Pebble Project

NORTHERN DYNASTY MINES INC.

DRAFT ENVIRONMENTAL BASELINE STUDIES
PROPOSED 2007 STUDY PLANS

CHAPTER 9.
TERRESTRIAL WILDLIFE AND HABITAT

DRAFT

SEPTEMBER 2007

TABLE OF CONTENTS

LIST OF TABLES (attached)

LIST OF FIGURES (attached)

ACRONYMS AND ABBREVIATIONS

ADF&G	Alaska Department of Fish and Game
ANHSC	Alaska Native Harbor Seal Commission
DEM	digital elevation model
GIS	geographic information system
GPS	global positioning system
MCH	Mulchatna Caribou Herd
MMPA	Marine Mammal Protection Act
NDM	Northern Dynasty Mines Inc.
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
USFWS	U.S. Fish and Wildlife Service

9. TERRESTRIAL WILDLIFE AND HABITAT

ABR, Inc., will lead the terrestrial wildlife and habitat program for the mine study area and the transportation corridor in 2007.

9.1 Mammals—Mine Study Area

9.1.1 Aerial-Transect Surveys

9.1.1.1 Introduction

The 2007 aerial surveys for large mammals in the mine area will continue research begun in 2004. Baseline data are being collected during important seasonal periods for selected species for characterization and project design purposes for the Pebble Project.

Caribou are the most abundant large mammals in the region and are important for both subsistence and sport hunting. One of the hallmarks of the Mulchatna Caribou Herd (MCH) has been its substantial and unpredictable variation in range use during the last 15 years. In view of that variability, baseline information on use of the mine area by caribou during postcalving aggregation is important. The postcalving period from late June to mid-July is when the greatest use of the mine area by the largest numbers of caribou occurs, as documented both by field surveys and by analysis of radio-telemetry data obtained from the MCH Technical Working Group.

Sightings of all species of large mammals on transect surveys, as well as other species (e.g., furbearers) that are encountered incidentally, will be recorded. Field-survey data will provide site-specific information on terrestrial mammal species to supplement the habitat-use information gained from literature review.

Specific objectives include the following:

- Map the distribution and record the abundance of large mammals in the mine study area during the postcalving period for caribou, using aerial-transect surveys in late June and mid-July 2007.
- In consultation with the MCH Technical Working Group, supplement the analysis of caribou movements in the preliminary environmental baseline document using telemetry data collected since the previous data transmittal in mid-2005.
- Collect information on mammals from incidental sightings by other personnel working on the Pebble Project.
- Supplement the mammal information in the environmental baseline document using data collected since 2005.

9.1.1.2 Methods

As in 2004 through 2006, the primary method used to survey large mammal species in the mine area in 2007 will be systematic aerial surveys in a fixed-wing airplane (Cessna 206 or similar) flying at 500 feet above ground level. The 2007 survey area for aerial-transect surveys of mammals in the mine study area (Figure 9.1-1) will be the same as was used in 2005 through 2006 (the survey area was expanded after the 2004 surveys). Two surveys (one day each in late June and in mid-July) will follow established systematic strip transects to provide complete coverage of the mine study area. The survey area will be sampled using simultaneous double counting to calculate a sightability correction factor. The primary species of interest for the surveys in 2007 will be caribou, but all species of mammals will be recorded and mapped opportunistically whenever encountered on surveys. Standard data will be noted (quantity, sex, age, activity), and all mammal locations will be recorded using a global positioning system (GPS) receiver for portrayal on maps created in a geographic information system (GIS). Analysis will focus on enumerating and mapping species seen on the surveys for a general assessment of distribution and relative abundance in the survey area, rather than deriving statistically rigorous estimates of regional populations and densities. Regional density estimates of caribou and brown bear populations are available from the Alaska Department of Fish and Game (ADF&G).

To solicit input from Northern Dynasty Mines Inc. (NDM) staff and contractors working on Pebble Project, wildlife observation log sheets will be posted in common locations at camps for workers to record miscellaneous sightings of large, medium, or small mammals encountered anywhere in the vicinity of the project. This approach, which increases the number of potential observers, was used successfully in 2004 through 2006 at the Pebble Project base in Iliamna and has yielded useful information by taking advantage of the presence of other observers when survey biologists were not present.

9.1.2 Brown Bear Telemetry

9.1.2.1 Introduction

The brown bear is an important species in the region and is susceptible to human harvest and disturbance. Indications from biologists and pilot/guides familiar with the region are that some bears make extensive seasonal movements over large areas of the region, whereas other bears may not move as much. The use of GPS collars elsewhere has proven to be highly effective in delineating seasonal movements and providing detailed data on habitat use and activity of marked individuals. This program element is designed as a cooperative study with ADF&G and the National Park Service (NPS) for tracking brown bear movements in the vicinity of Pebble Project, including both the mine study area and the transportation-corridor study area. The mine and transportation-corridor study areas are transitional zones containing moderate densities of brown bears (Becker, pers. comm., 2006), whereas the coastal area of the Cook Inlet drainages hosts a relatively high-density population, including substantial concentrations on coastal salt marshes and salmon streams (Bennett, 1996; Smith and Partridge, 2004; Putera, 2006; Olson and Putera, 2007). Extensive movements may be undertaken by brown bears between winter denning areas and summer feeding areas, so information on annual and seasonal movements is needed. The objective of the telemetry study is to develop a cooperative plan with ADF&G, NPS, and other stakeholders to deploy satellite-linked GPS collars on both male and female bears to characterize the extent of their annual and seasonal movements in relation to the proposed Pebble Project infrastructure.

This characterization will provide important background data on the size of the area and seasonal time frames within which bears may be affected by the project.

9.1.2.2 Methods

A detailed study plan will be developed in 2007/2008, in cooperation with ADF&G and NPS, to define responsibilities, schedules, field logistics, equipment, and analytical protocols. To characterize the differences between the home ranges and movements of male and female bears (and anticipating possible equipment failure), the preliminary plan is for 10 collars to be deployed on each sex, for a total sample of 20 collars. GPS telemetry is the preferred method of data collection due to its superior locational accuracy compared with satellite telemetry and the greater frequency of relocations compared with conventional VHF telemetry.

