Ambler Mining Region Economic Impact Analysis

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Document Information

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Acronyms

ADLWD	Alaska Department of Labor and Workforce Development
AEA	Alaska Energy Authority
AHFC	Alaska Housing Finance Corporation
AIAN	American Indian Alaska Native
AIDEA	Alaska Industrial Development and Export Authority
District	Ambler Mining District

Doyon	Doyon Limited
AMDIAR	Ambler Mining District Industrial Access Road
ANCSA	Alaska Native Claims Settlement Act
APMA	Annual Placer Mining Application
ARRA	American Recovery and Reinvestment Act of 2009
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
DCRA	Division of Community and Regional Affairs
DMTS	DeLong Mountain Transportation System
EIS	environmental impact statement
EPCM	Engineering, Procurement, Construction and Management
FNSB	Fairbanks North Star Borough
FY	Fiscal Year
kWh	kilowatt hour
LDC	Long Distance Commuting
LOM	Life of Mine
LPCs	Local Purchase Coefficients
Maniilaq	Maniilaq Association
NANA	NANA Regional Corporation
NWAB	Northwest Arctic Borough
PCE	Power Cost Equalization
PEA	Preliminary Economic Assessment Report
PILT	Payment in Lieu of Taxes
RCA	Regulatory Commission of Alaska
TCC	Tanana Chiefs Conference
TPA	Tribal Priority Allocation
UKMP	Upper Kobuk Minerals Project
YKCA	Yukon-Koyukuk Census Area

Executive Summary

Introduction

The Alaska Industrial Development and Export Authority (AIDEA) is proposing to construct a controlled-access industrial access road to the Ambler Mining District (District) located along the southern base of the Brooks Range in Interior Alaska. The proposed Ambler Mining District Industrial Access Road (AMDIAR) project would design, construct, and operate a controlled-access industrial transportation corridor from the District to the Dalton Highway (**Figure 1-1**). The proposed Brooks East Corridor has been identified as the most feasible alignment for surface transportation access to the District.

The District has significant mineral exploration and development potential. It is characterized as one of the world's largest undeveloped copper-zinc mineral belts.[1] Access to the region could spur the development of existing mining projects such as the Arctic, Bornite, Sun, and Smucker Projects, each of which has large estimated mineral reserves. Furthermore, access to the region could increase additional mineral exploration activity within the District.

The study area for this analysis includes the Yukon-Koyukuk Census Area (YKCA) and Northwest Arctic Borough (NWAB), with particular focus on the communities located in relatively close proximity to the proposed AMDIAR. YKCA study area communities include Bettles, Evansville, Allakaket, Alatna, Huslia, and Hughes, while NWAB study area communities include Kobuk, Shungnak, and Ambler. Communities within the study area rely heavily upon subsistence resources, which contribute significantly to the economic and social welfare of these communities.

Developing access to the District will facilitate mineral development in the region. The construction and operation of AMDIAR would provide major benefits to area residents and the State of Alaska, such as employment and income opportunities and reduced cost of living within the region. In addition to AMDIAR development, this economic impact analysis assumes that the major District mineral projects currently in the exploratory phase would develop due to road access and evaluates how this development would affect employment, income, and tax revenue.

Ambler Mining District Mineral Resources

The Ambler Mining Region has significant mineral exploration and development potential. Within the Ambler Mining Region is the Ambler Mining District, also referred to as the Ambler Mineral Belt. The Ambler Mineral Belt is a 75-mile-long area of mineralization that is considered one of the world's largest undeveloped copper-zinc mineral belts.[2]

There are four major mineral deposits within the District in different stages of exploration (the Arctic, Bornite, Sun, and Smucker deposits). As provided in **Table ES-1**, the most recent mineral resource estimates place the total available mineral resources of these four projects at a combined 160.7 million tons.

[1] Alaska Department of Commerce, Community, and Economic Development, 2014, Ambler Mining Region: Summary of Mineral Projects and Prospects, Division of Economic Development.

[2] Ibid.

Table ES-1 Mineral Resource Estimates for Major Ambler Mining District Projects

	Estimated Resource (tons)	Copper (tons)	Zinc (tons)	Lead (tons)	Silver (oz.)	Gold (oz.)
Arctic						
Indicated	26,300,000	857,000	1,169,000	200,000	40,800,000	550,000
Inferred	3,700,000	120,000	143,000	22,000	4,500,000	60,000
Total	30,000,000	976,000	1,312,000	222,000	45,300,000	610,000
Bornite						
Indicated	7,500,000	89,000	na	na	na	na
Inferred	100,100,000	1,646,000	na	na	na	na
Total	107,600,000	1,735,000	na	na	na	na
Sun						
Indicated	2,400,000	34,000	98,000	25,000	4,000,000	14,000
Inferred	12,800,000	146,000	502,000	176,000	28,800,000	89,000
Total	15,200,000	180,000	601,000	201,000	32,800,000	103,000
Smucker						
Historical Resource Estimate*	7,900,000	40,000	389,000	135,000	36,100,000	255,000
Total	7,900,000	40,000	389,000	135,000	36,100,000	255,000
Four Project Total	160,700,000	2,937,000	2,302,000	558,000	114,200,000	968,000

na = information is not available at this time.

*The historical resource estimate for the Smucker Project is considered relevant but not reliable. It is used here in the absence of more recent or reliable data about the project's available mineral resources.

Sources:

Andover Mining Corporation, September 30, 2013, Technical Report on the Sun Project, Brooks Range, Alaska, Prepared by Mine Development Associates.

NovaCopper, September 12, 2013, Preliminary Economic Assessment Report on the Arctic Project, Ambler Mining District, Northwest Alaska, Prepared by Tetra Tech, Website (http://www.novacopper.com/i/pdf/reports/2013_Arctic_PEA_FINAL.pdf) accessed November 3, 2014.

NovaCopper, April 1, 2014, NI 43-101 Technical Report on the Bornite Project, Northwest Alaska, USA, Prepared by BD Resource Consulting, Inc., SIM Geological Inc. and International Metallurgical & Environmental Inc., Website (http://www.novacopper.com/i/pdf/reports/Technical_Report_Bornite_Project_1April2014.pdf) accessed November 3, 2014.

Socioeconomic Condition

Hunting and fishing provide a reliable economic base for many rural areas of the state including the study area communities.[3] In areas of Alaska with a mixed economy, a family's subsistence production is augmented and supported by cash employment of family members. The combination of subsistence and cash employment offers a lifestyle valued by many rural communities.[4] Total subsistence harvest estimates within the study area range from 52.8 pounds per person in Evansville to nearly 1,500 pounds

[3] Wolfe, Robert J., and Robert J. Walker, 1987, Arctic Anthropology, Volume 24 (2), Website (http://www.subsistence.adfg.state.ak.us/download/download/subecon.pdf) accessed December 8, 2014.

[4] Ibid.

per person in Hughes. As an illustration of the relative importance of subsistence resources to study area communities, the per capita consumption of red meat, poultry, and fish throughout the United States in 2012 was approximately 200 pounds.[5]

Alaska Native populations constitute a high proportion of most study area communities' total populations. For example, 100 percent of the populations in New Allakaket, Alatna, Hughes, Kobuk, and Shungnak are Alaska Natives. Similarly, Alaska Native populations constitute most of the population in Evansville, Huslia, Ambler, and Allakaket, where between 77 percent and 93 percent of each community is Alaska Native.

In 2013, the total population of study area communities was 1,345, which was a 21.9 percent increase from 1990.[6] Despite this, half of the study area communities exhibited population declines from 1990 through 2013. Poverty rates within the study area were found to be high, with the YKCA and NWAB exhibiting a poverty rate of 23 percent and 19 percent, respectively.

In the NWAB, private industries employ roughly 60 percent of the total workforce, and the public sector employs the remaining 40 percent. The opposite is true in the YKCA, where roughly 60 percent of jobs are in government and 40 percent are in private industries.

Major Operational Metal Mines in Alaska

Currently there are six major mines operating in Alaska: Red Dog Mine, Fort Knox Mine, Greens Creek Mine, Pogo Mine, Kensington Mine, and the Usibelli Coal Mine. There are also over 180 rock, sand, and gravel mining operations and more than 300 placer mining operations throughout the state.[7] In addition to these major active mines, there are many mining exploration projects underway including the Upper Kobuk Minerals Project (UKMP), Chuitna Coal Project, Wishbone Hill Project, Donlin Gold Project, Pebble Project, Livengood Project, Niblack Project, and a number of others.[8] As provided in **Table ES-2,** the most recent employment estimates for each major active metal mine in Alaska range from 300 employees at the Kensington Mine to 629 employees at the Fort Knox Mine.

Table ES-2 Summary Characteristics of Major Active Alaska Metal Mines

Mine	Production Start	Material Produced	Type of Mine	Annual Employment (2013)	Annual Mill Throughput in Tons (2013)	Annual Output (2013)
Red Dog	1989	Zinc, lead, and silver	Open pit	550	4,230,000	607,704 tons of zinc; 106,594 tons of lead; and 6.1 million oz. of silver
Fort Knox	1996	Gold	Open pit	629	14,000,000	428,822 oz. of gold

[5] U.S. Department of Agriculture (USDA), Economic Research Service, Food Availability Data System, Website (http://www.ers.usda.gov/data-products/food-availability-%28per-capita%29-data-system.aspx) accessed December 8, 2014.

[6] U.S. Census Bureau, 1990 Census, Website (http://www.census.gov/main/www/cen1990.html) accessed October 31, 2014.

Alaska Department of Labor and Workforce Development, Population Estimates, Website (http://laborstats.alaska.gov/pop/popest.htm) accessed October 31, 2014.

[7] Alaska Miners Association, January 2013, The Economic Benefits of Alaska's Mining Industry, Prepared by McDowell Group, Website (https://dl.dropboxusercontent.com/u/2335359/AMA%20mcdowell%20reports/mining2013web%281%29.pdf) accessed November 28, 2014.

[8] Resource Development Council, Alaska's Mining Industry, Website (http://www.akrdc.org/issues/mining/overview.html#Anchor-Major-3800) accessed November 29, 2014.

Mine	Production Start	Material Produced	Type of Mine	Annual Employment (2013)	Annual Mill Throughput in Tons (2013)	Annual Output (2013)
Greens Creek	1989	Silver, gold, lead, and zinc	Underground	390	805,322	7.4 million oz. of silver; 57,457 oz. of gold; 57,614 tons of zinc; and 20,114 tons of lead
Pogo Gold Mine	2006	Gold	Underground	329	875,351	315,886 oz. of gold
Kensington Mine	2010	Gold	Underground	300	553,717	114,821 oz. of gold

Source: Alaska Department of Natural Resources and Alaska Department of Commerce, Community and Economic Development, Alaska's Mineral Industry 2013, Special Report 69, Website (http://137.229.113.30/webpubs/dggs/sr/text/sr069.pdf) accessed November 28, 2014.

Alaska Miners Association, January 2012, The Economic Impacts of Alaska's Mining Industry, Prepared by McDowell Group, Website (http://www.alaska.edu/files/bor/120412Ref04_AK_Mining_Industry_Economic_Impacts.pdf) accessed November 28, 2014.

State and Local Government Revenues

The State of Alaska collects revenues from the mining industry through claim rentals, production royalties, payments in lieu of labor, coal land rental, coal royalties, lease sale bonus payments, material sales, miscellaneous fees, fuel taxes, corporate income taxes, and mining license taxes. Municipalities receive revenue from the mineral industry from property taxes, payments in lieu of taxes (PILT), severance taxes, and sales taxes.[9] It is estimated that the mining industry was responsible for nearly $142.5 million in state and municipal revenues in 2013, which is 14 percent higher than total state and municipal mining-related revenues in 2012 and double the amount collected by the state and municipalities in 2008.[10]

Methodology and Data

Constructing and operating the road and mines will stimulate the state and regional economy. Expenditures on materials and labor needed to build and operate mines and the AMDIAR would create and support jobs and income for Alaskan construction companies, material providers, other directly related industries, and state and local governments.

This study uses an economic model known as IMPLAN to develop an understanding of the local economy, including the sectors that exist in the local area, the links among them, and the level of economic activity. To estimate total economic impacts, Cardno conducted a three-step analysis.

1. **Develop Economic Impact Models**: Step 1 involved developing an economic model of the state and region using IMPLAN software and 2012 IMPLAN data (the most recent data available).
2. **Identify Model Inputs and Gather Data:** In this task, data from AIDEA, DOWL HKM, and mining company reports were collected and evaluated to identify the change in demand for labor and goods and services in both the regional and state economy.

[9] Alaska Department of Natural Resources and Alaska Department of Commerce, Community and Economic Development, Alaska's Mineral Industry 2013, Special Report 69, Website (http://137.229.113.30/webpubs/dggs/sr/text/sr069.pdf) accessed November 28, 2014.

[10] Ibid.

3. **Estimate Economic Impacts**: Data for construction and operating expenditures were used to estimate direct jobs and income. Once direct impacts were determined, the regional economic impact model was used to estimate the total jobs and income impact, including the ripple effects (indirect and induced) throughout other economic sectors as money is recirculated in the economy.

In addition to conducting the IMPLAN analysis of AMDIAR and the mine projects' construction and operations, this analysis compiled previously completed heating and electricity consumption estimates from a variety of sources, such as the Alaska Housing Finance Corporation (AHFC), the Regulatory Commission of Alaska (RCA), and the Alaska Energy Authority (AEA) to establish baseline energy consumption estimates. These estimates were used to derive how consumer expenditures would be altered under lower cost heating fuel and diesel price assumptions.

In the absence of detailed financial information for prospective District mining projects, this analysis relies heavily upon the Arctic Mine Preliminary Economic Assessment (Arctic PEA) to estimate tax revenues generated from other prospective District mines. For example, the ratio of the Arctic Mine's anticipated mining license payments and corporate income taxes to gross revenue was used to estimate state mining license payments and corporate income taxes for the other identified District prospects.

