Ambler Mining District Access

Corridor Development Memorandum

September 2011

AMBLER MINING DISTRICT ACCESS

CORRIDOR DEVELOPMENT MEMORANDUM

AKSAS 63812

Prepared for:

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1.0 INTRODUCTION

1.1 Project Overview and Purpose

The Ambler Mining District Access project proposes to identify, design, and construct a transportation corridor from the Ambler mineral belt to either a port location on the west coast of Alaska or the surface transportation system in the Alaska Interior. The corridor is intended to provide surface transportation access to state lands and facilitate exploration and development of mineral resources along the Ambler mineral belt.

The South Flank of the Brooks Range contains extensive mineral resources. Limited exploration efforts since the 1950s have identified significant resources of copper and other base metals (Hawley and Vant, 2009). Exploration and development of these deposits has been economically and logistically curtailed by the lack of transportation infrastructure.

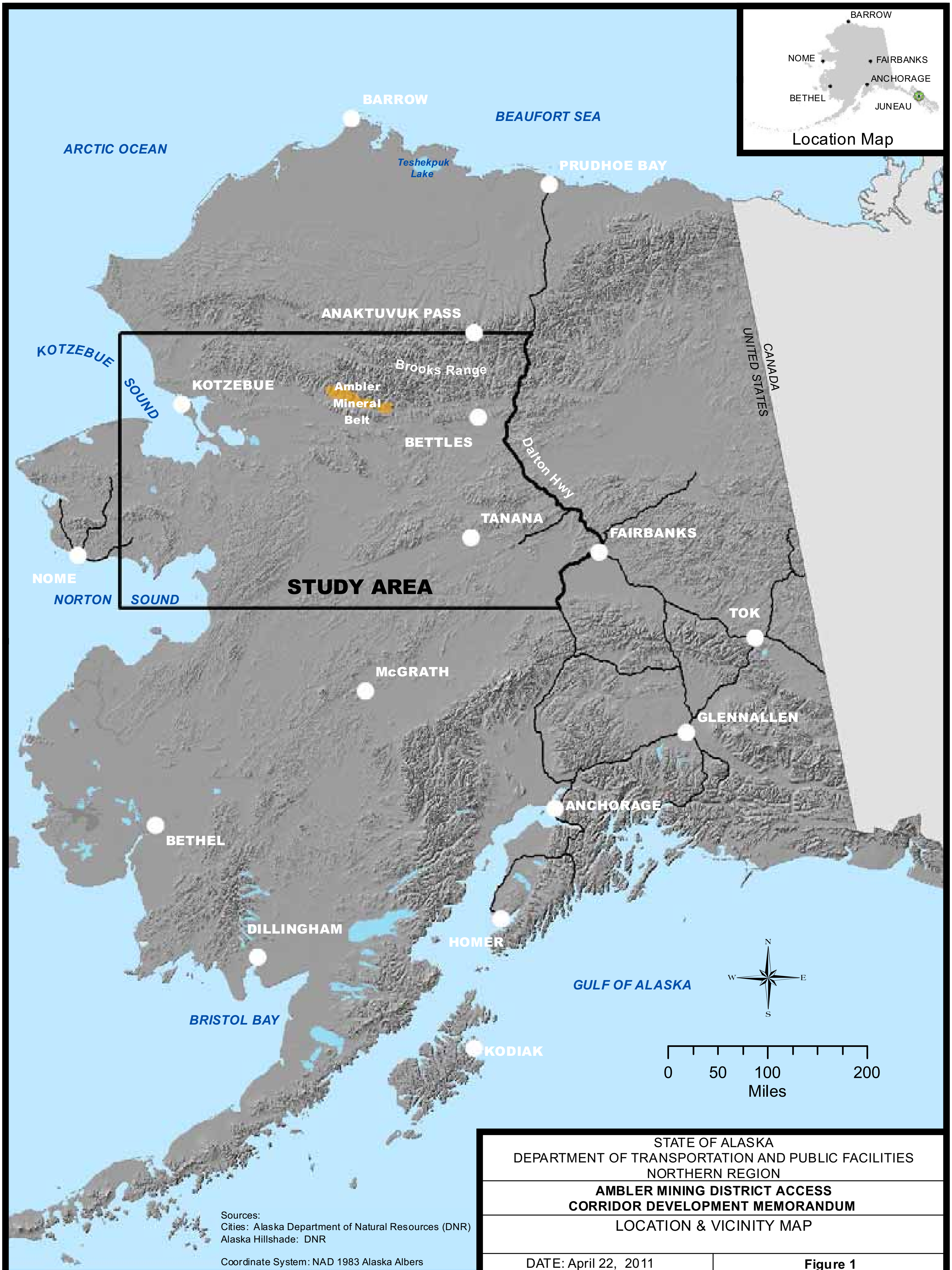
1.2 Project Study Area

The project study area extends from the Ambler mineral belt south to Nenana and from the Dalton Highway to the west coast (see Figure 1). Much of the study area is located outside of an organized borough. The western portion of the study area is located in the Northwest Arctic Borough (NWAB) (see Figure 2).

1.3 Objectives

The objectives of the corridor development process for this project are to:

- Establish a safe and reliable transportation system that accesses available resources along the Ambler mineral belt (see Figure 3);
- Provide feasible corridors that increase economic development opportunities while recognizing subsistence, cultural sensitivity, and stakeholder concerns, and minimizing impacts to environmental resources;
- Recommend logical termini at port locations to the west or existing road or rail systems to the east; and
- Maximize access to state lands for material sites and future development.



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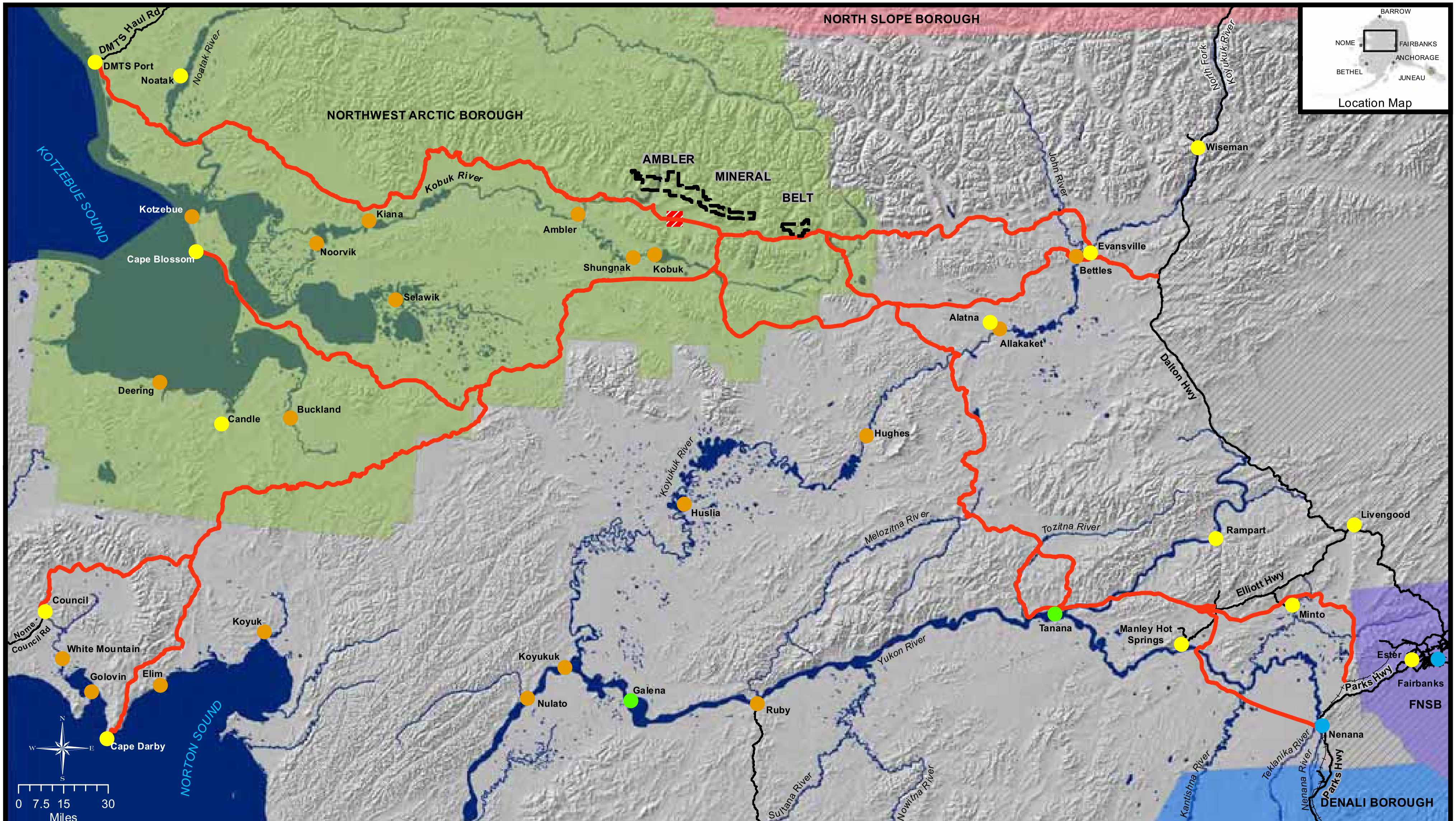

Railroad	Outside of Project Study Area	Place Names	DENALI BOROUGH
Existing Roads	Ambler Mineral Belt	First Class City	FAIRBANKS NORTH STAR BOROUGH (FNSB)
Water	Preliminary Corridors	Home Rule City	NORTH SLOPE BOROUGH
	Proposed Staging Area	Second Class City	NORTHWEST ARCTIC BOROUGH

Sources:
Borough Boundaries: DNR
Community Classes: DNR

Coordinate System: NAD 1983 Alaska Albers

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AMBLER MINING DISTRICT ACCESS CORRIDOR DEVELOPMENT MEMORANDUM

COMMUNITIES AND BOROUGHS

DATE: April 22, 2011 | **Figure 2**

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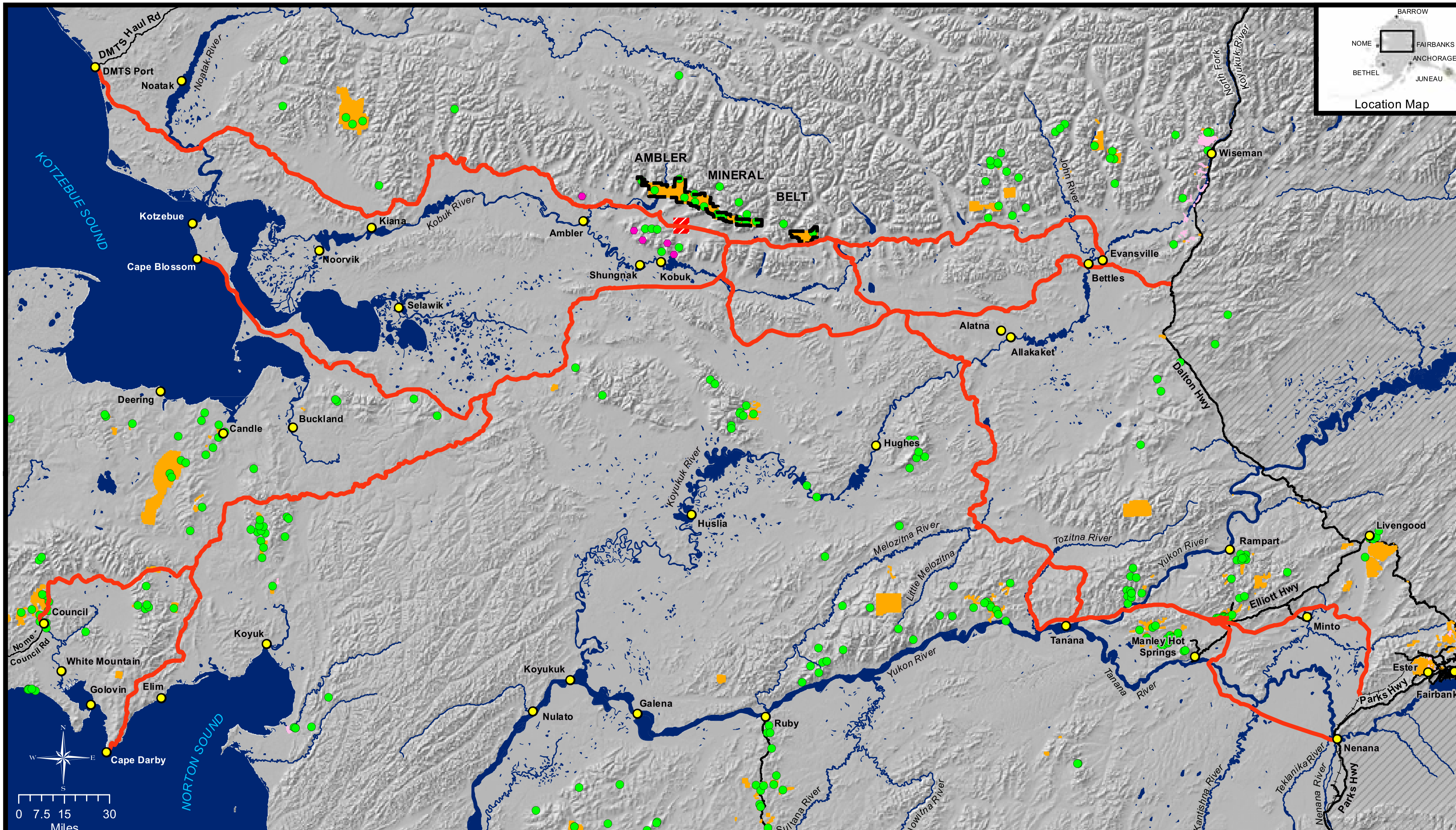

- Communities and Place Names
- Railroad
- Existing Roads
- Water
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- Ambler Mineral Belt
- Preliminary Corridors
- Proposed Staging Area
- Mineral Occurrences
- Naturally Occuring Asbestos
- Federal Mining Claims
- State Mining Claims

Sources:
Federal Mining Claims: BLM
State Mining Claims:DNR
Mineral Occurrence: Report on Minerals - C.C. Hawley & M.K. Vant, February 2009

Coordinate System: NAD 1983 Alaska Albers

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MINING CLAIMS AND
MINERAL OCCURRENCES

DATE: April 22, 2011

Figure 3

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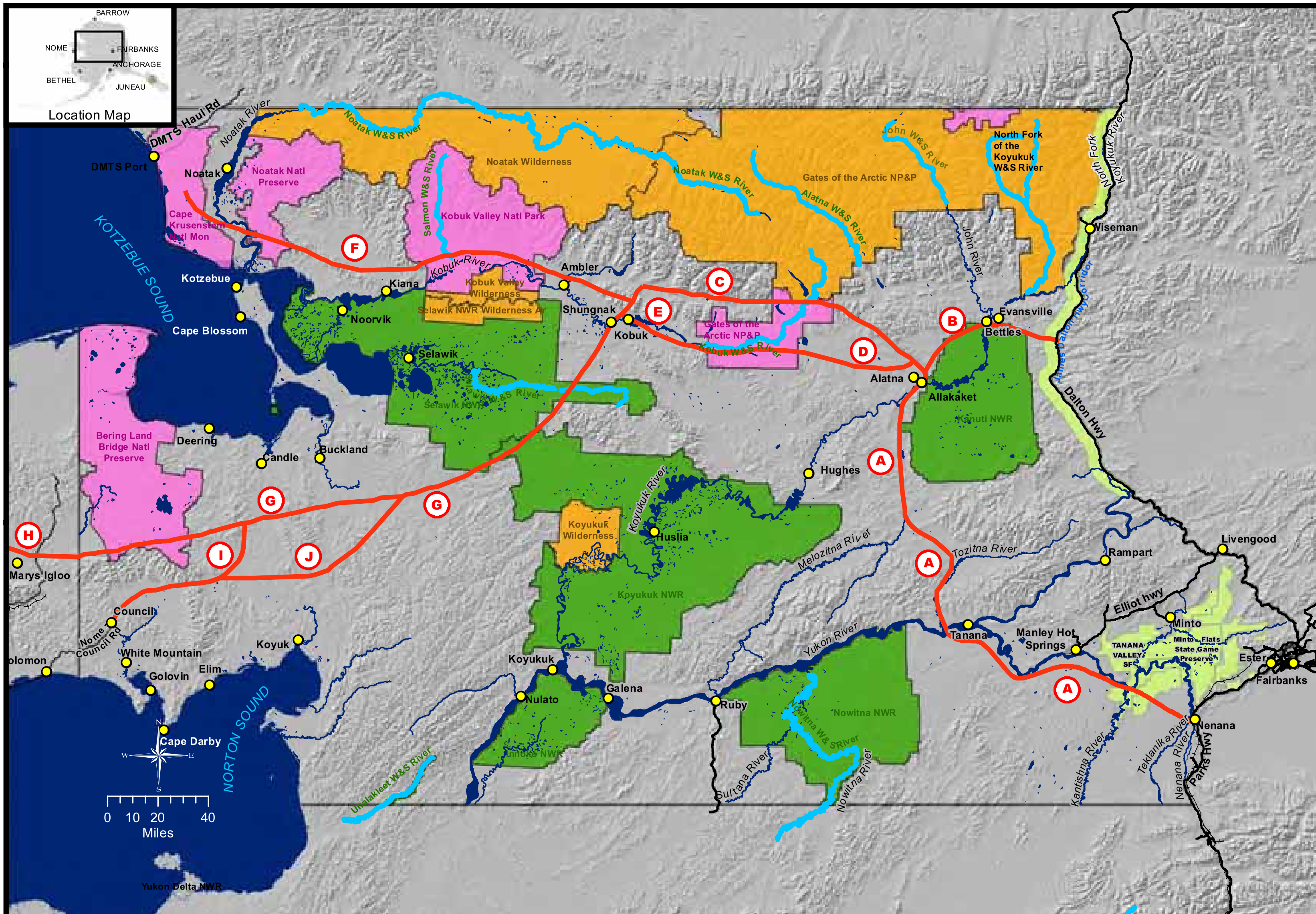
2.0 AMBLER MINING DISTRICT ACCESS AND HISTORICAL EVALUATIONS

