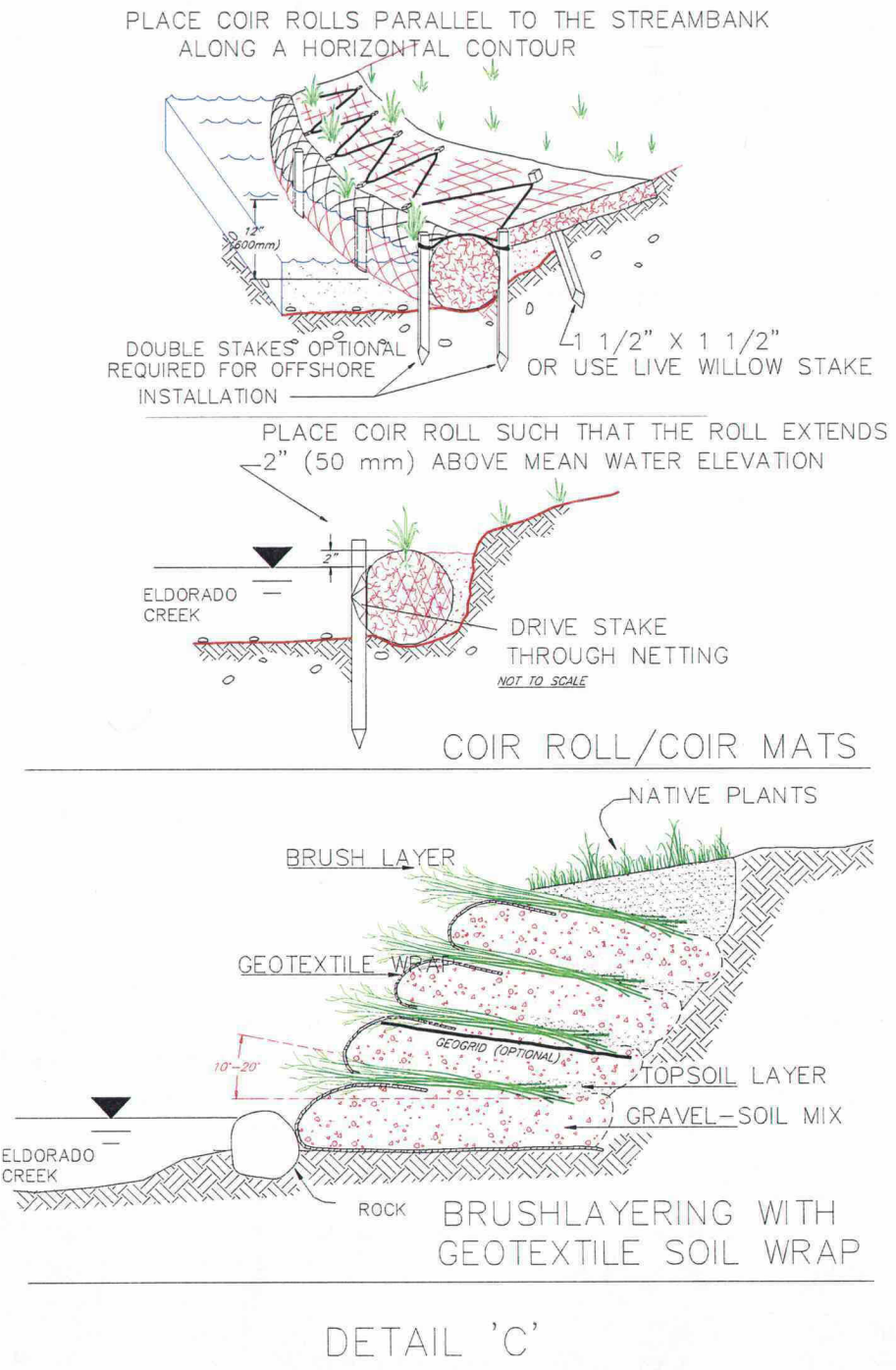


Figure 7. Typical bioengineered bank erosion control methods for Eldorado Creek reclamation.

areas. This height, plus an additional depth of 1 foot for organic overburden material, was used in a previous analysis to estimate the proper height of the Moose Creek floodplain.

That figure was then used to determine how much gravel was available for excavation, and how much was needed for bank protection and floodplain reclamation. Final approval of this plan will require a thorough hydraulic and geomorphic analysis of the Moose Creek reach, to determine channel configuration and floodplain elevations.

Stream Channel Erosion Control

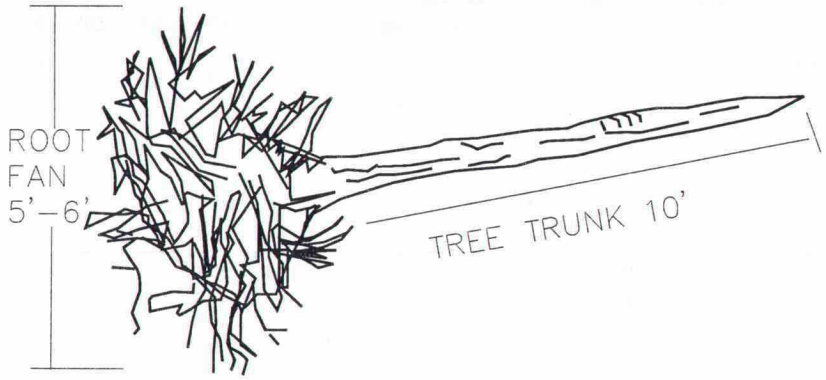
An integral part of the channel design and construction for Moose Creek is the installation of bioengineered erosion control structures. These structures are designed to provide protection from water erosion to newly constructed 'bare' banks, before vegetation is established. Bioengineering techniques generally involve using a combination of materials to armor and protect stream banks, including vegetation (willow), root wads, toe rock, coconut fiber bio-logs (coir logs), and coir blankets. An example of root wad construction is found in Figure 8.

