
**MINING AND REHABILITATION PLAN
PUT 23 GRAVEL MINE SITE
PRUDHOE BAY UNIT, ALASKA**

as required by
Material Sale Contract ADL 417964
USACE Permit No. POA-1984-454-O, Beaufort Sea 173

Revised by **BP Exploration (Alaska) Inc.**
16 April 2014

INTRODUCTION

BP Exploration (Alaska) Inc. (BPXA) submits this revised mining and rehabilitation plan for the Put 23 Gravel Mine Site in preparation for deepening excavation at the site for gravel mine extraction. The mine footprint will not be expanded. The mining and rehabilitation plans are required by the General Material Sale Contracts ADL 400816 and 413776 between Arco Alaska, Inc. (ARCO) and the Alaska Department of Natural Resources (ADNR) Division of Land and Water Management (DLWM), subsequently the Division of Mining, Land and Water (DMLW). The mining plan was approved by ADNR DLWM on March 4, 1981, and the Rehabilitation Plan was approved by ADNR DLWM on December 28, 1993. Both plans are currently approved for Put 23 Mine Site under the General Material Sale Contract ADL 417964.

The U.S. Army Corps of Engineers (USACE) permit 4-1980-0454, Beaufort Sea 173 was issued to ARCO on March 23, 1981 to stockpile gravel and construct roads in association with the Put 23 Mine Site. The permit was subsequently modified on November 6, 1996 for continued excavation and included the requirement and approval of the rehabilitation plan. This permit was transferred to BPXA on April 23, 2001. On September 19, 2003, a permit modification was completed to allow for expansion and maintenance of the flood control dike around the Put 23 Mine Site.

In 2007, the previously approved mining and rehabilitation plans were updated and combined into a single Mining and Rehabilitation Plan as part of BPXA's request of USACE permit renewal for continued gravel extraction operations and rehabilitation for the 10 year period beginning in November 2006. The plan was approved and permit POA-1984-454-O was issued with an expiration date of May 31, 2012. The last permit modification for continued excavation was issued on October 12, 2011, extending the expiration date to May 31, 2015.

This Mining and Rehabilitation Plan was revised on April 16, 2014 to reflect current and planned future gravel extraction operations and allows for inclusion of more recently recognized revegetation techniques to be consistent with recently approved rehabilitation plans.

The mine site plans meet the following objectives:

1. Maximizing gravel recovery while regarding habitat considerations in order to minimize the area disturbed
2. Conserving stockpiled overburden for use in potential revegetation projects.

The existing gravel mine site configuration has been updated in drawings that use current, more accurate mapping technology and allow better identification of the permitted acreage. Figure 1 provides the location of the mine site. Figure 2 identifies gravel extraction phases originally proposed and approved by ADNR and USACE. The total Put 23 Mine Site permitted area is approximately 349 acres. This acreage includes the 308 acre mining area currently identified in the most recent gravel sales contract (the original Phases I, II, and III) as well as the inactive, 41 acre Phase IV area.

The mining and rehabilitation plan assumes that all phases of the gravel mine site expansion will be completed prior to final closure. The final footprint impacted by mining will be reduced if a lesser volume of gravel is required than is potentially extractable.

EXISTING CONDITION

The overall footprint and configuration of the gravel mine area remains unchanged from the currently approved area. There were four phases approved for the mining of gravel. Phases I, II, and a portion of Phase III are currently active. The portion of Phase III that included the Trenching Trial Test is no longer needed for evaluation of rehabilitation techniques. Permission was granted to discontinue tundra rehabilitation evaluation under permit POA-1984-454-O, special condition 7, and this area is currently included in mining operations. Gravel depletion in Phase IV has not yet occurred and it is inactive.

Overburden material is currently stored in two areas at the Put 23 Mine Site (Figure 2): in the southwest and southeast ends of the pit. Overburden is temporarily being stored to the east of Phase III in preparation for Phase III activities and deepening of the mine.

A 6,500 foot long flood control dike runs along the western boundary of the mine site between the active mining area and the Putuligayak River. This dike was improved and expanded in September of 2003.

5. The exact timing of future expansions into Phase IV to the north east is entirely dependent upon future gravel needs related to exploratory, development, production, and maintenance requirements.
6. This deep mining will accomplish reduced disturbance of surface area and greater recovery of the natural resource gravel within a specific area.

SUMMER MINING PLAN

1. Summer mining will consist of mining gravel vertically to a depth of 30 feet. The Phase III area may be mined by pushing material down the side slopes to the existing pit floor.
2. Gravel will not be mined below the static water elevation. Continued authorization to discharge accumulated gravel mine water under the provisions of the existing Alaska Pollutant Discharge Elimination System (APDES) permit issued by the Alaska Department of Environmental Conservation (ADEC) is assumed. Mining will continue vertically until it is determined to be no longer practical for reasons of safety, gravel quality, or operational efficiency.
3. Mined material will be stockpiled within the perimeter of the extraction site or will be transported offsite where it is needed for construction.
4. Side slopes in Put 23 will be contoured to a ratio of 1:1.5 in those areas not already contoured. Some contouring may have to be performed following completion of gravel extraction activities.