Results

This analysis evaluated AMDIAR construction impacts over an estimated 4-year construction period as well as AMDIAR annual operations impacts. It assumes that the four major District mining projects will be developed, and evaluates the employment and income effects from the construction and operation of these mining projects. It is assumed that the construction of each mine will be over a 2-year period, while operation impacts are expected to occur annually over the life of each mine. In addition to evaluating the employment and income effects of AMDIAR and mine construction, this analysis also considers the state and local revenue generated due to mine development in the District, residential savings on heating oil purchases, study area savings on electricity purchases, Power Cost Equalization (PCE) program spending, out-migration effects, community connection to the mine power grid, and Native corporation revenue from gravel sales.

It is estimated that a total of 1,335 jobs will be directly supported by the construction of the AMDIAR over the entire construction phase. Assuming the AMDIAR construction phase is 4 years, the average direct construction employment is projected to be 334 jobs annually. Further, of these 334 jobs, it is estimated that 40 regional residents will be employed annually. It is estimated that construction-related spending for materials and services will support an additional 35 jobs throughout Alaska annually, while AMDIAR construction employee spending will support an additional 118 jobs each year. Overall, it is estimated that 486 jobs will be supported annually during the AMDIAR construction phase (**Table ES-3**).

Table ES-3 AMDIAR Construction Annual Average Employment Impacts

	Non-Residents	AK Residents Other than NWAB/YKCA	NWAB/YKCA Residents	Total
Direct effect	30	263	40	334
Indirect effect	0	35	0	35
Induced effect	0	115	3	118
Total effect	30	413	43	486

Assumes 4-year road construction phase.

Project development includes initial capital costs required to construct AMDIAR.

Annual average values correspond to the construction period years (years 2019, 2020, 2021, and 2031).

Totals may not sum up due to rounding.

Source: Cardno 2014 (based on IMPLAN modeling).

Table ES-4 illustrates the total annual employment estimates related to AMDIAR operations. It is estimated that a total of 43 jobs will be directly supported by AMDIAR operations. Furthermore, AMDIAR expenditures for goods and services during operations will support eight additional jobs throughout Alaska, while AMDIAR employee expenditures will support 17 additional jobs throughout the state annually. Overall, it is estimated that 68 jobs will be supported annually by AMDIAR operations.

Table ES-4 AMDIAR Operations and Maintenance Employment Impacts

	Non-Residents	AK Residents Other than NWAB/YKCA	NWAB/YKCA Residents	Total
Direct Effect	10	19	13	43
Indirect Effect	0	8	0	8
Induced Effect	0	16	1	17
Total Effect	10	43	14	68

Direct project operations represent road operations and maintenance.

Totals may not sum up due to rounding.

Source: Cardno 2014 (based on IMPLAN modeling).

Table ES-5 provides a summary of the estimated employment and income impacts associated with the construction of each major District mining project. Of all mines considered in this analysis, the construction of the Bornite Mine is expected to support the greatest number of jobs throughout the state, with an estimated 5,557 total jobs and $384.9 million of total income. Assuming a 2-year construction timeframe, the Bornite Mine is expected to support an average of 2,778 jobs throughout the state each year. The Arctic Mine is estimated to support 2,095 jobs and $145.1 million in income, or 1,048 jobs and $72.6 million in income annually. Construction of the Sun Mine is estimated to support 1,073 jobs and $74.3 million in income throughout the state, or an annual average of 537 jobs and $37.2 million of income. The Smucker Mine is anticipated to support a total of 553 jobs throughout the state and a total of $38.3 million in income. This represents an annual average of 277 total jobs per year and $19.2 million in income over the Smucker Mine's assumed 2-year construction period.

During the construction phase it is anticipated that 120 regional residents will be employed each year at the Arctic Mine, 318 regional residents will be employed at the Bornite Mine, 61 regional residents will be employed at the Sun Mine, and 32 regional residents will be employed at the Smucker Mine.

Table ES-5 Summary of Economic Effects of Mining Project Construction (Statewide)

	Labor Income ($ millions)			Employment (jobs)		
	Direct	Indirect and Induced	Total	Direct	Indirect and Induced	Total
Arctic Project	$103.3	$41.8	$145.1	1,340	755	2,095
Annual average	$51.6	$20.9	$72.6	670	378	1,048
Bornite Project	$273.9	$111.0	$384.9	3,553	2,004	5,557
Annual average	$137.0	$55.5	$192.4	1,777	1,002	2,778
Sun Project	$52.9	$21.4	$74.3	686	387	1,073
Annual average	$26.5	$10.7	$37.2	343	193	537
Smucker Project	$27.3	$11.0	$38.3	354	199	553
Annual average	$13.6	$5.5	$19.2	177	100	277

Annual average assumes 2-year construction phase.

Monetary values are reported in constant 2014 dollars.

Totals may not sum up due to rounding.

Source: Cardno 2014 (based on IMPLAN modeling).

Table ES-6 provides a summary of the estimated employment and income impacts associated with the operation of each major District mining project. The greatest number of direct operation employees is anticipated for the Arctic Mine, with an estimated 482 employees earning $51.6 million of income each year of operations. The three other mines (Bornite, Sun, and Smucker) each have similar direct employment estimates, ranging between 324 and 374 jobs directly supported annually by each mine's operations. In total, the operation of the Arctic Mine is estimated to support a total of 1,001 jobs and $102.0 million of income throughout the state each year of its operation. The statewide operational employment effects of the Bornite, Sun, and Smucker Mines is estimated to be 672 jobs, 778 jobs, and 735 jobs, respectively.

During the operations phase it is anticipated that 151 regional residents will be employed each year at the Arctic Mine, 102 regional residents will be employed at the Bornite Mine, 117 regional residents will be employed at the Sun Mine, and 111 regional residents will be employed at Smucker Mine.

Table ES-6 Summary of Average Annual Economic Effects of Mining Project Operations (Statewide)

	Labor Income ($ millions)			Employment (jobs)		
	Direct	Indirect and Induced	Total	Direct	Indirect and Induced	Total
Arctic Project	$51.6	$50.5	$102.0	482	519	1,001
Bornite Project	$34.6	$33.9	$68.5	324	349	672
Sun Project	$40.1	$39.2	$79.3	374	403	778
Smucker Project	$37.9	$37.0	$74.9	354	381	735

Monetary values are reported in constant 2014 dollars.

Totals may not sum up due to rounding.

Source: Cardno 2014 (based on IMPLAN modeling).

The timings of state and local payments are not estimated given the uncertainty regarding the timing of each mine's development. Rather, results are in most cases presented in terms of the life of the mine

(LOM), with the exception of AIDEA toll payments, mineral rent payments, and PILT payments. **Table ES-7** below provides a summary of state and local tax revenue estimated to be generated by the development of the four mining projects. For those payments in which a LOM estimate is provided (mining license, corporate income taxes, production royalty, and fuel taxes), the total LOM payments to the state over the life of the four major District mining projects are estimated to be $698.6 million. This does not include the annual estimated payments for claim rental ($637,000) on state lands. PILT to the NWAB is estimated to be $6.5 million (2014 dollars) in the first year these payments would be made by each of the prospective mines. Furthermore, it is estimated that AIDEA will receive approximately $1.0 billion in toll payments for the use of the AMDIAR over the 30-year life of the road. In consideration of AIDEA's expenditures for AMDIAR and the expected gross revenue from tolls, the total net revenue of AMDIAR is between $143.2 and $153.5 million over the 30-year life of AMDIAR and the project exhibits a net present value of $84.3 to $90.4 million assuming a discount rate of 3.9 percent.[11]

Table ES-7 State and Local Government Revenue for All Mine Projects Combined, 2014 Dollars

Payment Type	Payment
Mining license, LOM	$261,189,000
Corporate income tax, LOM	$357,697,000
Production royalty, LOM	$78,289,000
Fuel taxes, LOM	$1,400,000
AIDEA toll payments, life of road	$1,000,000,000
Claim Rental (annual, once payment max. achieved)	$637,000
NWAB PILT (1st Year, each mine)	$6,500,000

Less expensive heating fuel and diesel are expected to result in reduced heating oil and electricity expenditures in those communities able to contract for heating oil deliveries using the AMDIAR. Cardno estimates that the availability of lower cost fuel will lower study area residents' expenditures on heating oil by approximately $589,000 each year and on electricity by $54,000 each year. Other community electricity customers and non-PCE-eligible customers combined are estimated to spend $220,000 less on electricity within the study area. Lower cost electricity within the study area is also expected to reduce PCE payments by $391,000 for these communities. Also, it is estimated that Native corporations would receive a total of $28.6 million from gravel sales during the construction of AMDIAR.

The effects of study area communities connecting to the mine's power grid and of additional mining employment within the region on out-migration are less clear and warrant further evaluation. Assuming constant mine fuel costs and absent any consideration of infrastructure development costs, there appear to be cost advantages for residents of Shungnak and Kobuk to connect to the Arctic Mine's power grid.[12] The effective rates for Shungnak and Kobuk are expected to be $0.14 per kilowatt hour (kWh) with access to the AMDIAR and the delivery of lower cost diesel. Therefore, the cost advantages of connecting to the mine power grid warrant further analysis with more detailed information on the likely benefits and cost of developing infrastructure to connect these communities to AMDIAR as well as the costs and benefits of transmission lines connecting them to the mine's power grid.

[11] US Office of Management and Budget, Circular A-94 Appendix C, Website (http://www.whitehouse.gov/omb/circulars_a094/a94_appx-c) accessed January 15, 2015.

[12] Connection to the mines grid seemingly has cost advantages, but these calculations do not take into consideration for the additional cost that would undoubtedly result from providing a distribution network to the villages and would warrant further investigation as to if cost advantages actually exist when considering all cost.

1 Introduction

1.1 Background

The Alaska Industrial Development and Export Authority (AIDEA) is proposing to construct a controlled-access industrial access road to the Ambler Mining District (District) located along the southern base of the Brooks Range in Interior Alaska. The proposed Ambler Mining District Industrial Access Road (AMDIAR) project would design, construct, and operate a controlled-access industrial transportation corridor from the District to the Dalton Highway (**Figure 1-1**). The proposed Brooks East Corridor has been identified as the most feasible alignment for surface transportation access to the District.

The District has significant mineral exploration and development potential. Located within the District is the Ambler Mineral Belt, a 75-mile-long northwest and southeast zone of mineralization characterized as one of the world's largest undeveloped copper-zinc mineral belts.[13] Access to the region could very well spur the development of existing mining projects such as the Arctic, Bornite, Sun, and Smucker Projects, each of which has large estimated mineral reserves. Furthermore, access to the region could increase additional mineral exploration activity within the District.

In 2009, the Alaska Department of Transportation and Public Facilities (DOT&PF) began evaluating multiple road and railroad routes that could provide access to the District. Access to the District was assessed for both east and west alignments to the District. As a result of these studies a potential corridor was identified that would connect the Dalton Highway to the District traversing the Gates of the Arctic National Preserve. In 2013, the project was transferred from DOT&PF to AIDEA.

The study area for this analysis includes the Yukon-Koyukuk Census Area (YKCA) and Northwest Arctic Borough (NWAB), with particular focus on the communities located in relatively close proximity to the proposed AMDIAR. YKCA study area communities include Bettles, Evansville, Allakaket, Alatna, Huslia, and Hughes, while NWAB study area communities include Kobuk, Shungnak, and Ambler. Study area residents rely heavily upon subsistence resources, which contribute significantly to the economic and social welfare of the communities.

Developing access to the District will facilitate mineral development in the region. The construction and operation of AMDIAR would provide major benefits to area residents and the State of Alaska, such as employment and income opportunities and reduced cost of living within the region. In addition to AMDIAR development, this economic impact analysis assumes that the major District mineral projects currently in the exploratory phase would develop due to road access and evaluates how this development would affect employment and income and tax revenue.

1.2 Purpose and Scope

The objective of the analysis is to inform the public and other stakeholders regarding the economic impacts related to the development of AMDIAR and the development of mineral prospects in the District. To accomplish this, our analysis:

1. Identified the existing socioeconomic conditions for area communities;
2. Provided population, employment, and subsidy receipt projections for communities in the area and state revenue from oil and gas;

[13] Alaska Department of Commerce, Community, and Economic Development. 2014. Ambler Mining Region: Summary of Mineral Projects and Prospects. Division of Economic Development. pp 24.

3. Estimated annual labor and material expenditures anticipated for AMDIAR construction and operation;
4. Estimated labor and material expenditures anticipated for mine construction and operation; and
5. Estimated other regional transportation benefits of the AMDIAR including:
    a. Household and public facilities heating fuel cost savings resulting from the availability of lower cost heating oil,
    b. Community cost savings associated with connecting to the mine power grid and offsetting community diesel power consumption,
    c. Revenue to Alaska Native Land Claims Settlement Act (ANCSA) corporations resulting from aggregate sales, and
    d. Regional mining employment impacts upon out-migration.

1.3 Limitations

This analysis assumes that the prospective major District mining projects will develop if AMDIAR is constructed. It does not attempt to determine the probability or the timing of the mining projects actually occurring.

With the exception of the Arctic Mine, there is no financial information available for other major District mining projects. Therefore, this analysis relies heavily upon the Arctic Mine Preliminary Economic Assessment (Arctic PEA) to frame many of the assumptions used to estimate the economic impacts for these developments.

Estimates of AMDIAR impacts on study area community costs of living assume each community, with the exception of Huslia and Hughes, would have access to AMDIAR. This access, however, is not a component of the proposed project and would require additional expenditures by study area communities to obtain access to AMDIAR.

1.4 Study Area

The study area for this analysis includes the YKCA and NWAB, with particular focus on communities relatively close to the AMDIAR. YKCA study area communities include Bettles, Evansville, Allakaket, Alatna, and Hughes, while NWAB study area communities include Kobuk, Shungnak, and Ambler. Of these communities, Bettles and Evansville are closest to the proposed AMDIAR (0.5 mile), while Kobuk and Shungnak are also relatively close—9 miles and 14 miles, respectively (**Table 1-1**). Allakaket, New Allakaket, and Alatna are each approximately 35 miles from the proposed route, while the communities of Hughes and Huslia are relatively far away.

