POA-1983-478

Mine Site E Expansion
Wetland Mitigation Plan

ConocoPhillips Alaska, Inc.

May 15, 2018

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Summary

The following Wetland Mitigation Plan is proposed to ensure compliance with Section 404 of the Federal Clean Water Act in conjunction with the ConocoPhillips Alaska, Inc. (CPAI) application for a Department of the Army permit (Permit No. POA-1983-478). CPAI proposes to expand the existing Mine Site E to supply gravel fill material for future development and operational requirements within the Kuparuk River Unit (KRU; Sheet 1). The proposed expansion would extend Mine Site E to the north by approximately 24.1 acres, allowing for the extraction of approximately 1,200,000 cubic yards of gravel fill material (Sheets 3 and 4). The expansion is expected to occur over the next 5 years and possibly longer, depending on future oil field development and gravel needs.

CPAI proposes to rehabilitate the existing Mine Site E cells operated by CPAI and the proposed expansion areas in a sequential manner. Mine Site E consists of cells 1, 2, 3, 4, 4a, and 5. For purposes of this Mitigation Plan and the attached documents, all references to Mine Site E rehabilitation refer only to those cells operated by CPAI (1, 2, and 5) and the existing overburden pile to the northeast. Rehabilitation of the other cells will be undertaken by the operators of those cells. CPAI has developed a rehabilitation plan (Appendix A, *Mine Site E Rehabilitation Plan, Rev 1*) for the proposed expansion areas that builds on the original rehabilitation plan developed for Mine Site E that was submitted to the U.S. Army Corps of Engineers (USACE) in 1996, and was later revised in 2007. The rehabilitation proposed for the mine expansion area will be integrated with the previously USACE-approved Rehabilitation Plan's features. This Mitigation Plan discusses the entirety of the rehabilitation to be completed at Mine Site E, up to and following mine closure (both existing and proposed expansion). The total area to be rehabilitated (the existing mine site footprint plus the proposed expansion) will total approximately 110 acres.

Compensatory mitigation is not practicable for the proposed Mine Site E expansion. Use of a mitigation bank or in-lieu fee are not currently available, because no mitigation bank or in-lieu fee sponsor exists that includes the project area or the North Slope within its service area. Permittee-responsible mitigation is also not practicable, because the landowner (State of Alaska) will not currently commit to establishing a protection instrument to ensure the long-term protection of the mitigation site as required by 33 CFR 332.7(a). Although rehabilitation of the mine site described in this document will constitute avoidance and minimization rather than formal compensatory mitigation, the plan format generally follows the components required in a formal Mitigation Plan as outlined in the Final Rule on Compensatory Mitigation for Losses of Aquatic Resources (33 CFR § 332.4).

1. Objectives *[33 CFR § 332.4(c)(2)]*

CPAI acknowledges that it is not possible to restore the gravel mine to pre-mining contours and conditions. Therefore, the overall goal of the proposed rehabilitation is to create diverse fish and wildlife habitats, including new habitat types not present within the area prior to mining. There will be no net loss of aquatic resources because of the expansion. Mining areas would be

converted into both shallow littoral areas and deep-water habitat, including islands for waterfowl nesting. An outlet channel to the Ugnuravik River will be developed, which will eventually allow water to overflow a weir into a small stream/conveyance to the river. Minor losses of wetland and waterbody functions during mining will be offset by functional gains associated with final site rehabilitation. The habitat features to be included in the fully rehabilitated site are described in Section 6, Mitigation Work Plan.

2. Site Selection *[33 CFR § 332.4(c)(3)]*

Rehabilitation would occur in-situ at the site of the existing mine and the proposed expansion area. Because the proposed plan would rehabilitate the impacted area, no alternative sites were considered.

3. Site Protection Instrument *[33 CFR § 332.4(c)(4)]*

Because the proposed rehabilitation does not constitute compensatory mitigation, a site protection instrument is not required. Ownership of the land will remain with the current landowner, the State, post-rehabilitation.

4. Baseline Information *[33 CFR § 332.4(c)(5)]*

The existing mine and proposed expansion area are located within the Arctic Coastal Plain physiographic province that has continuous permafrost. The project area is characterized by an arctic climate with very low mean annual temperatures and precipitation. Due to the presence of shallow permafrost, soils show little profile development and groundwater movement is limited.

Currently, Mine Site E occupies an area that previously consisted of moist sedge/tussock tundra and part of a shallow lake. The existing mine site is characterized by unvegetated, human disturbed barrens or man-made waterbodies (NWI mapping code PUBH; Sheet 2). The existing mine is separated from the Ugnuravik River by a buffer of approximately 500 feet. The pits excavated during the initial mining took place in the late 1970s and early 1980s. The existing Overburden Stockpile is within 230 feet of the river.

The proposed mine expansion area currently consists of moist tussock tundra and wet sedge meadow, with intermixed shallow thaw ponds and flooded emergent vegetation communities. The ponds are less than 5 feet deep and do not support resident fish. Table 1 summarizes wetland and waterbody types present within the proposed expansion area.

Table 1. Wetlands and Waterbodies within in the Mine Site E Expansion Area			
NWI Code[a]	***Description***	***Management Category***	***Acres***
Scrub-Shrub/Emergent Wetlands			
PEM1/SS1E	Seasonally flooded/saturated emergent and broad-leaved deciduous scrub-shrub meadow	II	14.55
PEM1/SS1B	Saturated broad-leaved emergent and deciduous scrub-shrub meadow	III	2.7
Emergent Wetlands			
PEM1H	Permanently flooded emergent marsh	II	1.1
		Total Wetland Area[b]	***18.35***
Waterbodies			
PUBH/ PUBHh	Permanently flooded pond with an unconsolidated bottom	II	5.75
		Total Other Waters[b]	***5.75***
		Total Area[b]	***24.1***

[a] Wetland types classified by Cowardin classes and subclasses. P: palustrine; SS1: broad-leaved deciduous scrub-shrub; EM1: persistent emergent; UB: unconsolidated bottom. Water regimes. B: saturated; E: seasonally flooded/saturated; H: permanently flooded. Special modifiers. h: diked/impounded. Source: Cowardin et al. 1979.

[b] Total acreage present may not reflect the sum of the individual cells due to rounding.

An aquatic site assessment of the wetlands and waters in the proposed expansion area was not completed due to the lack of mitigation credits on the North Slope. As previously stated, there are no mitigation banks or in-lieu fee sponsors with available credits with a service area that includes the mine site. However, both “Pre- and Post-“ versions of the North Slope Rapid Assessment were completed for the site. The assessment determined the individual variable assessment scores after Final Rehabilitation would be similar or slightly higher than the pre-project conditions. This is primarily due to the fact that the nearest road and berm (north side of Cell 2 between Cell 2 and Cell 5) will be removed and pulled back to nearly twice the distance from the assessment site resulting in an increased value of the Impediment to hydrology (V_{IH}) assessment variable. The average Assessment Score prior to disturbance is 0.14 due to the site being surrounded by previous mining activities. The average Assessment Score after Final Rehabilitation would also be 0.14 (Appendix B).

Mammal species likely to occur in the vicinity of the proposed mine expansion area include caribou, foxes, bears, other carnivores, and small mammals such as ground squirrels and lemmings. Caribou densities near Mine Site E are expected to be low to moderate during calving, intermittently high during the mosquito and oestrid fly seasons (late June–mid-August), low during fall, and very low during winter. Arctic and red foxes both occur in the vicinity of the proposed mine expansion area. Foxes have denned in the high spot on the Mine Site E Overburden Stockpile. Low numbers of brown bears are expected to occur near Mine Site E; denning is possible but unlikely in the immediate vicinity. Polar bears may occur occasionally

within the mine expansion area, but the probability of denning is extremely low. Table 2 summarizes wildlife habitat types present within the proposed expansion area.

Table 2. Wildlife Habitat Types within in the Mine Site E Expansion Area

Wildlife Habitat Type[a]	***Acres***
Patterned Wet Meadow	11.75
Shallow Open Water	5.75
Moist Tussock Tundra	2.8
Moist Sedge-Shrub Meadow	2.7
Sedge Marsh	1.1
Total Area[b]	***24.1***

[a] Wildlife habitat types based on ecological land survey mapping of terrain features, surface forms, and vegetation types (Roth et al. 2007).

[b] Total acreage present may not reflect the sum of the individual cells due to rounding.

At least 53 species of birds are common or occur regularly in the vicinity of the mine. Bird species with high to moderate relative abundance in the region include the Greater White-fronted Goose, Tundra Swan, Northern Pintail, King Eider, Long-tailed Duck, Willow Ptarmigan, Pacific Loon, Semipalmated Sandpiper, Pectoral Sandpiper, Dunlin, Stilt Sandpiper, Red-necked Phalarope, Red Phalarope, Parasitic Jaeger, Long-tailed Jaeger, Savannah Sparrow, Snow Bunting, Common Redpoll, and Hoary Redpoll (ABR 2014).

Spectacled Eider, which are listed as threatened under the Endangered Species Act (ESA), have been observed to nest within 1 mile of the proposed mine site expansion area (to the south); however, the proposed mine site expansion footprint is considered an unlikely nesting area due to the lack of pre-nesting observations in the area over more than a decade of aerial and road surveys in the region (ABR 2017). Steller's Eider, also listed as threatened under the ESA, are unlikely to occur in the vicinity of the proposed mine expansion area.

5. Determination of Credits *[33 CFR § 332.4(c)(6)]*

As discussed in Section 1, Objectives, compensatory mitigation is not practicable for the proposed Mine Site E expansion. Rehabilitation of the mine site and the proposed expansion described in this document will constitute avoidance and minimization rather than formal compensatory mitigation (USACE/EPA, 1994). As a result, no credits are proposed to be generated through the rehabilitation of the mine site. No purchases of mitigation bank or in-lieu fee credits are proposed during any phase of the proposed rehabilitation as neither option is currently available for the North Slope. [Note: The North Slope Rapid Assessment was applied to both the pre-/post-project for comparison purposes. Both assessments produced an average Assessment Score of 0.14, thus the Rehabilitation Plan provides quantifiable on-site mitigation in the form of minimization.]

6. Mitigation Work Plan *[33 CFR § 332.4(c)(7)]*

Initial Rehabilitation

The proposed Mine Site E expansion will be conducted in two phases (Appendix A). Initial rehabilitation of Cell 1 and portions of Cell 2 will begin when the overburden generated during the expansion is placed into the littoral zone (Table 3). This rehabilitation approach will allow use of the area immediately adjacent to the active gravel mining zone (Cell 2) for equipment staging and gravel extraction. After three to five years, the littoral area may require re-contouring to achieve rehabilitation goals.

The second phase is the reclamation of the Overburden Stockpile. Additional material may be needed to address slope, habitat island, and littoral zone settlement issues. The Overburden Stockpile will be used as a source to offset potential material shortages required to close Cells 1, 2, and 5. Once determined no additional fill is required, the overburden pile will be contoured to create an upland habitat zone.

This approach will reduce temporal loss of habitat for workspace/staging and minimize the lag time between mine closure and completion of rehabilitation.

Table 3. Phases of Mine Expansion and Rehabilitation

Expansion	***Initial Rehabilitation Phase***	***Estimated Date[a]***
Expansion Phase 1, 24.1 acres	Cells 1 and 2 of existing mine development	Q1 2019
Overburden Stockpile Reclamation	Remove material, as needed, to close out Cells 1, 2, and 5. Create upland habitat zone.	Q2 2019 to Q3 2025
End of mine site life	Cells 1, 2 and 5 (the Expansion) areas along with final rehabilitation of entire mine site	Q3 2025

[a] Estimated expansion and corresponding rehabilitation phases are subject to change, pending future gravel needs.

Initial rehabilitation includes measures that can occur concurrently with mine operations. These may include placement and shaping of overburden, slope stabilization, creation of shallow littoral zones, seeding, and fertilizing. These activities will provide interim wildlife habitat values; improve aesthetics, stability, and function of the site; and prepare each zone for final rehabilitation.