The preliminary plan is to allocate collars equally among males and females in both the mine study area and transportation corridor study area, but practical constraints in locating and capturing animals may intervene. The capture and collaring operation is tentatively planned for spring (May and/or June) 2008, subject to agreements with ADF&G and NPS. The preliminary plan is for capture and collaring of bears to be conducted by ADF&G personnel using an NDM-chartered helicopter based at Iliamna; NPS and ABR Inc. will provide fixed-wing aircraft and personnel to support the collaring operation.

The radio-collar model to be used is the TGW-3680 GEN-3 Store-on-Board (SOB) configuration with Argos uplink (manufactured by Telonics, Inc., Mesa, AZ), with a full cast to resist submersion and equipped with tip switches to record activity counts. Location fixes would be acquired by the GPS receivers six times per day (four-hr intervals) during spring through fall (mid-April to mid-November). Collars would be up-linked once a day to a satellite to transmit location fixes via the Argos satellite data-collection system (operated by CLS America, Largo, MD). Collar operation would be suspended during the winter denning period (mid-November to mid-April) to preserve battery life and reduce data-distribution costs; collars would be programmed to restart in spring at about the time of den emergence.

It is expected that battery life will allow deployment for up to two years before the collar would be retrieved. At that time, all final GPS data stored in the collar receiver would be downloaded for detailed spatial analyses using GIS. Data obtained via satellite uplink and distribution before collar retrieval would provide adequate information for interim reporting and for adapting or modifying study design, but the final data would provide the most accurate movement data, free of potential distortion from the satellite transfer. In case of collar loss or failure, the interim data would serve as the final data set for analyses.

Radio-collars would be equipped with standard VHF transmitters to allow conventional relocation by aerial radio-tracking. Bears would be tracked periodically by NPS to check on the status of dependent cubs accompanying collared sows and to record data on behavior and social interactions, such as during the breeding season and at seasonal feeding concentrations in coastal marshes and at salmon-spawning streams.

Analytical methods would employ fixed-kernel home-range analysis to map and characterize annual and seasonal range-use patterns by each collared bear. Data to be analyzed include daily and seasonal movement rates and activity counts, extent of seasonal movements to feeding concentration areas and to denning areas, and extent of travel during the breeding season. Areas of recurring use would be identified. The use of specific areas during different seasons would be quantified by tallying and comparing

locations among map grid-cells and distance zones around the mine facilities and the transportation-corridor alignment, providing both characterization of current use and a basis for post-construction comparisons. Once mapping of wildlife habitat types has been completed, bear location data could be examined in terms of the frequency of relocation in specific habitat types. The final data could be used to develop spatially explicit movement models for analysis and monitoring of bear movements and distribution. Existing land-cover mapping could be used for areas outside of the wildlife habitat-mapping study areas for the mine and transportation corridor.

9.1.3 Trace Element Sampling of Mammalian Tissue

9.1.3.1 Introduction

Sampling for trace elements currently is being performed in various environmental media, vegetation, and tissues of fish and bivalve mollusks to provide baseline characterization for the Pebble Project. To date, no sampling of mammal tissue has been done for the Pebble Project, but a perceived need for such sampling was stated at the May 2005 community leaders' meeting in Anchorage and in ADF&G's comments on the 2006 study plan. Specifically, community leaders voiced concern about the safety of consuming game animals after mine development, and ADF&G called for sampling to establish baseline levels of trace elements that have the potential to increase in the environment with mining activity (Brookover, 2006).

The current goal of this task is to develop a plan to provide baseline data on the concentration of possible contaminants (heavy metals and mercury) in body tissues of selected mammal species that are important for human subsistence harvest and for their ecological role in the region. The plan will be developed in cooperation with ADF&G, NPS, the U.S. Fish and Wildlife Service (USFWS), the National Oceanic and Atmospheric Administration (NOAA), the Alaska Native Harbor Seal Commission (ANHSC), local hunters, and other technical consultants working on the Pebble Project. The focus of the plan will be to obtain and analyze samples from selected species of terrestrial mammals (including omnivores, carnivores, and herbivores) and harbor seals (Iliamna Lake population).

A preliminary tissue-sampling program was developed through consultation with technical experts from ADF&G, SLR International, and Shaw Alaska, Inc., and will be refined through further consultation with a technical working group to be formed in 2007. The goal of the mammal-tissue sampling program is to quantify baseline levels of trace elements in the terrestrial species inhabiting the mine area, as well as in harbor seals inhabiting Iliamna Lake. Noninvasive sampling is preferred, focusing on external organs such as hair and vibrissae (whiskers) rather than internal organs, but blood samples also will be collected for analysis.

Sampling efforts for seals will be coordinated with NOAA and the ANHSC. A site visit to Pedro Bay, Iliamna, and Newhalen is planned to solicit local/traditional knowledge regarding the population of harbor seals in Iliamna Lake. A qualified local biosampling technician will be sought from ANHSC to collect tissue samples from seals harvested for subsistence; no additional hunting effort is planned or intended beyond the normal subsistence harvest. This effort is tentatively scheduled to occur as lake seals are harvested during fall and winter 2007/2008. This work will be coordinated with the ANHSC, a co-management group with specific interest and experience in such work under the Marine Mammal Protection Act (MMPA). After acquiring the necessary MMPA permits from NOAA, researchers will

seek to collect samples of vibrissae; blood; and muscle, kidney, and liver tissue from harvested seals to be analyzed for trace elements. Additional tissue from each seal harvested will be collected and submitted to the National Marine Fisheries Service, Southwest Fisheries Science Center (La Jolla, California) for genetic characterization; these samples may be useful in examining the extent of genetic exchange between the lake population and the marine population of harbor seals in Bristol Bay. If possible, tissue samples from up to 10 seals will be collected.

9.1.3.2 Methods

Mammal-tissue sample collection, sample processing procedures, containers, handling, chain-of-custody, holding times, and quality assurance/quality control are described in the draft 2007 field sampling plan (under development). A draft of the 2007 field sampling plan for harbor seals in Iliamna Lake has been reviewed by NOAA, ADF&G, and USFWS. Finalization of the plan depends on input from the technical working group.