Table 1-1 Study Area Communities and Distance from AMDIAR

Community	Distance from AMDIAR (miles)
YKCA	
Bettles	0.5
Evansville	0.5
Allakaket	35
New Allakaket	36
Alatna	34
Hughes	67

Community	Distance from AMDIAR (miles)
Huslia	91
NWAB	
Kobuk	9
Shungnak	14
Ambler	22

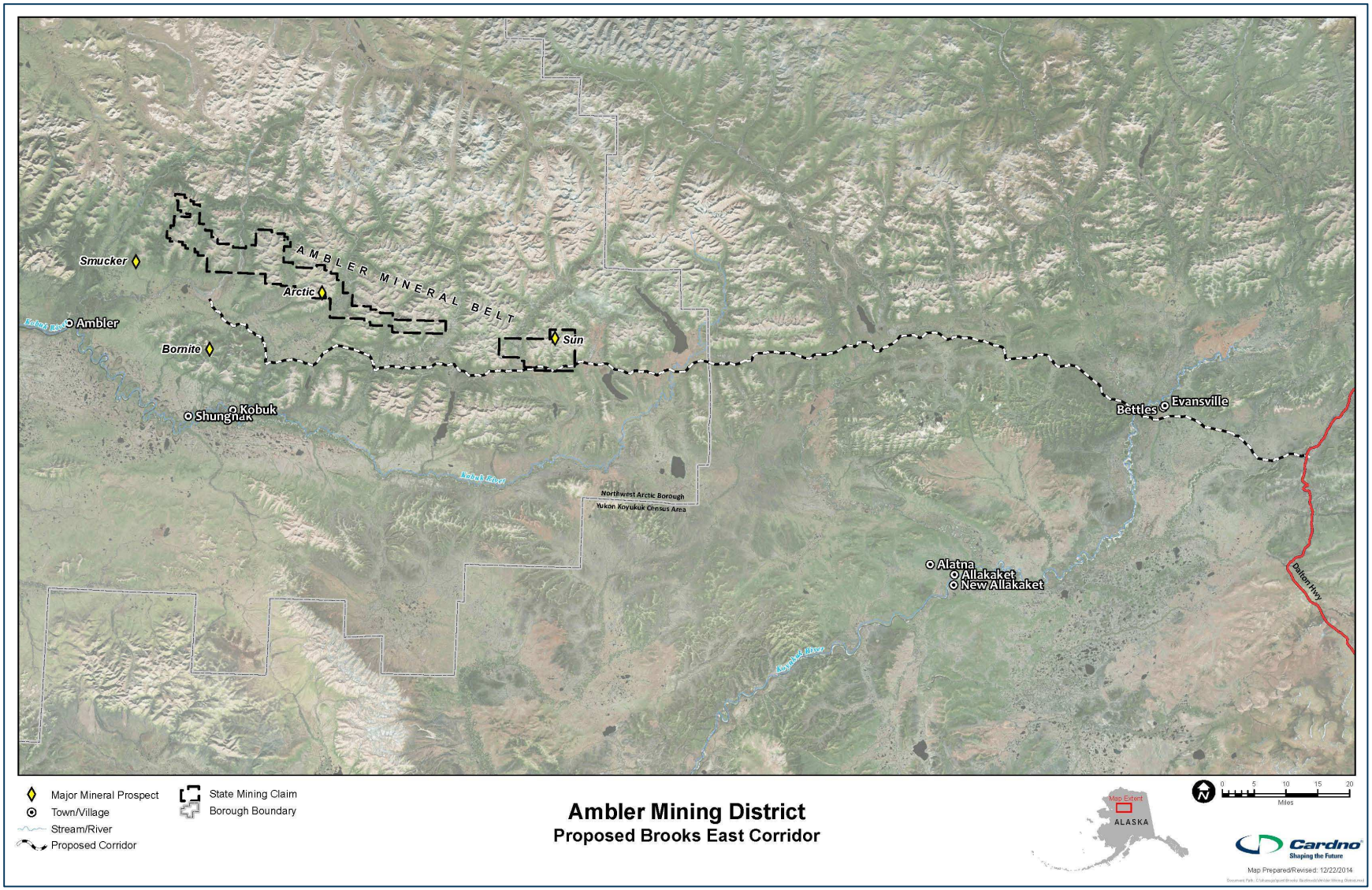

Figure 1-1 Ambler Mining District

1.5 Organization

This report contains seven chapters. Chapter 1 provides an overview of the project along with the purpose and scope of the analysis. Chapter 2 presents detail on the major District mining projects along with their estimated mineral resources. Chapter 3 presents the socioeconomic condition for the study area including; population, demographics, employment, income, major industries, sources of income, subsistence, Native Corporations, cost of living, government spending and out-migration. Chapter 4 provides information on other major metal mines currently operating within the state; including Red Dog Mine, Fort Knox Mine, Pogo Mine, Greens Creek Mine, and Kensington Mine. Chapter 5 provides information on the tax benefits provided by mining to the state and local municipalities throughout the states. Chapter 6 provides the methods and data used to estimate economic and fiscal impacts of developing overall mining operations in the District and AMDIAR. Furthermore, Chapter 6 also provides the methods and data used to estimate study area household savings due to AMDIAR access. Chapter 7 presents the findings of Cardno's research on the benefits associated with AMDIAR and District mine development.

2 Ambler Mining District Mineral Resources

The Ambler Mining Region has significant mineral exploration and development potential. Within the Ambler Mining Region is the Ambler Mining District, which is also referred to as the Ambler Mineral Belt. The Ambler Mineral Belt is a 75-mile-long northwest/southeast zone of mineralization that has been characterized as one of the world's largest undeveloped copper-zinc mineral belts.[14] Identified mineral resources in the region include copper, zinc, lead, silver, and gold. Furthermore, exploration activities have proved placer gold, coal, gemstone, and other mineral prospects are found within the region.

Due to lack of transportation corridors, the Ambler Mining Region is largely undeveloped. Mineral studies in the region have spanned nearly 100 years, but the total estimated value of the Ambler Mining Region remains undetermined.

2.1 Area Mining Projects

There are four major mineral deposits within the District in different stages of exploration (the Arctic, Bornite, Sun, and Smucker deposits). As provided in **Table 2-1**, the most recent mineral resource estimates available place the total available mineral resources of these four projects at a combined 160.7 million tons.

Table 2-1 Mineral Resource Estimates for Major Ambler Mining District Projects

	Estimated Resource (tons)	Copper (tons)	Zinc (tons)	Lead (tons)	Silver (oz.)	Gold (oz.)
Arctic						
Indicated	26,300,000	857,000	1,169,000	200,000	40,800,000	550,000
Inferred	3,700,000	120,000	143,000	22,000	4,500,000	60,000
Total	30,000,000	976,000	1,312,000	222,000	45,300,000	610,000
Bornite						
Indicated	7,500,000	89,000	na	na	na	na
Inferred	100,100,000	1,646,000	na	na	na	na
Total	107,600,000	1,735,000	na	na	na	na
Sun						
Indicated	2,400,000	34,000	98,000	25,000	4,000,000	14,000
Inferred	12,800,000	146,000	502,000	176,000	28,800,000	89,000
Total	15,200,000	180,000	601,000	201,000	32,800,000	103,000
Smucker						
Historical Resource Estimate*	7,900,000	40,000	389,000	135,000	36,100,000	255,000
Total	7,900,000	40,000	389,000	135,000	36,100,000	255,000

na = information is not available at this time

[14] Alaska Department of Commerce, Community, and Economic Development. 2014. Ambler Mining Region: Summary of Mineral Projects and Prospects. Division of Economic Development. pp 24.

*The historical resource estimate for Smucker is considered relevant but not reliable. It is used here in the absence of more recent information about the project's available mineral resources.

Sources: NovaCopper, September 12, 2013, Preliminary Economic Assessment Report on the Arctic Project, Ambler Mining District, Northwest Alaska, Prepared by Tetra Tech, Website (http://www.novacopper.com/i/pdf/reports/2013_Arctic_PEA_FINAL.pdf) accessed November 3, 2014.

NovaCopper, April 1, 2014, NI 43-101 Technical Report on the Bornite Project, Northwest Alaska, USA, Prepared by BD Resource Consulting, Inc., SIM Geological Inc. and International Metallurgical & Environmental Inc., Website (http://www.novacopper.com/i/pdf/reports/Technical_Report_Bornite_Project_1April2014.pdf) accessed November 3, 2014.

Andover Mining Corporation, September 30, 2013, Technical Report on the Sun Project, Brooks Range, Alaska, Prepared by Mine Development Associates.

2.1.1 Upper Kobuk Mineral Project

The Upper Kobuk Minerals Project (UKMP) was formed through an exploration agreement between NovaCopper and NANA Regional Corporation, Inc. (NANA) in October 2011. The agreement consolidated NovaCopper land holdings, NANA lands, and Alaska Native Claims Settlement Act (ANCSA) of 1971 lands into an area spanning nearly 353,000 acres.

As part of the agreement, if NovaCopper mines lands subject to the NANA agreement, NovaCopper will notify NANA, which in turn will have 120 days to either: a) exercise a non-transferrable back-in-right to acquire between 16 percent and 25 percent of the project, or b) not to exercise its back-in-right and instead receive a net proceeds royalty equal to 15 percent of the net proceeds realized by NovaCopper from the project. The cost to exercise the back-in-right option would be equal to the percentage interest in the project (16 to 25 percent of that project) multiplied by the difference between all costs incurred by NovaCopper on the project and $40 million.[15]

As it relates to possible development on Bornite lands or ANCSA lands, NovaCopper and NANA will execute a mining lease to allow NovaCopper or the joint venture to construct and operate a mine on Bornite lands or ANCSA lands. These leases will provide NANA a 2 percent smelter royalty for production from Bornite lands and 2.5 percent net smelter royalty for production from ANCSA lands.

If NovaCopper decides to construct a mine on its own lands subject to the NANA agreement, NANA will enter into a surface use agreement with NovaCopper, which will allow NovaCopper to access the project along routes approved by NANA. NovaCopper will provide NANA a 1 percent smelter royalty on the production and an annual payment of $755 per acre for each of the first 400 acres and $100 for each additional acre of the lands owned by NANA and used for access.

2.1.1.1 Arctic Project (NovaCopper)

The Arctic Project is one of the two NovaCopper projects that constitute the UKMP. The Arctic Project is located on the east side of Subarctic Creek, approximately 170 miles east of Kotzebue, 22 miles northeast of the village of Kobuk, and 160 miles west of the Dalton Highway. There is no road access or nearby power infrastructure.

The Arctic Project consists of 1,358 contiguous claims, including: 875 40-acre state claims, 481 160-acre state claims, and two federal patented claims totaling 272 acres. In total, the Arctic Project is approximately 112,000 acres, and is the most advanced mining project in the District.

[15] NovaCopper, April 1, 2014, NI 43-101 Technical Report on the Bornite Project, Northwest Alaska, USA, Prepared by BD Resource Consulting, Inc., SIM Geological Inc. and International Metallurgical & Environmental Inc., Website (http://www.novacopper.com/i/pdf/reports/Technical_Report_Bornite_Project_1April2014.pdf) accessed November 3, 2014.

An estimated 26.3 million tons of indicated resource and 3.7 million tons of inferred resource are projected at the Arctic Mine.[16] The project proposes a single open-pit mine, a conventional grinding mill-and-floatation circuit complex with a production rate of 10,000 tons of ore per day over a 12-year mine life.[17] According to the Arctic PEA, development of the Arctic Project is projected to cost $717.7 million with sustaining capital costs of $164.4 million. The proposed AMDIAR route from the Dalton Highway would provide access to the Project site. The total estimated capital expenditure is $882.1 million over the 12-year mine life, with an additional $81.6 million in closure and reclamation costs. Further, the PEA estimates that over the life of the Project the State of Alaska would receive $115 million in mining license fees and $158 million in state corporate income taxes. In 2013, the estimated annual state claim rental payment for the Project was $225,320.[18]

2.1.1.2 Bornite (NovaCopper)

The Bornite Project is also part of the UKMP and is located on land owned by NANA. NANA acquired the Bornite deposit and surface development from Kennecott Minerals in 1989.[19] The Bornite Project is located approximately 15 miles southwest of the Arctic Project on a 241,000-acre site.[20] It consists of two mineralized zones: Ruby Creek and South Reef. Exploration has determined that Ruby Creek resources may be extracted through open-pit mining while South Reef resources may be extracted using underground mining methods.[21] The Bornite Project is estimated to contain approximately 179 million pounds of copper indicated and 3.3 billion pounds of copper inferred.[22]

Primary access to the project is by air, with four well-maintained gravel airstrips approximately 4,900 feet long: the Dahl Creek Camp airstrip 10 miles south, Kobuk at 12 miles south, Shungnak at 15 miles southwest, and Ambler at 25 miles west. A 16-mile gravel access road connects Kobuk to the Bornite Project's main camp.

2.1.2 Sun (Andover)

Andover Mining Corporation (Andover) owns 100 percent of the Sun deposit, located approximately 35 miles east of the Arctic Project. However, Andover was deemed insolvent on February 12, 2014.[23] Assets will be liquidated in accordance with the Bankruptcy and Insolvency Act (Canada). The Sun deposit is 36,800 acres in size and includes the Main Sun Deposit, S.W. Sun Deposit, and a number of other

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16 NovaCopper, April 1, 2014, NI 43-101 Technical Report on the Bornite Project, Northwest Alaska, USA, Prepared by BD Resource Consulting, Inc., SIM Geological Inc. and International Metallurgical & Environmental Inc., Website (http://www.novacopper.com/i/pdf/reports/Technical_Report_Bornite_Project_1April2014.pdf) accessed November 3, 2014.

