

**Kobuk-Seward Peninsula RMP  
Reasonable Foreseeable Development  
Scenario  
Locatable and Salable Minerals**

**Prepared for**

**Bureau of Land Management,  
Fairbanks District Office**

**As part of the**

**Kobuk-Seward Peninsula Resource Management Plan**

**Prepared by**

**Staff  
Bureau of Land Management  
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## ACRONYMS USED IN THIS REPORT

ACEC	Area of critical environmental concern
ADEC	Alaska Department of Environmental Conservation
ADGGS	Alaska Division of Geological and Geophysical Surveys
ADMLW	Alaska Division of Mining, Lands, & Water
ADNR	Alaska Department of Natural Resources
AHEA	Alaska Hardrock Exploration Application
AMIS	Alaska Mineral Information System
ANCSA	Alaska Native Claims Settlement Act
APMA	Alaska Placer Mining Application
ARDF	Alaska Resource Data File
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
DMTS	DeLong Mountains Regional Transportation System
EPA	U.S. Environmental Protection Agency
FDO	Fairbanks District Office
FLPMA	Federal Land Policy and Management Act of 1976
KMDA	Known Mineral Deposit Area
KSP	Kobuk-Seward Peninsula
LMP	Locatable mineral potential
NEPA	National Environmental Policy Act
PLO	Public Land Order
RMP	Reasonable Foreseeable Development Scenario
RMP	Resource Management Plan
SRMA	Special Recreation Management Area
USGS	U.S. Geological Survey

# **Kobuk-Seward Peninsula RMP Reasonable Foreseeable Development Scenario Locatable and Salable Minerals**

## **SUMMARY**

The Bureau of Land Management Fairbanks District Office is preparing a Kobuk-Seward Peninsula Resource Management Plan to provide a comprehensive framework for managing and allocating uses of the public lands and resources within the Fairbanks District. This planning process meets the requirements of the National Environmental Policy Act through a detailed description of the alternatives and environmental consequences resulting from each alternative. The Federal Land Policy and Management Act requires the Secretary of the Interior, with public involvement, to develop, maintain, and when appropriate, revise land use plans that provide tracts or areas for the use of the public lands.

The Kobuk-Seward Peninsula Planning Area encompasses approximately 31.6 million acres in northwestern Alaska, of which approximately 13 million acres are BLM-administered lands. The area encompasses the area from Point Lay, south to Norton Sound, and from the Bering and Chukchi seas east to the upper Kobuk River. It includes the Seward Peninsula and the eastern Nulato Hills, bounding the Central Yukon Planning Area. The planning area is divided into four geographic regions for this report: the North Red Dog, East Ambler, Central Omar-Kiana, and the South Seward Peninsula areas.

Reasonable Foreseeable Development Scenarios provide a mechanism to analyze the effects that discretionary planning decisions have on mineral development based upon four alternatives. This RFD is used to predict the type, location, manner, and cumulative impacts of potential disturbance due locatable minerals extraction over the life of this RMP. This report has been formulated to project and predict development regardless of specific land management authority (Federal, State, Native, or private), but concentrates on the high mineral potential areas located on unencumbered BLM lands and State-selected and Native-selected lands. This report is a continuation of the Mineral Occurrence and Development Potential Report, Locatable and Salable Minerals.

A range of four alternatives were developed during the Kobuk-Seward Peninsula Resource Management Plan process. These include Alternative A – No Action, Alternative B – Development, Alternative C – Conservation, and Alternative D – Preferred. Due to the diminutive amount of BLM managed lands within the KSP Planning Area, the level of disturbance from reasonable foreseeable locatable mineral activity will be minimal. If the maximum amount of activity is allowed (Alternative B – Development), an estimated total of 1,796 acres could potentially be disturbed. If the least amount of activity is allowed (Alternative C – Conservation), an estimated total of 38 acres could potentially be disturbed on existing valid operations. If reasonable accommodations are given to all parties, (Alternative D – Preferred), an estimated maximum total of 1,796 acres could potentially be disturbed.

## INTRODUCTION

The Fairbanks District Office (FDO) of the Bureau of Land Management (BLM) is preparing a Kobuk-Seward Peninsula Resource Management Plan (RMP) to provide a comprehensive framework for managing and allocating uses of the public lands and resources within the Fairbanks District. This planning process will meet the requirements of the National Environmental Policy Act (NEPA) through a detailed description of the alternatives and environmental consequences resulting from each alternative. The Federal Land Policy and Management Act of 1976 (FLPMA), as amended, provides the authority for the BLM land use planning on public lands. In particular, Sec.202 (a) requires the Secretary of the Interior, with public involvement, to develop, maintain, and when appropriate, revise land use plans that provide by tracts or areas for the use of the public lands. Implementing regulations are contained in the Code of Federal Regulations, 43 CFR 1610. BLM Manual, 1601 Land Use Planning, and a handbook (H-1601-1 Land Use Planning Handbook), provide procedures and guidance for the planning process.

The Kobuk-Seward Peninsula Planning Area (KSP Planning Area) encompasses approximately 31.6 million acres in northwestern Alaska, of which approximately 13 million acres are BLM-administered lands managed by the Fairbanks District Office. A portion of the BLM-managed lands includes lands selected by, but not yet conveyed to, the State of Alaska and native Alaskans - referred to as State-selected and Native-selected lands. State lands in Alaska came about through the Alaska Statehood Act of 1959, which gave the new state selection rights to federal land to foster development and state independence, a process which was supposed to end in 1984. Native lands were designated as a result of the Alaska Native Claims Settlement Act (ANCSA) of 1971, which superseded the Statehood Act and provided for native claims to traditional lands.

The KSP Planning Area encompasses the area from Point Lay, south to Norton Sound, and from the Bering and Chukchi seas east to the upper Kobuk River (figures 1 & 2). It includes the Seward Peninsula and the eastern Nulato Hills at the boundary of the Central Yukon Planning Area. The KSP Planning Area generally encompasses the area included in the northwest Arctic Borough, the northern portion of the Bering Straits Region, and the western edge of the North Slope Borough. Three regional native corporations hold lands in the KSP Planning Area: the Arctic Slope, NANA, and Bering Straits corporations. There are approximately 22 communities within the area. The KSP Planning Area is mostly roadless except for about 200 miles of road on the Seward Peninsula originating in Nome, the 52-mile road from Red Dog mine to its port facility on the Chukchi Sea, and minor roads within the villages.

This Reasonable Foreseeable Development Scenario (RFD) (1) provides a mechanism to analyze the effects that discretionary planning decisions have on mineral development and (2) summarizes basic information used in developing the various alternatives analyzed in the NEPA document. By incorporating available geologic and economic information, as well as utilizing Federal and State mineral assessment reports, this RFD is used to predict the type, location, manner, and cumulative impacts of potential locatable

mineral extraction in the planning area over the life of the Kobuk-Seward Peninsula RMP. This RFD has been formulated to project and predict development regardless of specific land management authority, Federal, State, Native, or private; but concentrates on the high mineral potential areas located on unencumbered BLM land, State-selected, and Native-selected lands. The following sections present what has been identified about the geology, known mineral occurrences, and unknown potential of the KSP Planning Area. The planning area has been divided into four geographic regions for this report: the North Red Dog, East Ambler, Central Omar-Kiana, and the South Seward Peninsula areas as shown on Figures 1 & 2.

## DESCRIPTION OF GEOLOGY

### MINERAL TERRANES OF ALASKA

The KSP Planning Area is underlain by 16 Mineral Terrane units whose geologic settings are considered highly favorable for the existence of metallic mineral resources (AEIDC, 1982 and RDI and others, 1995). The geologic nature of each terrane will determine specific commodities and mineral deposit types. Unmapped areas are generally evaluated as having poor to only moderate mineral potential. Mineral terranes located within each region are discussed below and listed in Table 1 and shown in Figures 1, 1a-1c.

**North Red Dog area:** Mafic intrusive rocks; favorable for copper and nickel deposits with by-product platinum and cobalt. Ultramafic rocks; favorable for chromium, nickel, and platinum group metal deposits with by-product cobalt. Undivided felsic volcanic rocks; favorable for copper, lead, and zinc deposits with by-product silver and gold. Ophiolite terrane; favorable for copper, nickel, and chromium deposits with by-product platinum and gold. Black, carbonaceous shale and limestone; favorable for zinc, lead, barium deposits with by-product silver. And, Coal-bearing sandstone and shale; favorable for coal and uranium deposits with by-product vanadium (Figure 1a).

**East Ambler area:** Alkalic granitic rocks; favorable for uranium and rare earth elements. Felsic granitic rocks; favorable for tin, tungsten, molybdenum, uranium, and thorium deposits. Undivided granitic rocks; favorable for uranium, thorium, rare earth elements, tin, tungsten, molybdenum, copper, and gold. Ultramafic rocks; favorable for chromium, nickel, and platinum group metal deposits with by-product cobalt. Undivided felsic volcanic rocks; favorable for copper, lead, and zinc deposits with by-product silver and gold. Undivided sedimentary and felsic volcanic rocks; favorable for copper, lead, and zinc deposits with by-product silver and gold. Undivided sedimentary and mafic volcanic rocks; favorable for copper and zinc deposits with by-product silver and gold. Ophiolite terrane; favorable for copper, nickel, and chromium deposits with by-product platinum and gold. And, Limestone and dolomite; favorable for copper or deposits like those of igneous terranes (Figure 1b).

Table 1. Mineral Terranes of Alaska identified in the Kobuk-Seward Peninsula Planning Area.

Map unit	Name	Description	Favorable deposits
<b>SYNGENETIC DEPOSITS</b>			
<i>INTRUSIVE TERRANES</i>			
Granitic rocks			
IGA	Alkalic granitic rocks	Syenite, locally includes peralkaline granite and monzonite	Uranium and rare earth elements
IGF	Felsic granitic rocks	Granite and quartz monzonite	Tin, tungsten, molybdenum, uranium, and thorium
IGI	Intermediate granitic rocks	Granodiorite and quartz diorite	Copper, gold, and molybdenum
IGU	Undivided granitic rocks	Granite	Uranium, thorium, rare earth elements, tin, tungsten, molybdenum, copper, and gold
Mafic-ultramafic rocks			
IMA	Mafic intrusive rocks	Gabbro, locally includes mafic-rich intermediate rocks	Copper and nickel with by-product platinum and cobalt
IUM	Ultramafic rocks	Peridotite and dunite	Chromium, nickel, and platinum group metals with by-product cobalt
<i>VOLCANIC – SEDIMENTARY TERRANES</i>			
Felsic volcanic rocks			
VFU	Undivided felsic volcanic rocks	Rhyolite and quartz latite	Copper, lead, and zinc with by-product silver and gold
VFA	Alkalic felsic and intermediate volcanic rocks	Trachyte, phonolite, trachyandesite, and peralkaline volcanics	Uranium and thorium
VSF	Undivided sedimentary and felsic volcanic rocks	Rhyolite, quartz latite, and associated sediments	Copper, lead, and zinc with by-product silver and gold
Mafic volcanic rocks			
VSM	Undivided sedimentary and mafic volcanic rocks	Basalt and associated sediments	Copper and zinc with by-product silver and gold
VOP	Ophiolite terrane	Pillow basalt and associated mafic and ultramafic intrusives with minor chert and other pelagic sediments	Copper, nickel, and chromium with by-product platinum group metals and gold
<i>SEDIMENTARY TERRANES</i>			
Marine rocks			
SLS	Limestone and shale	Limestone and dolomite with interbedded shale	Copper, lead, and zinc
SBS	Black, carbonaceous shale and limestone	Limestone, dolomite, black shale, and chert	Zinc, lead, and barium with by-product silver
Continental rocks			
SCB	Coal-bearing sandstone and shale	Coal-bearing sandstone, shale, and conglomerate	Coal and uranium with by-product vanadium
<b>EPIGENETIC DEPOSITS</b>			
<i>SEDIMENTARY TERRANES</i>			
SLU	Limestone and dolomite	Limestone and dolomite	Copper or deposits like those of igneous terranes
SGS	Graywacke and shale	Interbedded greywacke and shale with minor volcanic rocks	Gold or deposits like those of igneous terranes

**Central Omar-Kiana area:** Alkalic granitic rocks; favorable for uranium and rare earth elements. Mafic intrusive rocks; favorable for copper and nickel with by-product platinum and cobalt. Undivided felsic volcanic rocks; favorable for copper, lead, and zinc deposits with by-product silver and gold. Undivided sedimentary and felsic volcanic

rocks; favorable for copper, lead, and zinc deposits with by-product silver and gold. Undivided sedimentary and mafic volcanic rocks; favorable for copper and zinc deposits with by-product silver and gold. Ophiolite terrane; favorable for copper, nickel, and chromium deposits with by-product platinum and gold. Limestone and shale; favorable for copper, lead, and zinc deposits. And, Coal-bearing sandstone and shale; favorable for coal and uranium deposits with by-product vanadium (Figure 1b).

**South Seward Peninsula area:** Alkalic granitic rocks; favorable for uranium and rare earth element deposits. Felsic granitic rocks; favorable for tin, tungsten, molybdenum, uranium, and thorium deposits. Intermediate granitic rocks; favorable for copper, gold, and molybdenum deposits. Undivided granitic rocks; favorable for uranium, thorium, rare earths, tin, tungsten, molybdenum, copper, and gold deposits. Alkalic felsic and intermediate volcanic rocks; favorable for epithermal gold, silver, and mercury deposits. Undivided sedimentary and mafic volcanic rocks; favorable for copper and zinc deposits with by-product silver and gold. Ophiolite terrane; favorable for copper, nickel, and chromium deposits with by-product platinum metals and gold. Limestone and shale; favorable for copper, lead, and zinc deposits. Black, carbonaceous shale and limestone; favorable for zinc, lead, barium deposits with by-product silver. Limestone and dolomite; favorable for copper or deposits like those of igneous terranes. Graywacke and shale; favorable for gold deposits or deposits like those of igneous terranes. And, Coal-bearing sandstone and shale; favorable for coal and uranium deposits with by-product vanadium (Figure 1c).

### **KNOWN MINERAL DEPOSIT AREAS (KMDA)**

Known Mineral Deposit Areas (KMDA) are described as a management tool for determining the likelihood of future discoveries in a particular area. They are based on a high concentration of historic mines and prospects, mineral occurrences in the BLM Alaska Mineral Information System (AMIS) database, and favorable geologic trends determined by mineral terrane mapping and have either been identified during mineral assessment studies or shown on the Mineral Terranes of Alaska map (RDI and others, 1995). The most recent version of KMDAs electronically available for the Kobuk-Seward Peninsula Planning Area (RDI and others, 1995) are depicted on Figures 1, 1a-1c. Fourteen KMDAs have been identified with one in the North Red Dog area (Figure 1a), three in the East Ambler area (Figure 1b), one in the Omar-Kiana area Figure 1b), and eight in the South Seward Peninsula area (Figure 1c).

### **HIGH LOCATABLE MINERAL OCCURRENCE POTENTIAL AREAS**

High, medium, and low locatable mineral potential (LMP) areas within the KSP Planning Area have been identified in the Mineral Occurrence and Development Potential Report, Locatable and Salable Minerals written by BLM staff (2005 report, Figures 6a & 6b). Eleven high LMP areas have been identified and are shown on the LMP maps (Figures 2, 2a-2c). The following section is based upon those findings.

### **North Red Dog area:**

***Red Dog High LMP area (Figure 2a):*** Sediment exhalative (SEDEX) and Bedded Barite lode deposits are located in the Red Dog High LMP area. SEDEX deposit types include the Red Dog Mine and the Lik-Su deposit which have the highest zinc-lead-silver potential. The Red Dog Mine is currently in production, has a mine life greater than 40 years, and through 2002 produced 5.9 million short tons of zinc, 970,320 short tons lead, and 59.2 million troy ounces of silver (Szumagala and others, 2004).

### **East Ambler area:**

***Ambler High LMP area (Figure 2b):*** A northwest-southeast trending area in the northern part of the Ambler High LMP area has been identified with high mineral potential. The area contains Kipushi, Kuroko Massive Sulfide, Polymetallic Vein, Serpentine-hosted asbestos lode deposits and placer gold deposits. Kipushi deposits include Jade Mountain Copper, Riley Lode, Ruby Creek (Bornite), and Naniratkohort Creek; Kuroko Massive Sulfide deposits include Arctic Camp, Dead Creek, Ruby, Smucker, and Sunshine Creek; Polymetallic Vein deposits include Wesley Creek; and Serpentine-hosted asbestos include Asbestos Mountain.

Gold placer deposits include Agnes, Bismark, California, Dahl, and Lynx creeks and Shungnak River.

### **Central Omar-Kiana area:**

***Omar-Kiana High LMP area (Figure 2b):*** Two areas have been identified in the Omar-Kiana High LMP area, the northern and southern areas. The northern area contains mainly Kipushi lode and Southeast Missouri Pb-Zn (lead-zinc) deposits and the southern area contains placer gold deposits. The northern area includes the Omar River and Frost Kipushi lode deposits and Powdermilk Southeast Missouri Pb-Zn (lead-zinc) deposit.

The southern area placer gold deposits include Bear, Boldrin, Gold Run, Homestake, Jack, Klery, and Peluk creeks.

### **South Seward Peninsula area:**

***Darby Mountains High LMP area (Figure 2c):*** A north northwest-south southeast trending area in the northern part of the Darby Mountains High LMP area has been identified with high mineral potential. The area contains Polymetallic Vein, Polymetallic Replacement, Low Sulfide Quartz Vein, Sandstone U (uranium), and other (without deposit model) lode deposits and placer gold deposits. Polymetallic Vein deposits include Foster, Omilak, Omilak East, and Unnamed. Low Sulfide Quartz Vein deposits include Otter Creek Lode. The Sandstone U deposit includes Death Valley.

Placer gold deposits include Camp Creek.

***Eastern Seward Peninsula-Western Alaska High LMP area (Figure 2c):*** A north northwest-south southeast trending area in the Eastern Seward Peninsula-Western Alaska High LMP area has been identified with high mineral potential. The area contains Fe Skarn, Pb-Zn (lead-zinc) Skarn, Polymetallic Vein, Polymetallic Replacement, Kuroko Massive Sulfide, Low Sulfide Quartz Vein, and other (without deposit model) lode deposits and placer gold deposits. Fe (iron) Skarn deposits include Billiken. Polymetallic Vein deposits include Independence Mine. Low Sulfide Quartz Vein deposits include Split Creek Lode. The other deposits include Patterson Creek Lode and Peace River.

Placer gold deposits in the northern part include Blank, Candle, Dixie, Gold Run, Jump, Minnehaha, Mud, Patterson, Thomas, Virginia, and Willow creeks. Placer gold deposits in the southern part include Alameda, Bear, Cub, Dime, Eldorado, Flat, Quartz, Rock, Rube, Sheridan, Spring, and Sweepstakes creeks and the Lower Peace River.

***Inmachuk High LMP area (Figure 2c):*** One high mineral potential area has been identified in the Inmachuk High LMP area that contains Polymetallic Replacement and other (without deposit model) lode deposits and placer gold deposits. Polymetallic Replacement deposits include Old Glory Creek Gossan and Pinnell River Gossan. The other deposits include Hannum.

Placer gold deposits include American, Arizona, Cunningham, Milroy, Nelson, and Old Glory Perry creeks; Discovery Gulch; Old Channel; and the Inmachuk and Pinnell rivers.

***Kougarok High LMP area (Figure 2c):*** Two areas have been identified in the Kougarok High LMP area, the northern and southern areas. The northern area contains Sn Greisen, Sn (tin) Skarn, Low Sulfide Quartz Vein, and Porphyry Mo (molybdenum) Low F (fluorine) lode deposits. The southern area contains other (without deposit model) lode deposits. Placer gold deposits are located in both areas. Sn (tin) Greisen deposits include Kougarok Project and Tin Cup. Low Sulfide Quartz Vein deposits include Midnight Mountain. The other deposits include Ward Copper in the north area and Dahl in the southern area.

Placer gold deposits in the northern part include Arctic, Arizona, Bryan, California, Coarse Gold, Dick, Eureka, Goose, Harris, Henry, Homestake, Macklin, Salmon, Taylor, Trinity, and Washington creeks; Dreamy, Mascot, and Merritt gulches; North Fork Kougarok and Kougarok rivers; Lost Surprise and Gurteen Bench. Placer gold deposits in the southern part include Atlas, Boulder, Camp, Coffee, Dahl, Garfield, Grouse, Independence, Joe, Miller, Neva, Quartz, Turner, Windy, and Winona creeks; Anderson, Black, and Buzzard gulches; Lower Kougarok and Noxapoga rivers; and Fox Bar.

***Nome High LMP area (Figure 2c):*** An east-west trending area in the Nome High LMP area has been identified with high mineral potential. The west area contains Low Sulfide Quartz Vein, Simple Sb (tin), Fe (iron) Skarn, Polymetallic Replacement, Kiroko Massive Sulfide, Graphite Vein, Kipushi, and W (tungsten) Skarn lode deposits and placer gold deposits. Low Sulfide Quartz Vein deposits include Boulder Creek,

Breen West, California, Charley, Gold Bug, Glacier Creek, Kern, New Era, Newton Gulch, Pioneer, Rock Creek, Sledge Lode, Sliscovich, Steep Creek, Steiner, Sophie Gulch, and Waterfall Creek. Simple Sb (antimony) deposits include Hed & Strand. Fe (iron) Skarn deposits include Galena, Mogul, Monarch, and Tub Mountain. Polymetallic Replacement deposits include Copper Mountain. Kuroko Massive Sulfide deposits include Christophosen. Graphite Vein deposits include Imuruk Basin Graphite. Kipushi deposits include Quarry. W (tungsten) Skarn deposits include Cabin Creek..

Placer gold deposits in the west area include Alpha, Anvil, Arctic, Balto, Banner, Basin, Bear, Boer, Bonanza, Bourbon, Boulder, Buster, Center, Christian, Cleveland, Darling, Dewey, Dexter, Divining, Dorothy, Dry, Extra Dry, Glacier, Goldbottom, Grouse, Hazel, Hobson, Hungry, Independence, Irene, Jess, Last Chance, Laurada, Lillian, Lindblom, Manila, May, McDonald, Monument, Mountain, Nelson, Oregon, Osborn, Otter, Peluk, Prospect, Quartz, Rock, Rocky Mountain, Rulby, Slate, Sledge, St. Michaels, Sunset, Trilby, Tripple, Twin Mountain, Upper Dry, Upper Sunset, Waterfall, and Willow creeks; Cripple, Nome, Penny, and Stewart rivers; Frisco, Hot Air, Rock Creek, Summit High (Haymaker), and Unnamed High benches; Copper, Fred, Grace, Grass, Green, Grouse, Grub, Mary, Moss, Nekula, Newton, Nugget, Snow, Sophie, Specimen, Stevens, and Washington gulches; Second, Intermediate, Monroeville, Nome, and Third beaches; and Engstrom Dredge and Dredge No. 5.

The east area contains Low Sulfide Quartz Vein, Simple Sb (antimony), Fe (iron) Skarn, Polymetallic Replacement, and Kuroko Massive Sulfide lode deposits and placer gold deposits. Low Sulfide Quartz Vein deposits include Big Hurrah Mine, Camp, Hill Lode, Homestake, Last Chance, Post, and Trilby Mountain. Simple Sb (antimony) deposits include Brookings. Fe (iron) Skarn deposits include Wheeler. Polymetallic Replacement deposits include Fish.

