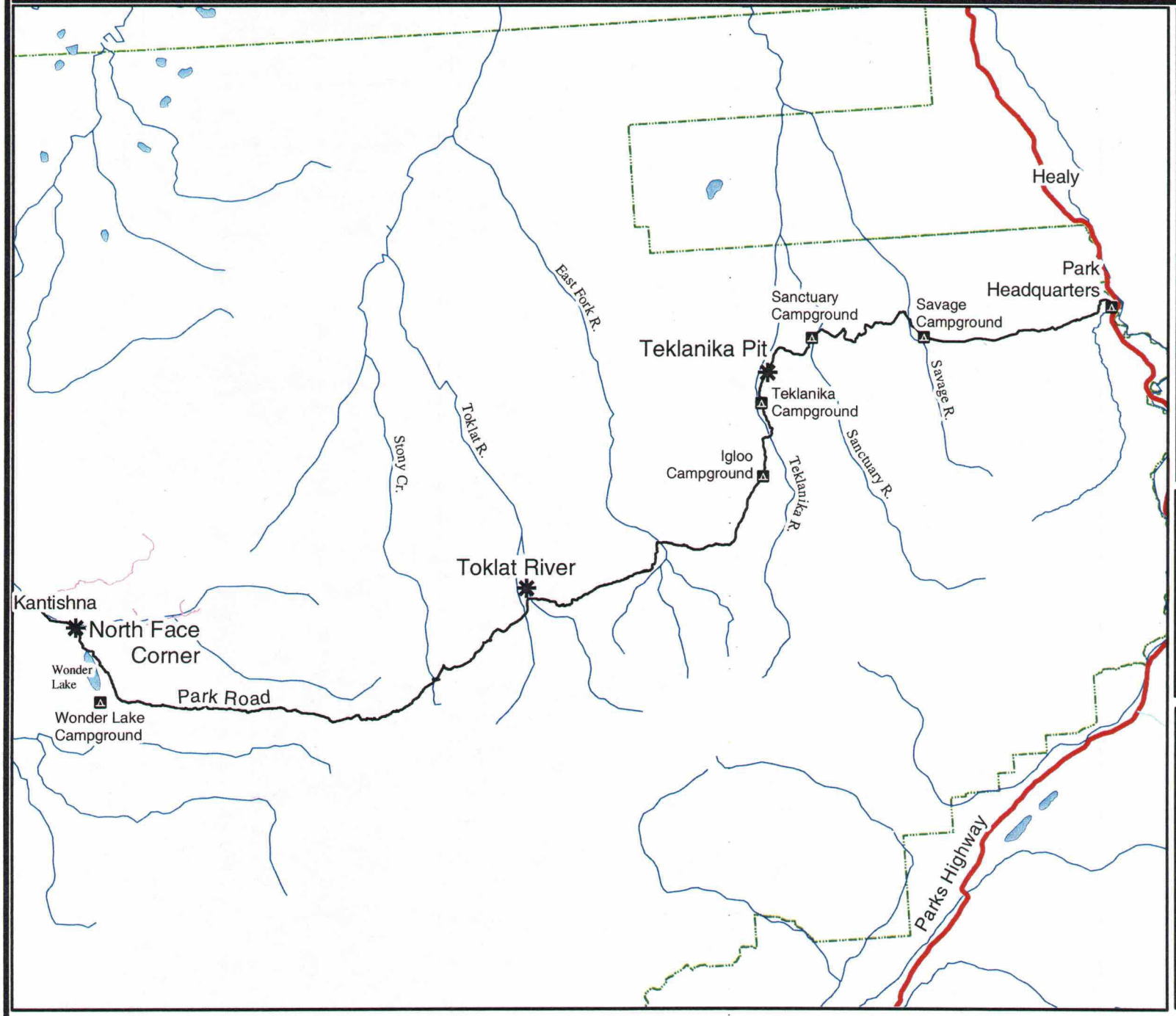
Map 2.1 - No Action Alternative

Denali National Park and Preserve
National Park Service
U. S. Department of the Interior

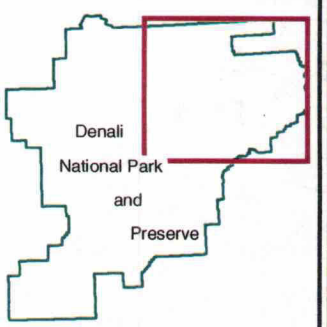


Legend

- Gravel Pits
- Campgrounds

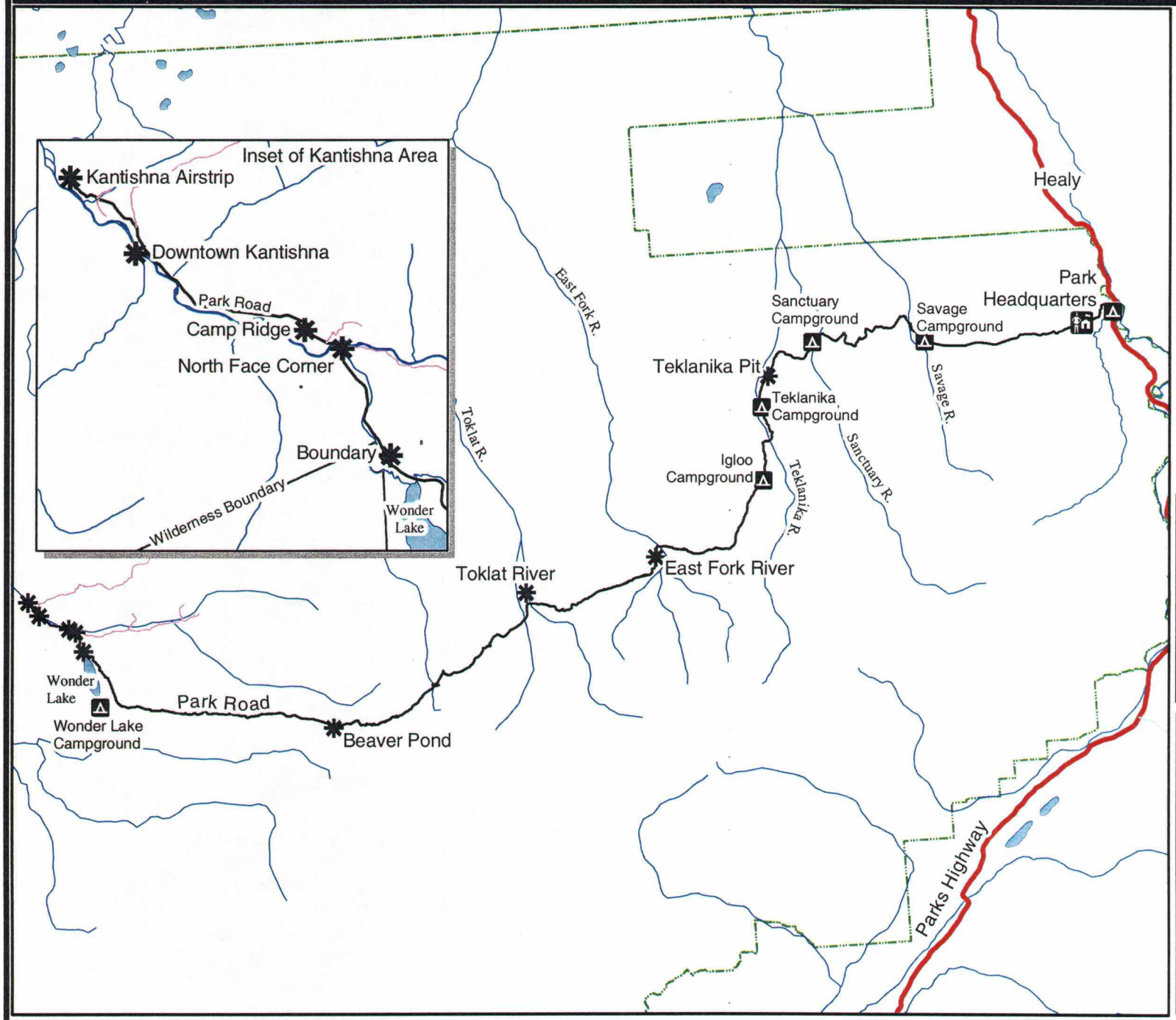
National Park Service
Denali National Park and Preserve

0 1.25 2.5 5 7.5 10 Miles



Map 2.2 - Alternative 2 - Maximum Flexibility/Short Hauls

Denali National Park and Preserve
National Park Service
U. S. Department of the Interior

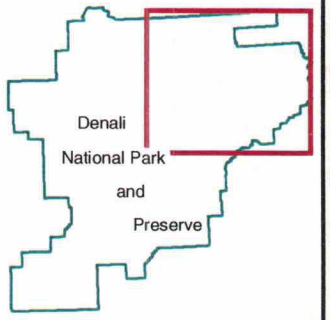


Legend

- Gravel Sources
- Campgrounds

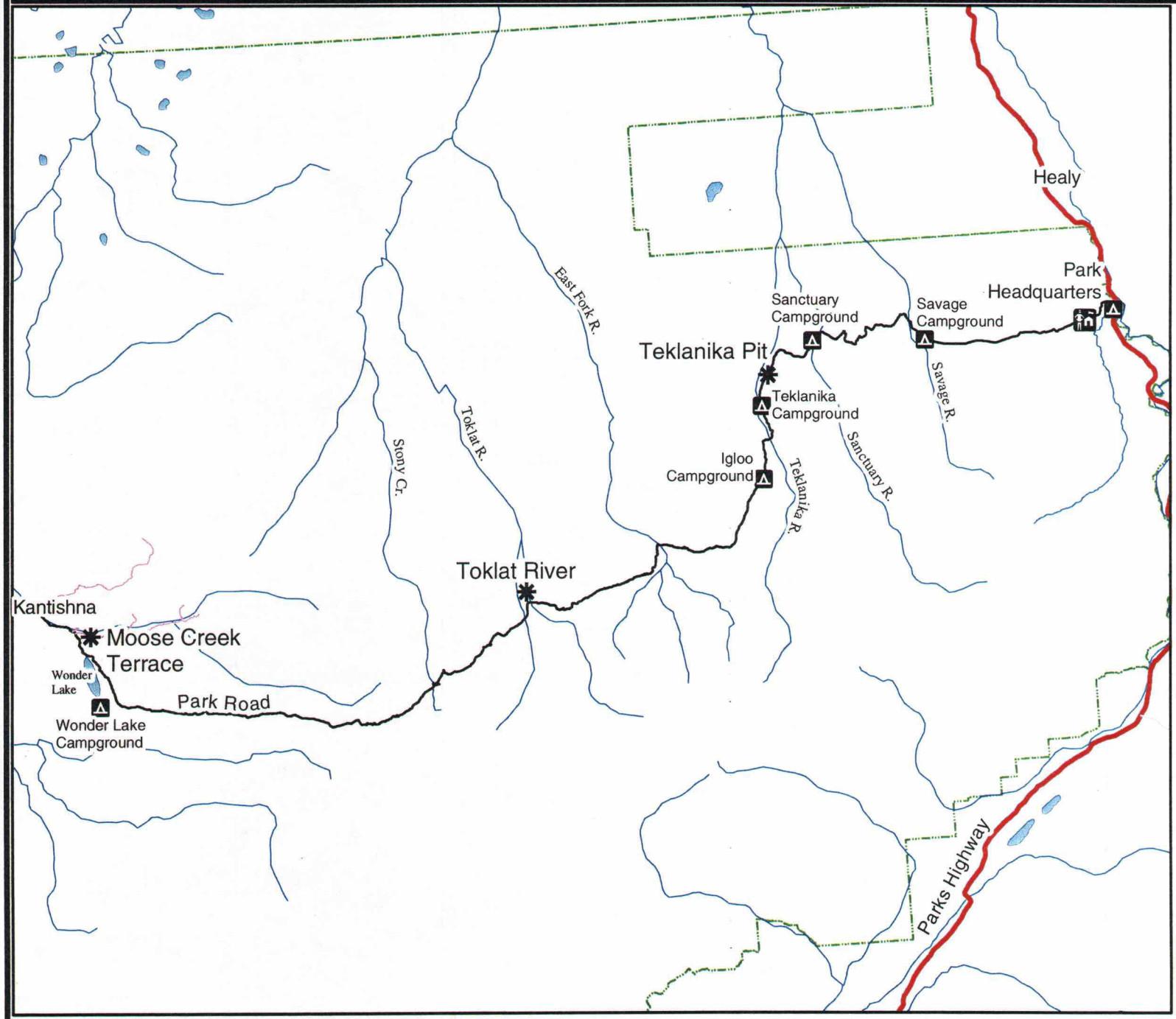
National Park Service
Denali National Park and Preserve