17 Alaska Industrial Development and Export Authority, February 2014, Ambler Mining Region: Summary of Mineral Projects and Prospects, Prepared by Division of Economic Development Department of Commerce, Community, and Economic Development.

18 NovaCopper, Upper Kobuk Mineral Project, Bornite Deposit – Ruby Creek Zone, NI 43-101 Technical Report, Website (http://www.novacopper.com/i/pdf/reports/Technical_Report_for_the_Bornite_Deposit_31January2013_.pdf) accessed December 1, 2014.

19 Ibid.

20 NovaCopper, April 1, 2014, NI 43-101 Technical Report on the Bornite Project, Northwest Alaska, USA, Prepared by BD Resource Consulting, Inc., SIM Geological Inc. and International Metallurgical & Environmental Inc., Website (http://www.novacopper.com/i/pdf/reports/Technical_Report_Bornite_Project_1April2014.pdf) accessed November 3, 2014.

21 Alaska Industrial Development and Export Authority, February 2014, Ambler Mining Region: Summary of Mineral Projects and Prospects, Prepared by Division of Economic Development Department of Commerce, Community, and Economic Development.

22 Alaska Industrial Development and Export Authority, February 2014, Ambler Mining Region: Summary of Mineral Projects and Prospects, Prepared by Division of Economic Development Department of Commerce, Community, and Economic Development.

23 Andover Mining Corp. 2014. News Release: Andover Fails to Receive Approval for Creditor Proposal and is Deemed Bankrupt.(http://www.infomine.com/index/pr/PB409191.PDF). Accessed November 4, 2014.

prospects totaling 230 State of Alaska 160-acre claims.[24] Resources include silver-copper-lead-zinc-gold mineralization. The most recent available indicated mineral resource estimate for the Sun Project is 2.4 million tons with grading 4.1 percent zinc, 1.4 percent copper, 1.1 percent lead, 57.6 percent silver, and 0.21 percent gold. The current estimate for inferred mineral resources is 12.8 million tons with grading 3.9 percent zinc, 1.1 percent copper, 1.4 percent lead, 76.8 percent silver, and 0.24 percent gold.

2.1.3 Smucker (Teck Resources)

Teck Resources Inc. owns the Smucker deposit, located 25 miles west of the Arctic Project. The property includes 27 State of Alaska claims.[25] Resources include copper, lead, zinc, silver, and gold. Early estimates indicate that the Smucker deposit contains about 7.2 million tons at 0.5 percent copper, 4.9 percent zinc, 1.7 percent lead, plus silver and gold values.[26] The Smucker deposit is still in the early stages of exploration.

[24] Andover Mining Corporation, September 30, 2013, Technical Report on the Sun Project, Brooks Range, Alaska, Prepared by Mine Development Associates.

[25] Alaska Department of Natural Resources, Information Resource Management, November 5, 2014, Alaska DNR State Mining Claims, Website (http://dnr.alaska.gov) accessed December 2, 2014.

[26] NovaCopper, April 1, 2014, NI 43-101 Technical Report on the Bornite Project, Northwest Alaska, USA, Prepared by BD Resource Consulting, Inc., SIM Geological Inc. and International Metallurgical & Environmental Inc., Website (http://www.novacopper.com/i/pdf/reports/Technical_Report_Bornite_Project_1April2014.pdf) accessed November 3, 2014.

3 Socioeconomic Condition

This section provides socioeconomic information for the study area. Topics include data regarding demographics, employment, income, industries, subsistence harvest, cost of living, federal and state spending, and out-migration.

3.1 Population and Demographics

As shown in **Table 3-1**, in 2013 the study area had a population of 13,446, a decrease of nearly 8 percent from 1990. In 2013, total population for study area communities was 1,345, which was a 21.9 percent increase from 1990. Despite this, half of study area communities exhibited population declines from 1990 through 2013. Allakaket in particular experienced a large population decline between 1990 and 2000, which was due to a massive flood that occurred in 1994.[27] As a result of the flood, 17 homes were destroyed, 24 homes suffered major damage, and an additional 16 suffered minor damage.[28] A portion of the community relocated to New Allakaket, which is located on higher ground above the floodplain.

Table 3-1 Historical Population of Study Area Communities, Region, and Alaska

Location	1990	2000	2010	2013	Percent Change (1990–2013)
YKCA	8,478	6,551	5,588	5,650	-33.4%
Bettles	36	43	12	14	−61.1%
Evansville	33	28	15	2	−93.9%
Allakaket	170	97	105	108	−36.5%
New Allakaket	na	36	66	68	88.9%
Alatna	na	35	37	26	−25.7%
Hughes	54	78	77	88	63.0%
Huslia	207	293	275	322	55.6%
NWAB	6,113	7,208	7,523	7,796	27.5%
Kobuk	69	109	151	159	130.4%
Shungnak	223	256	262	294	31.8%
Ambler	311	309	258	264	−15.1%
YKCA and NWAB	14,591	13,759	13,111	13,446	−7.8%
Study Area Communities	1,103	1,284	1,258	1,345	21.9%
Alaska	550,043	626,932	710,235	736,399	33.9%

na = not available

U.S. Census Bureau, 1990 Census, Website (http://www.census.gov/main/www/cen1990.html) accessed October 31, 2014.

U.S. Census Bureau, 2000 Census, Website (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml) accessed October 31, 2014.

[27] U.S. Army Corps of Engineers, Alaska District, December 11, 2007, Alaska Baseline Erosion Assessment, Erosion Information Paper – Allakaket, Alaska, Website (http://www.poa.usace.army.mil/Portals/34/docs/civilworks/BEA/Allakaket_Final%20Report.pdf) accessed December 22, 2014.

[28] Ibid.

U.S. Census Bureau, 2010 Census, Website (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml) accessed October 31, 2014.

Alaska Department of Labor and Workforce Development, Population Estimates, Website (http://laborstats.alaska.gov/pop/popest.htm) accessed October 31, 2014.

Population projections through 2035 for the study area, Alaska, and the United States are provided in **Table 3-2**. Population in the NWAB is projected to increase by 16.4 percent through 2035. In contrast, by 2035 the population of the YKCA is anticipated to decline by 16.8 percent (approximately 930 people). At the state and national levels, population is anticipated to increase by 17.3 percent and 15.2 percent, respectively, over the 2015–2035 period.

Table 3-2 Population Projections for Study Area Region, Alaska, and United States

Location	2015	2020	2025	2030	2035	Percent Change 2015–2035
YKCA	5,520	5,261	5,019	4,790	4,592	−16.8%
NWAB	7,904	8,211	8,507	8,818	9,199	16.4%
State of Alaska	754,937	791,856	825,950	856,893	885,674	17.3%
United States (millions)	321.4	333.9	346.4	358.5	370.1	15.2%

Adapted from Department of Labor and Workforce Development, Alaska Population Projections 2012-2042, Website (http://laborstats.alaska.gov/pop/popproj.htm) accessed October 31, 2014.

U.S. Census Bureau, Middle Series, Projections of the Population and Components of Change for the United States: 2015 to 2060, Website (http://www.census.gov/population/projections/data/national/2012/summarytables.html) accessed October 31, 2014.

Table 3-3 presents racial, ethnic, and poverty characteristics of the study area, Alaska and the United States based on 2012 census data. Statewide, 38 percent of residents are racial minorities, while the NWAB and the YKCA both have a higher proportion of racial minorities, with 89 percent and 79 percent of individuals belonging to a minority group, respectively. Alaskan Native populations constitute 81 percent of the NWAB's population and 69 percent of the YKCA's population.[29]

Alaskan Native populations constitute a high proportion of most study area communities' total population. For example, 100 percent of the population in New Allakaket, Alatna, Hughes, Kobuk, and Shungnak are Alaskan Native. Similarly, Alaskan Native populations constitute most of the population in Evansville, Huslia, Ambler, and Allakaket, where between 77 percent and 93 percent of each community is Alaskan Native. In contrast, Bettles does not have any Alaskan Native population.

Poverty rates represent the percentage of an area's total population living at or below the poverty threshold established by the U.S. Census Bureau. As provided in **Table 3-3**, poverty rates for the YKCA and NWAB are 23 percent and 19 percent, respectively. Allakaket, Huslia, Kobuk, and Ambler each exceed the poverty rates of the respective borough/census area in which they are located.

[29] The U.S. Census Bureau reports American Indian and Alaska Native (AIAN) in the same category. Results presented here assume that AIAN population estimates provided by the U.S. Census Bureau are Alaska Native populations within the study area.

Table 3-3 Racial, Ethnic, and Poverty Rates for Study Area Communities, Borough, and Census Area (2008–2012 Average)

Location	Race[1]								Hispanic or Latino[2]	Population at or Below Poverty Level[3]
	Total	White	Black	Alaska Native	Asian	Pacific Islander	Other Race	Two or More Races		
YKCA	5,637	1,235	6	3,889	22	22	18	445	70	1,284
	100%	22%	0%	69%	0%	0%	0%	8%	1%	23%
Bettles	30	30	0	0	0	0	0	0	0	0
	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%
Evansville	26	4	0	20	0	0	0	2	0	0
	100%	15%	0%	77%	0%	0%	0%	8%	0%	0%
Allakaket	46	0	0	43	0	0	0	3	0	21
	100%	0%	0%	93%	0%	0%	0%	7%	0%	46%
New Allakaket	79	0	0	79	0	0	0	0	0	4
	100%	0%	0%	100%	0%	0%	0%	0%	0%	5%
Alatna	1	0	0	1	0	0	0	0	0	0
	100%	0%	0%	100%	0%	0%	0%	0%	0%	0%
Hughes	80	0	0	80	0	0	0	0	0	13
	100%	0%	0%	100%	0%	0%	0%	0%	0%	16%
Huslia	352	8	0	300	0	0	0	44	0	134
	100%	2%	0%	85%	0%	0%	0%	13%	0%	38%
NWAB	7,601	868	30	6,146	51	8	1	497	66	1,433
	100%	11%	0%	81%	1%	0%	0%	7%	1%	19%
Kobuk	121	0	0	121	0	0	0	0	8	63
	100%	0%	0%	100%	0%	0%	0%	0%	7%	52%
Shungnak	368	0	0	368	0	0	0	0	0	63
	100%	0%	0%	100%	0%	0%	0%	0%	0%	17%

Location	Race[1]								Hispanic or Latino[2]	Population at or Below Poverty Level[3]
	Total	White	Black	Alaska Native	Asian	Pacific Islander	Other Race	Two or More Races		
Ambler	240	24	0	213	0	0	0	3	5	100
	100%	10%	0%	89%	0%	0%	0%	1%	2%	42%
Study Area Communities	1,343	66	0	1,225	0	0	0	52	13	398
	100%	5%	0%	91%	0%	0%	0%	4%	1%	30%
Alaska	711,139	477,985	24,219	98,976	37,968	7,363	7,836	56,792	40,371	66,631
	100%	67%	3%	14%	5%	1%	1%	8%	6%	9%

1. U.S. Census Bureau, 2012 ACS 5-Year Data, Table B02001: Race, Website (http://www.census.gov/acs/www/data_documentation/summary_file/) accessed October 28, 2014.
2. U.S. Census Bureau, 2012 ACS 5-Year Data, Table B03003: Hispanic or Latino Origin, Website (http://www.census.gov/acs/www/data_documentation/summary_file/) accessed October 28, 2014.
3. U.S. Census Bureau, 2012 ACS 5-Year Data, Table B17021: Poverty Status of Individual in the Past 12 Months by Living Arrangement, Website (http://www.census.gov/acs/www/data_documentation/summary_file/) accessed October 28, 2014.

3.2 Employment and Income

Table 3-4 presents employment by industry over the 2007–2013 period for the NWAB. Employment by industry indicates the composition and importance of specific industries in the regional economy. Employment in the NWAB totaled 2,941 jobs in 2013. Private industries employed approximately 60 percent of the total workforce, and the public sector employed the remaining 40 percent. The largest public sector employer is local government, which constituted 988 out of the 1,115 government jobs in 2013. Despite this, employment in local government declined by nearly 100 jobs since 2007.

Almost all industries have seen an increase in employment, the most rapid being the information industry, with a 27 percent growth rate since 2007. The industry with the largest total growth is "Private Ownership," with an increase of 121 jobs, and the industry with the most significant decrease is "Other Services," with a 38 percent drop. Employment data are not reported for many industries in **Table 3-4** due to non-disclosure policies. The Bureau of Labor Statistics protects the confidentiality of specific employers for the Quarterly Census of Employment and Wages.[30] For example, 2007 is the last year for which employment data is provided for the "Natural Resources and Mining" sector in the NWAB due to non-disclosure policies. However, data from the Alaska Department of Natural Resources for the Red Dog Mine reports that 550 people were employed at the mine in 2013.[31] This represents 19 percent of total employment in the NWAB that year. Additional information regarding Red Dog Mine employment is provided in **Section 4.1**.

Table 3-4 NWAB Annual Average Employment by Industry, 2007–2013

Industry	2007	2008	2009	2010	2011	2012	2013
Total industries	2,925	2,888	2,892	2,916	2,874	2,943	2,941
Total government	1,220	1,156	1,171	1,152	1,118	1,114	1,115
Federal government	50	47	46	51	48	50	50
State government	68	69	67	71	75	79	77
Local government	1,102	1,040	1,058	1,030	995	985	988
Private ownership	1,705	1,732	1,721	1,764	1,756	1,828	1,826
Goods producing	476	-	-	-	-	-	-
Natural resources and mining	421	-	-	-	-	-	-
Construction	56	63	73	62	43	56	-
Manufacturing	-	-	-	-	-	-	-
Service providing	1,229	-	-	-	-	-	-
Trade, transportation, and utilities	284	304	356	337	346	358	352
Information	48	55	55	58	52	53	61
Financial activities	130	135	-	-	-	-	-
Professional and business services	3	-	-	-	17	-	-

[30] Alaska Department of Labor and Workforce Development, Research and Analysis, Why is Certain Employment Data Suppressed, Website (http://labor.alaska.gov/research/CES/empnumsuppressed.htm) accessed November 17, 2014.