The selection of appropriate techniques is dependent on site conditions, and the hydraulic parameters of the stream. Some techniques are designed to provide habitat, while others protect against scour from high shear stress forces. Though the final design for the Moose Creek channel may result in the selection of certain methods, certain techniques may be described that will most likely be utilized in this project.

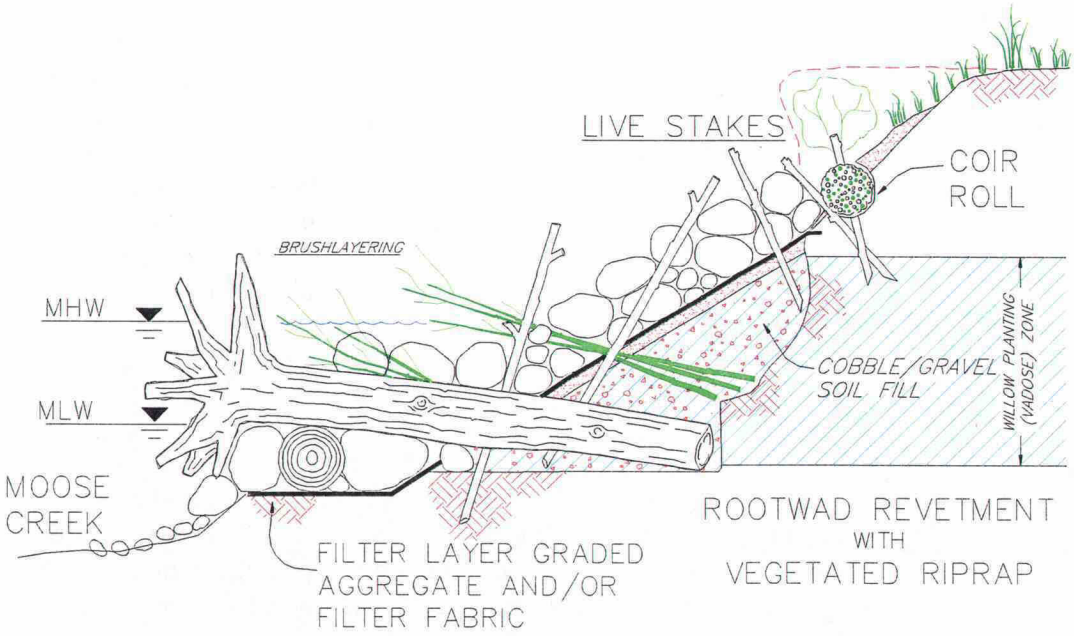
Brush layering may be used along straight or gently curving reaches of the new channel. Brush layering is a technique which combines layers of dormant willow cuttings with soil to revegetated and stabilize the streambank. Branches are placed on horizontal benches that follow the contour of the slope and provide reinforcement to the soil. Two layers of a biodegradable fabric wrap are used to build soil lifts in between the layers of cuttings. Buried toe rock is used at the base of the brush layering to provide protection against scour. The locations for this technique are found in the drawings, along with a description of the construction techniques.

Root wads are a streambank protection technique that provides immediate bank stabilization, protects the toe of the slope, and provides fish habitat. Root wads, when installed correctly with proper toe scour protection, are well suited for higher velocity river systems and riverbanks which are severely eroded. Root wad structures should be designed by an experienced hydraulic engineer with experience in design and installation, as buoyant forces and toe scour can result in structural failure in flooding conditions. The locations for this technique are found in the drawings, along with a description of the construction techniques.

Mitigative measures must be established to minimize sediment runoff into Moose Creek. Sediment control measures must be installed at the top of the banks, where new floodplains have been constructed, either by excavation or fill. Silt fencing, and/or straw wattles, should be installed along the banks as part of the bank stabilization project.



ROOT WADS SUITED FOR HIGHER VELOCITY RIVERS AND SEVERELY ERODED BANKS. REQUIRE HEAVY EQUIPMENT FOR COLLECTION, TRANSPORT, AND INSTALLATION.



DETAIL 'D'

Figure 8. Typical bioengineered bank erosion control methods for Moose Creek reclamation.

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Appendix D

APPENDIX D

Statement of Findings for Executive Order 11990 Protection of Wetlands

Gravel Acquisition Plan
Denali National Park and Preserve
Alaska

May 2003

Recommended:

Superintendent, Denali National Park and Preserve Date

Certified For Technical Accuracy and Servicewide Consistency:

Chief, Water Resources Division, Washington Office Date

Approved:

Regional Director, Alaska Region Date

INTRODUCTION

The National Park Service (NPS) has prepared and made available for public review, an environmental assessment (EA) to evaluate the impacts of implementing a 10-year gravel acquisition plan (GAP) for Denali National Park and Preserve.

In 1992, a gravel excavation site was established in the Toklat River floodplain, following the approval of a previous Denali Gravel Acquisition Plan. The 1996 Entrance Area and Road Corridor Development Concept Plan and Environmental Impact Statement (DCP/EIS) directed the park to relocate its rock/gravel processing site to the Toklat River floodplain excavation site because the current site, at the Toklat River bridges, created a visual intrusion for visitors. A 1999 EA was developed to complete the process of establishing a gravel-processing site in the Toklat River floodplain that would not affect the existing and proposed visitor rest area. The current Gravel Acquisition Plan proposes five alternatives to acquire sufficient gravel over a 10-year period to maintain and repair the park road. Within the alternatives there are 10 total sites considered. Three of them lie within a floodplain. East Fork River and Downtown Kantishna are new proposed sites and Toklat River is currently operating. The seven upland sites generally have vegetative cover that is a mosaic of upland and wetland tundra, and all of the sites have some area of wetland within or near the proposed mining area.

Executive Order 11990 (Protection of Wetlands) requires the NPS, and other federal agencies, to evaluate the impacts its actions are likely to have on wetlands. This executive order requires that short and long-term adverse impacts associated with occupancy, modification or destruction of wetlands be avoided whenever possible. Development and new construction in such areas should also be avoided wherever there is a practicable alternative.