WINTER MINING PLAN

1. Mining during the winter months is generally limited to minimal, immediate demand. Excavation is conducted with a trimmer, limiting the volume of gravel that can be excavated.

REHABILITATION PLAN

INTRODUCTION

This plan describes the proposed rehabilitation approach for the Put 23 Mine site located in the Eastern Operating Area (EOA) of the Prudhoe Bay Oilfield, Alaska. This plan follows the standard format for rehabilitation plans developed by BPXA. Because flexibility is needed in rehabilitation, most of this plan and subsequent monitoring reports are provided for information purposes only, with the understanding that some changes may be needed as rehabilitation progresses. However, the performance standards listed in Table 1 (see Goals and Objectives) should be considered compliance requirements.

The current proposed mining plan does not change the footprint of the mine and therefore does not change the tundra rehabilitation portion of the mining plan. This plan is meant to serve as an update to the tundra rehabilitation plan submitted in 2007 to reflect updated methods and approach to tundra rehabilitation.

This rehabilitation plan does not specifically address the preventions of pollutant seepage from the existing Oxbow Landfill and solid waste pit. It is assumed that a seepage control design will be a requirement of those facilities to prevent pollutant seepage into the proposed mine site lake.

LOCATION: The Put 23 Mine site is located near the northern end of the Ox Bow road. Location coordinates are: 70.29375862 N and -148.52325542 W.

HISTORY: The Put 23 Mine was opened on 2 July 1974 and has been in production through to the present. The mine is currently permitted for a total gravel extraction of over 10 million cubic yards.

A rehabilitation plan was developed for the Put 23 Mine on 24 January 2007. This supplemental rehabilitation plan was developed to reflect updated rehabilitation information and methods.

SITE SIZE: The original gravel pit was 73 acres, 6 acres of which were undisturbed. Phases I through IV total 274 acres, 97 acres of which are undisturbed. The final size of the area to be rehabilitated will be calculated upon completion of mining operations.

SITE DESCRIPTION AND SURROUNDING VEGETATION: The surrounding vegetation consists of wet and moist sedge tundra dominated by *Eriophorum angustifolium* (tall cottongrass) and *Carex aquatilis* (water sedge). *Arctophila fulva* (pendantgrass) is present in wetter areas and shallowly flooded habitats. *Dupontia fischeri* (Fisher's tundra grass) may be locally prevalent, and tussock tundra dominated by *Eriophorum vaginatum* (tussock cottongrass) may also occur in drier areas. The surrounding landscape is rolling to relatively flat with minimal topographic relief.

CONTAMINANTS: No contaminants are expected to be present.

SALINITY: Although no soil or surface water samples have been taken to date, it is not expected that salinity at levels likely to limit plant growth will be found at this site. Soil samples will be collected if revegetation does not progress as expected, and it is suspected that soil properties are adversely affecting revegetation.

SITE PREPARATION

1. The mine site will be left intact upon abandonment for possible future purposes such as stockpiling of reclaimed gravel, material staging areas, etc. If severe flooding occurs and overflows the dike, breaching would be conducted to the extent practicable to allow water to flow through the mine site-created lake.
2. Expansion of the mine site is entirely dependent upon future gravel needs related to exploratory, development, production, or maintenance requirements. Overburden from expansions will be stockpiled.
3. The access road leading into the gravel mine area at the east side of Put 23 will be retained as long as necessary to provide continued access to mining areas, overburden stockpiles for future revegetation projects, and water withdrawal sites from the reservoir system.

GOALS AND OBJECTIVES

The overall rehabilitation goal for this site is to promote the development of productive, diverse, and self-sustaining plant communities dominated by indigenous plant species, where possible (Table 1). The short-term objective is to promote natural colonization by indigenous plants.

Table 1. Goals, objectives, performance standards, and monitoring methods for rehabilitation of the Put 23 Mine site, Prudhoe Bay Oilfield, AK.

Goals	Establish diverse, productive, and self-sustaining 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.
Objectives	Promote vegetation recovery by indigenous plants. If this is not possible, establish a low cover of native-grass cultivars ¹ that will allow indigenous tundra plant species to colonize the site over time.
Performance Standards	By Year 10, 10% cover by indigenous vascular plants and 5 indigenous plant species with $\geq 0.2\%$ cover each or 10% total live vascular cover (including seeded grass cultivars).
Monitoring Methods	For vegetation cover and species composition, BPXA's standard method of measuring plant cover, the Laser Assisted Point Sampling (LAPS) method will be used.

¹Seeding with native-grass cultivars would only be performed if establishment of native species is not progressing as needed to meet performance standards.