[31] Alaska Department of Natural Resources and Alaska Department of Commerce, Community and Economic Development, Alaska's Mineral Industry 2013, Special Report 69, Website (http://137.229.113.30/webpubs/dggs/sr/text/sr069.pdf) accessed November 28, 2014.

Industry	2007	2008	2009	2010	2011	2012	2013
Educational and health services	537	-	-	-	-	-	-
Leisure and hospitality	169	174	179	172	176	185	189
Other services	59	44	40	44	59	66	36
Unclassified establishments	-	-	-	-	1	-	-

Source: Alaska Department of Labor and Workforce Development, Research and Analysis, Quarterly Census of Employment and Wages, Website (http://labor.alaska.gov/research/qcew/qcew.htm) accessed November 17, 2014.

Table 3-5 presents the average annual real wages (2013 dollars) by industry from 2007 through 2013 in the NWAB. Wages by industry is a good indicator of economic trends in the regional economy. The average annual wage in 2013 was $60,048, which is a substantial increase from the 2007 level of $49,655. It is worth noting that even though local government is the largest employer in the region (**Table 3-4**), the average local government wage is less than half of that of state government. Employees in state government had a relatively high average wage in 2013 at about $76,000, but construction jobs typically had an even higher average rate of almost $90,000 over the 2007–2012 period.

In 2013 dollars, most NWAB industries have seen an increase in wages since 2007, with exception of federal government and information. Wages for "other services" have almost doubled, while the number of those employed declined significantly (**Table 3-5**). Local government employees had a small increase in their annual wages (14 percent), but state government wages increased much more (24 percent) over the 2007–2013 period. Wages in the private ownership sector dropped from a high of $82,127 in 2012, but were still fairly high in 2013 at $72,649, and have grown substantially since 2007.

Table 3-5 NWAB Annual Average Annual Wages by Industry, 2013 Dollars

Industry	2007	2008	2009	2010	2011	2012	2013
Total industries	$49,655	$51,101	$53,767	$55,950	$57,250	$65,247	$60,048
Total government	$34,067	$33,851	$35,448	$37,724	$37,721	$37,607	$39,412
Federal government	$54,637	$54,933	$58,209	$54,234	$58,388	$58,150	$50,899
State government	$61,218	$62,393	$67,617	$66,589	$69,956	$72,357	$76,007
Local government	$31,458	$31,004	$32,421	$34,917	$34,294	$33,777	$35,978
Private ownership	$60,808	$62,614	$66,232	$67,852	$69,684	$82,127	$72,649
Goods producing	-	-	-	-	-	-	-
Natural resources and mining	-	-	-	-	-	-	-
Construction	$89,639	$89,312	$94,981	$82,515	$90,582	$90,066	-
Manufacturing	-	-	-	-	-	-	-
Service providing	-	-	-	-	-	-	-
Trade, transportation, and utilities	$41,793	$39,210	$47,592	$48,769	$47,772	$51,790	$47,628
Information	$61,021	$61,902	$64,417	$65,139	$66,903	$64,488	$58,152
Financial activities	$42,531	$44,009	-	-	-	-	-
Professional and business services	-	-	-	-	$45,089	-	-
Educational and health services	-	-	-	-	-	-	-
Leisure and hospitality	$33,079	$34,782	$36,111	$35,894	$34,975	$33,719	$33,926

Industry	2007	2008	2009	2010	2011	2012	2013
Other services	$14,174	$16,397	$22,093	$24,496	$21,748	$22,051	$26,229
Unclassified establishments	-	-	-	-	$15,543	-	-

Source: Alaska Department of Labor and Workforce Development, Research and Analysis, Quarterly Census of Employment and Wages, Website (http://labor.alaska.gov/research/qcew/qcew.htm) accessed November 17, 2014.

Table 3-6 presents employment by industry over the 2007–2013 period for the YKCA. Employment in the region totaled 2,429 jobs in 2013. Federal, state, and local governments provided more than half of the region's jobs, with local government providing around 85 percent of public sector jobs. The federal sector was one of the only industries experiencing a decrease in employment since 2007 along with "financial activities," which fell from 26 jobs in 2007 to 10 jobs in 2013.

Overall, however, most YKCA industries have grown since 2007. Job growth in the information industry was relatively constant until 2013, when it had a sudden increase of nearly 100 percent. Professional and business services started 2007 with only three jobs, but by 2010 they peaked at 36. Since 2010 they have been declining.

Table 3-6 YKCA Annual Average Employment by Industry, 2007–2013

Industry	2007	2008	2009	2010	2011	2012	2013
Total industries	2,132	2,122	2,202	2,282	2,371	2,519	2,429
Total government	1,420	1,463	1,500	1,466	1,485	1,594	1,539
Federal government	107	111	101	99	100	102	93
State government	104	107	108	111	107	110	122
Local government	1,210	1,245	1,291	1,257	1,278	1,382	1,324
Private ownership	712	659	702	815	887	925	891
Goods producing	138	81	99	147	-	233	-
Natural resources and mining	75	-	-	-	-	-	-
Construction	54	50	74	91	-	-	-
Manufacturing	9	-	-	-	-	-	-
Service providing	574	578	603	668	-	692	-
Trade, transportation, and utilities	214	239	239	231	248	254	231
Information	10	10	12	11	10	10	19
Financial activities	26	26	24	20	16	10	-
Professional and business services	3	-	-	36	32	29	29
Educational and health services	163	-	-	-	-	-	-
Leisure and hospitality	52	33	44	47	52	-	-
Other services	107	100	100	119	124	132	130
Unclassified establishments	-	-	-	-	3	-	-

Source: Alaska Department of Labor and Workforce Development, Research and Analysis, Quarterly Census of Employment and Wages, Website (http://labor.alaska.gov/research/qcew/qcew.htm) accessed November 17, 2014.

Table 3-7 presents average annual wages in 2013 dollars by industry over the 2007–2013 period for the YKCA. The average annual wage in 2013 was $41,011, and has increased since 2007. As is the case

with employment and wages in the NWAB, local government is the largest regional employer, but pays the lowest wages. Five industries in the YKCA exhibited declines in real average annual wages from 2007 to 2013, while real income increased for state government, private ownership, and trade. The information industry had a sudden drop in average wage from $35,301 in 2007 to $19,078 in 2013. The largest increase was in the "Goods producing" sectors, which were declining until a large increase of about $25,000 between 2010 and 2012. The private ownership industry also saw a significant increase of roughly $11,500 between 2007 and 2013.

Table 3-7 YKCA Annual Average Wages by Industry, 2013 Dollars

Industry	2007	2008	2009	2010	2011	2012	2013
Total industries	$36,442	$35,374	$35,969	$38,393	$40,237	$40,070	$41,011
Total government	$32,539	$32,143	$32,368	$33,728	$33,644	$32,493	$32,468
Federal government	$53,098	$49,527	$50,010	$53,096	$48,891	$51,109	$50,166
State government	$62,327	$61,465	$64,111	$62,485	$61,679	$65,937	$67,396
Local government	$28,134	$28,073	$28,333	$29,636	$30,104	$28,457	$28,007
Private ownership	$44,226	$42,548	$43,664	$46,832	$51,229	$53,127	$55,720
Goods producing	$78,934	$71,120	$75,523	$71,578	-	$94,865	-
Natural resources and mining	-	-	-	-	-	-	-
Construction	$83,022	$70,874	$74,355	$69,141	-	-	-
Manufacturing	-	-	-	-	-	-	-
Service providing	$35,882	$38,544	$38,434	$41,386	-	$39,074	-
Trade, transportation, and utilities	$38,824	$41,786	$40,469	$46,034	$39,826	$40,569	$40,074
Information	$34,579	$34,810	$28,729	$32,203	$34,701	$35,301	$19,078
Financial activities	$22,800	$22,031	$18,231	$20,392	$30,417	$21,702	-
Professional and business services	-	-	-	$60,626	$55,443	$44,720	$61,267
Educational and health services	-	-	-	-	-	-	-
Leisure and hospitality	$19,365	$21,953	$15,095	$14,992	$14,860	-	-
Other services	$27,147	$27,274	$26,730	$25,683	$30,122	$21,892	$26,668
Unclassified establishments	-	-	-	-	$20,399	-	-

Source: Alaska Department of Labor and Workforce Development, Research and Analysis, Quarterly Census of Employment and Wages, Website (http://labor.alaska.gov/research/qcew/qcew.htm) accessed November 17, 2014.

Table 3-8 shows historical unemployment rates for study area communities, NWAB, YKCA, and Alaska. Generally, unemployment within the region and study area communities is high, with typical unemployment rates in the double digits. There is consistently quite a large variance in unemployment levels throughout this region, though. For example, Bettles had no one unemployed in each year disclosed in **Table 3-8**, while Allakaket had over 50 percent unemployed in 2013. This is due to the small populations, where a civilian labor force might consist of 20 people, and relatively few job opportunities. As a whole, Alaska's statewide unemployment does not follow sporadic trends as the smaller cities do; it has maintained a level between 6 percent and 9 percent.

Table 3-8 Study Area Unemployment Rates, Percent

Location	1990	2000	2010	2013
YKCA	21.4	12.5	24.2	21.9
Bettles	-	0.0	0.0	0.0
Evansville	21.1	0.0	0.0	0.0
Allakaket	69.1	25.0	54.5	51.5
New Allakaket	-	27.8	19.0	31.3
Alatna	100	11.8	42.9	0.0
Hughes	19.0	6.0	26.5	48.5
Huslia	40.3	11.2	36.6	16.2
NWAB	20.3	9.9	26.3	26.2
Kobuk	46.7	0.0	25.0	28.6
Shungnak	15.7	18.2	34.5	49.4
Ambler	50.0	20.6	36.1	42.0
Alaska	8.8	6.1	8.6	8.8

Sources: U.S. Census Bureau, 1990 Census, Website (http://www.census.gov/prod/www/decennial.html) accessed December 8, 2014.

U.S. Census Bureau, 2000, Summary File 3, Website (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml) accessed December 8, 2014.

U.S. Census Bureau, 2010 ACS 5-year data, Table S2301, Website (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml) accessed December 8, 2014.

U.S. Census Bureau, 2013 ACS 5-year estimates, Table S2301, Website (http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml) accessed December 8, 2014.

3.3 Major Industries and Businesses

Table 3-9 below shows the top ten employers in the NWAB for 2006. The Alaska Department of Labor and Workforce Development (ADLWD) no longer publishes the top ten employers by region; therefore, **Table 3-9** provides the most recent top employer data publically available for the borough. As provided below, the NWAB School District, Maniilaq Association (Maniilaq), and Teck Alaska are by far the largest employers in the region. Maniilaq is a non-profit corporation that provides social and health services to Native Alaskans in the NWAB. Employees of the NWAB School District include all of the teachers and faculty working at the 13 schools in the district. Teck Alaska is the owner and operator of the Red Dog Mine, which is discussed in greater detail in **Section 4.1**.

Table 3-9 Top Ten Employers in the NWAB, 2006

	Low Monthly Employment	High Monthly Employment	Annual Average
NWAB School District	625	668	648
Maniilaq Association	514	569	542
Teck Cominco Alaska, Inc.	329	434	384
City of Kotzebue	66	79	75
NANA Management Services, LLC	55	73	64
AK Commercial Co.	60	71	62

	Low Monthly Employment	High Monthly Employment	Annual Average
Kikiktagruk Inupiat Corp	30	84	54
NW Inupiat Housing Authority	33	76	51
Veco Alaska, Inc.	28	70	45
OTZ Telephone Cooperative, Inc.	32	43	36

Source: Red Dog Mine Extension, Aqqaluk Project Final Supplemental EIS, October 2009, Prepared by Tetra Tech, Website (http://dnr.alaska.gov/mlw/mining/largemine/reddog/pdf/rdseis2009vol1.pdf) accessed December 3, 2014.

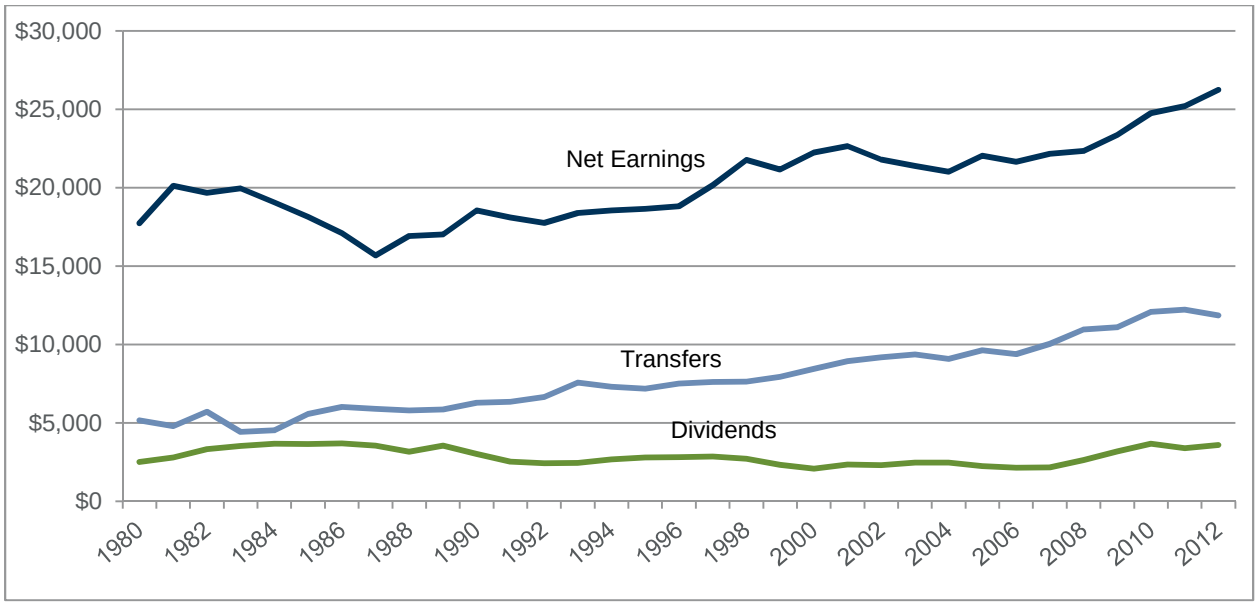
In 2011, 63 percent of jobs in the YKCA were in federal, state, local, or tribal government (**Table 3-6**). Private industry jobs are scarce in the YKCA, compared to other areas of Alaska. The Tanana Chiefs Conference (TCC) has been the largest private employer in the area since 2009, with an average monthly employment of between 100 and 250 people.[32] TCC is a non-profit corporation that provides social and health services to Alaska Natives within the YKCA, similar to Maniilaq.