To comply with these orders, the NPS has developed a set of agency policies and procedures, which can be found in Director's Order 77-1: Wetland Protection and Procedural Manual 77-1: Wetland Protection. These documents provide guidance for managing NPS activities that result in the modification or occupation of wetlands, or that result in impacts to wetland values.

The purpose of this Statement of Findings (SOF) is to present the NPS rationale for its proposed Denali Gravel Acquisition Plan that includes operating borrow extraction and processing sites in locations with unavoidable impacts to wetland areas and values.

WETLANDS WITHIN THE PROJECT AREA

Technical staff from Hart Crowser, Inc. delineated wetlands at 11 prospective gravel acquisition sites in August and September 2001 using the Routine Onsite Determinations methods described in the *Corps of Engineers Wetlands Delineation Manual* (U.S. Army Corps of Engineers 1987). The types, approximate areas, and functions of wetlands delineated at the sites considered in this EA are summarized from the jurisdictional wetland determination report prepared by Hart Crowser (2002). Wetland delineations have not been conducted at the Downtown Kantishna or East Fork River sites. Descriptions of wetlands at the latter two sites are based on a combination of field observations of nearby sites (Kantishna Airstrip, Camp Ridge, and East Fork Cabin), aerial photo interpretation, and National Wetland Inventory (NWI) maps. Wetland and upland vegetation types described herein follow the *Alaska Vegetation Classification* (Viereck et al. 1992). Wetlands are classified according to the U.S. Fish and Wildlife Service's *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979). Plant nomenclature generally follows Hultén (1968), except where there have been recent taxonomic changes. More recent taxonomy follows Kartesz, as found

on the Natural Resources Conservation Service National Plants Database (USDA NRCS 2000) website at http://plants.usda.gov/.

Wetland functions at the delineated sites were assessed using *Wetland Values: Concepts and Methods for Wetland Evaluation* (Reppert et al. 1979), also known as the Reppert Method. Using this method a rating of high, moderate or low is given to major functions of wetlands including: natural biological functions; hydrologic support; storm and floodwater storage and retardation (or attenuation); groundwater recharge; and water quality protection or purification. Because of the relatively simple structure, small size, proximity to human activities, and homogeneous nature of site vegetation, functional values range from low to moderate for all sites and functions. Natural biological functions include general and specific habitat requirements for fish and wildlife. Hydrologic support includes contributions to base flows in streams during low flow periods. Study area, sanctuary, and refuge is an assessment of uniqueness and ability to be used as a scientific study area and sanctuary or refuge for rare or sensitive species. All functions were estimated using best professional judgment evaluation of the physical and biological characteristics of the wetlands and adjacent uplands and their landscape positions.

Table D.1 summarizes the wetland determinations, classifications and estimated acreages at each site. Table D.2 presents the summarized results of the functional assessment of the wetlands at the candidate sites. Wetland boundaries at the respective sites are included on the proposed mining plans in Appendix C of the EA. Existing upland and wetland conditions at each site are summarized below, as are expected wetland impacts based on the mapped wetland locations relative to the mining plans.

No federally designated threatened or endangered species are known to occur within Denali National Park (pers. comm., Ted Swem, USFWS, Fairbanks, Alaska, June 9, 2000). Therefore, no such species are expected to be affected by the proposed gravel acquisition plan, and the topic of potential effects on threatened and endangered species was dismissed from detailed consideration in the EA.

TABLE D.1: SUMMARY OF WETLAND DETERMINATIONS, CLASSIFICATIONS AND ESTIMATED ACREAGES

Site	Jurisdictional Wetland Determination[1]	Wetland Classification[2]	Estimated Wetland Area on the Site
Teklanika Pit	Nonjurisdictional/isolated	PSS1B	1.2
Toklat River	Jurisdictional	R3US/UB	185
Beaver Pond	Jurisdictional	PSS/EM1B	0
Boundary	Nonjurisdictional/isolated	PSS1C	0.4
		PEM/SS1C	
Moose Creek Terrace	Nonjurisdictional/isolated	PSS1/4B	4.0
Camp Ridge	Nonjurisdictional/isolated	PSS1/4B	1.5
		PEM1B	
Downtown Kantishna	Jurisdictional	PSS1/4B	13.1
	Jurisdictional	R3USCx	1.6
Kantishna Airstrip	Nonjurisdictional/isolated	PSS1/4B	9.1

1 Preliminary jurisdictional determination. Determinations are subject to verification by the Alaska District, U.S. Army Corps of Engineers.

2 Wetland classification follows Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979).

TABLE D.2: SUMMARY OF RESULTS OF MODIFIED REPPERT FUNCTIONAL ASSESSMENT

Wetland	Wetland Classification[1]	Natural Biological Functions	Study Area, Sanctuary, Refuge	Hydrologic Support	Storm & Floodwater Storage & Retardation	Ground water Recharge	Water Purification
TP	PSS1B	Moderate	Moderate	Relatively low	Relatively low	Low	Relatively low
EFR	R3US/UB	Relatively low	Relatively low	Relatively low	Moderate	Moderate	Relatively low
TR	R3US/UB	Relatively low	Relatively low	Relatively low	Moderate	Moderate	Relatively low
BP	PSS/EM1B	Moderately high	Moderate	Moderate	Relatively low	Low	Relatively low
B	PSS/EM1C	Moderately high	Moderate	Relatively low	Relatively low	Moderate	Relatively low
NFC	PSS1/4B	Moderate	Moderate	Moderate	Relatively low	Low	Relatively low
MCT	PSS1/4B	Moderate	Moderate	Moderate	Relatively low	Low	Relatively low
CR	PSS1/4B and PEM1B	Moderate	Moderate	Moderate	Relatively low	Low	Relatively low
DK	PSS1/4B	Moderate	Moderate	Moderate	Moderate	Low	Low
	R3USCx	Low	Low	Low	Moderate	Low	Low
KA	PSS1/4B	Moderate	Moderate	Moderate	Relatively low	Low	Relatively low

[1] Wetland classification follows Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979).

