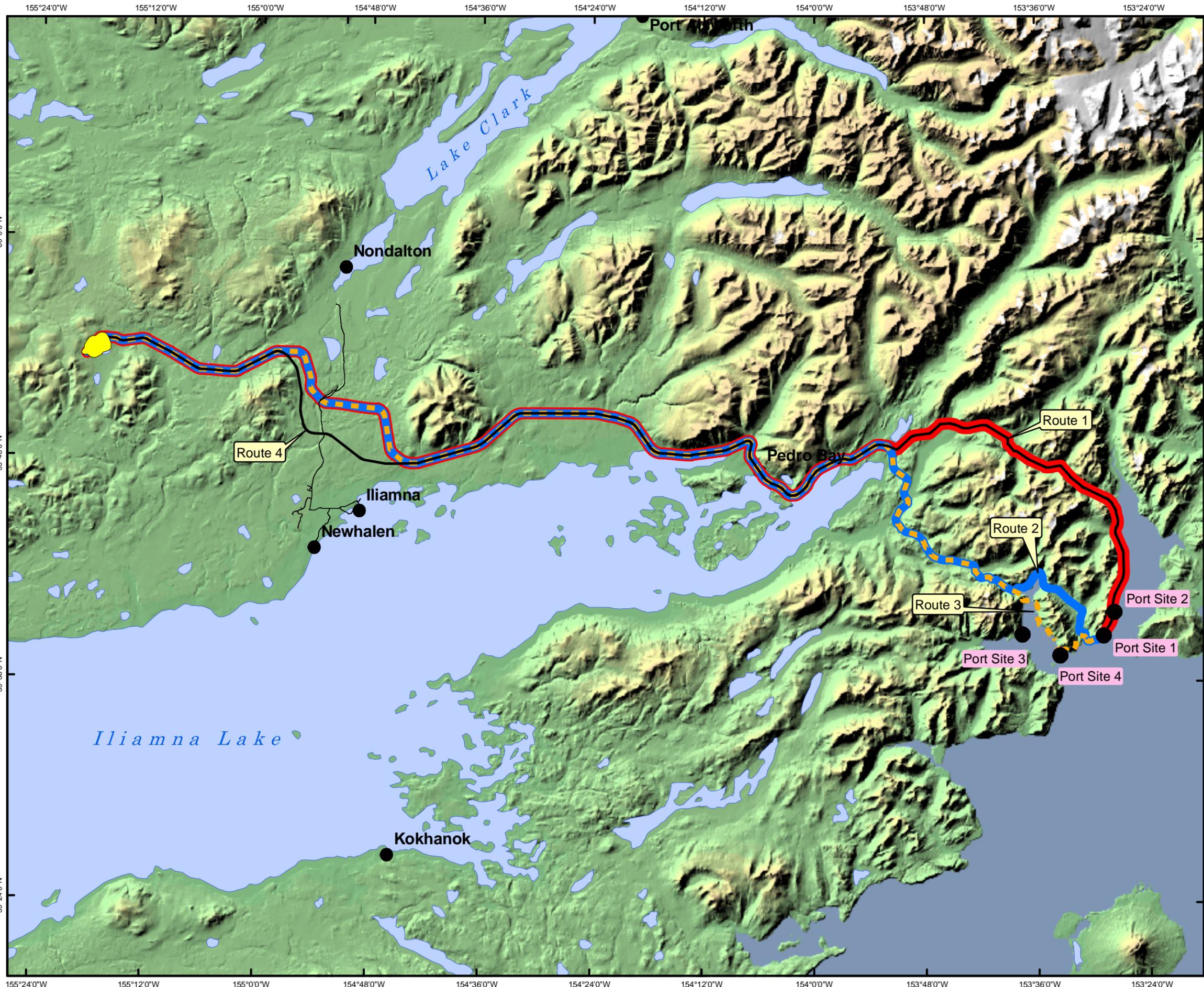
Legend

— DOT & PF Possible Road Routes

Northern Dynasty Mines Inc.



Pebble Project
Baseline Study Area
Figure 1.4



Northern Dynasty Mines Inc.



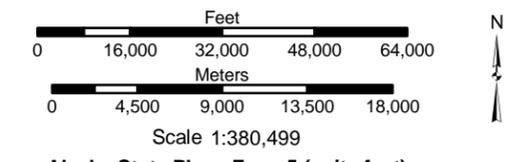
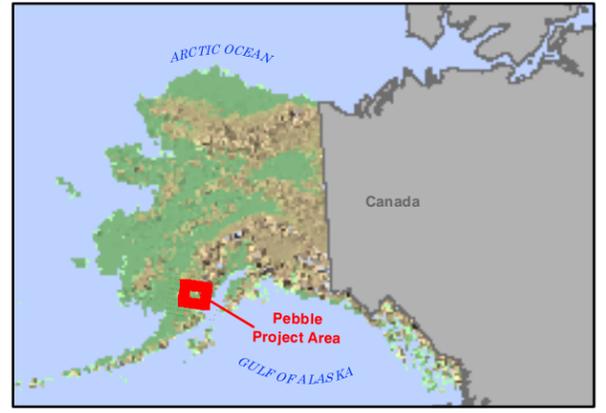
Pebble Project
 Preliminary Access Routes
 Figure 1.5

Legend

Routes of Interest

-  Route 1
-  Route 2
-  Route 3
-  Route 4
-  Orebody
-  Existing Roads
-  Port Sites

Received Access Routes AutoCAD file from PN&D, 6/7/2004



Scale 1:380,499
 Alaska State Plane Zone 5 (units feet)
 1983 North American Datum

File: RDI_ND_SPLAN1-5_11x17L_1of1_D03.mxd	Date: June 28, 2004
Version: 1	Author: RDI-DWR