Access for exploration and development in the Ambler mineral belt is currently dependent upon air and river travel. The closest road network is the Dalton Highway, approximately 200 miles to the east. Deep-water access is limited along the northwest coast and goods must be lightered off barges to shore in communities like Nome and Kotzebue, and then transported on river barges to the upper Kobuk Valley. Although barge access to the upper Kobuk Valley is typically available in July and August, water conditions are often shallow. Residents report that during low water years, barge access may not be possible even during the high flow months of July and August. When accessible, shallow-draft barges must be used which are not capable of transporting the volume of heavy equipment and other materials needed for resource exploration and production. Limited payload capacity, combined with the short barge season and lack of reliable access from marginal river conditions, essentially makes access for exploration and development dependent upon air travel.

Known mineral resources in the Ambler mineral belt have resulted in numerous studies of potential access over the last 45 years. Figure 4 illustrates the known studies overlying the project study area and a bibliography of these studies is included in Appendix A.

Past studies have evaluated potential overland connections to the Dalton Highway through Bettles and to the Parks Highway through Tanana and Nenana; as well as western overland connections to Nome, Teller, Kotzebue, and the Delong Mountain Transportation System (DMTS). These previous studies were reviewed as part of the corridor development process.



CORRIDORS FROM PAST STUDIES				
	YEAR	AGENCY	MODE	PURPOSE
A	**NENANA-ALATNA**			
	1968	State of Alaska	Rail/Road	Mineral development
	1972	USDOT & FHWA	Rail	Engineering & construction feasibility
	1973	State of Alaska	Multi-use	Extend transportation system
	1973	USBM	Rail/Road	Mineral industry
	1977	USDOI	Rail	Mineral transport
	1981	DOT&PF	Rail	Resource development
	1983	BCMC	Rail	Mineral transport
	1992	AIDEA	Rail	Mineral development, link resources to ports
	1992	DOT&PF	Rail	Resource development
	1993	DNR	Rail/Road	Mineral development, community access
	2001	DOT&PF	Rail/Road	Resource development, community access
	2004	DOT&PF	Rail/Road	Mineral development, link resources to ports
	2005	NovaGold, Inc.	Rail/Road	Mineral development, link resources to ports
B	**DALTON-ALATNA**			
	1972	USDOT & FHWA	Road	Engineering & construction feasibility
	1973	State of Alaska	Multi-use	Extend transportation system
	1973	USBM	Road	Mineral industry
	1978	Kennecott	Road	Mineral transport
	1981	DOT&PF	Road	Resource development
	1983	BCMC	Road	Mineral transport
	1985	Kennecott	Road	Mineral transport
	1993	DNR	Rail/Road	Mineral development, community access
	2001	DOT&PF	Rail/Road	Mineral development, link resources to ports
	2004	DOT&PF	Rail/Road	Mineral development, link resources to ports
	2005	NovaGold, Inc.	Rail/Road	Mineral development, link resources to ports
C	**ALATNA-AMBLER DISTRICT**			
	1973	State of Alaska	Multi-use	Extend transportation system
	1978	Kennecott	Road	Mineral transport
	1981	DOT&PF	Rail/Road	Resource development
	1983	BCMC	Rail/Road	Mineral transport
	1985	Kennecott	Road	Mineral transport
	1992	AIDEA	Rail	Mineral development, link resources to ports
	1992	DOT&PF	Rail	Resource development
	1993	DNR	Rail/Road	Mineral development, community access
	2005	NovaGold, Inc.	Rail/Road	Mineral development, link resources to ports
D	**ALATNA-KOBUK**			
	1968	State of Alaska	Rail/Road	Mineral development
	1972	USDOT & FHWA	Rail/Road	Engineering & construction feasibility
	1973	State of Alaska	Multi-use	Extend transportation system
	1973	USBM	Rail/Road	Mineral industry
	1977	USDOI	Rail	Mineral transport
	2001	DOT&PF	Rail/Road	Mineral development, link resources to ports
	2004	DOT&PF	Rail/Road	Mineral development, link resources to ports
	2005	NovaGold, Inc.	Rail/Road	Mineral development, link resources to ports
E	**AMBLER DISTRICT-KOBUK**			
	1973	State of Alaska	Multi-use	Extend transportation system
	1978	Kennecott	Road	Mineral transport
F	**AMBLER DISTRICT-NW ALASKA**			
	1973	State of Alaska	Multi-use	Extend transportation system
	1973	USBM	Rail	Mineral industry
	1977	USDOI	Rail	Mineral transport
	1981	DOT&PF	Rail/Road	Resource development
	1983	BCMC	Rail/Road	Mineral transport
	1993	DNR	Multi-use	Connect other access links, spurs
	2001	DOT&PF	Rail/Road	Resource development, community access
	2004	DOT&PF	Rail/Road	Mineral development, link resources to ports
	2005	NovaGold, Inc.	Rail/Road	Mineral development, link resources to ports
G	**KOBUK-SEWARD PENINSULA**			
	1973	State of Alaska	Multi-use	Extend transportation system
	1973	USBM	Rail/Road	Mineral industry
	1973	USDOT & FHWA	Road	Mineral development, increase standard of living
	1978	Kennecott	Road	Mineral transport
	1981	DOT&PF	Rail/Road	Resource development
	1983	BCMC	Rail/Road	Mineral transport
	1992	AIDEA	Rail	Mineral development, link resources to ports
	1993	DNR	Multi-use	Mineral development
	2001	DOT&PF	Rail/Road	Mineral development, link resources to ports
	2004	DOT&PF	Rail/Road	Mineral development, link resources to ports
	2005	NovaGold, Inc.	Rail/Road	Mineral development, link resources to ports
H	**SEWARD PENINSULA-TELLER**			
	1973	USBM	Rail/Road	Mineral industry
	1973	USDOT & FHWA	Road	Mineral development, increase standard of living
	1980	DOT&PF	Road	Design, construction, & economic feasibility
	1981	DOT&PF	Road	Resource development
	1983	BCMC	Road	Mineral transport
I	**SEWARD PENINSULA-COUNCIL**			
	1973	State of Alaska	Multi-use	Extend transportation system
	1973	USDOT & FHWA	Road	Mineral development, increase standard of living
	1980	DOT&PF	Road	Design, construction, & economic feasibility
	1981	DOT&PF	Rail/Road	Resource development
	1983	BCMC	Rail/Road	Mineral transport
	1993	DNR	Multi-use	Mineral development
	2001	DOT&PF	Rail/Road	Mineral development, link resources to ports
	2004	DOT&PF	Rail/Road	Mineral development, link resources to ports
	2005	NovaGold, Inc.	Rail/Road	Mineral development, link resources to ports
J	**SEWARD PENINSULA-162 W LONGITUDE**			
	1973	USDOT & FHWA	Road	Mineral development, increase standard of living
	1978	Kennecott	Road	Mineral transport
	1981	DOT&PF	Rail/Road	Resource development
	1983	BCMC	Rail	Mineral transport
	1992	AIDEA	Rail	Mineral development, link resources to ports

Place Names
Railroad
Water
Existing Roads
Study Area
Corridors from Past Studies
A

Note: Corridors from past studies are approximate in location as the data is from a variety of data sets and data sources.

AIDEA	Alaska Industrial Development and Export Authority
BCMC	Bear Creek Mining Company
DNR	Department of Natural Resources
DOT&PF	Alaska Department of Transportation and Public Facilities
FHWA	Federal Highway Administration
USBM	United States Bureau of Mines
USDOI	United States Department of the Interior
USDOT	United States Department of Transportation

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CORRIDORS FROM PAST STUDIES

DATE: April 22, 2011

Figure 4

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3.0 CORRIDOR DEVELOPMENT PROCESS

3.1 Logical Termini

The first step in developing potential corridors is to identify the logical termini (beginning and endpoint) for the proposed project.

Since the purpose of this project is to provide surface access to the Ambler mineral belt, the beginning terminus of the corridors must be located in this area. The beginning point of the surface access could be a village, airport, or an exploration staging area in close proximity to the Ambler mineral belt. Since this is a state funded project, access to state lands is the highest priority and the majority of the known mineral deposits are located in the Ambler mineral belt on state lands.

The intent of the project is not to connect directly to any one mineral deposit, but to provide access to a point where multiple deposits could be accessed by the transportation system. The terminus in this area was located about midway along the lateral extent of the known deposits in the Ambler mineral belt, at the northern base of the Cosmos Hills just north of Kobuk. This terminus would provide a central transportation access for the many potential exploration and development activities that may occur within the Ambler mineral belt. The same terminus is assumed for all proposed corridors. Since public comment has not indicated a general consensus or endorsement of access to a specific community or airport, a staging area outside the communities near the mineral deposits is proposed as the terminus. Pending public review of the corridors and input from the local villages, the road terminus could be moved to one of the villages or airports, if so desired.

The other termini for possible surface transportation access to the Ambler mineral belt were identified as points where the proposed surface access could connect with existing or planned regional transportation infrastructure. Therefore, proposed ending termini included connections to existing marine, rail or road transportation routes. The state's primary surface transportation rail and road routes are located east of the Ambler mineral belt. Potential corridors to the west from the Ambler mineral belt would provide access to marine transportation options.

The following termini were selected as a result of analyzing potential transportation connections:

Dalton Highway: The Dalton Highway is a primary state transportation route that connects the north slope of Alaska to Fairbanks, and southward to other major Alaskan cities and ports. A corridor that ends at the Dalton Highway would provide road access to air, rail, and highway facilities in Fairbanks. The closest logical connection from the Ambler mineral belt to the Dalton Highway is due east of Evansville.

Alaska Railroad Corridor: The Alaska Railroad provides passenger and freight service between Anchorage and Fairbanks. The existing rail corridor from Anchorage to Fairbanks generally parallels the Parks Highway corridor. A surface transportation corridor from the Ambler mineral belt that connects to the Alaska Railroad corridor would provide access to the main rail line. The closest logical connection from the Ambler mineral belt to the Alaska Railroad is in the vicinity of Nenana.

DMTS Port: The DMTS port is located on the west coast of Alaska on Kotzebue Sound, north of Kotzebue. The port is located within Cape Krusenstern National Monument. The DMTS port was established in 1989 to provide marine access for shipping products from the Red Dog Mine to international markets.

Cape Blossom: Cape Blossom is located on the Baldwin Peninsula facing Kotzebue Sound just south of Kotzebue and is identified in previous studies as a potential deep-water port site.

Cape Darby: Cape Darby is located on Norton Sound southeast of Nome. Cape Darby has been identified in previous studies to have the best deep-water access in the Norton Sound area.

Council: Council is located northeast of the City of Nome and is connected to Nome by the Nome-Council Road, where a deep-water port is proposed.

3.2 Proposed Corridor Widths

Given the limited data available on environmental resources in the study area, it is important to acquire sufficient data to be able to refine the corridors to minimize environmental impacts and maximize use of state lands and areas with good geotechnical characteristics. The recommended corridor width for photogrammetric mapping and/or LiDAR must be wide enough to allow for the optimum corridor to be developed. Corridor width for data collection will vary with the width being wider in flat areas and narrower in steeper areas.

Figures 6 through 25 illustrate the proposed corridor widths, ranging from two miles in areas constrained by mountainous terrain to five miles in flat terrain. A corridor width of five miles is recommended within most conservation system units to provide adequate data to pick the best possible alignment in these areas. The only exception is the Brooks East Corridor through the Gates of the Arctic National Park and Preserve (GANPP) where the corridor is well-defined by the topography of the corridor. Potential large bridge crossing locations have a five mile mapping radius to provide data for the hydrology analysis and optimize each crossing location.

3.3 Potential Corridors

Once the end termini were identified, potential corridors were developed to connect the terminus in the Ambler mineral belt to terminus at the various modal transportation connections. The corridor development process included analysis designed to identify corridors that would reduce construction and maintenances costs, improve the operational efficiency of transportation, and minimize social and environmental impacts. Corridor development began with collecting background geographic information system (GIS) data including:

- Aerial photography
- USGS topographic maps
- Topographic information from the Alaska Digital Elevation Model
- Wetlands from the National Wetlands Inventory
- Lakes and other water bodies
- Rivers, creeks, and other waterways
- Geotechnical conditions
- Permafrost occurrence
- Wilderness areas, national parks, wildlife refuges, and other federally protected lands
- Local communities

Corridors developed in past studies and existing transportation routes (winter trails, tractor trails, etc.) provided insight into the development of the proposed corridors. Segments from previously developed corridors were analyzed with current data to develop corridors that minimized steep slopes, wetlands, and federally protected lands, and maximized use of state lands, areas with better geotechnical conditions, and optimal stream crossings.

Steep areas were avoided where possible to minimize required excavation and fill. Terrain information and USGS topographic maps were used to evaluate topography. Terrain information consisted of a series of data points in a 60-meter grid pattern, each with a latitude, longitude, and elevation parameter. The relative slope of each route was calculated using GIS to identify optimal areas for a road or rail corridor. Obtaining photogrammetric data or LiDAR (light detection and ranging) data is needed to refine the terrain analysis from the very conceptual level possible with this existing data.

The limited available wetland data was used to refine the corridors to minimize wetland effects. Using the applicable GIS information (wetlands, water bodies, waterways, aerial photographs, and USGS maps), corridors were shifted to higher ground in order to bypass lower, wetter ground. Minimizing impacts to wetlands sometimes conflicts with minimizing long hillside benching. These tradeoffs will need to be re-evaluated when better topographic and wetland survey information is available.

River crossing locations were also important in corridor development. River and stream crossings were minimized when possible to reduce structure costs, which comprise a substantial portion of preliminary baseline costs for these corridors. Optimal crossing locations for large rivers were identified using GIS data, USGS maps, and aerial photographs. Crossing locations away from meanders and side channels (which indicates a higher likelihood that braided rivers may migrate) and at narrower parts of the river (shorter spans) were preferred.

Geotechnical considerations for corridor development included permafrost and material sources. Known permafrost areas were avoided where possible to reduce embankment thickness and construction costs. Areas with good potential for borrow sites were preferred to reduce material hauling costs. GIS geotechnical information, permafrost information, and USGS maps were used to determine the presence (or lack) of these conditions.

Finally, federally protected lands and existing communities were avoided where possible. State-owned lands were preferred to reduce land acquisition costs.

Eight potential corridors (3 road, 4 road and rail, and 1 rail) were developed using the GIS data and analysis described above (see Figure 5).