Placer gold deposits in the east area include Adams, Adventuress, Aggie, American, Auburn, Banner, Barney, Basin, Benson, Bertha, Big Four, Big Hurrah, Birch, Bob, Boulder, Butte, Cache, Cahill, California, Camp, Canyon, Chickamin, Coca Cola, Crooked, Daniels, Dawson, Dividend, Dixon, Dome, Dry Mystery, Dutch, Eagle, Eldorado, Elkhorn, El Patron, Fox, Game, Gold, Goldbottom, Goose, Holyoke, Iron, Jerome, Kasson, Koyana, Last Chance, Left Fork Dome, Lion, Melsing, Monument, Moonlight, Mud, Mystery, No Man, Nugget, Ophir, Oversight, Penelope, Pennant, Penny, Quartz, Rabbit, Ready Bullion, Richter, Ridgeway, Rock, Ruby, Ryan, Shoal, Shovel, Silverbow, Slate, Snowball, Spruce, Swede, Sweetcake, Sunshine, Thorpe, Warm, Weasel, Whiskey, Willow, and Wilson creeks; Albion, Balm of Gilead, Bear, Gold Moon, Hardluck, Meddler, Moran, Nugget, Problem, Puzzle, and Sapphire gulches; Daniels and Koyana beaches; Casadepaga, Niukluk, and Solomon rivers; and Ruby Dredging Co. and Northwest Alaska Mining Co.

***Shaktoolik High LMP area (Figure 2c):*** A northeast-southwest trending area in the Shaktoolik High LMP area has been identified with high mineral potential. The area contains placer gold deposits.

Placer gold deposits include Christmas and Ungalik River.

***Shishmaref High LMP areas (Figure 2c):*** Two areas have been identified in the Shishmaref High LMP area, the northern and southern areas. The northern area contains Sn (tin) Vein lode deposits and placer gold deposits. The southern area contains Low Sulfide Quartz Vein lode deposits. Sn (tin) Vein deposits include Ear Mountain Lode.

No historically producing placer gold mines are located in the northern or southern areas.

***Teller High LMP area (Figure 2c):*** A northeast-southwest trending area in the Teller High LMP area has been identified with high mineral potential. The area contains Low Sulfide Quartz Vein and Porphyry Mo (molybdenum) Low F (fluorine) lode deposits and placer gold deposits. Low Sulfide Quartz Vein deposits include Alder Creek Lode.

Placer gold deposits include Alder, Allene, Bering, Canyon, Coyote, Dese, Dewey, Eagle, Hume, McKinley, Moonlight (Igloo Creek), Nolan, Offield, Quartz, Skookum, Sunset, and Windy creeks; Bluestone and Right Fork Bluestone rivers; and Gold Run.

***Wales High LMP area (Figure 2c):*** One northwest-southeast trending area in the Wales High LMP area has been identified with high mineral potential. The area contains Sn (tin) Vein, Sn (tin) Skarn, Fe (iron) Skarn, and Polymetallic Replacement lode deposits and tin and gold placer deposits. Sn Vein deposits include Cape Mountain and Potato Mountain lodes. Sn (tin) Skarn deposits include Black Mountain Lode and Lost River Mine.

Placer tin deposits include Cassiterite, First Chance, Grouse, Iron, and Sutter creeks; Goodwin Gulch; Cape and Potato Mountain. Placer gold deposits include Anikovik River, Anikovik River Beach, and Deer Creek.

## **HISTORICAL EXPLORATION ACTIVITY**

Historical exploration activity is discussed here to describe the extent of current mineral industry activity within the entire planning area. This discussion creates a baseline of understanding as to which target areas the mineral industry is interested and to what extent their activity is occurring. Information for this section comes from numerous sources including the BLM and State of Alaska Department of Natural Resources (ADNR) mining claim databases and annual placer mining and hard rock exploration applications, State of Alaska Division of Geological and Geophysical Surveys (ADGGS) 2003 mineral industry activity report (Szumagala and others, 2004), and BLM Mineral Occurrence and Development Potential Report (BLM, 2005).

### **ANNUAL PLACER MINING APPLICATIONS (APMA'S)**

For any operator planning on conducting exploration or mining activities in the State of Alaska permits and licenses are required by as many as 12 Federal and State agencies.

Operators may participate in the ADNR Bond Pool program as part of AS 27.19.040 Reclamation bonding. The ADNR, Division of Mining, Lands, & Water (ADMLW) and BLM requires that those bonding pool participants planning any surface disturbance occurring from exploration, development, reclamation, transportation of equipment, or placer mining activities performed on mineral properties have an Annual Placer Mining Application (APMA) or an Annual Hardrock Exploration Application (AHEA) submitted and approved under the Placer Mine Permitting Program. AMPAs and AHEAs satisfy the requirement for all permits and licenses required by as many as 12 Federal and State agencies. Mines such as the Red Dog Mine and Rock Creek Project are permitted under the ADNR's Large Mine Permitting Program. During 2004, the last complete year of information, 46 APMA and AHEAs were submitted for projects located within the KSP Planning Area. Five were lode exploration applications, three placer exploration applications, 24 placer mining applications, and 14 offshore mining applications were filed (AK DNR, 2004). APMA are currently being submitted for 2005, but are not discussed in this report due to time constraints. The ADNR has required APMA applications dating back to 1998. APMA and AHEA information is available through the ADNR, ADMLW offices in Anchorage and Fairbanks.

Lode exploration projects include the Ambler and Lik-Su projects on BLM unencumbered and State lands, the Noatak Project (CC group) on State lands, and the proposed Big Hurrah Mine and Rock Creek Project on private lands. Placer exploration projects include the Boulder/Turner Creek project on BLM unencumbered land and Boulder and Clara creeks projects on State lands. Placer mining projects on State lands include Boulder, Dick, Garfield, Gold Run, Iron/Benson, Macklin, Mud, Quartz, Sherrette, and Windy creeks and Nome Beach. One placer mining project on Mystery Creek is located on Native land. Placer mining operations on private-patented lands include Anvil, Candle, Dexter, Dick, Dry, Gold Run, and Sherrette creeks and the Kougarok River. Even though applications have been submitted, there are no placer mining activities on BLM unencumbered land at this time.

## **MINERAL CLAIM STAKING**

Mining claims have been staked throughout the KSP Planning Area for both lode and placer deposits. Extensive claim staking has historically occurred on the Ambler, Darby Mountains, Inmachuk, Kougarok, Nome, Omar-Kiana, Red Dog, Shaktoolik, Shishmaref, Teller, and Wales areas (Figures 2, 2a-2c). As of January 2003 there were a total of 622 Federal claims covering 13,934 acres and as of December 2004 there were a total of 6,652 State claims and 175 State prospecting sites covering a total of 325,800 acres (BLM, 2005). Table 2 lists lode and placer properties, discussed in this report, that are located on BLM unencumbered and State-selected and Native-selected lands that have active Federal or State mining claims and APMA. Active mining claim locations are available electronically from BLM, for Federal claims, and the ADNR, for State claims, on a state-wide basis.

**North Red Dog area:** Federal and State lode claims are located on the Lik-Su property. State lode mining claims are located on the Unnamed (Kukpowruk) property. The Red Dog Mine is located on native land.

**East Ambler area:** Federal and State lode claims are located on the Arctic Camp, Smucker, and Unnamed properties. State lode mining claims are located on the Sunshine Creek (Ruby) property.

**Central Omar-Kiana area:** State lode mining claims are located on the Omar River property. State placer mining claims are located on Gold Run, Homestake, and Klerly creeks.

**South Seward Peninsula area:** Federal lode claims are located on the Christophosen Creek, Graphite Creek, and Imuruk Basin Graphite properties. State lode mining claims are located on the Breen East (Hobson), Charlie Creek, Death Valley, Johns Creek Lode, Manila Ridge, Metal Ridge East, Sliscovich, Unnamed (Bear Creek), Unnamed (Short Creek), and Unnamed (Tubutulik) properties.

Federal placer mining claims are located on Black, Boulder, and Turner creeks and the Ungalik River. State placer mining claims are located on Bear, California, Camp, Charley, Elkhorn, Elkhorn-Niukluk, Goldbottom, Grouse, Hobson, Homestake, Johns, Manila, Pine, Richter, Upper Homestake, and Upper Warm creeks and the Solomon River.

## **HISTORICAL PRODUCTION**

Historic production in the KSP Planning Area has included placer gold and tin which were the main historical commodities produced, along with historical producing lode gold, tin, silver, lead, and zinc deposits. Over 885 mineral locations have been identified in the study area with approximately 470 placer gold and tin occurrences located mainly in the area southeast of the Noatak River. The main placer producing area was on the Seward Peninsula with minor production in the Ambler area (BLM, 2005).

**North Red Dog area:** The Red Dog Mine is the largest zinc mine in the world. Production through 2002 includes 5.9 million short tons of zinc, 970,320 short tons of lead, and 59.2 million troy ounces of silver. Red Dog Mine's expectant mine life is greater than 40 years which would include the additional deposits located in close proximity like the Lik-Su deposit (Szumigala and others, 2004; BLM, 2005).

**East Ambler area:** Historical placer mining produced 15,000 troy ounces gold in the East Ambler area mainly from the Shungnak River and Cosmos, Dahl, and Lynx creeks. There has been no reported lode production from this area (Szumigala and others, 2004; BLM, 2005).

**Central Omar-Kiana area:** Historical placer mining produced approximately 40,600 troy ounces gold in the Central Omar-Kiana area mainly from the Boldrin, Gold Run, and

Klery creeks. There has been no reported lode production from this area (Szumigala and others, 2004; BLM, 2005).

**South Seward Peninsula area:** The southern Seward Peninsula is the main placer producing area and has seen activity since the 1898 gold strike at Anvil Creek. Since that

Table 2. Lode and placer properties on BLM unencumbered, State-selected, and Native-selected lands with active mining claims and/or APMA's located in the Kobuk-Seward Peninsula Planning Area.

Deposit name	ARDF/AMIS no.	Land status	Mining claims	APMA no. (2004)	Deposit type
<b>NORTH RED DOG AREA</b>					
Lik-Su	DL005/018-001	State	Federal & State	F049339	Lode
Unnamed (Kukpowruk)	DL008/018-016	State-selected	State	None	Lode
<b>EAST AMBLER AREA</b>					
Arctic Camp	AR025/028-004	State	Federal & State	F049785	Lode
Smucker	AR033/028-033	State-selected	State	None	Lode
Sunshine Ck (Ruby)	AR028/028-042	State	State	None	Lode
Unnamed	AR034/028-069	State-selected	Federal & State	None	Lode
<b>CENTRAL OMAR-KIANA AREA</b>					
Gold Run Creek	BM008/027-006	State-selected	State	None	Placer
Homestake Creek	BM009/027-011	State-selected	State	None	Placer
Klery Creek	BM005/027-001	State-selected	State	None	Placer
<b>SOUTH SEWARD PENINSULA AREA</b>					
Bear Creek	CA026	BLM	State	None	Placer
Bear Creek	CA027/045-029	BLM	State	None	Placer
Black Gulch	BN018/044-058	State-selected	Federal	None	Placer
Boulder Creek	BN015/044-059	State-selected	Federal	F047271 F049434	Placer
Breen East (Hobson)	NM085/052-267	State-selected	State	None	Lode
California Creek	BN030/044-045	State-selected	State	None	Placer
Camp Creek	SO057/053-194	State-selected	State	None	Placer
Charlie Creek	NM048/052-029	State-selected	State	None	Lode
Charley Creek	NM047/052-028	State-selected	State	None	Placer
Christophosen Creek	TE103	State-selected	Federal	None	Lode
Death Valley	BN089/044-157	State-selected	State	None	Lode
Elkhorn Creek	SO056	State-selected	State	None	Placer
Elkhorn-Niukluk	053-190	State-selected	State	None	Placer
Goldbottom Creek	SO058/053-198	State-selected	State	None	Placer
Graphite Creek	TE105	State-selected	Federal	None	Lode
Grouse Creek	BN090/044-105	State-selected	State	None	Placer
Hobson Creek	NM084/052-106	State-selected	State	None	Placer
Homestake Creek	BN037/044-052	State-selected	State	None	Placer
Imuruk Basin Graphite	TE103/043-030	State-selected	Federal	None	Lode
Johns Creek	053-072	State-selected	State	None	Placer
Johns Creek Lode	SO141/053-059	BLM	State	None	Lode
Manila Creek	NM098/052-110	State-selected	State	None	Placer
Manila Ridge	052-113	State-selected	State	None	Lode
Metal Ridge East	NM059/052-252	State-selected	State	None	Lode
Pine Creek	053-037	State-selected	State	None	Placer
Richter Creek	SO051/053-195	Native-selected	State	None	Placer
Sliscovich	NM086/052-114	State-selected	State	None	Lode
Solomon River	SO137	BLM	State	None	Placer
Turner Creek	044-063	State-selected	Federal	F049061	Placer
Ungalik River	NR009/054-001	Native-selected	Federal	None	Placer
Unnamed (Bear Creek)	045-084	BLM	State	None	Lode

Unnamed (Short Ck)	NM116	State-selected	State	None	Lode
Unnamed (Tubutulik)	BN085/044-173	State-selected	State	None	Lode
Upper Homestake Ck	BN038	State-selected	State	None	Placer
Upper Warm Creek	053-197	Native-selected	State	None	Placer

strike over 5 million troy ounces of gold have been recovered by nearly 20,000 prospectors in the Cape Nome Mining District. An additional 1.5 million troy ounces of gold has been mined from the Council, Kougarok, Port Clarence, Koyuk, and Fairhaven mining districts in the Seward Peninsula. During 2003, placer mining occurred at five placer operations which produced 1,000 troy ounces of gold. Placer tin has been produced from the alluvial deposits at Cape and Potato mountains and Buck and Cape creeks on the western tip of the Seward Peninsula. Over 81 million pounds of tin has been produced up through the 1950's (Szumigala and others, 2004; BLM, 2005).

Historical lode gold production in the South Seward Peninsula area came from the Big Hurrah Mine which produced 27,000 troy ounces of gold between 1903 and 1907. Lode tin production, on the western tip of the Seward Peninsula, came mainly from the Lost River Tin Mine which produced 315 short tons of tin-tungsten-fluorite ore in the early 1950's. Graphite, iron, beryllium, tungsten, asbestos, and fluorite were mined at Tin City (Szumigala and others, 2004; BLM, 2005).

## EXPLORATION ACTIVITIES

The ADGGS publishes yearly reports outlining mineral exploration activities in Alaska. The following information is based on the current information for 2003 for the KSP Planning Area (Szumigala and others, 2004). Exploration activity proposals during 2004 were identified with the submittals of the APMA's or AHEA's.

**North Red Dog area:** There are no identified exploration projects reported in the North Red Dog area as of 2003 (Szumigala and others, 2004). Two AHEA exploration projects were submitted for the Lik-Su and Noatak Project (CC group) projects for 2004 (AK DNR, 2004). No APMA placer mining projects were submitted for 2004 (AK DNR, 2004).

**East Ambler area:** There are no identified exploration projects reported in the East Ambler area as of 2003 (Szumigala and others, 2004). One AHEA exploration project was submitted for the Arctic Camp Project for 2004 (AK DNR, 2004). No APMA placer mining projects were submitted for 2004 (AK DNR, 2004).

**Central Omar-Kiana area:** There are no identified exploration projects reported in the Central Omar-Kiana area as of 2003 (Szumigala and others, 2004). No APMA or AHEA exploration projects were submitted for 2004 (AK DNR, 2004).

**South Seward Peninsula area:** Alder Resources Inc. and subsidiary Royal Pretoria Gold Ltd. continued exploration on the Area 51 property, located 51 miles north of Nome during 2003. Soil samples were collected with results up to 0.219 troy ounces gold per ton and 1.65 percent arsenic. Rock samples collected contained up to 1.12 troy ounces

gold per ton and a trench contained a 20-foot-wide zone containing up to 0.2 troy ounces gold per ton. Mineralization consists of semi-massive pyrite, pyrrhotite, and arsenopyrite hosted in mafic schist. Alder Resources Inc., in cooperation with Bering Straits, Native Corp., prospected placer gold properties along Ophir Creek. Soil samples and 50 stream-sediment samples were collected along the stream (Szumigala and others, 2004). Two AHEA exploration projects were submitted for the Big Hurrah Mine and Rock Creek lode projects and three APMA exploration projects were submitted for the Boulder, Boulder/Turner, and Clara creek placer projects for 2004 (AK DNR, 2004).

## **FIELD STUDIES – FEDERAL AND STATE**

No known field studies are currently being conducted in the KSP Planning Area by any pertinent Federal or State agency.

The ADGGS has completed geologic mapping and geochemical sampling as part of the airborne geophysical surveys being conducted for the Council area on the Seward Peninsula (Szumigala and others, 2004).

## **GEOPHYSICAL SURVEYS**

Very limited geophysical data is readily available for the KSP Planning Area. These data sets are routinely used in the identification/interpretation of mineral resource and potential. The ADGGS is conducting a geophysical survey program in the KSP Planning Area covering areas prospective for mineral deposits. Geophysical survey data, including electromagnetic and total field aeromagnetic surveys, was published for the Council Area of the Seward Peninsula in 2003, covering portions of the Solomon and Bendeleben quadrangles. Geophysics data, including airborne-electromagnetic and aeromagnetic surveys, collected in the Nome area during 1993-94 was released in 2004 (BLM, 2005).

U.S. Geological Survey (USGS) data sets covering the planning area include Alaska aeromagnetic compilation, digital grids, and survey data (Open-File Report 97-520). The aeromagnetic compilation maps represent data from numerous separate surveys, digitized maps, and previous gridded compilations. A digital re-release of the data was published in 1999 (Open-File Report 99-0503). Merged aeroradiometric data for Alaska, gridded data and plot files, was published in Open-File Report 99-0016. This publication contains uranium, potassium, and thorium equivalent concentration in red-green-blue format for the North Slope and Brooks Range (BLM, 2005).

No other known airborne geophysical programs have been conducted by Federal or State agencies within the KSP Planning Area.

## **NEW DEPOSIT DISCOVERIES**

The ADGGS publishes yearly reports outlining mineral exploration activities in Alaska. No new mineral deposit discoveries were reported during 2003 for the KSP Planning Area (Szumigala and others, 2004).

## PAST AND PRESENT DEVELOPMENT ACTIVITY

Past and present development activity is discussed here to characterize the extent of current mineral industry activity within the entire planning area. This discussion creates a baseline of understanding regarding the mineralized targets of interest to the mineral industry and to what extent their development activities are occurring. Information for this section comes from numerous sources including the ADGGS Alaska's Mineral Industry 2003 activity report (Szumagala and others, 2004) and the BLM Mineral Occurrence and Development Potential Report (2005).

### PAST DEVELOPMENT ACTIVITY

There has been extensive development activity within the KSP Planning Area boundary including large scale mining operations. Lode mine operations include the Red Dog Mine, Omilak lead, zinc, silver lode deposits; the Big Hurrah gold lode deposit; and the Lost River tin lode deposit. Placer mine operations include tin on Buck and Cape creeks, Potato Mountain, Cape Mountain; placer gold on Anvil, Boldrin, Cosmos, Dahl, Klery, Gold Run, and Lynx creeks; Nome Beach and offshore; and Shungnak River.

Table 3 lists those lode mineral occurrences containing resource estimates in the KSP Planning Area boundary (see Table 4 for the resource figures). This information was derived using the BLM's AMIS (USBM, 2004) and the USGS's Alaska Resources Data Files (ARDF) data bases.

Table 3. Lode mineral occurrences containing resource estimates in the Kobuk-Seward Peninsula Planning Area.

Deposit name	ARDF/AMIS no.	Commodities	Deposit type	Land status
<b>NORTH RED DOG AREA</b>				
Lik-Su	DL005/018-001	Pb, Zn, Ag, Ba, Cd	Sed Exhalative Zn-Pb (Cox 31a)	State
Red Dog	DL001/018-002	Pb, Zn, Ag, Ba	Sed Exhalative Zn-Pb (Cox 31a)	Native
<b>EAST AMBLER AREA</b>				
Arctic Camp	AR025/028-004	Ag, Au, Cu, Pb, Zn	Kuroko massive sulfide (Cox 28a)	State
Ruby Ck (Bornite)	AR018/028-002	Cu, Ag, Au, Co	Kipushi Cu-Pb-Zn (Cox 32c)	Native
Smucker	AR033/028-033	Ag, Cu, Pb, Zn	Kuroko massive sulfide (Cox 28a)	State-selected
Sunshine Ck (Ruby)	AR028/028-042	Cu, Pb, Zn	Kuroko massive sulfide (Cox 28a)	State
<b>CENTRAL OMAR-KIANA AREA</b>				
Frost	BM011/027-028	Ba, Cu, Zn, Ag, Pb	Kipushi Cu-Pb-Zn (Cox 32c)	State
Omar River	BM012/027-020	Cu, Co	Kipushi Cu-Pb-Zn (Cox 32c)	State
<b>SOUTH SEWARD PENINSULA AREA</b>				
Big Hurrah Mine	SO023/053-057	Ag, Au, Cu, W, Zn	Low-sulfide Au qtz (Cox 36a)	Native-selected
Billiken	BN075/044-121	Cu, Fe, Ag, Au	Fe skarn deposits (Cox 18d)	State
Death Valley	BN089/044-157	U, Th	Sandstone U (Cox 30c)	State-selected
Imuruk Basin Graphite	TE103/043-030	Graphite	Unconformity U-Au (Cox 37a)	State-selected
Monarch	NM017/052-003	Fe, Au, Mn, Pb, Zn	Unknown	State

Rock Creek Project	SO013/053-055	Au	Low-sulfide Au qtz (Cox 36a)	Native
Tub Mtn.	NM018/052-002	Fe, Mn	Unknown	State

## PRESENT DEVELOPMENT ACTIVITY

The ADGGS publishes yearly reports outlining mineral development activities in Alaska. The following information is based on the current information for 2003 (Szumigala and others, 2004) covering the entire planning area.

**North Red Dog area:** No current development activity has been reported in the North Red Dog area (Szumigala and others, 2004).

**East Ambler area:** No current development activity has been reported in the East Ambler area (Szumigala and others, 2004).

**Central Omar-Kiana area:** No current development activity has been reported in the Central Omar-Kiana area (Szumigala and others, 2004).

**South Seward Peninsula area:** NovaGold Resources Inc. reportedly conducted development activities at its Rock Creek Project near Nome. Activities included engineering, feasibility studies, 36,000 feet of drilling, and a detailed economic assessment study. The assessment was for an open-pit mine with a 4.4:1 stripping ratio (tons of waste rock to ore) using electrical power supplied by Nome Joint Utilities. Resource estimates reported to be 11,786,000 short tons of ore grading 0.059 troy ounce gold per ton, for 550,000 troy ounces (Szumigala and others, 2004).

Placer properties controlled by NovaGold Resources Inc. include the 90 square mile Nome Project in the Nome area. Resource estimates of 2.26 million troy ounces of gold in a 295 million cubic yard sand and gravel aggregate source. Resource estimates are based on over 7,000 drill holes (Szumigala and others, 2004).

## MINING ACTIVITY

The ADGGS publishes yearly reports outlining mining/production activities in Alaska. The following information is based on the current information for 2003 (Szumigala and others, 2004) covering the entire planning area. Placer mining activity proposals during 2004 were identified with the submittals of the ADNDR APMAs.

**North Red Dog area:** Teck Cominco Ltd.-NANA Regional Corp's Red Dog Mine near Kotzebue milled 3,476,700 short tons of ore resulting in 137,679 short tons of lead, 7,701,000 troy ounces of silver, and 638,569 short tons of zinc. Ore grade was 21.7 percent zinc, 6.2 percent lead, and 3.1 percent silver per ton. Operating profit for 2003 was \$50 million employing 388 people, 56 percent NANA Corp. shareholders (Szumigala and others, 2004). No APMA placer mining projects were submitted for 2004 (AK DNR, 2004).

