APPENDIX B
POINT THOMSON GAS CYCLING PROJECT
MINE SITE MINING AND REHABILITATION PLAN

(T9N, R23E, Sec 10 E ½ SE ¼ & Sect. 11 West 1/2 of SW 1/4; U. M.)

This plan describes the proposed mining and rehabilitation of the proposed Point Thomson Mine Site. This mine site is required to support construction of the Point Thomson Gas Cycling Project located on the North Slope of Alaska. This material site will serve as the primary source of construction gravel for the project, which includes three well pads, a facilities pad, an infield road system, a dock, an airstrip, and stockpiles for maintenance gravel and overburden. The mine site will be located to the south of the Central Processing Facility (CPF), and approximately 2 miles south of the coastline (refer to Figure 5-2). Construction of the Point Thomson facilities will require the extraction of approximately 2,600,000 cubic yards (neat-line measure) of gravel from this mine site.

B.1 EXISTING CONDITIONS

This proposed mine site is located within T9N, R23E, E1/2 SE 1/4 Sec. 10, W 1/2 of SW 1/4 Sec 11, U. M. The site will be located within a 46.5-acre area to the west of an unnamed creek (refer to Figure 7-16). A geotechnical soils investigation was conducted at the mine site location in the vicinity of the proposed mine site in March 2000. The preliminary results of that investigation indicated the presence of gravel to a depth of 30 to 47 ft and overlain by an overburden layer of peat and silt that ranges between 3.5 and 12 ft thick.

The plant community surrounding the site is typical wet sedge tundra, dominated by sedges. Grass, forb and shrub species are minor components of this community. This vegetation is in its natural state and contains no exotic species. Four vegetation types were classified by LGL Alaska Research Associates, Inc.[1] from 19 July 1997 photography based on the Walker (1983)[2] vegetation classification scheme:

- Wet sedge/moist sedge, dwarf shrub tundra complex (IIId)
- Moist sedge, dwarf shrub/wet graminoid tundra complex (IVa)
- Moist sedge, dwarf shrub tundra (Va)
- Moist graminoid, dwarf shrub tundra/barren complex (Ve)

[1] Noel, L.E. and D.W. Funk. 1999. *Vegetation and Land Cover in the Point Thomson Unit Area, Alaska 1998.* Report prepared for Point Thomson Working Interest Owners. Eds. LGL Alaska Research Associates, Inc., Anchorage, AK.

[2] Walker, D.A. 1983. A hierarchical tundra vegetation classification especially designed from mapping in northern Alaska. Pages 1332-1337 in *Proceedings of the Fourth International Conference on Permafrost*. July 17-22, 1983, Fairbanks, AK.

The unnamed creek to the east of the mine site has a narrow channel typical of many of tundra creeks. Ground surface elevations in the area of the mine site slope from southwest (~28 ft mean sea level, MSL) to northeast (~21 ft MSL).

B.2 MINING PLAN

The Point Thomson Gas Cycling Project gravel structures will require approximately 2,600,000 cubic yards of gravel from the mine site. The development pit will be mined on a one-time basis during a winter construction season (refer to Figures 7-16 and 7-17).

B.2.1 Overburden

The overburden will be removed in a north to south direction for 1,900 ft beginning near the access road and extending west for approximately 1,065 ft. Approximately 586,000 cubic yards of overburden will be loosened with explosives, segregated from the gravel, and placed in a stockpile located west of the mine. The stockpile will have an area of approximately 18.80 acres based on dimensions of 1,780 ft in length and 460 ft in width. A temporary silt fence will be constructed at the toe of the stockpile in order to prevent silt-laden runoff from the stockpile. The temporary silt fence will retain meltwater and fines which may wash from the stockpile prior to revegetation.