A qualified commercial analytical laboratory will use standard Environmental Protection Agency methods to quantify trace elements. Mammalian tissue samples will be tested for the same analytes that have been established for the fish-tissue and mollusk sampling programs: antimony (Sb), arsenic (As), beryllium (Be), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), molybdenum (Mo), nickel (Ni), selenium (Se), silver (Ag), thallium (Tl), and zinc (Zn). The analytical methods described in the draft field sampling plan were selected through consultation with Sean Farley (ADF&G, Anchorage, AK), Alan Koenig (U.S. Geological Survey, Denver, CO), Jane Whitsett (Shaw Alaska, Inc., Anchorage, AK), and Lynda Huckestein (Columbia Analytical Services, Kelso, WA).

9.2 Raptors— Mine Study Area

No field surveys for raptors will be conducted in 2007. Surveys for nesting raptors were conducted in 2004 and 2005, as described in Chapter 9 of the study plans for those years (NDM, 2004, 2005).

9.3 Waterbirds— Mine Study Area

No field surveys for waterbirds will be conducted in 2007. Surveys for migrating and nesting waterbirds were conducted in 2004 and 2005, as described in Chapter 9 of the study plans for those years (NDM, 2004, 2005).

9.4 Landbirds and Shorebirds— Mine Study Area

No field surveys for breeding landbirds and shorebirds will be conducted in 2007. Surveys for these bird groups were conducted in 2004 and 2005, as described in Chapter 9 of the study plans for those years (NDM, 2004, 2005).

9.5 Wildlife Habitat Mapping— Mine Study Area

No field surveys for the wildlife habitat mapping work will be conducted in 2007. Field data were collected in 2004 and 2005, as described in the study plans for those years (NDM, 2004, 2005), and digital mapping of habitats is being conducted now. ABR Inc. is using vegetation mapping being

conducted by Three Parameters Plus and will add information on physiography and surface form to the vegetation data to yield a multivariate map of wildlife habitats for the mine studies area.

9.6 Wood Frogs— Mine Study Area

9.6.1 Introduction

The goals of this study are as follows:

- To assess habitat suitability for wood frogs (*Rana sylvatica*) in the Pebble Project study area.
- To determine the presence or absence (occupancy) of wood frogs in a range of waterbody types in the project study area.

Declines in amphibian populations have been occurring worldwide for several decades, due in part to alterations of development from water-born contaminants and increases in surface water acidity from industrial activities (Blaustein and Wake, 1990; Wyman, 1990), and possibly also due to increases in ultraviolet radiation from reductions in the earth's ozone layer (Blaustein et al. 1994). There is general consensus that such declines have not occurred to a great degree in the wood frog populations in Alaska (the only amphibian species ranging north of southeast Alaska; Hodge, 1976), because water quality and amphibian habitats in the state are generally in pristine condition. (Note that global effects, such as a thinning ozone layer and global warming, may still present a problem for Alaskan frogs.) Monitoring efforts for wood frog populations in Alaska, however, have been initiated only recently, and there is growing interest in determining population levels, if only to serve as controls in evaluating the declines occurring in other amphibian species in more developed regions of the world. In the first wide-ranging study of wood frogs in southcentral Alaska, Gotthardt (2004) found the species to be "widespread and abundant" in the more developed portions of the Cook Inlet region. Indications are that the species is less common farther west in Alaska, but few surveys have been conducted there.

The 2007 wood frog study for Pebble Project will consist of an office-based assessment of wood frog habitat in the vicinity of Pebble Project coupled with occupancy field surveys to evaluate the occurrence of the species in the area. A literature search will be conducted to determine habitat use by wood frogs in Alaska and also to compile occurrence data for the region of the Pebble Project (some data already exist on wood frog occurrence from wildlife and fisheries surveys in the area). Then in May 2007, field surveys will be conducted to determine the occupancy of the species in a range of suitable habitats. When the wildlife habitat mapping is complete for the Pebble Project, the results of this study will allow an evaluation of the potential for the species to occur across the project study area based on the presence of suitable habitat.

9.6.2 Methods

In spring 2007, a literature review will be conducted specifically for evaluation of habitat use by wood frogs in Alaska and in other boreal forest environments in North America. A summary of habitat use will be compiled, and habitats used by wood frogs in other studies will be equated to those known to occur in the Pebble Project study area.

Using the 2004 aerial photography and the mapped hydrology for the area, scientists will identify waterbody habitats to sample in the study area. The mine study area for wood frogs will be the same as that used for wildlife habitat mapping (Figure 9.1-2), and the waterbody types will be the strata in which sample points will be randomly located. The actual survey points will be located at the edge of each waterbody and will be determined using stratified, random methods in a GIS. Sample sites will be accessed by helicopter and on foot by navigating to pre-determined GPS coordinates for each survey point.

Field surveys for calling male frogs will be conducted most likely in early May 2007. The timing of the surveys will be finalized in late April when an assessment of snowmelt and waterbody-ice conditions in the study area can be made. The surveys will focus on determining the presence of the species and will follow the protocol of the North American Amphibian Monitoring Program (NAAMP, 2004), with modifications in timing for the long afternoon and dusk periods in Alaska. No systematic sampling efforts will be made to quantify the number of frogs present, although qualitative indexes of abundance will be made using the Wisconsin calling index (NAAMP, 2004; Gotthardt, 2004). Occupancy sampling likely will involve either a double-sampling scheme or a removal-sampling scheme following the methods for occupancy studies outlined in MacKenzie and Royle (2005) and MacKenzie et al. (2006). A final decision on the specific occupancy study design to be used will be made following an evaluation of the number and dispersion of waterbodies throughout the study area. Surveys will be kept short (five minutes) to enable a greater number of habitats to be surveyed in a given day. Data analysis to determine probability of occupancy in the waterbody types in the study area will be conducted using the program *PRESENCE* Version 2.0. The use of co-variates (such as air temperature and cloud cover) will be considered in the analysis to improve the estimates of occupancy rate.

When the wildlife habitat mapping is complete (not expected until 2008), researchers will evaluate the potential for wood frogs to occur in appropriate habitats across the Pebble Project study area. Using these mapped habitats and the occupancy data for the project study area from 2007, it should be reasonable to extrapolate and predict the occurrence of the species in a range of habitats throughout the project study area. With this information, the acreage of suitable wood frog habitat in the project study area can be determined.