Initial rehabilitation of the existing mine site has already begun with the establishment of side-slopes at approximately 3H:1V and placement of overburden from previous mining operations into a stockpile in the Interim Rehabilitation area (Cell 1). Rehabilitation work will include placing the overburden from Cell 5 into the SE Interim Rehabilitation area as part of creating a littoral zone within and re-grading of the existing surface and edges of the Overburden Stockpile to the northeast of the mine. This is intended to impede flow and develop shallow waterbodies to help retain moisture for upland vegetation and reduce erosion during breakup. The newly created

slopes and spoil areas may also receive interim revegetation efforts to protect slope stability and enhance habitat value for wildlife; however, the site would not be fully revegetated until Final Rehabilitation (see Appendix A).

Once final rehabilitation commences, the Interim Rehabilitation area will be integrated into the deep-water habitat from the previously approved plan. The interim features, such as terraces and stabilized slopes, will provide improved underwater habitat in the deep water.

To limit introduction of invasive plant species across the rehabilitation areas, CPAI proposes to seed the Interim Rehabilitation area using native-grass cultivars. The seed mix will depend on availability, but likely will include *Festuca rubra* ('Arctared' red fescue), *Poa glauca* ('Tundra' glaucous bluegrass), *Arctagrostis latifolia* ('Alyeska' polargrass) and/or *Deschampsia caespitosa* ('Nortran' tufted hairgrass; Appendix C, *Revegetation Plan for Mine Site E, Kuparuk Oilfield, Alaska* [2018 Revegetation Plan]).

Final Rehabilitation

Final rehabilitation will commence when Cell 5 is exhausted of usable gravel within the footprint of the expansion. Cells 1, 2, and 5 will be hydraulically connected. The deep-water habitat of each cell will not be integrated until the end of the mine site life, as it could present a serious safety hazard for personnel working in adjacent areas during mining operations. During mine operation, water levels will be controlled via pumping as needed for mine access and operation. Excess water would be pumped into Cell 1 or an approved tundra location. As the mine expansion progresses, inorganic overburden will be used to create water diversion dikes around the perimeter of the active mine to prevent surface water flow into the mine expansion as well as create a thermal berm to minimize the chance of thermokarst along the edge of the pit.

At the end of the mine site life, the deep-water habitat will be allowed to recharge naturally. Pumping will cease, allowing water to naturally recharge the mine site. Natural recharge allows the perimeter mine site features to come to thermal equilibrium each year as the water rises. A hydraulic connection will be provided between the deep-water area created and the former detention pond at the northeast corner of Cell 1. A weir will be installed in the detention pond to maintain the desired water level. This will allow water from Cells 1, 2, and 5 to flow into the Ugnuravik River. The final water surface elevation of the rehabilitated mine site will be approximately 16 feet above BPMSL, and an outlet weir will be installed to prevent erosion as the spring floods flow out of the mine site.

Created habitat features of the final rehabilitation design are described below. As with the Interim Rehabilitation area, habitat features will be revegetated with live indigenous plants collected from adjacent tundra or elsewhere on the North Slope and native plant seeds available from either commercial growers or collected from natural populations to limit introduction of invasive plant species across the rehabilitation areas (Appendix C).

LITTORAL ZONE

Shallow littoral areas will be formed by shaping the surface of the overburden material placed in Cell 1 of the mine. The edge of the littoral shelf will be contoured irregularly and sloped at a

3H:1V slope to the mine floor, providing the transition to the deep-water habitat. The terraces and slopes created during the interim rehabilitation effort should have established vegetation by this time, which will provide added stability to the shallow littoral areas after the mine site reaches the design water surface elevation. Deeper terraces and slopes will provide varying habitats.

The Overburden Stockpile will be re-contoured to provide potential upland habitat upon mine closure. The stockpile will be re-shaped with scalloped edges and varying surface elevations to provide relief and potential denning habitat. The surface of the stockpile will contain a couple of perched ponds that will act as stormwater retention areas that are connected by earthen bioswale with isolated, hardened (gravel/rock) swales to prevent erosion. The bioswales will be vegetated over time to manage flow and prevent excessive erosion. The excess stormwater/melting snow will eventually drain onto the existing tundra near the outlet weir of the Mine Site E which flows into the Unguravik River.

The 2018 Revegetation Plan (Appendix C) prepared for the proposed Mine Site E expansion includes the following rehabilitation treatments for the eventual shallow littoral areas: seeding of wetland sedges, transplantation of tundra plugs, and planting of sprigs of *Arctophila fulva*. These treatments will help establish a diverse, productive community of indigenous plants, and provide habitat favored by waterbirds.

The 2007 USACE permit modification set a goal of 20-25% percent of the final rehabilitation area to include littoral zones. Correspondingly, each phase of rehabilitation will have a goal of a minimum of 20 percent of the final water surface to be developed as littoral zones. This approach will ensure that upon completion, the final total rehabilitation area will include the desired amount of littoral zones (20 percent).

ISLANDS

Four nesting islands for waterfowl, ranging in size from 0.5 to 1.2 acres, will be constructed in the shallow littoral areas. These islands are intended to provide nesting areas for birds. The tops of the islands will be 2 to 3 feet above the water surface, and their side slopes will be sloped at approximately 10H:1V to allow birds easy access. Islands will be at least 50 feet from the shoreline, to provide protection from terrestrial predators (e.g., foxes).

The 2018 Revegetation Plan (Appendix C) proposes fertilization and seeding with native-grass cultivars on the islands to rapidly establish plant cover, provide forage and cover for birds, and initiate the process of soil development. This treatment will be applied prior to flooding. When the water surface is near the design elevation, additional plant cultivation treatments may be applied, which may include transplanting willow cuttings (*Salix* spp.), tundra plugs, and/or sprigs of *Arctophila fulva*.

DEEP WATER HABITAT

The area of the final deep-water habitat is expected to be approximately 74 acres in total. The maximum depth of the lake is expected to be approximately 56 feet, with the majority of the area greater than 30 feet in depth. Overburden material will be used to ensure all slopes are a

maximum of 3H:1V. The deep-water area will be connected to the Ugnuravik River (outflow only), and may provide overwintering habitat for fish, such as Arctic grayling (if stocked).

7. Maintenance Plan *[33 CFR § 332.4(c)(8)]*

During initial and interim rehabilitation (prior to final hydraulic filling), an annual trash pickup effort will be instituted following breakup to keep any snow dump areas clean and free of debris.

8. Performance Standards *[33 CFR § 332.4(c)(9)]*

It is anticipated that minor losses of wetland and waterbody functions will be offset by ultimate functional gains, such as creation of overwinter fish habitat associated with final site rehabilitation. Performance standards have been developed to allow for quantitative assessment of revegetation progress at each site component. Some flexibility is needed with respect to specific objectives and scheduling due to uncertainties about how site conditions will develop over time, both before and after completion of mining. Proposed standards are summarized in Table 4 below and further described in the 2018 Revegetation Plan (Appendix C).

Table 4. Objectives and Performance Standards for Cell 1, Mine Site E, North Slope, Alaska

Site Component	Objectives	Performance Standards
Shallow littoral areas (Cell 1)	Create productive wildlife habitat, especially for waterbirds.	≥50% survival of tundra plugs and statistically significant increase in mean diameter, within 5 years. ≥25 stems/m^2 of *Arctophila* stems within ≥20% of shallow littoral areas, within 10 years.
Islands (Cell 1)	Create productive wildlife habitat, especially for waterbirds.	≥10% total live cover of indigenous vascular plants (ILVC) and ≥5 species of indigenous vascular plants, each with ≥0.2% cover, within 10 years. ≥25% survival of willow cuttings and statistically significant increase in mean height, within 5 years. ≥50% survival of tundra plugs and statistically significant increase in mean diameter, within 5 years. ≥25 stems/m^2 of *Arctophila* stems within ≥20% of shallow littoral area, within 10 years.
Berms	Primary objective: promote thermal stability around the edges of the mine site.	No vegetation performance standard (vegetation has negligible effect on the primary objective).

Table 4. Objectives and Performance Standards for Cell 1, Mine Site E, North Slope, Alaska

Site Component	Objectives	Performance Standards
	Secondary objective: promote establishment of a plant community dominated by indigenous species.	≥5 species of indigenous vascular plants, within 10 years.
Side slopes	Primary objective: promote thermal stability around the edges of the mine site and flooded pits.	No vegetation performance standard (vegetation has negligible effect on the primary objective).
	Secondary objective: promote establishment of a plant community dominated by indigenous species.	≥5 species of indigenous vascular plants, within 10 years.
Perched Wetlands (Former overburden stockpile)	Create productive wildlife habitat, especially for waterbirds.	≥50% survival of tundra plugs and statistically significant increase in mean diameter, within 5 years. ≥25 stems/m^2 of Arctophila stems within ≥20% of pond shorelines, within 10 years.
Uplands (Former overburden stockpile)	Primary objective: promote thermal stability of stockpile and maintain flooded conditions in three excavated depressions.	No vegetation performance standard (vegetation has negligible effect on the primary objective).
	Secondary objective: promote establishment of a plant community dominated by indigenous species.	≥5 species of indigenous vascular plants, within 10 years.

9. Monitoring Requirements *[33 CFR § 332.4(c)(10)]*

A CPAI representative with knowledge of the rehabilitation intent will monitor the construction of the rehabilitation features. The individual will explain the plan to the construction supervisor and monitor the rehabilitation efforts. Additionally, the water recharge process will be visually monitored for scour and erosion.

A CPAI representative will monitor the rehabilitated site for two years after final rehabilitation activities are completed and the site has flooded to the desired elevation. Rehabilitated side slopes will be visually checked for erosion and instability. Corrective action is expected to be taken as necessary to meet the intent of the rehabilitation plan.

The 2018 Revegetation Plan (Appendix C) includes a multi-year monitoring period to assess whether revegetation and rehabilitation goals have been met. Preliminary monitoring will be conducted to determine whether achievement of performance standards on schedule appears likely, or whether additional treatments are needed. If the performance standards for a particular treatment have not been reached by the target date, the need for additional rehabilitation treatments and/or monitoring will again be assessed and implemented, as necessary. CPAI will submit an annual report to USACE by December 1 of each year which will include a photographic image of the site and surrounding areas and a written report of any physical changes from the previous annual report.

10. Long-Term Management Plan *[33 CFR § 332.4(c)(11)]*

Long-term management for the Mine Site E area is based on (1) the oil and gas lease, including its terms on site restoration, (2) applicable Alaska Department of Natural Resources regulations and internal policy documents on land management.

11. Adaptive Management Plan *[33 CFR § 332.4(c)(12)]*

If the goal of at least 20 percent shallow littoral habitat cannot be achieved using the proposed rehabilitation plan, alternative options would be considered. One such option would be to excavate areas under abandoned dikes adjacent to the mine site, transfer additional material from the Overburden Stockpile, to produce fill to be used for habitat and create additional shallow areas, or raise areas that were originally intended to be part of the littoral zone but subsided. The USACE would be consulted during this process to ensure compliance with the Section 404 permit.

12. Financial Assurances *[33 CFR § 332.4(c)(13)]*

CPAI is Alaska's largest oil producer and has been a leader in oil and gas exploration and development in the State for more than 50 years. As such, CPAI has a strong financial position with assets in Southcentral Alaska and on the North Slope. CPAI has an existing bond with the State that secures compliance with CPAI's state lease including use and rehabilitation of Mine Site E. As such, CPAI requests that USACE conclude that additional financial assurances are not necessary.

