

**ATTACHMENT D
GRAVEL SITE MINING AND REHABILITATION PLAN**

**MINING AND REHABILITATION PLAN
LIBERTY GRAVEL MINE SITE
NORTH SLOPE, ALASKA**

BP Exploration (Alaska) Inc.
April 2007

INTRODUCTION

A gravel mine site is required to supply an estimated 1,000,000 cubic yards of gravel for the Liberty Development Project consisting primarily of an expansion to the existing Endicott satellite drilling island (SDI).

The goal for the mine site preparation, operation, subsequent closure and rehabilitation is to minimize tundra disturbance.

The following figures provide additional information regarding the mine site development and rehabilitation:

- Figure 1 shows the vicinity of the proposed mine site
- Figure 2 shows the location of the proposed mine site and overburden storage areas.
- Figure 3 shows the proposed mine site cross sections.
- Figure 4 shows the mine site grading after excavation and features of the rehabilitation plan.
- Figure 5 shows a typical cross section through the rehabilitated mine site.

The proposed Liberty mine site will disturb approximately 63 acres. This includes a staging area for mining activities, overburden storage areas and the anticipated excavation surface area of approximately 18 acres.

The final area affected by the mining activity may be reduced if less gravel is required than is currently anticipated.

EXISTING CONDITIONS

The proposed Liberty mine site will be located in the eastern operating area of the Prudhoe Bay Unit (EOA/PBU), approximately 7.5 miles northeast of the Deadhorse

Airport. The proposed mine site is adjacent to the existing Duck Island Mine Site at South ½ Section 6, North ½ Section 7, Township 10 North, Range 16 East, Umiat Meridian.

This site was chosen after field geotechnical investigations of several alternative mine sites near the Endicott Road to confirm gravel quality and quantity.

The mine site is still in the planning stages as part of the Liberty Development Project SDI island expansion, therefore, at this stage of the development some flexibility is required regarding mining and rehabilitation plans.

A geotechnical characterization of the material source has been conducted but no development has yet occurred at the site. The attached figures are provided for information and guidance and should not be regarded as depicting the final mine site configuration. The outer perimeter boundary shown in the figures describe the maximum aerial extent of the mine site for permitting requirements. The revegetation performance standards are listed in Table 2.

Permits authorizing the proposed mining plan are as follows:

- U.S. Army Corps of Engineers (Section 404)
- Alaska Department of Natural Resources (Material Sale Contract)
- North Slope Borough (Development Permit)

MINING PLAN

General

The mine site will provide gravel to satisfy the expansion of the existing SDI to accommodate new facilities and the drilling operations. It is anticipated that gravel will be mined from the site over two winter seasons so that any extra gravel required due to settlement at the SDI can be made up prior to the arrival of the drilling equipment. Gravel may also be required for bridge abutments at the West Sagavanirktok River and road approaches.

The excavated gravel area is shown in Figure 2. The tundra and overburden overlaying the excavated area will be moved adjacent to the north and south sides of the excavated area. The mined area is expected to provide approximately 1,000,000 cubic yards of gravel. Approximately 290,000 cubic yards of overburden is expected to overlay the suitable gravel fill material. The site will be accessed directly by a gravel road from the Endicott Road and a seasonal ice road between the SDI and the mine site. The ice road route will be determined after bathymetric surveys and field reconnaissance of the area between the mine site and the SDI are conducted during the summer 2007. The goal will be to utilize the existing river channel while avoiding over-wintering fish habitat.

Summer Mining Plan

No summer mining activities are planned.

Winter Mining Plan

Mining operations will occur during the winter months and will include the preparation of gravel access roads and ice pad staging areas for equipment at the east end of the mine site. The south side of the excavated area will be offset approximately 300 ft. from the Endicott Road for safety considerations. The intent is to locate the excavated area as closely as practicable to the existing road system to minimize potential environmental impacts and to facilitate future rehabilitation options. A shallow berm on the north and west sides of the excavated area will connect to the proposed access road at the northeast corner of the excavation and to the Endicott Road at the southwest corner of the excavation to protect the site from flooding. A 48-inch diameter culvert conducts water under the Endicott Road into the ephemeral Duck Island Creek. The berms on the north and west sides of the excavated area will prevent Duck Island Creek from flowing into the excavated area. It is not anticipated that the seasonal flow from Duck Island Creek would be diverted outside of the natural slough. Since the excavated area is on relatively high terrain the threat of flooding is minimized. A major flood event would threaten the excavated area from all sides.