It is anticipated that the majority of the overburden will remain stockpiled at the site for revegetation of existing or future gravel facilities. Overburden from the Point Thomson Gas Cycling Project mine site will be used during rehabilitation of pre-existing exploration pads within the Point Thomson Unit. Approximately 65,000 cubic yards of overburden may be used during the rehabilitation of new gravel construction currently envisioned within the Point Thomson Unit.

B.2.2 Gravel

The length of the mine site, measured in a north-south direction, is approximately 1,900 ft. Actual gravel mining will be conducted from north to south with the northern portion of the mine being the deepest if required. Blasting will be conducted in 20-ft lifts to loosen the material and to provide 2-inch-minus material for construction. Mining will extend to approximately a point 160 ft west of the creek (refer to Figure 7-19). Gravel extraction within the development pit may be conducted to a maximum depth of 60 ft, depending on the total need and the quality of the material mined. An excavation to yield approximately 2,600,000 cubic yards of gravel would have an average depth of 41 ft, based on an overburden thickness of 8 ft. Excavation to a depth of 60 ft, if required, would yield approximately 3,000,000 cubic yards of gravel. The ANFO bags will be burned on site, in compliance with the regulations of the Bureau of Alcohol, Firearms, and Tobacco. Ash from the bag burning will be tested for the presence of hydrocarbons and hauled to Prudhoe Bay for proper disposal.

Experience at other North Slope facilities indicates that gravel requirements for maintenance during facility life are approximately 15% of the original gravel volume used. A stockpile containing approximately 2,274,000 cubic yards of gravel will be constructed north of the gravel mine. This gravel will be used for road and pad maintenance and to account for any thaw settlement that may occur.

B.2.3 Fresh-Water Reservoir

It is anticipated that gravel mining at the mine site will produce an excavation approximately 40 ft deep, with some areas up to 60 ft deep. The excavation will be converted into a fresh-water reservoir by constructing a diversion structure to channel peak fresh water flows into the excavation from the unnamed stream to the east. The maximum volume of the reservoir would be approximately 527,300,000 gallons, based on the excavation of 2,600,000 cubic yards of gravel. The depth of the reservoir will allow use of the water during both the summer and winter. Typical water uses during drilling, construction, operations, and maintenance include make-up water for drilling mud, tundra ice road construction, ice pads, water for camps and facilities, and dust control.

The diversion structure will consist of a concrete-lined channel with a fish exclusion device and an adjustable weir. The reservoir will be maintained and operated as a water source free of fish. The weir crest will be adjusted during spring break-up to divert high flows during the period of peak stream flow without diverting the base (low water level) flow from the stream. At other times the weir will be maintained at its highest level to prevent fish entry, stream diversion, and any potential for salt-water intrusion during storm surges. It should be noted that storm surge is not expected to penetrate this far south from the coast. The downstream end of the channel will discharge into the reservoir over an area of articulated concrete mats to prevent erosion from the excavation side slope. The weir will be designed to prevent thermal degradation of the permafrost. Figures 7-18 and 7-19 show details of the diversion structure.

B.3 REHABILITATION

This rehabilitation plan addresses revegetation needs to restore plant cover to the exposed gravel and overburden stockpiles. The overburden stockpile will be rehabilitated shortly after mining is completed, and if applicable, exploration site rehabilitation is completed. The gravel stockpile and other gravel structures will be rehabilitated after facility abandonment. Exposed gravel within the excavation will be naturally submerged once the excavation fills with water.

B.3.1 Goals and Objectives

The goal will be to return the stockpiles to natural plant species. The first objective will be leave the mine site in a clean manner. The second objective will be to establish a stand of *Puccinellia borealis* grass to provide cover to areas of barren soil. The third objective will be to allow natural tundra plant species to invade and overtake the seeded grass.