**East Ambler area:** No current mining activity has been reported in the East Ambler area (Szumigala and others, 2004). No APMA placer mining projects were submitted for 2004 (AK DNR, 2004).

**Central Omar-Kiana area:** No current mining activity has been reported in the Central Omar-Kiana area (Szumigala and others, 2004). No APMA placer mining projects were submitted for 2004 (AK DNR, 2004).

**South Seward Peninsula area:** Six placer operations were reported in the South Seward Peninsula area producing 1,303 troy ounces of gold. The exact properties are not known, but Dry Creek, Kougarok Creek, and Nome Beach were the reported locations (Szumigala and others, 2004). Twenty four APMA's were submitted for the Anvil, Boulder, Candle, Darling, Dexter, Dick, Dry, Garfield, Gold Run, Iron/Benson, Macklin, Mud, Mystery, Quartz, Sherrette, and Windy creeks and the Kougarok River and Nome Beach placer mining projects for 2004. Fourteen APMA placer mining projects were submitted for the Nome offshore area for 2004 (AK DNR, 2004).

## **INDUSTRIAL MINERALS**

Industrial minerals have been identified within the KSP Planning Area as discussed in the BLM Mineral Occurrence and Development Potential Report (BLM, 2005). All of the occurrences discussed are located in the East Ambler and South Seward Peninsula areas. Occurrences in the East Ambler area include asbestos at the Asbestos and Jade mountains, Jade Hills, and Wesley Creek properties; jade at the Asbestos and Jade mountain properties; and talc at the Asbestos Mountain property. Occurrences in the South Seward Peninsula area include graphite at the Imuruk Basin Graphite prospect and fluorite as a gangue mineral at the Lost River Mine (BLM, 2005).

Demand for industrial minerals is being provided by other sources outside of the KSP Planning Area. None of the industrial mineral deposits within the planning area will be developed in the near future, as the cost of development and remote location make the deposits uneconomic. There is no foreseeable development potential for industrial minerals from BLM unencumbered, State-selected, or Native-selected lands, thus industrial minerals will not be discussed further as part of this report.

## **SALABLE MATERIALS**

Salable materials including sand & gravel, building stone, pumice, clay, and limestone are common throughout the KSP Planning Area (BLM, 2005). Production of sand & gravel during 2003 is reported by the State of Alaska to include a small amount from the Nome area in the South Seward Peninsula area. Totals include 295 million cubic yards of sand and gravel aggregate in the NovaGold Resources Inc. Nome Project area (Szumagala and others, 2004). There are no known current salable material activities on BLM unencumbered, State-selected, or Native-selected lands within the KSP Planning Area.

Future sand and gravel needs for the KSP Planning Area will be well supplied, long into the future by the NovaGold Resources Inc. resource. There is no foreseeable development potential for salable materials from BLM unencumbered, State-selected, or Native-selected lands, thus salable materials will not be discussed further as part of this report.

## **BASELINE SCENARIO ASSUMPTIONS AND MODELS**

This section provides background information used to estimate effects of developing lode and placer mineral occurrences located on BLM unencumbered lands, State-selected, and Native-selected lands. This section is also where estimated disturbances and cumulative impacts from such development are identified and discussed. This process requires an estimate of the economic viability for three types of mining operations within the KSP Planning Area; open pit, underground, and placer operations.

### **LOCATABLE MINERALS ECONOMIC ASSUMPTIONS**

Because many of the identified occurrences are unexplored, some assumptions about the deposits and likely development scenarios are required. The purpose of this discussion is to present schematics based on mining methods, and estimate the amount of disturbance resulting from those activities through the year 2020. All discussions are based upon the following assumptions.

- All potentially productive areas are open to mineral entry except those closed by law, regulation, or executive order. Lands discussed in this report include BLM unencumbered lands and active Federal mining claims on State-selected and Native-selected lands.
- Land conveyances are scheduled to be completed and withdrawals lifted by 2010, which would allow for exploration and development by 2020 on those overselected lands that return to BLM domain. Lands conveyed to the State of Alaska and Native Corporations could be open to mineral exploration and development under the jurisdiction of the new land owners.
- Additional exploration and development in parts of the planning area will increase the known reserve base which could make mining economically feasible.
- Current management decisions influence current exploration investments for long-term development, beyond 2020. In particular, any restrictions on near-term access may preclude or delay future development.
- The mine models created for this report are hypothetical mining and milling scenarios made without the authors exploring potential mine sites or determining significant information about ore bodies and environmental conditions. However, the starting points for the estimates are active mines of a similar nature. As noted above, there is one operating open pit lead-zinc mine, one near-development open pit gold mine, and numerous operating placer mines in the area. The Red Dog Mine and Rock Creek Project are used as examples for the type of lode mine development that might be seen on BLM unencumbered, State-selected, and Native-selected lands. All disturbance estimates would be increased or decreased

by different terrain, deposit size, ore grade, mine development requirements, and energy and transportation requirements.

- This analysis is based on information that is currently available to the public. Confidential or proprietary data was not included in this report. In some instances, additional exploration has occurred, but the results are not available to the public. There may be instances where the economic viability of an occurrence has been determined and is different than presented in this document. The authors know of no such case at the time of writing.

## **MINING PROCESS DISCUSSION**

The mining process generally consists of exploration, development, extraction, processing, and reclamation.

Mineral exploration begins with prospecting, which is generally inexpensive and results in little environmental impact. Access to remote areas is generally the most expensive part of prospecting in Alaska, but other significant expenses include geochemical sampling, geophysical surveying, satellite remote sensing, and other sophisticated methods for identifying mineral deposits. After identifying a valuable target on open public (Federal) land, the prospector will stake and record claims. A claimant begins target testing to confirm the presence of a deposit and determine its size, shape, characteristics, and mineral grade. This requires trenching and drilling test holes over an extended area. Because of the expense, trenching and drilling is generally limited to the extent necessary to identify sufficient resources/reserves which would support the costs of development. Helicopter use can limit surface impacts where road building would otherwise be required. If the target location appears to be economic, the prospector will apply for appropriate permits to develop and operate a mine.

Mine development prepares the site for extraction, and primarily involves establishing the infrastructure necessary to mining. This includes power and water supplies, support and mineral processing facilities, and transportation facilities such as roads and airplane landing sites. Surface locations for ore stockpiles, waste rock, heap leach piles (if used), and tailings impoundments are also prepared. For an open pit mine, initial stripping of surface soils and overburden uncovers the ore body. For an underground mine, shafts or adits, drifts, crosscuts, ramps, and raises are excavated. Development generates substantial capital costs, and involves environmental impacts over the area of development. A large mine and associated facilities might cover a few thousand acres, with much of the surface disturbance occurring during development. Continued exploration activities, including trenching and drilling, are occurring during this period to expand the grade and resource/reserve figures of the deposit.

Extraction (or mining) is generally defined by drilling, blasting, loading, and hauling the ore out of the open pit or underground workings. Waste material may be used to backfill large mined-out areas in surface or underground workings. Continued mining will result in growing waste dumps, heap leach piles, tailings ponds, and other surface disturbances. Continued exploration activities, including trenching and drilling, are occurring during

this period to expand the grade and resource/reserve figures of the deposit. With placer mining, generally a short section of a surface stream is relocated, the old streambed is cleared, and exposed gravels are processed through sluices. The stream is returned to its former location as part of the reclamation of the area. Suction dredging of placer deposits does not require stream relocation because a pump suctions sediment from the stream bottom to process through sluices.

Mineral processing at a lode mine mill site concentrates the ore material before shipment to a smelter or refinery. Exceptions to this include some copper ores that may be refined on site, and placer metals that are already concentrated. Concentrating includes crushing and grinding the ore, then putting the resulting material through physical or chemical processes to separate the valuable minerals from waste tailings. These tailings are disposed of in tailings ponds near the site, and the water is generally recycled for reuse at the mine. The tailings may contain trace amounts of minerals, waste rock, and chemicals from processing. At some locations, tailings from old mine workings are re-milled with modern processes that allow additional mineral recovery. Tailings may be used to backfill underground stopes (voids). Tailings ponds are engineered to high standards to prevent discharge of acid runoff.

Reclamation is complete when the area is returned to beneficial non-mining use. Common practices include capping waste dumps and tailings piles with soil, removing buildings and roads, planting appropriate ground cover, and directing water flow to minimize acid runoff. This requires long-term monitoring to assure the efforts function as expected.

## **MINING METHOD SCHEMATICS AND MINING PRODUCTION RATES**

This section categorizes identified mineral deposits by the method that may be used to extract the resource based largely on expected deposit characteristics and in part on the expected costs of certain activities. Open pit mining is occurring at the Red Dog Mine in the North Red Dog area, and is planned for the Rock Creek Project in the South Seward Peninsula area. Underground mining methods have historically been used in the area, and are suited to certain types of deposits, particularly those occurring at depth. Open pit mines may revert to underground methods as the deposit is being mined at greater depths. Placer mining methods are extensively used in the Seward Peninsula area on mineral deposits in streambeds, stream benches, along active and historical beach lines, and offshore.

### **Lode Deposits**

Factors affecting the size of a proposed mine include the amount of ore to be mined, the depth to the ore and the thickness of orebody, the amount of waste and tailings to be disposed of, the distance to powerlines, the distance to employee housing, and the local topography. For that reason, only gross estimates of disturbance can be developed, even where some resource/reserve information about a deposit is available. Rather than attempt a location-by-location estimate where resource size is unknown, Table 4 presents statistical estimates of disturbance for deposits in the area for which a resource size has

been estimated. These estimates are based on existing operations in the area and elsewhere, and generally reflect a moderate stripping ratio of overburden to ore for surface mining or depth from surface for underground operations. These are order of magnitude estimates, meaning they may be 50% higher or lower as the result of unknown or unforeseen circumstances. Note that the production estimates for the Red Dog Mine and Rock Creek Prospect do not exactly correspond to actual experience or published plans. Rock Creek Prospect appears to intend to mine at a faster rate than estimated using Taylor's Rule (Hoskins, 1977). Red Dog Mine is mining at a slower pace, though this table is based only on the main deposit (Teck Cominco, 2005). Variance from these estimates does not reflect on efficiency or management but is the result of mining and transportation conditions inherent in the deposit.

Table 4. Lode deposits in the Kobuk-Seward Peninsula Planning Area with published resource estimates.

Deposit name	Resources (short tons)	Reference	Estimated ore mining rate (short tons/day)	Model mine method	Estimated disturbed acres
<b>NORTH RED DOG AREA</b>					
Lik-Su	27,500,000	Schmidt, 1997	5,425	OP	1,221
<b>Red Dog Mine</b>	<b>55,700,000</b>	Szumigala and others, 2004	<b>9,211</b>	<b>OP</b>	<b>1,489</b>
<b>EAST AMBLER AREA</b>					
Arctic Camp	37,000,000	Newberry and others, 1997	6,777	OP	1,327
Ruby Creek (Bornite)	100,000,000	Szumigala and others, 2004	14,286	UG	1,223
Smucker	7,200,000	Newberry and others, 1997	1,986	OP UG	837 282
Sunshine Creek (Ruby)	4,000,000	Newberry and others, 1997	1,278	OP UG	709 203
<b>CENTRAL OMAR-KIANA AREA</b>					
Frost	9,000,000	Szumigala and others, 2004	2,347	UG	319
Omar River	35,000,000	BLM, 1994	6,501	UG	681
<b>SOUTH SEWARD PENINSULA AREA</b>					
Big Hurrah Mine	100,000	Szumigala and others, 2004	80	UG	26
Billiken	100,000,000	Newberry and others, 1997	14,286	OP UG	1,757 1,223
Death Valley	3,700,000	Szumigala and others, 2004	1,205	OP <i>UG</i>	693 <i>194</i>
Imuruk Basin Graphite	65,000	Hudson, 1998	58	<i>OP</i> UG	222 20
Monarch	500,000	Hawley and Hudson, 2002	55,000	UG	19
<b>Rock Creek Prospect</b>	<b>11,786,000</b>	Szumigala and others, 2004	<b>2,874</b>	<b>OP</b>	<b>827</b>
Tub Mountain	8,000	Hawley and Hudson, 2002	13	UG	7

**Bold** indicates operating or proposed operations. OP = Open pit. UG = Underground.

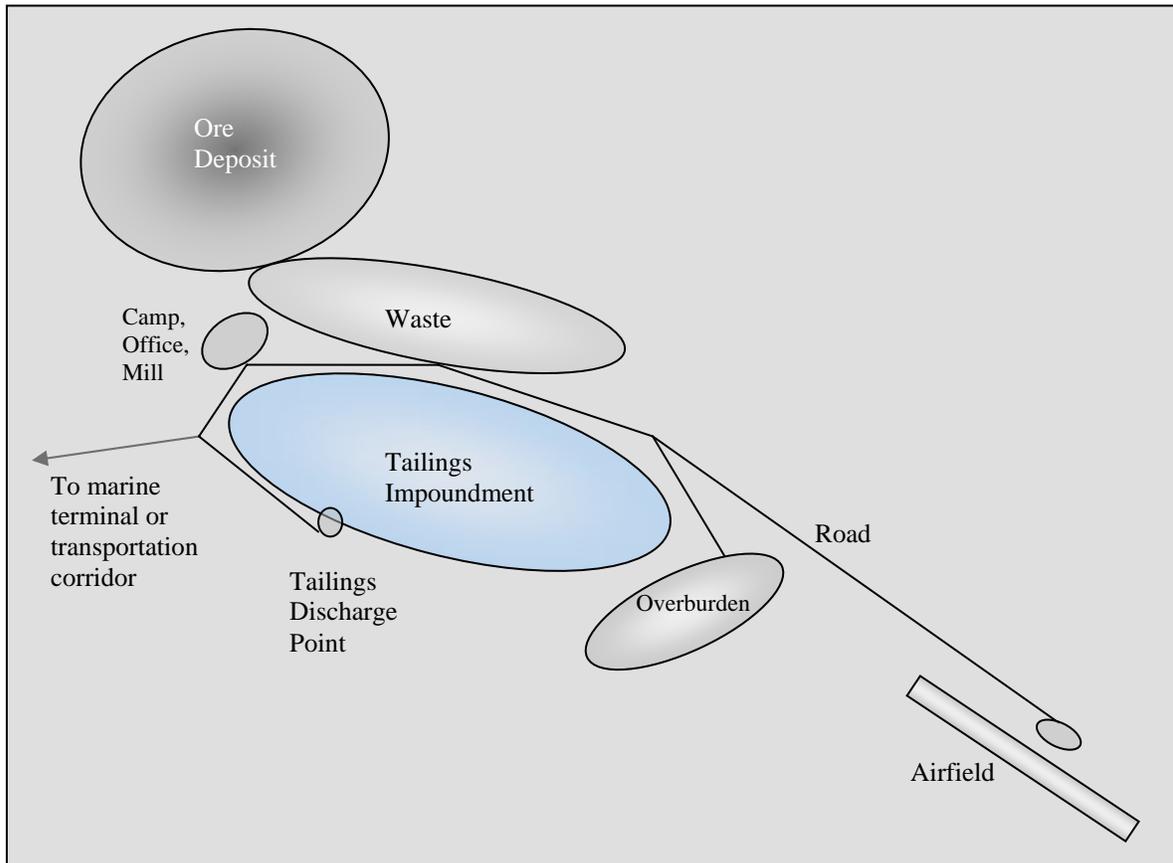
*Italic* indicates an alternative development scenario to the information contained below.

Within this section, information from similar resources/reserves in other areas is used to estimate the size of occurrences that have not yet been delineated. This allows an estimate of the disturbance that could result from development of occurrences located on unencumbered BLM land, State-selected, and Native-selected lands within the KSP Planning Area. The primary deposit model source used by the authors is the USGS Mineral Deposit Models Bulletin by Cox & Singer (1986). Where information from the deposit or nearby deposits was substantially different from the Cox and Singer model, the local information was used. Appendix 1 lists the occurrences, land status, deposit model type, resource/reserve estimates, mining method and production rates, and their estimated disturbed acreages.

### **Open Pit Mining Methods**

An open pit mine will generally include the mine pit, overburden and waste rock piles, tailings impoundment, a mill and facilities location, and associated roads. Facilities are necessary for offices, warehouses, washhouses, lunchrooms, and equipment bays. Remote Alaskan sites may include an employee camp, electrical generation plant, airfield, marine terminal, and road between the mill and the terminal that may be some distance. The Red Dog Mine requires fuel and ore concentrate storage by the mill, a road

Figure 3. Example of an open pit mine layout.



of over 50 miles in length, and a marine terminal with additional fuel and ore concentrate storage because the terminal is icebound most of the year. Water runoff toward the site will be controlled to divert flow around the mine operations. A possible layout for an open pit mine is shown in Figure 3.

The following selected occurrences in the KSP Planning Area may be mined by open pit mining methods. These occurrences are ranked as high or medium probability of reasonably foreseeable development. They either have lode claims located on them or have reported elevated mineral values. Only those with high and medium potentials are likely to be explored or developed during the life of the plan and thus will be a part of this discussion. All other occurrences have been identified with low potentials and are not discussed further in this report.

### North Red Dog area:

Deposit name	ARDF/AMIS no.	Commodities	Deposit type	Land status
Unnamed (Kukpowruk)	DL008/018-016	Cu	Unknown	State-selected

**Unnamed (Kukpowruk):** A deposit of unknown characteristics has an unknown probability of development within 15 to 20 years; however, it is likely that additional exploration will occur on this deposit. Such exploration will likely disturb less than 5 acres, though as much as 15 might be disturbed in the process of delineating a significant resource. The disturbed area would be reclaimed during the period unless exploration defined sufficient reserves for development. It is not possible to estimate disturbance resulting from development or production based on available information.

**Conclusion:** Five acres of disturbance might occur during the upcoming 15 to 20 years, with subsequent reclamation.

### East Ambler area:

Deposit name	ARDF/AMIS no.	Commodities	Deposit type	Land status
Jade Mtn Copper	AR005/028-031	Cu, Pb	Kipushi Cu-Pb-Zn (Cox 32c)	Native-selected
Smucker	AR033/028-033	Cu, Pb, Zn, Ag	Kuroko massive sulfide (Cox 28a)	State-selected
Unnamed	AR034/028-069	Cu	Unknown	State-selected

**Jade Mountain:** The copper deposit at Jade Mountain has analytical data from one sample (Nelson, 1997) that results in a recoverable metal value of \$10.73 using a 5-year average price. No estimate of resources/reserves is given. The Kipushi Cu-Pb-Zn (copper-lead-zinc) model (Cox and Singer, 1986) provides a description but no statistical information on quantity or grade for similar deposits. However, the nearby Ruby Creek Mine is one of the examples cited for the deposit type. The Ruby Creek Mine has estimated reserves of 100 million short tons, which might result in a mining rate of over 14,000 short tons of ore per day (Nelson, 1997). Mining costs for this type of deposit have not been estimated for this area. The low metal value makes development unlikely unless additional exploration identifies higher grade ore. Exploration within the next 15

to 20 years might result in 5 acres of disturbance and 1 acre of reclamation. Development is not anticipated before 2020.

**Smucker:** Based on available quality estimates, the recoverable metal value for the Smucker prospect is \$85.20 per short ton, with an estimated 7.2 million short tons of ore and an anticipated mining rate of nearly 2,000 short tons per day. Mining costs have not been estimated for the area, but in the nearby Koyukuk Mining District, Kuroko massive sulfide deposit mining required a recoverable metal value of \$368 per ton for a deposit much smaller than Smucker (Coldwell, 2002). However, that model incorporates underground mining methods and a 200-mile road, unlike expectations for the Smucker deposit. In the same report, an open pit copper porphyry mine with a mining rate of 3,900 short tons per day required a recovered metal value of \$90 per short ton. The Koyukuk model is about twice the size estimated for Smucker, so the required metal value for a similar type of mine at Smucker would be somewhat higher, over \$100 per short ton. This assumes all other factors are the same or similar, i.e. transportation over a shorter road but requiring a river port and barges with similar capital and operating costs. Increases in mineral prices make development and production likely to occur during the reasonably foreseeable future. As noted above, development and production at the Smucker deposit is estimated to result in 840 acres of disturbance for the mine, facilities, landing strip, port, and roads.

**Unnamed:** A deposit of unknown characteristics has unknown development potential within the next 15 to 20 years; however, it is likely that additional exploration will occur on this deposit. Such exploration will likely disturb less than 5 acres, though as much as 15 might be disturbed in the process of delineating a significant reserve. It is not possible to estimate disturbance resulting from development or production based on available information.

**Conclusion:** Exploration at Jade Mountain Copper and the Unnamed deposit are expected to disturb a total of 10 acres (5 acres each) while development and production of the Smucker prospect is expected to disturb 840 acres before 2020. The exploration is expected to be reclaimed if the locations are not promising.

**South Seward Peninsula area:**

Deposit name	ARDF/AMIS no.	Commodities	Deposit type	Land status
Alpha Ridge	NM171/052-298	Au, Pb, Sb, Zn	Low-sulfide Au qtz (Cox 36a)	Native-selected
Beltz/Split Creek	CA048/045-015	Cu, Pb, Zn, Ag	Unknown	BLM
Christophosen Creek	TE103	Graphite	Unknown	State-selected
Death Valley	BN089/044-157	U, Th	Sandstone U (Cox 30c)	State-selected
Graphite Creek	TE105	Graphite	Unknown	State-selected
Imuruk Basin Graphite	TE104/043-030	Graphite	Unknown	State-selected
Manila Ridge	052-113	Cu	Unknown	State-selected
Metal Ridge East	NM059/052-252	Cu, Pb, Zn, Au	Unknown	State-selected
Unnamed (Kougarok)	BN034	Cu	Unknown	State-selected
Unnamed (Short Ck)	NM116	Au	Unknown	State-selected
Unnamed (Tubutulik)	BN085/044-173	Bi	Unknown	State-selected

**Alpha Ridge:** Alpha Ridge prospect has an apparent recoverable metal value of about \$5 per short ton, based on available information and recent market prices. Although this deposit type is typically mined by underground methods, the location is along a ridge that might make open pit mining preferable, at least for the upper portion of the deposit. No reserve estimate is provided. The Low-sulfide Au-(gold) qtz deposit model (Cox & Singer, 1986) has a mean reserve of 33,000 short tons. For an underground quartz vein mine in the Koyukuk Mining District with a similar reserve size, an anticipated mining rate is 36 short tons per day, and off-site milling, the required metal value is \$521 per short ton (Coldwell, 2002). No corresponding surface mine model was developed to estimate costs for the Koyukuk Mining District. While open pit mining may be less expensive than underground mining, it would not be 96% less, particularly for a small operation such as Alpha Ridge might be. Exploration in the 1990s may have resulted in information that improves the economics of this prospect, but based on available information, development seems unlikely in the foreseeable future. If it occurs, it could result in 180 acres of surface disturbance. Given recent exploration history for the prospect, additional exploration also seems unlikely with 0 acres of disturbance anticipated.

**Christophosen Creek, Graphite Creek, and Imuruk Basin Graphite:** Christophosen Creek, Graphite Creek, and Imuruk Basin Graphite are three locations within close proximity to each other from which graphite has or could be mined. Previous mining appeared to be by small open pit with some production reported in 1994. Abundant graphite supplies on the world market have depressed prices, but it is anticipated that further mining could occur in this area if market opportunities arise. Such operations would be small; apparent consumption for the United States was only 31 short tons in 2004. For that reason, it is estimated that daily production would be minimal, and a total of 20 acres would be disturbed before 2020 for the three locations, with 20 acres of reclamation dependant on timing.