Examination of the land forms surrounding the proposed mine site suggests that the permafrost is uniform with little thermokarst or ice polygon features. There are shallow ponds to the northeast of the mine site. Based on the experience at the nearby Duck Island Mine Site, BPXA does not expect to encounter significant solid ice features that could thaw and erode into the excavated area.

The site will be monitored during overburden stripping to identify any such ice features. If massive ice is encountered, it will be excavated and replaced with overburden prior to spring break-up.

Mining operations will commence with survey and staking followed by overburden stripping. It is anticipated that an average 10 ft. overburden layer will be removed from the excavated area and stock piled. The organic overburden will be removed and stockpiled separately from the non-organic overburden. The depth of the organic layer will be confirmed by visual inspection during stripping operations so that the amount of organic soil is optimized for other potential rehabilitation uses. Mining operations will include blasting and mechanical excavation to a depth of approximately 50 ft.

Stepped access ramps will be constructed as mining progresses deeper into the excavated area. Road access to the excavated area is favored on the east side where the existing gravel pad turn out will be utilized from the Endicott Road. The road gradient into the excavated area will not exceed a 10% gradient. Mined gravel will be transported from the mine site to the SDI via ice roads.

The excavated area side walls will be stepped as shown in Figure 3 and as close to vertical as allowed by safe mining practices during winter months. Overburden removed from the excavation area will be stockpiled on ice pads adjacent to the north and south

sides of the excavated area. This will reduce the impact to underlying vegetation until the stockpiles are used to contour the excavated area or used for other rehabilitation activities.

A berm will be formed around the excavated area to prevent flooding during the spring break-up and summer months while the excavated area remains open. After the first winter the access roads into the excavated area will remain open to allow access during the following winter should this be necessary.

REHABILITATION PLAN

Introduction

This Liberty Rehabilitation Plan (Plan) describes methods and procedures proposed for rehabilitating the Liberty mine site and are subject to confirmation based on a biological assessment of the site prior to mining operations. The Plan may be amended when more site-specific information is available and as the rehabilitation progresses over time. The target revegetation performance standards are listed in Table 1. A proposed treatment, monitoring, and reporting schedule to evaluate progress towards the performance standards is listed in Table 2.

Surrounding Vegetation

The vegetated area surrounding the Liberty mine site lies within the Sagavanirktok River delta, a relatively flat, rolling landscape with minimal topographic relief. The vegetation is wet and moist tundra dominated by *Eriophorum angustifolium* and *Carex aquatilis*. *Arctophila fulva* is present in wetter areas and shallow flooded habitats. *Dupontia fischeri* may be locally prevalent and in drier areas tussock tundra dominated by *Eriophorum vaginatum* may also occur.

Site Preparation

The excavated area will be prepared for restoration when it is no longer required for the Liberty Development Project (i.e. after the second winter season). Inorganic overburden will be placed over the stepped benches in the excavated area side walls and allowed to form side slopes with natural angle of repose expected to be between 2:1 and 3:1 H:V. These side slopes would be consistent with those at the nearby Duck Island Mine Site. The inorganic material, except for the flood protection berm, will be replaced in the excavated area to moderate the side slopes. The harvested organic material stockpile will be used to encourage natural species revegetation on the flood protection berm. Excess organic material that is not used on the flood protection berm, will remain stockpiled for potential use elsewhere such future use would be done in consultation with the regulatory agencies.

The goal after gravel mining is complete is to replace the stockpiled overburden back into the excavated area to create, to the extent practicable, shallow sloping excavated area side

walls. The excavated area may eventually be breached at the northwest corner to connect to the ephemeral Duck Island Creek once the excavated area has flooded. The excavated area will be allowed to flood gradually over time from locally occurring run-off waters.

Goals and Objectives

The objective for flood protection berm is the short-term establishment of seeded grasses that will assist in stabilizing the soil surface while allowing natural colonizers to establish over time. The objective for the former overburden stockpile area is to ensure adequate soil nutrients to encourage rejuvenation of existing native plants. The goal for the flood protection berm is to establish diverse and productive wetland and upland plant communities similar to those in the surrounding area, thereby improving the appearance of the site and improving its suitability for some wildlife species. The goal for the former stockpile area is to restore conditions comparable to those that existed prior to the stockpiling of material (Table 1).