0 1.25 2.5 5 7.5 10 Miles



Map 2.3 - Minimum Visual Intrusion - Long Hauls

Denali National Park and Preserve
National Park Service
U. S. Department of the Interior

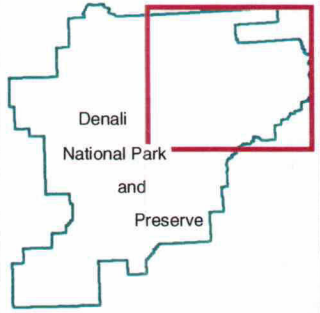


Legend

- Gravel Sources
- Campgrounds

National Park Service
Denali National Park and Preserve

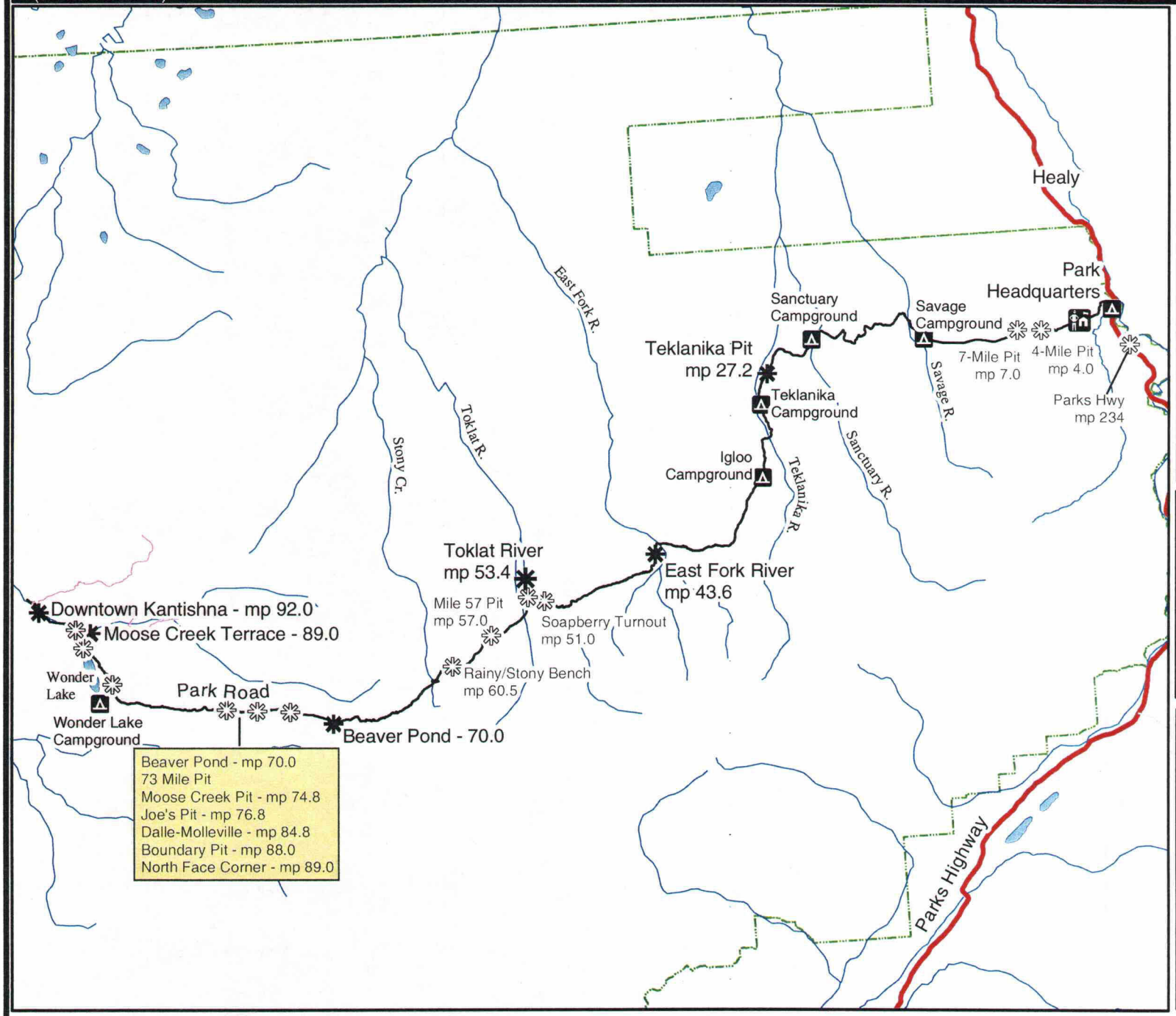
0 1.25 2.5 5 7.5 10 Miles



Map 2.4 - Alternative 4 - Phased Development of Moderate Number of Sites

(NPS Preferred)

Denali National Park and Preserve
National Park Service
U. S. Department of the Interior

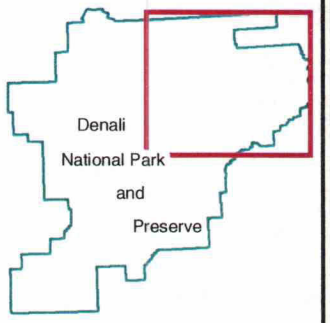


Legend

- Gravel Sources
- Campgrounds
- Reclamation Sites

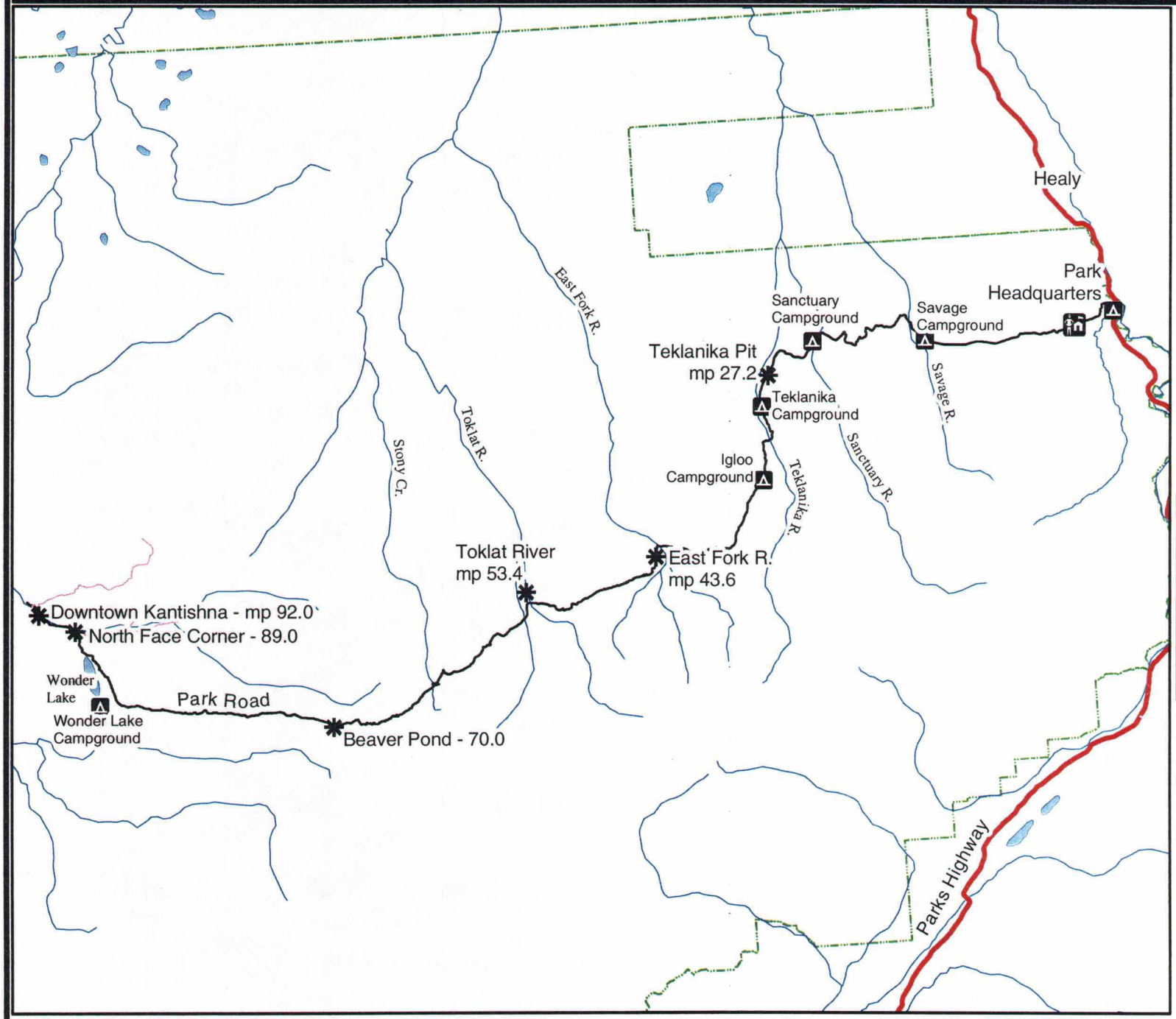
National Park Service
Denali National Park and Preserve

0 1.25 2.5 5 7.5 10 Miles



Map 2.5 - Alternative 5 - Most Economic Alternative with Moderate Hauls

Denali National Park and Preserve
National Park Service
U. S. Department of the Interior

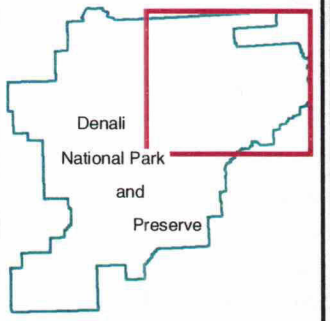


Legend

- Gravel Sources
- Campgrounds

National Park Service
Denali National Park and Preserve

0 1.25 2.5 5 7.5 10 Miles



Reclamation:
The southern corner of the pit wall, which is briefly visible from the park road, has been reclaimed with vegetation. The south and north pit walls would be reclaimed as the project progresses to the northeast, with a priority placed on the north-facing walls because the tops of them are slightly visible from the park road through a screen of white spruce trees. The slopes would be contoured to a 2:1 grade and the organic overburden material would be spread evenly over these barren slopes to hasten natural recovery.

2. East Fork River

Location and Access:
This site is positioned in the floodplain of the East Fork of the Toklat River south of Mile 43.6 of the Denali Park Road in T 16 S, R 12 W, and Section 1, FM. The site is restricted by river banks to the west and east, park road to the north, and the Denali Wilderness boundary to the south. A 10- to 12-foot wide 0.25-mile gravel spur road from the park road to the East Fork Cabin provides access to the edge of the floodplain.

Site Size and Estimated Volumes:
This site has no set dimensions except for operations within the confines noted above. Studies of bed-load transport (Emmett 2002) indicate an estimated maximum average of 5,400 cy /yr could be safely removed from the floodplain without adversely affecting river processes. Over a period of 10 years this site could produce up to 54,000 cy of coarse aggregate. This site could be operated for decades.