**Death Valley:** Death Valley prospect has an apparent recoverable metal value of \$106.92 per short ton, with estimated reserves of 3.7 million short tons. If developed, production is estimated at 1,200 short tons per day. No estimate of mining cost is available, but with increasing U<sub>3</sub>O<sub>8</sub> prices and recent news about the Garnet Point deposit on the Seward Peninsula, it seems likely that further interest will be shown in this location. An open pit mine at this location might result in 700 acres of disturbance, with support facilities and access road. Mine life would be less than 9 years, using the Taylor Rule, so any disturbance might be in reclamation by 2020. However, it is unlikely that reclamation would be completed before 2020.

**Beltz/Split Creek, Manila Ridge, Metal Ridge East, etc.:** Deposits of unknown characteristics at six locations (e.g. Beltz/Split Creek, Manila Ridge, Metal Ridge East, Unnamed (Kougarok), Unnamed (Short Ck) and Unnamed (Tubutulik)) have unknown development potential within the next 15 to 20 years; however, it is likely that additional exploration will occur on these deposits. Such exploration will likely disturb less than an average of 5 acres per location (30 acres total), though additional acreage might be

disturbed in the process of delineating a significant reserve if discovered. Disturbed areas would be reclaimed unless exploration defined sufficient reserves for development.

**Conclusion:** No activity is likely at Alpha Ridge. Some mining will take place at one or more of the three graphite locations, with a resulting 20 acres of disturbance. At Death Valley, disturbance of up to 700 acres is possible. Development disturbance would not be reclaimed before 2020. Exploration disturbance at six locations would be about 30 acres, all of which would likely be reclaimed during the foreseeable period.

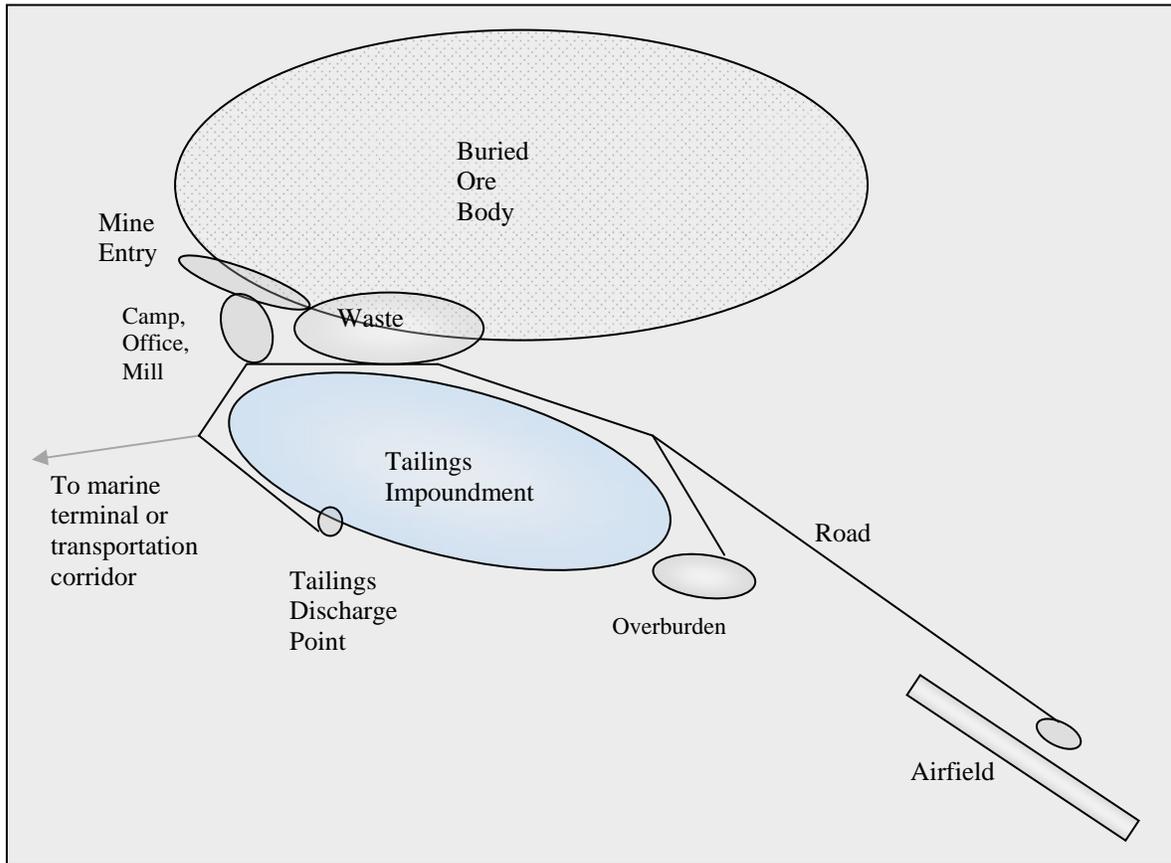
### **Underground Mining Methods**

Underground mining includes a variety of methods of removing ore without disturbing a significant amount of the surface, so there is less area to reclaim. An underground mine is accessed by an adit (a horizontal entrance into a hillside) or by a vertical shaft with a headframe to run a skip (like an elevator car) to the lower levels. Both entries involve surface disturbance. One advantage of some types of underground mining is that mining is selective, so there is less waste rock removed, and removed waste may remain in the mine, so less surface area is disturbed for waste rock piles. While the amount of tailings is the same, some tailings may be returned to back fill mined-out areas of an underground mine, meaning a smaller tailings impoundment is required. Other surface facilities remain similar to open pit mine requirements. Offices, warehouses, washhouses, lunchrooms, and equipment bays will be located near the mine entry, though some mines have underground equipment bays. Remote Alaskan sites may include an employee camp, electrical generation plants, an airfield, a marine terminal, and a road between the mill and the terminal that may be some distance. Water runoff toward the site will be controlled to divert flow around the mine operations. A possible layout for an underground mine layout is shown in Figure 4.

The following selected occurrences in the KSP Planning Area may be mined by underground mining methods. This type of mining method is most typical for the deposits located in the South Seward Peninsula area. These occurrences have been ranked with a high or medium reasonable foreseeable development potential. They either have lode claims located on them or have reported elevated mineral values. Only those with high and medium potentials are likely to be explored or developed during the life of the plan and thus will be a part of this discussion. All other occurrences have been identified with low potentials and are not discussed further in this report.

The Low-sulfide Au (gold) quartz deposits (Cox and Singer, 1986) constitute the bulk of occurrences likely to be mined by underground methods. Of these, one reserve estimate is available for the Big Hurrah Mine. The remaining eight deposits have no reported estimate of resources/reserves, and out of those eight Charlie Creek has no reported sampled ore grade.

Figure 4. Example of an underground mine layout.



**South Seward Peninsula area:**

Deposit name	ARDF/AMIS no.	Commodities	Deposit type	Land status
Alder Prospect	SO030/053-073	Au, Cu	Low-sulfide Au qtz (Cox 36a)	Native-selected
Big Hurrah Mine	SO023/053-057	Ag, Au, Cu, W	Low-sulfide Au qtz (Cox 36a)	Native-selected
Boulder Creek	NM165	Sb, Au, Pb, W	Low-sulfide Au qtz (Cox 36a)	Native-selected
Breen East (Hobson)	NM085/052-267	Au, Sb	Unknown	State-selected
Charlie Creek	NM048/052-029	Au, Be	Low-sulfide Au qtz (Cox 36a)	State-selected
Granite Creek	BN092/044-099	Pb, Zn, Au, Ag	Polymetallic veins (Cox 22c)	State-selected
Johns Creek Lode	SO141/053-059	Au, Cu	Unknown	BLM
Kougarok R. Lode	044/032	Cu	Unknown	State-selected
Last Chance	SO021/053-062	Sb, Au, Ag, Cu	Unknown	Native-selected
Otter Creek Lode	BN088/044-112	Au, Ag	Low-sulfide Au qtz (Cox 36a)	State-selected
Post	SO059/053-187	Au	Low-sulfide Au qtz (Cox 36a)	State-selected
Quigley; Gray Eagle	SO019	Sb, Au	Simple Sb deposits (Cox 27d)	Native-selected
Silver; Flynn	SO020	Au, Ag, W	Low-sulfide Au qtz (Cox 36a)	Native-selected
Sliscovich	NM086/052-114	Au, Sb, Ag, As	Low-sulfide Au qtz (Cox 36a)	State-selected
Trilby Hill	SO172/053-060	Sb, Au	Simple Sb deposits (Cox 27d)	Native-selected
Unnamed (Bear Creek)	045-084	Pb, Zn, Ag	Unknown	BLM
Unnamed (Boulder Ck)	NM183/052-302	Au, Pb, Zn, As	Low-sulfide Au qtz (Cox 36a)	Native-selected
Unnamed (Twin Mtn)	NM187/052-305	Sb, Au, Ag, Pb	Simple Sb deposits (Cox 27d)	Native-selected
Windy Creek	BN094/044-176	Pb, Zn, Mo	Porphyry Mo, low-F (Cox 21b)	State-selected

**Big Hurrah Mine:** The Big Hurrah Mine has an estimated 100,000 short tons of reserves, which would result in an estimated production rate of 80 short tons per day, and surface disturbance of 30 acres when operating (Hudson, 1999). Present disturbance includes prospecting pits and trenches dug as late as the 1980s, with a 2004 AHEA indicating 4.5 acres to be disturbed in 2004 with reclamation at the end of the exploration season. The recoverable metal value suggested by sample grade information is less than \$92 per short ton. No estimate of mining cost is available for a similar sized operation in the area. The estimated recoverable metal value required for a mine with one-third the deposit size in the nearby Koyukuk Mining District is \$521 if the ore is shipped offsite for milling (Coldwell, 2002). Cost per ton tends to decline as production rates increase, so it is possible that the Big Hurrah Mine could be profitable. Continuing interest and recently high gold prices suggest the Big Hurrah Mine is a promising target before 2020.

**Post:** The Post deposit has a high reported grade from one sample, but no other information is available. The sample suggests a recoverable metal value of nearly \$250 at a 5-year average price. Low-sulfide Au quartz deposit modeled by Cox & Singer (1986) had median reserves of 33,000 short tons, with 80% between 1,100 and 1 million short tons. A reserve of 3,100 short tons would produce at about 6 short tons per day for 1 or 2 years from startup, and require about 12 employees. If development were to occur production would be about 35 short tons per day. The Post deposit requires additional resource/reserve delineation before any determination can be made as to development potential. Exploration would entail about 5 acres of disturbance. Reclamation would be 5 acres for exploration disturbance. If development were to occur disturbance would be somewhat less than 40 acres with mill and transportation facilities required by an underground operation.

**Alder Prospect, Boulder Creek, Charlie Creek, Otter Creek Lode, Silver;Flynn, Sliscovich, and Unnamed (Boulder Creek):** The remaining seven Low-sulfide Au quartz locations would require resource/reserve delineation before any development or production could begin. Ore grade information suggests that these deposits would produce recoverable metal values of less than \$20 per short ton, so development before 2020 is unlikely, barring a significant discovery. Exploration could result in up to 35 acres disturbance between the seven locations, with reclamation planned at the end of the exploration season or mine life.

**Quigley/Gray Eagle, Trilby Hill, and Unnamed (Twin Mountain):** The Simple Sb (antimony) model (Cox and Singer, 1986) reports a median deposit size of 198 short tons, which would represent a mine operating at less than 1 short ton per day. Disturbance would be less than 20 acres. Although the median deposit grade is 35%, the Quigley/Gray Eagle location has a reported grade of 63.7%. With the 5-year average price of \$0.91, that would result in a recoverable metal value of over \$1,000 per short ton (net of mill recovery factor). The median quality results in a recoverable metal value of \$550 for the Trilby Hill and Unnamed (Twin Mountain) locations. No estimate of mining cost is available of a similar sized operation in the area. Exploration and/or development may begin at the Quigley/Gray Eagle location before 2020 due to the high-grade ore. Exploration may begin at the other two locations if metal prices continue to

rise. Exploration is estimated to be less than 5 acres per location (15 acres total) and development and production less than 20 acres for the Quigley/Gray Eagle. Reclamation would be 15 acres for exploration disturbance.

***Granite Creek:*** Granite Creek is a Polymetallic vein deposit of unknown size. Ore sample grade suggests a recoverable metal value of \$22.56, but there is no available estimate of mining cost. The median deposit size is reported as 8,377 short tons (Cox & Singer, 1986). This would result in a mine producing about 7 short tons per day. It is likely that additional exploration will occur before 2020 to delineate sufficient resources/reserves for a mine. Exploration would focus on looking for higher-grade ore. Such exploration will disturb less than 5 acres and reclamation would be 5 acres. Development and production are unlikely during the next 15 to 20 years.

***Windy Creek:*** Windy Creek is a Porphyry Mo (molybdenum), low-F (fluorine) deposit with unknown resource/reserve quantities. The indicated ore grade results in a recoverable metal value of \$4.18 per short ton, however a recent report indicated a higher molybdenum content that raised the value to \$12 per short ton (Szumigala and others, 2004). The median deposit type size is 103 million short tons. Exploration is expected at the location to better delineate the occurrence. Such exploration will disturb an average of less than 5 acres, though additional acreage might be disturbed in the process of delineating a significant resource/reserve. Reclamation would be 5 acres for exploration disturbance. The recoverable mineral value is low when compared to underground mining cost estimates in the area, so development during the foreseeable future is unlikely based on available information.

***Breen East, Johns Creek Lode, Kougarok River Lode, Last Chance, and Unnamed (Bear Creek):*** Development potential of deposits with unknown characteristics is unknown for the next 15 to 20 years; however, it is likely that additional exploration will occur on these deposits. Such exploration will likely disturb less than an average of 5 acres per location (25 acres total), though additional acreage might be disturbed in the process of delineating a significant resource/reserve. The disturbed area (25 acres) would be reclaimed unless exploration defined sufficient resources/reserves for future development.

***Conclusion:*** Exploration disturbance at these nineteen locations would be about 95 acres, all of which would likely be reclaimed during the foreseeable period. Development and production disturbance would be about 50 acres at the Big Hurrah Mine and Quigley/Gray Eagle properties, but reclamation would not be complete before 2020.

### **Placer Mining Methods**

Surface placer mines in Alaska are usually small operations involving two or three workers for less than half of the year, but for several “mining seasons.” A bulldozer or other earth-moving machine is used to construct settling ponds, spillways, drainage ditches, and working areas. If the area is to be mined from within an active stream

channel, a diversion is build to route water around the area. On a typical mine, one to two acres are stripped ahead of action mining, though in areas with permafrost, the stripping must occur at least a year in advance of mining to allow for ground thawing. Overburden and top soil is stripped from the gold-bearing gravels and stockpiled for future reclamation. Pay gravels are excavated and moved near the wash plant using the bulldozer or other machinery, then fed into a feeder-hopper where it is sprayed with water and classified by size using stationary and vibrating screens. Larger pieces are ejected from the wash plant into a tailings pile, while smaller rock and gravel is mixed with water. The slurry flows through the sluice box or jig unit where gold and heavy black sands are collected and concentrated. Water used in the wash plant is laden with sediment and is diverted from the sluice box through a series of settling ponds. Once cleaned, the process water is recycled for use in the sluice or returned to the stream. When mining is complete in an area, tailings are replaced into the mine cut, reshaped, and covered with the overburden and topsoil. For a large mine, this reclamation can occur in one area while mining moves to another area or for a small mine as the operation moves upstream. When all mining is complete, the settling ponds and other infrastructure are reclaimed in a similar manner and the stream channel returned to a natural stream pattern (BLM, 1989) as required by the BLM 3809 regulations.

The following occurrences located within the Central Omar-Kiana and South Seward Peninsula areas have active Federal or State placer mining claims and APMAs located on BLM unencumbered, State-selected, and Native-selected lands and thus, have been ranked with a high reasonable foreseeable development potential. Only those with high development potential are likely to be developed during the next 15 to 20 years and thus will be included as part of this discussion. All placer occurrences with high and medium development potential are listed in Appendix 2. All the remaining placer occurrences have been identified with low potential and are not discussed further in this report, nor are they listed in Appendix 2.

**Central Omar-Kiana area:**

Deposit name	ARDF/AMIS no.	Commodities	Deposit type	Land status
Gold Run Creek	BM008/027-006	Au	Placer Au-PGE (Cox 39a)	State-selected
Homestake Creek	BM009/027-011	Au	Placer Au-PGE (Cox 39a)	State-selected
Klery Creek	BM005/027-001	Au	Placer Au-PGE (Cox 39a)	State-selected

**South Seward Peninsula area:**

Deposit name	ARDF/AMIS no.	Commodities	Deposit type	Land status
Bear Creek	CA026	Au, PGE	Placer Au-PGE (Cox 39a)	BLM
Bear Creek	CA027/045-029	Au, PGE	Placer Au-PGE (Cox 39a)	BLM
Black Gulch	BN018/044-058	Au, Ag	Placer Au-PGE (Cox 39a)	State-selected
Boulder Creek	BN015/044-059	Au, Ag	Placer Au-PGE (Cox 39a)	State-selected
California Creek	BN030/044-045	Au, Ag	Placer Au-PGE (Cox 39a)	State-selected
Camp Creek	SO057/053-194	Au	Placer Au-PGE (Cox 39a)	State-selected
Charley Creek	NM047/052-028	Au	Placer Au-PGE (Cox 39a)	State-selected
Elkhorn Creek	SO056	Au	Placer Au-PGE (Cox 39a)	State-selected
Elkhorn-Niukluk	053-190	Au	Placer Au-PGE (Cox 39a)	State-selected
Goldbottom Creek	SO058/053-198	Au, Ag	Placer Au-PGE (Cox 39a)	State-selected

Grouse Creek	BN090/044-105	Au, U	Placer Au-PGE (Cox 39a)	State-selected
Hobson Creek	NM084/052-106	Au	Placer Au-PGE (Cox 39a)	State-selected
Homestake Creek	BN037/044-052	Au, Ag, W	Placer Au-PGE (Cox 39a)	State-selected
Johns Creek	053-072	Au	Placer Au-PGE (Cox 39a)	BLM
Manila Creek	NM098/052-110	Au	Placer Au-PGE (Cox 39a)	State-selected
Pine Creek	053-037	Au	Placer Au-PGE (Cox 39a)	State-selected
Richter Creek	SO051/053-195	Au	Placer Au-PGE (Cox 39a)	Native-selected
Solomon River	SO137	Au	Placer Au-PGE (Cox 39a)	BLM
Turner Creek	044-063	Au, Ag	Placer Au-PGE (Cox 39a)	State-selected
Ungalik River	NR009/054-001	Au	Placer Au-PGE (Cox 39a)	Native-selected
Upper Homestake Ck	BN038	Au, W	Placer Au-PGE (Cox 39a)	State-selected
Upper Warm Creek	053-197	Au	Placer Au-PGE (Cox 39a)	Native-selected

The Placer Au-PGE (gold-platinum group elements) model shows modeled deposit reserve median of 1.2 million short tons, with 80% between 24,250 and 55 million short tons with gold grading at 0.0058 troy ounces per short ton (Cox and Singer, 1986).

Twenty-four mining and three exploration APMA's for the KSP Planning Area indicate that many operations have less than 5 acres currently disturbed, a level which does not require reclamation bonding under state law. Several operations are larger, though none is as large as 15 acres (AK DNR, 2004). This is indicative of foreseeable placer operations throughout the area. In 2004, an AMPA was made to explore state claims on State land at Gold Run Creek, with estimated disturbance of 3.35 acres. Another acre was disturbed by a camp location to hand test up to three additional State-selected areas in the Boulder Creek area.

The remaining 24 locations listed in the above table have no current activity, and previous reports included one with the most recent activity in the 1980s, two with activity prior to 1969, and the remainder with activity before 1945 (Williams, 2000; Hudson, 1999; Dashevsky, 2000; and Hawley and Hudson, 2002). Any of these occurrences could be in production in the foreseeable future because the locations are known. Additional exploration to determine economic viability might be required before a significant operation would begin, and would take one to three years. Several of the locations may not be economic, so a reduced number would begin operations. The operating claims will presumably continue operating until reserves are depleted.

The amount of ore within a deposit is variable and the Cox and Singer median reported at 1.2 million short tons represents a common deposit size. The area of disturbance might extend to 90 acres during the life of the mine, however disturbance at any one time would be substantially less because mined sections would be reclaimed as additional sections are opened. Because many of these areas have been mined or explored in the past, the Cox and Singer median quantity is probably too large to represent remaining reserves. Anecdotal information suggests that an average of three people would be employed mining each operating location for two to three months per year, and that the production might cover mining and living costs for those individual during mining. Some locations might result in a profit over those expenses, but it may not be significant.

Placer mining in the nearby Koyukuk Mining District (Coldwell, 2002) would have similar characteristics and would require similar operations. Weather conditions limit the

season for surface placer mining, and the easily extracted reserves have already been mined. Order of magnitude estimates were made from financial models for operations of 4 to 10 persons processing 148,880 to 2,302,080 bank cubic yards of material with a 15% rate of return on investment. Parameters included a 180-day season and a standardized suite of equipment. One variable was different distances from an existing transportation corridor. The least required recoverable metal value per ton mined was \$4.23 (2001 dollars) for a deposit of 2,877,600 loose cubic yards (25% swell factor) requiring a 10-mile road to access, or \$4.11 if most access was by winter trail. A 100-mile distance would be much more costly, at \$35.05 for road and \$18.55 for winter trail. Assuming a 71% mill recovery factor and a 55% smelter recovery factor, gold graded at 0.0058 troy ounces per ton would generate \$0.43 per ton at the 5 year average price of \$327.60 per ounce (USGS, 2005). If gold exceeded \$800 per troy ounce, that grade would generate just over \$1 per ton, making both a higher grade of gold and less expensive mining methods necessary for a profitable operation in the area.

Specific information for the identified locations is scarce. Information from ARDF indicates that the Klery Creek gold grade would generate \$5.79 per ton of ore at recent prices, and the Bear Creek grade would generate \$12.02 if all metals were recovered at recent prices. This might suggest the area has a higher grade than the Cox and Singer median. Combined with exploration over the last twenty years, this area will continue to be of interest for placer gold mining.

Conclusion: Existing disturbance is 4.35 acres. Additional exploration may result in 1 to 5 acres disturbance at any or all of 25 occurrences, but is expected to be less than 22 acres for all locations over the next 20 years. Development and operation might occur at about 5 locations, with additional disturbance averaging 10 acres for each location, or 50 additional acres during the life of the plan. Reclamation is estimated at a total of 76.35 acres over the 20 year planning period, with existing disturbance reclaimed.

## **SURFACE DISTURBANCE DUE TO LOCATABLE MINERAL ACTIVITY**

Information used to develop the estimated surface disturbance resulting from locatable mineral activity with the KSP Planning Area was derived from the BLMs AMIS data base, the USGS ARDF open-file reports, BLMs Mineral Occurrence and Development Potential Report, U.S. Bureau of Mines mineral terranes map, Federal and State mining claim data bases, and ADGGS Alaska's Mineral Industry 2003 report. All mineral activities discussed are restricted to BLM unencumbered, State-selected, and Native-selected lands. The following discussion is written to fit the development alternatives derived during the RMP process.

### **ESTIMATE OF CURRENT SURFACE DISTURBANCE RESULTING FROM LOCATABLE MINERAL ACTIVITY**

Estimate of current surface disturbance resulting from locatable mineral activity in the KSP Planning Area is 9 acres as discussed in detail in the following section and

shown in Table 5. The acreage includes 0 acres on BLM unencumbered lands, 4.5 acres on State-selected lands, and 4.5 acres on Native-selected lands.