Wetland Functions

In recent years, the evaluation of wetland rehabilitation has attempted to assess functionality as a criterion for successful rehabilitation. However, wetland function and thereby the possibility of restoring wetland functions in arctic ecosystems are poorly understood (Funk and Streever 2003, unpub. manuscript). Hydrogeomorphic models or HGM's are one approach being used to make functional wetland assessments. HGM's evaluate different biological and environmental variables and contrast this information to ecologically comparable, 'normal' functioning wetlands. In order to effectively deliver a functional HGM assessment, a significant amount of baseline or reference site data must be available. HGM's are developed locally or regionally for different environmental gradients. There is no HGM for Alaska's North Slope and it is doubtful that such an approach will work.

In consultation with the U.S. Army Corps of Engineers, BPXA has established a practice of defining clear goals, objectives, and performance standards as part of their current approach to rehabilitation. The quantitative measures associated with BPXA's rehabilitation goals, objectives, and performance standards typically focus on percent vascular cover, species composition, and available soil nutrients. Additional qualitative measures often include monitoring the site for wildlife activity, and significant areas of subsidence or thermokarst.

It is reasonable to assume that, until adequate HGM data are made available, inference to wetland functionality may be derived from BPXA's current approach to rehabilitation; reasoning that a positive trend in vegetative establishment and species diversity promotes soil stability, develops soil structure, and indicates adequate plant available nutrients; evaluating surface stability indicates maintenance of thermal equilibrium; and observations of wildlife activity support habitat development and food web structuring.

Rehabilitation Treatments

Disturbed areas outside the excavated area will be seeded with *Puccinellia borealis*, a native grass that is short-lived and non-competitive to invasion by indigenous tundra plant species. An application of approximately 3-5 lb/acre of *P. borealis* should provide adequate cover (BP Exploration (Alaska), Inc. et al. 2004). *P. borealis* seed is available in limited quantities, and this seeding plan (either the species or the year of planting) may be revised if enough seed is not available.

Based on past experience, applying phosphorus fertilizer will greatly enhance establishment of seeded grasses and encourage the invasion of the site by indigenous species. An application of 400 lbs/acre 10:20:20 NPK fertilizer is recommended as a balanced application suitable for most soils in this region. Soil samples will be collected and nutrient analysis conducted to finalize the most appropriate fertilizer application.

The first summer following mine site closure, the area will be allowed to settle, soil samples will be collected, and the area will be inspected to determine the extent of rehabilitation treatments required. Rehabilitation treatments will begin during the following growing season; after breakup and before freeze up in autumn when the soil surface has thawed and drained of excess moisture. The seeded grass is expected to reach maturity by the third growing season following seeding and to begin declining after four to five growing seasons, allowing natural colonizers to occupy the site.

Performance Standards

By the tenth year following cultivation treatments, seeded areas will support 10% total live vascular plant cover excluding seeded grass cultivars. At least five species of naturally colonizing plants should be present, with at least 0.2% cover by each. These performance standards are intended to lead to a soil stabilizing plant cover on the site while also promoting eventual replacement of seeded grasses with naturally colonizing species. These standards do not apply to areas that are ponded for more than four weeks during the growing season. Other disturbed areas, primarily the former overburden stockpile area will, by year 10, support a live vascular cover $\geq 15\%$ of that found in the surrounding undisturbed area (Table 1).

Monitoring for Performance Standards

Monitoring will be used to evaluate the progress of vegetation relative to performance standards. The final monitoring will establish whether the revegetation performance standards have been met.

Canopy cover and species composition will be assessed using BPXA's standard method, as described in "BP Revegetation and Compliance Monitoring; Standardized Methods for Documenting Plant Community Development" and according to the schedule in Table 2. If intermediate sampling indicates that vegetation has not established enough to meet the proposed standards, additional remedial actions may be required to increase plant cover.

Reporting

Progress reports following BPXA's standard format will be submitted by 1 February of the year following site visits scheduled in Table 2. Reports will be provided to State of Alaska Department of Natural Resources, U. S. Army Corp of Engineers, and the U. S. Fish and Wildlife Service.