B.3.2 Rehabilitation Approach

Prior to revegetation, the site will be inspected to determine the size of area needing treatment. Soils will be sampled at that time and submitted to a laboratory for testing nutrient availabilities, salinity, and standard soil characterization. An indigenous grass species (*Puccinellia borealis*) will be seeded to the stockpile. This grass is known to establish cover quickly before yielding territory to indigenous plants adapted to the site[3]. It is anticipated that the gravel stockpile will be

[3] McKendrick, Jay D. 2001. Boreal alkaligrass (*Puccinellia borealis*). *Agroborealis* 33(1):16-20.

depleted over the course of the facility life. The remaining gravel will be rehabilitated consistent with the other gravel structures at the end of the facility life.

B.3.3 Drainage and Erosion Control

Drainage from the stockpiles is not an issue. Snow is routinely blown from the top of each pile during winter storms; rainfall events in this climate are not intense. Low perimeter berms around the bases of the stockpiles will divert meltwater and fines which may wash from the stockpile prior to revegetation. The seeded grass will provide protection against soil erosion.

B.3.4 Plant Cultivation

The application of *Puccinellia borealis* will be designed to deliver approximately 10 to 15 pure live seeds per square foot. Seed may be applied with mechanical or hand spreaders. If soil fertility proves inadequate, an appropriate fertilizer application will be given at the time seed is applied.

B.3.5 Soils

Soils will be sampled prior to fertilizing and again at the end of the 5-year monitoring period. During monitoring inspections signs of erosion will be addressed.

B.3.6 Surface Stability

The stability of the stockpile surfaces is not expected to present a problem, based on the stability of a similar stockpile over a 20-year period at the closed Point Thomson Area Material Site.

B.3.7 Performance Standard

The revegetation success will require establishing an initial grass cover to control soil erosion and trap wind-borne native plant seeds. Eventually, the seeded grass stand should die out and be replaced with a complex of indigenous plant species which will colonize and develop a natural tundra community. Revegetation will be considered complete when the percentage of plant canopy cover reaches 10%. It is anticipated that this standard can be achieved 5 years after the initial application of seed.

B.3.8 Monitoring

Each stockpile will be monitored for revegetation success and to check for signs of erosion for a 5-year period after seeding and fertilizing. Monitoring is projected to occur in the second, third, and fifth years after seeding. Vegetation features to be measured include plant species present on site, canopy cover, and plant population densities. Repeat photography will be used to document vegetation aspect changes through time. Plant canopy cover will be measured with the walking point method, and plant densities with a 0.25-square-meter plot frame.

B.3.9 Reporting

Technical reports will be prepared after each field inspection. Plant and soil data obtained will be included in the second, third, and fifth year reports.

B.3.10 Remedial Action

Appropriate remedial actions will be taken to ensure the revegetation goal (percentage of plant canopy cover) is reached. These actions may include top-dressing, overseeding, and or fertilizing.

B.3.11 Observed Performance at Similar Site

A similar site located within the Point Thomson Unit was last mined in 1980 and then revegetated. Dr. Jay McKendrick (Lazy Mountain Research, Palmer, Alaska) provided the following observations about the revegetation of the former Point Thomson Area Material Site (old gravel mine site):

> "I inspected the site in 1999 and found the overburden stockpile to be supporting a wide complex of indigenous tundra plant species. Many of these were heavily grazed by geese and caribou, which was evidenced by the aftermath stubble and number of animal droppings and caribou hoof prints on the ground. High ground next to water bodies, such as the flooded mine and stockpile at this location, are often sought by molting geese. The vegetation and vantage point on the elevated ground are desirable for feeding and loafing birds, and the adjacent water provides escape habitat should predators approach. The high ground affords insect relief to caribou during the summer months when insect harassment is at its peak.
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> "The overburden stockpile lies next to the water-filled pit, and is surrounded on three sides with a gravel berm placed there as part of the original rehabilitation plan. The vegetation on the stockpile consists of a variety of graminoids (grass and sedge species), forbs, and a few willow. It differs from the surrounding vegetation in having a greater plant species diversity and supporting plants adapted to sites drier than that surrounding the site."