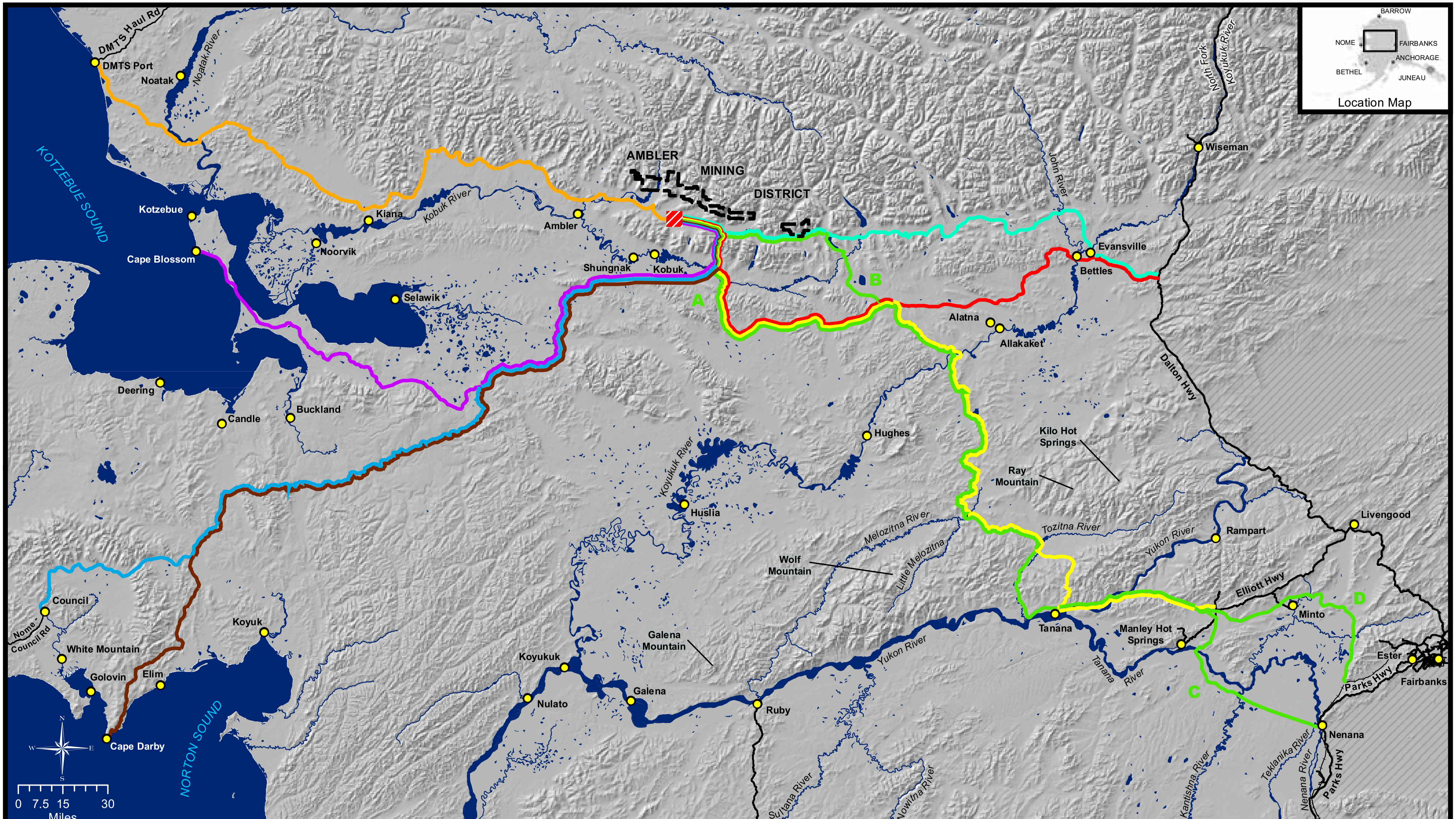
3.4 General Corridor Descriptions

3.4.1 Brooks East Corridor (1 - Road)

This corridor is the shortest option, measuring approximately 216 miles from the Ambler mineral belt to the Dalton Highway (Figures 6 through 8). The corridor leaves the Ambler mineral belt and travels east, south of the Brooks Range and through the Ambler Lowlands, and crosses the Kogoluktuk and Mauneluk River. The corridor keeps to the east and south of the Schwatka Mountains and enters the lower portion of the GANPP running between the Walker and Nutuvukti Lakes and crossing the Kobuk Wild and Scenic River (WSR). The corridor exits the GANPP north of the Helpmejack Hills and continues east crossing the Alatna River, through the Alatna Hills and around Deadman Mountain and crossing the John River. After crossing the John River, the corridor begins to turn south following the Ninemile Creek through the Ninemile Hills where it then follows and existing winter trail heading towards Evansville. The corridor travels around Evansville to the east, heading east on Prospect-Bettles Winter Trail crossing the Koyukuk River and tying into the Dalton Highway at Prospect Creek.

3.4.2 Kanuti Flats Corridor (2 - Road)

This corridor is 241 miles long and also extends from the Ambler mineral belt to the Dalton Highway (Figures 6 through 8). It travels the same corridor as Brooks East Corridor (1) from the Ambler mineral belt to the eastern end of the Ambler Lowlands where it then turns south following the Mauneluk and Pah Rivers. The corridor crosses the Kobuk River and the Arctic Circle, north of the Pah River Flats. It turns east along the southern GANPP boundary. The corridor continues east for almost 40 miles on the south side of the Alatna Hills, north of the Arctic Circle crossing the Alatna River and Alatna Lowlands to Double Point Mountain. From here the corridor begins to head northeast through the Alatna Hills and crosses the Koyukuk River near Bettles. The corridor ties into Brooks East Corridor (1) at the Prospect-Bettles Winter Trail, a few miles southeast of Evansville.



Communities and Place Names	Outside of Project Study Area	1-Brooks East Corridor 216 Miles (Road Only)	3-Elliott Hwy Corridor 365 Miles (Road Only)	7-Selawik Flats Corridor 331 Miles (Road & Rail)
Railroad	Ambler Mineral Belt	2-Kanuti Flats Corridor 241 Miles (Road Only)	4-Parks Hwy RR Corridor 420-450 Miles (Rail Only)	8-Cape Darby Corridor 340 Miles (Road & Rail)
Existing Roads	Proposed Staging Area	5-DMTS Port Corridor 257 Miles (Road & Rail)	6-Cape Blossom Corridor 245 Miles (Road & Rail)	
Water				

Sources:
Commmunities and Place Names: DNR, DOT&PF
Existing Roads: DOT&PF
DMTS Haul Road: NANA
Railroad: DNR

Coordinate System: NAD 1983 Alaska Albers

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PRELIMINARY CORRIDORS

DATE: May 19, 2011 | **Figure 5**

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3.4.3 Elliott Highway Corridor (3 - Road)

This corridor is the longest road corridor at 365 miles long (Figures 10 through 14). It follows the same corridor as Kanuti Flats Corridor (2) from Ambler mineral belt to Siruk Creek, approximately 15 miles east of the GANPP boundary. The Elliott Highway Corridor (3) runs southeast following Siruk Creek across the Arctic Circle. It continues southeast by Lake Mingkoket until it reaches the Koyukuk River. At the Koyukuk River, the corridor heads south along the east edge of Kohokachalla Mountain, and follows the eastern edge of the Mentanontli River until it reaches the western edge of Lake Todatonten. At the southern tip of Lake Todatonten, the corridor picks up the Tanana Allakaket Winter Trail for approximately 10 miles. The corridor then veers away from the trail, avoiding the Slokhenjikh Hills and lowland areas, and runs along the western edge of the Melozitna River. The corridor crosses the Melozitna River approximately five miles south of Tokatjikh Hill and heads southeast towards the Tozitna River. Once across the Tozitna River, the corridor connects into the Tanana Allakaket Winter Trail again and travels south towards Tanana. Just north of Tanana, the corridor turns east and runs along the northern edge of the Yukon River until it crosses the Yukon River north of Sixteenmile Lake. The corridor then continues east to the Elliott Highway near Eureka.

3.4.4 Parks Highway RR Corridor (4 - Rail)

This rail corridor follows the Elliott Highway Corridor (3) from the Ambler mineral belt to the Tozitna River (Figure 9 through 14). At the Tozitna River, the rail corridor follows the river south to the Yukon River, approximately 10 miles west of Tanana. The corridor then heads east and follows the Elliott Highway Corridor (3) to a point approximately 5 miles west of Eureka.

Two options were evaluated for both the northern and southern portions of this rail corridor; therefore, the length of the corridor varies from 420 to 450 miles. On the northern portion of the corridor (Figures 9 and 10), Option A follows the Elliott Highway Corridor (3) to Siruk Creek. Option B follows the Brooks East Corridor (1) from the Ambler mineral belt east to the boundary of GANPP. Option B heads south through GANPP just west of Nutuvuki Lake to Siruk Creek. Although it enters GANPP and crosses the Kobuk WSR, Option B has less steep terrain and is shorter than Option A.

On the southern portion of the corridor (Figures 13 and 14), Option C heads southeast from the Elliott Highway between Baker and Hutlinana Creeks, crossing the Tanana River near Baker Creek. Option C follows the Tanana River to the southeast, crossing the Kantishna River south of Rock Creek. From there, the corridor continues southeast to the existing rail system at Nenana. Option D heads east from the Elliott Highway along a winter trail, crossing the Tolovano River east of Minto. This corridor heads south along another winter trail crossing Tatalina and Chatanika Rivers as it heads toward Minto Lakes and then to the existing rail track at Dunbar. Option D is longer, but crosses the Kantishna River further north, avoiding the Tanana and Teklanika Rivers.

Using each of these options four Parks Highway Railroad Corridors have been developed as listed below:

- Parks Highway Railroad Corridor A - Options B and D
- Parks Highway Railroad Corridor B - Options A and D
- Parks Highway Railroad Corridor C - Options B and C
- Parks Highway Railroad Corridor D - Options A and C

3.4.5 DMTS Port Corridor (5 - Road/Rail)

This northwest corridor extends 257 miles between the Ambler mineral belt and DMTS Port (Figure 15 through 17). From the Ambler mineral belt, the corridor travels west through the Ambler Lowlands along the southern reaches of the Brooks Range, north of the Kobuk River. It crosses the Shungnak and Ambler Rivers as it heads towards Jade Mountains. The corridor enters Kobuk Valley National Park (KVNP) west of the Jade Mountains and crosses several rivers including the Salmon WSR. The corridor exits the KVNP south of the Kallarichuk Hills, approximately seven miles north of the Kobuk River. West of KVNP, the corridor travels between the Squirrel River and the Kiana Hills until it reaches a short (13 mile) crossing of the Noatak National Preserve (NNP) along the Agashashok River. It then enters the National Petroleum Reserve, crosses the Noatak River and runs between Igichuk Hills and Sevisok Slough. Approximately 30 miles from the DMTS Port, the corridor crosses into the Cape

Krusenstern National Monument where it travels northwest through a large wetland area to the DMTS Port.

3.4.6 Cape Blossom Corridor (6 - Road/Rail)

This corridor connects the Ambler mineral belt to Cape Blossom on the Baldwin Peninsula and is 245 miles long (Figure 18 through 20). The corridor heads east then south from the Ambler mineral belt along Mauneluk River. The corridor crosses the Kobuk River and heads west along the Sheklukshuk Range within the Selawik National Wildlife Refuge (NWR) for about 30 miles. The corridor then heads south crossing Rabbit River and east of a large area of wetlands within the refuge. The corridor continues south through the Arctic Circle, crossing the Selawik River near Ingruksukruk Creek until it reaches the Tagagawik River. From the Tagagawik River, the corridor heads west, south of Selawik Lake and north of the Selawik Hills. The corridor then traverses the Baldwin Peninsula north and west to Cape Blossom. Although Cape Blossom is not a developed port, it has been the subject of numerous studies due to the potential for accessing deeper marine waters compared to most other locations on the west coast of Alaska.

3.4.7 Selawik Flats Corridor (7 - Road/Rail)

Selawik Flats Corridor (7) extends 331 miles from the Ambler mineral belt to Council, on the Seward Peninsula (Figures 21 through 25). The corridor follows the Cape Blossom Corridor (7) from the Ambler mineral belt to near the southern boundary of the Selawik NWR. From there, the Selawik Flats Corridor (7) heads west-southwest, crossing the Buckland and Kiwalik Rivers. After crossing the Kiwalik River, the corridor heads south for approximately 20 miles. The corridor heads west along the northern edge of Death Valley, passing between the Darby Mountains and the Bendeleben Mountains, along the northern edge of McCarthy's Marsh. At the western edge of McCarthy's Marsh, the corridor connects to an existing tractor trail that leads south to Council. At Council, the corridor connects to the Nome-Council Road.

3.4.8 Cape Darby Corridor (8 - Road/Rail)

Cape Darby Corridor extends 340 miles from the Ambler mineral belt to Cape Darby at the southernmost tip of the Seward Peninsula (Figures 21 through 25). The corridor follows the Selawik Flats Corridor (6) from the Ambler mineral belt to Death Valley. It continues south, east of Death Valley for approximately 25 miles. The corridor heads southwest along the

Kwiniuk River and the southern edge of the Darby Mountains. The corridor parallels approximately 10 miles of steep shoreline along the Kwiktalik Mountains until it reaches Cape Darby. Cape Darby is similar to Cape Blossom in that it is an undeveloped location that has been identified as a possible port site with potential for deep marine water access.

4.0 CORRIDOR DATA GAPS/PROPOSED FIELDWORK

This Corridor Development Memorandum was completed using information collected from office research and prior fieldwork. No new fieldwork was performed. When sufficient work has been completed to narrow the potential corridors down to the one or two most feasible corridors, additional data collection and field study will be needed to complete the necessary analyses required to confirm and refine the corridor. The most beneficial step to refine the corridors is to improve the corridor mapping. This Corridor Development Memorandum was completed with USGS mapping and Alaska DEM contour data. The two most likely mapping alternatives are photogrammetric mapping and LiDAR. Photogrammetry offers the potential for digital orthophotos and mapping with 5-foot accuracy, and is typically the choice for reconnaissance and similar planning level studies. LiDAR offers improved accuracy, as low as 2-foot contours, and would be most beneficial as the project enters the design tasks. Some ground-based data would still be required – particularly at the water crossings, but LiDAR would provide cost-effective coverage for a wide access corridor. Proposed corridor widths for obtaining improved mapping range from two to five miles, as discussed in Section 3.2. Based on available funding it may be more economical to collect photogrammetric data for the study corridors, refine the alignment, and then collect LiDAR data for a 500-foot to 1,000-foot width along the alignment.