Remedial Action

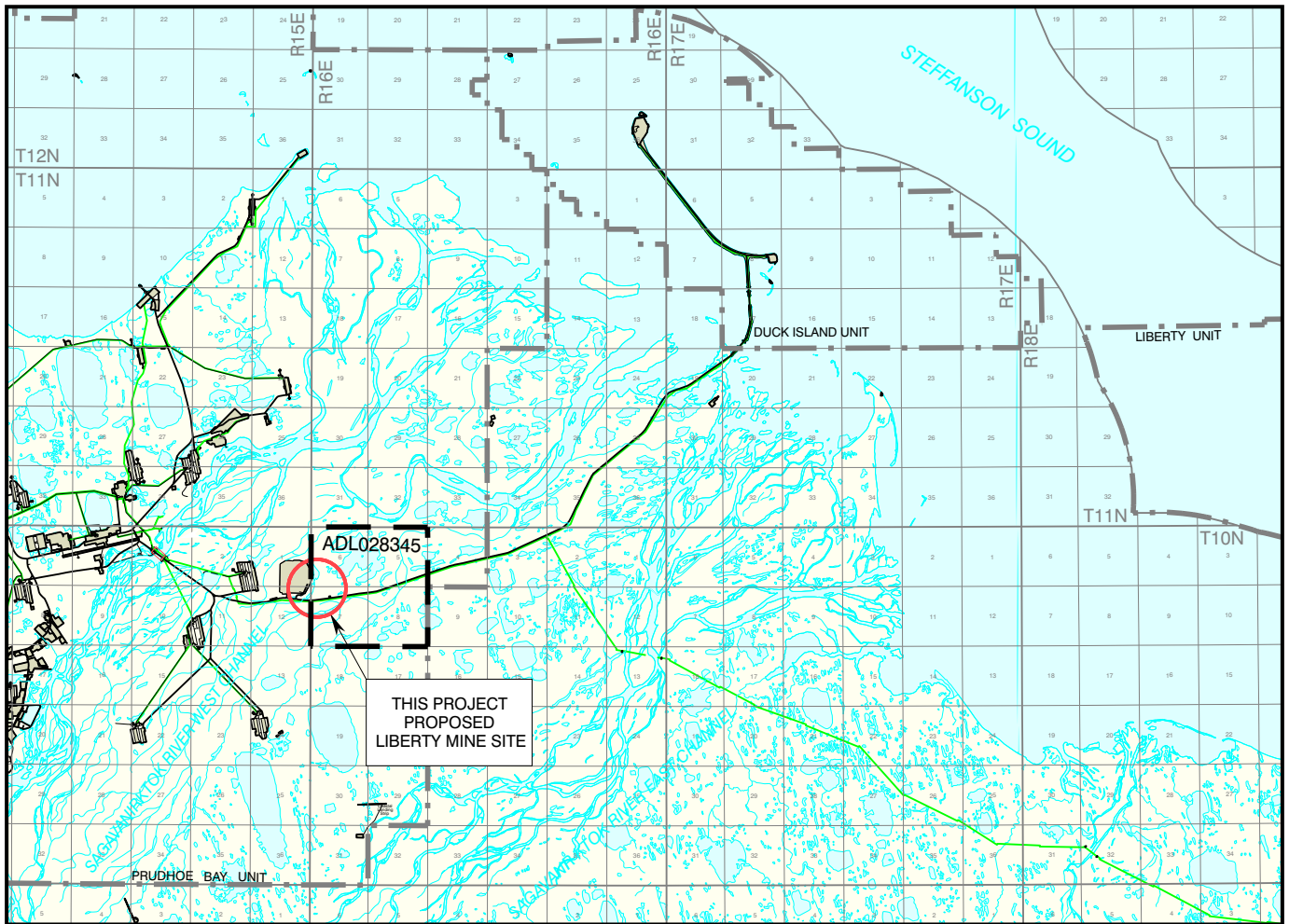
If monitoring suggests that performance standards may not be met by Year 10, additional seeding, fertilizing, and/or other planting approaches will be considered in consultation with agency representatives.

REFERENCES

- BP Exploration (Alaska), Inc, Conoco Phillips Alaska, Inc., ABR, Inc., and Lazy Mountain Research. 2004. North Slope Plant Establishment Guidelines Table May 11, 2004. Prepared by Oasis Environmental, Inc. 10 pp.
- Funk, D.F., and B. Streever. 2003. Wetland function on the Arctic Coastal Plain of Alaska. Unpublished manuscript prepared by LGL Alaska Research Associates, Inc., and BP Exploration (Alaska), Inc. Environmental Studies Program. Anchorage, Alaska.