9.7 Harbor Seals—Iliamna Lake

9.7.1 Introduction

No transect surveys of terrestrial mammals will be conducted in the transportation corridor in 2007, but aerial surveys of harbor seal haul-out sites in Iliamna Lake will be conducted (Figure 9.2-1). This effort will be coordinated with similar aerial surveys of harbor seals using marine haul-out sites in the coastal bays near the possible port site (Chapter 12). The 2007 study of Iliamna Lake seals will provide a second year of baseline survey data for this high-profile but poorly documented population of harbor seals, which is one of very few populations of lake seals known in the world.

Tissue sampling of seals in Iliamna Lake is described in Section 9.1.3, above.

9.7.2 Methods

Known haul-out sites reported by previous researchers and confirmed in 2005 will be surveyed in 2007. The same survey method will be used for harbor seals in Iliamna Lake as for harbor seals in the coastal bays (see Chapter 12 for details). A pilot and two observers will count seals between May and October from a Cessna 206 airplane (or suitable substitute) flying at an altitude of 1,000 feet above ground level. Observers will use photography to record groups of more than 20 seals for later correction of counts, if necessary. Fewer surveys (12 instead of 22) will be flown of the lake haul-out sites than of the marine haul-outs. The period of greatest interest is the month of August, which available data indicate encompasses the peak haul-out period.

9.8 Raptors—Transportation Corridor

No field surveys for raptors will be conducted in 2007. Surveys for nesting raptors were conducted in 2004 and 2005, as described in Chapter 9 of the study plans for those years (NDM, 2004, 2005).

9.9 Waterbirds—Transportation Corridor

No field surveys for waterbirds will be conducted in 2007. Surveys for migrating and nesting waterbirds were conducted in 2004 and 2005, as described in Chapter 9 of the study plans for those years (NDM, 2004, 2005).

9.10 Landbirds and Shorebirds—Transportation Corridor

No field surveys for breeding landbirds and shorebirds will be conducted in 2007. Surveys for these bird groups along the transportation corridor were conducted only in 2005, as described in Chapter 9 of the study plan for that year (NDM, 2005).

9.11 Wildlife Habitat Mapping—Transportation Corridor

No field surveys for the wildlife habitat mapping work will be conducted in 2007. Field data were collected in 2004 and 2005 and digital mapping of habitats is being conducted now. ABR Inc. is using the vegetation mapping being conducted by HDR, Inc., and will add information on physiography and surface form to the vegetation data to yield a multivariate map of wildlife habitats for the transportation-corridor area.

9.12 Wood Frogs—Transportation Corridor

The wood frog survey is described in Section 9.6. The transportation-corridor study area for wood frogs will be the same as that used for wildlife habitat mapping (Figure 9.2-2).

9.13 References

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TABLE

TABLE 9-1
Pebble Project Environmental Studies
Study Summary for Wildlife, 2004-2007
Consultant: ABR, Inc.

Discipline	2004 Data Collected or Tasks	2005 Data Collected or Tasks	2006 Data Collected or Tasks	2007 Tasks to be Completed
Mammals	**Mine Studies Area**			
	Information Gathering / Literature Search	Information Gathering / Literature Search & Review	Information Gathering / Literature Search & Review	Information Gathering / Literature Search & Review
	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	2006 Study Plan Summary	2007 Study Plan Summary
	Aerial Transect Surveys (1 each in April, May, July, August, October, November)	Aerial Transect Surveys (1 in March, 2 in May, 1 in June, 1 in July, 1 in August, 1 in October, 1 in December)	Aerial Transect Surveys (2 in May, 1 in June, 1 in July)	Aerial Transect Surveys (1 in June, 1 in July)
	Bear Den Survey (August)	Bear Den Surveys (1 each in May and July)	Bear Den Surveys (1 each in May and July)	Bear Den Survey (if warranted by field observations)
		Beaver Cache Survey in mine area (1 in October)		
		Mulchatna Caribou Herd Telemetry Data Analysis	Mulchatna Caribou Herd Telemetry Data Analysis	Continue Mulchatna Caribou Herd Telemetry Data Analysis with Additional Data
	Preliminary Impact Analysis of Mine Development Scenarios and Mitigation Planning	Initial Environmental Analysis of Mine Development Concepts and Mitigation Planning	Input to Preliminary Environmental Evaluation Document	Further Input for Environmental Sensitivity Analysis
				Plan Brown Bear GPS Telemetry Study
				Develop Plan for Baseline Trace Elements Analysis of Tissues from Terrestrial Mammals, and Begin Collecting Tissue Samples from Harbor Seals in Iliamna Lake
	Data Entry and Analysis	Data Entry and Analysis	Data Entry and Analysis	Data Entry and Analysis
	Communication and Data Management	Communication and Data Management	Communication and Data Management	Communication and Data Management
	Coordination with NDM, Agency Meetings	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting
		2004 Progress Report	Draft Environmental Baseline Document	Draft Environmental Baseline Document

Discipline	2004 Data Collected or Tasks	2005 Data Collected or Tasks	2006 Data Collected or Tasks	2007 Tasks to be Completed
Raptors	**Mine Studies Area**			
	Information Gathering / Literature Search	Information Gathering / Literature Search & Review	Information Gathering / Literature Search & Review	
	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Recommendations	Scope, Schedule, Field Sampling Recommendations
	2004 Study Plan	2005 Study Plan	2006 Study Plan Summary	
	Aerial Surveys for Tree-nesting Raptors (April)	Aerial Surveys to Determine Occupancy (May)		
	Aerial Surveys for Cliff-nesting Raptors (May-June)	Aerial Surveys to Determine Nesting Success and Productivity (June-August)		
		Aerial Surveys for Wintering Bald Eagles (November and February)		
	Preliminary Impact Analysis of Mine Development Scenarios and Mitigation Planning	Initial Environmental Analysis of Mine Development Concepts and Mitigation Planning	Input to Preliminary Environmental Evaluation Document	
	Data Entry and Analysis	Data Entry and Analysis	Data Analysis	
	Communication and Data Management	Communication and Data Management	Communication and Data Management	Communication
	Coordination with NDM, Agency Meetings	Coordination with NDM, agency meetings, and monthly reporting	Coordination with NDM, agency meetings, and monthly reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting
		2004 Progress Report	Draft Environmental Baseline Document	Draft Environmental Baseline Document
Waterfowl	**Mine Studies Area**			
	Information Gathering / Literature Search	Information Gathering / Literature Search & Review	Information Gathering / Literature Search & Review	
	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Recommendations	Scope, Schedule, Field Sampling Recommendations
	2004 Study Plan	2005 Study Plan	2006 Study Plan Summary	
	Spring and Fall Waterfowl Migration Surveys (April, May, Sept, Oct)	Spring and Fall Migration Surveys (April, May, August, Sept, Oct)		
	Breeding Waterfowl Surveys (early June)	Breeding Waterfowl Surveys (late May)		
	Breeding Swan Surveys (early June)	Breeding Swan Surveys (late May)		
	Breeding Harlequin Duck Surveys (May)	Breeding Harlequin Duck Surveys (May)		
	Brood-rearing Harlequin Duck Surveys (July)	Brood-rearing Harlequin Duck Surveys (July, August)		
	Brood-rearing Waterfowl Surveys (July)	Brood-rearing Waterfowl Surveys (July)		
		Breeding Gull Surveys (June)		
		Molting Waterfowl Surveys (July, August)		
	Preliminary Impact Analysis of Mine Development Scenarios and Mitigation Planning	Initial Environmental Analysis of Mine Development Concepts and Mitigation Planning	Input to Preliminary Environmental Evaluation Document	
	Data Entry and Analysis	Data Entry and Analysis	Data Analysis	
	Communication and Data Management	Communication and Data Management	Communication and Data Management	Communication
	Coordination with NDM, Agency Meetings	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting
		2004 Progress Report	Draft Environmental Baseline Document	Draft Environmental Baseline Document