**North Red Dog area:** Mining activity reported during 2003 for the North Red Dog area is occurring at the Red Dog Mine which is located on Native lands (Szumigala and others, 2004). Exploration projects or development actives at the Lik-Su project and Noatak Project (CC group) are being actively explored on State lands (AK DNR, 2004). Active Federal and State lode mining claims are located at the Lik-Su property on State lands and State lode claims at the Unnamed (Kukpowruk) property on State-selected lands. No active Federal or State lode claims are located on BLM unencumbered lands in the North Red Dog area. No active placer mining claims are located in the North Red Dog area.

Estimated current surface disturbance includes 2,000 acres for the Red Dog Mine and 10 acres for the Lik-Su and Noatak Project (CC group) exploration projects. Total estimated surface disturbance in the entire North Red Dog area resulting from active locatable mineral activity is 2,010 acres on State and Native lands.

Estimated current surface disturbance resulting from locatable mineral activity, in the high mineral potential area of the KSP Planning Area, includes 0 acres for the Unnamed (Kukpowruk) property on State-selected lands. Total estimated current surface disturbance in the North Red Dog area resulting from active locatable mineral activity is 0 acres on BLM unencumbered, State-selected, or Native-selected lands.

**East Ambler area:** No development actives were reported by the ADGGS during 2003 in the East Ambler area (Szumigala and others, 2004). There is current surface disturbance resulting from locatable mineral activity at the Arctic Camp project which is being actively explored (AK DNR, 2004). Active Federal and State lode mining claims are located at the Arctic Camp property on State lands and at the Unnamed property on State-selected lands. State lode mining claims are located at the Sunshine Creek (Ruby) property on State lands and at the Smucker property on State-selected lands. No active Federal or State lode claims are located on BLM unencumbered lands in the East Ambler area. No active placer mining claims are located in the East Ambler area.

Estimated current surface disturbance includes 5 acres for the Arctic Camp exploration project. Total estimated surface disturbance in entire East Ambler area resulting from active locatable mineral activity is 5 acres on State lands.

Estimated current surface disturbance resulting from locatable mineral activity, in the high mineral potential area of the East Ambler area, includes 0 acres for the Jade Mountain Copper exploration property on Native-selected lands and the Unnamed exploration property and Smucker development property on State-selected lands. Total estimated current surface disturbance in the East Ambler area resulting from active locatable mineral activity is 0 acres on BLM unencumbered, State-selected, and Native-selected lands

**Central Omar-Kiana area:** No exploration projects or development activities were reported during 2003 (Szumigala and others, 2004) and no current surface disturbance is resulting from locatable mineral activity in the Central Omar-Kiana area (AK DNR, 2004). Active State lode mining claims are located at the Omar River property on State lands. No active Federal or State lode claims are located on BLM unencumbered lands, State-selected, and Native-selected lands in the Central Omar-Kiana area. Active State placer mining claims are located at Gold Run, Homestake, and Klery creeks on State-selected lands.

Estimated current surface disturbance includes 0 acres for the Omar River lode property and 3.5 acres for the Gold Run, Homestake, and Klery creek placer properties. Total estimated surface disturbance in the entire Central Omar-Kiana area resulting from active locatable mineral activity is 3.5 acres on State-selected lands.

Estimated current surface disturbance resulting from locatable mineral activity, in the high mineral potential area of the KSP Planning Area, includes 3.5 acres for the Gold Run, Homestake, and Klery creek placer properties. Total estimated current surface disturbance in the Central Omar-Kiana area resulting from active from locatable mineral activity is 3.5 acres on State-selected and 0 acres on BLM unencumbered and Native-selected lands.

**South Seward Peninsula area:** Mineral activity reported during 2003 for the South Seward Peninsula area includes exploration activities by Alder Resources, Inc. occurring on Area 51 lode property on State lands and Ophir Creek placer property on native-selected lands. Development activities were reportedly occurring at NovaGold Resources, Inc. Rock Creek property on Native lands during 2003 and 2004 (Szumigala and others, 2004; AK DNR, 2004). There is current surface disturbance resulting from locatable mineral activity at the Rock Creek Project and at the Big Hurrah Mine on Native-selected lands. Placer disturbance is at Boulder Creek on Native-selected lands and at Turner Creek on State-selected lands, which are being actively explored (AK DNR, 2004).

Active Federal lode mining claims are located on State-selected lands at the Christophosen Creek, Graphite Creek, and Imuruk Basin Graphite properties. Active State lode mining claims are located on State-selected lands at the Breen East (Hobson), Charlie Creek, Death Valley, Manila Ridge, Metal Ridge East, Unnamed (Short Creek), and Unnamed (Tubutulik) properties. Active State lode mining claims are located on BLM unencumbered lands at the Beltz/Split Creek, Johns Creek Lode, and Unnamed (Bear Creek) properties. Active Federal placer mining claims are located on State-selected lands on Black, Boulder, and Turner creeks and the Ungalik River. Active State placer mining claims are located on BLM unencumbered lands on Bear and Johns creeks and the Solomon River. Active State placer mining claims are located on State-selected lands on California, Camp, Charley, Elkhorn, Goldbottom, Grouse, Hobson, Homestake, Manila, Pine, Upper Homestake, and Upper Warm creeks and on Native-selected lands at Richter Creek.

Estimated current surface disturbance includes 4.5 acres for the Big Hurrah Mine exploration project and 1 acre for the Boulder and Turner creek placer mines. Total estimated surface disturbance in the entire South Seward Peninsula area resulting from active locatable mineral activity is up to 5.5 acres.

Estimated current surface disturbance resulting from locatable mineral activity, in the high mineral potential area of the KSP Planning Area, includes 4.5 acres for the Big Hurrah Mine exploration project and 1 acre for the Boulder Creek placer property and 0 acres for the Turner creek dredging property. Total estimated current surface disturbance in the South Seward Peninsula area from locatable mineral activity is 5.5 acres; on State-selected (1 acre) and on Native-selected (4.5 acres) lands. No surface disturbance from locatable mineral activities are estimated to occur on BLM unencumbered lands.

### **ESTIMATE OF FUTURE SURFACE DISTURBANCE FOR MINES, MILLS, ROADS, AND LOCATABLE MINERAL RELATED INFRASTRUCTURE THAT MAY RESULT FROM PROJECTIONS OF FUTURE ACTIVITY**

Estimate of future surface disturbance for mines, mills, roads, and locatable mineral related infrastructure that may result from projections of future activity in the KSP Planning Area is 1,825 acres as discussed in detail in the following section and shown in Table 5. The acreage includes 38 acres on BLM unencumbered lands, 1,680 acres on State-selected lands, and 107 acres on Native-selected lands.

**North Red Dog area:** There is expected to be a continuation of the mineral related activities in the North Red Dog area occurring on the Lik-Su and Noatak Project (CC group) exploration projects (AK DNR, 2004) based on APMA applications and the Red Dog Mine, which are located on State and Native lands.

A very small amount of reasonably foreseeable future locatable mineral activity in the high mineral potential area of the North Red Dog area is expected to occur. Future exploration activities are estimated to occur at one location at the Unnamed (Kukpowruk) property on State-selected lands. The property would be developed as an open pit mine and would require multiple years of exploration and development work before production could begin. During the next 15 to 20 years, only exploration work would be completed and cause a disturbance from 5 to 15 acres.

Total estimated future surface disturbance resulting from locatable mineral activity, in the high mineral potential area of the KSP Planning Area, in the North Red Dog area is 5 acres on State-selected lands. No future surface disturbance from locatable mineral activities are estimated to occur on BLM unencumbered or Native-selected lands.

**East Ambler area:** There is expected to be a continuation of the mineral related activities in the East Ambler area occurring on the Arctic Camp exploration project (AK DNR, 2004) based on APMA applications, which is located on State lands.

A fair amount of reasonably foreseeable future locatable lode mineral activity in the high mineral potential area of the East Ambler area is expected to occur. Future exploration activities are estimated to occur at two locations including the Jade Mountain Copper property on Native-selected lands and the Unnamed property on State-selected lands. Future development activities are estimated to occur at one location at the Smucker property on State-selected lands. The properties would be developed as open pit mines and would require multiple years of exploration and development work. During the next 15 to 20 years, exploration work completed on the Jade Mountain Copper and Unnamed properties would cause a disturbance of 5 acres each (10 acres total). During the next 15 to 20 years, development work completed on the Smucker property would cause a total disturbance of 840 acres.

A very small amount, if any, of reasonably foreseeable future locatable placer mineral activity in the high mineral potential area of the East Ambler area is expected to occur. Future yearly exploration activities could, but are not likely to, occur on Agnes, Bismark, California, and Lynx creeks and the Shungnak River on Native-selected lands. If exploration activities were to occur a disturbance of 1 to 5 acres would be expected at each location. However, during the next 15 to 20 years, no exploration work will occur at these locations and no surface disturbance is anticipated.

Total estimated future surface disturbance resulting from locatable lode mineral activity, in the high mineral potential area of the KSP Planning Area, in the East Ambler area is 845 acres on State-selected and 5 acres on Native-selected lands (850 total acres). Total estimated surface disturbance from locatable placer mineral activity is 0 acres. No future surface disturbance from locatable mineral activities are estimated to occur on BLM unencumbered lands.

**Central Omar-Kiana area:** There is no estimated reasonably foreseeable future surface disturbance resulting from locatable lode mineral activity on BLM unencumbered, State-selected, and Native-selected lands in the Central Omar-Kiana area. There is expected to be a very small amount of reasonably foreseeable future locatable placer mineral activity in the Central Omar-Kiana area. Future exploration, development and placer mining activities are estimated to continue at three placer operations at Gold Run, Homestake, and Klery creeks on State-selected lands. During the next 15 to 20 years, mineral related placer activities would result in a disturbance of 1 acre for exploration and 20 acres for development and production.

Total estimated future surface disturbance resulting from locatable mineral activity, in the high mineral potential area of the KSP Planning Area, in the Central Omar-Kiana area is 21 acres on State-selected lands. No future surface disturbance from locatable mineral activities are estimated to occur on BLM unencumbered or Native-selected lands.

**South Seward Peninsula area:** There is expected to be a continuation of the mineral related activities in the South Seward Peninsula area occurring on the Big Hurrah Mine and Rock Creek Project exploration lode projects and the Anvil, Boulder, Candle, Clara, Darling, Dexter, Dick, Dry, Garfield, Gold Run, Iron/Benson, Macklin, Mud, Quartz,

Sherrette, Turner, and Windy creeks; Nome Beach and offshore; and Kougarok River placer properties based on APMA applications (AK DNR, 2004).

A high amount of reasonably foreseeable future locatable lode mineral activity in the high mineral potential area of the South Seward Peninsula area is expected to occur. Future exploration activities are estimated to occur at 25 locations in the South Seward Peninsula area (Figure 2c). Three locations at the Beltz/Split Creek, Johns Creek Lode, and Unnamed (Bear Creek) properties on BLM unencumbered lands; Thirteen locations at the Breen East (Hobson), Charlie Creek, Granite Creek, Kougarok River Lode, Manila Ridge, Metal Ridge East, Otter Creek Lode, Post, Sliscovich, Unnamed (Kougarok River), Unnamed (Short Creek), Unnamed (Tubutulik), and Windy Creek properties on State-selected lands; And, nine locations at the Alder Prospect, Big Hurrah Mine, Boulder Creek, Last Chance, Quigley; Gray Eagle, Silver; Flynn, Trilby Hill, Unnamed (Boulder Creek), and Unnamed (Twin Mountain) prospects on Native-selected lands. Future development and production activities in the high mineral potential area of the South Seward Peninsula area are estimated to occur at four locations including two locations at the Death Valley and Imuruk Basin Graphite properties on State-selected lands and two locations at the Big Hurrah Mine and Quigley/Gray Eagle properties on Native-selected lands. The properties would be either developed as an open pit or underground mines and would require that multiple years of exploration and development work be completed before production. During the next 15 to 20 years, exploration work completed on the above twenty five named exploration properties would cause a disturbance of 5 acres for each property for a total of 125 acres; BLM unencumbered (15 acres), State-selected (65 acres), and Native-selected lands (45 acres). Development work would be completed on the following properties: Big Hurrah Mine (30 acres), Death Valley (700 acres), Imuruk Basin Graphite (20 acres), and Quigley/Gray Eagle (20 acres). Total disturbance for the South Seward Peninsula area would be 895 acres; BLM unencumbered (15 acres), State-selected (785 acres), and Native-selected lands (95 acres).

There is expected to be a very small amount of reasonably foreseeable future locatable placer mineral activity in the high mineral potential area of the South Seward Peninsula area. Future yearly exploration activities could occur at three locations on Johns and Sheridan creeks and Solomon River on BLM unencumbered lands. Additional exploration may occur at fourteen locations on California, Camp, Charley, Elkhorn, Elkhorn-Niukluk, Goldbottom, Goose, Grouse, Hobson, Homestake, Manila, Pine, and Turner creeks, and Black Gulch on State-selected lands and at seven locations on Bonanza, Puckmummie, Richter, Upper Homestake, and Upper Warm creeks, Hopefull Gulch, and the Ungalik River on Native-selected lands. Future yearly development and production activities could occur on Bear Creek (2 locations) on BLM unencumbered lands and Boulder Creek on State-selected lands. During the next 15 to 20 years, mineral related activities would result in disturbance of 1 acre at each exploration location for a total of 24 acres on BLM unencumbered (3 acres), State-selected (14 acres), and Native-selected lands (7 acres); and 10 acres at each development and production location for a total of 30 acres on BLM unencumbered (20 acres), State-selected (10 acres), and Native-selected lands (0 acres).

Total estimated future surface disturbance resulting from locatable mineral activity, in the high mineral potential area of the KSP Planning Area, in the South Seward Peninsula area is 949 acres (895 lode and 54 placer). This includes 15 acres for lode mineral activities and 23 acres for placer mineral activities on BLM unencumbered lands, 785 acres for lode mineral activities and 24 acres for placer mineral activities on State-selected lands, and 95 acres for lode mineral activities and 7 acres for placer mineral activities on Native-selected lands.

### **ESTIMATE OF STAGED FUTURE SURFACE RECLAMATION OF DISTURBANCE ACTIVITY**

Estimate of staged future surface reclamation of disturbance activity in the KSP Planning Area is 990 acres as discussed in detail in the following section and shown in Table 5. The acreage includes 38 acres on BLM unencumbered lands, 844.5 acres on State-selected lands, and 107.5 acres on Native-selected lands.

**North Red Dog area:** If the exploration activities were to occur in the high mineral potential area of the North Red Dog area, on State-selected lands at the Unnamed (Kukpowruk) property, there would be 5 acres of disturbance and 5 acres of ongoing reclamation activities.

Reasonably foreseeable estimated staged future surface reclamation of disturbance resulting from locatable mineral activity in the high mineral potential area of the North Red Dog area is 5 acres on State-selected lands.

**East Ambler area:** If the lode exploration activities were to occur in the high mineral potential area of the East Ambler area at the Smucker and Unnamed properties on State-selected lands and at the Jade Mountain Copper property on Native-selected lands, there would be 10 acres of disturbance for the exploration properties and 840 acres of disturbance for the development property requiring reclamation. Ongoing reclamation would be occurring on the lode exploration properties for a total of 6 acres.

There is no foreseeable estimated staged future surface reclamation of disturbance resulting from placer exploration activities occurring in the high mineral potential area of the East Ambler area on Native-selected lands on Agnes, Bismark, California, and Lynx creeks and the Shungnak River because no anticipated disturbance is anticipated.

Reasonably foreseeable estimated staged future surface reclamation of disturbance resulting from locatable mineral activity in the high mineral potential area of the East Ambler area is 5 acres for lode exploration on State-selected lands and 1 acre for lode exploration on Native-selected lands (6 acres total). No staged future surface reclamation is estimated to occur on BLM unencumbered lands. Acres disturbed due to development would not be reclaimed during the life of the plan.

**Central Omar-Kiana area:** No lode exploration activities are expected to occur in the high mineral potential area of the Central Omar-Kiana area. If the placer activities were to occur in the high mineral potential area of the East Ambler area at the Gold Run, Homestake, and Klery creek properties on State-selected lands, there would be 1 acre of disturbance for the exploration property and 20 acres of disturbance for the two development and production properties requiring reclamation. Ongoing reclamation would be occurring on the placer properties for a total of 24.5 acres, including current 3.5 acre disturbance at Gold Run Creek.

Reasonably foreseeable estimated staged future surface reclamation of disturbance resulting from locatable mineral activity in the high mineral potential area of the Central Omar-Kiana area is 24.5 acres; 1 acre for placer exploration and 20 acres for development and production on State-selected lands (21 acres total) and 3.5 acres for current disturbance on State-selected lands. No staged future surface reclamation is estimated to occur on BLM unencumbered or Native-selected lands.

**South Seward Peninsula area:** If the lode exploration, development, and production activities were to occur in the high mineral potential area of the South Seward Peninsula area at the three properties on BLM unencumbered lands; at the fifteen properties on State-selected lands; and at the eleven prospects on Native-selected lands, there would be 125 acres of disturbance for the exploration properties and 770 acres of disturbance for the development and production properties requiring reclamation. Ongoing reclamation would include 129.5 acres (includes 4.5 existing disturbed acres at the Big Hurrah Mine) for the exploration properties and 770 acres for the development and production properties, for a total of 899.5 acres (all lands would be reclaimed).

If the placer exploration, development, and production activities were to occur in the high mineral potential area of the South Seward Peninsula area at the three locations on BLM unencumbered lands; at the fourteen locations on State-selected lands; and the seven locations on Native-selected lands, there would be 24 acres of disturbance for the exploration properties and 30 acres of disturbance for the development and production properties requiring reclamation. Ongoing reclamation would include 1 acre of current disturbance, 24 acres for the exploration properties and 30 acres for the development and production properties, for a total of 55 acres (all lands would be reclaimed).

Reasonably foreseeable estimated staged future surface reclamation of disturbance resulting from locatable mineral activity in the high mineral potential area of the South Seward Peninsula area is 38 acres (15 lode and 23 placer) on BLM unencumbered lands, 809 acres (785 lode and 24 placer) for on State-selected lands, 102 acres (95 lode and 7 placer) on Native-selected lands, and 4.5 acres of existing lode disturbance on Native-selected lands and 1 acre of existing placer disturbance on State-selected lands (954.5 acres total).

#### **ESTIMATED TOTAL SURFACE DISTURBANCE**

*(Total surface disturbance = current + future disturbance)*

Estimated total surface disturbance in the KSP Planning Area is 1,834 acres as discussed in detail in the following section and shown in Table 5. The acreage includes 38 acres on BLM unencumbered lands, 1,684.5 acres on State-selected lands, and 111.5 acres on Native-selected lands.

**North Red Dog area:** The reasonably foreseeable estimated total surface disturbance in the high mineral potential area of the North Red Dog area, on the Unnamed (Kukpowruk) property, is 0 acres of current disturbance plus 5 acres of future disturbance for a total of 5 acres on State-selected lands.

**East Ambler area:** The reasonably foreseeable estimated total surface disturbance in the high mineral potential area of the East Ambler area at the Jade Mountain Copper, Smucker, and Unnamed properties, is 0 acres of current disturbance plus 5 acres for lode exploration on State-selected lands and 5 acres for lode exploration on Native-selected lands and 840 acres for development and production on State-selected lands (850 acres total).

**Central Omar-Kiana area:** The reasonably foreseeable estimated total surface disturbance in the high mineral potential area of the Central Omar-Kiana area from placer activities at the Gold Run, Homestake, and Klery creek properties, is 3.5 acres of current disturbance plus 1 acre for placer exploration and 20 acres for placer development and production on State-selected lands (24.5 acres total).

**South Seward Peninsula area:** The reasonably foreseeable estimated total surface disturbance in the high mineral potential area of the South Seward Peninsula area is 5.5 acres for existing disturbance plus 15 acres for lode mineral activities and 23 acres for placer mineral activities on BLM unencumbered lands, 785 acres for lode mineral activities and 24 acres for placer mineral activities on State-selected lands, and 95 acres for lode mineral activities and 7 acres for placer mineral activities on Native-selected lands (954.5 acres total).

#### **ESTIMATED TOTAL NET SURFACE DISTURBANCE**

*(Total net surface disturbance = current + future disturbance – reclamation)*

Estimated total net surface disturbance in the KSP Planning Area is 844 acres as discussed in detail in the following section and shown in Table 5. The acreage includes 0 acres on BLM unencumbered lands, 840 acres on State-selected lands, and 4 acres on Native-selected lands.

Mining projects would require access by road, air, snow, or water. In the case of the larger operations, multiple year round access modes would be developed to allow use of the least-cost alternative for transportation of employees, supplies, products, etc., based on weather and other factors. Disturbance estimates include an allowance for transportation, including ports. If a regional road were constructed to mining areas, estimates for disturbance could be reduced.

No estimate was made of gravel needs required by the individual projects. Local material sources would be used wherever possible including the use of excavated mine site material.

**North Red Dog area:** The reasonably foreseeable estimated total net surface disturbance in the high mineral potential area of the North Red Dog area, on the Unnamed (Kukpowruk) property, is 0 acres of current disturbance plus 5 acres of future disturbance minus 5 acres of reclamation for a total of 0 acres on State-selected lands (0 acres total).

**East Ambler area:** The reasonably foreseeable estimated total net surface disturbance in the high mineral potential area of the East Ambler area at the Jade Mountain Copper, Smucker, and Unnamed properties, is 0 acres of current disturbance plus 10 acres for lode exploration and 840 acres for development and production minus 6 acres for reclamation on the exploration properties for 840 acres on State-selected lands and 4 acres on Native-selected land (844 acres total).

**Central Omar-Kiana area:** The reasonably foreseeable estimated total net surface disturbance in the high mineral potential area of the Central Omar-Kiana area at the Gold Run, Homestake, and Klery creek properties, is 3.5 acres of current disturbance plus 1 acre for placer exploration and 20 acres for placer development and production minus 3.5 acres current disturbance, 1 acre for reclamation on the exploration property and 20 acres for reclamation on the development and production properties on State-selected lands (0 acres total).

Table 5. Table listing the surface disturbance due to locatable mineral activity on BLM unencumbered, State-selected, and Native-selected lands.

		Current surface disturbance	Future surface disturbance	Future surface reclamation	Total surface disturbance	Total net surface disturbance
<b>North Red Dog area</b>	Lode	0	5	5	5	0
	Placer	0	0	0		
<b>East Ambler area</b>	Lode	0	850	6	850	844
	Placer	0	0	0		
<b>Central Omar-Kiana area</b>	Lode	0	0	0	24.5	0
	Placer	3.5	21	24.5		
<b>South Seward Peninsula area</b>	Lode	4.5	895	899.5	954.5	0
	Placer	1	54	55		
<b>Totals</b>		9	1,825	990	1,834	844

**South Seward Peninsula area:** The reasonably foreseeable estimated total net surface disturbance in the high mineral potential area of the South Seward Peninsula area is 4.5 acres for existing lode disturbance and 1 acre for existing placer disturbance; plus 39 acres (15 lode and 24 placer) on BLM unencumbered lands, 808 acres (785 lode and 23 placer) on State-selected lands, and 99 acres (95 lode and 4 placer) on Native-selected

lands; minus reclaimed areas of 39 acres (15 lode and 24 placer) on BLM unencumbered lands, 808 acres (785 lode and 23 placer) for on State-selected lands, and 99 acres (80 lode and 4 placer) on Native-selected lands (0 acres total).