3.4 Sources of Income

Figure 3-1 below provides historical per capita income for the major components of personal income within the NWAB, including net earnings, transfers, and dividends. Net earnings are the sum of wages and salaries, supplements to wages and salaries, and proprietor income. Transfer income includes payments for which no service was performed and includes payment by the federal, state, and local government and by businesses. Sources of transfer payments include the Alaska Permanent Fund Dividend (PFD), retirement checks, Social Security checks, veterans' and Medicare benefits, family assistance, and food stamps. Dividend income provided in **Figure 3-1** includes income resulting from payments made by corporations, interest income, and rental income.

The Red Dog Mine started production in 1989 at which time a notable trend in NWAB net earnings began to develop. Real per capita net earnings for NWAB residents in 1989 were approximately $17,000 and by 2012 per capita income was $26,000, an increase of 54 percent. Also, 1982 was the first year in which Alaskan residents received PFD payments. The PFD payment is a component of transfer income, and as illustrated below, per capita personal transfer income has increased since PFD payments began.

[32] Alaska Department of Labor and Workforce Development, July 2010, Alaska Economic Trends, The Trends 100: Alaska's Largest Private Employers in 2009, Website (http://labor.alaska.gov/trends/jul10.pdf) accessed December 5, 2014.



Source: Bureau of Economic Analysis, Regional Data, GDP & Personal Income, CA04 Personal Income and Employment Summary, Website (http://www.bea.gov/) accessed November 14, 2014.

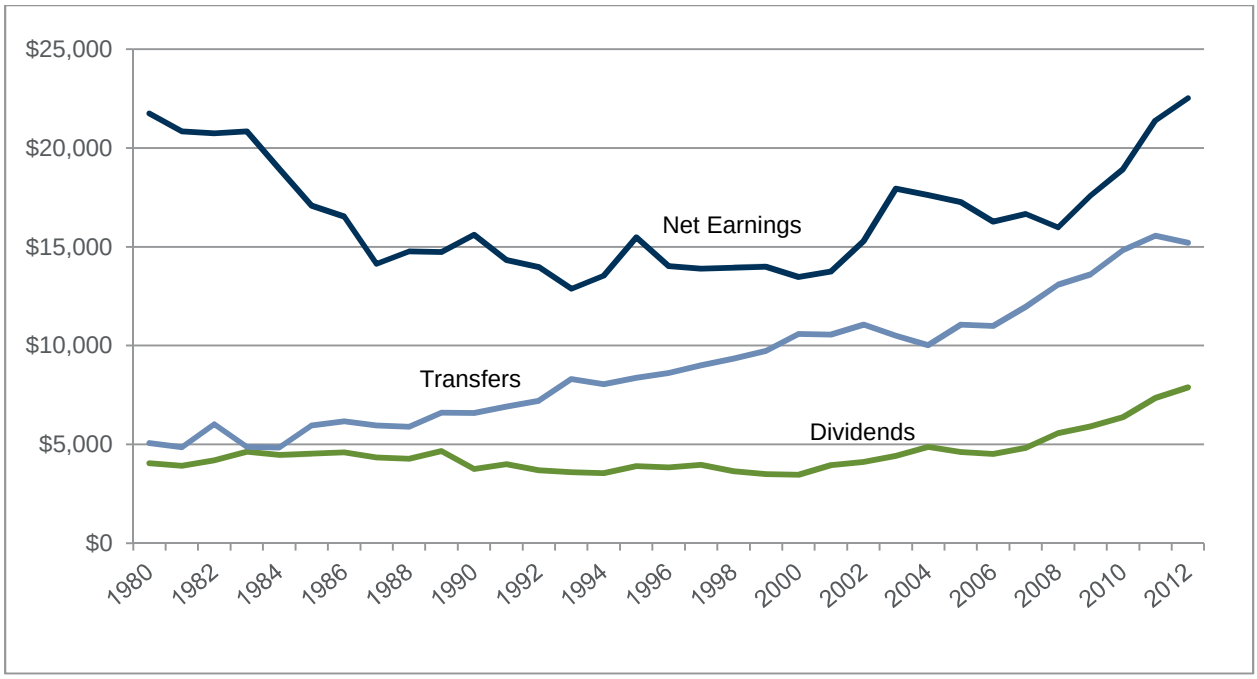
Bureau of Labor Statistics, Consumer Price Index, Website (http://www.bls.gov/cpi/data.htm) accessed November 14, 2014.

Alaska Department of Labor and Workforce Development, Research and Analysis Section, Population Estimates, Website (http://laborstats.alaska.gov/pop/popest.htm) accessed November 14, 2014.

Figure 3-1 NWAB Real Per Capita Income by Component (2012 dollars)

Figure 3-2 below provides per capita income for the major components of personal income within the YKCA. Real per capita net earnings in the YKCA increased by 20 percent over the 1980–2012 period. However, net earnings have not exhibited the same trend as evident in the NWAB. Real net earnings in the NWAB have exhibited an increasing trend since 1987, whereas real per capita net earnings in the YKCA fluctuated between $13,000 and $15,000 over the 1986–2002 period. It was not until 2003 that real per capita net earnings in the YKCA surpassed the level of real net earnings achieved in 1980.

Per capita transfer payments in the YKCA began at a similar level to the NWAB, roughly $5,000 per person, and increased by 250 percent over the 1980–2012 period. In 1980, transfer income accounted for 16 percent of total per capita personal income, and by 2012 it accounted for 33 percent of per capita personal income. Dividends had been relatively constant at just below $5,000, but since 2004 have experienced close to 60 percent growth.



Source: BEA, Regional Data, GDP & Personal Income, CA04 Personal Income and Employment Summary, Website (http://www.bea.gov/) accessed November 14, 2014.

Bureau of Labor Statistics, Consumer Price Index, Website (http://www.bls.gov/cpi/data.htm) accessed November 14, 2014.

Alaska Department of Labor and Workforce Development, Research and Analysis Section, Population Estimates, Website (http://laborstats.alaska.gov/pop/popest.htm) accessed November 14, 2014.

Figure 3-2 YKCA Real Per Capita Income by Component

3.5 Subsistence

Communities within the study area rely heavily upon subsistence resources, which contribute significantly to the economic and social welfare of these communities. The study area economy comprises a subsistence component as well as a cash component; as such, study area communities can be classified as having mixed economies.[33] Within a mixed economy, income is used to purchase goods and services, while subsistence resources provide a reliable source of food.[34] The combination of subsistence and cash income offers a lifestyle valued by many rural communities.[35]

Table 3-10 below provides the most recent per capita subsistence harvest data available for study area communities. Total subsistence harvest estimates range from 52.8 pounds per person in Evansville to nearly 1,500 pounds per person in Hughes. As an illustration of the relative importance of subsistence resources to study area communities, the per capita consumption of red meat, poultry, and fish throughout the United States in 2012 was approximately 200 pounds.[36]

[33] Alaska Department of Subsistence, Alaska's Economies and Subsistence, Website (http://www.adfg.alaska.gov/static/home/library/pdfs/subsistence/ak_economies_subsistence.pdf) accessed December 23, 2014.

[34] Wolfe, Robert J. and Robert J. Walker, 1987, Arctic Anthropology, Volume 24 (2), Website (http://www.subsistence.adfg.state.ak.us/download/download/subecon.pdf) accessed December 8, 2014.

[35] Ibid.

[36] USDA, Economic Research Service, Food Availability Data System, Website (http://www.ers.usda.gov/data-products/food-availability-%28per-capita%29-data-system.aspx) accessed December 8, 2014.

Table 3-10 Per Capita Harvest of Subsistence Resources (pounds)

	Bettles (2011)	Evansville (2011)	Allakaket (2011)	Alatna (2011)	Hughes (1982)	Huslia (1983)	Kobuk (2012)	Shungnak (2012)	Ambler (2012)
Fish	12.0	12.8	326.5	48.8	1,234.2	645.2	142.8	111.6	210.4
Land mammal	155.0	27.0	179.9	228.7	228.2	397.4	107.8	198.7	348.5
Marine mammal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1
Birds and eggs	2.4	1.6	13.0	18.1	24.4	33.1	6.4	5.0	5.3
Marine invertebrates	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Vegetation	5.9	11.4	6.0	3.7	5.6	6.4	6.0	5.2	9.8
Total	175.3	52.8	525.3	299.3	1,492.3	1,082.1	263.0	320.5	576.2

Source: Alaska Department of Fish and Game, Community Subsistence Information System, Website (http://www.adfg.alaska.gov/sb/CSIS/index.cfm?ADFG=harvInfo.harvestCommSelComm) accessed November 5, 2014.

3.6 Alaska Natives and Alaska Native Corporations

As discussed previously, each study area community, with the exception of Bettles, is predominately Alaska Native. The combined population for study area communities is approximately 91 percent Alaska Native (**Table 3-3**). Federally recognized tribes in the study area include Evansville Village, Allakaket Village, Alatna Village, Huslia Village, Hughes Village, Native Village of Kobuk, Native Village of Shungnak, and Native Village of Ambler.[37]

Through ANCSA, the U.S. Congress placed Alaska Native land ownership with profit-making Native corporations rather than with tribes. ANCSA established Alaska Native regional and village corporations to manage appropriations of nearly $1 billion and 44 million acres of land.[38] ANCSA divided Alaska into 12 geographic regions, and Alaska Natives then organized a corporation for each region. In addition, a thirteenth regional corporation was subsequently formed for non-resident Alaska Natives. Those corporations were authorized to select lands that would become their fee simple property. Each region also contains numerous smaller village corporations. In all, the ANCSA created approximately 220 village corporations. Village corporations selected the surface lands around their villages, while the regional corporation retained subsurface rights.

Alaska Natives born before 1971 received 100 shares in their village corporation as well as their regional corporation. Shares in village and regional corporations cannot be sold or traded, but can be passed to family members. As shareholders, Alaska Natives receive dividends from the corporations and in many cases corporations provide funding for social programs, scholarships, and cultural programs.

[37] Federal Register, January 29, 2014, Volume 79, Number 19, Website (http://www.bia.gov/cs/groups/public/documents/text/idc006989.pdf) accessed November 3, 2013.

[38] Gorsuch, Lee and Steve Colt, February 1994, A Study of Five Southeast Alaska Communities, Website (http://www.iser.uaa.alaska.edu/Publications/StudyOf5-SE-AK-Communities.pdf) accessed November 3, 2014.

3.7 Native Corporations

Doyon Limited (Doyon) owns subsurface rights within the study area, while NANA owns both surface rights and subsurface rights within the study area.[39] Village corporations within the study area include Evansville Incorporated and K'oyitl'ots'ina Limited, which was created through the merger of Alatna (Alatna Endeavors, Inc.), Allakaket (Aaia Kaa ka, Inc), Hughes (Hadohdleekaga, Inc.), and Huslia (Bin Googa, Inc.).[40] Ambler, Kobuk, and Shungnak village corporations, along with seven other village corporations, merged with NANA in 1972, at which time these village corporations dissolved.[41] As established by Section 7(i) of ANCSA, regional corporations must redistribute 70 percent of net revenues earned on subsurface development on their lands among the 12 regional corporations, including the distributing region.[42] Under Section 7(j) of ANCSA, the percentage of the 70 percent pool that a regional corporation receives is divided equally among itself and the village corporations and at-large shareholders.

3.7.1 Doyon, Limited

Portions of the proposed AMDIAR route cross land for which Doyon owns the subsurface rights.[43] Furthermore, there are four proposed AMDIAR material sites located on land for which Doyon owns the subsurface estate. Doyon has land entitlements of 12.5 million acres and is the largest private landowner in Alaska and one of the largest in the nation.[44] Its region extends from the Brooks Range in the north to the Alaska Range in the south. The Alaska-Canada border forms Doyon's eastern border, while Doyon's western border almost reaches the Norton Sound. Doyon has over 18,700 shareholders and is headquartered in Fairbanks.[45]

Doyon owns 13 businesses, which provide services to the oil industry, government contracting, and the tourism industry.[46] Doyon Drilling is the corporation's largest subsidiary, producing more than half of the corporation's revenues. The subsidiary is actively engaged in arctic drilling on the North Slope. Doyon is a partner in a gas exploration project in the Nenana Basin, and also holds prospective gas resources in Yukon Flats. Doyon also manages 38 sand, gravel, and rock sources in 34 villages within the Doyon region to generate revenue.[47]

3.7.2 NANA Regional Corporation, Incorporated

The NANA region is 38,000 square miles in size, or an area roughly the size of Indiana. NANA owns 2.28 million acres, or approximately 9.4 percent of the 24.3 million acres that constitute the region. NANA is a

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[39] 78 FS 54482

75 FS 55344

[40] Alaska Department of Commerce, Community and Economic Development, Community and Regional Affairs, Website (http://commerce.state.ak.us/dnn/dcra/Home.aspx) accessed November 4, 2014.