Material Characteristics:
The material is derived from fluvial gravel composed of volcanics, sandy sediments, and conglomerates. The particles are well-rounded and mixed in size, but mostly composed of gravel, cobbles, and river rock. Limited fines would occur in depositional areas of the floodplain.

Extraction, Processing, Storage, and Use:
Heavy equipment would drive out onto the floodplain from a ramp at the end of the East Fork Road during September or emergencies. Extraction and processing activities would occur mostly before or after the bulk of the summer visitation because this site is highly visible from the park road. As at the Toklat River site over the last decade, mirror channels would be excavated with a front-end loader from a downstream position to an upstream position beside an active river channel and loaded into dump trucks. One or two mirror channels would be excavated to produce the desired amount of material. The last scrape would connect the mirror channel on the upstream side with the active river channel. A large scrape could be excavated once every 2 to 3 years with interim years for natural recovery before the next scrape is excavated. Dump trucks would haul the material to the Ghiglione Bridge parking area for stockpiling or to Toklat Road Camp for processing. Most of the material would be used for sub-grade repairs, ditches, gabions, or other road maintenance applications requiring larger particles. The East Fork site would be reserved for emergency road repairs between the Teklanika Pit and Toklat River site, such as a massive slope failure along Igloo Canyon or the Polychrome Pass area. Up to 2,000 cy of unused material could be stockpiled at Ghiglione Bridge at Mile 42.

Reclamation:
Each mirror channel would be reclaimed within 5 years by natural stream flow processes. Because no vegetation survives in the active floodplain, vegetative recovery is not needed. The

NPS would make level surveys across, above, and below the extraction area to assure natural river processes are not adversely affected.

3. Toklat River

Location and Access:
This site is positioned in the floodplain of the Toklat River about 0.75 miles north of Mile 53.4 of the Denali Park Road in T 16 S, R 13 W, and Section 15, FM. The site is restricted by river banks to the west and east, park road to the south, and the Denali Wilderness boundary to the north. A 14- to 20-foot wide 0.75-mile gravel spur road from the park road to the Toklat Camp provides access to the edge of the floodplain and processing area.

Site Size and Estimated Volumes:
This site has no set dimensions except for operations within the confines noted above. Studies of bed-load transport (Karle 1989 and Emmett 2000) indicate an estimated maximum average of 11,100 cy /yr could be safely removed from the floodplain without adversely affecting river processes. Over a period of 10 years this site could produce up to 111,000 cy of coarse aggregate. This site could be operated for decades without exceeding recommended extraction rates. The NPS stockpiled about 15,000 cy of pit-run material at this site at the end of 2002.

Material Characteristics:
The material is derived from fluvial gravels composed of volcanics, sandy sediments, and conglomerates. The particles are well-rounded and mixed in size, but mostly composed of gravel, cobbles, and river rock. Limited fines would occur in depositional areas of the floodplain.

Extraction, Processing, Storage, and Use:
Heavy equipment would drive out onto the floodplain from a ramp at the end of the Toklat Camp access road. Extraction and processing activities would occur mostly before or after the bulk of the summer visitation because this site is visible from the park road. As during the last decade, mirror channels would be excavated with a front-end loader from a downstream position to an upstream position beside an active river channel and loaded into dump trucks. One to four mirror channels would be designed each season to produce up to 11,100 cy each year. The last scrape would connect the mirror channel on the upstream side with the active river channel. Dump trucks would haul the material to a processing site near the Toklat Road Camp for screening and/or crushing. No material would be stockpiled or processed below the ordinary high water mark (OHW) until sheetpiling is installed pursuant to a Clean Water Act Section 404 permit for the crushing site, which is scheduled for FY03. This material would be used for all road maintenance activities along the western half of the park road. Coarse material could be used along more easterly segments of the park road where such material is not economically available from outside sources or the Teklanika Pit.

Reclamation:
Each mirror channel would be reclaimed within 5 years by natural stream flow processes. Because no vegetation survives in the active floodplain, vegetative recovery is not needed. The NPS would make annual level surveys across, above, and below the extraction area to assure natural river processes are not adversely affected.

4. Beaver Pond

Location and Access:
This site lies between 150 feet and 500 feet south of Mile 70 of the Denali Park Road in T 17 S, R 15 W, and Section 21, FM. The park road restricts the site to the north, and the Denali Wilderness boundary restricts the site to the south. This part of the wilderness boundary follows a reach of the small stream draining the area near Grassy Pass (Mile 69) to the Thorofare River. The site is accessed by a 150-foot long by 10- to 20-foot wide road that curves through shrub tundra into the extraction area from the south side of the Denali Park Road.

Site Size and Estimated Volumes:
The existing pit dimensions are about 350 feet long by 200 feet wide and 20 feet deep at its deepest point. The new extraction area dimensions would be up to 500 feet long by 300 feet wide (154,365 ft^2or 3.5 acres) with a deposit thickness of up to 40 feet, which could produce a maximum of 70,000 cy of pit-run material. Less than the full area and volume may be extracted to minimize visual impacts along the park road and impacts to wetlands. About 45 % of the site already lacks vegetation and overburden from previous extraction activities. The remaining area is covered with tundra composed of low and tall shrubs, mosses and lichens and grasses and sedges. The overburden would be less than 1 foot thick.

Material Characteristics:
The material is glacial drift and outwash gravel composed of unsorted rounded cobbles to sub-angular pea gravel, sand, and fines. The relatively even distribution of size class of material (20% > 15 cm, 25% 15 cm – 5 cm, 20 % 5 cm – 0.5 cm, and 35% < 0.5 cm) would provide pit-run material for road surfacing and other area projects.

Extraction, Processing, Storage, and Use:
This site would be operated throughout the summer season as needed. The process and storage area would be in the middle of the lower end of the extraction area, to minimize visibility from the park road. A bulldozer would push overburden toward the eastern side of the pit, building a berm to obstruct the view into the extraction area from west-bound traffic on the park road. The bulldozer would pull material down into the pit where it would be screened to remove oversize material. Most of the screening and stockpiling would occur in fall or spring. NPS or contractor dump trucks would haul the material to park road maintenance and construction sites during summer. Most of the material would be used for road surfacing and subsurface excavation replacement material within 10 miles of the site, particularly for the Mile 70-72 project. The oversize material would be used for ditches, gabions, or other road maintenance applications requiring larger particles. Additional specialized material may be brought here from other sources and stockpiled for project use.

Reclamation:
The slopes would be contoured to an approximate 2:1 grade and the organic overburden material would be spread evenly over barren slopes to hasten natural recovery. Backfill would be needed to blend the contours of the site with the surrounding topography without expanding the area of disturbance. If the NPS extracted the entire 70,000 cy of material at the site, about 27,000 cy of backfill would be needed to recontour the site. The NPS Maintenance Division estimates that up to 27,000 cy of material would be generated as waste from road rehabilitation projects at MP 70 to 72 and MP 68. The final site would be configured to blend with the surrounding topography and to screen it from the park road. See drawings in Appendix C for details. The final reclamation is not likely to occur within the next 10 years.

5. Boundary

Location and Access:
This site lies about 200 feet east of Mile 88 of the Denali Park Road just south of the boundary between the former Mount McKinley National Park and the Denali National Park additions. The site is in T 16 S, R 17 W, and Section 29, FM, and about 1,500 feet north of Wonder Lake. This former borrow site is restricted by the park road to the west. The Denali Wilderness boundary is over 2,500 feet east of the site. Current access to the site is by a 250-foot long by 12-foot wide gravel road that curves over a rise through shrub tundra into the extraction area from the eastern side of the Denali Park Road. The site design includes new access that would arc into the site from the south side of the deposit. A small area adjacent to the park road is used for bus parking and stockpiling of small volumes of gravel.

Site Size and Estimated Volumes:
The existing pit dimensions are about 200 feet long by 150 feet wide and about 10 feet deep. The new extraction area dimensions would be up to 450 feet long by 400 feet wide (104,145 ft^2 or 2.4 acres) with a deposit thickness of up to 13.5 feet. The site could produce a maximum 40,000 cy of pit-run material. Less than the full area and volume may be extracted to minimize visual impacts along the park road. About 10 % of the site is already lacking vegetation and overburden from previous extraction activities. The remaining area is covered with tundra composed of dispersed white spruce, low and tall shrubs, mosses, lichens, grasses, and sedges. The overburden would average about 2 feet thick.

Material Characteristics:
The material is glacial drift that appears to have surrounded former ice blocks that melted. The underlying stratum appears to be stream-flow deposits with a delta lobe extending from the Boundary site to the western side of Lake Creek. The mixed material is sedimentary rock, granitic rock, and volcanic material.

Extraction, Processing, Storage, and Use:
This site would be operated throughout the summer season as needed. The process and storage area would be in the middle of the extraction area to minimize visibility from the park road, Camp Denali, and North Face Lodge. A bulldozer would push overburden toward the northern side of the pit, building a berm to obstruct the view into the extraction area from the park road and lodges. Additional overburden material would be stored in a natural depression located in the northwestern part of the project area. The bulldozer or a front-end loader would pull mined material down into the pit where it could be screened to remove oversize material. Most of the screening and stockpiling at the site would occur in fall or spring. NPS or contractor dump trucks would haul the material to park road maintenance and construction sites during summer. Most of the material would be used for road surfacing. The oversize material would be used for ditches, gabions, or other road maintenance applications requiring larger particles. Part of this site was already used to store reject material from the North Face Corner site. A small extraction area on the south side of the deposit has been used for lodge vehicle and NPS bus parking as well as storage of processed gravel.

Reclamation:
The slopes would be contoured to an approximate 2:1 grade and the stockpiled organic overburden material would be spread evenly over barren slopes to hasten natural recovery. The final site would be configured to blend with the surrounding topography and to screen it from the park road. See drawings in Appendix C for details.

6. North Face Corner

Location and Access:
This site lies adjacent to the southern side of Mile 89 of the Denali Park Road, about 400 feet northwest of the North Face Lodge and 1,400 feet southwest of Camp Denali. The site is in the 1980 Denali National Park extension pursuant to ANILCA in T 16 S, R 17 W, and Section 19, FM. The Denali Wilderness boundary lies about 1 mile south of this source site. This deposit is part of the gravel benches lining the south side of Moose Creek for miles, providing a nearly limitless source of unsorted gravel.

Site Size and Estimated Volumes:
The North Face Corner site could be developed in six phases, as shown in site drawings in Appendix C. Phase 1 would be about 750 feet long and 225 feet wide (164,000 sq. ft. or 3.8 acres) with a maximum deposit thickness of 40 feet. Phase 1 could provide up to 193,500 cy of pit-run gravel. This estimated volume would easily handle the projected needs at the western end of the park road over the next 10 years. Phases 2 through 6 would continue in a northeasterly direction in a fashion similar to Phase 1. This site could produce several hundred thousand cy of pit-run material over the long term. Up to 10,000 cy of authorized gravel remain in the bank at this site pursuant to the 1999 EA. The site is covered 90% with low shrub tundra, about 5% grasses/sedges, and 5% barren rock. The resulting overburden would be about 1 foot thick.

Material Characteristics:
The gravel bench is composed of glacial drift underlain by Birch Creek Schist. The poorly sorted or well-mixed, sub-angular to well-rounded material is composed of particle sizes from silt-sand to cobbles. Recent extractions show the material is comparable to the Moose Creek Terrace formation. The naturally mixed material could produce useable pit-run, or it may require screening and crushing as in recent years.