### **ESTIMATED NUMBER AND TYPE OF INFRASTRUCTURE FACILITIES THAT MAY IMPACT AIR QUALITY**

Although no part of the Red Dog Mine or the DeLong Mountains Regional Transportation System (DMTS) is on BLM-administered land, it is the largest mineral development in the area and is indicative of conditions that might arise at other mineral developments. Red Dog Mine is presently addressing a fugitive dust issue related to the release of metal bearing dust in the tundra areas surrounding the Red Dog Mine and the DMTS, including the port facility. The Alaska Department of Environmental Conservation (ADEC) is addressing a risk assessment which will result in a risk management plan for monitoring and actions needed to address risks if they become significantly elevated. This excludes the area within the existing ambient air/solid waste permit boundary, where the mine operates within permitted standards. Releases and air emissions for the mine, road, and port meet state air quality standards.

**North Red Dog area:** There will be no long-term infrastructure facilities affecting air quality as the result of locatable mineral activity on BLM unencumbered, State-selected, and Native-selected lands in this area. A temporary small diesel or gasoline generator (50 kW) and/or small water pumps (less than 40 horsepower) might be required for exploration of the Unnamed (Kupowruk) location. Every mining operation in the area would be required to comply with existing Federal and State air quality laws to protect the residents and the environment. For that reason, no significant impediment of air quality is expected to result from foreseeable development.

**East Ambler area:** If the Smucker prospect is developed on State-selected lands, there will be emissions from heavy equipment, some potential for windborne dust from unstabilized disturbed areas, and possibly on-site electricity generation requiring a 16-20 Mw diesel-powered plant. A temporary small diesel or gasoline generator (50 kW) and/or small water pumps (less than 40 horsepower) might be required for exploration at each of three locations (Jade Mountain Copper on Native-selected lands, Smucker, and Unnamed). Any exploration or development and production operation would be required to comply with existing Federal and State air quality laws to protect the residents and the environment. For that reason, no significant impediment of air quality is expected to result from foreseeable development.

**Central Omar-Kiana area:** There will be no long-term infrastructure facilities affecting air quality as the result of locatable mineral activity on BLM unencumbered, State-selected, and Native-selected lands in this area. A temporary small diesel or gasoline generator (50 kW) and/or small water pumps (less than 40 horsepower) might be required for each of the three placer operations (Gold Run, Homestake, and Klery creeks on State-selected lands). To the extent that any exploration or development and production occur within this area, the operation would be required to comply with existing Federal and

State air quality laws to protect the residents and the environment. For that reason, no significant impediment of air quality is expected to result from foreseeable development.

**South Seward Peninsula area:** If the Death Valley prospect is developed on State-selected lands, there will be emissions from heavy equipment, some potential for windborne dust from disturbed areas that were not stabilized, and possibly on-site electricity generation requiring a 13 Mw diesel-powered plant. To a lesser extent, development and production from the Big Hurrah on Native-selected lands, the three graphite (Christophosen Creek, Graphite Creek or Imuruk Basin Graphite) on State-selected lands, or the three antimony (Quigley/Gray Eagle, Trilby Hill, or Unnamed (Twin Mountain)) locations on Native-selected lands would result in lesser amounts of the same disturbance. A temporary small diesel or gasoline generator (50 kW) and/or small water pumps (less than 40 horsepower) might be required for exploration at each of 49 lode and placer locations (Alder Prospect, Bear Creek (2 locations), Beltz/Split Creek, Black Gulch, Bonanza Creek, Boulder Creek Breen East, California Creek, Camp Creek, Charlie Creek, Charley Creek, Elkhorn Creek, Elkhorn-Niukluk, Goldbottom Creek, Goose Creek, Granite Creek, Grouse Creek, Hobson Creek, Homestake Creek, Hopefull Gulch, Johns Creek, Johns Creek Lode, Kougaruk River Lode, Last Chance, Manila Creek, Manila Ridge, Metal Ridge East, Otter Creek Lode, Pine Creek, Puckmummie Creek, Post, Richter Creek, Sheridan Creek, Silver/Flynn, Sliscovich, Solomon River, Tisuk River, Turner Creek, Ungalik River, Unnamed (Bear Creek), Unnamed (Kougarok River), Unnamed (Short Creek), Unnamed (Tubutulik), Upper Homestake Creek, Upper Warm Creek, and Windy Creek) and three placer mines (Bear Creek (two locations) and Boulder Creek). All of these operations will be required to comply with existing Federal and State air quality laws to protect the residents and the environment. For that reason, no significant impact to air quality is expected as the result of foreseeable development.

#### **ESTIMATED QUANTITY AND QUALITY OF PRODUCED WATER DISPOSED ON THE SURFACE AND ESTIMATED AMOUNT OF SURFACE WATER NEEDED**

The U.S. Environmental Protection Agency (EPA) and the ADEC currently permit the Red Dog Mine for 2.4 billion gallons of discharge water per year. Teck Cominco has been treating and releasing about 1.4 billion gallons that meet permit limits on zinc, lead, cadmium, mercury, selenium, cyanide, total suspended solids, and total dissolved solids. The Red Dog Mine is not on land managed by BLM, but is the largest mining operation in the area and exceeds the size of any known occurrence on BLM-administered lands.

**North Red Dog area:** Exploration at the Unnamed (Kukpowruk) occurrence on State-selected lands may result in some surface disposal of water required for drilling and short-term camp facilities. Other disposal options are sometimes available, such as injection to a subsurface reservoir or removal from the location; otherwise, it may be locally disposed after appropriate treatment for contaminants. Operations would be required to meet applicable Federal and State water quality standards for permitting.

**East Ambler area:** Lode exploration at the Jade Mountain Copper on Native-selected lands and Unnamed occurrence on State-selected lands may result in some surface disposal of water required for drilling and short term camp facilities. Other disposal options are sometimes available, such as injection to a subsurface reservoir or removal from the location; otherwise, it may be locally disposed after appropriate treatment for contaminants. Operations would be required to meet applicable Federal and State water quality standards for permitting.

Development and production of the Smucker prospect would require water for processing and domestic use. Note that the Smucker deposit is about 8% the size of the Red Dog deposits, with lower-graded zinc-lead-silver ore. On-site flotation milling would use a closed circuit for water, with only the initial input plus makeup water for the amount remaining in the tailings. About 918 gallons per minute would be required for processing, for a maximum of 1.3 million gallons for the first day of operations. This would require treatment of about 482 million gallons of water per year, with about 48 million gallons per year of makeup water. It is assumed that mine discharge will generally provide this water, and surface water will be required infrequently and there would be no untreated discharge of produced water. It is estimated that 200 mine, mill, and camp employees will require up to 3 million gallons per year of potable water from a local water source, which will be discharged appropriately. Operations would be required to meet applicable Federal and State water quality standards for permitting.

**Central Omar-Kiana area:** Water use for placer mining at the Gold Run, Homestake, and Klery creeks locations on State-selected lands will be limited to the amount put through a gravity separation process (500 gallons per minute, possibly recycled; 38 million gallons based on seven working hours each of 180 days), for surface disposal of non-recycled water. An additional 9,000 to 18,000 gallons would be required for domestic purposes annually at each location, but disposal must meet applicable Federal and State water quality standards for permitting.

**South Seward Peninsula area:** Lode exploration at twenty-six occurrences may result in some surface disposal of water required for drilling and short-term camp facilities. Other disposal options are sometimes available, such as injection to a subsurface reservoir or removal from the location; otherwise, it may be locally disposed after appropriate treatment for contaminants.

Development and production of the Death Valley prospect on State-selected lands would require water for processing and domestic use. Note that, while in situ leaching has become a common method of uranium mining in the United States, it does not appear that this deposit is below permafrost, so mechanical mining would be required. The deposit is about 4% the size of the Red Dog deposits, with a uranium ore rather than zinc-lead-silver ore. On-site milling would require acidic leaching and alkaline precipitation. Water use may be over 500 gallons per minute for processing (263 million gallons per year), but up to half of the water can be recycled in the mill. All water would be treated prior to discharge into surface streams. It is estimated that up to 200 mine, mill, and

camp employees will require up to 2.2 million gallons per year of potable water from a local water source, which will be discharged appropriately. Operations would be required to meet applicable Federal and State water quality standards for permitting.

Water use for placer mining at three locations will be limited to the amount put through a gravity separation process (500 gallons per minute, possibly recycled), plus domestic use of 9,000 to 18,000 gallons annually at each location. Water needs for exploration would be significantly less.

## **REASONABLE FORESEEABLE DEVELOPMENT SCENARIO DISCUSSION BY ALTERNATIVE**

### **ALTERNATIVE A – NO ACTION**

Under the No Action Alternative approximately half of BLM managed lands in the KSP Planning area are currently closed to mineral entry either by ANSCA d(1) withdrawals or by State or Native selection. At the time conveyances are completed (2010) all segregated lands returning to BLM-management would be open for mineral entry. Currently locatable mineral activity is occurring at the Big Hurrah Mine lode project on Native-selected lands and placer activity on Boulder, Gold Run, Homestake, Klery and Turner creeks on State-selected lands. All current activity is occurring in the Central Omar-Kiana and South Seward Peninsula areas.

All mineral related activities occurring on BLM-managed lands are subject to current BLM surface regulations as outlined in 43CFR 3809. Operators are required to submit Plans of Operation which include site-specific guidelines as listed in BLM-Alaska Stipulations and Required Operating Procedures. All operations are required to meet applicable Federal and State air and water quality standards for permitting.

If locatable mineral activity were to occur on every active Federal mining claim, as allowable by present BLM authority on BLM-managed lands, an estimated total of 67 acres (35 lode and 32 placer) could potentially be disturbed in the KSP Planning Area on State-selected and Native-selected lands. No disturbance will occur on BLM unencumbered lands. Under this alternative no further disturbance would be anticipated until the conveyance process is completed. Future mineral activities could be expected to occur on those lands returning to BLM-management. Due to the small size of the existing and future anticipated operations, as well as the short yearly period of operation, there would be a minor impact on the local air and water quality.

Salable material (sand and gravel) activities on federally administered surface/minerals and split estate are available for exploration and development unless specifically closed by Public Land Order (PLO). Activities are subject to BLM-Alaska Stipulations and Required Operating Procedures. Large reserves of salable material exists on State and Native lands and no disturbance of BLM managed lands is anticipated.

### **ALTERNATIVE B – DEVELOPMENT**

Under the Development Alternative all future mineral activities would be allowed in the KSP Planning Area as all ANCSA d(1) withdrawals would be repealed and all segregated lands returning to BLM-management would be open for mineral entry. If all reasonable foreseeable future mineral activities were to occur in the KSP Planning Area, activities would occur in the North Red Dog, East Ambler, Central Omar-Kiana, and South Seward Peninsula areas.

Lode mineral activities in the North Red Dog area would occur at the Unnamed (Kukpowruk) property and result in a surface disturbance of 5 acres on State-selected lands. Lode activities in the East Ambler area would occur at the Jade Mountain Copper property on Native-selected lands and the Smucker and Unnamed properties on State-selected lands and result in a surface disturbance of 845 acres on State-selected lands and 5 acres on Native-selected lands. Placer activities in the East Ambler area could, but are not likely to, occur on Agnes, Bismark, California, and Lynx creeks and the Shungnak River, on Native-selected lands and result in a surface disturbance of 0 acres on Native-selected lands. Placer activities in the Central Omar-Kiana area would occur on Gold Run, Homestake, and Klery creeks on State-selected lands and result in a surface disturbance of 21 acres on State-selected lands. Lode activities in the South Seward Peninsula areas would occur at the Beltz/Split Creek, Johns Creek Lode, and Unnamed (Bear Creek) properties on BLM unencumbered lands; at the Breen East (Hobson), Charlie Creek, Death Valley, Granite Creek, Imuruk Basin Graphite, Kougarok River Lode, Manila Ridge, Metal Ridge East, Otter Creek Lode, Post, Sliscovich, Unnamed (Kougarok River), Unnamed (Short Creek), Unnamed (Tubutulik), and Windy Creek properties on State-selected lands; and, the Alder Prospect, Big Hurrah Mine, Boulder Creek, Last Chance, Quigley; Gray Eagle, Silver; Flynn, Trilby Hill, Unnamed (Boulder Creek), and Unnamed (Twin Mountain) prospects on Native-selected lands and result in a surface disturbance of 15 acres on BLM unencumbered lands, 785 acres on State-selected lands and 95 acres on Native-selected lands. Placer activities in the South Seward Peninsula areas would occur on Bear (2 locations), Johns, and Sheridan creeks and Solomon River on BLM unencumbered lands; on California, Camp, Charley, Elkhorn, Elkhorn-Niukluk, Goldbottom, Goose, Grouse, Hobson, Homestake, Manila, Pine, and Turner creeks, Black Gulch, and Tisuk River on State-selected lands; on Bonanza, Puckmummie, Richter, Upper Homestake, and Upper Warm creeks, Hopefull Gulch, and the Ungalik River on Native-selected lands and result in a surface disturbance of 23 acres on BLM unencumbered lands, 15 acres on State-selected lands and 7 acres on Native-selected lands.

If locatable mineral activity were to occur on every existing operation, as allowable by present BLM authority on BLM-managed lands, an estimated total of 1,816 acres could potentially be disturbed in the KSP Planning Area. Total includes surface disturbance of 38 acres on BLM unencumbered lands, 1,671 acres on State-selected lands and 107 acres on Native-selected lands. Depending upon the results of conveyances, some of this locatable mineral activity may occur on lands owned by the State and native corporations. Due to the small size of the existing operations as well as the short period of operation there would be a minor impact on the local air and water quality.

All mineral related activities occurring on BLM-managed lands are subject to current BLM surface regulations as outlined in 43CFR 3809. Operators are required to submit Plans of Operation which include site-specific guidelines as listed in BLM-Alaska Stipulations and Required Operating Procedures. All operations are required to meet applicable Federal and State air and water quality standards for permitting.

Salable material (sand and gravel) activities on federally administered surface/minerals and split estate are available for exploration and development. All ANCSA d(1) withdrawals would be repealed. Activities are subject to BLM-Alaska Stipulations and Required Operating Procedures.

### **ALTERNATIVE C – CONSERVATION**

Under the Conservation Alternative limitedo future mineral entry would be allowed on lands retained in BLM management in the KSP Planning Area. Many of the existing ANSCA d(1) withdrawals would remain in place and new withdrawals would be implemented. Given the current land status, approximately 6.5 million acres would be closed to locatable mineral entry and 6.5 million acres would be open. Of the 6.5 million acres proposed for closure, more than 3 million acres are selected and subject to possible conveyance out of federal ownership. Areas recommended for closure to mineral entry include the Kigluaik Mountain, McCarthy’s Marsh, Upper Kuzitrin, and the Nulato Hills Areas of Critical Environmental Concern (ACECs); a 300 foot setback specified in PLO 6477 for the Fish, Inglutalik, Kuzitrin, Pah, Shaktooluk, Tubutilik, Ungalik, and west bank of Noatak rivers; 300 feet on either side of tributaries of above mentioned rivers (including Boston Creek); 300 feet on both sides of the upper portion mainstems and tributaries of the Agiapuk, Buckland, East Fork Koyukuk, Ipewik, Kivalina, Koyukuk, Kukpowruk, Nilik, Omar, Pick, and Squirrel rivers and Kiliovilik Creek (Upper Selawik); and additional rivers for special status plants on the North Fork Squirrel and “NoName” Squirrel rivers and the west and middle forks of the Buckland River.

However, locatable mineral activity would still be allowed on existing “grandfathered” Federal mining claims within the closed areas discussed above and the remainder of the planning area. Active Federal lode mining claims occur at the Unnamed property in the East Ambler area and Christophosen Creek, Graphite Creek, Imuruk Basin Graphite properties in the South Seward Peninsula area. Active Federal placer mining claims occur on Boulder and Turner creeks, Black Gulch, and the Ungalik River in the South Seward Peninsula area. Locatable mineral activity may also occur on lands within the planning area that are conveyed to the State and native corporations.

If locatable mineral activity were to occur on every active Federal mining claim, as allowable by present BLM authority on BLM-managed lands, an estimated total of 67 acres (35 lode and 32 placer) could potentially be disturbed in the KSP Planning Area on Sate-selected and Native-selected lands. No disturbance will occur on BLM unencumbered lands. Under this alternative no further disturbance would be anticipated as lands returning to BLM-management would be included into existing or future

withdrawals that would be closed to mineral entry. Due to the small size of the existing and future anticipated operations, as well as the short yearly period of operation, there would be a minor impact on the local air and water quality.

All mineral related activities occurring on BLM-managed lands are subject to current BLM surface regulations as outlined in 43CFR 3809. Operators are required to submit Plans of Operation which include site-specific guidelines as listed in BLM-Alaska Stipulations and Required Operating Procedures. All operations are required to meet applicable Federal and State air and water quality standards for permitting.

Salable material (sand and gravel) activities on federally administered surface/minerals and split estate are available for exploration and development unless specifically closed by PLO. BLM-managed land in McCarthy's Marsh and the Kigluaik ACEC would be closed to salable material activities. Sale of mineral materials from riverbeds, ocean beach/lagoons, and lake shores would be prohibited. Activities are subject to BLM-Alaska Stipulations and Required Operating Procedures. Large reserves of salable material exists on State and Native land and no disturbance of BLM lands is anticipated.

#### **ALTERNATIVE D – PREFERRED**

Under the Preferred Alternative all future mineral activities would be allowed in the KSP Planning Area as most ANCSA d(1) withdrawals would be repealed. Given the current land status, approximately 10.5 million acres would be open to locatable mineral entry. Approximately 2.5 million acres would be closed of this, 1.9 million acres is selected and could be conveyed out of federal ownership. The Western Arctic Caribou Herd insect relief ANCSA d(1) withdrawal would be retained until such time as a new withdrawal could be implemented. The following areas would be withdrawn from mineral entry: Kigluaik Mountain Special Resource Management Area (SRMA), 300 foot buffer on either side of the Ungalik River as identified in PLO 6477, and 300 foot buffer on either side of Boston Creek and the upper Kivalina River. If all reasonable foreseeable future mineral activities were to occur in the KSP Planning Area, activities would occur in the North Red Dog, East Ambler, Central Omar-Kiana, and South Seward Peninsula areas.

Lode and placer mineral activities in the North Red Dog, East Ambler, Central Omar-Kiana, and South Seward Peninsula areas are the same as discussed in Alternative B – Development.

If locatable mineral activity were to occur on every existing operation, as allowable by present BLM authority on BLM-managed lands, an estimated total of 1,816 acres could potentially be disturbed in the KSP Planning Area. Total includes surface disturbance of 38 acres on BLM unencumbered lands, 1,671 acres on State-selected lands and 107 acres on Native-selected lands. Depending upon the results of conveyances, some of this locatable mineral activity may occur on lands owned by the State and native corporations. Due to the small size of the existing operations as well as the short period of operation there would be a minor impact on the local air and water quality.

All mineral related activities occurring on BLM-managed lands are subject to current BLM surface regulations as outlined in 43CFR 3809. Operators are required to submit Plans of Operation which include site-specific guidelines as listed in BLM-Alaska Stipulations and Required Operating Procedures. All operations are required to meet applicable Federal and State air and water quality standards for permitting.

Salable material (sand and gravel) activities on federally administered surface/minerals and split estate are available for exploration and development. Salable material sales within established withdrawals would be approved on a case-by-case basis. Activities are subject to BLM-Alaska Stipulations and Required Operating Procedures. Large reserves of salable material exist on State and Native land and no disturbance of BLM lands is anticipated.

Table 6. Estimated acres of disturbance by alternative on BLM unencumbered, State-selected, and Native-selected lands.

Area	Alt A - No Action		Alt B - Development		Alt C - Conservation		Alt D - Preferred	
	BLM	Selected	BLM	Selected	BLM	Selected	BLM	Selected
North Red Dog	0	SS - 0 NS - 0	0	SS - 5 NS - 0	0	SS - 0 NS - 0	0	SS - 5 NS - 0
East Ambler	0	SS - 0 NS - 0	0	SS - 845 NS - 5	0	SS - 0 NS - 0	0	SS - 845 NS - 5
Central Omar-Kiana	0	SS - 56 NS - 0	0	SS - 21 NS - 0	0	SS - 56 NS - 0	0	SS - 21 NS - 0
South Seward Peninsula	0	SS - 11 NS - 0	38	SS - 800 NS - 102	0	SS - 11 NS - 0	38	SS - 800 NS - 102

SS – State-selected, NS – Native-selected

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## **STATEMENT OF QUALIFICATIONS**

Mark P. Meyer, Physical Scientist and Darla D. Pindell, Mineral Economist, Bureau of Land Management, Division of Energy and Solid Minerals.

## APPENDIX I

Appendix 1. Estimated maximum disturbance from lode mineral development within the Kobuk-Seward Peninsula Planning Area.

PoD	Deposit name	Status	Deposit model type (Cox and Singer)	Reserves/resources	Mine production rates (est.)	Disturbed acreage (est.)	Reasonably foreseeable Alt. B
<b>NORTH RED DOG AREA</b>							
m	Unnamed (Kukpowruk)	SS	Unknown	Unknown, Cu	No data	5 to 15 acres for exploration	5 acres dist. 5 acres recl.
<b>EAST AMBLER AREA</b>							
m	Jade Mountain Copper	NS	32c - Kipushi Cu-Pb-Zn	Unknown	14,000 stpd used for analysis	5 acres for exploration	5 acres dist. 1 acre recl.
h	Smucker	SS	28a - Kuroko massive sulfide	7.2 million st reserves; 0.5% Cu, 4.9% Zn, 1.72% Pb, 5.56 oz/t Ag, 0.04 oz/t Au (Newberry and others, 1997)	2,000 stpd used for analysis	840 acres for development and production	840 acres
m	Unnamed	SS	Unknown	Unknown	No data	5 acres for exploration	5 acres dist. 5 acres recl.
<b>SOUTH SEWARD PENINSULA AREA</b>							
m	Alder Prospect	NS	36a - Low-sulfide Au qtz	Unknown	Not calculated	1 to 5 acres for exploration	5 acres dist. 5 acres recl.
m	Alpha Ridge	NS	36a - Low-sulfide Au qtz	Unknown	36 stpd used for analysis	180 acres for development and production	0 acres
m	Beltz/Split Creek	BLM	Unknown	Unknown	No data	1 to 5 acres for exploration	5 acres dist. 5 acres recl.
m	Big Hurrah Mine	NS	36a - Low-sulfide Au qtz	100,000 st proven, inferred, indicated reserves; 0.61 oz/t Au, 0.55 oz/t Ag	80 stpd used for analysis	1 to 5 acres for exploration, 25 to 40 acres for development and production	4.5 ext. dist., 5 acres dist., 9.5 acres recl. 30 acres dist. for devel.
m	Boulder Creek	NS	36a - Low-sulfide Au qtz	Unknown	No Data	1 to 5 acres for exploration	5 acres dist. 5 acres recl.

PoD = Probability of development: h = high, m = moderate; Status: NS = Native-selected, SS = State-selected, BLM = Bureau of Land Management

Appendix 1. Estimated maximum disturbance from lode mineral development within the Kobuk-Seward Peninsula Planning Area -- continued.