[41] NANA/Maniilaq Tribal Governments, Website (http://www.englishoe.com/nana.pdf) accessed November 4, 2014.

[42] CIRI, Resource Revenue Distributions, Website (http://www.ciri.com/shareholders/benefits/dividends-and-distributions/resource-revenue-distributions/) accessed November 6, 2014.

[43] 78 FS 54482

[44] Resource Development Council, Alaska's Native Corporations, Website (http://www.akrdc.org/issues/nativecorporations/overview.html) accessed November 4, 2014.

[45] ANCSA Regional Association, Economic Impact Report 2009-2012, Website (http://ancsaregional.com/wp-content/uploads/2013/12/ANCSA%20REPORT_digital.pdf) accessed November 4, 2014.

[46] Doyon Limited, Doyon Family of Companies, Website (http://www.doyon.com/business_operations/subsidiaries.aspx) accessed November 6, 2014.

[47] Doyon Limited, Sand, Gravel and Rock, Website (http://www.doyon.com/lands/sand_gravel_rock.aspx) accessed November 6, 2014.

billion dollar corporation with more than 13,500 employees worldwide and more than 12,000 shareholders.[48] The NANA family of businesses includes approximately 40 companies that provide services including engineering; construction; resource development; facilities management; logistics; real estate and hotel development; information technology; and telecommunications.[49]

Two NANA subsidiaries, NMS and NANA Lynden Logistics, play major roles in Red Dog Mine operations. Other subsidiaries, including NANA/Major Drilling, NANA Oilfield Services, NMS Security, NANA WorleyParsons, NANA/Pacific, NMS Training Systems, and NMS Staffing, provide services to Red Dog Mine operations and others in Alaska's mining industry.[50]

NANA also has a stake in the Red Dog Mine, which is located on NANA lands and operated by Teck Alaska. The mine was developed in 1982 under an operating agreement specifying that NANA shareholders receive direct and meaningful benefits from development at the mine. Furthermore, NANA owns the land in which the Bornite Project is located. NANA acquired the Bornite deposit and surface development from Kennecott Minerals in 1989.[51]

3.7.3 Village Corporations

K'oyitl'ots'ina Limited was formed on July 1, 1980, through the merger of four village corporations. The corporation has numerous subsidiaries including Brooks Range Contract Services, KCORP Technology Services, KCORP Support Services, Control Contractors, and Yukon Fire Protection Systems. Evansville, Incorporated is the Native village corporation for the village of Evansville. Evansville, Incorporated has a land entitlement of 69,000 acres located in the vicinity of Evansville/Bettles near the John and Koyukuk Rivers.[52] The corporation owns the surface estate of the lands conveyed to them in 2013, while Doyon owns the subsurface estate.[53]

3.8 Cost of Living

A detailed cost of living analysis for multiple areas of Alaska was conducted in 2009 to identify the geographic differences in costs that could affect pay equity among state employees throughout the state.[54] The study evaluated geographic cost differentials for expenditures such as housing, utilities, food, transportation cost, clothing, medical, home furnishings, and recreation.

In the study, Anchorage served as the index base community and was assigned the cost differential of 1.00. Differentials for the communities measure differences between a given community and Anchorage.

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[48] Resource Development Council, Alaska's Native Corporations, Website (http://www.akrdc.org/issues/nativecorporations/overview.html) accessed November 4, 2014.

ANCSA Regional Association, Economic Impact Report 2009-2012, Website (http://ancsaregional.com/wp-content/uploads/2013/12/ANCSA%20REPORT_digital.pdf) accessed November 4, 2014.

[49] NANA, The NANA Family of Companies, Website (http://nana-dev.com/companies/?cInd=Mining&cServ=all#companylist_query_wrap) accessed November 6, 2014.

[50] Alaska Miners Association, January 2012, The Economic Impacts of Alaska's Mining Industry, Prepared by McDowell Group, Website (http://www.alaska.edu/files/bor/120412Ref04_AK_Mining_Industry_Economic_Impacts.pdf) accessed November 28, 2014.

[51] NovaCopper, April 1, 2014, NI 43-101 Technical Report on the Bornite Project, Northwest Alaska, USA, Prepared by BD Resource Consulting, Inc., SIM Geological Inc. and International Metallurgical & Environmental Inc., Website (http://www.novacopper.com/i/pdf/reports/Technical_Report_for_the_Bornite_Deposit_31January2013_.pdf) accessed November 3, 2014.

[52] Evansville Inc., Evansville Corporate Profile, Website (http://kazwork.net/evansville_home_2_003.htm) accessed November 5, 2014.

[53] 78 FS 54482

[54] Alaska Department of Administration, Personnel and Labor Relations, April 30, 2009, Alaska Geographic Differential Study, Prepared by McDowell Group, Website (http://doa.alaska.gov/dop/gds/home.html) accessed November 30, 2014.

For example, the Kotzebue cost differential of 1.61 means that the cost of living in Kotzebue is 61 percent higher than Anchorage. The study did not include any study area communities; despite this, the cost of living differentials for communities in relatively close proximity such as Kotzebue and those communities/regions not located on the road system such as the Southwest Small Communities Region are assumed to serve as a reasonable proxy for the study area. As provided in **Table 3-11** below, the cost of living in Kotzebue and the other roadless areas is between 31 percent and 61 percent higher than in Anchorage.

Table 3-11 Geographic Cost Differentials, 2008

Community/Region	Cost of Living Differential
Anchorage	1.00
Fairbanks	1.03
Parks/Elliott/Steese Highway	1.00
Kotzebue	1.61
Arctic Region	1.48
Roadless Interior	1.31
Bethel	1.53
Southwest small communities	1.44

Fairbanks is the Fairbanks North Star Borough (FNSB) and includes the City of Fairbanks, North Pole, and surrounding area.

Parks/Elliott/Steese Highways includes Healy, Cantwell, Central, Nenana, Manley Hot Springs, and Talkeetna.

Arctic Region includes Barrow, Kotzebue, Nome, and Teller.

Roadless Interior includes Fort Yukon, Galena, and McGrath.

Southwest Small Communities includes Aniak, Anvik, Chignik, Emmonak, Goodnews Bay, Illiamna, King Salmon, Port Moller, Saint Mary's, and Unalakleet.

Source: Alaska Department of Administration, Personnel and Labor Relations, April 30, 2009, Alaska Geographic Differential Study, Prepared by McDowell Group, Website (http://doa.alaska.gov/dop/gds/home.html) accessed November 30, 2014.

3.8.1 Heating Fuel

Heating fuel is a major expenditure for study area residents and businesses. Fuel for the study area is typically transported by air. For example, Allakaket and Alatna receive fuel by air because fuel barges cannot navigate the upper Koyukuk River.[55] Similarly, the recent shallow depth of the Kobuk River has precluded annual barge delivery of fuel to Ambler, Shungnak, and Kobuk.[56]

Table 3-12 provides the estimated annual heating oil consumption for the YKCA and NWAB and is based on research compiled by the Alaska Housing Finance Corporation (AHFC).[57] AHFC research found that residential users in the YKCA use an average of 127 million British thermal units (MMBtu) per year for space heating and 15 MMBtu for hot water heating. The study also found that 55 percent of space heating needs in the YKCA were met by using heating oil, while 44 percent were met by using wood. Estimates of annual household oil consumption for heating in **Table 3-12** assume that all average annual domestic hot water energy needs (15 MMBtu) of residential users in the YKCA were met through the burning of heating oil, while heating oil use for space heating was derived by using the proportion of residential space

[55] Wilson, Meghan, Saylor, Ben, Szymoniak, Nick, Colt, Steve, and Ginny Fay, June 2008, Components of Delivered Fuel Prices in Alaska, Prepared by ISER for AEA.

[56] NANA Regional Corporation, Northwest Arctic Strategic Energy Plan, Website (http://nana.com/files/forms/Northwest_Arctic_Strategic_Energy_Plan.pdf) accessed November 30, 2014.

[57] AHFC, 2014 Alaska Housing Assessment, Website (http://www.ahfc.us/efficiency/research-information-center/housing-assessment/) accessed November 16, 2014.

heating using heating oil (55 percent) and applying this to the average space heating use (127 MMBtu). This same approach was used for the NWAB, where it was determined that 80 percent of space heating used heating oil, while 19 percent used wood. Using this approach Cardno estimated that residential households in the YKCA use 633 gallons of fuel on average for space heating and domestic hot water heating, while households in the NWAB use 776 gallons of fuel.

Table 3-12 Annual Household Heating Oil Consumption Estimates (2014)

	Space Heating (MMBtu)	Domestic Hot Water (MMBtu)	Heating Oil (MMBtu)	Wood (MMBtu)	Electricity Space Heating (MMBtu)	Annual Heating Oil Consumption (Gallons)[3]
YKCA[1]	127	15	85	56	1	633
NWAB[2]	105	20	104	20	1	776

[1] As determined by the 2014 Alaska Housing Assessment, this analysis assumes 44 percent of space heating needs within the YKCA are met with wood, while 55 percent of space heating needs are met with fuel oil.

[2] As determined by the 2014 Alaska Housing Assessment, this analysis assumes 19 percent of space heating needs within the NWAB are met with wood, while 80 percent of space heating needs are met with fuel oil.

[3] Assumes heating oil contains 134,000 Btu per gallon.

Source: Adapted from AHFC, 2014 Alaska Housing Assessment, Website (http://www.ahfc.us/efficiency/research-information-center/housing-assessment/) accessed November 16, 2014.

Household heating oil consumption estimates derived in **Table 3-12** were used in conjunction with recent heating oil prices within study area communities to estimate average annual household expenditures for heating oil. It is assumed that the average heating oil consumption estimates for the overall YKCA (633 gallons) and the NWAB (776 gallons) serve as a reasonable proxy for the respective study area communities within the YKCA and NWAB. As provided in **Table 3-13**, Cardno estimated that average household heating oil expenditures in the YKCA study area communities ranged from $4,432 to $5,699, while the average household heating oil expenditures in NWAB study area communities ranged from $7,125 to $7,490 each year.

Table 3-13 Average Annual Household Heating Oil Consumption and Expenditures (2014)

Community	Average Heating Fuel Consumption (gallons)[1]	Heating Oil Price, July 2014 ($/gal)[2]	Average Household Heating Oil Expenditures
YKCA			
Bettles/Evansville	633	$7.45	$4,717
Allakaket/New Allakaket/Alatna	633	$7.00	$4,432
Hughes	633	$9.00	$5,699
Huslia	633	$7.00	$4,432
NWAB			
Kobuk	776	$9.65	$7,490
Shungnak	776	$9.18	$7,125
Ambler	776	$9.30[3]	$7,218

Sources:

[1] Adapted from AHFC, 2014 Alaska Housing Assessment, Website (http://www.ahfc.us/efficiency/research-information-center/housing-assessment/) accessed November 16, 2014.

[2] Alaska Department of Commerce, Community, and Economic Development, Community and Regional Affairs, Community Information, Website (http://commerce.state.ak.us/cra/DCRAExternal/community/Details/3dab0bf2-69d6-4a39-845b-722247ac6070) accessed November 22, 2014.

[3] AHFC, 2014 Alaska Housing Assessment, Website (http://www.ahfc.us/efficiency/research-information-center/housing-assessment/) accessed November 16, 2014.

*All heating oil prices are for July 2014 with exception of Ambler, which is for January 2013.

3.8.2 Electricity

Diesel fuel is used to generate all of the electricity produced and consumed in each study area community.[58] The cost of electricity for rural Alaskans is high when compared to costs in urban areas of Alaska. For this reason, the State of Alaska subsidizes rural electric utilities customers through the Power Cost Equalization (PCE) program. The PCE was established in 1985 and is funded by the state legislature, the National Petroleum Refiners Association, donations, and the PCE endowment fund.[59]

As shown in **Table 3-15**, the costs of electricity within study area communities would be much higher without the PCE program. Without a PCE payment, residential rates in the study area would range from $0.60 and $0.77 per kilowatt hour (kWh). These rates are much higher than in Anchorage and Fairbanks, which as of June of 2013 had residential rates of $0.14 per kWh and $0.32 per kWh, respectively.[60] However, the effective residential rates for study area communities are between $0.14 and $0.22 per kWh, after accounting for the PCE rate. Additional detail is provided on how PCE rates are calculated for study area communities in **Appendix A**.

Table 3-14 Electricity Generation and Costs for Study Area Communities (FY 2013)

Community	Total Sold (kWh)	Total Diesel Used (gallons)	Average Diesel Price (per gallon)	Total Fuel Cost (dollars)	Total Non-Fuel Costs (dollars)	Total Cost Per kWh
Allakaket/Alatna	625,389	57,239	$6.10	$347,555	$108,286	$0.73
Bettles/ Evansville	550,309	45,905	$4.50	$202,509	$164,144	$0.67
Ambler	1,241,635	94,692	$4.20	$397,743	$340,464	$0.59
Huslia	978,952	73,950	$3.95	$292,283	$268,435	$0.57
Shungnak	980,235	122,825	$5.10	$626,144	$268,787	$0.91
Kobuk*	624,336	0	$0.00	$0	$171,197	$0.27
Hughes	331,316	46,995	$6.02	$289,735	$63,343	$1.07

*Kobuk receives electricity from Shungnak.

Source: Alaska Energy Authority, Power Cost Equalization Program: Statistical Data by Community, Reporting Period: July 1, 2012 to June 30, 2013, Website (http://www.akenergyauthority.org/PDF%20files/pcereports/FY13StatisticalRptComt.pdf) accessed November 22, 2014.

The PCE program effectively reduces rates rural customers pay for electricity. Provided that an electric utility meets PCE program eligibility requirements, PCE-eligible utility customers include residential and community facilities. State and federal offices and facilities, as well as commercial customers, including schools, are not eligible for the PCE program. Residential customers are eligible for PCE credit up to 500

[58] Alaska Department of Commerce, Community, and Economic Development, December 2005-January 2010, Current Community Conditions: Fuel Prices Across Alaska.