Extraction, Processing, Storage, and Use:
Mining would be initiated on the western part of the project area to minimize impacts to the North Face Lodge and park visitors. Initially, this site would require processing and stockpiling activities adjacent to the park road, where recent mining, processing, and stockpiling has occurred. As Phase 1 was developed and a working area created, processing and stockpiling would be relocated to the Phase 1 area. This site would be operated throughout the summer season as needed. The process and storage area would be tucked around the western side of the site to help minimize visibility to visitors on the park road and at North Face Lodge and Camp Denali. A bulldozer would push overburden toward the eastern and southern sides of site, away from extraction areas. The bulldozer or a front-end loader would pull material down into the pit where it could be screened and crushed, as needed, to remove oversize material. Most of the screening and stockpiling at the site would occur in fall or spring. NPS or contractor dump trucks would haul the material to park road maintenance and construction sites during the summer. Much of the material would be crushed and used for road surfacing, but the available quantities are so great the material could be screened and used for all maintenance and construction needs. The oversize material would be used for ditches, gabions, or other road maintenance applications requiring larger particles.

Reclamation and Mitigation:
The slopes would be contoured to a 2:1 grade and the stockpiled organic overburden material would be spread evenly over barren slopes to hasten natural recovery. The final site would be configured to blend with the surrounding topography, forming a new terrace line. A new bus stop

shelter, visitor rest stop and trailhead would be constructed after the extraction area is exhausted, pursuant to a Kantishna Area Management Plan. See drawings in Appendix C for site details.

7. Moose Creek Terrace

Location and Access:
This site lies about 1.1 miles east of Mile 89 of the Denali Park Road and the North Face Lodge along the north side of a mining access road (Moose Creek Road). The site is in the Denali National Park ANILCA additions in T 16 S, R 17 W, and Section 20, FM. The Denali Wilderness boundary lies about one mile southeast of this source site. This source site would be located between the Moose Creek Road to the south and Moose Creek to the north. Gravel benches line the south bank of Moose Creek for miles, providing a nearly limitless source of gravel. The unimproved Moose Creek Road is 10- to 12-foot wide, traverses mostly shrub tundra and open white spruce forest, and would require gravel fill and drainage and structural improvements to support heavy equipment.

Site Size and Estimated Volumes:
The potential new extraction areas are designed as two separate mining units yielding up to 99,000 cy of pit-run material, and involving about 3.7 acres for extraction. Unit 1 extraction area dimensions would be up to 366 feet long by 170 feet wide (47,832 ft^2 or 1.1 acres) with a design thickness of up to 9 feet. Unit 2 extraction area dimensions would be up to 600 feet long by 190 feet wide (111,195 ft^2 or 2.6 acres) with a design thickness of up to 21 feet. There are many expansion possibilities of this pit after these two units were exhausted. Unit 3 is a possible optional cut for future extraction of up to 65,000 cy, but it is not being evaluated in this document. The site is covered 90% with low shrub tundra, about 5% grasses/sedges, and 5% barren rock. The overburden would be less than 1 foot.

Material Characteristics:
The gravel benches are composed of glacial drift underlain by Birch Creek Schist. Bedrock outcrops protrude through parts of the river terrace formed by the alluvium. The poorly sorted or well-mixed, sub-angular to well-rounded material is composed of particle sizes from silt-sand to cobbles. Early analyses show the material is about 30% cobbles, 40% pebbles, and 30% sand/silt. The material was estimated to be 10% granite, 25% schist, 30% shale, 10% volcanics, and 25% sand/silt sediment and sandstone. The naturally mixed material would likely produce usable pit-run, or it may require limited screening.

Extraction, Processing, Storage, and Use:
This site would be operated throughout the summer season as needed. The process and storage area would be on a lower terrace with a spur road skirting the lower edge of the upper terrace slope to help minimize visibility to hikers on the Moose Creek Road. A bulldozer would push overburden toward the western, northern, and eastern sides of the extraction area pit, away from extraction areas. The bulldozer or a front-end loader would pull material down into the pit where it could be screened, as needed, to remove oversize material. Most of the screening and stockpiling at the site would occur in fall or spring. NPS or contractor dump trucks would haul the material to park road maintenance and construction sites during the summer. Much of the material would be used for road surfacing, but the available quantities are so great the material could be used for all maintenance and construction needs. The oversize material would be used for ditches, gabions, or other road maintenance applications requiring larger particles.

Reclamation and Mitigation:
The slopes would be contoured to a 2:1 grade and the stockpiled organic overburden material would be spread evenly over barren slopes to hasten natural recovery. The final site would be configured to blend with the surrounding topography, forming a new terrace line. A new visitor parking area and trail on the eastern side of the extraction and processing area may be constructed, pursuant to a Kantishna Area Management Plan, to position hikers beyond the heavy equipment. See drawings in Appendix C for site details.

8. Camp Ridge

Location and Access:
This site lies immediately north of Mile 90 of the Denali Park Road and about 0.5 mile west of Camp Denali facilities in the Denali National Park additions. The site is located in T 16 S, R 17 W, and Section 19, FM, about 0.4 miles west of the North Face Corner. The site is restricted to the south and west by the park road, to the east by the Camp Denali access road, and to the north by steep terrain. The Denali Wilderness boundary lies about 2 miles south of the site.

Site Size and Estimated Volumes:
The new extraction area would be up to 104,000 sq. ft. or 2.4 acres, with an average deposit thickness of about to 30 feet. The site would produce about 72,000 cy of bank-run material. The site is covered with open needle-leaved forest with white spruce (20-30%) and ericaceous shrubs. Tussocks formed of sedges and cottongrass are interspersed with drier hummocks with shrubs like bog blueberry, Labrador Tea, lowbush cranberry and dwarf birch. About 80% of the area is wetlands. The resulting overburden would be about 1-2 feet thick with peat in some parts of the site. Substantial reject and waste is suspected until corings could be obtained.

Material Characteristics:
The material characteristics here are not known. This site would need to be tested before it is developed.

Extraction, Processing, Storage, and Use:
This site would be developed in four phases. During Phase 1 trees and other vegetation would be removed from along the road and material would be excavated and loaded into dump trucks and transported to another location, likely North Face Corner, for processing and stockpiling. This is because there is insufficient space to excavate and process material adjacent to the park road until the site is cut more deeply into the terrace. During Phase 1 most of the excavations and processing would probably occur in the spring and fall when road and lodge traffic is reduced in the area. At least 40,000 to 50,000 cy of material (from Phase 1 and part of Phase 2) would need to be processed offsite (probably at North Face Corner) before processing could occur at Camp Ridge. During Phase 2 extraction, processing and stockpiling would occur in the enlarged site, after sufficient working space had been created. A bulldozer would push overburden toward the western and eastern sides of the extraction area to stay out of way of the park road and extraction face. The bulldozer or a front-end loader would pull material down into the pit where it could be screened and crushed, as needed, to remove oversize material. Much of the material would be used for road surfacing, and the oversize material would be used for ditches, gabions, or other park projects requiring larger particles.

Reclamation:
The slopes would be contoured to a 2:1 grade and the stockpiled organic overburden material would be spread evenly over barren slopes to hasten natural recovery. The final site would be

configured to blend with the surrounding topography. The site could not be hidden from the park road. See drawings in Appendix C for details.

9. Downtown Kantishna

Location and Access:
This large area lies on the western side of Moose Creek, immediately north the Kantishna Roadhouse, and across Moose Creek beginning at Mile 91 of the Denali Park Road in the Denali National Park additions. The site is in T 16 S, R 18 W, and Sections 14 and 15, FM. These former mining claims are restricted on the east by Moose Creek, private property to the south and north, and steep slopes to the west. The Denali Wilderness boundary is at least 2.5 miles south of the site. Access to the site is currently available by gravel road through Moose Creek, but a bridge would be needed in the future to facilitate continuous use by heavy equipment. The overall objective would be to mine mineral materials in the process of reclaiming the site to restore natural functions.

Site Size and Estimated Volumes:
The site dimensions are about 3,700 feet long by 650 to 1,000 feet wide with an estimated deposit thickness of 5-10 feet. The site covers about 2,405,000 ft^2 (55.2 acres.) Because the primary objective would be to restore mining tailings and other mining features, including depressions, and to restore natural functions of Eldorado and Moose Creeks, the site is estimated to produce a maximum 59,000 cy (see Karle 2002.) Though most of the area was previously disturbed, much of the area has already been colonized with alders, willows, cottonwood, and white spruce trees. Very little overburden occurs on the site.

Material Characteristics:
The material is mostly washed gravel and cobbles, as most of the fines have been flushed downstream. The site could contain some pockets of fine silty-sandy material where settling ponds were established during mining operations.

Extraction, Processing, Storage, and Use:
This site would be operated throughout the summer season as needed. The process and storage area would be in the middle of the extraction area to minimize visibility from the park road, Kantishna Roadhouse and Denali Backcountry Lodge. A bulldozer would push vegetation overburden toward the western side of the extraction area. Berms or gravel stockpiles would be erected to the south and north of the processing area to deflect noise from screening or crushing plants away from the lodges. The bulldozer would level high areas and fill low areas and front-end loaders would load dump trucks with excess material to be processed near the center of the site. The processed material could be used for most maintenance and construction projects at the western end of the park road, such as the state right of way and Kantishna Airstrip. Reject material from road and airstrip projects could be deposited on this site to aid in site restoration and make available gravel from the site tailings piles and other gravel for road maintenance uses.

Reclamation:
The sites would be contoured to match surrounding grades and to produce adequate meandering channels in Eldorado and Moose Creeks to facilitate fish passage. The final site contours would also provide for floodplain development on the site rather than define narrow channels for the creeks. The NPS may employ similar revegetation techniques to this area as were used on Glen Creek to restore mining claims. See drawings in Appendix C for site details.

10. Kantishna Airstrip

Location and Access:
This site is located in the Denali National Park additions near the end of the Denali Park Road at Mile 93, T 16 S, R 18 W, and Section 11, FM. The Denali Wilderness boundary is about 4 miles south of the site. A new 500-foot-long access road would need to be constructed to the northern end of deposit from the end of the new park road extension parallel to the Kantishna Airstrip and the old Jauhola Road. Or, if the southern end of the deposit is exploited, a 200-foot road would gain access to the edge of the deposit from the new park road extension parallel to the Kantishna Airstrip. Site development would be restricted by the underlying water table, judged to be 10 to 15 feet below the surface.

Site Size and Estimated Volumes:
The deposit dimensions are about 1,100 feet long by 300 feet wide and 10 feet deep, for a total surface area of about 330,000 sq. ft. (7.6 acres) and estimated total bank cut of 88,000 cy. The overburden is estimated to be an average of 1 foot thick, and the total overburden cut would be about 12,000 cy, leaving a maximum usable mineral material yield of about 76,000 cy. Less than the full area and volume would likely be extracted, to minimize visual impacts to hikers on the Skyline Drive and Wickersham Dome area. This site would be operated to produce gravel needed only for improvements to the Kantishna Airstrip and the last 1-2 miles of the park road.

Material Characteristics:
The material is derived from former Moose Creek floodplain terrace and Friday Creek alluvium. The outwash material is composed of granites, schist, volcanics, shales, and conglomerates. The rounded to well-rounded particles of cobbles to sand contain a little clay.

Extraction, Processing, Storage, and Use:
This site would be operated throughout the summer season as needed. The process and storage area would be in the middle of the extraction area or nearer the south edge of the cut area to reduce noise impacts to park visitors at the Kantishna Airstrip and Denali Backcountry Lodge. A bulldozer would push overburden toward the northern and eastern sides of the bank cut, away from the extraction zone. The bulldozer or a front-end loader would pull material down into the pit where it could be screened to remove oversize material and crushed to produce sub-angular material for road and airstrip surfacing. Most of the screening and crushing at the site would occur in fall or spring to minimize noise impacts on park visitors. NPS or contractor dump trucks would haul the material to Kantishna Airstrip or park road maintenance and reconstruction sites during summer.

Reclamation:
The slopes would be contoured to a 2:1 grade and the stockpiled organic overburden material would be spread evenly over barren slopes and pit floor to hasten natural recovery. The final site would be configured to blend with the surrounding topography to minimize visual impacts to park visitors hiking in the area. See drawings in Appendix C for details.