References

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Sheets

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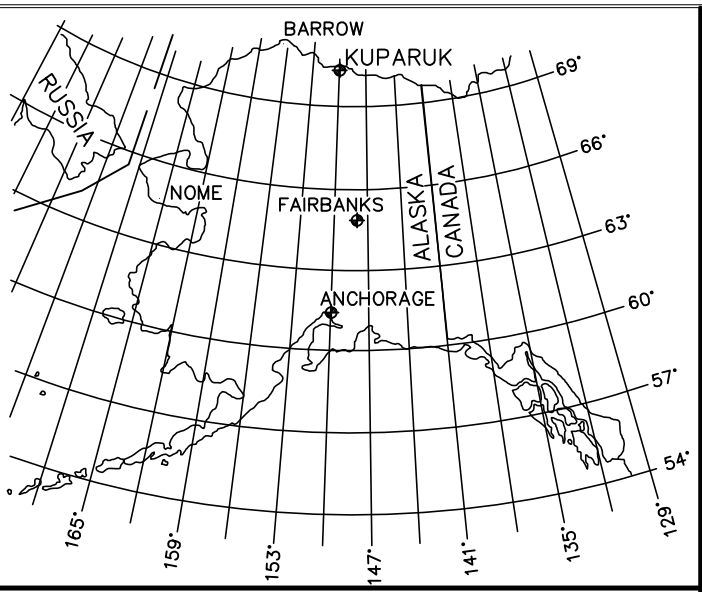
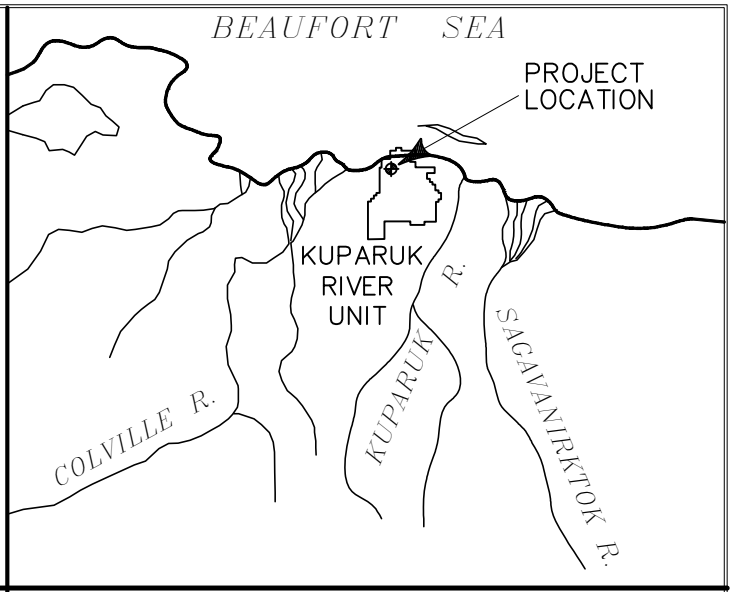
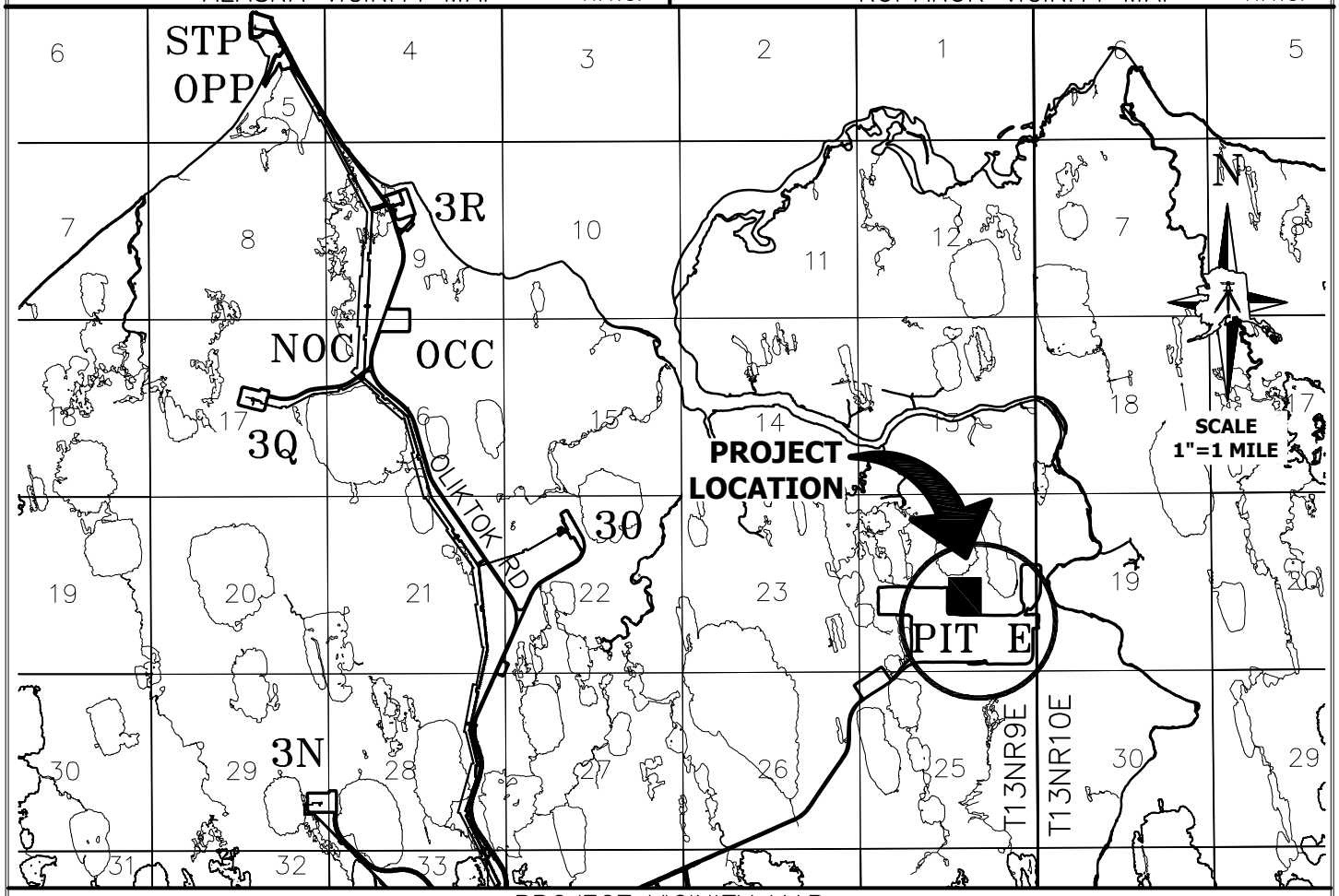


ALASKA VICINITY MAP N.T.S.



KUPARUK VICINITY MAP N.T.S.



PROJECT VICINITY MAP

PURPOSE:
EXPAND EXISTING GRAVEL MATERIAL SOURCE FOR OILFIELD DEVELOPMENT

DATUM:
BPMSL, NAD83 ASP ZONE 4

ADJACENT PROPERTY OWNERS:
1. STATE OF ALASKA DNR
2. NORTH SLOPE BOROUGH

APPLICANT: CONOCOPHILLIPS ALASKA INC.

LOCATION: T13N, R9E UMIAT MERIDIAN

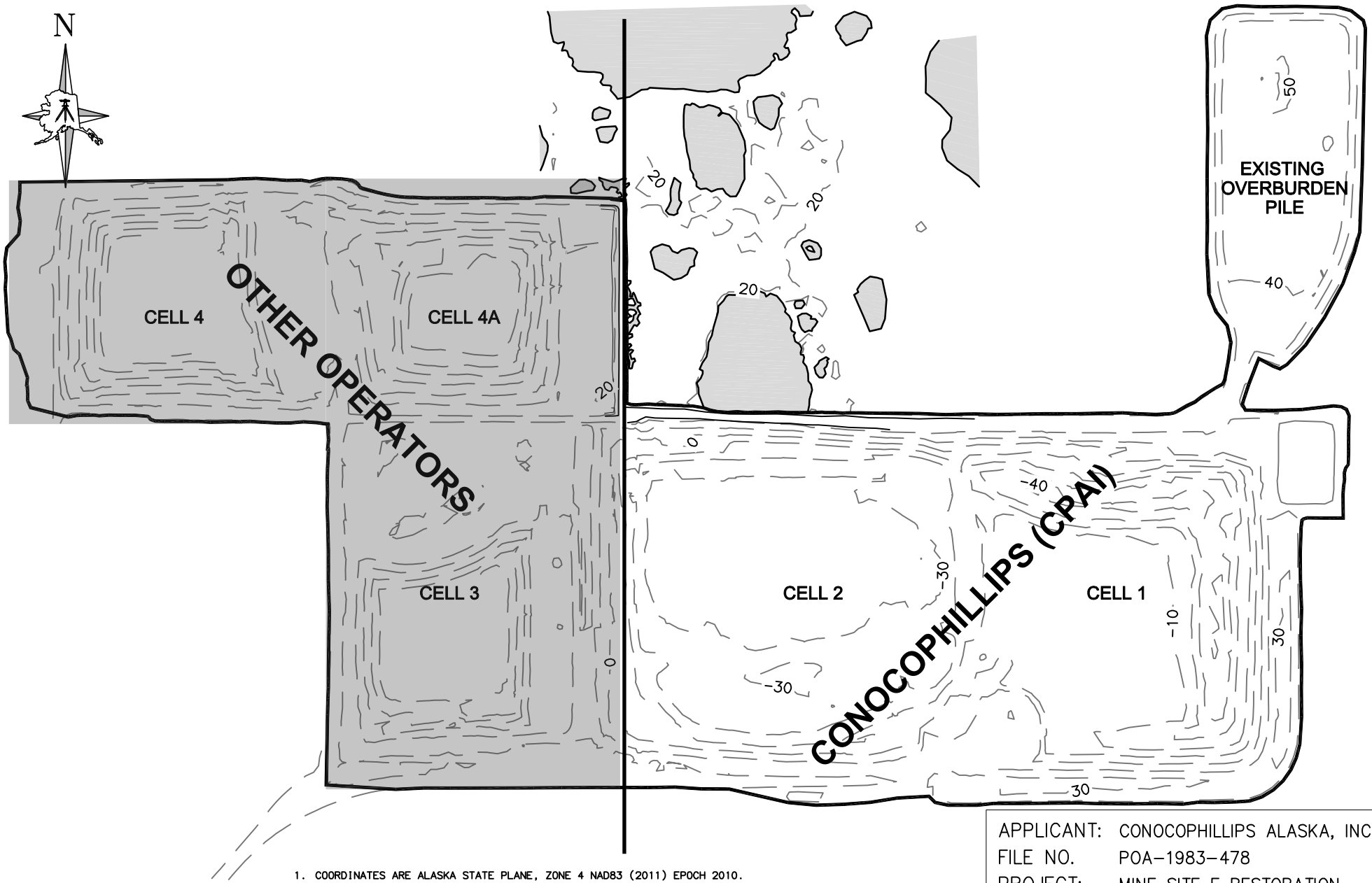
ADDRESS: 700 G STREET #1950 ANCHORAGE, ALASKA 99501