Table 1. Goals, Objectives, Performance Standards, and Monitoring Methods	
Goals	<p><u>Flood protection berm</u>: Establish diverse and productive wetland and upland plant communities on the site similar to those of the surrounding area, thereby improving the appearance of the site and improving its suitability for some wildlife species.</p> <p><u>Former stockpile area</u>: Restore natural conditions comparable to those that existed prior to material stockpiling.</p>
Objectives	<p><u>Flood protection berm</u>: Short-term establishment of seeded grass that will not persist, allowing natural tundra plant species to colonize the site over time.</p> <p><u>Former stockpile area</u>: Ensure adequate soil nutrients to encourage rejuvenation of native plants.</p>
Performance Standard	<p><u>Flood protection berm</u>: By year 10, 10% cover by live vascular plants, including seeded grasses, with at least 1% cover of naturally colonizing species. Species composition consisting of at least 5 naturally colonizing species with 0.2% canopy cover each, on the excavated area and the gravel pad removal area.</p> <p><u>Former stockpile area</u>: Live vascular cover \geq 15% of that found in the surrounding, undisturbed area.</p>
Monitoring Methods	<p>Use BPXA's standard method for measuring plant vegetation cover.</p> <p>Establish photopoints to qualitatively assess changes in site conditions.</p>

Table 2. Proposed schedule for application of rehabilitation treatments, site monitoring, and reporting.		
Year	Treatment & Monitoring	Reporting
First summer following site close out	Sample and test soil for fertility and other features. Inspect site to determine extent of rehabilitation activities required. Establish photopoint markers	None.
Year 0	Apply fertilizer and seed; quantitatively measure cover in former stockpile area; collect photo records.	Progress report.
Year 2	Measure vegetation cover and species composition, and compile a species list, using BPXA's standard method in seeded areas and former stockpile area. Sample soil where revegetation success appears lacking. Observe surface stability qualitatively and collect photo records	Progress report.
Year 6	Measure vegetation cover and species composition, and compile a species list, using BPXA's standard method in seeded areas and former stockpile area. Sample soil where revegetation success appears lacking. Observe surface stability qualitatively and collect photo records	Progress report.
Year 10	Measure vegetation cover and species composition, and compile a species list, using BPXA's standard method in seeded areas and former stockpile area. Sample soil where revegetation success appears lacking. Observe surface stability qualitatively and collect photo records	Final report.



This map is based on U.S.G.S. quad Beechey Point (A-2, A-3, B-2, B-3) and on the Unit Operator's Facility Maps.



PROJECT LOCATION:

PRUDHOE BAY UNIT - LIBERTY MINE SITE

NAD83

LAT. = 70° 14' 30.03"

LONG. = -148° 11' 06.48"

ALASKA STATE PLANE ZONE 4, NAD 83

X = 1,864,732.90 FEET

Y = 5,941,043.61 FEET

ADL 028345 SECS. 6, 7 T10N, R16E

DATUM: MEAN SEA LEVEL

PURPOSE: MINE DEVELOPMENT

ADJACENT PROPERTY OWNER: STATE OF ALASKA

COUNTY: NORTH SLOPE BOROUGH

APPLICANT: BP EXPLORATION ALASKA, INC.