Discipline	2004 Data Collected or Tasks	2005 Data Collected or Tasks	2006 Data Collected or Tasks	2007 Tasks to be Completed
Breeding Birds	**Mine Studies Area**			
	Information Gathering / Literature Search	Information Gathering / Literature Search & Review	Information Gathering / Literature Search & Review	
	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Recommendations	Scope, Schedule, Field Sampling Recommendations
	2004 Study Plan	2005 Study Plan	2006 Study Plan Summary	
	Breeding Bird Point-Count Surveys (June)	Breeding Bird Point-Count Surveys (June)		
	Preliminary Impact Analysis of Mine Development Scenarios and Mitigation Planning	Initial Environmental Analysis of Mine Development Concepts and Mitigation Planning	Input to Preliminary Environmental Evaluation Document	
	Data Entry and Analysis	Data Entry and Analysis	Data Analysis	Data Analysis
	Communication and Data Management	Communication and Data Management	Communication and Data Management	Communication
	Coordination with NDM, Agency Meetings	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting
		2004 Progress Report	Draft Environmental Baseline Document	Draft Environmental Baseline Document
Habitat Mapping	**Mine Studies Area**			
	Information Gathering / Literature Search	Information Gathering / Literature Search	Information Gathering / Literature Search	
	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Plan	Scope, Schedule	Scope, Schedule
	2004 Study Plan	2005 Study Plan	2006 Study Plan Summary	
	Habitat Surveys to Ground Truth Aerial Photography (August)	Habitat Surveys to Ground Truth Aerial Photography (August)		
	Map Coordination with 3PP	Map Coordination with 3PP	Map Coordination with 3PP	Map Coordination with 3PP
	Data Entry and Analysis	Data Entry and Analysis	Data Analysis and Digital Habitat Mapping	Data Analysis and Digital Habitat Mapping
	Communication and Data Management	Communication and Data Management	Communication and Data Management	Communication and Data Management
	Coordination with NDM, Agency Meetings	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting
		2004 Progress Report		
Rare Plant Occurrence Potential	**Mine Studies Area**			
		Information Gathering	Information Gathering	
	Scope	Scope, Schedule	Scope, Schedule	
		2005 Study Plan	2006 Study Plan Summary	
		Data Compilation and Analysis	Data Compilation and Analysis	
			Draft Environmental Baseline Document	
Wood Frogs	**Mine Studies Area**			
				Information Gathering / Literature Search & Review
				Scope, Schedule, Field Sampling Plan
				2007 Study Plan Summary
				Presence/absence Surveys (mid-May)
				Data Analysis
				Communication and Data Management
				Coordination with NDM, Agency Meetings, and Monthly Reporting
				Draft Environmental Baseline Document

Discipline	2004 Data Collected or Tasks	2005 Data Collected or Tasks	2006 Data Collected or Tasks	2007 Tasks to be Completed
Harbor Seals	**Iliamna Lake**			
		Information Gathering / Literature Search & Review	Information Gathering / Literature Search & Review	Information Gathering / Literature Search & Review
		Scope, Schedule, Field Sampling Plan		Scope, Schedule, Field Sampling Plan
		2005 Study Plan		Study Plan
		Aerial Transect Surveys (May-October)		Aerial Surveys of Harbor Seal Haul-outs in Iliamna Lake (12 total; May-October)
		Communication and Data Management	Communication and Data Management	Communication and Data Management
		Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting
		Draft Environmental Baseline Document	Draft Environmental Baseline Document	Draft Environmental Baseline Document
Mammals	**Transportation Corridor**			
	Information Gathering / Literature Search	Information Gathering / Literature Search & Review	Information Gathering / Literature Search & Review	(See above for information on harbor seal surveys in Iliamna Lake, now listed under a separate task)
	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Recommendations	
	2004 Study Plan	2005 Study Plan	2006 Study Plan Summary	
	Aerial Reconnaissance Surveys (1 each in April, May, July, August, October, November)	Aerial Transect Surveys (1 in March, 2 in May, 1 in June, 1 in July, 1 in August, 1 in October, 1 in December)		
	Aerial Survey of Bears on Salmon Spawning Streams (1 in August)			
			Beaver Cache Survey in transportation corridor (1 in October)	
	Data Entry and Analysis	Data Entry and Analysis	Data Analysis	Data Analysis
	Communication and Data Management	Communication and Data Management	Communication and Data Management	Communication and Data Management
	Coordination with NDM, Agency Meetings	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting
		2004 Progress Report	Draft Environmental Baseline Document	Draft Environmental Baseline Document
			Planning for Cooperative Survey Efforts with Agencies	Planning for Cooperative Survey Efforts with Agencies