FILE NO. POA–1983–478

PROPOSED: EXPANDED MINE SITE BOUNDARY

IN & NEAR: KUPARUK RIVER UNIT

COUNTY: NORTH SLOPE BOROUGH
STATE: ALASKA

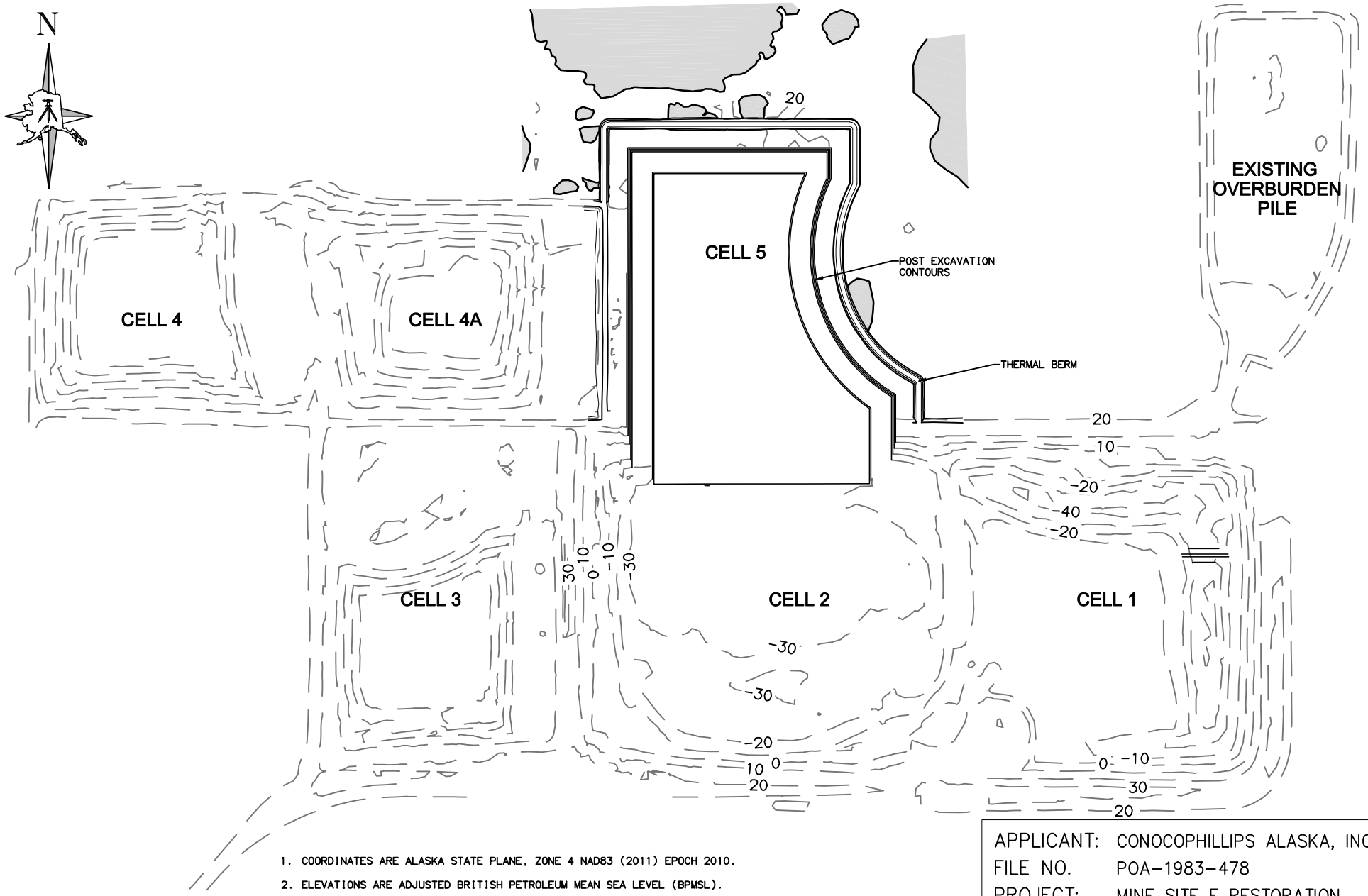


1. COORDINATES ARE ALASKA STATE PLANE, ZONE 4 NAD83 (2011) EPOCH 2010.
2. ELEVATIONS ARE ADJUSTED BRITISH PETROLEUM MEAN SEA LEVEL (BPMSL).
3. CONTOUR INTERVALS ARE 10 FEET.

EXISTING CONDITONS

SCALE: 1" = 500'

APPLICANT:	CONOCOPHILLIPS ALASKA, INC.
FILE NO.	POA-1983-478
PROJECT:	MINE SITE E RESTORATION
LOCATION:	T13N, R9E, SEC 24
WATERBODY:	UGNURAVIK RIVER
DATE:	5/17/18
SHEET:	2 OF 7

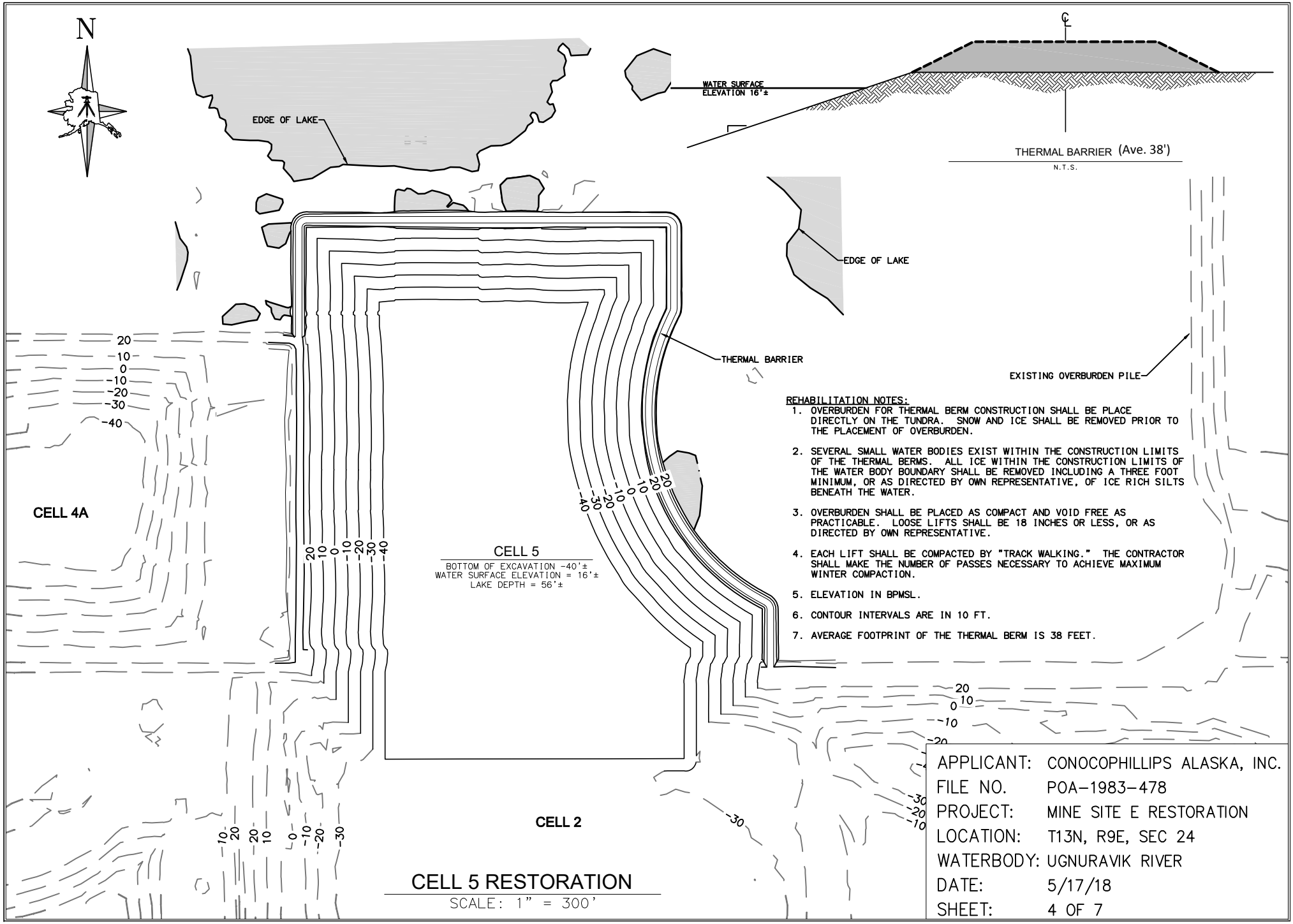


1. COORDINATES ARE ALASKA STATE PLANE, ZONE 4 NAD83 (2011) EPOCH 2010.
2. ELEVATIONS ARE ADJUSTED BRITISH PETROLEUM MEAN SEA LEVEL (BPMSL).
3. CONTOUR INTERVALS ARE 10 FEET.
4. AVERAGE FOOTPRINT OF THE THERMAL BERM IS 38 FEET.

PROPOSED MINE SITE EXPANSION

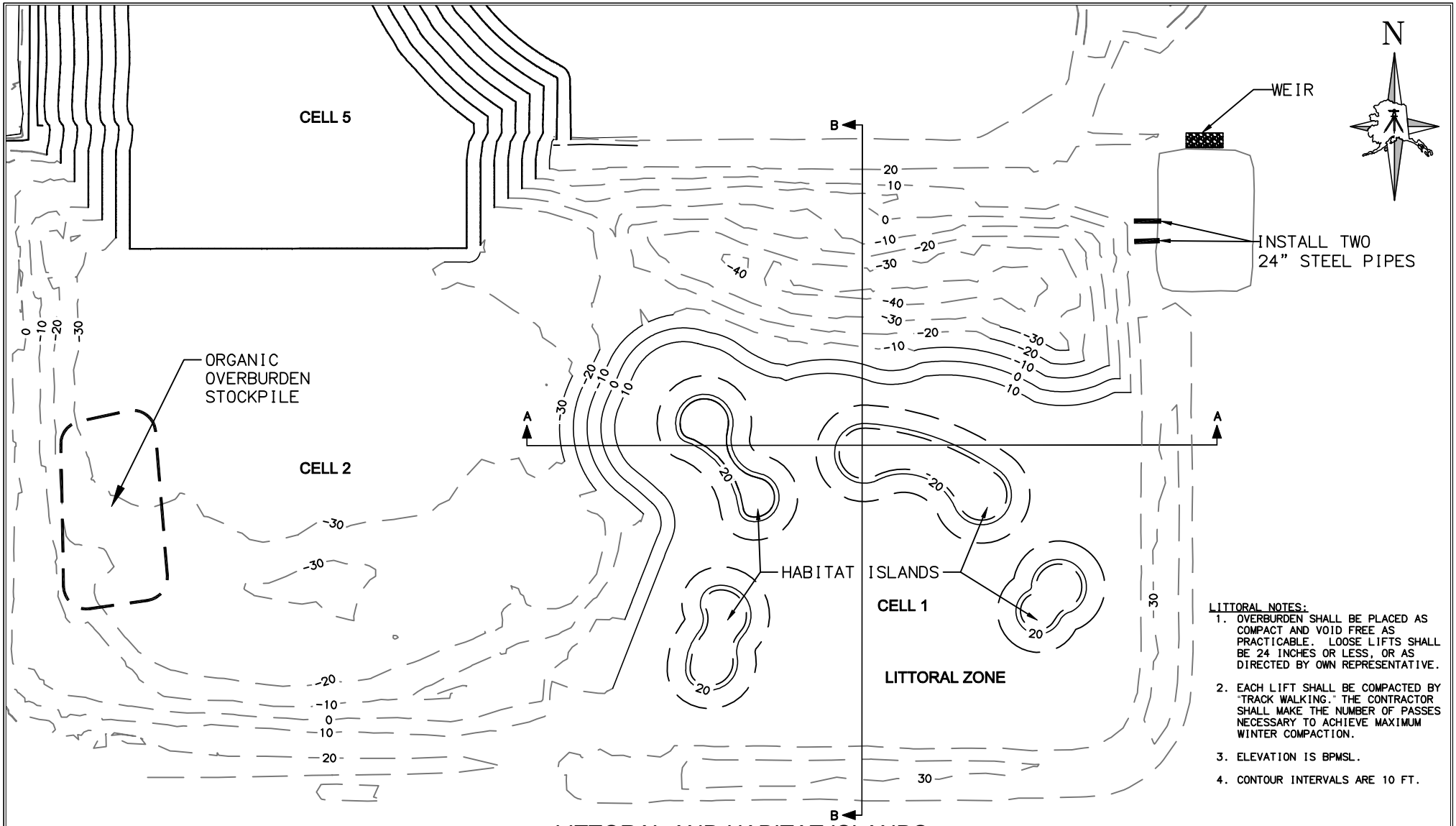
SCALE: 1" = 500'

APPLICANT:	CONOCOPHILLIPS ALASKA, INC.
FILE NO.	POA-1983-478
PROJECT:	MINE SITE E RESTORATION
LOCATION:	T13N, R9E, SEC 24
WATERBODY:	UGNURAVIK RIVER
DATE:	5/17/18
SHEET:	3 OF 7



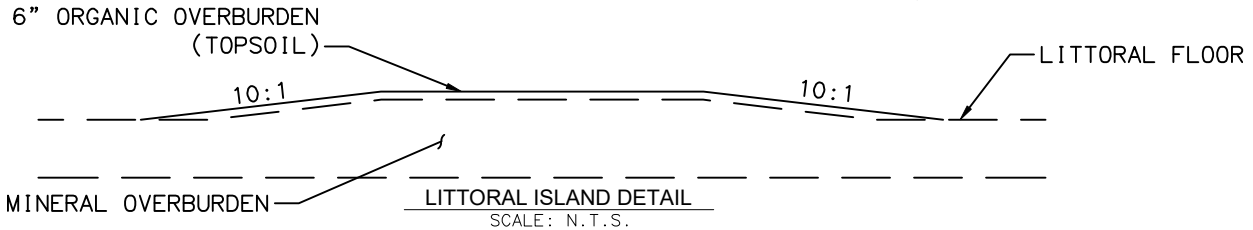
CELL 5 RESTORATION

SCALE: 1" = 300'