ELEMENTS COMMON TO ALL ALTERNATIVES

1. Maintain Road Purpose and Character

The use and development of mineral material sources along the Denali Park Road will be consistent with the purposes for the Denali Park Road and the definition of road character. The park's General Management Plan (NPS 1986) stated the park access system should, "Provide ... efficient public transportation ... which enables visitors to use and enjoy the park in the safest and freest possible manner compatible with protection of park resources." The Road System Evaluation (NPS 1994) and Appendix C of the Denali National Park Entrance Area and Road Corridor Development Concept Plan (NPS 1996) further defined the road's purpose and character.

The purpose of the road is to provide park visitors of all ages and abilities an opportunity to access a rugged wilderness area to observe outstanding scenery and wildlife interactions in natural habitat. The road provides circulation and access to public and administrative facilities and helps meet ANILCA requirements for reasonable access to private property in the Kantishna Hills.

The character of the road and its relationship with the landscape is considered an integral part of the visitor experience. As visitors travel from east to west into the park, the environment changes from an urban/developed zone to rustic to primitive. Likewise, the road tracks with the character of the land. The road first traverses the entrance area and park headquarters with a two-lane paved surface open to general traffic to the Savage River Bridge at Mile 15. Beyond the Savage River Bridge the road is gravel-surfaced; vehicle access is not restricted during the shoulder seasons, depending on snow and road conditions. Between Mile 15 and Mile 30 at the Teklanika Bridge, the road is a gravel two-lane road over broad sweeping terrain. From Mile 30 to Mile 93 the road becomes a one-lane gravel road through rugged mountainous country with two-lane sections and pullouts for passing traffic. Vehicular access beyond Mile 15 is restricted during the main visitor season between the Saturday of Memorial Day weekend and the second Thursday after Labor Day. Vehicle access west of the Teklanika rest stop is restricted to administrative traffic during the shoulder seasons. Vehicle traffic east of the Teklanika rest stop is unrestricted to all traffic during the shoulder seasons, depending on snow and road conditions.

The volumes of mineral material needed for the various sections of the park road would not need to exceed the requirements to maintain the purpose and character of the road. In some places the road needs to be rebuilt because it is failing or subsurface material has rotted and needs to be replaced. In other places new administrative facilities are being constructed. In all cases, however, the basic character of the road would be maintained.

2. Use Current Road Design and Maintenance Standards

The Denali National Park Road Design Standards (NPS 1995a) and the Denali National Park Road Maintenance Standards (NPS 1995b) would be followed unless changed in the next 10 years. The road design standards address geometric and structural design for various portions of the road. Geometric design standards include factors such as width, alignment, design speed, grade, clearance, drainage, parking areas, pullouts, pull-offs, bridges, and signing and marking. Structural design standards address factors such as the design vehicle, design load, load bearing section, and backslopes.

The road maintenance standards address the methods to achieve the design standards. Maintenance standards are subdivided into the following activities: surface maintenance, sight distance, parking areas, drainage systems, bridges, signs and markers, snow and ice control, and structural maintenance. Surface maintenance is subdivided into gravel and asphalt surface activities. Gravel surface maintenance includes surface preparation, aggregate placement, compacting, tolerances, and dust control measures. Asphalt surface maintenance includes crack sealing, chip seal and slurry seal, pothole patching, and asphalt paving. Sight distance maintenance involves maintaining appropriate vertical alignment and vegetation control along the road corridor. Drainage maintenance includes excavations, pipe placement, bedding, resurfacing, ditches, and related structures. Snow and ice control is basically subdivided into winter snow and ice control and spring road opening. Some snow removal may occur in summer during the visitor season. Road structural maintenance deals with surface, base and sub-grade treatments and repairs, geotechnical treatments like binders and palliatives, geotechnical fabrics, slope stabilization structures (gabions and sheet piling), subsurface drainage systems (like curtain drains and French drains), and slope problems from erosion and shear failure.

3. Monitor Road Conditions

NPS maintenance and physical resources personnel and Federal Highway Administration inspectors would continue to monitor the road condition and rates of surface material loss and surface migration or creep. Weak shoulders would be noted and slated for repairs or rehabilitation. Soft spots in the sub-grade or excessive surface and subsurface water would be noted and corrected as needed. Extended narrow segments of the road with insufficient sight distances and passing areas would be listed and prioritized for correction. Monitoring of the effectiveness and environmental effects of the dust palliative calcium chloride would continue over larger stretches of the park road. A wider application of this palliative or the discovery and use of a better one could reduce the long-term mineral material needs along the park road.

4. Use External Material Sources

To be consistent with NPS Special Directive 91-6, mineral material for park road maintenance and construction projects would be obtained from external source sites to the extent economically and environmentally feasible and reasonable. As noted in the 1992 gravel acquisition plan, the greatest expense is usually hauling. At that time, hauling gravel from external sources beyond the Savage River checkpoint was determined to be generally uneconomic and unreasonable. Appendix B contains a cost analysis of acquiring gravel from external and in-park sources to locations along the park road. Map 1.4 depicts the locations of potential source sites outside the park. The NPS could pursue long-term access to external sources for pit-run material and as a site for processing material. External sources could include material deposits on native corporation lands, ADOT sites, and Alaska Railroad lands. Materials from these locations could be hauled and stockpiled at designated locations along the park road. Maximizing use from external sources would conserve and extend the life of internal sources for road maintenance and small projects.

5. Continue to Use Teklanika Pit and Toklat River

The Teklanika Pit and Toklat River extraction areas would be used in all scenarios considered in this EA. The Teklanika Pit is extremely useful for material stockpiling and processing, as a location to deposit reject material, and as a source of road surfacing material. For these reasons the NPS prefers to conserve this source site for as long as reasonable. The NPS avoids using Teklanika Pit source for sub-grade, ditch, and gabion applications requiring coarser material, except for the 10-15 % of oversize rock rejected during screening. The volumes of material to be removed from the Teklanika Pit could vary between the alternatives, but the annual extraction is likely to be between 3,000 and 8,000 cy/yr. The Toklat River floodplain area was originally authorized for an average annual extraction of 7,500 cy/yr, but this amount could be safely increased to 11,100 cy/yr and still be below the recommended 5% of the annual bed-load transport (Karle 1989, Emmett 1990, and Emmett 2001.) The no-action alternative would utilize only mineral material from these two source sites after 2003. The action alternatives would all use these two sites and a combination of one or more additional source sites from within the park.

PROCESS OVERVIEW OF SITE DEVELOPMENT & RESTORATION

This section provides a general description of the steps performed to develop and restore NPS mineral materials extraction sites in the park. Sites are designated by a name and milepost number, which is measured from the intersection of the George Parks Highway and the Denali Park Road. Five types of extraction/stockpile sites and processes are described for this plan:

I. UPLAND EXTRACTION SITES– Long-term material extraction from upland sites with minimal area of delineated wetlands.
II. FLOODPLAIN EXTRACTION SITES – Annual, short-duration extraction from active gravel floodplains such that extraction channels are rapidly scoured and replenished with spring and summer floods.
III. STOCKPILE / STAGING AREAS – Designated areas that would be used for long-term material stockpiling and staging.
IV. RESTORATION SITES – Sites that are no longer needed for material extraction or stockpiling that would be restored.
V. POTENTIAL (TEST) SITES – Sites that meet the environmental and administrative criteria outlined above and may have material quality and quantity necessary for future extraction but require further mapping and material testing before a decision can be made.

I. Process to Develop and Operate Upland Extraction Sites.

The following general procedures would be used at several sites. These are Teklanika Pit at MP 27.2, Beaver Pond Pit at MP 70, Boundary Pit at MP 88, Moose Creek Terrace at MP 89A, North Face Corner at MP 89B, Camp Ridge at MP 90, Downtown Kantishna at MP 91 and Kantishna Airstrip at MP 93. Maps provided in Appendix C show site-specific dimensions and limits.

1. *Select Operator Camp, Staging, Fueling, Maintenance Area.*
Depending on the source site location, the operators would be housed and staged at either the park entrance area, the Toklat Road Camp, or in the Kantishna area. Staging of equipment, supplies and fuel would occur at one of these three locations. Operating equipment such as bulldozers, loaders and backhoes would be parked at the extraction

site after adequate parking space is created off the park road footprint and in such manner to minimize visual impacts. Fuel would be trucked to the heavy equipment; it would not be stored on the extraction site unless adequate double-walled containers or other adequate secondary containment was established. Maintenance and repair of equipment would occur at the base camps or excavation site, as appropriate.

2. *Survey Site.*
Before any extraction operations begin, NPS or contractors would survey and stake the site according to plan maps. The following areas would be staked: location and maximum width of access, limits of the extraction area, stockpile area, equipment operating areas, topsoil storage areas and the top of the high wall. All points should be surveyed relative to permanently marked control points established outside the disturbed area. NPS, FHWA and ADOT (where required) and contractor personnel should be involved in establishing boundaries.

3. *Protect Water Resources and Control Surface Runoff.*
This step involves installing long-term silt fences or sediment control structures and sediment basins on the downhill sides of extraction areas, stockpiles, reject material and overburden storage areas.

4. *Clear Vegetation.*
The NPS or contractor would then enter the area and cut trees and brush. Cut vegetation would be stockpiled in a cleared area with topsoil and chipped or burned on site. Alternately, the slash could be hauled to an administrative site for short-term storage or disposal. Dump trucks, rubber-tired loaders, or bulldozers would be used for slash and tree removal. A burn box may be used to facilitate safe, clean, and complete burning. Trees may be salvaged and stockpiled for NPS administrative use.

5. *Remove and Salvage Topsoil.*
Topsoil would be removed from all areas to be excavated or bladed that season. Topsoil would be removed to at least the base of the organic layer. Soil depth will vary within sites, and a NPS restoration specialist will specify salvage depth. A bulldozer, tracked loader, rubber-tired loader, or grader would be used for topsoil salvage. The salvaged topsoil would be stockpiled in areas not disturbed by other operations and would be used in the final reclamation. Stockpiles would be no more than 10 feet high to maximize soil productivity and minimize visual intrusion. These topsoil stockpiles should be signed to prevent accidental use as fill material.

6. *Extract Mineral Material and Stockpile.*
A bulldozer would push material down from the top of a site slope to create pit-run stockpiles or to feed material into a screening or crushing plant. Rubber-tired or tracked loaders would be used to load stockpiled material for transport to maintenance or construction sites. Operators would be careful not to exceed the maximum high wall slope and to maintain a positive draining pit floor as defined in the site plan. Undersize material, oversize rock, and screened/crushed rock would be separated and stockpiled according to survey stakes and a site plan.

7. *Screening and Crushing.*
A screening and/or crushing plant would be brought into the material site any time after extraction begins to process the pit-run. The NPS, FHWA, or contractor will monitor and analyze the character, depth, and productivity of the deposit during the early stages of

extraction. Based on this information, the extraction area could be adjusted to address annual or foreseeable project needs.

8. *Dispose of Waste Material.*
Concurrent with extraction or at the end of extraction, the undersize and oversize waste material would be placed back into the mined-out extraction area and contoured to blend with the surrounding topography. Some of the undersized material may be saved for use as binder with crushed rock. Some of the oversized material may be screened for use in gabions or other engineered structures.

9. *Restore Mined Areas.*
All areas not needed for stockpiles, access, and loading would be restored periodically and concurrently with extraction operations wherever possible. Restoration areas would be scarified (if needed), and contoured to blend with surrounding topography and to control surface runoff, in conformance with the site plan. Topsoil would then be evenly spread over the contoured area. Approved native seed and transplant vegetation would be disseminated over the restoration area to control exotic plants. The area would then be blocked from vehicle and foot traffic.

10. *Monitor Site.*
Operating procedures at active extraction sites would be monitored on a regular basis to assess their effectiveness in preventing resource impacts. Operating procedures that are causing resource damage or conflicts will be modified as needed. The restored areas would be monitored according to a monitoring plan (see subsequent section in Chapter 2 on mitigation and monitoring). Areas failing to recover or areas with excessive erosion would be re-addressed as needed.