Discipline	2004 Data Collected or Tasks	2005 Data Collected or Tasks	2006 Data Collected or Tasks	2007 Tasks to be Completed
Raptors	**Transportation Corridor**			
	Information Gathering / Literature Search	Information Gathering / Literature Search & Review	Information Gathering / Literature Search & Review	
	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Recommendations	Scope, Schedule, Field Sampling Recommendations
	2004 Study Plan	2005 Study Plan	2006 Study Plan Summary	
	Aerial Surveys for Tree-nesting Raptors (April)	Aerial Surveys to Determine Occupancy (May)		
	Aerial Surveys for Cliff-nesting Raptors (May-June)	Aerial Surveys to Determine Nesting Success and Productivity (June-August)		
		Aerial Surveys for Wintering Bald Eagles (November and February)		
	Data Entry and Analysis	Data Entry and Analysis	Data Analysis	
	Communication and Data Management	Communication and Data Management	Communication and Data Management	Communication
	Coordination with NDM, Agency Meetings	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting
		2004 Progress Report	Draft Environmental Baseline Document	Draft Environmental Baseline Document
Waterfowl	**Transportation Corridor**			
	Information Gathering / Literature Search	Information Gathering / Literature Search & Review	Information Gathering / Literature Search & Review	
	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Recommendations	Scope, Schedule, Field Sampling Recommendations
	2004 Study Plan	2005 Study Plan	2006 Study Plan Summary	
	Spring and Fall Waterfowl Migration Surveys (April, May, Sept, Oct)	Spring and Fall Migration Surveys (April, May, August, Sept, Oct)		
	Breeding Waterfowl Surveys (early June)	Breeding Waterfowl Surveys (late May)		
	Breeding Swan Surveys (early June)	Breeding Swan Surveys (late May)		
	Breeding Harlequin Duck Surveys (May)	Breeding Harlequin Duck Surveys (May)		
		Brood-rearing Harlequin Duck Surveys (July, August)		
	Data Entry and Analysis	Data Entry and Analysis	Data Analysis	
	Communication and Data Management	Communication and Data Management	Communication and Data Management	Communication
	Coordination with NDM, Agency Meetings	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting
		2004 Progress Report	Draft Environmental Baseline Document	Draft Environmental Baseline Document

Discipline	2004 Data Collected or Tasks	2005 Data Collected or Tasks	2006 Data Collected or Tasks	2007 Tasks to be Completed
Breeding Birds	**Transportation Corridor**			
	Information Gathering / Literature Search	Information Gathering / Literature Search & Review	Information Gathering / Literature Search & Review	
	Scope, Schedule	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Recommendations	Scope, Schedule, Field Sampling Recommendations
	2004 Study Plan	2005 Study Plan	2006 Study Plan Summary	
		Breeding Bird Point-Count Surveys (June)		
		Data Entry and Analysis	Data Analysis	
	Communication and Data Management	Communication and Data Management	Communication and Data Management	Communication
	Coordination with NDM, Agency Meetings	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting
		2004 Progress Report	Draft Environmental Baseline Document	Draft Environmental Baseline Document
Habitat Mapping	**Transportation Corridor**			
	Information Gathering / Literature Search	Information Gathering / Literature Search	Information Gathering / Literature Search	
	Scope, Schedule, Field Sampling Plan	Scope, Schedule, Field Sampling Plan	Scope, Schedule	Scope, Schedule
	2004 Study Plan	2005 Study Plan	2006 Study Plan Summary	
	Habitat Surveys to Ground Truth Aerial Photography (August)	Habitat Surveys to Ground Truth Aerial Photography (August)		
	Map Coordination with HDR	Map Coordination with HDR	Map Coordination with HDR	Map Coordination with HDR
	Data Entry and Analysis	Data Entry and Analysis	Data Analysis and Digital Habitat Mapping	Data Analysis and Digital Habitat Mapping
	Communication and Data Management	Communication and Data Management	Communication and Data Management	Communication and Data Management
	Coordination with NDM, Agency Meetings	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting	Coordination with NDM, Agency Meetings, and Monthly Reporting
		2004 Progress Report		
Rare Plant Occurrence Potential	**Transportation Corridor**			
		Information Gathering	Information Gathering	
	Scope	Scope, Schedule	Scope, Schedule	
		2005 Study Plan	2006 Study Plan Summary	
		Data Compilation and Analysis	Data Compilation and Analysis	
			Draft Environmental Baseline Document	
Wood Frogs	**Transportation Corridor**			
				Information Gathering / Literature Search & Review
				Scope, Schedule, Field Sampling Plan
				2007 Study Plan Summary
				Presence/absence Surveys (mid-May)
				Data Analysis
				Communication and Data Management
				Coordination with NDM, Agency Meetings, and Monthly Reporting
				Draft Environmental Baseline Document