5.0 REFERENCES

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APPENDIX A

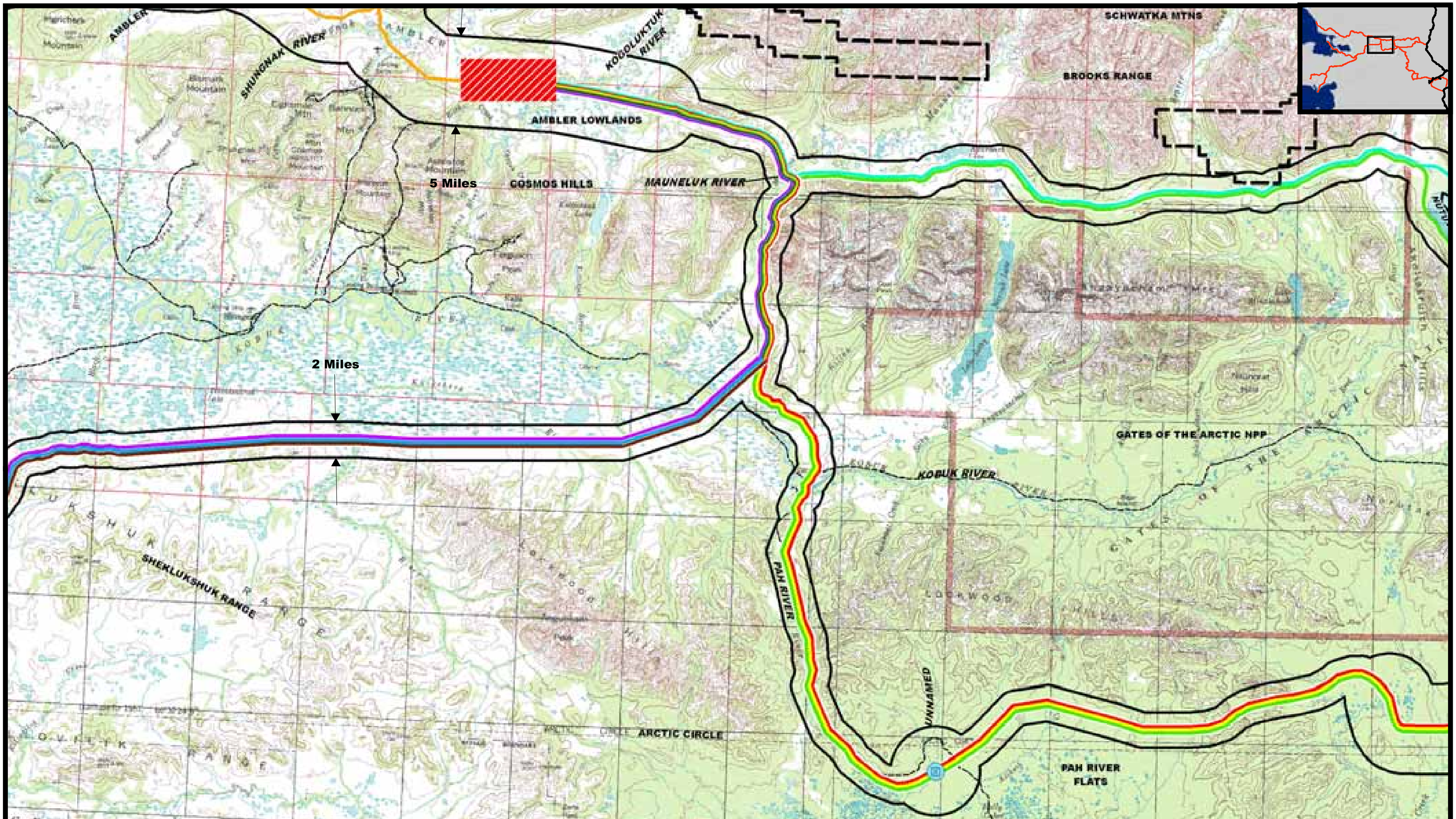
Bibliography of Past Corridor Studies

Bibliography of Past Corridors Studies

Past Corridors	Study Title	Date	Entity
A, D	Report and Recommendations for Engineering Service Requirements - Transportation Corridor Nenana-Dunbar Area to Kobuk River Valley	Mar-68	State of Alaska
A, B, D	Alaska Transportation Corridor Study	Apr-72	US DOT & FHWA
A, B, C, D, E, F, G, I, K	Alaska Planning Map - Proposed Extension of Transportation System	Jun-73	State of Alaska, Department of Highways
A, B, D, F, G, H	Optimum Transportation Systems to Serve the Mineral Industry North of the Yukon Basin in Alaska	Sep-73	U.S. Bureau of Mines
G, H, I, J	Western Access Road Project S-0145(1) Environmental Impact Statement	Nov-73	US DOT & FHWA
A, D, F	Economic Mining Feasibility Studies of Selected Mineral Deposit Types in the Western Brooks Range, Alaska	1977	U.S. Department of the Interior
B, C, E, G, J	Arctic Deposit - Order of Magnitude Evaluation	Aug-78	Kennecott
H, I,	Western and Arctic Alaska Transportation Study - Nome-Kotzebue Road Preliminary Feasibility Study	Jan-80	DOT&PF
A, B, C, F, G, H, I, J	Western and Arctic Alaska Transportation Study - Phase III: Project Evaluation Final Report, Volume V: Transportation Infrastructure for Mineral Development	May-81	DOT&PF
A, B, C, F, G, H, I, J	An Analysis of the Transportation of Ore Concentrates from the Ambler Mining District to Ports in North America and Japan	Jan-83	Bear Mining Creek Company
B,C	Arctic, Alaska Project, Pre-AFD Report	Apr-85	Kennecott
A, C, G, J, K	Northwest Alaska Resource Development Transportation Alternatives Study: Phases I and II	1992	Alaska Industrial Development and Export Authority
A, C	Railroad Extension to Tanana - Cost-Benefit Analysis	Mar-92	DOT&PF
A, B, C, F, G, I, K	State Land Selection Access Corridor Study, State of Alaska - Major Corridor Descriptions & Map of Proposed Corridor Centerlines	1993	DNR
A, B, D, F, G, I	Resource Transportation Analysis - Phase I - Potential Corridors Identification	2001	DOT&PF
A, B, D, F, G, I	Resource Transportation Analysis - Phase II - Yukon River Port and Road Network	2004	DOT&PF
K, I	Northwest Alaska Transportation Plan, Community Transportation Analysis	Feb-04	DOT&PF
A, B, C, D, F, G, I	Ambler District Access Study - Phase II Alternative Refinement	2005	NovaGold Alaska, Inc.

APPENDIX B

Recommended Corridor Study Width



Existing Roads	Recommended Corridor Width	1-Brooks East Corridor 216 Miles (Road Only)	3-Elliott Hwy Corridor 365 Miles (Road Only)	7-Selawik Flats Corridor 331 Miles (Road & Rail)
Outside of Project Study Area	RS2477 Routes	2-Kanuti Flats Corridor 241 Miles (Road Only)	4-Parks Hwy RR Corridor 420-450 Miles (Rail Only)	8-Cape Darby Corridor 340 Miles (Road & Rail)
Ambler Mineral Belt	Large Bridges	5-DMTS Port Corridor 257 Miles (Road & Rail)	6-Cape Blossom Corridor 245 Miles (Road & Rail)	
Proposed Staging Area				

N W E S

0 2.5 5 10
Miles

Coordinate System: NAD 1983 Alaska Albers

STATE OF ALASKA
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NORTHERN REGION

AMBLER MINING DISTRICT ACCESS
CORRIDOR DEVELOPMENT MEMORANDUM

EAST CORRIDORS
Map 1 of 3

DATE: May 24, 2011 | **Figure B1**

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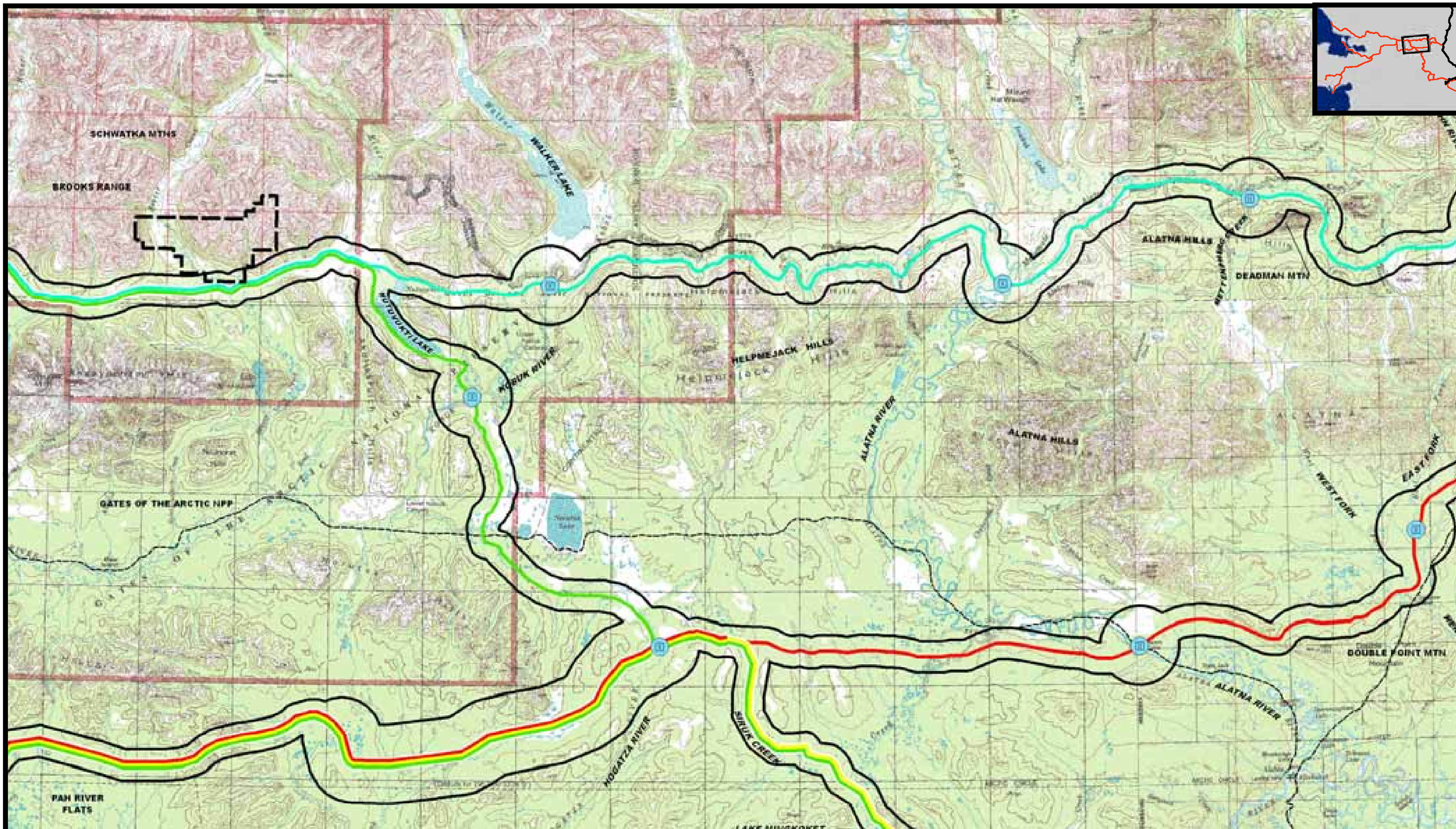

Existing Roads
Outside of Project Study Area
Ambler Mineral Belt
Proposed Staging Area
Recommended Corridor Width
RS2477 Routes
Large Bridges

1-Brooks East Corridor 216 Miles (Road Only)
2-Kanuti Flats Corridor 241 Miles (Road Only)
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8-Cape Darby Corridor 340 Miles (Road & Rail)

N W E S

0 2.5 5 10
Miles

Coordinate System: NAD 1983 Alaska Albers

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EAST CORRIDORS
Map 2 of 3

DATE: May 24, 2011

Figure B2

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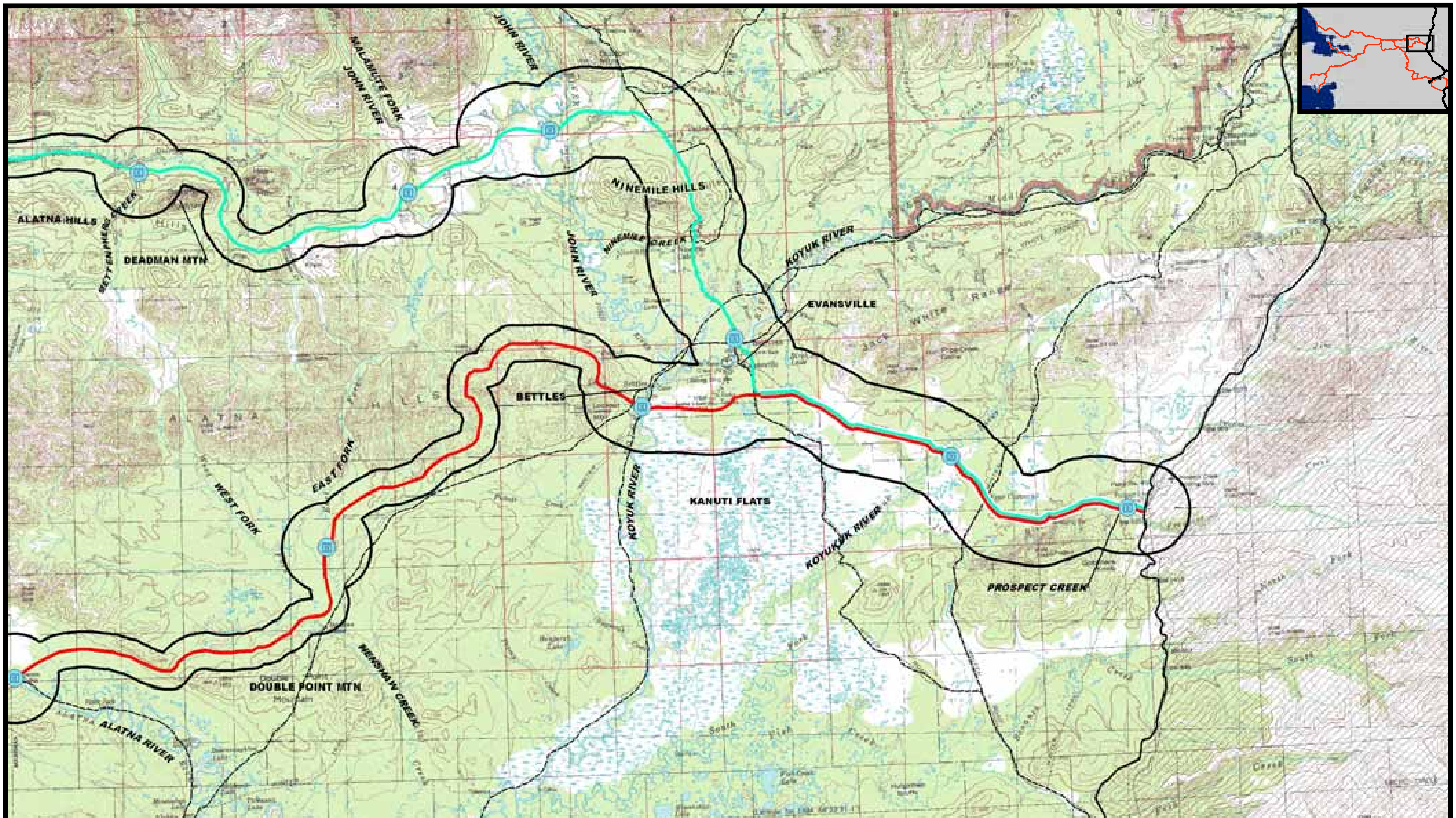

Existing Roads
Outside of Project Study Area
Ambler Mineral Belt
Proposed Staging Area
Recommended Corridor Width
RS2477 Routes
Large Bridges

1-Brooks East Corridor 216 Miles (Road Only)
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8-Cape Darby Corridor 340 Miles (Road & Rail)

N E S W

0 2.5 5 10
Miles

Coordinate System: NAD 1983 Alaska Albers

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EAST CORRIDORS
Map 3 of 3

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Figure B3

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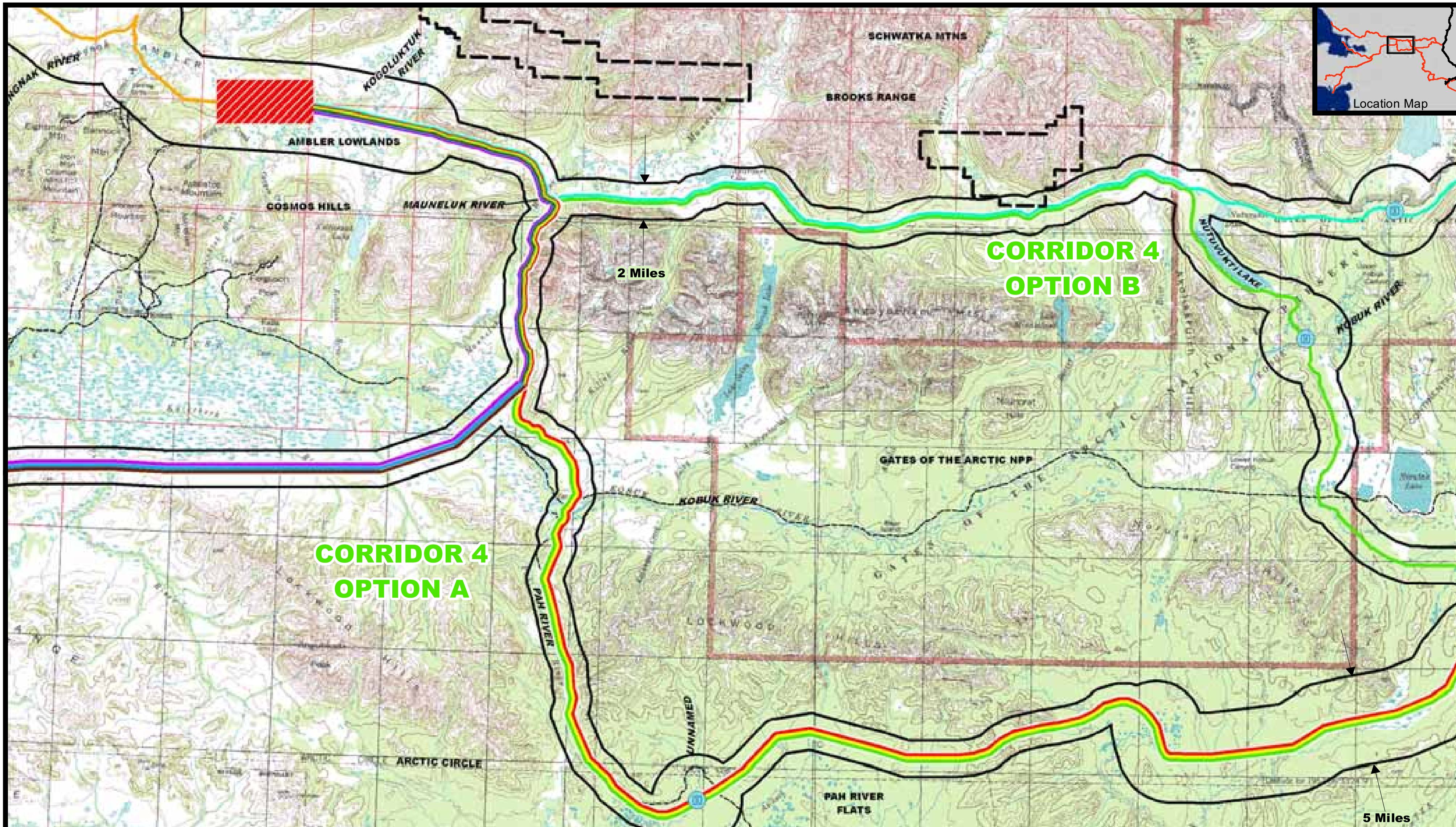