LITTORAL AND HABITAT ISLANDS

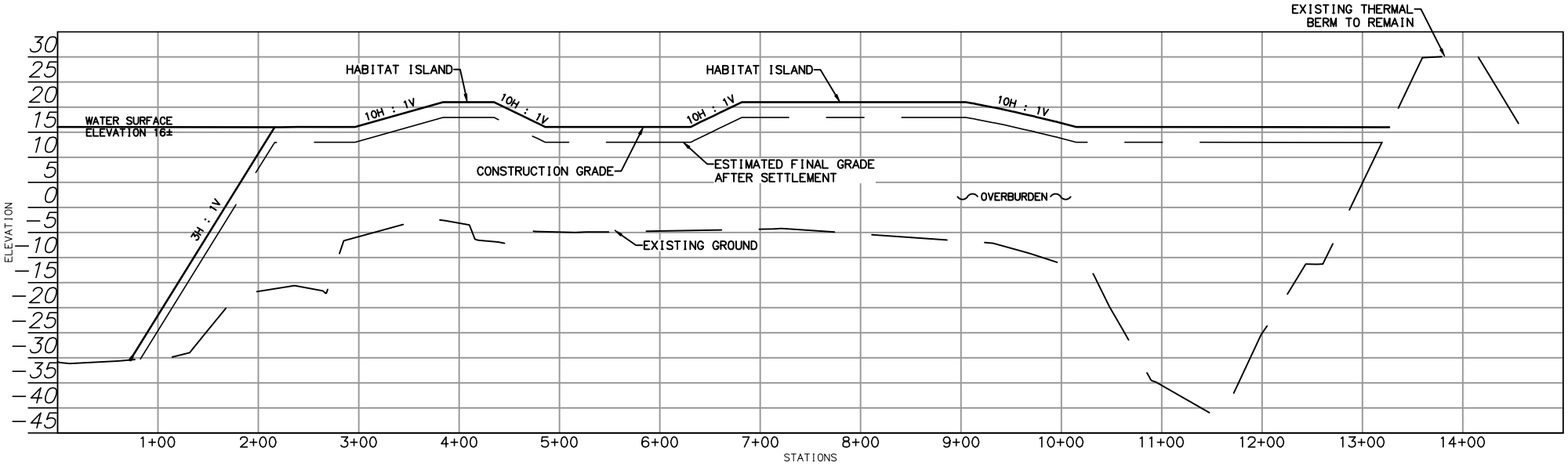
SCALE: 1" = 300'



LITTORAL ISLAND DETAIL

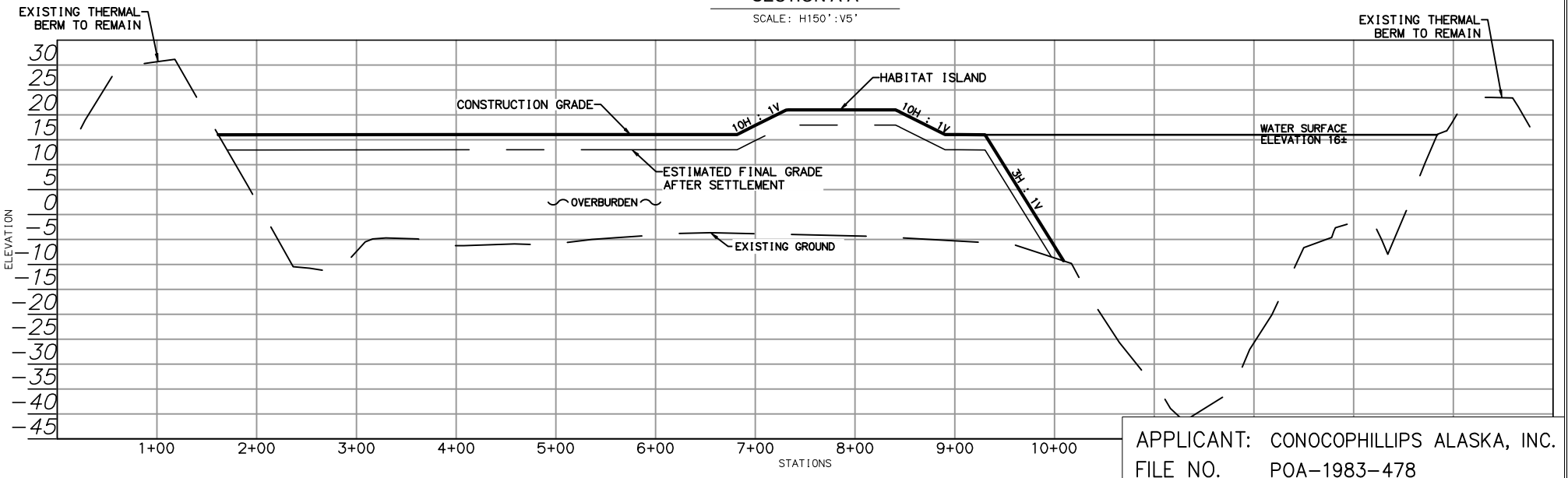
SCALE: N.T.S.

APPLICANT:	CONOCOPHILLIPS ALASKA, INC.
FILE NO.	POA-1983-478
PROJECT:	MINE SITE E RESTORATION
LOCATION:	T13N, R9E, SEC 24
WATERBODY:	UGNURAVIK RIVER
DATE:	5/17/18
SHEET:	5 OF 7



SECTION A-A

SCALE: H150':V5'



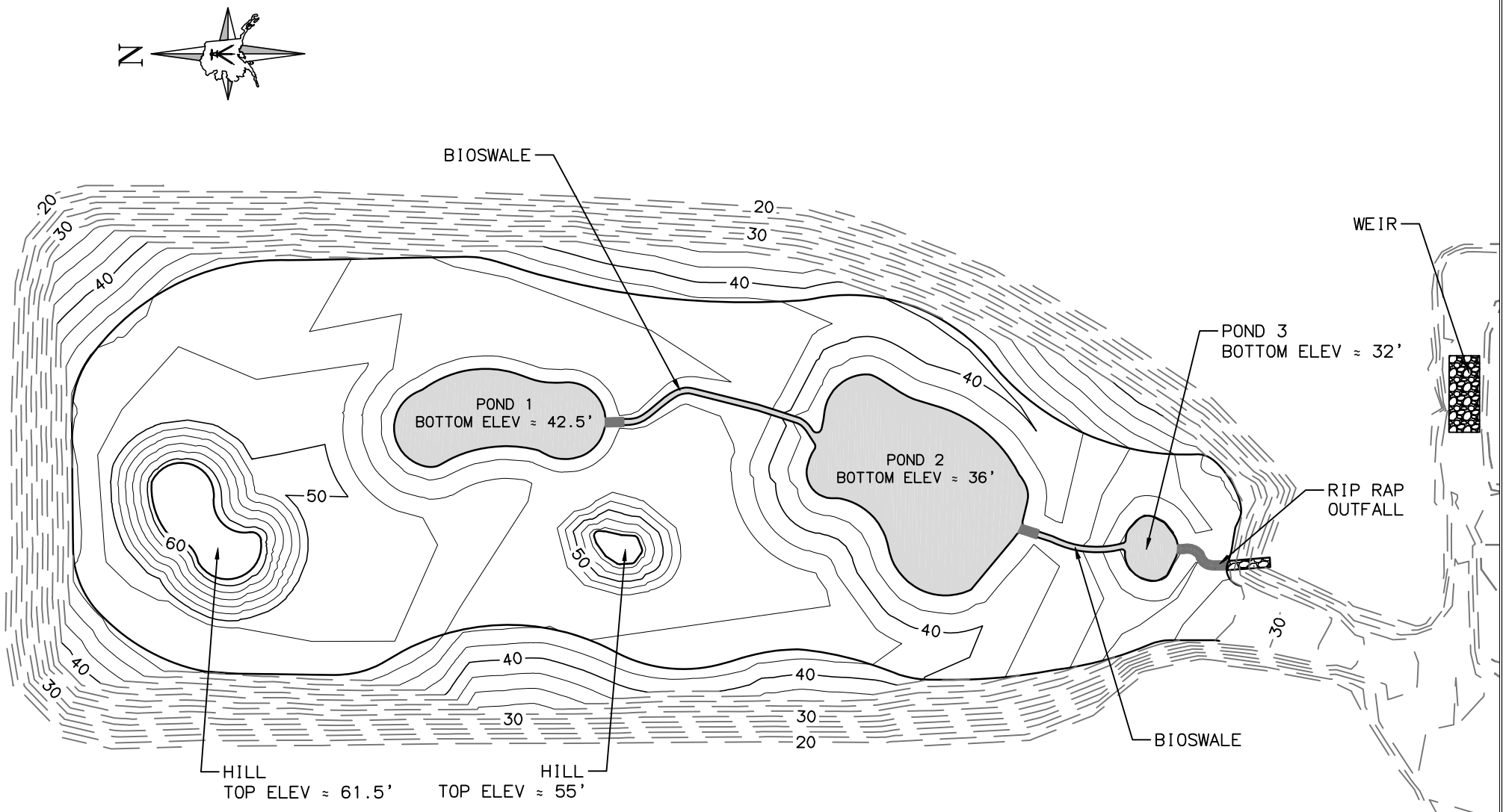
SECTION B-B

SCALE: H150':V5'

LITTORAL SECTIONS

SCALE: 1" = 150'

APPLICANT:	CONOCOPHILLIPS ALASKA, INC.
FILE NO.	POA-1983-478
PROJECT:	MINE SITE E RESTORATION
LOCATION:	T13N, R9E, SEC 24
WATERBODY:	UGNURAVIK RIVER
DATE:	5/17/18
SHEET:	6 OF 7



OVERBURDEN RESTORATION NOTES:
1. ELEVATIONS ARE BPMSL.
2. CONTOUR INTERVALS ARE 2 FOOT.

OVERBURDEN PILE RESTORATION

SCALE: 1" = 150'

APPLICANT:	CONOCOPHILLIPS ALASKA, INC.
FILE NO.	POA-1983-478
PROJECT:	MINE SITE E RESTORATION
LOCATION:	T13N, R9E, SEC 24
WATERBODY:	UGNURAVIK RIVER
DATE:	5/17/18
SHEET:	7 OF 7

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Appendix A

Mine Site E Rehabilitation Plan Rev 1

May 2018

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MINE SITE E
REHABILITATION PLAN

Prepared for:

ConocoPhillips Alaska, Inc.

Prepared by:

EXP Energy Services

3800 Centerpoint Drive, Suite 200

Anchorage, AK 99503

May 24, 2018

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Appendix B Revegetation Plan

CONOCOPHILLIPS ALASKA INC.

MINE SITE "E" REHABILITATION PLAN

INTRODUCTION

Mine Site "E" is located in the Milne Point Unit, on the North Slope of Alaska (see Location Map, Sheet 1 of 7). Mine Site E consists of cells 1, 2, 3, 4, 4a, and 5. For purposes of this Rehabilitation Plan and the attached documents, all references to Mine Site E rehabilitation refer only to those cells operated by ConocoPhillips Alaska, Inc. (CPAI) (cells 1, 2, and 5) and the existing overburden pile to the northeast.

This rehabilitation plan presents an updated plan to complete final site rehabilitation of Mine Site "E" for cells 1, 2, and 5; rehabilitation of the other cells will be undertaken by another operator. Current plans for the operation and maintenance of the facilities in the Kuparuk River Unit call for the mine site to be active until final abandonment of the field. Final site rehabilitation would commence at final abandonment.