FIGURES

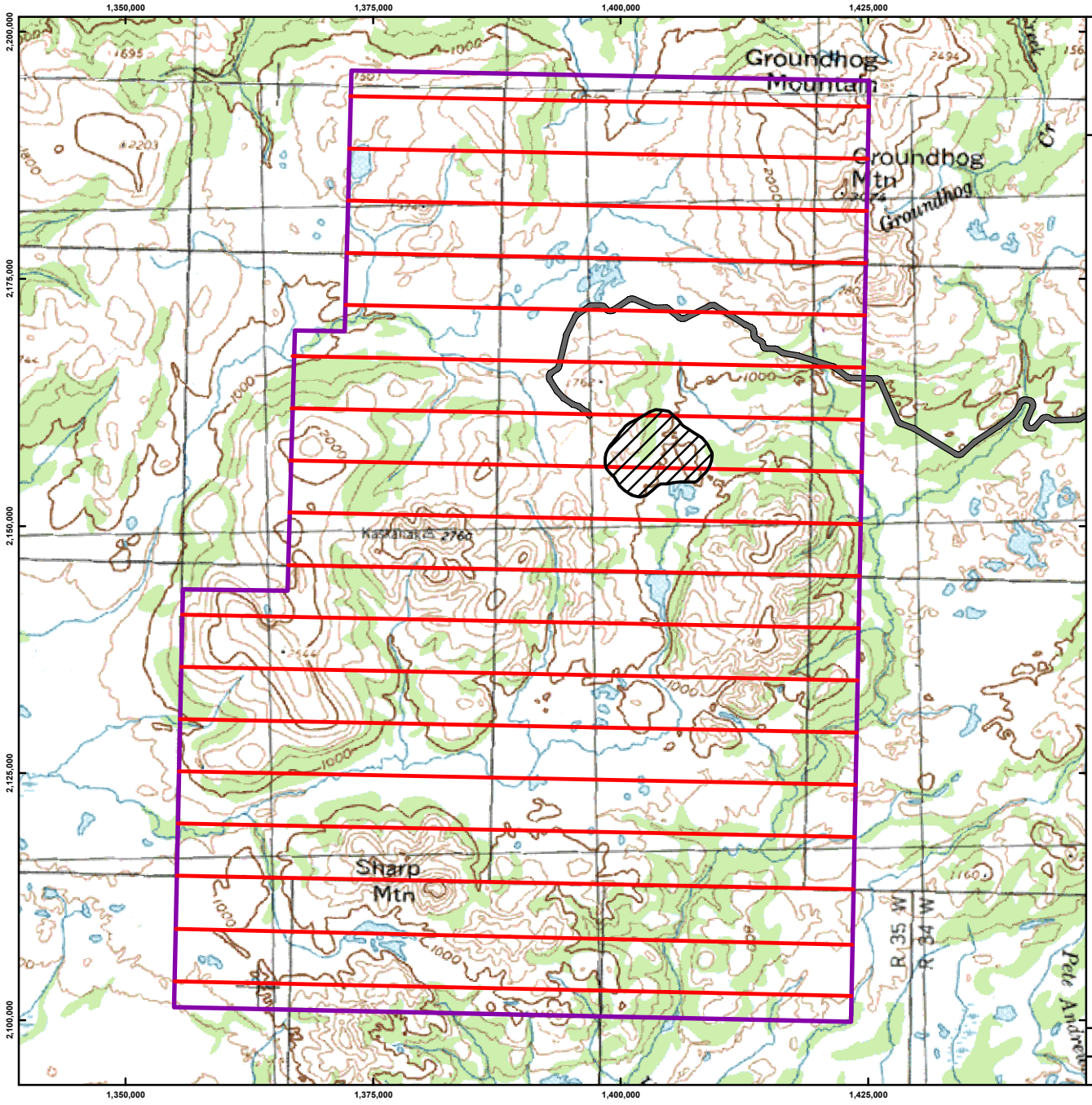

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Figure 9.1-1.
Aerial-Survey Transects
for Large Mammals,
Mine Study Area,
2007

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Large Mammal Survey Area

- 2007 Aerial-Survey Transect
- 2007 Mine Transect Survey Area
- General Pit Outline
- Possible Road Alignment

Miles 0 1 2 3 4
Kilometers 0 2 4 6
N

Scale 1:190,000

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

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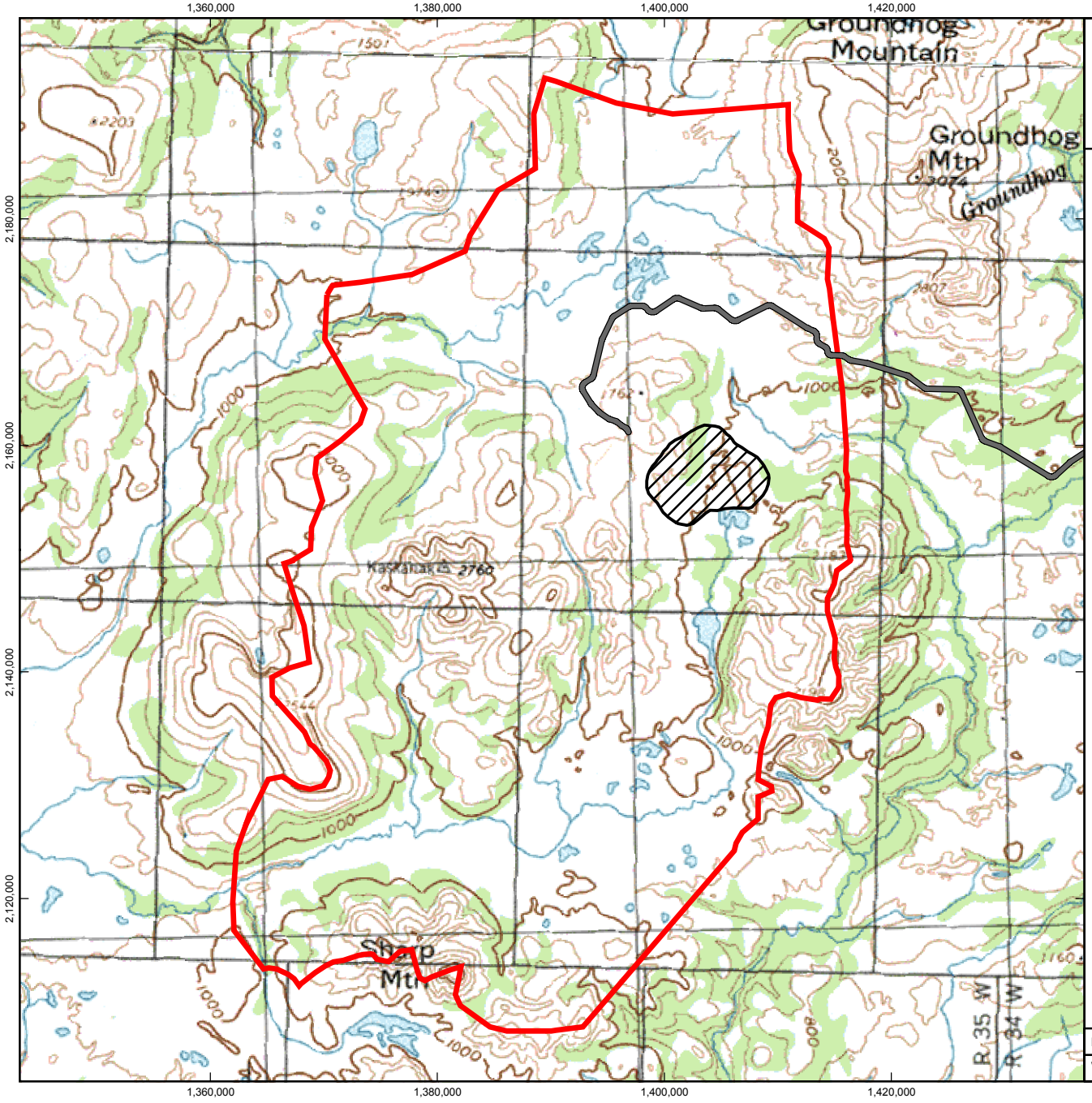