Railroad
Existing Roads
Outside of Project Study Area
Ambler Mineral Belt
Proposed Staging Area
Recommended Corridor Width
RS2477 Routes
Large Bridges

1-Brooks East Corridor 216 Miles (Road Only)
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8-Cape Darby Corridor 340 Miles (Road & Rail)

N E S W

0 2.5 5 10
Miles

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SOUTHEAST CORRIDORS
Map 1 of 6

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Figure B4

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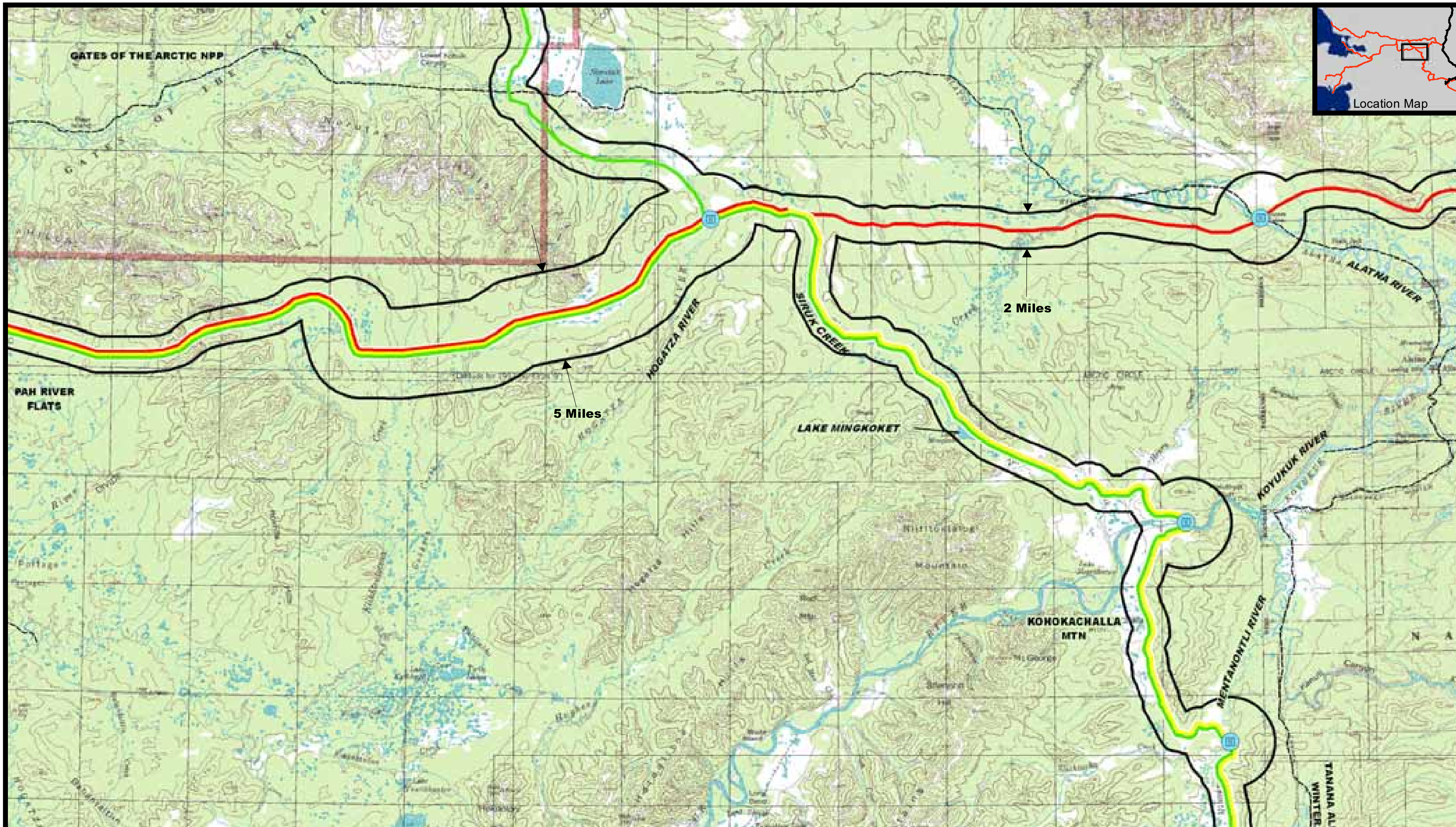

Railroad	Recommended Corridor Width	1-Brooks East Corridor 216 Miles (Road Only)	4-Parks Hwy RR Corridor 420-450 Miles (Rail Only)	7-Selawik Flats Corridor 331 Miles (Road & Rail)
Existing Roads	RS2477 Routes	2-Kanuti Flats Corridor 241 Miles (Road Only)	5-DMTS Port Corridor 257 Miles (Road & Rail)	8-Cape Darby Corridor 340 Miles (Road & Rail)
Outside of Project Study Area	Large Bridges	3-Elliott Hwy Corridor 365 Miles (Road Only)	6-Cape Blossom Corridor 245 Miles (Road & Rail)	
Ambler Mineral Belt				
Proposed Staging Area				

0 2.5 5 10
Miles

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SOUTHEAST CORRIDORS
Map 2 of 6

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Figure B5

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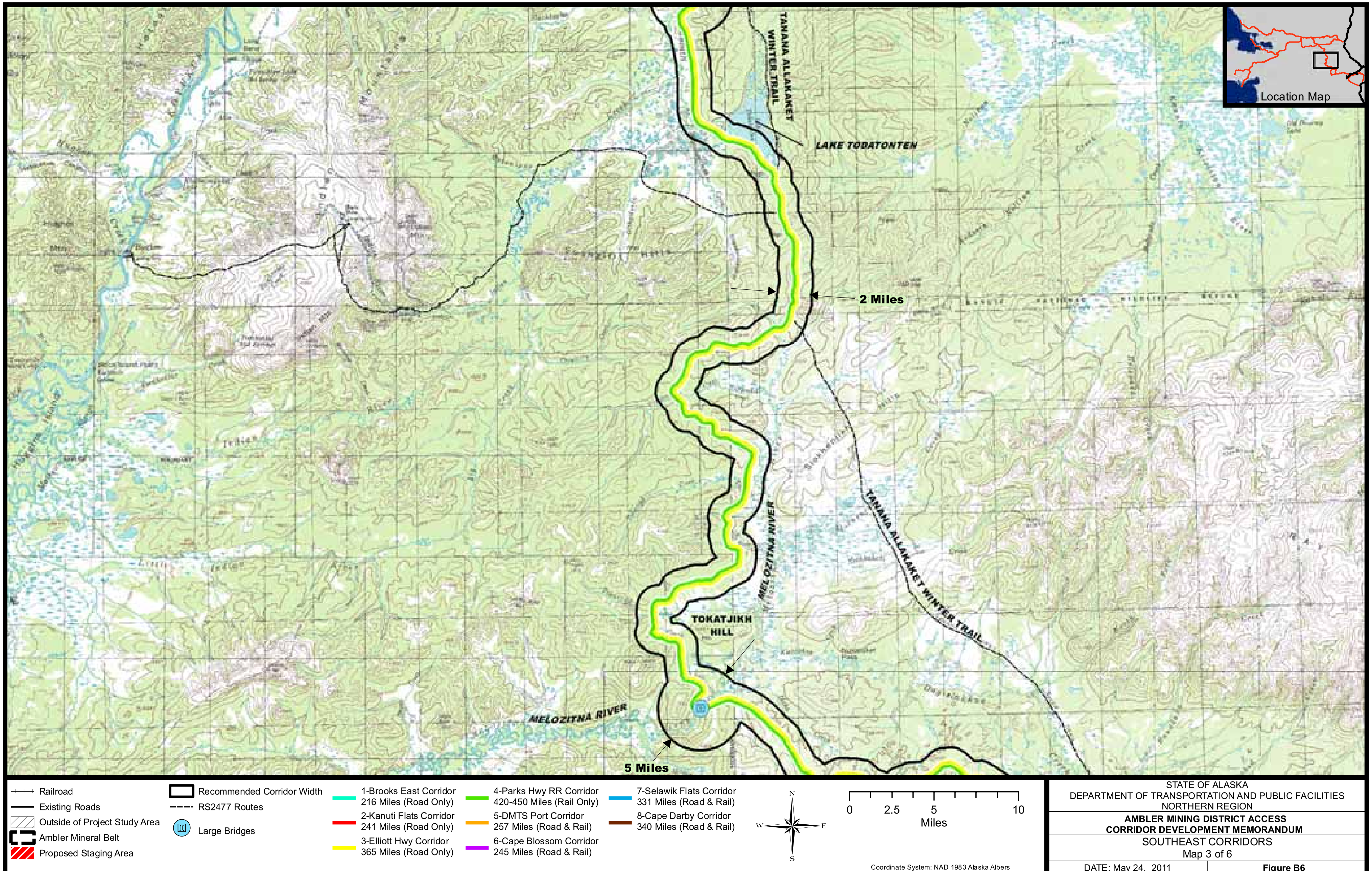

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SOUTHEAST CORRIDORS
Map 3 of 6

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Figure B6

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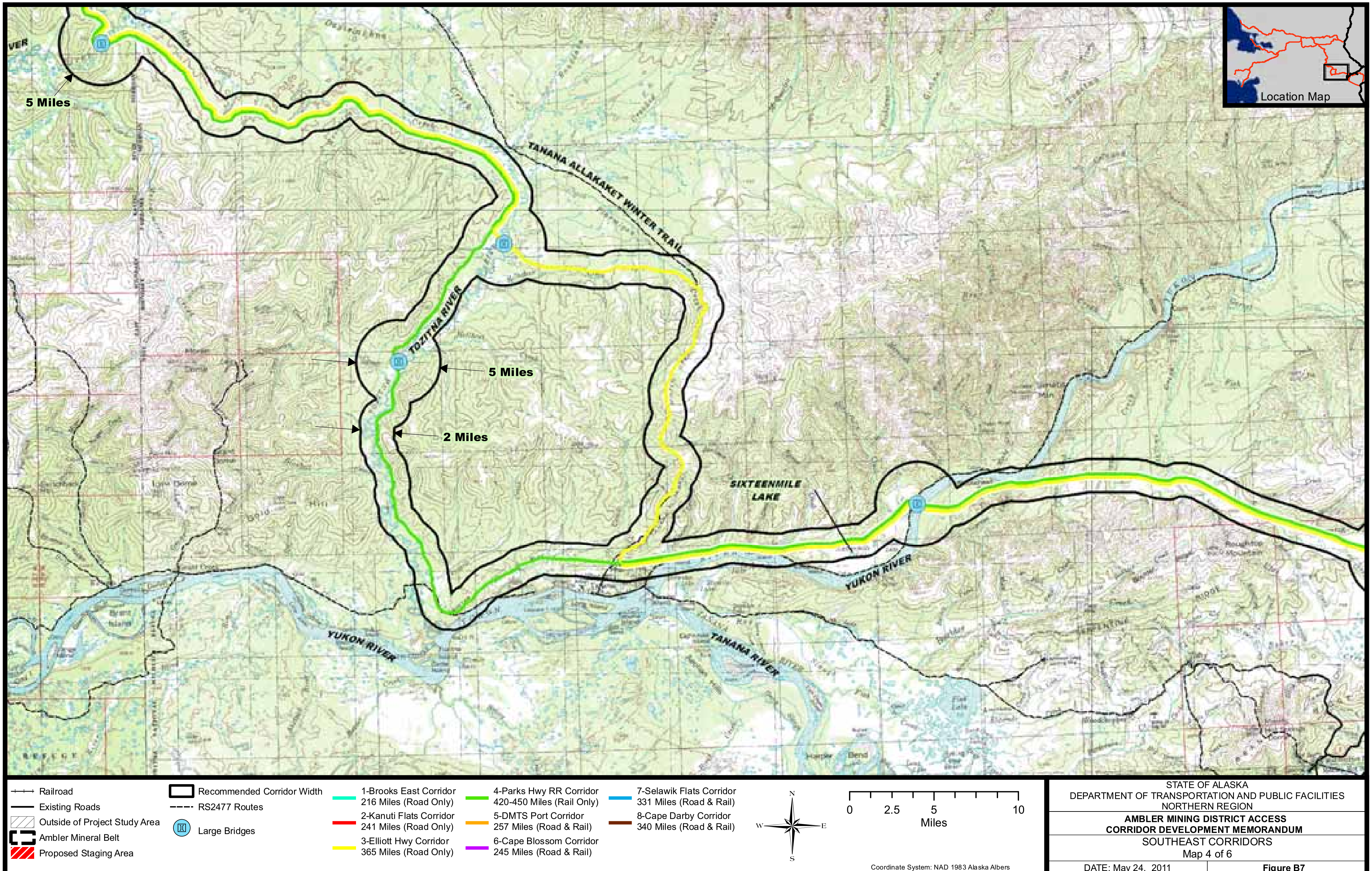

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SOUTHEAST CORRIDORS
Map 4 of 6