This plan assumes that all of the gravel that was approved for removal by the permitting agencies in 1985 (and more recently) will be extracted prior to final closure. It is not possible to restore the site to pre-mining conditions. Therefore, the intent of the plan is to rehabilitate the site to create a diversity of habitats. The habitats created would include habitats that were not present at the site prior to mining. Specifically, the plan provides for the revegetation of exposed soils, creation of islands for waterfowl nesting, creation of shallow littoral habitat as well as creation of deep-water habitat.

LIMITATIONS

This rehabilitation plan assumes that Mine Site “E" is not expanded beyond the currently permitted boundaries, including cell 5. This rehabilitation plan represents a set of objectives and goals that are expected to be conceptually met. The general plan intent will be adhered to. However, some deviations and changes are inevitable due to the many variables involved in the project (adaptive management). If it becomes desireable to expand this site or to use this site in an alternative manner, this rehabilitation plan will be reviewed to ensure continued applicability.

This rehabilitation plan also assumes that the most suitable rehabilitated use of Mine Site "E" will be as wildlife habitat. The rehabilitation plan presented herein represents an estimate of the actions that might be used to rehabilitate the site. If a more suitable rehabilitated use of the site is identified prior to final rehabilitation, this rehabilitation plan will be reviewed and revised as necessary.

BACKGROUND

ConocoPhillips Alaska, Inc. (CPAI) first obtained the required permits to extract gravel from this site in early 1984. The permits allowed CPAI to construct an access road to the mine site and to open a new pit (Cell 1) located 1200 feet east of an existing BP mine site (cell 3). Thus, the original BP and CPAI pits constitute the cell 3 and cell 1 of the present site (see Vicinity Map, Sheet 1 of 7). The overburden pile north of cell 3 and northeast of cell 1 is the overburden from cells 1 and 3. The settling pond in the northeast corner of cell 1 allows water velocities to attenuate prior to discharge to the tundra.

CPAI obtained the required permits for a site expansion, into the central third of the present site (cell 2), in early 1985. Overburden from the expansion area was placed into the cell 1.

In August 1996 CPAI applied to continue gravel extraction operation and rehabilitation of cells 1, 2, and 3 of Mine Site “E”. In October, 1996 a new COE permit was issued for Mine Site “E”, which stipulated that CPAI is responsible for the final rehabilitation of cell 1, cell 2, and cell 3.

In February, 2006 Pioneer Natural Resources Alaska, Inc received a permit to expand the mine site. Pioneer’s permit created cells 4 and 4a northeast and north of cell 3, as shown on sheet 2 of 7. The rehabilitation of cell 3, 4, and 4a is included in Pioneer’s permit (later transferred to Caelus).

The most current Rehabilitation Plan for cell 1 and 2, for which CPAI is responsible, was approved by COE in 2007.

SITE DESCRIPTION

Mine Site "E" occupies an area that previously contained small tundra ponds and a small tributary to the Ugnuravik River. The small tributary originated in a series of shallow lakes south of the mine site and flowed northeast across the eastern third of the site. The tributary stream probably flowed intermittently throughout the open water season. A buffer of approximately 800 feet separates the east edge of the site from the Ugnuravik River. The overburden stockpile is located northeast of the pit. There is a buffer of about 200 feet between the stockpile and the Ugnuravik River.

Access to the site is from the southwest. Expansion of the site has resulted in a rectangular shaped pit (cells 1-3), with the long axis aligned approximately in an east-west direction. The aerial extent of terrestrial disturbance has been minimized by excavating a deep pit with steep side slopes.

Lakes and adjacent habitat in the general area are likely used by shorebirds such as plovers, sandpipers, and phalaropes, and by waterfowl such as black brant,

Canada goose, pintail, oldsquaw, king eider, and pacific loon. Most avifauna in the area are migratory and thus, are present for only a portion of the year. Habitat for shorebirds and waterfowl is abundant in the Milne Point Unit.

Use of the rehabilitated mine site by mammals is expected to be minimal. Nevertheless, caribou may be in the area during the summer, and arctic fox and small mammals such as shrews and voles, lemmings and ground squirrels may be present in the mine site vicinity throughout the year.

REHABILITATION PLAN

The rehabilitation plan includes a diversity of wildlife habitats created by the construction of the following features:

Littoral Zone - Approximately 20% of the entire pit area of cell 1, 2 and 5 will be waterfowl habitat with islands and water depths of 3' or less. The shallow littoral habitat will be suitable for emergent aquatic vegetation, water bird feeding, and other wildlife uses. The lake shoreline will be graded to 3:1 slope and is expected to provide habitat for diving ducks, geese, and swans. The overburden placed to create to create littoral zones is expected to have settlement of 30-70%. The construction grading plan will leave this area high to allow for the anticipated settlement. After three to five years the area will be stable and touch up grading will be completed to achieve the littoral zone goals.

Islands - Four islands, approximately 0.4 acre, 0.5 acre, 0.9 acre and 1.2 acres, will be constructed along the south and east side off Cell 1 and into cell 2. These islands will provide nesting areas for birds. The islands will be placed a minimum of 50 feet away from the shore. The sides of the islands will be sloped at approximately 1:10 to provide a littoral zone and allow birds easy access to the islands. The top of the island will be placed at an elevation of 19 feet, which will place the top 3 feet above the planned water surface.

Outlet Connector Channel - A rock outlet weir will be constructed on the north side of the settling pond. This will provide a stabilized outlet, maintain desired water level, and prevent head cutting into the new lake. It will also direct sheet flow to the historic drainage channel for the area. To minimize the height of the berms, reduce hydraulic head, and minimize the fill needed to create littoral habitat a water level of 16 feet British Petroleum Mean Sea Level (BPMSL) was chosen as the planned water level. This level drives the design height of the berms, depth of the lake, and construction of shallow areas and islands.

Deep Lake – The lake will be created as a result of continued gravel mining. Slopes of 3:1 will be maintained as the gravel is removed. The lake will occupy cell 2, 5 and the north edge of cell 1. A beach shoal is expected to develop at the final water level in the reclaimed E mine site. The maximum depth of the lake is expected to be approximately 56 feet. The area of the newly created open-water habitat is expected to be approximately 74 acres (see Sheet 4 of 7).

To construct these features, existing site structures will be modified as follows:

Overburden Stock Pile - The existing overburden stock pile northeast of cell 1 will be reduced, recontoured and revegetated to provide upland habitat. The material, if needed, will be placed into cell 1 along with the overburden from cell 5 to create littoral area and nesting islands.

Berms - Sections of the mine site dikes on the north, south and east edges of the site have impeded surface drainage. The berms or dikes that surround cells 1 and 2 will be reduced to no less than 5 feet above the existing grade to prevent thermal degradation.

Unvegetated disturbed areas are intended to be revegetated during site rehabilitation. Appendix B presents the plan for the revegetation of the final site features.

REHABILITATION SCHEDULE

Rehabilitation has begun with the placement of overburden in cell 1 from earlier mining operations and would continue with overburden from cell 5 being placed in the littoral zone (in cell 1). Current plans for the operation and maintenance of the facilities in the Kuparuk River Unit call for the mine site to be active for another 5 years. Final site rehabilitation would commence at final abandonment.

The first phase of rehabilitation will be the recontouring of the large overburden pile northeast of cell 1. If extra material is needed for meeting final elevations in the littoral zone, then some of the material may be removed from the stockpile and placed in cell 1.

This work will be incorporated into the operation and maintenance of the mine site over approximately the next 5 years by CPAI in-house staff on a time available basis. The material will be moved and placed in the summer months. As the overburden stockpile material is used, the remaining overburden mound will be graded and recontoured such that drainage is directed inward and down to the access ramp to the pit, away from the adjacent tundra.

The removal of material from some of the perimeter dikes or berms will be completed at the end of mining of gravel. This material will be used to create littoral area and islands. The pit is expected to take 15 years from the time of rehabilitation to fill up naturally to elevation 16 ft AMSL. The overburden filling, littoral areas and rock weir should be completed a minimum of 5 years before the lake fills up to allow the areas to thaw stabilize prior to submersion.

REHABILITATION MONITORING

Rehabilitation Construction

A CPAI representative with knowledge of the intent of the rehabilitation plan will monitor the construction of the rehabilitation features. The individual will explain the plan to the construction supervisor, and monitor the rehabilitation efforts. Additionally, the filling process will be monitored for scour and erosion.

Post-Construction

A CPAI representative will monitor the rehabilitated site for two years after the site has filled with water. The outlet channel connection to the Ugnuravik River tributary will be visually monitored during breakup and in mid to late summer for thermal degradation, hydraulic scour, and overall stability. Rehabilitated side slopes will be visually checked for erosion and instability. Corrective action is expected to be taken as necessary to meet the intent of the rehabilitation plan.

Revegetation treatments will be applied to final site features as soon as they are stable enough to support revegetation efforts (e.g., seed and fertilizer application, etc.) Appendix B presents the detailed revegetation plan.

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APPENDIX A

REHABILITATION PLAN SHEETS

See *Mine Site E Expansion Wetland Mitigation Plan,* Drawings Sheets 1 – 7

APPENDIX B

REVEGETATION PLAN

See *Mine Site E Expansion Wetland Mitigation Plan,* Appendix C: Revegetation Plan for Mine Site E, Kuparuk Oilfield, Alaska (May 2018)

Appendix B

North Slope Rapid Assessment for the Mine Site E Expansion Project

May 2018

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ALASKA NORTH SLOPE REGION RAPID WETLAND ASSESSMENT			
Section A: Desk Top (Offsite) Data			
Site Name/Location:	Mine Site E	Latitude/UTM Northing:	70.4634
Date:	5/1/2018	Longitude/UTM Easting:	-149.6981
Impact/Mitigation:	Impact	Pre/Post:	Pre-project
Region:	Arctic Coastal Plain	Coordinate System:	NAD 83
HGM Class:	Depressional/Organic Flat	Imagery Source (Year):	2015
Investigator(s):	M. Holley		

Determine values for variables 1-5 using an 80 meter radius plot.		
1 V_{LLD}	Local Landscape Disturbance - percent of the plot (0 - 100) occupied by anthropogenic disturbance and/or man-made features.	40%
	V_{LLD} Subindex Score	0.0
2 V_{SW}	Anthropogenically Derived Surface Water - percent of the plot (0 - 100) occupied by surface water derived from human activities, including thermokarst if directly associated, and conspicuously linked.	30%
	V_{SW} Subindex Score	0.0
3 V_{IH}	Impediment to Hydrology - number of quarter segments (0 - 4) assignable in any direction that have hydrologic impediments.	2
	V_{IH} Subindex Score	0.5
4 V_{DD}	Evidence of Dust - accumulation of sediment on vegetation, appearing as areas of discoloration.	0.8
5 V_{TK}	Evidence of Thermokarst	0.7
Determine values for variables 6-8 using an 800 meter radius plot.		
6 V_{LD}	Landscape Disturbance - percent of the plot (0 - 100) occupied by anthropogenic disturbance and/or man-made features.	36%
	V_{LD} Subindex Score	0.36
7 V_{IW}	Impediment to Wildlife - number of quarter segments (0 - 4) assignable in any direction with impediments to the free movement of wildlife.	3
	V_{IW} Subindex Score	0.25
8 V_{DR}	Distance to Roadway - minimum distance in meters (0 - 800) to a roadway of any size, class, or condition.	225m
	V_{DR} Subindex Score	0.45
	Habitat Assessment Score	0.22
	Hydrology Assessment Score	0.21
	Biogeochemical Cycling Assessment Score	0.0

Remarks

Desktop survey of Cell 5 (proposed) immediately adjacent to existing Cells 2 (south) and 4A (west) with Overburden Stockpile to the east. Site receives water pumped from existing pit (source of anthropogenic water).