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Figure 9.1-2.
Mapping Area
for Wildlife Habitats,
Mine Study Area, 2007

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Legend

- 2007 Mapping Area for Wildlife Habitats
- General Pit Outline
- Possible Road Alignment

Miles 0 1 2 3 4

Kilometers 0 1 2 3 4 5 6

N

Scale 1:165,000

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

File: HabMapping_Mine_StudyPlan07_07-170-1.mxd	Date: Feb. 23, 2007
Version: 1	Author: ABR-AZC

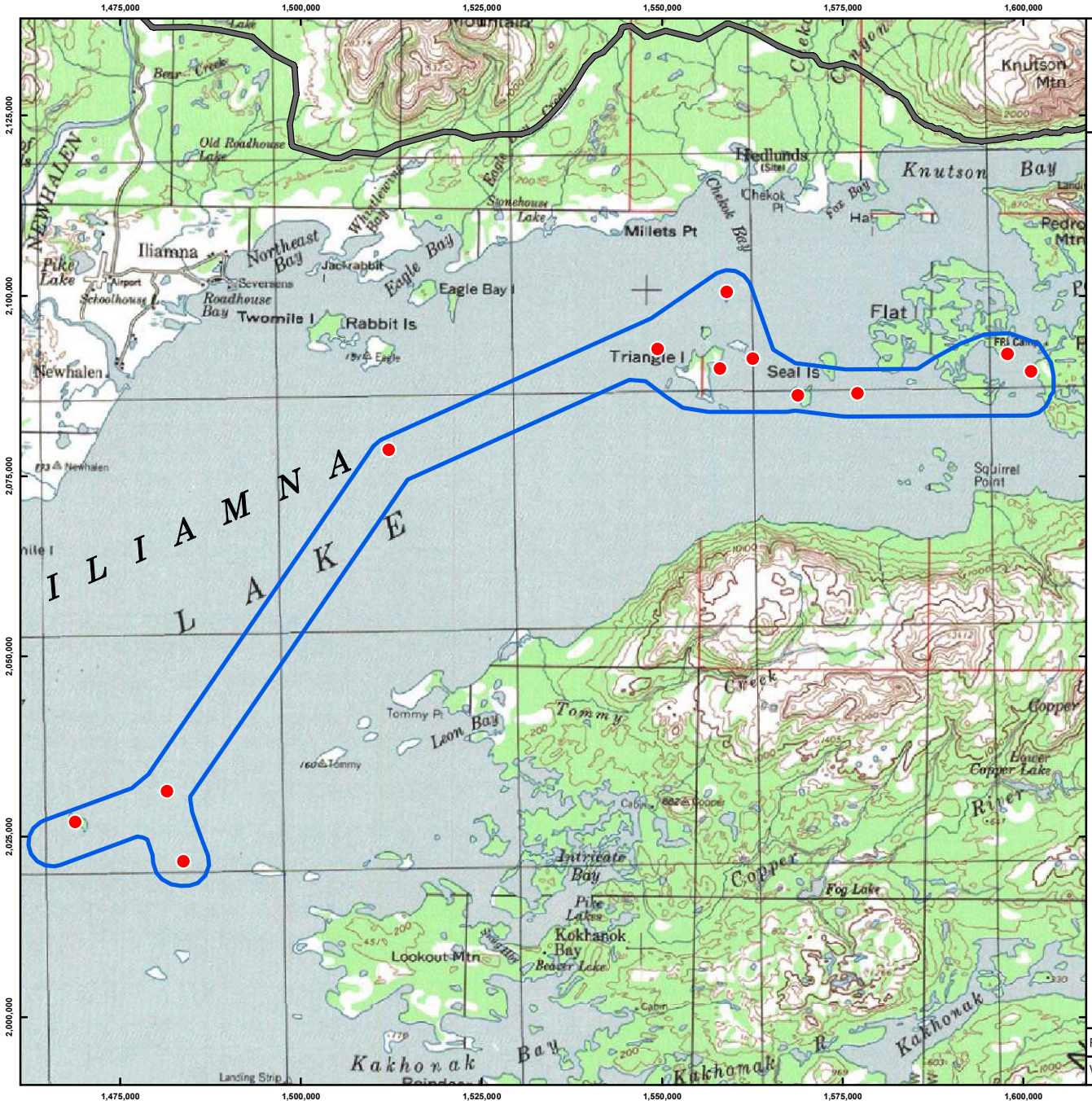

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Figure 9.2-1.
Survey Area for Harbor Seals,
Iliamna Lake, 2007

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Survey Area

- 2007 Iliamna Lake Seal Survey Area
- Harbor Seal Haulout
- Possible Road Alignment

Miles 0 1 2 3 4 5 6
Kilometers 0 2 4 6 8 10
N

Scale 1:260,000
Alaska State Plane Zone 5 (units feet)
1983 North American Datum

File: IliamnaLake_Seals_StudyPlan07_07-170-1-2.mxd	Date: Feb. 26, 2007
Version: 1	Author: ABR-AZC

1,400,000 1,450,000 1,500,000 1,550,000 1,600,000

2,150,000

2,100,000

2,100,000

2,050,000

1,650,000 1,700,000 1,750,000 1,800,000 1,850,000

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Figure 9.2-2.
Mapping Area for Wildlife Habitats, Transportation-corridor Study Area, 2007

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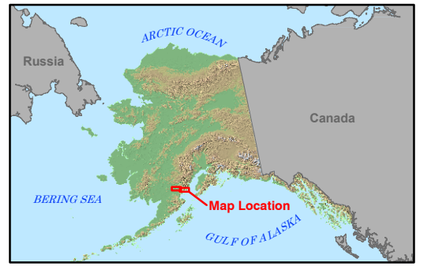
Legend

- 2007 Mapping Area for Wildlife Habitats (2000-ft road corridor)
- General Pit Outline
- Possible Submarine Powerline
- Possible Port Site



0 2 4 6 8 10 Miles

0 2 4 6 8 10 12 Kilometers

N

Scale 1:260,000

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

File: HabMapping_Rd_StudyPlan07_07-170-1.mxd	Date: Feb. 23, 2007
Version: 1	Author: ABR-AZC