TP –Teklanika Pit; EFR – East Fork River; TR – Toklat River; BP – Beaver Pond; B –Boundary; NFC – North Face Corner; MCT – Moose Creek Terrace; CR – Camp Ridge; DK – Downtown Kantishna; KA – Kantishna Airstrip.

Teklanika Pit

Palustrine scrub-scrub broad-leaved deciduous wetlands (PSS1B) associated with lower-lying areas and small water track features cover about 1.2 acres of the site. Scrub-shrub vegetation consists of a dwarf scrub community that varies in species composition across the site. Dominant plants include dwarf birch (*Betula nana*), willows (*Salix* sp.) that are generally less than 2 feet tall, sedges (*Carex* sp.), and polar grass (*Arctagrostis latifolia*). Cloudberry (*Rubus chamaemorus*), Arctic sweet coltsfoot (*Petasites frigidus*), cottongrass (*Eriophorum* sp.), sphagnum moss (*Sphagnum* sp.), and leatherleaf (*Chamaedaphne calyculata*) are associated species. Cloudberry, Arctic sweet coltsfoot, sphagnum and are most abundant in and immediately adjacent to the small water tracks that generally run from ESE to NNW from near the SE corner towards the north end of the site. The water tracks terminate south of the north boundary in a variation of the dwarf scrub community characterized by taller dwarf birch and willows, up to about 3 feet tall. Small tussocks are scattered throughout the area. Shallow, organic (peat) soils that support this wetland vegetation are seasonally or permanently saturated. Dwarf deciduous scrub-shrub wetland types are widespread in the park. Wetland functions at this site were rated as moderate for biological functions and sanctuary/refuge, and low or relatively low for the four water resource functions.

East Fork River

The entire site (up to 11 acres) consists of unvegetated gravel bars within the active channel of the East Fork Toklat River. Although it is unclear why, some of these gravel deposits are identified as upland on the National Wetlands Inventory map for this area. Most gravel bars and braided channels are classified as riverine upper perennial unconsolidated shore/unconsolidated bottom (R3US/UB) wetlands. These wetlands are widespread in the park and are associated with all of the larger rivers, including the Toklat River, Teklanika River, Sanctuary River, and Savage River. These riverine upper perennial wetlands appear to provide moderate to low levels of most wetland functions. The ratings are moderate for storm and floodwater storage and retardation (or attenuation) and groundwater recharge, given their large size and connectivity with other wetlands and adjacent uplands. The water quality protection or purification function appears to be relatively low because the only source of pollutants is atmospheric deposition.

Toklat River

The entire site (185 acres) consists of unvegetated gravel bars within the active channel of the Toklat River. The gravel bars and braided channels are classified as riverine upper perennial unconsolidated shore/unconsolidated bottom (R3US/UB) wetlands. These wetlands are widespread in the park and are associated with all of the larger rivers, including the Toklat River, Teklanika River, Sanctuary River, and Savage River. These upper perennial wetlands appear to provide moderate to low levels of most functions, similar to the East Fork River site.

Beaver Pond

There is a mosaic of palustrine scrub-shrub broad-leaved deciduous and emergent wetlands (PSS/EM1B) that cover an area of approximately 0.4 acre east of the proposed mine site. Wetlands are composed of a mixture of dwarf scrub, tall scrub and mixed graminoid-forb herbaceous vegetation associated with a drainage and beaded stream downslope of the Denali Park Road. Dominant plants include willows, dwarf birch, bog blueberry (*Vaccinium uliginosum*), lowbush cranberry (*Vaccinium vitis-idaea*), sedges, and crowberry. Common but not dominant associates included rough fescue, Arctic sweet coltsfoot, mosses, shrubby cinquefoil,

and a horsetail species (*Equisetum* sp.). Flow from a network of drainage channels and wetlands north of the park road appears to be concentrated and conveyed to this wetland through the culvert in the road. Surface water enters the wetland and spreads out in the tall scrub community at the south edge of the park road. Downslope surface water flow becomes more concentrated in a drainage channel and beaded stream that flows into the larger perennial stream on the valley floor to the south. Permanently saturated mineral soils around shallowly inundated areas and beads (ponds) of the stream are covered by the mixed graminoid-forb vegetation and scrub vegetation is in between the nodes of the stream and higher gradient areas. These palustrine scrub-shrub and emergent wetland types are common throughout the park.

Natural biological functions, including food chain production and general and specialized habitat, are moderately high because of surface water connections to aquatic environments (the beaded stream) as well as the larger size of these wetlands. Hydrologic support functions are higher because of the presence of the beaded stream. Groundwater recharge appears low, because the wetland is such a small proportion of the total subbasin area. Although vegetation density is high, water purification or protection appears to be only moderate because the only source of pollutants to this area, other than road dust, is from atmospheric deposition.

Boundary

Wetlands cover an area of about 0.4 acre and consist of an isolated, seasonally saturated, palustrine broad-leaved deciduous scrub-shrub and emergent system (PSS/EM1C) located in a closed depression. The dwarf-low shrub vegetation is dominated by dwarf willows, bog blueberry, lowbush cranberry, dwarf birch, crowberry, mosses and lichens. Crowberry is abundant and forms dense, continuous patches on the tops and sides of small hummocks. A sedge species is also present but not dominant. The emergent vegetation class is a mixed graminoid and forb community type. Dominant plants included sedges, violet (*Viola* sp.), rough fescue, an oxytrope species (*Oxytropis sp.*), bog blueberry, dwarf birch, moss, and scattered lichens. Mineral soils with an appreciable amount of fines are likely seasonally saturated. Natural biological support functions, storm and floodwater storage, and water purification or protection are rated moderate given the relatively simple vegetation structure, relatively small size, and isolated nature of the wetland. Hydrologic support and groundwater recharge appears low because of the wetlands small size and moderately poorly drained soils.