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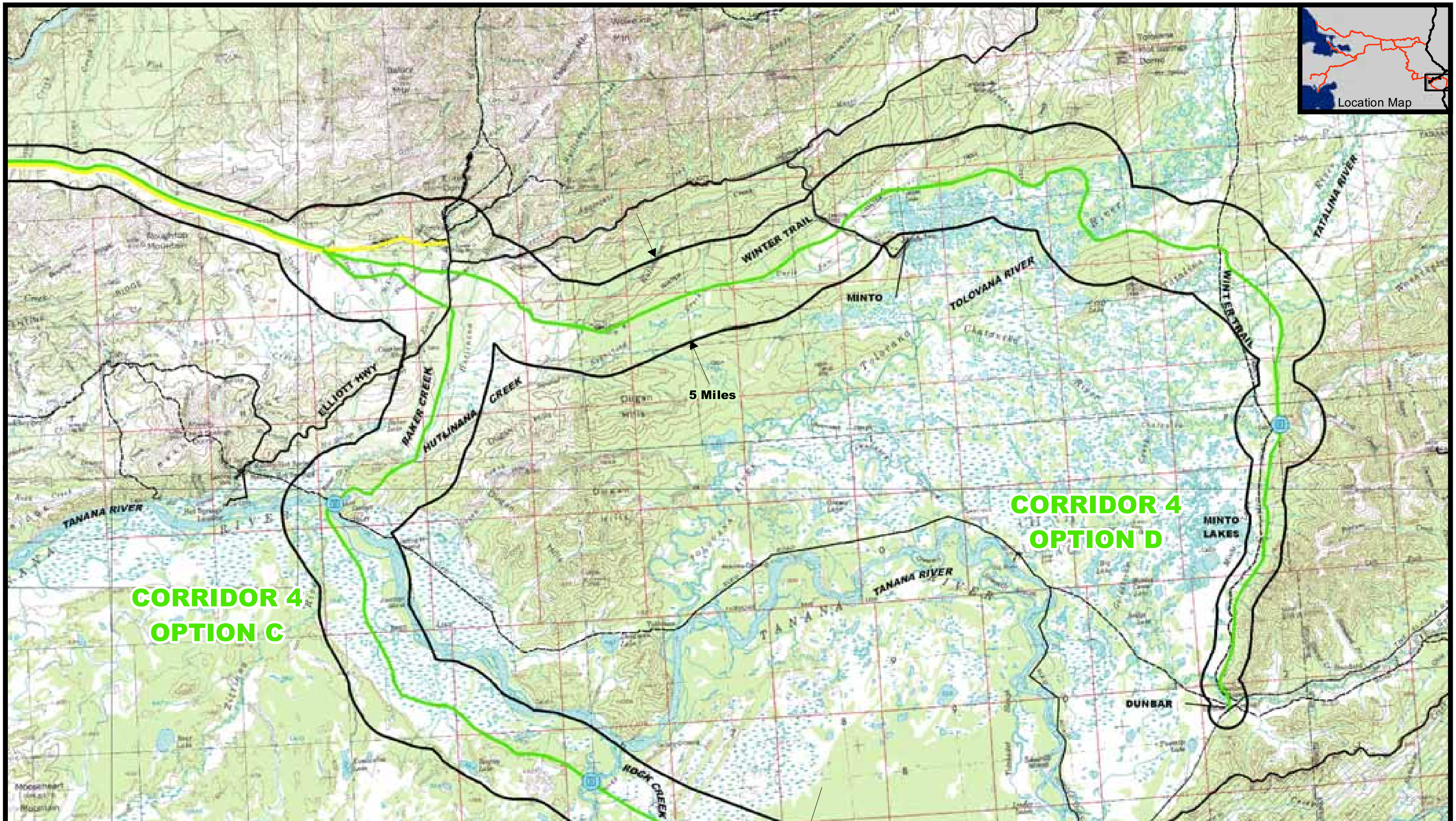

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SOUTHEAST CORRIDORS
Map 5 of 6

DATE: May 24, 2011

Figure B8

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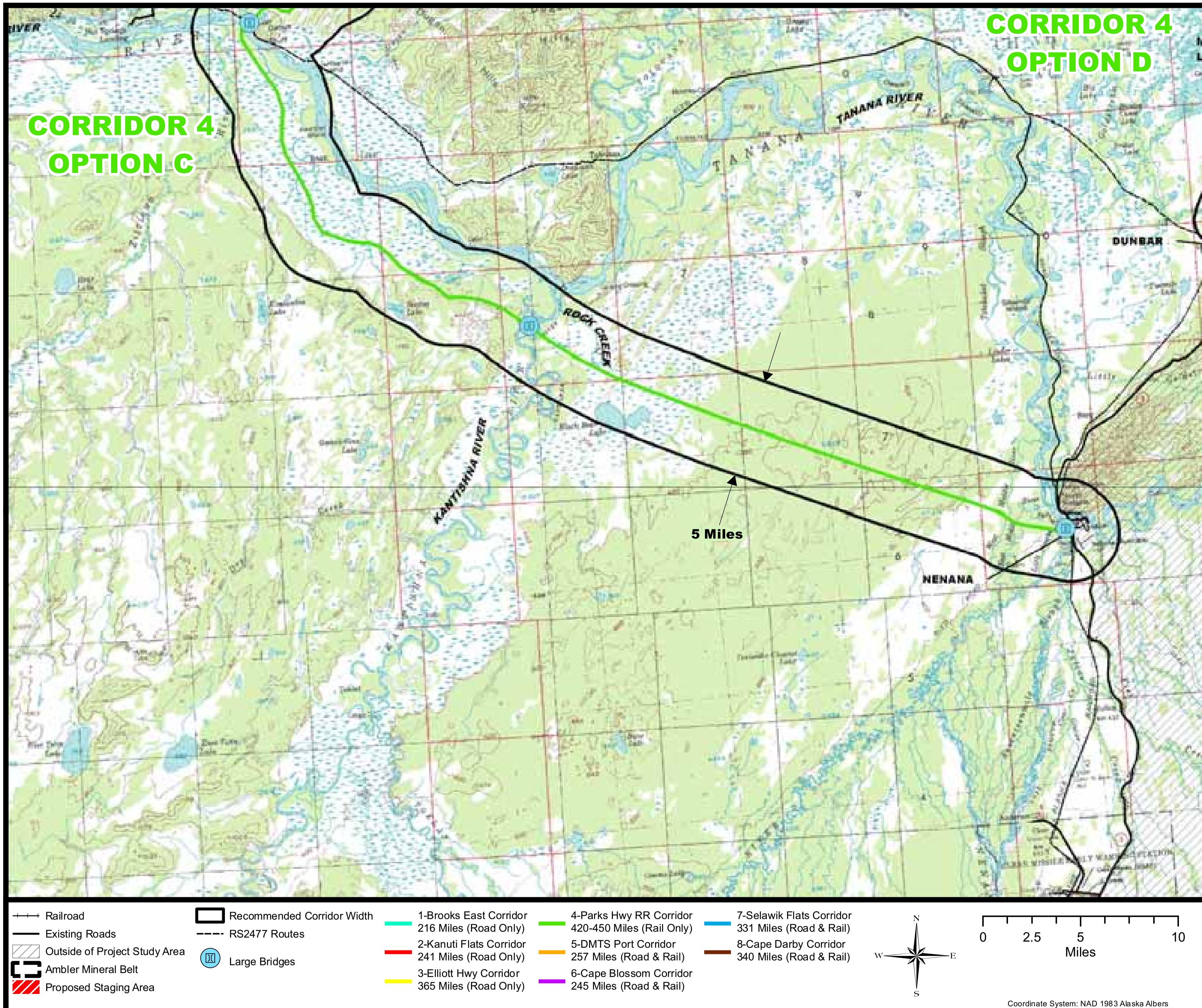

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SOUTHEAST CORRIDORS
Map 6 of 6

DATE: May 24, 2011 **Figure B9**

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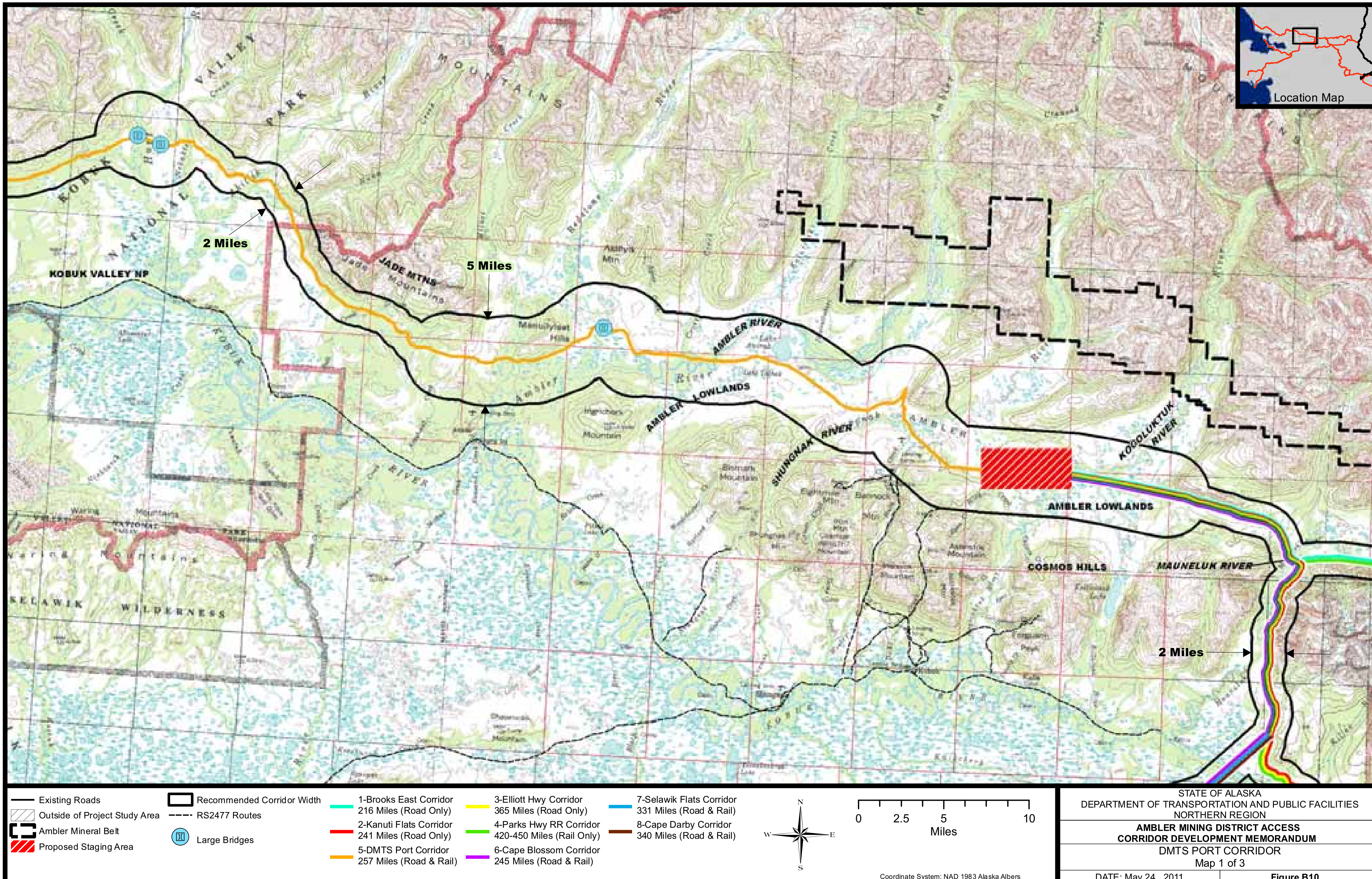

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DMTS PORT CORRIDOR
Map 1 of 3

DATE: May 24, 2011 | **Figure B10**

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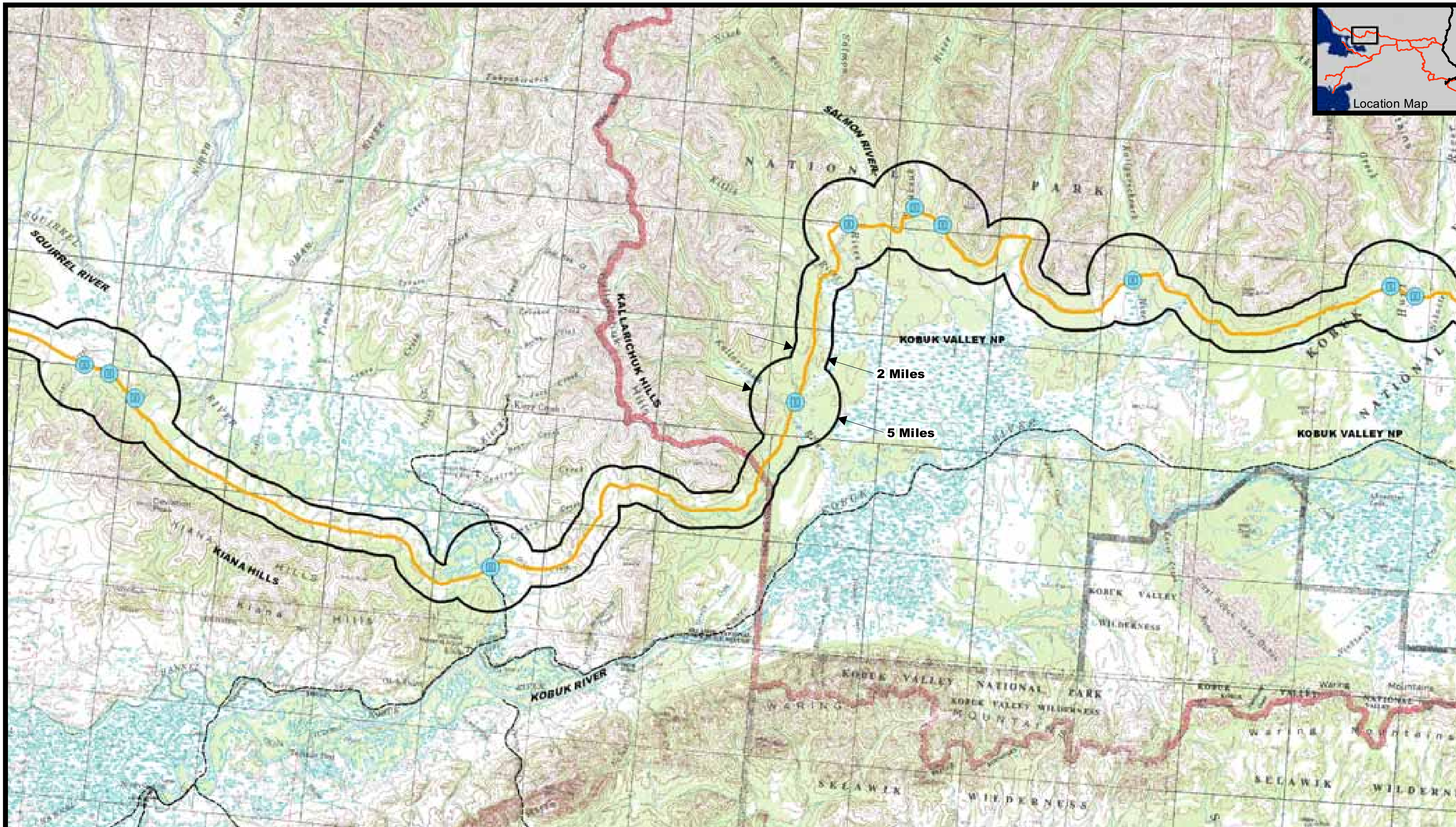

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AMBLER MINING DISTRICT ACCESS
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DMTS PORT CORRIDOR
Map 2 of 3

DATE: May 24, 2011 | **Figure B11**

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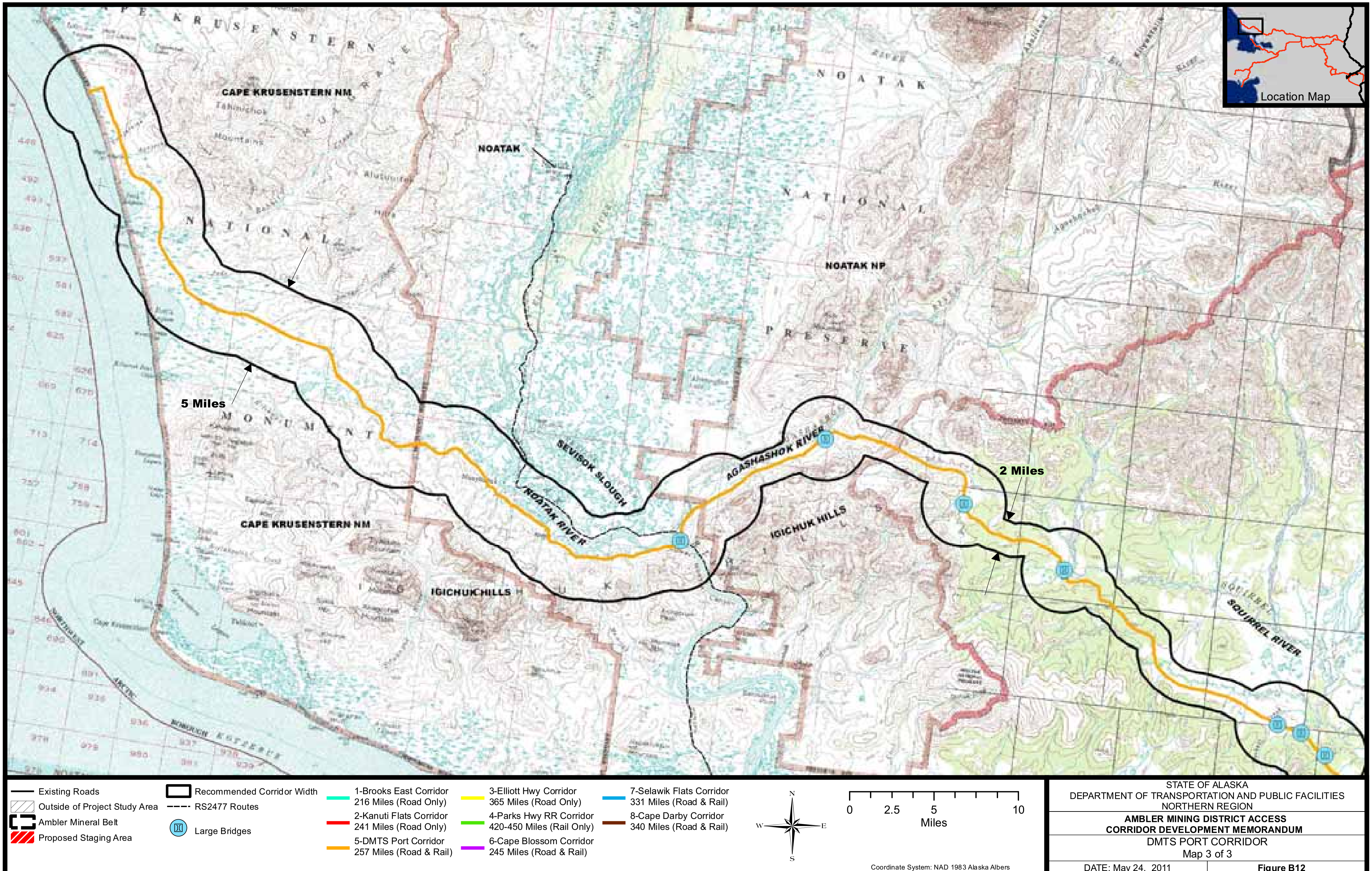