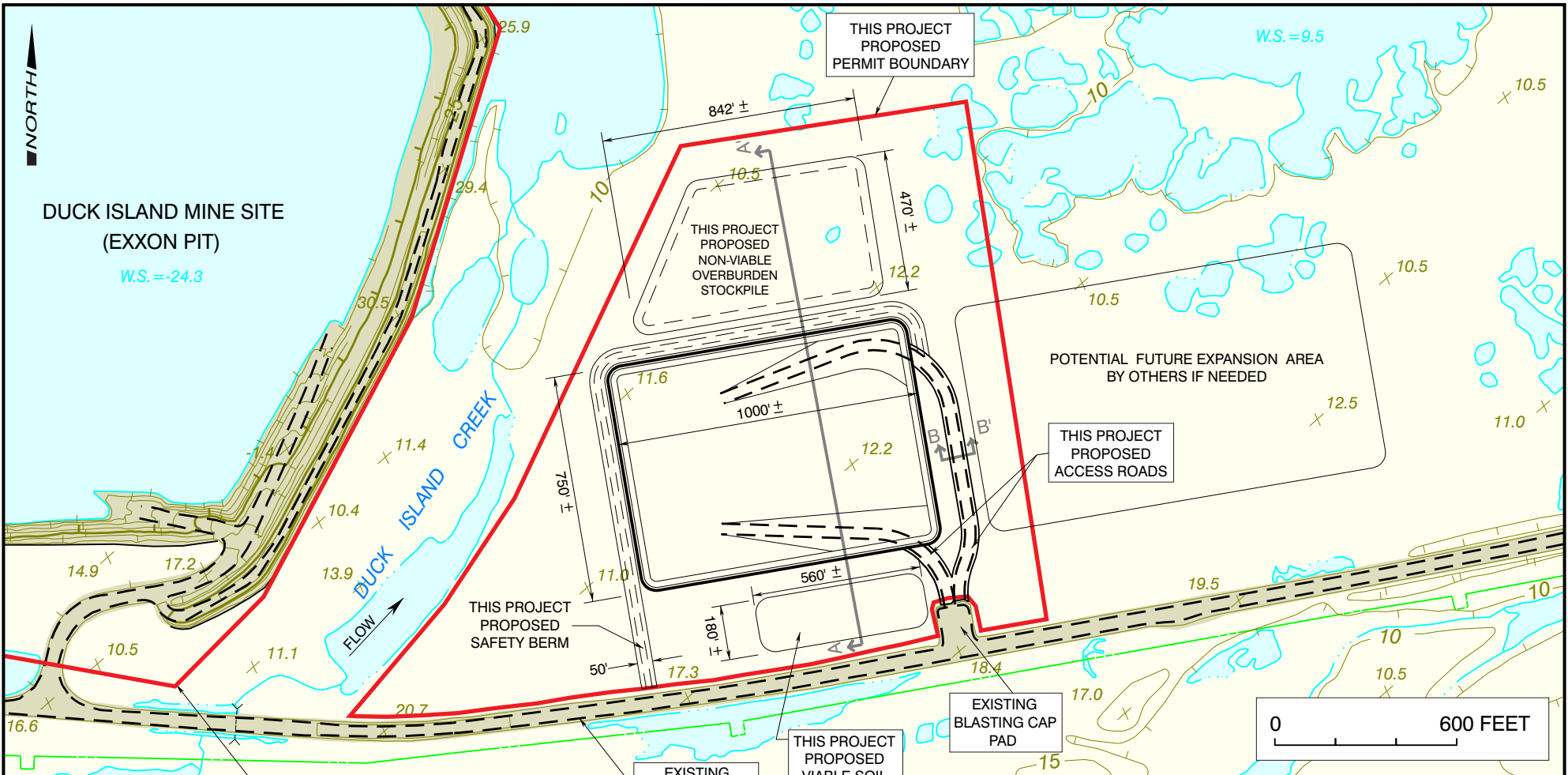
BP EXPLORATION (ALASKA) INC.

**LIBERTY DEVELOPMENT PROJECT
MINE SITE
VICINITY MAP**

DATE:
April 2007

SCALE:
1" = 3 Miles

FIGURE:
1



PROPOSED LIBERTY MINE SITE QUANTITIES

PERMIT BOUNDARY AREA	63 ACRES
EXCAVATION AREA	18 ACRES
EXCAVATED VOLUME	1,000,000 CY
VIABLE SOIL OVERBURDEN STOCKPILE VOLUME	60,000 CY
VIABLE SOIL OVERBURDEN STOCKPILE FOOTPRINT	3 ACRES
NON-VIABLE OVERBURDEN STOCKPILE VOLUME	215,000 CY
NON-VIABLE OVERBURDEN STOCKPILE FOOTPRINT	8 ACRES
SAFETY BERM OVERBURDEN FOOTPRINT	3 ACRES
SAFETY BERM OVERBURDEN VOLUME	15,000 CY
ACCESS ROAD FOOTPRINT	2 ACRES
ACCESS ROAD VOLUME	15,000 CY