II. Process to Develop and Operate Floodplain Extraction Sites.

The following general procedures would be used at East Fork River at MP 43.6 and Toklat River at MP 53.4. Maps provided in Appendix C show site-specific dimensions and limits.

1. *Select Operator Camp, Staging, Fueling, Maintenance Area.*
The operators at the Toklat River or East Fork River floodplain sites would be housed and staged at either the park entrance area or the Toklat Road Camp. Staging of equipment, supplies and fuel would occur at one of these two locations. Operating equipment would be parked near the extraction site at the Toklat Camp or near the East Fork Cabin. Fuel would be trucked to the heavy equipment at East Fork; equipment at Toklat would be refueled at the Toklat Camp. Routine maintenance of equipment would occur at the Toklat Camp or the entrance area facilities.

2. *Design Gravel Excavation Channels.*
NPS personnel would survey and stake out mirror images of active river channels, which would connect to natural bends in the natural channels. The length, width, depth and slope of the excavated channels would match the natural channel segments, channels would be located where sediment deposition is likely.

3. *Excavate Mirror Channels.*
NPS operators would use loaders or backhoes to excavate mirror channels from downstream to upstream. Individual channel excavations would be limited to an annual

average of 11,100 cy in the Toklat River and 5,400 cy in the East Fork River. Each season no more than four channel excavations would be excavated in the Toklat River and no more than two channel excavations would be excavated in the East Fork River. Excavations would occur during periods of low water, and early or late summer (late May to early June and early to mid-September.) This would lessen negative visual impacts to most park visitors and allow equipment to operate in the floodplain during low water. The final scrape would open the excavated mirror channel to flow from the natural channel. The excavated material would be stockpiled out of the floodplain.

4. *Monitor Effects on Rivers.*
The NPS would monitor the short and long-term effects on the rivers upstream and downstream of the excavation areas. Long-term monitoring would include annual level surveys of the existing cross-section system. (See subsequent section on mitigation and monitoring.)

III. Process to Develop and Operate Stockpile/Staging Areas.

The following general procedures would be used near several sites. These are Teklanika Pit site at MP 27, the Ghiglione Bridge at MP 42, the East Fork River site at MP 43.6, the Toklat Road Camp at MP 53.4, the Beaver Pond site at MP 70, the North Face Corner stockpile area at MP 89, and Downtown Kantishna stockpile area at MP 92. Maps provided in Appendix C show site-specific dimensions and limits.

1. *Survey Site.*
Before any extraction operations begin, NPS or contractors would survey and stake the site according to plan maps, as discussed previously for upland extraction sites.

2. *Protect Water Resources and Control Surface Runoff.*
The contractor would install long-term silt fences or sediment control structures and sediment basins on the downhill sides of extraction areas, stockpiles, reject material, and overburden storage areas.

3. *Clear Vegetation.*
The NPS or contractor would then enter the area and cut trees and brush. Specific procedures and equipment would be as discussed previously for upland extraction sites.

4. *Remove and Salvage Topsoil.*
Topsoil would be removed from all areas to be bladed and salvaged, according to the specifications described previously for upland extraction sites.

5. *Stockpile.*
Dump trucks would then periodically place crushed, screened or pit-run material at the site. Rubber tire or tracked loaders would be used to load stockpiled material for transport to maintenance or construction sites. All loading transport and storage activities would remain within the approved stockpile area as specified in the site plan.

6. *Restore Areas No Longer Needed.*
All areas not needed for stockpiles, access, and loading would be restored, following the specific procedures described previously for upland extraction sites.

7. *Monitor Site.*
Operating procedures at stockpile sites would be monitored on a regular basis to assess their effectiveness in preventing resource impacts, as described previously for upland extraction sites.

IV. Process to Restore Areas No Longer Needed.

The following general procedures would be used to restore sites; These sites are the pit at MP 234 of the George Parks Highway, 4-mile Pit at MP 4, 7-mile Pit at MP 7, Soapberry Turnout at MP 51, Toklat Alluvial Fan at MP 53.4, Carwile Pit at MP 57.0, Rainy/Stony Bench at MP 60.5, 73-mile Pit at MP 73, Joe's Pit at MP 76.8, Dalle-Molle-ville at MP 84.8, Boundary Pit at MP 88.0, and North Face Corner at MP 89.0. All or part of these sites would be restored over time. See Map 2.6 for the locations of restoration sites. The area to be restored at each site is indicated in the subsequent discussion entitled Mitigation and Monitoring Assumed for All Alternatives.

1. *Survey Site.*
Before operations begin, the NPS would survey and clearly stake the following according to the site maps: maximum width of access, maximum extent of topsoil removal areas, topsoil storage areas, top of cut areas and bottom of fill areas. All points would be surveyed relative to two, permanently marked control points established outside the proposed area of disturbance. Park, FHWA and contractor staff should be involved in establishing the boundaries.

2. *Protect Water Resources and Control Surface Runoff.*
The contractor would install temporary silt fences or sediment control structures on the downhill sides of extraction areas, stockpiles, reject material, and overburden storage areas.

3. *Site Clearing.*
The contractor would then enter the area and cut trees and brush, as described previously for upland extraction sites and staging areas.

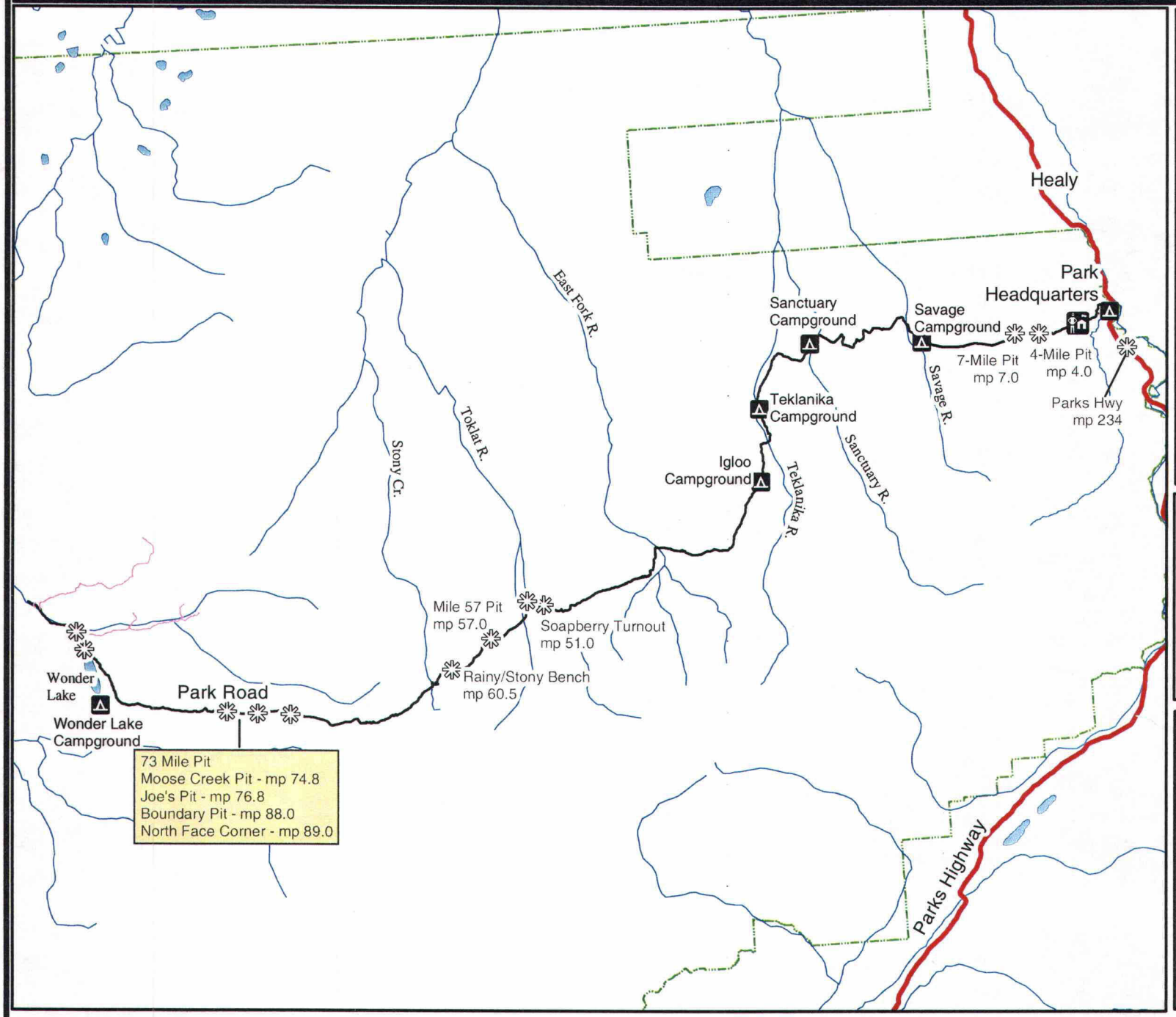
4.a. *Topsoil Salvage.*
Topsoil would then be removed from all areas to be excavated or bladed. A NPS restoration specialist would determine the depth of topsoil removal prior to operations. A bulldozer, tracked loader or rubber-tired loader would be used for salvage operations. The salvaged topsoil would then be stockpiled in areas that will not be disturbed by recontouring or scarifying operations and will be used in final reclamation.

NOTE: If excess material was removed in the process of restoration contouring, the following step would be required.

4.b. *Material Extraction and Stockpiling.*
To create contours that blend with surrounding topography (including the use of reject material from road and other construction projects), a bulldozer or track loader would push the material down from the top of the pit slope into pit-run stockpiles. A loader would then fill dump trucks for hauling the material to a project or stockpile site.

Map 2.6 - Potential Restoration Sites for Mitigation

Denali National Park and Preserve
National Park Service
U. S. Department of the Interior

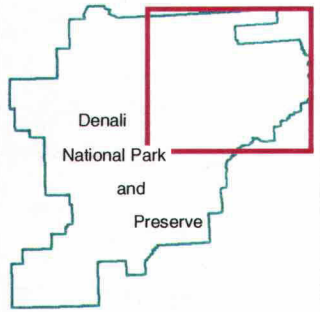


Legend

- Campgrounds
- Reclamation Sites

National Park Service
Denali National Park and Preserve

0 1.25 2.5 5 7.5 10 Miles



5. Site Restoration.
The site would be recontoured to blend with surrounding topography and to control surface runoff in conformance with the site plan. Salvaged topsoil would then be spread evenly over the surface and the road permanently closed. Vegetation transplants may be used to close the access and visually screen the extraction site.

6. *Monitoring.*
Site monitoring would take place according to the plan in the monitoring program described in the following section on mitigation and monitoring.

V. Process to Test Potential Extraction Areas.

The following general procedures would be used at the Old Teklanika Pit at MP 27.5, the Moose Creek Terrace Site at MP 89, the Camp Ridge Site at MP 90, and the Kantishna Airstrip Site at MP 93. Maps provided in Appendix C show site-specific dimensions and limits.

1. *Stake Site.*
Before operations begin, clearly stake the following according to the site maps: access route, areas of access improvement or blading (if needed), maximum extent of topsoil removal (if needed), topsoil storage areas (if needed), and drill hole or trench sample points. Park, FHWA, and contractor staff should be involved in establishing the access route and areas of testing.

2. *Protect Water Resources and Control Surface Runoff.*
Temporary silt fences or sediment control structures would be installed on the downhill sides of bladed access and trenching or drilling areas if needed.

3. *Topsoil Salvage (if needed).*
Topsoil would then be removed from all areas to be excavated or bladed (if any). A NPS restoration specialist would determine depth of topsoil removal prior to operations. A bulldozer, tracked loader or rubber-tired loader would be used for salvage operations. The salvaged topsoil would then be stockpiled in areas that will not be disturbed by recontouring or scarifying operations and will be used in final reclamation.