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DMTS PORT CORRIDOR
Map 3 of 3

DATE: May 24, 2011 | **Figure B12**

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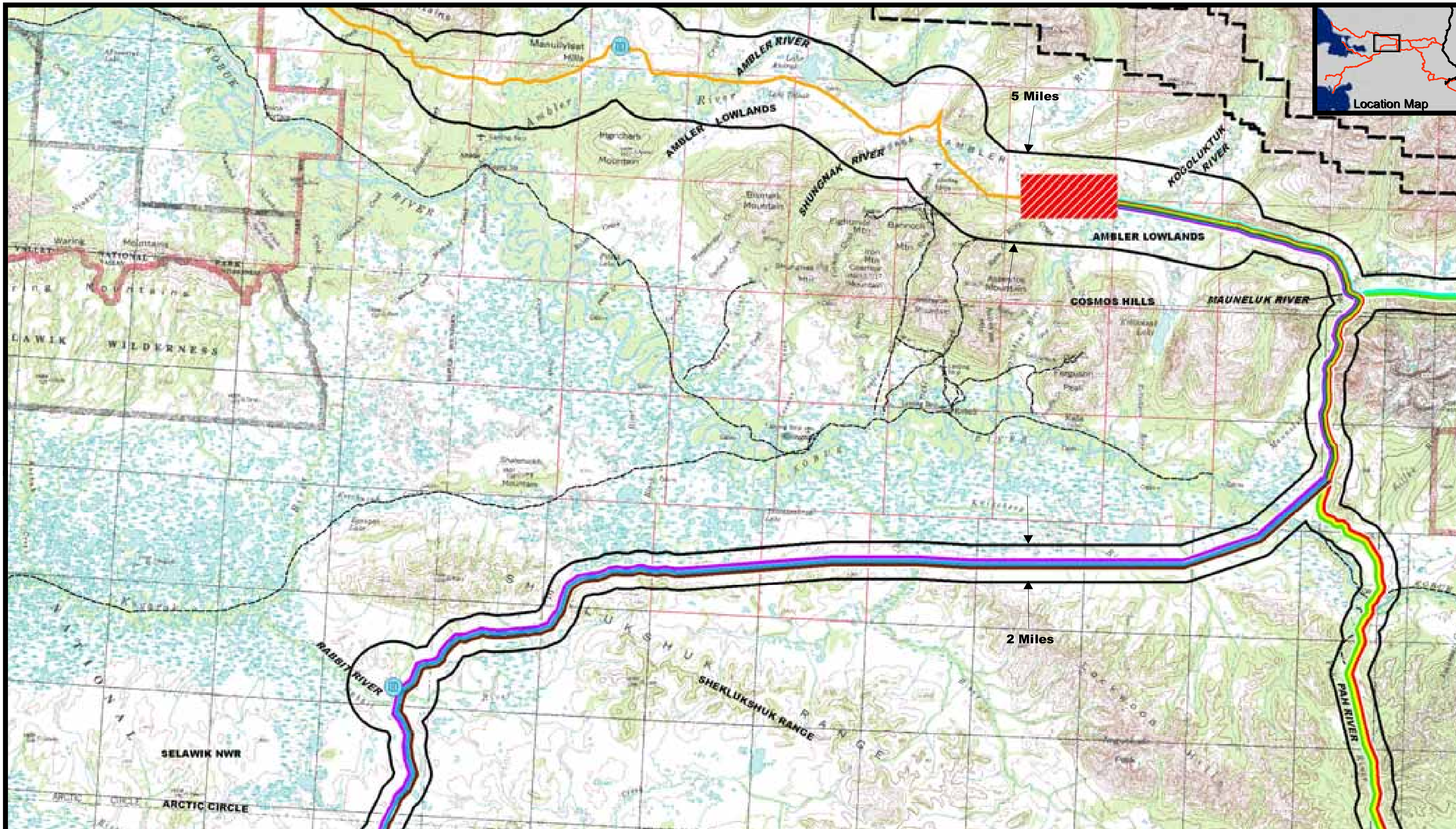

Existing Roads
Outside of Project Study Area
Ambler Mineral Belt
Proposed Staging Area
Recommended Corridor Width
RS2477 Routes
Large Bridges

1-Brooks East Corridor 216 Miles (Road Only)
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0 2.5 5 10 Miles

Coordinate System: NAD 1983 Alaska Albers

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NORTHERN REGION

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CORRIDOR DEVELOPMENT MEMORANDUM

CAPE BLOSSOM CORRIDOR
Map 1 of 3

DATE: May 24, 2011

Figure B13

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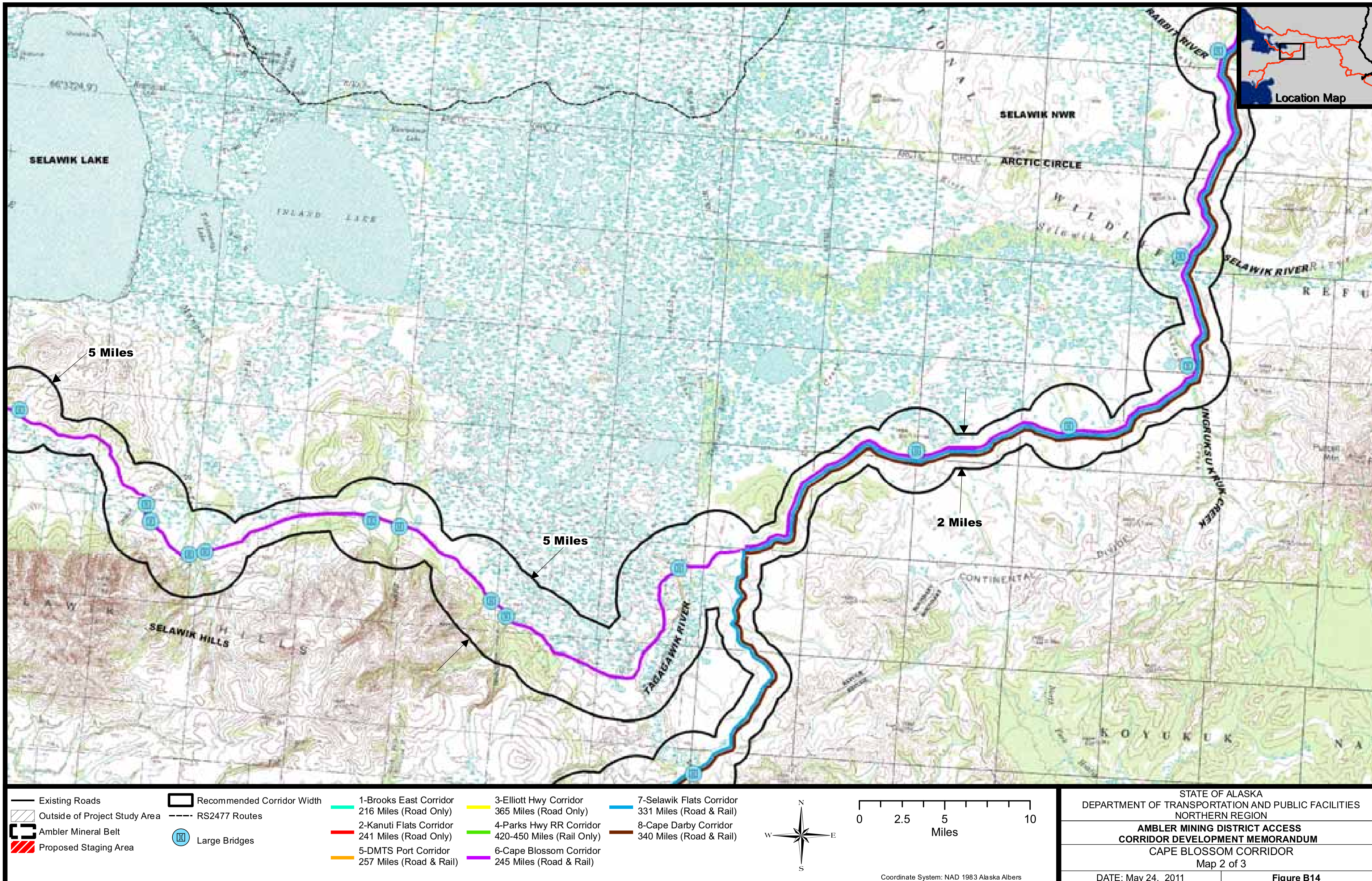

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NORTHERN REGION

AMBLER MINING DISTRICT ACCESS CORRIDOR DEVELOPMENT MEMORANDUM

CAPE BLOSSOM CORRIDOR
Map 2 of 3

DATE: May 24, 2011

Figure B14

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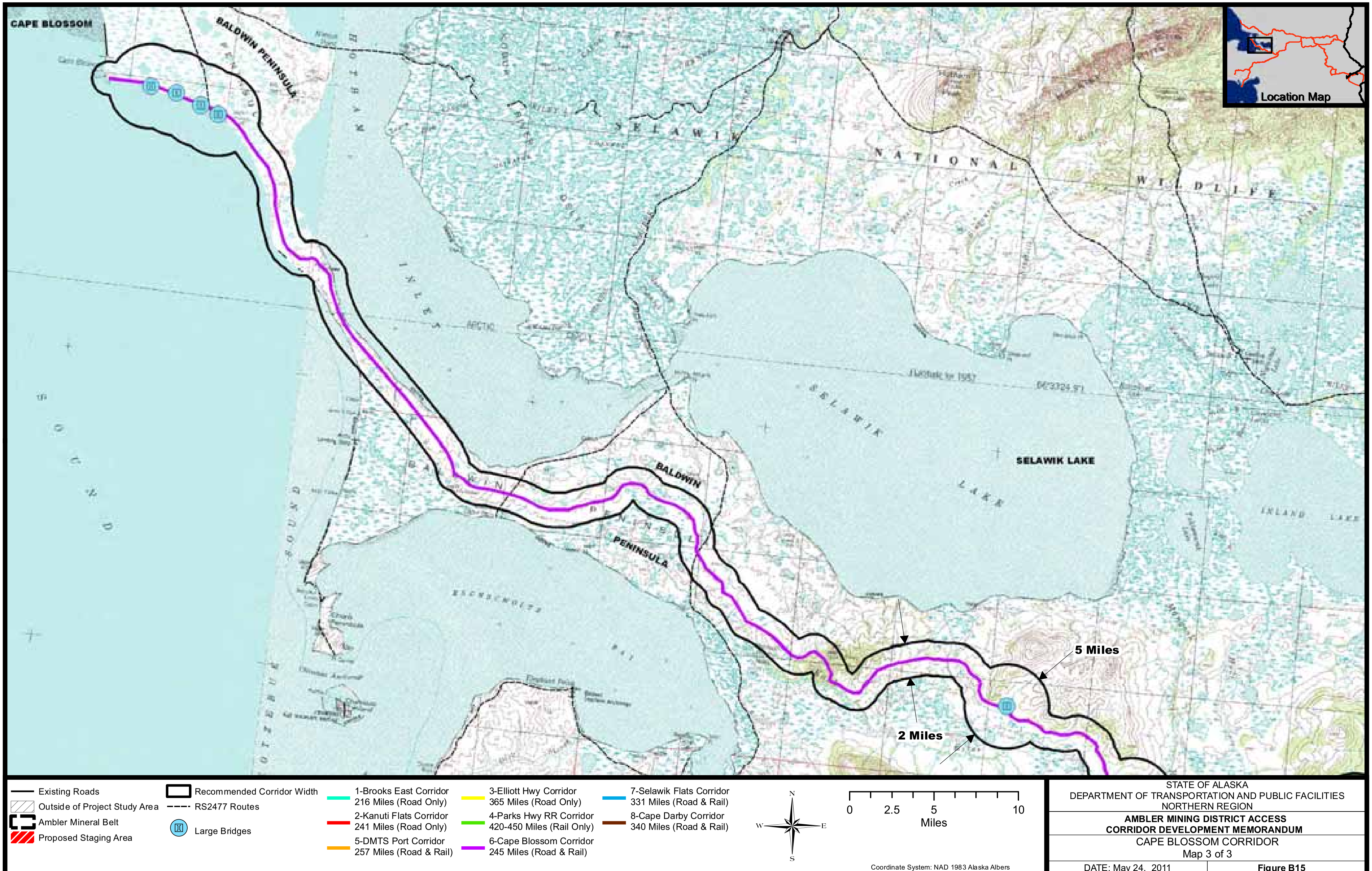

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CORRIDOR DEVELOPMENT MEMORANDUM

CAPE BLOSSOM CORRIDOR
Map 3 of 3

DATE: May 24, 2011

Figure B15

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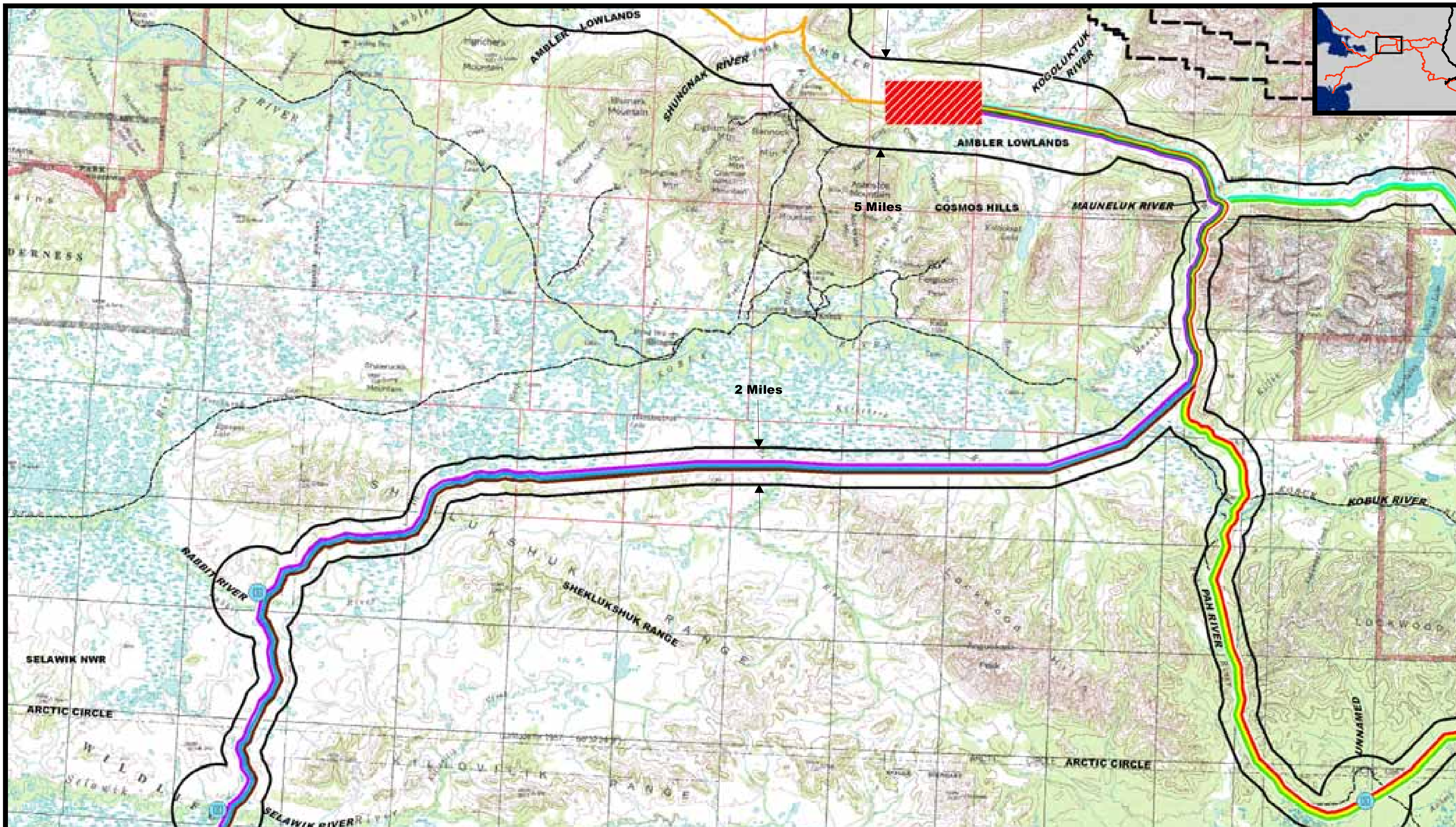