ALL LOCATIONS, DIMENSIONS AND QUANTITIES ARE APPROXIMATE

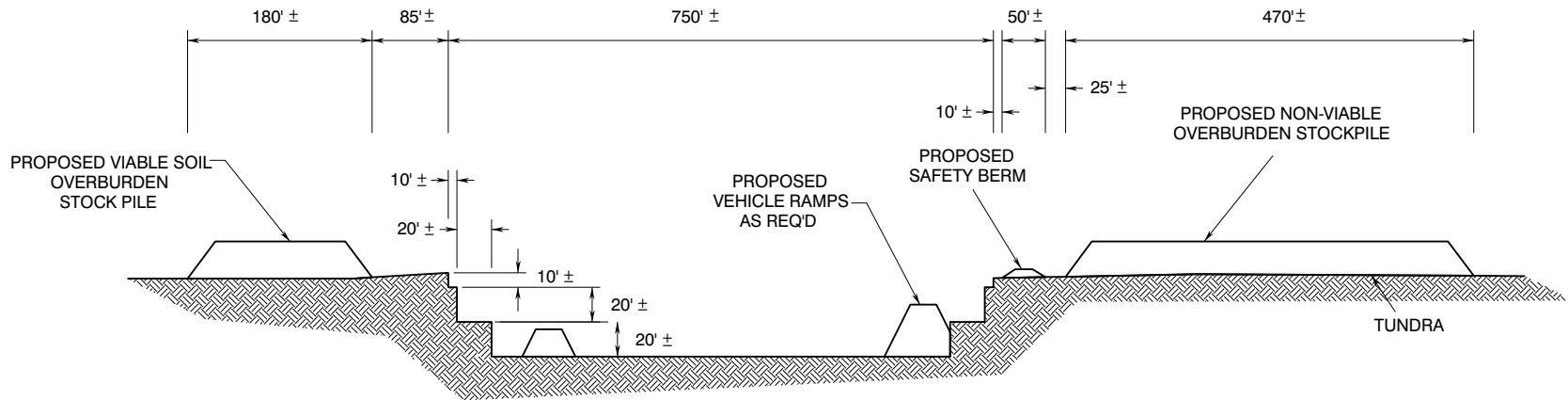
BP EXPLORATION (ALASKA) INC.

**LIBERTY DEVELOPMENT PROJECT
PROPOSED MINE SITE PLAN
LOCATION MAP**

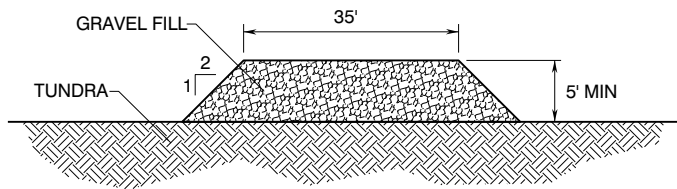
DATE: April 2007	SCALE: 1" = 500 Feet	FIGURE: 2
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SOUTH

NORTH



EXCAVATION CROSS SECTION A-A'



ACCESS ROAD CROSS SECTION B-B'

BP EXPLORATION (ALASKA) INC.