PoD	Deposit name	Status	Deposit model type (Cox and Singer)	Reserves/resources	Mine production rates (est.)	Disturbed acreage (est.)	Reasonably Foreseeable Alt. B
<b>SOUTH SEWARD PENINSULA AREA -- continued</b>							
m	Breen East (Hobson)	SS	Unknown	Unknown	No data	1 to 5 acres for exploration	5 acres dist., 5 acres recl.
m	Charlie Creek	SS	36a - Low-sulfide Au qtz	Unknown	No data	1 to 5 acres for exploration	5 acres dist., 5 acres recl.
h	Christophosen Creek	SS	Graphite	Included in Imuruk Basin Graphite	Included in IBG	Included in IBG	Included in IBG
h	Death Valley	SS	30c - Sandstone U	1 million st inferred; 0.27% U3O8 (Szumigala and others, 2004)	1,200 stpd used for analysis	700 acres for development and production	700 acres dist., <700 recl.
m	Granite Creek	SS	22c - Polymetallic veins	Unknown	7 stpd used for analysis	1 to 5 acres for exploration	5 acres dist., 5 acres recl.
h	Graphite Creek	SS	Graphite	Included in Imuruk Basin Graphite	Included in IBG	Included in IBG	Included in IBG
h	Imuruk Basin Graphite (IBG)	SS	Graphite	65,000 st resource; 60% graphite: 10 million st resource; 10% graphite (Hudson, 1998)	<1 stpd	20 acres for development and production	20 acres dist., 20 acres recl.
m	Johns Creek Lode	BLM	Unknown	Unknown	No data	1 to 5 acres for exploration	5 acres dist., 5 acres recl.
m	Kougarok R. Lode	SS	Unknown	Unknown	No data	1 to 5 acres for exploration	5 acres dist., 5 acres recl.
m	Last Chance	NS	Unknown	Unknown	No data	1 to 5 acres for exploration	5 acres dist., 5 acres recl.
m	Manila Ridge	SS	Unknown	Unknown	No data	1 to 5 acres for exploration	5 acres dist., 5 acres recl.
m	Metal Ridge East	SS	Unknown	Unknown	No data	1 to 5 acres for exploration	5 acres dist., 5 acres recl.
m	Otter Creek Lode	SS	36a - Low-sulfide Au qtz	Unknown	No data	1 to 5 acres for exploration	5 acres dist., 5 acres recl.

PoD = Probability of development: h = high, m = moderate; Status: NS = Native-selected, SS = State-selected, BLM = Bureau of Land Management

Appendix 1. Estimated maximum disturbance from lode mineral development within the Kobuk-Seward Peninsula Planning Area -- continued.

PoD	Deposit name	Status	Deposit model type (Cox and Singer)	Reserves/resources	Mine production rates (est.)	Disturbed acreage (est.)	Reasonably Foreseeable Alt. B
<b>SOUTH SEWARD PENINSULA AREA -- continued</b>							
m	Post	SS	36a - Low-sulfide Au qtz	Unknown	35 stpd used for analysis	5 acres for exploration, <40 acres for development and production	5 acres dist., 5 acres recl.
m	Quigley; Gray Eagle	NS	27d - Simple Sb	Unknown	<1 stpd	1 to 5 acres for exploration, <20 acres for development and production	5 acres dist., 5 acres recl., 20 acres dist. for devel.
m	Silver; Flynn	NS	36a - Low-sulfide Au qtz	Unknown	No data	1 to 5 acres for exploration	5 acres dist., 5 acres recl.
h	Sliscovich	SS	36a - Low-sulfide Au qtz	Unknown	No data	1 to 5 acres for exploration	5 acres dist., 5 acres recl.
m	Trilby Hill	NS	27d - Simple So	Unknown	<1 stpd	1 to 5 acres for exploration, <20 acres for development and production	5 acres dist., 5 acres recl.
m	Unnamed (Bear Creek)	BLM	Unknown	Unknown	No data	1 to 5 acres for exploration	5 acres dist., 5 acres recl.
m	Unnamed (Boulder Creek)	NS	36a - Low-sulfide Au qtz	Unknown	No data	1 to 5 acres for exploration	5 acres dist., 5 acres recl.
m	Unnamed (Kougarok River)	SS	Unknown	Unknown	No data	1 to 5 acres for exploration	5 acres dist., 5 acres recl.
m	Unnamed (Short Creek)	SS	Unknown	Unknown	No data	1 to 5 acres for exploration	5 acres dist., 5 acres recl.
m	Unnamed (Tubutulik)	SS	Unknown	Unknown	No data	1 to 5 acres for exploration	5 acres dist., 5 acres recl.

PoD = Probability of development: h = high, m = moderate; Status: NS = Native-selected, SS = State-selected, BLM = Bureau of Land Management

Appendix 1. Estimated maximum disturbance from lode mineral development within the Kobuk-Seward Peninsula Planning Area -- continued.

PoD	Deposit name	Status	Deposit model type (Cox and Singer)	Reserves/resources	Mine production rates (est.)	Disturbed acreage (est.)	Reasonably Foreseeable Alt. B
<b>SOUTH SEWARD PENINSULA AREA -- continued</b>							
m	Unnamed (Twin Mountain)	NS	27d - Simple Sb	Unknown	<1 stpd	1 to 5 acres for exploration, <20 acres for development and production	5 acres dist., 5 acres recl.
m	Windy Creek	SS	21b - Porhyry Mo, low F	Unknown	14,600 stpd used for analysis	5 to 15 acres for exploration	5 acres dist., 5 acres recl.

PoD = Probability of development: h = high, m = moderate; Status: NS = Native-selected, SS = State-selected, BLM = Bureau of Land Management

## APPENDIX 2

Appendix 2. Estimated maximum disturbance from placer mineral development within the Kobuk-Seward Peninsula Planning Area -- continued.

PoD	Deposit name	Status	Deposit model type (Cox and Singer)	Reserves/resources	Mine production rates (est.)	Disturbed acreage (est.)	Reasonably Foreseeable Alt. B
<b>EAST AMBLER AREA</b>							
m	Agnes Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Bismark Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	California Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Lynx Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Shungnak River	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Shungnak River	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
<b>CENTRAL OMAR-KIANA AREA</b>							
m	Bear Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Gold Run Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	10 acres for dev. & prod.	10 acres
h	Homestake Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
m	Jack Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Klery Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	10 acres for dev. & prod.	10 acres

PoD = Probability of development: h = high, m = moderate; Status: NS = Native-selected, SS = State-selected, BLM = Bureau of Land Management

Appendix 2. Estimated maximum disturbance from placer mineral development within the Kobuk-Seward Peninsula Planning Area -- continued.

PoD	Deposit name	Status	Deposit model type (Cox and Singer)	Reserves/resources	Mine production rates (est.)	Disturbed acreage (est.)	Reasonably Foreseeable Alt. B
<b>SOUTH SEWARD PENINSULA AREA</b>							
m	Adams Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Aggie Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Alameda Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Bear Creek	BLM	39a - Placer Au-PGE	Unknown	Unknown	10 acres for dev. & prod.	10 acres
h	Bear Creek	BLM	39a - Placer Au-PGE	Unknown	Unknown	10 acres for dev. & prod.	10 acres
m	Bear Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Big Hurrah Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Birch Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Black Gulch	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
m	Bob Creek	BLM	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Bonanza Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
h	Boulder Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	10 acres for dev. & prod.	10 acres
m	Boulder Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Butte Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres

PoD = Probability of development: h = high, m = moderate; Status: NS = Native-selected, SS = State-selected, BLM = Bureau of Land Management

Appendix 2. Estimated maximum disturbance from placer mineral development within the Kobuk-Seward Peninsula Planning Area -- continued.

PoD	Deposit name	Status	Deposit model type (Cox and Singer)	Reserves/resources	Mine production rates (est.)	Disturbed acreage (est.)	Reasonably Foreseeable Alt. B
<b>SOUTH SEWARD PENINSULA AREA -- continued</b>							
m	Buzzard Gulch	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Cache Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	California Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
m	Camp Creek	BLM	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Camp Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
m	Canyon Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Charley Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
m	Christmas	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Cub Creek	BLM	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Elkhorn Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
h	Elkhorn - Niukluk	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
m	Fox Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Goldbottom Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre

PoD = Probability of development: h = high, m = moderate; Status: NS = Native-selected, SS = State-selected, BLM = Bureau of Land Management

Appendix 2. Estimated maximum disturbance from placer mineral development within the Kobuk-Seward Peninsula Planning Area -- continued.

PoD	Deposit name	Status	Deposit model type (Cox and Singer)	Reserves/resources	Mine production rates (est.)	Disturbed acreage (est.)	Reasonably Foreseeable Alt. B
<b>SOUTH SEWARD PENINSULA AREA -- continued</b>							
h	Goose Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
m	Grouse Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Grouse Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
m	Grouse Creek	NS	39e - Alluvial placer Sn	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Henry Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Hobson Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
h	Homestake Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
h	Hopefull Gulch	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
m	Jerome Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Johns Creek	BLM	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
m	Kanauguk River	SS	39e - Alluvial placer Sn	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Kasson Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Lion Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres

PoD = Probability of development: h = high, m = moderate; Status: NS = Native-selected, SS = State-selected, BLM = Bureau of Land Management

Appendix 2. Estimated maximum disturbance from placer mineral development within the Kobuk-Seward Peninsula Planning Area -- continued.

PoD	Deposit name	Status	Deposit model type (Cox and Singer)	Reserves/resources	Mine production rates (est.)	Disturbed acreage (est.)	Reasonably Foreseeable Alt. B
<b>SOUTH SEWARD PENINSULA AREA -- continued</b>							
h	Manila Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
m	Manila Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Meddler Gulch	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Merritt Gulch	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Monument Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Moran Gulch	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Northwest Alaska Mining Company	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Offield Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Ophir Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Osborn Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Otter Creek	SS	39e - Alluvial placer Sn	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Penny Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Pine Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre

PoD = Probability of development: h = high, m = moderate; Status: NS = Native-selected, SS = State-selected, BLM = Bureau of Land Management

Appendix 2. Estimated maximum disturbance from placer mineral development within the Kobuk-Seward Peninsula Planning Area -- continued.

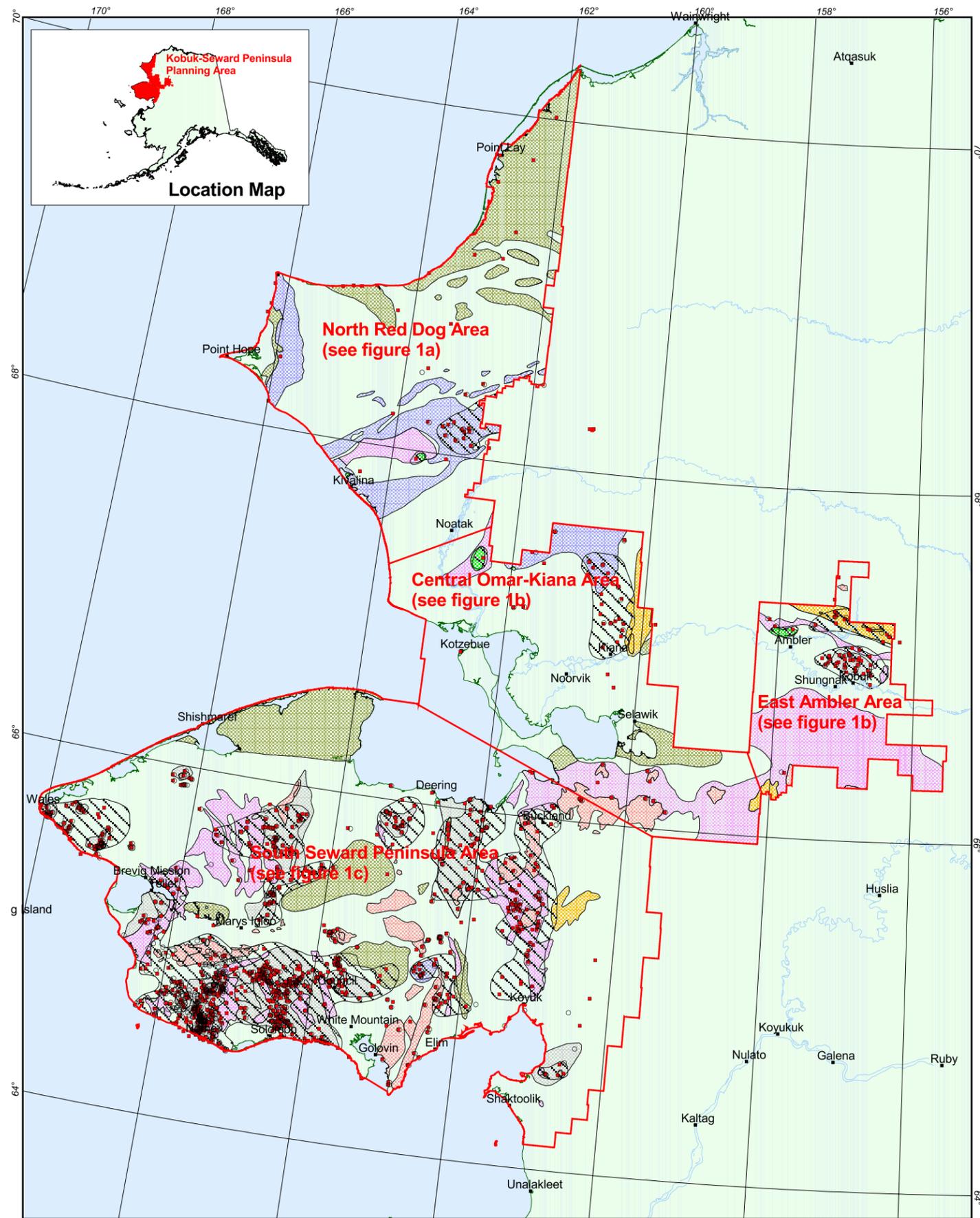
PoD	Deposit name	Status	Deposit model type (Cox and Singer)	Reserves/resources	Mine production rates (est.)	Disturbed acreage (est.)	Reasonably Foreseeable Alt. B
<b>SOUTH SEWARD PENINSULA AREA -- continued</b>							
m	Problem Gulch	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Puckmummie Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
m	Puzzle Gulch	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Quartz Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Rabbit Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Richter Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
m	Rock Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Ruby Gulch	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Sapphire Gulch	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Sheridan Creek	BLM	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
m	Shovel Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Sledge Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Solomon River	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Solomon River	BLM	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre

PoD = Probability of development: h = high, m = moderate; Status: NS = Native-selected, SS = State-selected, BLM = Bureau of Land Management

Appendix 2. Estimated maximum disturbance from placer mineral development within the Kobuk-Seward Peninsula Planning Area -- continued.

PoD	Deposit name	Status	Deposit model type (Cox and Singer)	Reserves/resources	Mine production rates (est.)	Disturbed acreage (est.)	Reasonably Foreseeable Alt. B
<b>SOUTH SEWARD PENINSULA AREA -- continued</b>							
m	St. Michaels Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Sweetcake Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Tisuk River	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
h	Turner Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
m	Twin Mountain Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
h	Ungalik River	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
h	Upper Homestake Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
h	Upper Warm Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	1 acre
m	Willow Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Winona Creek	SS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres
m	Winston Creek	NS	39a - Placer Au-PGE	Unknown	Unknown	1 to 5 acres for exploration	0 acres

PoD = Probability of development: h = high, m = moderate; Status: NS = Native-selected, SS = State-selected, BLM = Bureau of Land Management



# EXPLANATION

- Mineral occurrences ARDF
  - Mineral occurrences AMIS
- Mineral Terranes**
- |                                      |      |                 |   |
|--------------------------------------|------|-----------------|---|
|                                      | UNIT | classifications | INTRUSIVE TERRANES                        |
| <b>Granitic Rocks</b>                |      |                 |   |
|                                      | IGU  |                 | Undivided granitic rocks                  |
|                                      | IGA  |                 | Alkalic granitic rocks                    |
|                                      | IGF  |                 | Felsic granitic rocks                     |
|                                      | IGI  |                 | Intermediate granitic rocks               |
| <b>Mafic-ultramafic Rocks</b>        |      |                 |   |
|                                      | IMA  |                 | Mafic intrusive rocks                     |
|                                      | IUM  |                 | Ultramafic rocks                          |
| <b>VOLCANIC-SEDIMENTARY TERRANES</b> |      |                 |   |
| <b>Felsic Volcanic Rocks</b>         |      |                 |   |
|                                      | VFU  |                 | Undivided felsic volcanic rocks           |
|                                      | VFA  |                 | Alkalic felsic volcanic rocks             |
|                                      | VSF  |                 | Undivided sedimentary and felsic volcanic |
| <b>Mafic Volcanic Rocks</b>          |      |                 |   |
|                                      | VSM  |                 | Undivided sedimentary and mafic volcanic  |
|                                      | VOP  |                 | Ophiolite terrane                         |
| <b>SEDIMENTARY TERRANES</b>          |      |                 |   |
| <b>Marine Rocks</b>                  |      |                 |   |
|                                      | SLS  |                 | Limestone and shale                       |
|                                      | SBS  |                 | Black, carbonaceous shale and limestone   |
| <b>Continental Rocks</b>             |      |                 |   |
|                                      | SCB  |                 | Coal-bearing sandstone and shale          |
|                                      | SGS  |                 | Graywacke and shale                       |
|                                      | SLU  |                 | Limestone                                 |
|                                      |      |                 | Known mineral deposit areas (KMDA)        |
|                                      |      |                 | Kobuk-Seward Peninsula Boundary           |

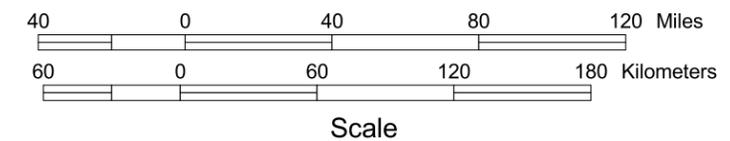


Figure 1. Index map of the locateable mineral occurrence and mineral terrane maps of the Kobuk-Seward Peninsula Planning Area.

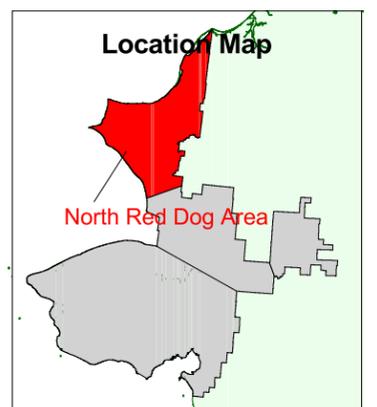
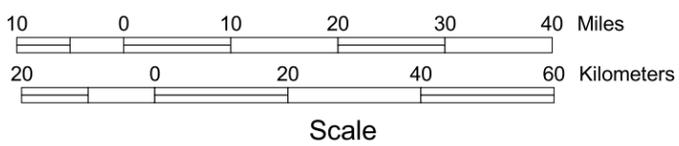
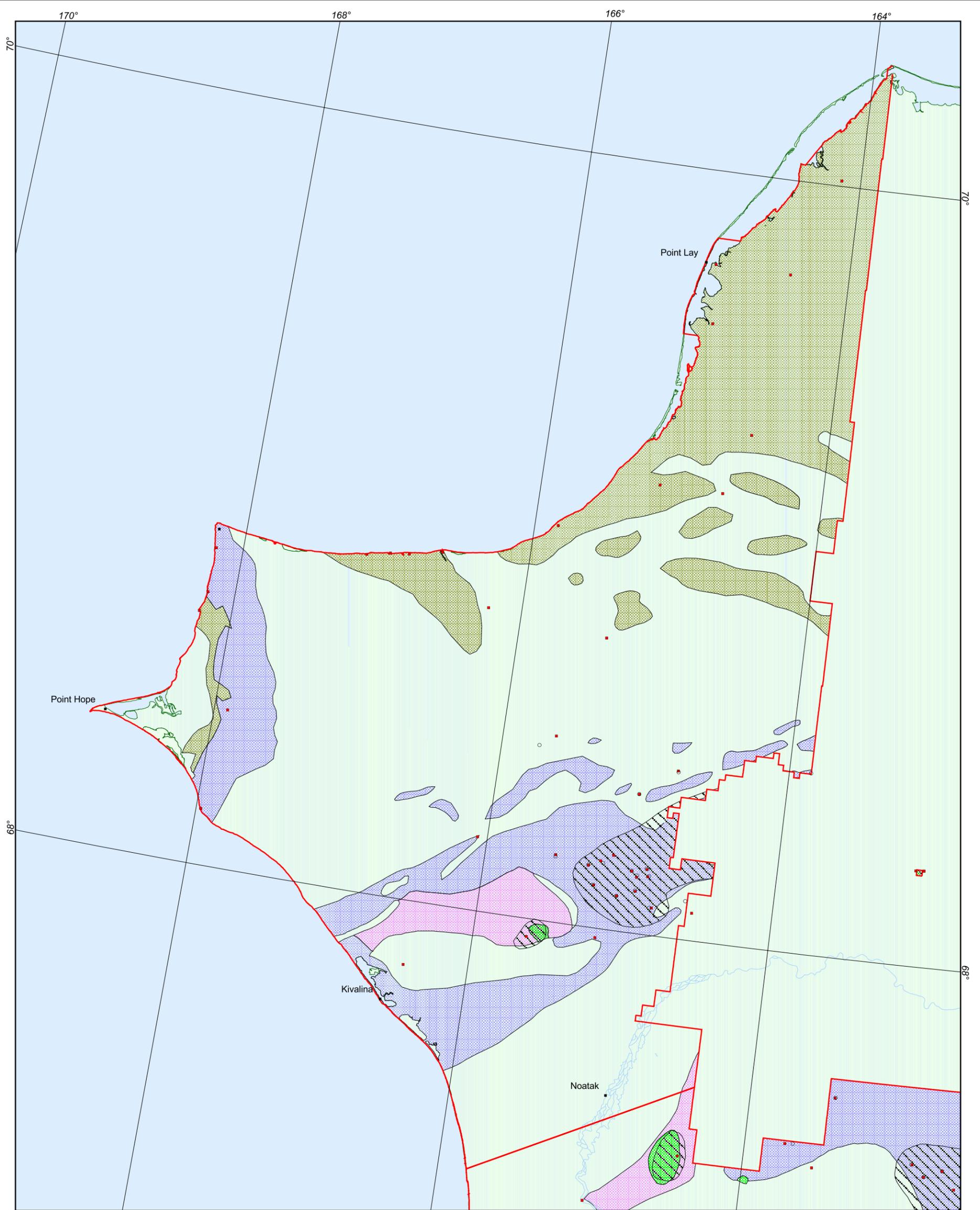


Figure 1a. Locateable mineral occurrence and mineral terrane map of the North Red Dog Area, Kobuk-Seward Peninsula Planning Area.