ALASKA NORTH SLOPE REGION RAPID WETLAND ASSESSMENT			
Section C: Summary of Assessment Scores			
On-Site Variable Subindex Scores			
V_{MT}	Microtopography	N/A	
V_{SR}	Average species richness	N/A	
V_{BG}	Average percent bare ground	N/A	
V_{LDD}	Local evidence of dust deposition	N/A	
V_{LTK}	Local evidence of thermokarst	N/A	
Off-Site Variable Subindex Scores			
V_{LLD}	Local landscape disturbance	0.0	
V_{SW}	Anthropogenically derived surface water	0.0	
V_{IH}	Impediment to hydrology	0.5	
V_{DD}	Evidence of dust	0.8	
V_{LD}	Landscape disturbance	0.36	
V_{IW}	Impediment to wildlife	0.25	
V_{DR}	Distance to roadway	0.45	
V_{TK}	Evidence of thermokarst	0.7	
Assessment Scores			
	Habitat	0.22	
	Hydrology	0.21	
	Biogeochemical	0.0	
	On-site Modifer	N/A	
	AVERAGE SCORE	0.14	

CALCULATIONS:

Impact Site:

Habitat assessment score = $[MIN(V_{IW}, V_{DR}) + ((V_{LD} + V_{LLD})/2)]/2$
$V_{IW} = 0.25$, $V_{DR} = 0.45$, $V_{LD} = 0.36$, $V_{LLD} = 0.0$
$[(0.25) + ((0.36 + 0.0)/2)]/2 = [(0.25) + (0.18)]/2 = [0.43]/2 = 0.22$

Hydrology assessment score = $[((V_{IH} + V_{SW})/2) \text{ X } ((V_{LD} + V_{LLD})/2)]^{1/2}$
$V_{IH} = 0.5$, $V_{SW} = 0.0$, $V_{LD} = 0.36$, $V_{LLD} = 0.0$
$[((0.5 + 0.0)/2) \text{ X } ((0.36 + 0.0)/2)]^{1/2} = [(0.25) \text{ X } (0.18)]^{1/2} = [0.045]^{1/2} = 0.21$

Biogeochemical cycling assessment score = $MIN(V_{LD}, V_{LLD})$
$V_{LD} = 0.36$, $V_{LLD} = 0.0$
$MIN(0.36, 0.0) = 0.0$

Average Score = (Habitat + Hydrology + Biogeochemical)/3
$(0.22 + 0.21 + 0.0)/3 = (0.43)/3 = 0.14$

ALASKA NORTH SLOPE REGION RAPID WETLAND ASSESSMENT			
Section A: Desk Top (Offsite) Data			
Site Name/Location:	Mine Site E	Latitude/UTM Northing:	70.4634
Date:	5/1/2018	Longitude/UTM Easting:	-149.6981
Impact/Mitigation:	Mitigation	Pre/Post:	Pre-project
Region:	Arctic Coastal Plain	Coordinate System:	NAD 83
HGM Class:	Lacustrine deepwater	Imagery Source (Year):	2015
Investigator(s):	M. Holley		

Determine values for variables 1-5 using an 80 meter radius plot.		
1 V_{LLD}	Local Landscape Disturbance - percent of the plot (0 - 100) occupied by anthropogenic disturbance and/or man-made features.	100%
	V_{LLD} Subindex Score	0.0
2 V_{SW}	Anthropogenically Derived Surface Water - percent of the plot (0 - 100) occupied by surface water derived from human activities, including thermokarst if directly associated, and conspicuously linked.	100%
	V_{SW} Subindex Score	0.0
3 V_{IH}	Impediment to Hydrology - number of quarter segments (0 - 4) assignable in any direction that have hydrologic impediments.	0
	V_{IH} Subindex Score	1.0
4 V_{DD}	Evidence of Dust - accumulation of sediment on vegetation, appearing as areas of discoloration.	1.0
5 V_{TK}	Evidence of Thermokarst	1.0
Determine values for variables 6-8 using an 800 meter radius plot.		
6 V_{LD}	Landscape Disturbance - percent of the plot (0 - 100) occupied by anthropogenic disturbance and/or man-made features.	41%
	V_{LD} Subindex Score	0.22
7 V_{IW}	Impediment to Wildlife - number of quarter segments (0 - 4) assignable in any direction with impediments to the free movement of wildlife.	3
	V_{IW} Subindex Score	0.25
8 V_{DR}	Distance to Roadway - minimum distance in meters (0 - 800) to a roadway of any size, class, or condition.	526m
	V_{DR} Subindex Score	1.0
	Habitat Assessment Score	0.18
	Hydrology Assessment Score	0.23
	Biogeochemical Cycling Assessment Score	0.0

Remarks

Desktop survey of Cell 5 (proposed) assuming final rehabilitation on-site.

N/A N/A

N/A

ALASKA NORTH SLOPE REGION RAPID WETLAND ASSESSMENT			
Section C: Summary of Assessment Scores			
On-Site Variable Subindex Scores			
V_{MT}	Microtopography	N/A	
V_{SR}	Average species richness	N/A	
V_{BG}	Average percent bare ground	N/A	
V_{LDD}	Local evidence of dust deposition	N/A	
V_{LTK}	Local evidence of thermokarst	N/A	
Off-Site Variable Subindex Scores			
V_{LLD}	Local landscape disturbance	0.0	
V_{SW}	Anthropogenically derived surface water	0.0	
V_{IH}	Impediment to hydrology	1.0	
V_{DD}	Evidence of dust	1.0	
V_{LD}	Landscape disturbance	0.22	
V_{IW}	Impediment to wildlife	0.25	
V_{DR}	Distance to roadway	1.0	
V_{TK}	Evidence of thermokarst	1.0	
Assessment Scores			
	Habitat	0.18	
	Hydrology	0.23	
	Biogeochemical	0.0	
	On-site Modifer	N/A	
	AVERAGE SCORE	0.14	

CALCULATIONS:

Mitigation Site:

Habitat assessment score = $[MIN(V_{IW}, V_{DR}) + ((V_{LD} + V_{LLD})/2)]/2$
$V_{IW} = 0.25$, $V_{DR} = 1.0$, $V_{LD} = 0.22$, $V_{LLD} = 0.0$
$[(0.25) + ((0.22 + 0.0)/2)]/2 = [(0.25) + (0.11)]/2 = [0.36]/2 = 0.18$

Hydrology assessment score = $[((V_{IH} + V_{SW})/2) \text{ X } ((V_{LD} + V_{LLD})/2)]^{1/2}$
$V_{IH} = 1.0$, $V_{SW} = 0.0$, $V_{LD} = 0.22$, $V_{LLD} = 0.0$
$[((1.0 + 0.0)/2) \text{ X } ((0.22 + 0.0)/2)]^{1/2} = [(0.5) \text{ X } (0.11)]^{1/2} = [0.055]^{1/2} = 0.23$

Biogeochemical cycling assessment score = $MIN(V_{LD}, V_{LLD})$
$V_{LD} = 0.22$, $V_{LLD} = 0.0$
$MIN(0.36, 0.0) = 0.0$

Average Score = (Habitat + Hydrology + Biogeochemical)/3
$(0.18 + 0.23 + 0.0)/3 = (0.41)/3 = 0.14$


Basemap
Bookmarks
Map Contents
Measure
800 m
80 m
Length: 80 m
400 m
1000 ft
Latitude:70.468443 Longitude:-149.730680

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Appendix C

Revegetation Plan for Mine Site E, Kuparuk Oilfield, Alaska

May 2018

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REVEGETATION PLAN FOR MINE SITE E, NORTH SLOPE, ALASKA

Prepared for **Conocophillips Alaska, Inc.**

by **ABR, Inc.—Environmental Research & Services**

May 2018

INTRODUCTION

Mine Site E is located approximately 2 miles east of the Oliktok Road, within the Milne Point Unit on Alaska's North Slope. The mine currently occupies ~170 acres and has supplied gravel for construction of roads and pads since 1984. The current rehabilitation plan for the mine was approved in 1991 and is being implemented as stipulated in the permit issued by the U. S. Army Corps of Engineers (#P-830478) for mine development. The mine previously consisted of three cells (Cells 1, 2, and 3) operated by ConocoPhillips Alaska, Inc. (CPAI). The rehabilitation plan was revised in 2008 to account for two new cells (4 and 4A) that were being opened by another operator, and it is being revised again in 2018 because CPAI plans to develop a new cell (Cell 5). This updated revegetation plan describes the rehabilitation approach proposed by CPAI for Cells 1, 2, and 5; rehabilitation of the other cells will be undertaken by another operator. Mining is now complete in Cell 1. Mining in Cell 2 is expected to be complete in 2018, but this cell will be used for at least 5 years to access Cell 5.

The overall goal of the rehabilitation effort is to create a diversity of potentially valuable wildlife habitats, including nesting islands for waterfowl and littoral areas for aquatic vegetation. The revised plan includes salvaging all of the live vegetation and the uppermost 2 ft of organic and mineral soil from Cell 5. This material (combined) will be stored temporarily and placed on the islands and at selected locations within the littoral areas in Cell 1 to promote vegetation recovery (see Plant Cultivation). The three ponds and interconnecting channel on the recontoured overburden pile also will be treated with this material if feasible. Many of the live plant parts in the material are expected to survive and regrow after being placed in Cell 1. The organic soil also provides nutrients, enhances moisture retention, and is a potential source of seeds for natural revegetation as well as beneficial soil fungi and bacteria.

This revised plan reflects changes to the engineering plan as detailed under site preparation (see below). The recommendations are based on the assumptions that the civil work at the site will be completed as outlined in the revised engineering plan and that site conditions will develop as expected. If these assumptions are not met, further modifications to the revegetation plan may be necessary.

SITE PREPARATION

The overburden (thermal) berms will remain in place. This represents a change from the original plan which specified that berms would be reduced to approximately1 ft above the surrounding grade. Another change from the original plan is that the overburden stockpile at the northeast corner of the site will not be removed completely. Instead, it will be contoured to create a mixture of upland and wetland conditions. Three depressions (west, center, east) will be excavated to a depth of approximately 4–8 ft, which will capture drifting snow each winter, eventually filling with water to create ponds and saturated soil conditions (i.e., perched wetlands). The stockpile will remain 5–10 ft thick, maintaining frozen conditions at depth to prevent water from draining out of the system. An additional change is the use of live plants and soil salvaged from Cell 5 to further the rehabilitation at Mine Site E. The material will be used to treat the shallow littoral areas and islands in Cell 1, and if feasible, the ponds and interconnecting channel on the former stockpile.

The shallow littoral area in Cell 1 is expected to have a total area of ~ 15 acres, with water depth ranging from 1–3 ft when the water surface has reached the design elevation. The northern portion of Cell 1 will remain a deep lake, as will Cell 2 when mining is complete. A weir will be constructed at the location of the former settling pond, near the northeast corner of Cell 1, to control water movement out of the pit once it fills.

Four islands (~0.5–1.0 acre each) will be constructed within the littoral area of Cell 1 to provide nesting habitat for waterfowl. The islands will be constructed in general conformance with the Alaska Department of Fish and Game's North Slope Gravel Pit Performance Guidelines (Technical Report No. 93-9), and will have side slopes no steeper than 10:1. A layer of organic-rich overburden (4–6 in) salvaged from Cell 5 will be placed on the tops of the islands to improve conditions for plant growth. Any remaining material will be placed at selected locations within the littoral area.

GOALS, OBJECTIVES AND PERFORMANCE STANDARDS

The overall goal of the revegetation effort at Mine Site E is to establish productive, diverse, and self-sustaining plant communities that will provide habitat value for wildlife and promote long-term surface stability of the site. To attain this goal, specific revegetation objectives have been developed for each site component. Performance standards are proposed, to allow objective determination of whether each objective has been met. However, some flexibility is needed with respect to objectives and scheduling, due to uncertainties about how site conditions will develop over time. This will allow response to unanticipated site changes while maintaining the overall goals of the rehabilitation effort. Objectives and performance standards are detailed below and summarized in Table 1.

SHALLOW LITTORAL AREAS

For shallow littoral areas in Cell 1, the revegetation objective is to create productive wildlife habitat, especially for waterbirds. This objective will be promoted by transplanting tundra plugs and/or sprigs of the aquatic grass *Arctophila fulva* along the planned final shoreline. The performance standards for tundra plugs are 50% survival after 5 years and a statistically significant ($p = 0.05$) increase in mean diameter. Diameter measurements will be based on a sample of approximately 10% of the transplanted plugs. For transplanted *Arctophila*, the performance standard is a mean density of 25 sprigs/m^2 within at least 20% of the shallow littoral areas, to be assessed 10 years after planting. Live plant materials will be collected from the adjacent tundra or elsewhere on the North Slope, under permit from the Alaska Department of Natural Resources. This objective and performance standard are the same those as in the original plan. In addition, plants and soil salvaged from Cell 5 will be placed in selected locations within the littoral areas, if there is sufficient material after treating the islands. The addition of this material should improve overall growing conditions in the shallow littoral area. However, this plan does not include additional performance standards for cover and diversity because water will eventually become too deep for most plants.