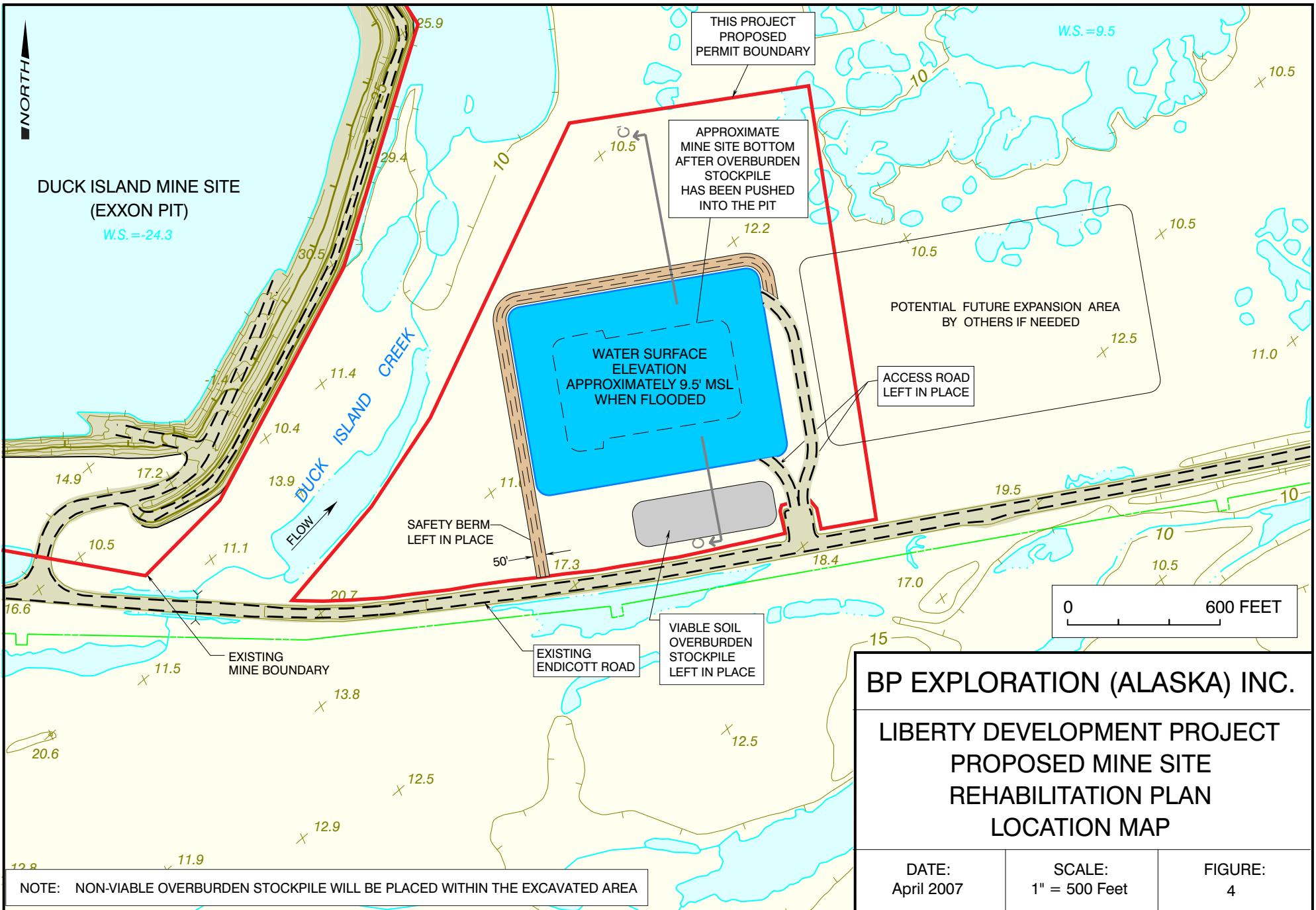
LIBERTY DEVELOPMENT PROJECT
PROPOSED MINE SITE PLAN
CROSS SECTIONS

ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE

DATE:
April 2007

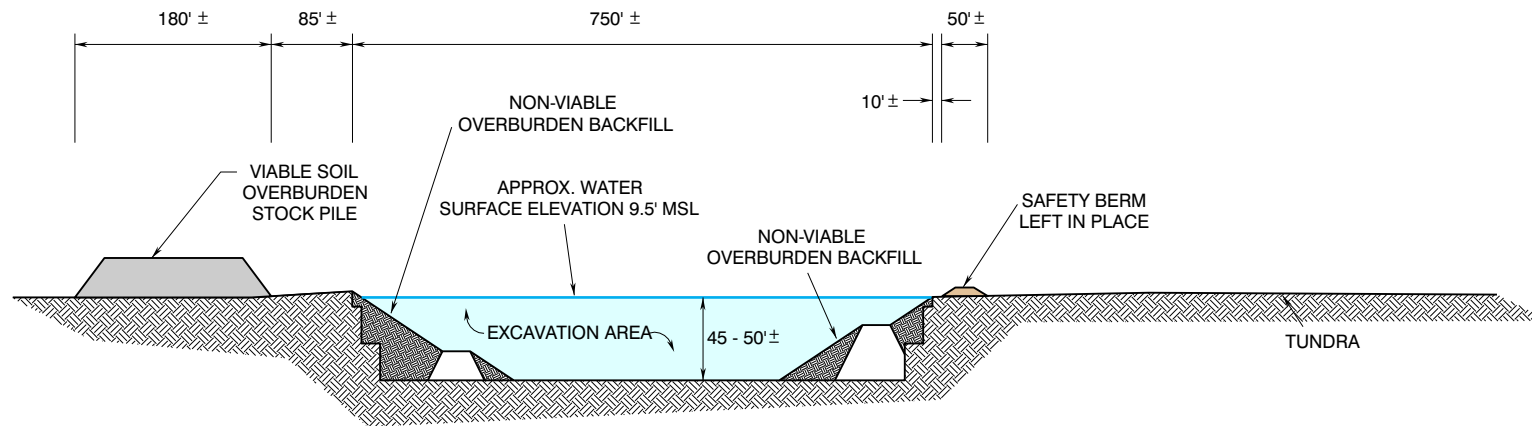
SCALE:
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FIGURE:
3



SOUTH

NORTH



REHAB CROSS SECTION C-C'

NON-VIABLE OVERBURDEN WILL BE PLACED IN EXCAVATION ALONG PIT WALLS,
VIABLE OVERBURDEN STOCKPILE SOIL WILL REMAIN IN PLACE FOR FUTURE USE AS NEEDED.

ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE

BP EXPLORATION (ALASKA) INC.

LIBERTY DEVELOPMENT PROJECT
PROPOSED MINE SITE
REHABILITATION PLAN
CROSS SECTION

DATE:
April 2007

SCALE:
NOT TO SCALE

FIGURE:
5