REHABILITATION TREATMENTS

Areas backfilled with overburden or excavated to tundra grade will be fertilized (20-20-10 NPK at 400 pounds/acre). Seed or other plant materials may also be applied to these areas, depending on the moisture regime following completion of mining activities and the availability of seed (Table 2). If the areas are well drained, seeds of legumes and other forbs such as *Artemisia* (wormwood), *Castilleja* (paintbrush), and *Chamerion latifolium* (river beauty) may be broadcast. If soil conditions are wetter, a wetland seed mulch (dominated by sedges and grasses) may be applied. If the establishment of indigenous species does not progress as expected by Year 7, a light seeding of native-grass cultivars may be applied to provide vegetation cover. This cover may help trap snow and seeds and contribute to natural vegetation recovery over the long term, but may slow the rate at which native species establish in the short term.

PERFORMANCE STANDARDS

The performance standards, to be achieved by Year 10, reflect the goal of the rehabilitation effort, which is to establish productive, diverse, and self-sustaining plant communities on the site. Conditions vary considerably among sites, making it important to maintain some flexibility with respect to both objectives and performance standards. This flexibility will allow response to unanticipated site changes while still allowing the overall rehabilitation goal for the Put 23 Mine site to be met.

The performance standards require areas to support:

1. 10% cover of indigenous vascular plants, and
2. Five indigenous plant species with $\geq 0.2\%$ cover each or 10% total live cover (including seeded grass cultivars).

Year 0 is defined as the year following completion of civil work, during which the site will be allowed to settle and stabilize before treatments and assessment begin in Year 1. These performance standards apply to areas that are not ponded for more than 4 weeks during the growing season. In accordance with the 1996 USACE permit M-800454, this rehabilitation plan will be re-evaluated for approval by the USACE at least 6 months prior to its planned implementation.

MONITORING FOR PERFORMANCE STANDARDS

Monitoring will be conducted to evaluate the progress of revegetation relative to performance standards. The final monitoring will establish whether the revegetation performance standards have been met. Vegetation canopy cover and species composition will be measured using BP's protocol document *BPXA Revegetation Studies and Compliance Monitoring; Standardized Methods for Documenting Plant Community Development* (ABR, Inc. et al. 2002), modified to incorporate the laser-assisted point

sampling (LAPS) device. Vegetation will be quantitatively monitored three times after applying initial rehabilitation treatments (Table 2).

DISCRETIONARY RESEARCH

No additional research is currently planned for this site.

Table 2. Proposed schedule for application of rehabilitation treatments, monitoring, and reporting for the Put 23 Mine site, Prudhoe Bay Oilfield, Alaska.

Year 0 (planned)	Year 1 (planned)	Year 5 (planned)	Year 7 (planned)	Year 10 (planned)
<ul style="list-style-type: none"> • Mining activities completed, backfill will be placed as necessary and final grading will be completed. • Re-evaluate Rehabilitation Plan • Obtain approval of Rehabilitation Plan from USACE 	<p>Treatment:</p> <ul style="list-style-type: none"> • Fertilize (20-20-10 NPK) at 400 lbs/acre • Sow seed (selection will depend on hydrologic conditions and seed availability but may include upland legumes and forbs, or wetland sedges and grasses). <p>Monitoring:</p> <ul style="list-style-type: none"> • Vegetation cover (qualitative) • Surface Stability (qualitative) • Establish photo points • Wildlife Use <p>Submit progress report describing treatments and findings.</p>	<p>Monitoring:</p> <ul style="list-style-type: none"> • Soil¹ • Vegetation cover (quantitative and species list) • Surface Stability (qualitative) • Photos • Wildlife Use • Assess likelihood of achieving performance standard by Year 10 <p>Submit progress report describing treatments and findings</p>	<p>Monitoring:</p> <ul style="list-style-type: none"> • Soil¹ • Vegetation cover (quantitative and species list) • Surface Stability (qualitative) • Photos • Wildlife Use • Determine whether additional plant cultivation treatments are warranted <p>Submit progress report describing treatments and findings.</p>	<p>Monitoring:</p> <ul style="list-style-type: none"> • Soil¹ • Vegetation cover (quantitative and species list) • Surface Stability (qualitative) • Photos • Wildlife Use • Determine if performance standard has been met <p>Submit final report describing findings.</p>

¹ Only sampled if plant cover appears to be negatively affected by soil characteristics.

REMEDIAL ACTION

The results of the qualitative vegetation monitoring in Year 5 and interim quantitative vegetation monitoring in Year 7 will aid in determining whether the performance standards are likely to be attained by Year 10. This will allow for an early response if plant communities in the rehabilitated areas do not develop as expected. If performance standards are not met by Year 10, BPXA will ask for input from resource agency representatives to determine what, if any, additional remedial work should be undertaken.

REPORTING

Progress reports following BPXA's standard format will be submitted by 1 February following each year listed in Table 2. Reports will be provided to the following resource agencies:

1. U.S. Army Corps of Engineers
2. U. S. Fish and Wildlife Service
3. Alaska Department of Natural Resources Division of Oil and Gas
4. Alaska Department of Natural Resources Division of Mining, Land, and Water
5. North Slope borough Planning Department

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REFERENCES

- ABR, Inc., Lazy Mountain Research, Inc., and BP Environmental Studies Working Group. 2002. BPXA Revegetation Studies and Compliance Monitoring: Standardized Methods for Documenting Plant Community Development. 4 pp.
- 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.
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