4. *Site Testing*
A track-mounted drill rig (for borings) or track-mounted backhoe (for trenches) would access the site by a designated route, including the use of rubber mats under the rigs to protect underlying vegetation and soils. A minimum number of vehicles and trips would be used to protect the delicate soils and tundra vegetation. Borings or trenches would then be installed at the designated sites to determine the type and configuration of the gravel deposit.

5. *Site Restoration.*
All disturbed areas would be backfilled, scarified if necessary, and recontoured to blend with surrounding topography. Salvaged topsoil would then be spread evenly over the surface and the access route permanently closed and abandoned. Vegetation transplants may be used to close the access and visually screen the extraction site if needed.

6. *Monitoring.*
Site monitoring would take place according to the plan in the monitoring program described in the following section on mitigation and monitoring.

MITIGATION AND MONITORING ASSUMED FOR ALL ALTERNATIVES

The NPS would use the following measures in all alternatives to mitigate and monitor environmental impacts of the actions. Additional measures may be used for individual alternatives.

- Topsoil and overburden would be stockpiled adjacent to or close to extraction areas and used to reclaim used parts of borrow sites.
- Sites would be designed so that site restoration of the extraction area would blend in with the surrounding terrain to the maximum extent possible, and return natural functions and processes to the sites.
- Mirror channels in river floodplains would be reclaimed by natural water flows and unrecognizable within 5 years of extraction.
- Silt screens and other devices would be used to control sediment input into streams, rivers and other water bodies to protect water quality and aquatic habitat.
- Dust palliatives would be applied to the park road to reduce the rate of surface material loss, especially fines, which would reduce maintenance requirements.
- Screening and crushing would be conducted, to the extent possible, during shoulder seasons to minimize noise impacts on park visitors and wildlife.

Monitoring

Monitoring of conditions and responses associated with extraction, storage, and testing activities are planned as an integral component of the extraction and restoration process. A few key variables should be monitored during and after extraction, storage, and testing operations to ensure that actual conditions and responses are in line with those predicted. If the project is not progressing as predicted, alternative management actions could be applied, as needed.

Three types of monitoring are proposed:
1) Operational Monitoring will be useful to control extraction/restoration activities and to apply adaptive management to minimize resource damage from extraction activities,
2) Sediment Monitoring will provide a baseline of sediment conditions and early warning of excessive sediment release and,
3) Project Documentation will establish long term resource (hydrologic, geomorphic and vegetative) response to extraction activities and will be of interest to persons designing future similar projects or for review of this project.

1) Operational Monitoring (Project Management) will consist of pre-construction and routine site inspections by NPS resource specialists during implementation to assure that extraction activities are being performed in accordance with the project plan and that no unforeseen resource protection measures need be applied. The NPS Project Manager must approve deviations from the project plan *before* implementation. The NPS Project Manager will also be the primary point of contact for on-site public information.

2) Sediment Monitoring (where appropriate) will consist of collecting baseline data before the initiation of extraction activities and the evaluation of sediment related conditions that could be used to trigger additional management actions/mitigation. Turbidity should be measured just downstream of the site before, during, and after extraction. Should the results of this monitoring show persistent elevated turbidity, actions can be taken to stabilize or otherwise control the sediment.

3) Project Documentation may be accomplished through repeat photography. Photo points would be identified and a series of photographs taken before, during, and after extraction activity to show how geomorphology and vegetation responds through time. Level surveys across, above, and below extraction zones in river floodplains would be obtained annually to assess effects of extraction on natural river processes upstream and downstream of the extraction zone. Park resource specialists may wish to establish vegetation plots to track the progress of vegetative regeneration.

Mitigation and Reclamation Sites

Several small to medium-sized former extraction sites and the Downtown Kantishna site, a large area disturbed by historic placer mining, would be available for reclamation to mitigate the visual and ecological impacts of expanding existing or developing new extraction sites. The NPS could restore a total of about 65 previously disturbed acres by contouring (including using project reject material), scarifying, and revegetating the sites with appropriate plant materials. The sites to be restored are listed below, starting from the park entrance area and progressing toward Kantishna.

George Parks Highway Pit MP 234
About 1 acre at the back (north) side of this pit area where it drains into lower lying terrain could be restored. Much of this site is used for equipment storage and as a shooting range for law enforcement and wildlife management personnel.

Mile 4 Pit
About 1 acre could be restored here, where NPS had done some drainage and restoration work here in the late to mid 1990s. Additional work could be done in the improved drainage area.

MP 7 Pit
About 1 to 2 acres could be restored at the western end and backslope of this pit area. The area is used for equipment and supply storage and surplus equipment sales.

Soapberry Turnout
Up to 0.5 acre could be restored near the old vehicle pullout area.

Toklat Alluvial
Reclamation of this pit will probably be included as part of the construction of the Toklat Rest Stop. The specific area to be reclaimed depends on the final location of the Toklat Rest Stop.

Mile 57 Pit (Carwile Pit)
About 20,000 square feet or just under 0.5 acre could be restored at this location.

Stony/Rainy Bench
Up to 4 acres of the access route and extraction area could be restored.

73-Mile Pit
This site would be reclaimed as a scenic pullout with a vegetated island, to help shield it from the road, where buses could park and let visitors disembark to enjoy the view of the Alaska Range and Muldrow Glacier.

Moose Creek Pit, MP 74.8
This pit has been reclaimed to the size NPS desires. The material stockpiles have been leveled and largely contoured, but fill material is needed on the northern edge of the site to make it blend in with the surrounding terrain.

Joe's Pit, MP 76.8
This 3,000-sq.-ft. (0.07 acre) pit about 40 feet on the north side of the park road could be reclaimed, and the Moose Creek and Hideout pits in either direction could be used for materials storage and equipment turnaround because material stored at this pit is visible from the park road.

Boundary Pit, MP 87.6
The southern part of this site would be retained as a parking area for lodge vehicles to disembark guests to visit the Wonder Lake area. The backslopes and pit floor of this parking area would be landscaped. About 1 acre of the northern part of the Boundary pit area and access road would be fully restored.

North Face Corner, MP 89
Slopes above this extraction site would be restored in summer 2003, and as soon as practicable thereafter the extraction area floor would be converted into a bus turnaround and visitor rest stop.

Downtown Kantishna
A large area, perhaps 55 acres in size, would be restored after extraction and processing of excess material and contouring of this floodplain site. This would occur near the end of the 10-year cycle.

ALTERNATIVES EVALUATED IN DETAIL

The five GAP alternatives that are evaluated in detail in this EA are described in full below. For each alternative, there is a general discussion of the objectives for the alternative, the source sites included, the volumes of material to be obtained from in-park and external sources and the use of the material obtained from the sites. The general discussion is followed by a discussion of characteristics for the respective material sites that are specific to that alternative. The description of each alternative and site references the total available volume for each alternative and the maximum amount of material available from each site. The cost analysis documented in Appendix B indicates the volumes that would likely be obtained from each site by alternative over the 10-year planning period, based on expected material production and transport costs.

Alternative 1 - No Action

Objectives
This alternative would continue the present course of gravel extraction, processing, and reclamation as described in the approved 1992 Borrow Use Management Plan and the 1999 finding of no significant impact (FONSI) for the EA for Gravel Acquisition at North Face Corner.

Three widely distributed source sites are identified in these plans to maintain and repair the Denali Park Road.

Overview of Material Sources and Uses

The material source sites inside the park would be the Teklanika Pit at Milepost (MP) 27.2 of the Denali Park Road, the Toklat River Bar extraction area downstream of MP 53.4, and the North Face Corner at MP 89 (see Map 2.1). External material sources would also be used, particularly for new construction projects along the park road. Material from the Teklanika Pit could be used for small projects, such as trail surfacing and road shoulder repairs, along road segment 1. Material from both external sources and the Teklanika Pit would be used on road segments 1 through 3 (Park Entrance to Igloo Creek Canyon). A nearly limitless supply of gravel could be procured from external sources along the George Parks Highway. The cost analysis (see Appendix B) indicates that approximately 221,000 cy of material (or up to about 240,000 cy with the contingency factor included) would likely be obtained from external sources over the next 10 years under Alternative 1. The Teklanika Pit would be expected to supply about 35,000 cy over the next 10 years. The Toklat River site would be authorized and expected to supply about 7,500 cy/yr or about 75,000 cy of material over the next 10 years. The North Face Corner site would be authorized to supply up to an additional 10,000 cy after the 2002 summer season. The total estimated volumes to be supplied from in-park sources for Denali Park Road maintenance would be about 120,000 to 130,000 cy (with the contingency allowance) over the next 10 years. All mineral materials needed for other than park road maintenance would need to come from external sources. Deviations or limitations in this alternative from the source site descriptions presented above are provided below

Alternative Details for Source Sites

Teklanika Pit

The currently authorized material borrow plan for the park (NPS 1992) authorized the Teklanika Pit to be doubled in size with a life expectancy for 30 years (or until 2022.) Less than half of this remaining volume would be authorized in the next 10 years (2003 to 2012), or about 35,000 cy for an annual average production of about 3,500 cy/yr. The new extraction area dimensions would be a maximum of about 160 feet long by 200 feet wide (32,000 ft2) with a deposit thickness of at about 30 feet. About 0.75 acres of low, open and closed birch shrub vegetation would be removed to develop the site. Averaging about one foot thick, the resulting overburden over the next 10 years would be about 3,500 cy. A vegetative buffer of 15 to 25-foot tall white spruce would be maintained to screen the expanded Teklanika Pit from visitors traveling on the park road. Pit walls would be graded to a 2:1 backslope and covered with stockpiled organic overburden for reclamation. The methods for extraction, processing, stockpiling, material use, and reclamation at this site would proceed as described in the previous section describing Teklanika Pit and in Appendix C.

Toklat River Floodplain

The park's approved borrow use management plan (NPS 1992) authorized the use of the Toklat River floodplain extraction area. The site has an unlimited life expectancy to produce mineral material at an average of 7,500 cy/yr, or 75,000 cy over the next 10 years. This estimate is less than 5% of the annual bed-load transport estimate for the Toklat River at over 200,000 cy/yr. The extraction area is within an exclusion from wilderness designation and the mirror channel sites vary annually, depending on river flow and channel characteristics.

The extraction design and parameters would be similar to the site overview provided above, except the volume of streambed material removed from mirror channels would be limited to no

more than 7,500 cy per year on average. No more than three mirror channels would be excavated each season. All other methods of extraction, processing, storage, use, and reclamation would be as described above and in Appendix C.

North Face Corner
This site at Mile 89 of the Denali Park Road was authorized in 1999 for up to 40,000 cy of material from a bank cut (NPS 1999.) About 30,000 cy have already been removed, leaving up to 10,000 cy as available pit-run. The FONSI for this source site stated, however, the NPS would *try* to complete extraction by the end of 2001 and begin reclamation in summer of 2002. The NPS plans to extract no more than 10,000 cy to lay back the pit walls to at least a 2:1 backslope for visitor safety and to enable the stockpiled overburden and waste material to be spread across the pit faces to facilitate revegetation. The newly leveled area from the extraction would be developed into a visitor rest stop and bus stop shelter for the Kantishna area (NPS 1999.)

Alternative 2 – Maximum Flexibility/Short Hauls

Objectives
The primary objective of this alternative would be to authorize the extraction and use of the maximum number of source sites in the park to provide the most flexibility and shortest haul distances. This alternative would enable the NPS and its contractors to target source sites nearest those areas needing mineral materials, thereby reducing hauling costs and potential damage to the park road from the passage of heavy equipment. All source sites within the park could be used for road repair and rehabilitation and any new park construction projects. This alternative would easily meet the estimated 10-year material needs for park projects.