North Face Corner

The entire top of the terrace on the site (about 5.7 acres) is an isolated, saturated palustrine scrub-shrub broad-leaved deciduous and broad-leaved evergreen (PSS1/4B) wetland. Dwarf scrub vegetation is dominated by dwarf birch and several ericaceous shrubs, including bog blueberry, Labrador tea, lowbush cranberry, and crowberry. A sedge species, cloudberry, polar grass, and Arctic sweet coltsfoot were among the associated species. Silt loam mineral soils appear to be permanently saturated because of a combination of shallow permafrost and subsurface drainage from the mountain slopes to the southwest. Apparent wetland functions are similar to those provided by other previously described scrub-shrub wetlands. Natural biological support functions, hydrologic support, storm and floodwater storage, groundwater recharge and water quality protection range from low to moderate because of the wetland's landscape position, isolated nature, and relatively simple vegetation structure.

Moose Creek Terrace

There are two wetlands at the Moose Creek Terrace site. These cover a total area of about 4.0 acres. Both are a mixture of palustrine scrub-shrub broad-leaved evergreen and broad-leaved deciduous (PSS1/4B) wetlands characterized by dwarf scrub vegetation types dominated by species similar to those described on other sites. Soils are apparently permanently-saturated mineral soils. Shallow subsurface drainage from the slopes to the south appears to be the primary source of wetland hydrology to both wetlands. Because there is no direct surface water connection to Moose Creek, it appears that these are isolated and nonjurisdictional wetlands. Functions for the PSS1/4B wetlands are similar to those previously discussed. Natural biological support functions may be somewhat higher than most other wetlands, given the moderate structural complexity and proximity to the Moose Creek riparian corridor that provide habitat and travel corridor opportunities to fish and wildlife. Hydrologic support, storm and floodwater storage, groundwater recharge, and water purification or protection range from low to moderate.

Camp Ridge

Much of the site is wetland (1.5 acres) consisting of a mosaic of PSS1/4B and PEM1B wetlands. Wetlands consist of an open needleleaf forest type, dwarf scrub, and tussock tundra community types. Tree cover is generally less than 30 percent in the open needleleaf forest, so it is not considered a forested wetland according to the USFWS wetland classification system (Cowardin et. al. 1979). In addition, a portion of the site is characterized by a tussock tundra vegetation type that is classified as PEM1B wetland. White spruce and ericaceous shrubs similar to previously described scrub-shrub wetlands are dominant. Tussock tundra vegetation includes dwarf ericaceous shrub species similar to other wetlands as well as scattered black spruce (*Picea mariana*) and tussocks formed by cottongrass and sedges. Soils appear to be permanently saturated as a result of shallow permafrost and subsurface drainage patterns, and range from mineral to organic (sphagnum peat). These palustrine scrub-shrub and emergent wetlands appear to provide low to moderate levels of all functions similar to previously described isolated wetlands.

Downtown Kantishna

The NWI map shows relatively extensive PSS1/4B wetland along the southwest boundary of the site, south of Eldorado Creek. In addition, there are three riverine wetlands including Moose Creek (R3UBH) Eldorado Creek (R3UBHx) and a seasonally flooded, excavated unsolidated shore (R3USCx) wetland in the northeast corner. Palustrine scrub-shrub wetlands appear to be upslope of historically disturbed areas. Dominant plants in this wetland include willows and dwarf evergreen shrubs similar to those for other wetlands with this classification. Soils are likely relatively shallow and permanently saturated. Riverine wetlands have been disturbed by historic placer mining activities. These wetlands are generally unvegetated braided channels or sparsely vegetated gravel bars. Where vegetation exists, it consists primarily of pioneer species, including willows, alder and cottonwood. Palustrine scrub-shrub wetlands appear to provide low to moderate levels of functions. Because of historical disturbance, riverine wetland functions appear to be relatively low for all categories except flood storage and attenuation. Because the site is in the floodplain, this function appears to be moderate.

Kantishna Airstrip

The entire top of the terrace (about 9.1 acres) at this site is a mixed PSS1/4B wetland. The dwarf scrub vegetation is dominated by plants similar to those at wetlands described previously. Other plants that were common but not dominant included woodland horsetail (*Equisetum sylvaticum*), black spruce, sedges, and lichens. This wetland appears to provide similar functions as the other PSS1/4B wetlands. Functions range from low to moderate.

THE PROPOSAL IN RELATION TO WETLANDS

The proposed action, three alternative actions and a no-action alternative are described in detail in the Environmental Assessment for the Denali National Park Gravel Acquisition Plan. All five of the alternatives would directly impact wetlands in the park. Alternative 1: No-Action and Alternative 3: Minimum Visual Intrusion/Long Hauls would continue to extract and process borrow material from the Teklanika and Toklat River sites, while Alternative 3 would also include new development at the Moose Creek Terrace site. Alternative 2: Maximum Flexibility/Short Hauls would use material from the existing Teklanika and Toklat River sites, plus the East Fork River, Beaver Pond, Boundary, Camp Ridge, Downtown Kantishna and Kantishna Airstrip sites. Alternative 4: Phased Development with a Moderate Number of Sites and Alternative 5: Economic Alternative with Moderate Hauls also call for material extraction from the Teklanika, Toklat River, East Fork River and Downtown Kantishna sites, plus the Moose Creek Terrace site (Alternative 4) or the North Face Corner site (Alternative 5). Based on the similarity of their components and impacts, the NPS has identified both Alternative 4 and Alternative 5 as the NPS-preferred alternatives.

Plans for gravel extraction at the respective sites have been developed in a manner to avoid direct or indirect wetland impacts to the greatest extent possible. Nevertheless, given the extent of wetland area within the road corridor and elsewhere in the park landscape, some inclusion of wetland area within the proposed mining area boundaries is unavoidable. Table D.3 (presented in the EA as Table 4.5) identifies the areas of wetland impacts by site and alternative. Maps D.1 through D.7 show the locations of wetlands relative to the mining plans for the potential source sites included in Alternative 4 or 5 (the preferred alternatives).