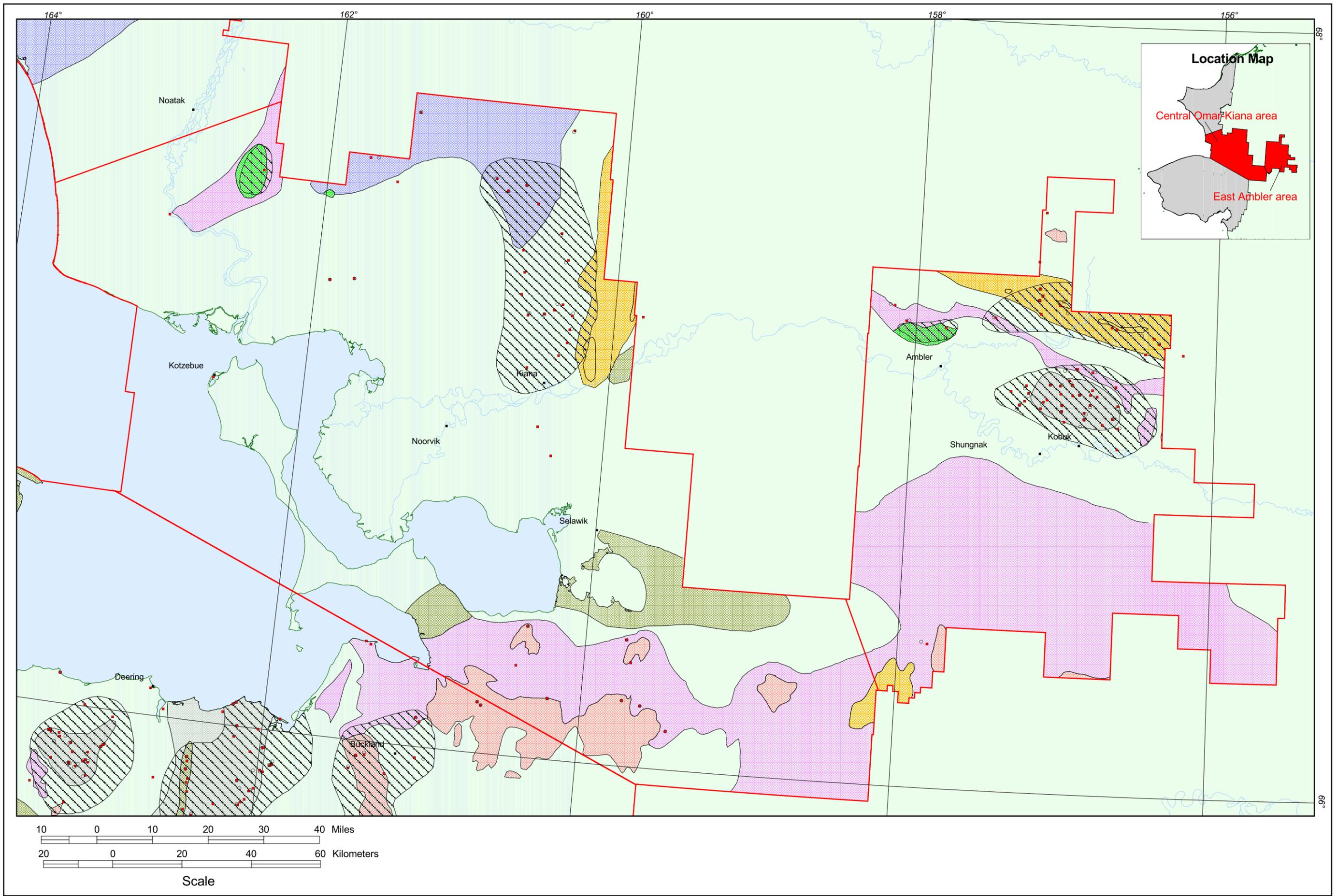


Figure 1b. Locateable mineral occurrence and mineral terrane map of the Central Omar-Kiana and the East Ambler Areas, Kobuk-Seward Peninsula Planning Area.

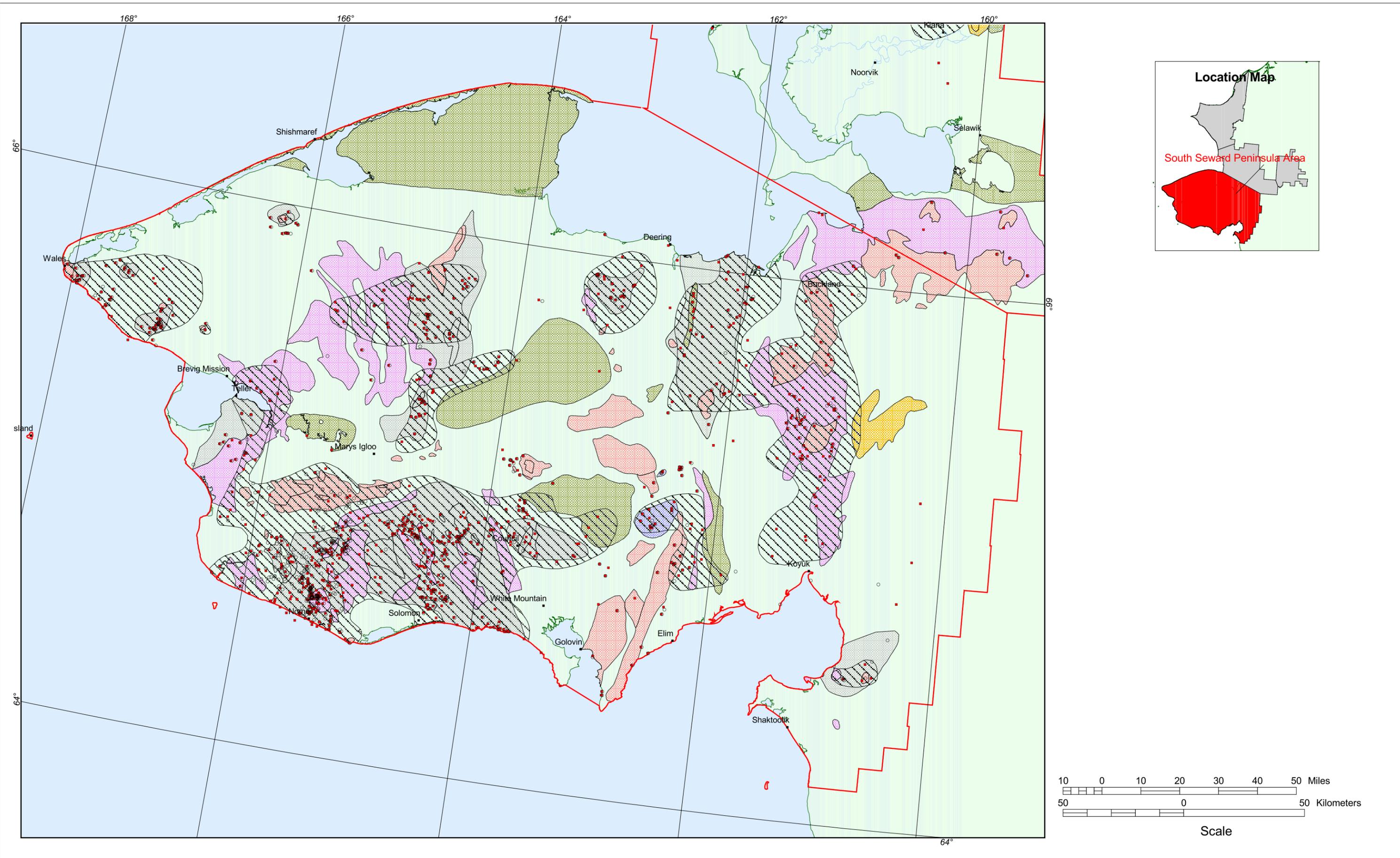
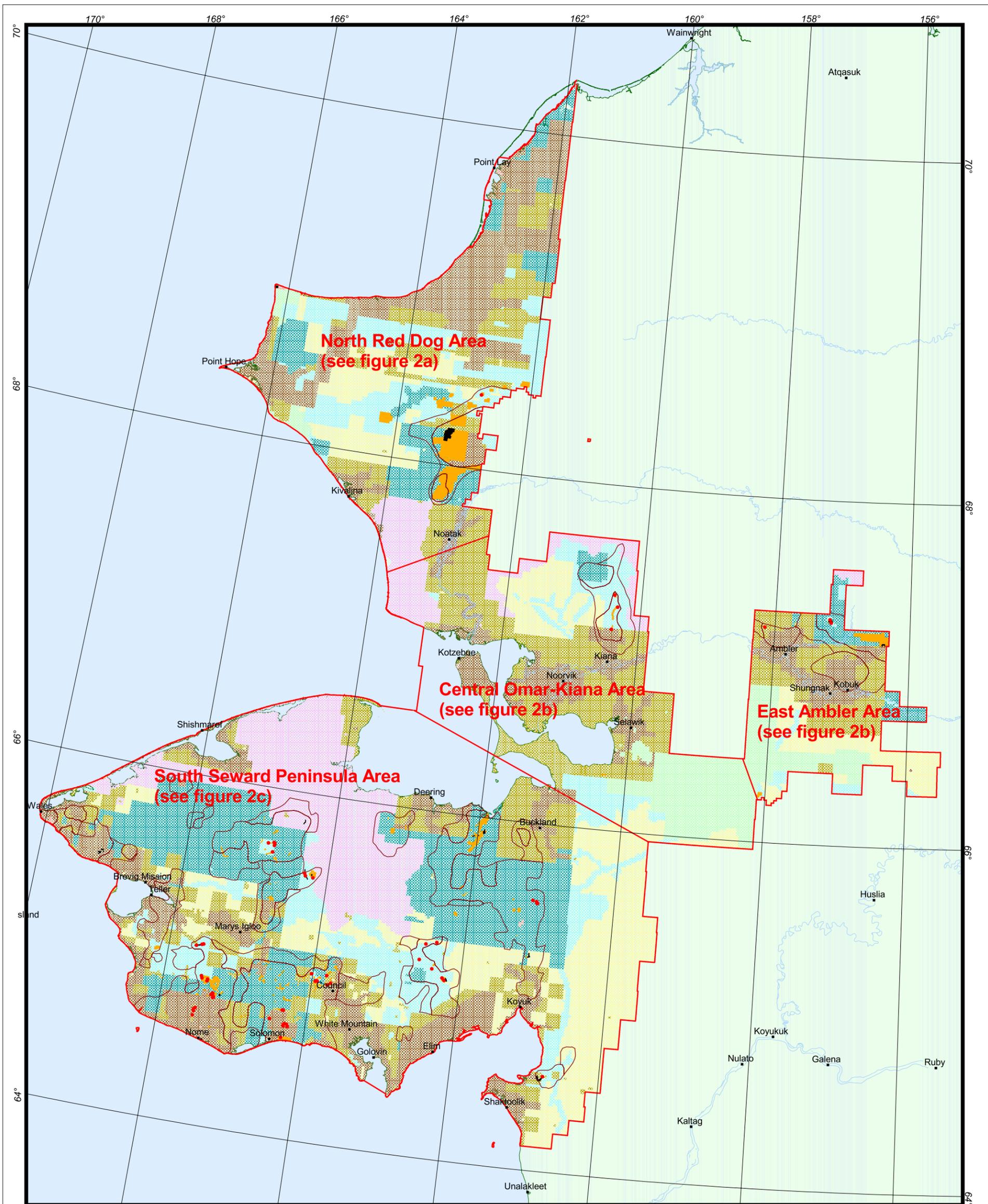


Figure 1c. Locateable mineral occurrence and mineral terrane map of the South Seward Peninsula, Kobuk-Seward Peninsula Planning Area.



### EXPLANATION

- |                                      |                                     |                     |
|--------------------------------------|-------------------------------------|---------------------|
| • Selected Lode & Placer Occurrences | <b>Land Status (as of May 2004)</b> | Native Patent or IC |
| State Mining Claims                  | Bureau of Land Management           | Native Selected     |
| Federal Mining Claims (as of 2004)   | Fish and Wildlife Service           | Private             |
| <b>Mineral Potential</b>             | Forest Service                      | State Patent or TA  |
| High occurrence potential area       | Military                            | State Selected      |
| Kobuk-Seward Peninsula Boundary      | National Park Service               | Town / Village      |

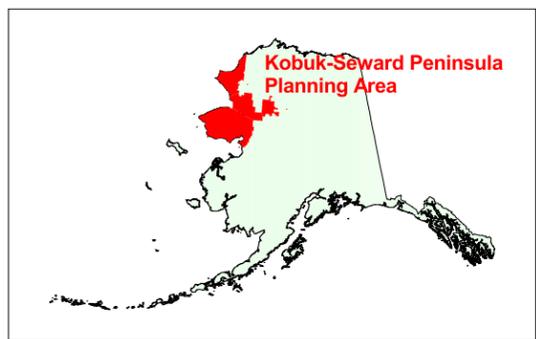
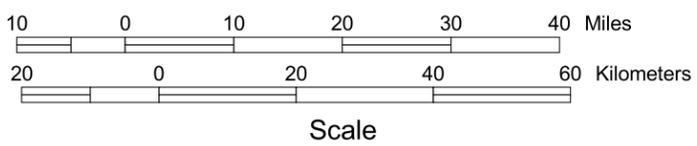
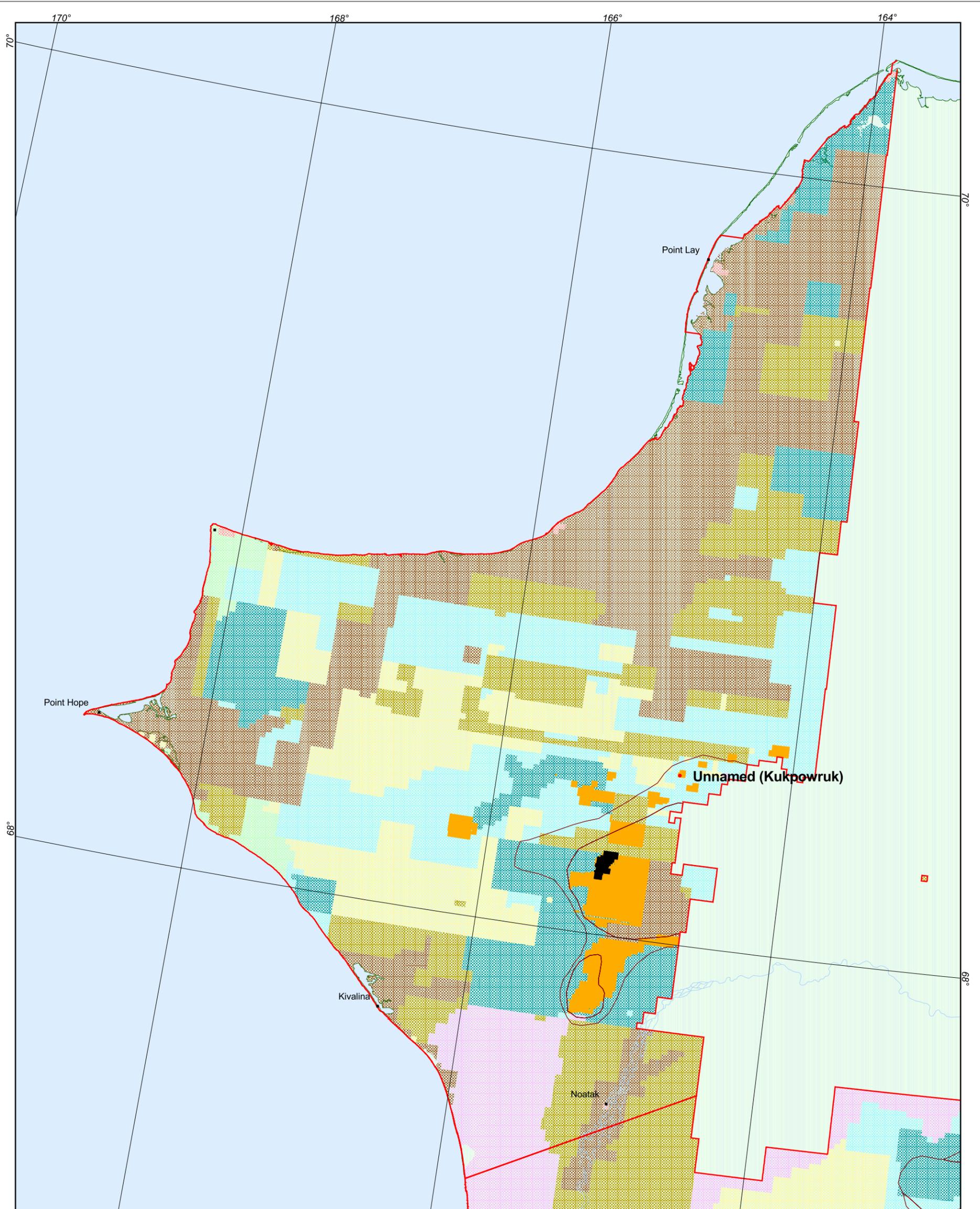


Figure 2. Index map of the locatable high mineral potential and land status maps of the Kobuk-Seward Peninsula Planning Area.



Scale

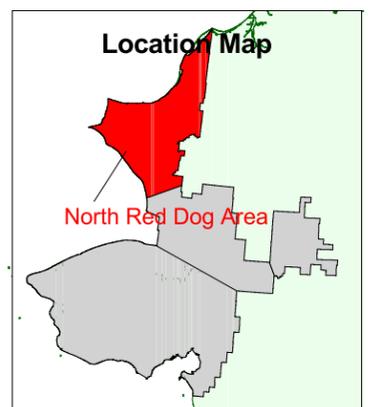


Figure 2a. Locateable high mineral potential and land status map of the North Red Dog Area, Kobuk-Seward Peninsula Planning Area.

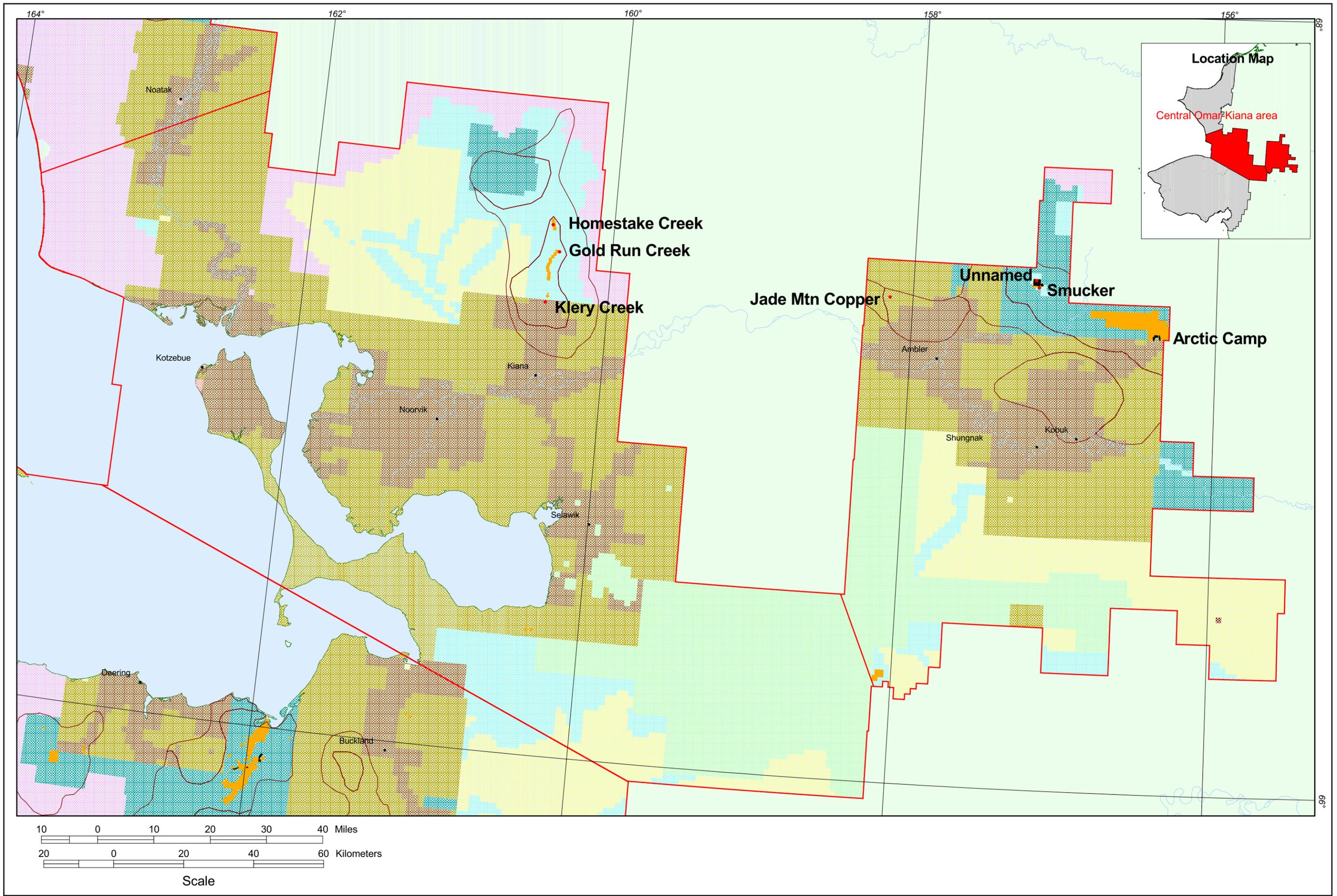


Figure 2b. Locateable high mineral potential and land status map of the Central Omar-Kiana and the East Ambler Areas, Kobuk-Seward Peninsula Planning Area.

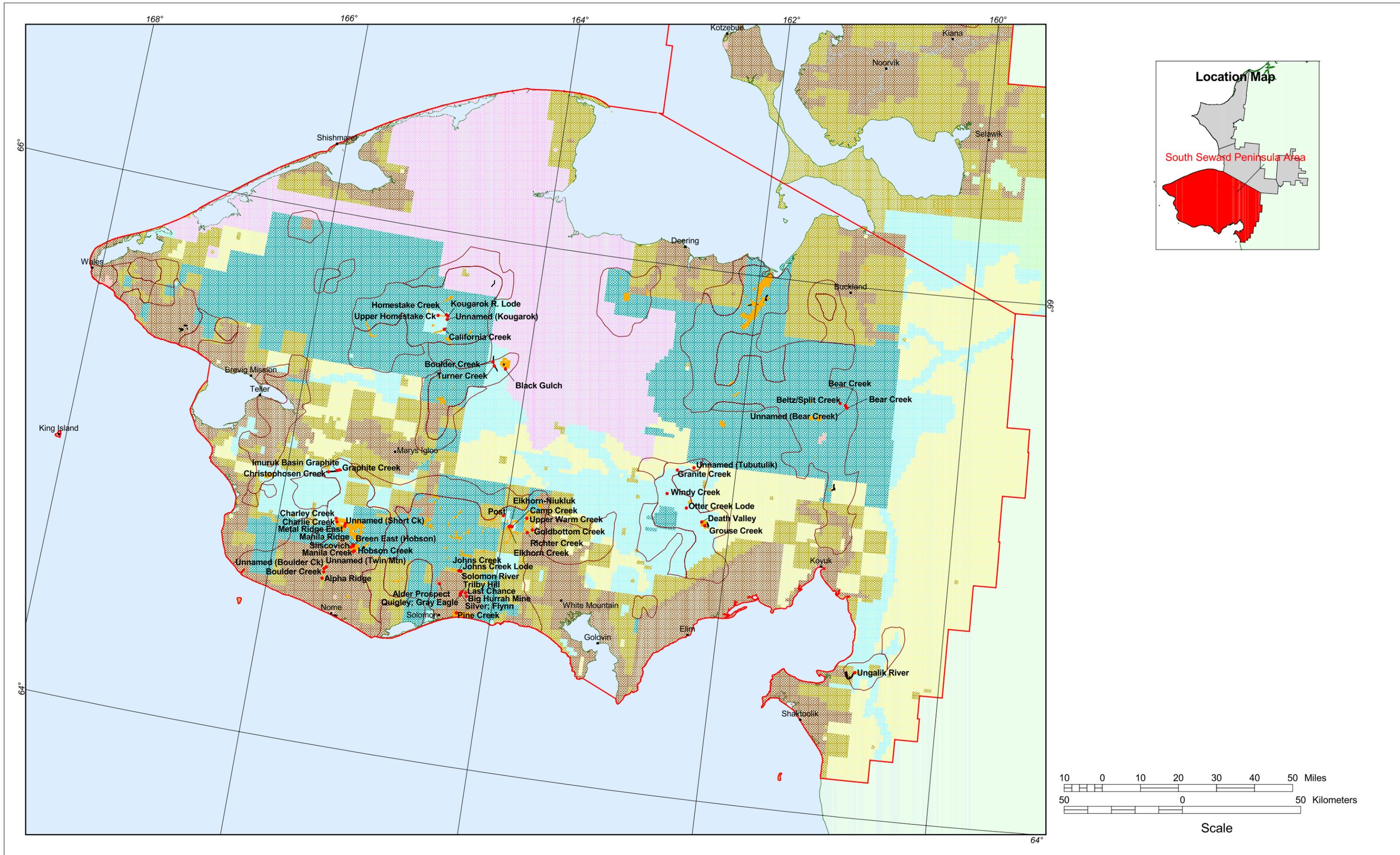


Figure 2c. Locateable high mineral potential and land status map of the South Seward Peninsula area, Kobuk-Seward Peninsula Planning area.