Overview of Material Sources and Uses
This alternative would authorize the use of 9 material source sites within the park. These would be Teklanika Pit at MP 27.2, East Fork River at MP 43, Toklat River at MP 53.4, Beaver Pond at MP 70, Boundary at MP 88, North Face Corner at MP 89, Camp Ridge at MP 90, Downtown Kantishna at MP 91 and Kantishna Airstrip at MP 93 (Map 2.2). Consistent with the direction the Front Country Plan that previously disturbed sites should be developed first, gravel would be removed from the Downtown Kantishna site before any other west-end sites were developed. External material sources would also be used, particularly for construction projects along the park road between segments 1-3. Material from external source sites only would be used for park road maintenance or construction projects along road segment 1 (entrance area to the Savage River Bridge). Material from both external sources and Teklanika Pit would be used on road segments 2 and 3 (Savage River Bridge to Igloo Creek Canyon.) A nearly limitless supply of gravel could be procured from external sources along the George Parks Highway, but the cost analysis for this alternative indicates about 12,500 cy of material would be acquired from external sources over the next 10 years. Under this alternative, the total potential amount of material available for Denali Park Road maintenance and park construction projects would be more than enough to meet material needs over the next 10 years, but the total amount available would not need to be produced. Estimates and procedures to produce mineral materials at the various source sites in this alternative are provided below.

Alternative Details for Source Sites

Teklanika Pit
The Teklanika Pit would be authorized to supply up to 75,000 cy over the next 10 years. The cost analysis indicates that the projected volume in this scenario would be about 64,000 cy. As with all

of the alternatives, pit-run and screened material from this site would be reserved largely for road surfacing material on road segments 2-5.

East Fork River
The East Fork River could supply up to 5,400 cy/yr or 54,000 cy in 10 years. This site would likely be reserved for use during a slope failure along Polychrome Pass, particularly MP 45, and for spring road opening needs between Igloo and Polychrome Pass (MP 34 to MP 50.) The generally coarse-grained material would also be used for ditches, gabions, sub-grade, and other large materials size applications on the eastern end of the gravel road. Based on the cost analysis, the expected 10-year volume obtained from the East Fork site would be about 51,000 cy.

Toklat River
The Toklat River site would be authorized and expected to supply about 11,100 cy/yr or about 111,000 cy of material over the next 10 years. This site would be a primary source of material for all park projects along road segments 4-7.

Beaver Pond
Though the Beaver Pond site could produce up to 70,000 cy, this alternative would likely result in production of about 20,000 cy from Beaver Pond over the next 10 years, based on the cost analysis. The NPS prefers to conserve this strategically located site for many more decades. Gravel from Beaver Pond would be needed for road surface maintenance on segments 6, 7, and 8, especially a planned road repair project between Miles 70 to 72.

Boundary
This site could produce a maximum of 39,000 cy of material, but under this alternative it is likely that no more than 11,000 cy would be used. This would enable the NPS to produce and stockpile gravel in this strategic location for road material in segment 8, while minimizing visual and noise impacts in the Wonder Lake area. This would also leave some reserve material in this location for future options.

North Face Corner
The slopes of this site would be reclaimed in summer 2003, but the extraction area floor would be used as a processing and stockpile area for material produced from the nearby Camp Ridge site until the extraction area at Camp Ridge is enlarged enough for processing and stockpiling. Once the Camp Ridge area is sufficiently large to handle all processing and storage needs for that source, the North Face Corner site would be converted into a bus turnaround and visitor rest stop.

Camp Ridge
This site could produce up to 72,000 cy over the next 10 years, but the cost analysis indicates that likely no more than 3,000 cy of mineral material would be needed from this location in that period. The remaining volume of mineral material at this site could be used for several decades.

Downtown Kantishna
Material from Downtown Kantishna could be produced as a by-product of site reclamation. The NPS would recover mineral material while in the process of smoothing contours on the former mining claims to fill pits and remove piled up mining tailings. Depending on final designs to increase stream channel sinuosity to improve fish habitat, the NPS would recover up to 59,000 cy of gravel material. Limitations and delays for extraction at this site would depend on the amount of fine material available to make the material useful for roadwork and the availability of a portable bridge capable of safely supporting heavy equipment. The material at this site would need to be screened and crushed to provide suitable material for roadwork and construction

projects. Once the excess material is extracted and removed and the site re-contoured, the area would be reclaimed and the bridge could be removed.

Kantishna Airstrip
This site would be held in reserve to address annual maintenance and projected reconstruction of the Kantishna Airstrip and the last 1.5 miles of the Denali Park Road (MP 91.5-93). An estimated 9,000 cy would be obtained from the site over the next 10 years, although this site could easily produce a larger volume. Maintenance of a small extraction site at this location would provide a strategic material location at the distal end of the Denali Park Road.

Alternative 3 – Minimum Visual Intrusion/Long Hauls

Objectives
The primary objective of this alternative would be to minimize the number of gravel extraction sites and their visual intrusions on park resources and visitor experience. This alternative would be the most restrictive to the NPS in terms of future options and choices. Authorized source sites within the park could be used for road repair and rehabilitation and any new park construction projects. With the use of outside source sites, this alternative would easily meet the estimated 10-year mineral material needs for park projects.

Overview of Material Sources and Uses
This alternative would authorize the use of 3 material source sites within the park. These would be Teklanika Pit (MP 27.2), Toklat River (MP 53.4), and the Moose Creek Terrace (MP 89). External material sources would also be used, particularly for construction projects along the park road between segments 1-3. Only material from external sources would be used for park road maintenance or construction projects along road segments 1-3 (entrance area to Sable Pass). Material from both external sources and Toklat Pit would be used on road segment 4 (Sable Pass to Polychrome Pass.) Teklanika Pit would be used primarily to stockpile and further process outside source material and for minor amounts of road surfacing material in emergencies. A nearly limitless supply of gravel could be procured from outside sources along the George Parks Highway, and this alternative calls for maximizing the use of outside sources based on economics and environmental impacts. The cost analysis indicates that up to 121,000 cy of material (excluding the contingency factor) from external sources would likely be used over the next 10 years. Estimates and procedures to produce mineral materials at the various source sites in this alternative are provided below. Under this alternative the North Face Corner site would be reclaimed and a vehicle turnaround and rest stop would be constructed on the former roadbed and extraction area, as described in the EA for the North Face Corner Gravel Extraction (NPS 1999c).

Alternative Details for Source Sites

Teklanika Pit
The Teklanika Pit would be used primarily to stockpile large amounts of material from outside sources and to deposit reject material for future restoration. Valuable road-surface quality material at this site would be conserved for many decades ahead and would be tapped at this location only for emergencies (less than 10,000 cy/10 years). Northwestern and southeastern pit walls would be restored to reduce visual impacts. Small amounts of material could be taken from the northeastern pit wall only.

Toklat River
The Toklat River site would be authorized to supply about 11,100 cy/yr or about 111,000 cy of material over the next 10 years. The cost analysis indicates that essentially the entire authorized volume would likely be used over the 10-year planning period. This site would be a primary source of material for all park projects along road segments 4-7.

Moose Creek Terrace
This huge material source site could easily supply all mineral material resource needs at the western end of the park road. About 5,000 cy of material would be needed to upgrade the existing mile-long access corridor from the Denali Park Road at Mile 89 to the Moose Creek Terrace deposit. Given the urgent needs for mineral materials at the western end of the park road, this site would be developed right away under this alternative. The Moose Creek Terrace site would need to supply up to 105,000 cy to meet the estimated balance of NPS gravel needs estimates over the next 10 years. Given the size of this deposit, this source would likely last for several decades. To mitigate impacts to park visitors hiking in the area, the NPS would construct a new trail along the banks of Moose Creek skirting the extraction area, or the NPS would construct a parking area and trail head at the upstream side of the Moose Creek Terrace site. The site would otherwise be developed as described above and in Appendix C.

Alternative 4 – Phased Development of Moderate Number of Sites *(NPS Preferred)*

Objectives
The primary objective of this alternative would be to authorize the testing, extraction and stockpiling at a moderate number of source sites in the park to provide for flexibility and reduce haul distances. The North Face Corner site would be restored as soon as practicable and other sites along the park road would be restored as described in the section on mitigation measures. At the western end of the park road, the first phase would entail developing access to and extraction at Beaver Pond and Downtown Kantishna, with a goal of reclaiming the former mining claims in Downtown Kantishna. The second phase would involve the development of the Moose Creek Terrace site after other appropriate sites near the western end of the park were exhausted for projects at the far western end of the park road. Potential new or expanded source sites would be tested and delineated to determine more accurately the deposit characteristics and sizes. All active source sites within the park could be used for road repair and rehabilitation and any new construction projects. This alternative would easily meet the estimated 10-year needs for park projects.

Overview of Material Sources and Uses
This alternative would authorize the use of up to 5 material source sites within the park at any one time, with phased activity at 6 sites overall. These would be Teklanika Pit (MP 27.2), East Fork River (MP 43), Toklat River (MP 53.4), Beaver Pond (MP 70), Moose Creek Terrace (MP 89), and Downtown Kantishna (MP 91). Consistent with the direction in the Frontcountry Plan, the development and use of the Moose Creek site would not be initiated until material at Downtown Kantishna is appropriately exhausted for projects along road segments 8 and 9. External material sources would also be used, particularly by construction projects along park road segments 1-3. Only material from external source sites would be used for park road maintenance or construction projects along road segment 1 (entrance area to the Savage River Bridge). Material from both external sources and Teklanika Pit would be used on road segments 2 and 3 (Savage River Bridge to Igloo Creek Canyon.) A nearly limitless supply of gravel could be procured from external sources along the George Parks Highway, but this alternative would likely use about 12,500 cy of

material from external sources over the next 10 years, based on results of the economic analysis of external and in-park materials. Estimates and procedures to produce mineral materials at the various source sites in this alternative are provided below.

Alternative Details for Source Sites

Teklanika Pit
The Teklanika Pit would be expected to supply up to 73,500 cy over the next 10 years. As with all of the alternatives, pit-run and screened material from this site would be reserved largely for road surfacing material on road segments 2-4.

East Fork River
The East Fork River could physically sustain extraction at an average rate of 5,400 cy/yr or 54,000 cy in 10 years, but part of the identified extraction area lies within the designated Denali Wilderness and would not be authorized for mechanized extraction of gravel. The cost analysis indicates that approximately 43,000 cy would likely be obtained from the East Fork site over 10 years. This site would be likely be reserved for use during a slope failure along Polychrome Pass, particularly MP 45, and for spring road opening needs between Igloo and Polychrome Pass (MP 34 to MP 50.) The generally coarse-grained material would also be used for ditches, gabions, subgrade, and other large materials size applications on the eastern end of the gravel road.

Toklat River
The Toklat River site would be authorized to supply about 11,100 cy/yr or about 111,000 cy of material over the next 10 years. The cost analysis indicates that approximately 102,000 cy would likely be obtained from this site. This site would be a primary source of material for all park projects along road segments 2-7.

Beaver Pond
Though the Beaver Pond site could produce up to 70,000 cy, this alternative would likely result in removal of approximately 20,000 cy from Beaver Pond over the next 10 years to conserve this strategically located site for many more decades. Gravel from Beaver Pond would be needed for road surface maintenance on segments 6, 7, 8, and the road repair project between Miles 70 and 72.

Moose Creek Terrace
This site would produce material in Phase 2 of the 10-year plan for park maintenance and road repair projects near the western end of the park road after the Downtown Kantishna site is exhausted. Up to 99,000 cy of material would be authorized from this site in the next 10 years, although the cost analysis shows about 32,000 cy would likely be used. Other aspects of development for this site would be as described previously for Alternative 3.

Downtown Kantishna
Material from Downtown Kantishna would be produced as a by-product of site reclamation. The NPS would remove up to 59,000 cy of gravel material while in the process of smoothing contours on the former mining claims to fill pits and remove mining tailings. Other aspects of site development and material use for this site would be as described previously for Alternative 2.