TABLE D.3: SUMMARY OF WETLAND IMPACTS (ACRES) BY ALTERNATIVE

Site	Wetland Classification[1]	Alternative1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
TP	PSS1B[2]		1.2	1.2	1.2	1.2
EFR	R3US/UB		2.3[3]		2.3[3]	2.3[3]
TR	R3US/UB		3.3[3]	3.3[3]	3.3[3]	3.3[3]
BP	PSS/EM1B					
B	PSS/EM1C[2]		0.4			
NFC	PSS1/4B[2]					3.1
MCT	PSS1/4B[2]			4.0	4.0	
CR	PSS1/4B[2] and		0.7			
	PEM1B[2]		0.8			
DK[4]	PSS1/4B					
	R3USCx		1.6		1.6	1.6
KA	PSS1/4B[2]		9.1			
	Total Impact (acres)	None	19.4	8.5	12.4	11.5

1 Wetland classification follows Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979)

2 Appear to be isolated, nonjurisdictional wetlands. The Alaska District, U.S. Army Corps of Engineers will make the final jurisdictional determination.

3 Including up to an acre of impacts from the temporary (seasonal) access road.

4 It is assumed that potential impacts to riverine wetlands (Moose Creek and Eldorado Creek) would be avoided or negligible. Gravel removal, processing and storage would be limited to previously disturbed areas.

TP – Teklanika Pit; EFR – East Fork River; TR – Toklat River; BP – Beaver Pond; B –Boundary; NFC – North Face Corner; MCT – Moose Creek Terrace; CR – Camp Ridge; DK – Downtown Kantishna; KA – Kantishna Airstrip.