ISLANDS

The primary revegetation objective for islands in Cell 1 is to create productive wildlife habitat, especially for waterbirds. This objective will be promoted by transplanting willow cuttings, tundra plugs and/or *Arctophila* sprigs, seeding with other indigenous vascular plants,

and the placement of live plant materials and soil salvaged from Cell 5 (see Site Preparation). A secondary objective is to promote the establishment of a plant community dominated by indigenous vascular plants. To achieve these objectives, total cover of natural colonizers and other indigenous plants (ILVC) should be ≥10% within 10 years. The community should include ≥5 species, with each contributing ≥0.2% to the ILVC. This is the minimum cover of an individual species that can be measured using standard methods, and indicates the potential for successful establishment of these species over the long term. The performance standards for willow cuttings are 25% survival after 5 years, and a statistically significant ($p = 0.05$) increase in mean height, to ensure that the plants are thriving and contributing to development of the community. The standards for tundra plugs and *Arctophila* sprigs are the same as those described for the shallow littoral areas (see above).

BERMS

The primary objective for thermal barriers (berms) is to promote surface stability around the edges of the mine site. A secondary objective for berms is to promote the establishment of a plant community dominated by indigenous species, although vegetation establishment on the berms will likely be limited, because of severely dry conditions resulting from the ground surface being perched well above the water table in the surrounding tundra. However, the lack of vegetation cover is not expected to negatively affect the thermal stability that berms provide. The performance standard is the presence of ≥5 species of indigenous vascular plants within 10 years.

SIDE SLOPES

For the steep side slopes adjacent to the deep areas of the pit, the primary and secondary objectives, as well as the vegetation performance standard, are the same as described for berms (see above).

PERCHED WETLANDS ON FORMER OVERBURDEN STOCKPILE

The revegetation objective for the perched wetlands on the former overburden stockpile is to create productive wildlife habitat, especially for waterbirds. This objective will be promoted by transplanting tundra plugs and/or *Arctophila* sprigs along the planned final shoreline of each pond and interconnecting channel. The performance standards for tundra plugs are 50% survival after 5 years and a statistically significant ($p = 0.05$) increase in mean diameter. Diameter measurements will be based on a sample of approximately 10% of the transplanted plugs. For

transplanted *Arctophila*, the performance standard is a mean density of 25 sprigs/m^2 within at least 20% of the pond shorelines, to be assessed 10 years after planting. Live plant materials will be collected from the adjacent tundra or elsewhere on the North Slope, under permit from the Alaska Department of Natural Resources. In addition, plants and soil salvaged from Cell 5 will be placed in the ponds and other selected areas, if feasible, and if there is sufficient material after treatment of Cell 1 is complete. The addition of this material should improve overall growing conditions in the perched wetlands.

UPLANDS ON FORMER OVERBURDEN STOCKPILE

The primary objective for the upland areas on the former overburden stockpile is to promote stability around the edges of the perched wetlands. A secondary objective for uplands is to promote the establishment of a plant community dominated by indigenous vascular species. Dry conditions are expected to limit vegetation establishment as described for berms. The performance standard is the presence of ≥5 species of indigenous vascular plants within 10 years.

PLANT CULTIVATION TREATMENTS

Plant cultivation treatments will use only indigenous plant species collected from local populations, under a Land Use Permit issued to ABR, Inc. from the Alaska Department of Natural Resources. Unlike the original plan, this revised plan does not include the use of native-grass cultivars, for several reasons. Unless fertilizer is reapplied every 3–5 years, these grasses typically become unproductive, with standing dead vegetation (i.e., plant litter) comprising most of the ground cover. Not only does this type of ground cover provide low quality wildlife habitat, it may actually inhibit the development of a plant community dominated by species from the local flora. Additionally, all commercially produced seed includes a small percentage of weed seed, creating a risk of introducing both non-native and potentially invasive species.

SHALLOW LITTORAL AREAS

Plants and soil removed from Cell 5 will be spread in selected locations in Cell 1 to provide a source of live plant materials that should establish rapidly. When the water surface in the pit reaches the design elevation (expected to require at least 5 years), tundra plugs and/or *Arctophila* sprigs will be transplanted along the planned final shoreline. These plantings will increase cover and diversity of indigenous plants and improve habitat value for waterfowl. Vegetation will be harvested from the adjacent tundra or elsewhere on the North Slope.

ISLANDS

Each island in Cell 1 will be treated with plants and soil salvaged from Cell 5 as described in site preparation (see above). Also, the islands will be seeded with indigenous legumes and other indigenous forb species, to increase taxonomic diversity and possibly increase nutrient inputs to the soil. However, depending on the ice content of the overburden used to construct the islands, one or more years may be required for the islands to drain and stabilize before treatments can be applied safely and effectively. Seed of suitable indigenous species is not available commercially, but can be provided in limited quantities by the Alaska Plant Materials Center or obtained by field collecting from local populations along the road system. Availability varies from year to year, but species used likely will include *Astragalus alpinus* (alpine milkvetch), *Oxytropis campestris* (field locoweed), *Oxytropis deflexa* (nodding locoweed), *Oxytropis viscida* (viscid locoweed), and/or *Epilobium latifolium* (river beauty).

When the water surface in Cell 1 reaches the design elevation, additional plant cultivation treatments will be applied. Depending on conditions as the site stabilizes, materials used may include willow cuttings (*Salix* spp.), tundra plugs and/or *Arctophila* sprigs (along the shorelines of the islands). Live plant materials will be collected from the adjacent tundra or elsewhere on the North Slope.

BERMS

If conditions are suitable, the berms will be seeded with indigenous legumes and other indigenous forb species as described for islands (see above).

SIDE SLOPES

If conditions are suitable, the side slopes will be seeded with indigenous legumes and other indigenous forb species as described for islands (see above).

PERCHED WETLANDS ON FORMER OVERBURDEN STOCKPILE

The ponds and interconnecting channel on the former overburden stockpile will be treated with plants and soil removed from Cell 5, if feasible, to provide a source of live plant materials that should establish rapidly. When each pond is completely full (expected to require at least 10 years), *Arctophila* sprigs will be transplanted along submerged portions of the pond shorelines. These plantings will increase cover and diversity of indigenous plants and improve

habitat value for waterfowl. Vegetation will be harvested from the adjacent tundra or elsewhere on the North Slope.

UPLANDS ON FORMER OVERBURDEN STOCKPILE

Upland portions of the former stockpile will be seeded with indigenous plants adapted to low soil moisture. The 5–10 ft thickness of residual overburden needed to maintain thermal stability is expected to create conditions too dry to support natural colonization by wetland plants from the adjacent tundra.

MONITORING

Development of stable landforms and diverse plant communities on North Slope disturbed sites frequently requires many years. Therefore, this plan includes a multi-year monitoring period to assess whether the rehabilitation goals have been met. As described above, specific performance standards are specified for each revegetation treatment. Preliminary monitoring will be conducted to determine whether achievement of performance standards on schedule appears likely, or whether additional treatments are needed. If the performance standards for a particular treatment have not been reached by the target date, the need for additional rehabilitation treatments and/or monitoring will again be assessed.

VEGETATION COVER AND DIVERSITY

Vegetation cover will be measured using the point-intercept method, on 5–10 transects within each site component. Transect length and the total number of points sampled will vary depending on the size of the area, with a minimum of 500 points per site component. Depending on site conditions, the points may be distributed in a stratified design to account for site heterogeneity (e.g., presence of ponds), or using another systematic approach.

SURVIVAL AND GROWTH OF TRANSPLANTS

Survival of tundra plugs and willow cuttings will be assessed by comparing the number of living cuttings or plugs with the total number planted. Growth of tundra plugs will be monitored by tracking the diameter of a sample (~10%) of the plugs. Similarly, growth of transplanted willow cuttings will be monitored by measuring the height of a sample of cuttings. Growth of the *Arctophila* population will be monitored by counting live sprigs within measured sampling areas to estimate stem density.

SCHEDULE

Rehabilitation of Cell 1 is expected to begin in 2019 with the placement of overburden salvaged from Cell 5. Mining in Cell 2 should be completed by 2018, and it will continue to be used for access to Cell 5 for at least 5 years. The timing of some of the revegetation treatments will depend on the rate at which the physical characteristics of the site develop. For example, tundra plugs and *Arctophila* sprigs cannot be planted until the water level has reached the design elevation, which is expected to require ~5 years after construction is complete. A general plan for scheduling revegetation treatments is presented in Table 2.

Table 1. Objectives and performance standards for Cell 1 and the former overburden stockpile, Mine Site E, North Slope, Alaska.

Site Component	Objectives	Performance Standards
Shallow littoral areas (Cell 1)	Create productive wildlife habitat, especially for waterbirds.	≥50% survival of tundra plugs and statistically significant increase in mean diameter, within 5 years. ≥25 stems/m^2 of *Arctophila* stems within ≥20% of shallow littoral areas, within 10 years.
Islands (Cell 1)	Create productive wildlife habitat, especially for waterbirds.	≥10% total live cover of indigenous vascular plants (ILVC) and ≥5 species of indigenous vascular plants, each with ≥0.2% cover, within 10 years. ≥25% survival of willow cuttings and statistically significant increase in mean height, within 5 years. ≥50% survival of tundra plugs and statistically significant increase in mean diameter, within 5 years. ≥25 stems/m^2 of *Arctophila* stems within ≥20% of shallow littoral area, within 10 years.
Berms	Primary objective: promote thermal stability around the edges of the mine site.	No vegetation performance standard (vegetation has negligible effect on the primary objective).
	Secondary objective: promote establishment of a plant community dominated by indigenous species.	≥5 species of indigenous vascular plants, within 10 years.
Side slopes	Primary objective: promote thermal stability around the edges of the mine site and flooded pits.	No vegetation performance standard (vegetation has negligible effect on the primary objective).
	Secondary objective: promote establishment of a plant community dominated by indigenous species.	≥5 species of indigenous vascular plants, within 10 years.
Perched Wetlands (Former overburden stockpile)	Create productive wildlife habitat, especially for waterbirds.	≥50% survival of tundra plugs and statistically significant increase in mean diameter, within 5 years. ≥25 stems/m^2 of Arctophila stems within ≥20% of pond shorelines, within 10 years.

Table 1 (cont.).

Site Component	Objectives	Performance Standards
Uplands (Former overburden stockpile)	Primary objective: promote thermal stability of stockpile and maintain flooded conditions in three excavated depressions.	No vegetation performance standard (vegetation has negligible effect on the primary objective).
	Secondary objective: promote establishment of a plant community dominated by indigenous species.	≥5 species of indigenous vascular plants, within 10 years.

Table 2. General plan for scheduling revegetation treatments in Cell 1 and the former overburden stockpile at Mine Site E, Kuparuk Oilfield, Alaska.

Site Component	Revegetation Treatment	Timing of Application
Shallow littoral areas (Cell 1)	Place organic material from Cell 5	During construction of islands
	Transplant tundra plugs, *Arctophila* sprigs	1 year after water surface elevation reaches design elevation
Islands (Cell 1)	Place organic material from Cell 5	During construction of islands
	Seed indigenous species	After islands have thawed and drained (~3 years)
	Transplant willow cuttings, tundra plugs, and/or *Arctophila* sprigs	1 year after water surface elevation reaches design elevation
Berms	Seed indigenous species adapted to dry conditions	~3 years after civil work complete
Side slopes	Seed indigenous species adapted to dry conditions	~3 years after civil work complete
Perched Wetlands (Former overburden stockpile)	Transplant *Arctophila* sprigs.	~3 years after civil work complete
Uplands (Former overburden stockpile)	Seed indigenous species adapted to dry conditions.	~3 years after civil work complete