Existing Roads
Outside of Project Study Area
Ambler Mineral Belt
Proposed Staging Area
Recommended Corridor Width
RS2477 Routes
Large Bridges

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N E S W

0 2.5 5 10
Miles

Coordinate System: NAD 1983 Alaska Albers

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NORTHERN REGION

AMBLER MINING DISTRICT ACCESS
CORRIDOR DEVELOPMENT MEMORANDUM

SOUTHWEST CORRIDORS
Map 1 of 5

DATE: May 24, 2011

Figure B16

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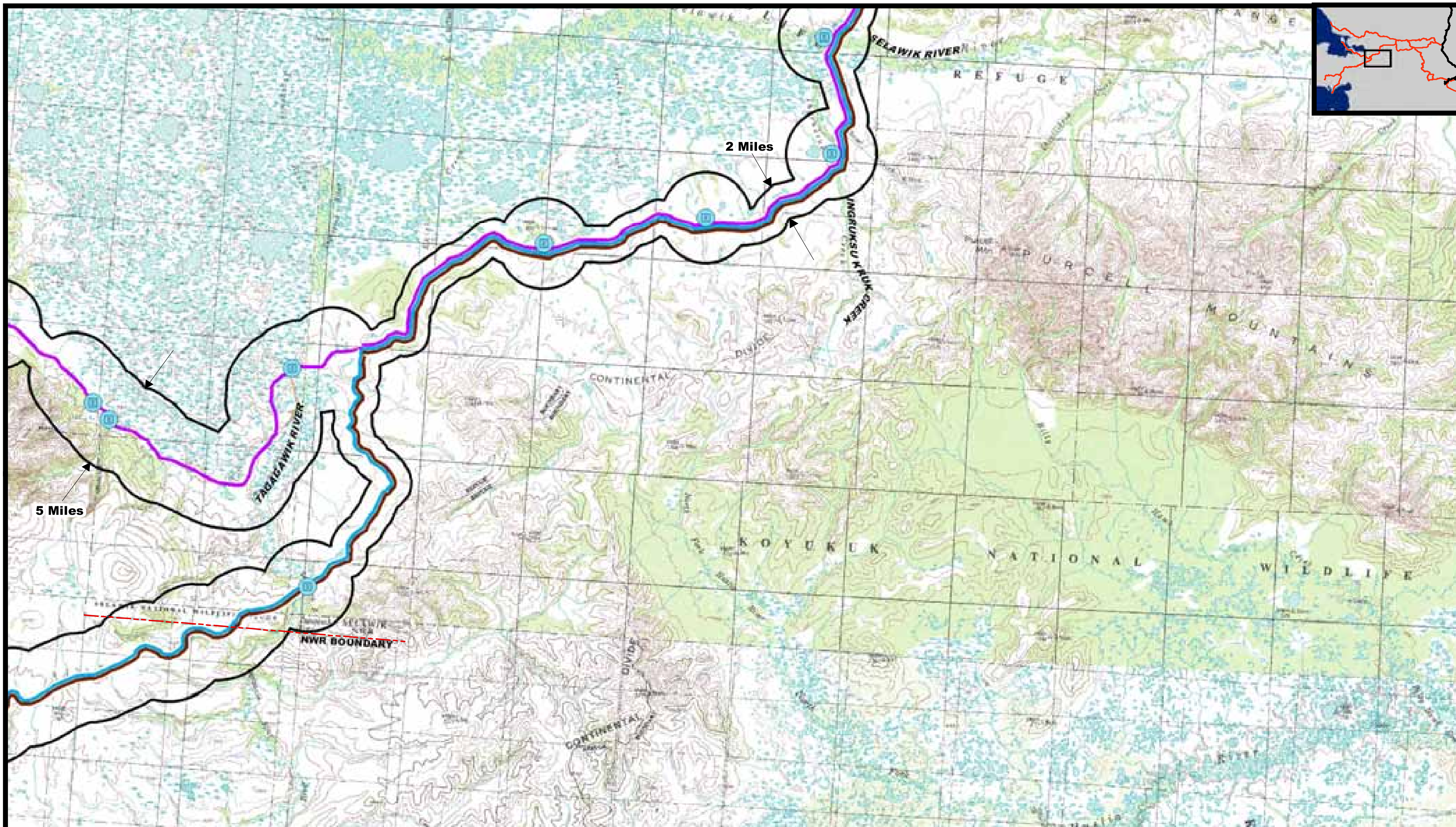

Existing Roads
Outside of Project Study Area
Ambler Mineral Belt
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N E S W

0 2.5 5 10
Miles

Coordinate System: NAD 1983 Alaska Albers

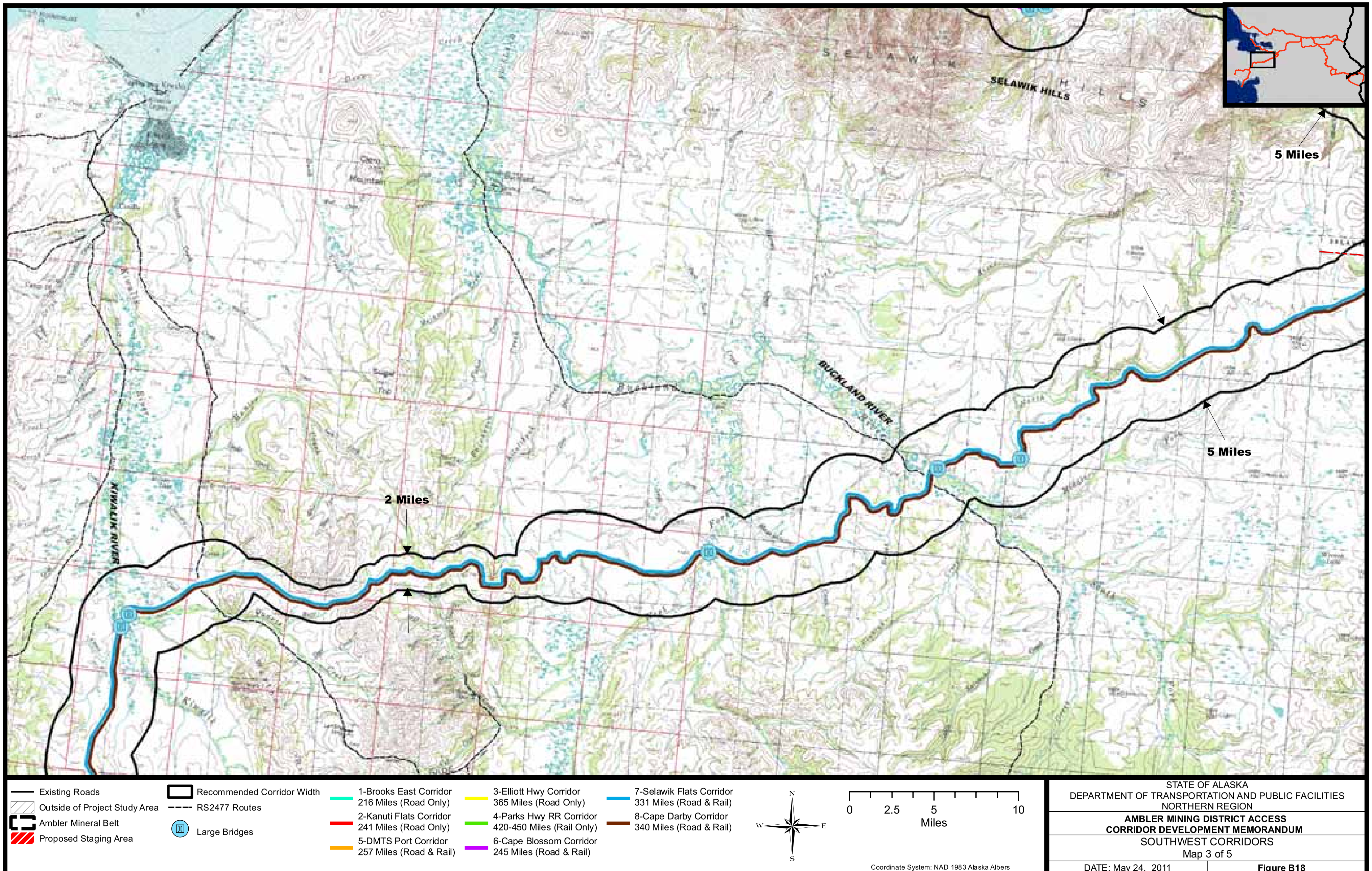
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
NORTHERN REGION

AMBLER MINING DISTRICT ACCESS
CORRIDOR DEVELOPMENT MEMORANDUM

SOUTHWEST CORRIDORS
Map 2 of 5

DATE: May 24, 2011

Figure B17



STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
NORTHERN REGION

AMBLER MINING DISTRICT ACCESS
CORRIDOR DEVELOPMENT MEMORANDUM

SOUTHWEST CORRIDORS
Map 3 of 5

DATE: May 24, 2011 **Figure B18**

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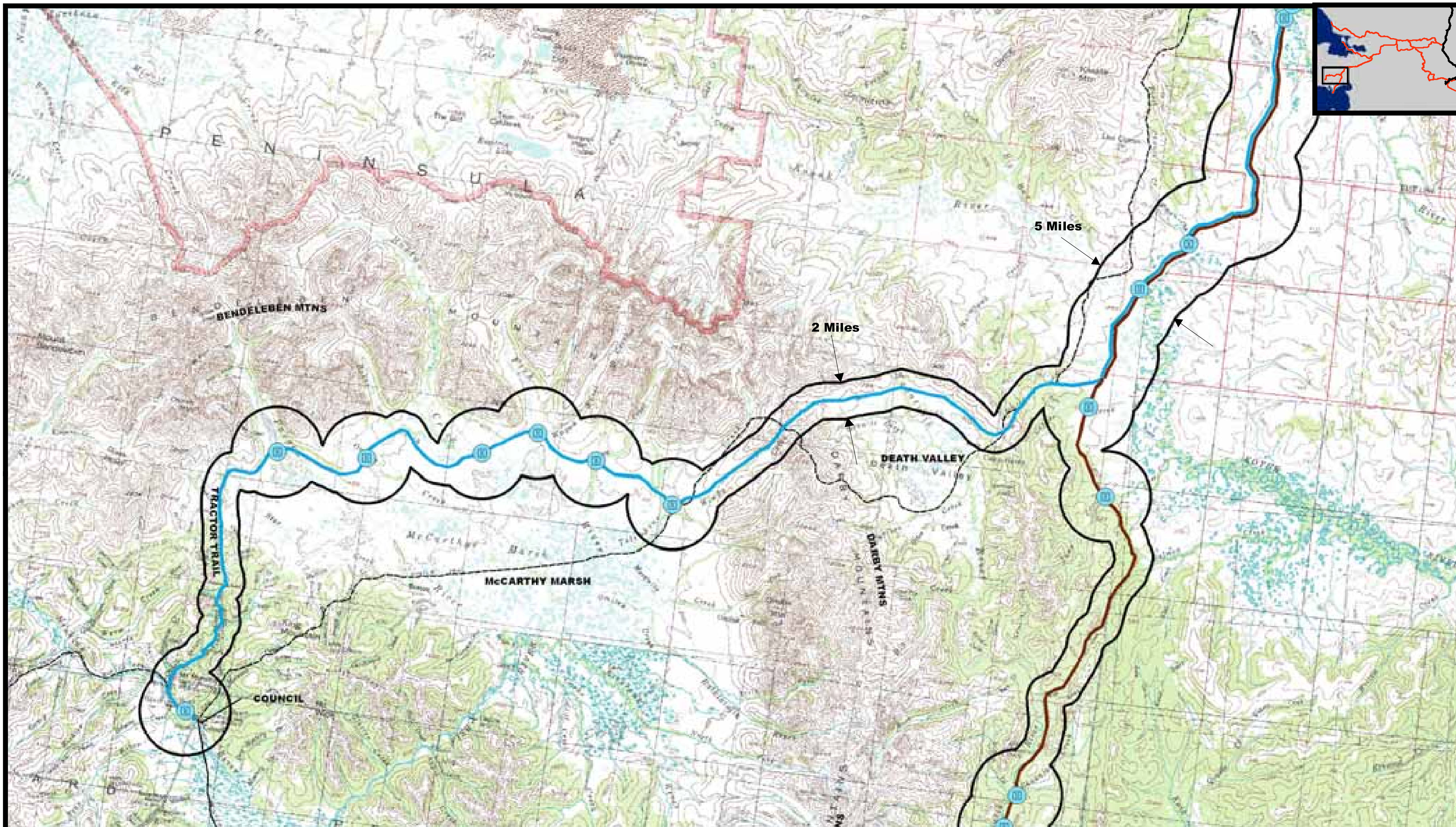

Existing Roads	Recommended Corridor Width	1-Brooks East Corridor 216 Miles (Road Only)	3-Elliott Hwy Corridor 365 Miles (Road Only)	7-Selawik Flats Corridor 331 Miles (Road & Rail)
Outside of Project Study Area	RS2477 Routes	2-Kanuti Flats Corridor 241 Miles (Road Only)	4-Parks Hwy RR Corridor 420-450 Miles (Rail Only)	8-Cape Darby Corridor 340 Miles (Road & Rail)
Ambler Mineral Belt	Large Bridges	5-DMTS Port Corridor 257 Miles (Road & Rail)	6-Cape Blossom Corridor 245 Miles (Road & Rail)	
Proposed Staging Area				

N S W E

0 2.5 5 10
Miles

Coordinate System: NAD 1983 Alaska Albers

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
NORTHERN REGION

AMBLER MINING DISTRICT ACCESS
CORRIDOR DEVELOPMENT MEMORANDUM

SOUTHWEST CORRIDORS
Map 4 of 5

DATE: May 24, 2011

Figure B19

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Existing Roads
Outside of Project Study Area
Ambler Mineral Belt
Proposed Staging Area
Recommended Corridor Width
RS2477 Routes
Large Bridges
1-Brooks East Corridor 216 Miles (Road Only)
2-Kanuti Flats Corridor 241 Miles (Road Only)
5-DMTS Port Corridor 257 Miles (Road & Rail)
3-Elliott Hwy Corridor 365 Miles (Road Only)
4-Parks Hwy RR Corridor 420-450 Miles (Rail Only)
6-Cape Blossom Corridor 245 Miles (Road & Rail)
7-Selawik Flats Corridor 331 Miles (Road & Rail)
8-Cape Darby Corridor 340 Miles (Road & Rail)

N E S W

0 2.5 5 10
Miles

Coordinate System: NAD 1983 Alaska Albers

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CORRIDOR DEVELOPMENT MEMORANDUM

SOUTHWEST CORRIDORS
Map 5 of 5

DATE: May 24, 2011 | **Figure B20**

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Ambler Mining District Access