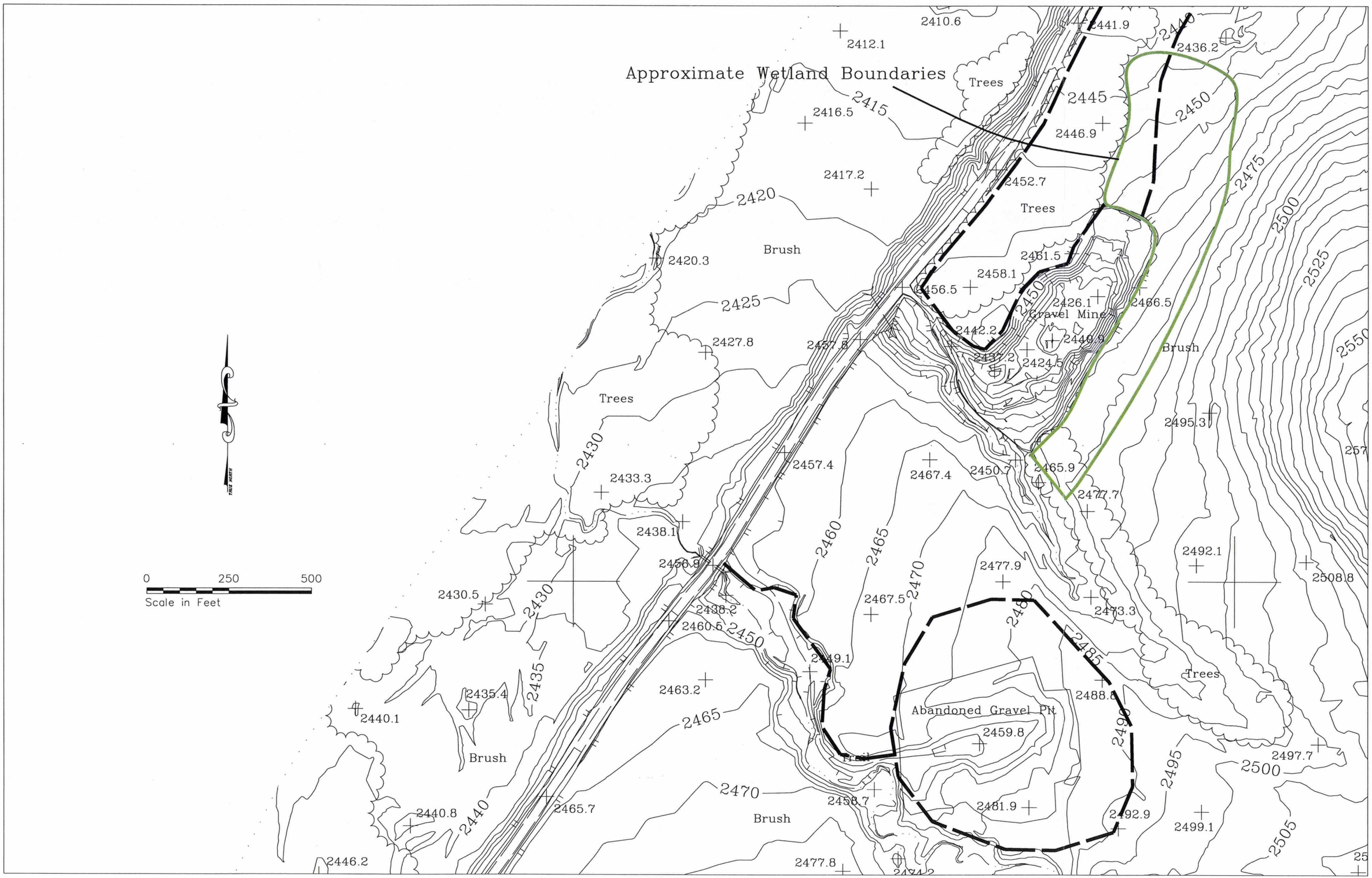


FIGURE D.1—TEKLANIKA PIT MINING AREA AND WETLANDS

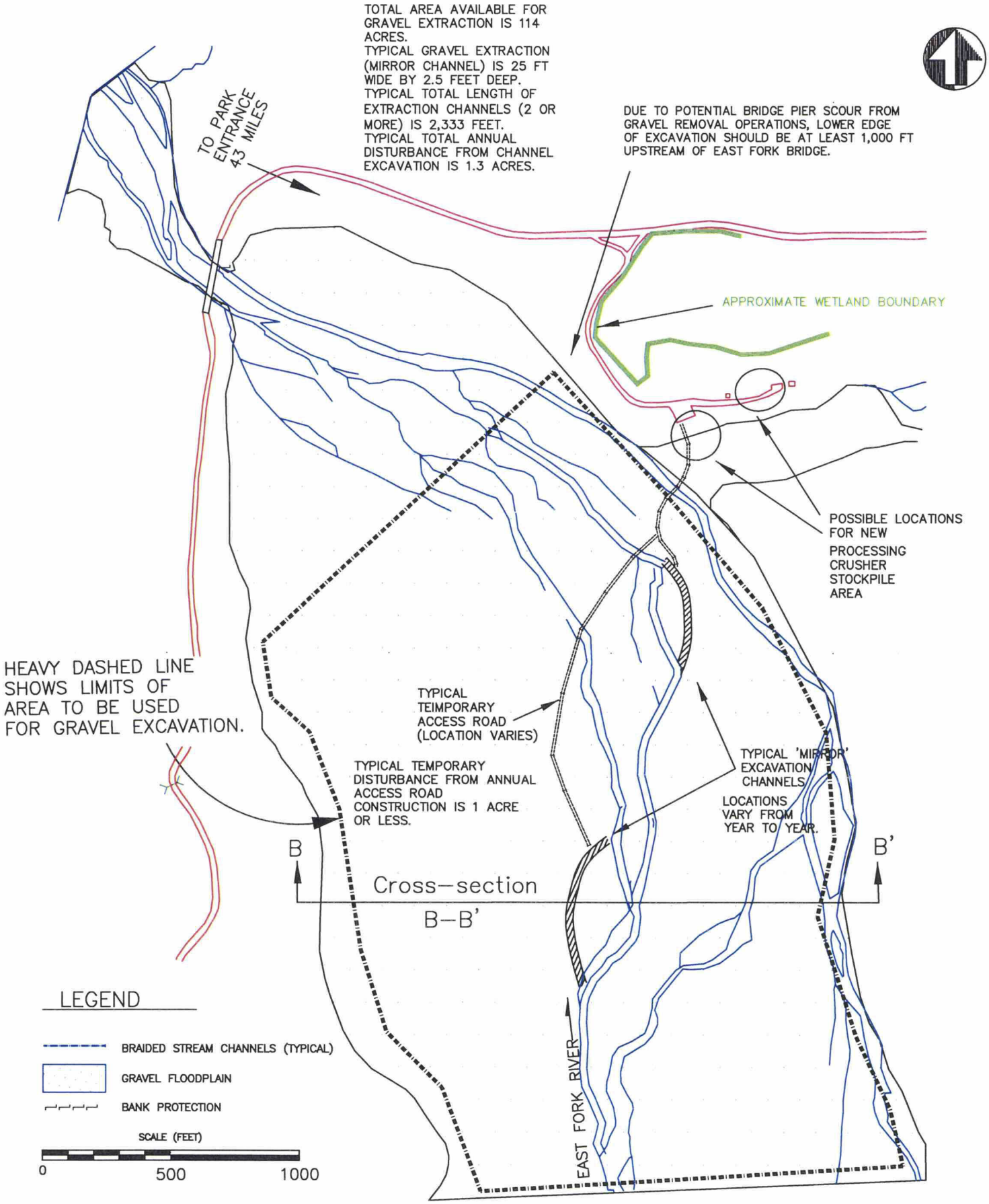


FIGURE D.2–EAST FORK RIVER MINING AREA AND WETLANDS

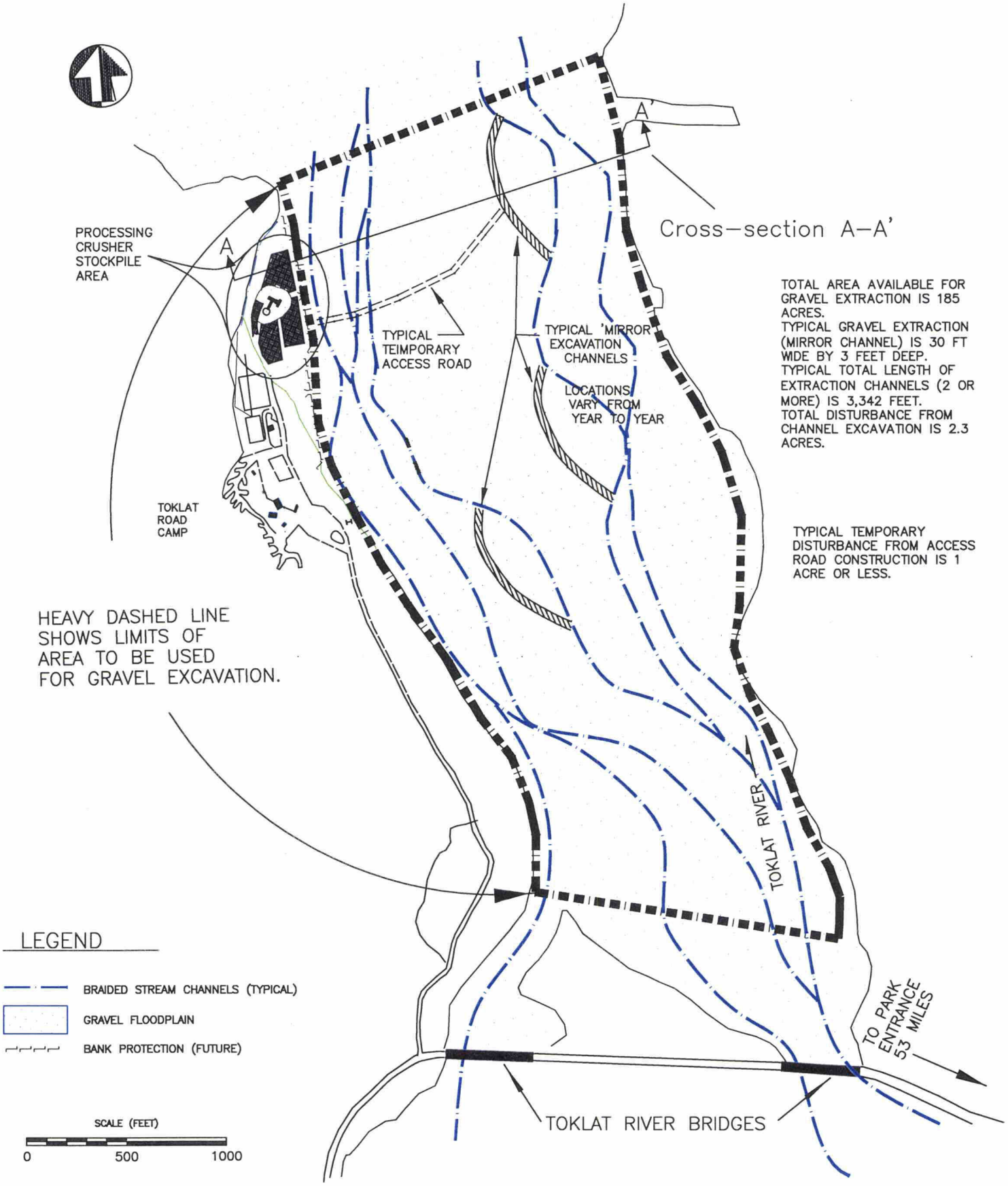
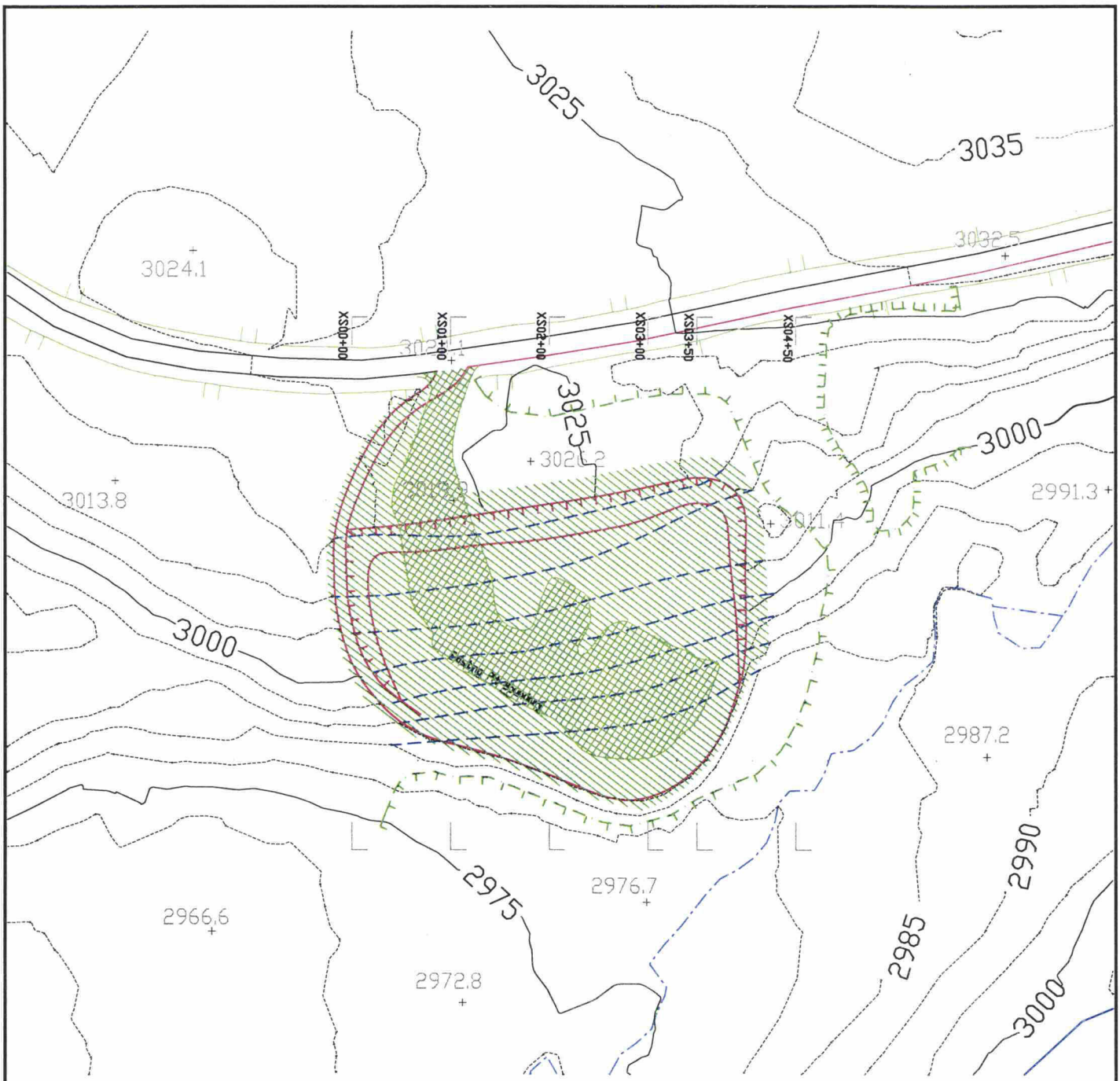


FIGURE D.3–TOKLAT RIVER MINING AREA AND WETLANDS



Legend

- Proposed Extraction Area
- Post Reclamation Contours
- Access Road / Working Area
- X-S 00+00 - Cross-Section Locations
- Approx. Wetland Boundary (ticks towards wetland)
- Approx. Area of Disturbance (post reclamation)

N

mn 22°34'

100 0 100 200

Feet

Geologic Resources Division

Denali National Park

Figure D.4-Beaver Pond Mining Area and Wetlands