[59] Alaska Energy Authority, July 2014, Power Costs Equalization Program Guide, Website (http://www.akenergyauthority.org/PDF%20files/PCEProgramGuideJuly292014EDITS.pdf) accessed November 22, 2014.

[60] Fried, Neal, July 2014, The Cost of Living in Alaska, Website (http://laborstats.alaska.gov/col/col.pdf) accessed November 22, 2014.

kWh per month per customer, while community facilities as a group can receive PCE credit for 70 kWh per month multiplied by the number of residents in the community.[61]

Calculations in **Table 3-15** use the last reported residential rates and PCE rates for fiscal year (FY) 2013. Therefore, estimated annual residential electricity expenditures are approximations since residential rates, PCE rates, and effective rates change throughout the fiscal year. Despite this, the following calculations are considered a reasonable estimate of annual residential electricity payments for study area residents.

Table 3-15 Estimated Average Annual Household Electricity Expenditures (FY 2013)

Community	Average Annual Use (kWh)	Average Annual PCE Eligible (kWh)	Average Annual Non-PCE Eligible (kWh)	Last Reported Residential Rate	Last Reported PCE Rate	Effective Rate	Estimated Annual Residential Electricity Payment*
				Dollars Per kWh			
Allakaket/ Alatna	3,220	3,074	146	$0.77	$0.55	$0.22	$786
Bettles/ Evansville	3,910	3,080	830	$0.67	$0.46	$0.21	$1,217
Ambler	5,639	3,779	1,861	$0.62	$0.42	$0.20	$1,891
Huslia	5,279	3,879	1,400	$0.60	$0.41	$0.19	$1,590
Shungnak	6,266	4,312	1,954	$0.68	$0.48	$0.20	$2,186
Kobuk	4,907	3,547	1,360	$0.68	$0.48	$0.20	$1,630
Hughes	4,539	3,875	664	$0.71	$0.57	$0.14	$1,026
Average	4,964	3,704	1,261	$0.67	$0.47	$0.20	$1,537

*Assumes the last reported residential rate and PCE rate are a reasonable proxy for residential rates and PCE rates throughout the 2013 fiscal year.

Source: Alaska Energy Authority, Power Cost Equalization Program: Statistical Data by Community, Reporting Period: July 1, 2012 to June 30, 2013, Website (http://www.akenergyauthority.org/PDF%20files/pcereports/FY13StatisticalRptComt.pdf) accessed November 22, 2014.

3.9 Government Spending

Federal spending in Alaska is high, primarily due to a large military presence; vast federal land holdings; federal health care and other programs for Alaska Natives; and federal support for infrastructure construction.[62] Previous research into what drives the Alaska economy found that if federal spending stopped; one-third of the jobs in Alaska would disappear.[63] Government spending is important to the state's economy as well as the study area's economy. As provided in **Section 3.2** above, approximately 40 percent of jobs in the NWAB and 60 percent of jobs in the YKCA are government jobs. The likely job creation offered by AMDIAR construction and any mining activity would provide for a more diverse economy less reliant on government spending.

[61] Alaska Energy Authority, July 2014, Power Costs Equalization Program Guide, Website (http://www.akenergyauthority.org/PDF%20files/PCEProgramGuideJuly292014EDITS.pdf) accessed November 22, 2014.

[62] Goldsmith, Scott, December 2008, What Drives the Alaska Economy, UAA ISER, Website (http://www.iser.uaa.alaska.edu/Publications/researchsumm/UA_RS_13.pdf) accessed December 6, 2014.

[63] Ibid.

Federal spending in Alaska has exhibited a noticeable decline in recent years, falling from $2.5 billion in FY 2010 to $1.3 billion in FY 2014 (a decline of nearly 50 percent).[64] However, recent state expenditures have increased from $9.2 billion in 2007 to $11.7 billion in 2012.[65] State spending could decline in the near future given the importance of oil to state revenue and the recent decline in oil prices.[66] This section provides additional information regarding federal and state spending in study area communities for a select number of federal and state programs that have particular relevance to the study area.

3.9.1 Indian Health Service

The Indian Health Service (IHS) provides primary health care and disease prevention services to approximately 2.1 million American Indians and Alaska Natives through a network of over 632 hospitals, clinics, and health stations on or near Indian reservations.[67] IHS provides significant funding to ANCSA non-profit regional corporations for social, education, and health services for Alaska Natives. Regional non-profit corporations receiving these federal funds in the study area include Maniilaq and the TCC. Maniilaq manages social and health services in the NWAB, while TCC manages the health and social services in Interior Alaska. **Table 3-16** provides IHS Self Governance Funding to Maniilaq and the TCC over the 2009–2013 period. Over this timeframe funding to Maniilaq and TCC has increased by 9 percent and 48 percent, respectively.

Table 3-16 IHS Self Governance Funded Compacts by Fiscal Year (million $)

Regional Corporation	2009	2010	2011	2012	2013
Maniilaq Association	$37.5	$41.8	$41.7	$43.2	$41.0
Tanana Chiefs Conference	$35.1	$40.1	$39.7	$45.3	$51.8

Source: Indian Health Services, Congressional Justification, 2010–2015, Website (http://www.ihs.gov/budgetformulation/congressionaljustifications/) accessed December 4, 2014.

3.9.2 Bureau of Indian Affairs

The Bureau of Indian Affairs (BIA) provides services directly or through contracts, grants, or compacts to a service population of about 1.7 million American Indians and Alaska Natives who are enrolled members of 565 federally recognized tribes in the 48 contiguous United States and Alaska. The BIA's Tribal Priority Allocations (TPA) fund basic tribal services, such as social services, adult vocational training, child welfare, natural resources management, and contract support. TPA is the principal source of funds for tribal governments and agency offices.[68]

In FY 2015, Alaska will receive $23.2 million in TPA base funding from the BIA.[69] Publically available information on the TPA program funding for all study area communities is limited; therefore, **Table 3-17**

[64] University of Alaska Anchorage and Small Business Development Center, Government Spending in Alaska, Website (http://ptacalaska.org/government-contracting/government-spending-alaska/) accessed December 6, 2014.

[65] U.S. Census Bureau, Federal, State and Local Government, Government Finance Statistics, Website (http://www.census.gov/govs/) accessed December 6, 2014.

[66] The price of Alaska North Slope crude at the time of writing, December 4, 2014, is $67.36 per barrel, while on July 2, 2014, ANS crude was selling for $110.71 per barrel.

[67] Department of Health and Human Services, Fiscal Year 2015, Indian Health Services: Justification of Estimates for Appropriations Committees, Website (http://www.ihs.gov/budgetformulation/includes/themes/newihstheme/documents/FY2015CongressionalJustification.pdf) accessed December 5, 2014.

[68] Bureau of Indian Affairs, Report on Tribal Priority Allocations, July 1999, Website (http://files.eric.ed.gov/fulltext/ED445850.pdf) accessed December 6, 2014.

[69] Bureau of Indian Affairs, Budget Justifications and Performance Information Fiscal Year 2014, Website (http://www.bia.gov/DocumentLibrary/index.htm) accessed December 18, 2014.

provides recent TPA base funding for study area communities for which information could be obtained. In general, total TPA base funding remained relatively constant for study area communities with the exception of Kobuk, which did not receive TPA funding in 2013 or 2015. TPA funding throughout the Alaska region has remained relatively constant at approximately $23 million over the 2011–2015 period.

Table 3-17 BIA TPA Base Funding by Fiscal Year

Community	2011	2012	2013	2014	2015
Ambler	$93,700	$93,900	$94,800	$97,100	$92,300
Kobuk	$149,000	$149,000	$0	$153,000	$0
Shungnak	$400	$400	$400	$400	$400
Alaska Region Total	$23,687,700	$23,534,500	$23,325,400	$23,226,800	$23,199,200

Source: Bureau of Indian Affairs, Indian Affairs FY Budget Justification and Performance Information, Website (http://www.bia.gov/DocumentLibrary/index.htm) accessed December 6, 2014.

3.9.3 Public School Funding

Table 3-18 provides federal and state funding for the NWAB and YKCA school district over the 2009–2013 period. State funding in the NWAB increased from $27.2 million in 2009 to $40.8 million in 2013, or an increase of 50 percent, while over the same timeframe federal funding has declined by a small margin. State public school funding in the YKCA has increased from $6.2 million in 2009 to $14.7 million in 2013, or an increase of approximately 140 percent, while federal public school funding in the YKCA has increased by 36 percent over the same timeframe.

Table 3-18 Federal and State Public School Funding, in Millions

	2009		2010		2011		2012		2013	
	State	Federal	State	Federal	State	Federal	State	Federal	State	Federal
NWAB	$27.2	$7.9	$28.6	$6.9	$28.9	$7.9	$37.9	$7.7	$40.8	$7.8
YKCA	$6.2	$1.1	$10.8	$1.3	$10.7	$1.9	$12.5	$0.9	$14.7	$1.5

Source: Alaska Department of Education and Early Development, Annual Revenues, Website (https://www.eed.state.ak.us/schoolfinance/) accessed December 8, 2014.

3.9.4 Division of Community and Regional Affairs

The Division of Community and Regional Affairs (DCRA) Grants Section is responsible for administering a variety of state and federal grant programs.[70] Some DCRA-administered programs have a set funding pool, such as the bulk fuels program and community development block grants, whereas some DCRA-administered grants are the result of community requested appropriations, such as legislative grants.[71] Within the study area, over the 2009–2014 period, DCRA provided American Recovery and Reinvestment Act (ARRA) grants, legislative grants, and capital matching grants to study area communities, with the bulk of these grant funds being classified as legislative grants. DCRA distributed a total of $2.4 million to study area communities from 2009 through 2014 (an annual average of $396,500) (**Table 3-19**).

[70] Department of Commerce, Community and Economic Development, Division of Community and Regional Affairs, Website (http://commerce.state.ak.us/dnn/dcra/GrantsSection.aspx) accessed December 4, 2014.

[71] Haymaker, Judy, Alaska Division of Community and Regional Affairs, Personal communication with Lee Elder, Cardno, December 23, 2014.

Table 3-19 Total DCRA Grants to Study Area Communities, 2009–2014

Community	2009	2010	2011	2012	2013	2014	Annual Average
Alatna	$0	$800	$0	$0	$180,000	$0	$30,100
Allakaket	$0	$17,300	$150,000	$0	$640,000	$0	$134,600
Ambler	$0	$7,800	$0	$0	$0	$0	$1,300
Bettles	$0	$700	$0	$426,600	$0	$0	$71,200
Evansville	$0	$0	$0	$0	$0	$0	$0
Hughes	$42,700	$2,400	$0	$89,300	$102,600	$238,700	$79,300
Huslia	$0	$8,300	$90,000	$0	$170,000	$200,000	$78,100
Kobuk	$0	$3,300	$0	$0	$0	$0	$500
Shungnak	$0	$8,200	$0	$0	$0	$0	$1,400
Total	$42,700	$48,800	$240,000	$515,900	$1,092,600	$438,700	$396,500

Source: Department of Commerce, Community and Economic Development, Division of Community and Regional Affairs, Website (http://commerce.state.ak.us/dnn/dcra/Home.aspx) accessed December 4, 2014.

3.9.5 Power Cost Equalization Program

The PCE program is administered by the Alaska Energy Authority (AEA) and was established in 1985 as part of a statewide energy plan to provide economic assistance to customers in rural areas of Alaska.[72] The PCE program was established to assist rural residents at a time when state funds were being used to construct major energy projects to assist more urban areas. Most urban and road-connected communities benefit from major state-subsidized energy projects, whereas rural communities not on the road system that are dependent on diesel fuel do not benefit from large, subsidized energy projects. The PCE program provides electricity rate relief to rural residents who do not benefit from the major state-subsidized energy projects on the road system.

Table 3-20 provides the total PCE payments made within each fiscal year to study area communities over the 2009–2013 period. As provided below, PCE payments to study area communities have been approximately $1 million each year over the 2009–2013 period. PCE payments for study area communities were the highest in FY 2012, with $1.1 million in PCE payments that year.

Table 3-20 Power Cost Equalization Payments for Study Area Communities (FY 2013)

Community	2009	2010	2011	2012	2013
Allakaket/Alatna	$114,000	$126,000	$141,000	$166,000	$163,000
Bettles/Evansville	$59,000	$54,000	$54,000	$62,000	$63,000
Ambler	$289,000	$212,000	$196,000	$236,000	$221,000
Huslia	$238,000	$183,000	$163,000	$201,000	$205,000
Shungnak	$213,000	$145,000	$193,000	$264,000	$233,000
Kobuk	$9,000	$72,000	$48,000	$70,000	$77,000
Hughes	$59,000	$60,000	$70,000	$117,000	$116,000

[72] Alaska Energy Authority, July 2014, Power Costs Equalization Program Guide, Website (http://www.akenergyauthority.org/PDF%20files/PCEProgramGuideJuly292014EDITS.pdf) accessed November 22, 2014.

Community	2009	2010	2011	2012	2013
Total	$980,000	$853,000	$866,000	$1,117,000	$1,078,000

Source: Alaska Energy Authority, Power Cost Equalization Program: Statistical Data by Utility, FY 2009 – 2013, Website (http://www.akenergyauthority.org/programspce.html) accessed December 23, 2014.

3.10 Out-Migration

Migration from small rural communities to urban centers has been occurring in Alaska for decades. The process of migration for rural Alaska has been likened to a stepping stone approach, where residents tend to move from smaller villages to regional population centers and then to urban centers such as Anchorage or Fairbanks.[73] There are many reasons people move, but research has found that the primary driver for moving from rural areas to more urban locations is employment or educational opportunities. This section describes the trends in rural out-migration and research on the contributing factors for migration such as employment opportunities, health care, education, and cost of living. As provided in **Table 3-21** below, an increasingly large share of Alaska Natives are living in urban areas of Alaska, while a shrinking proportion are residing in rural areas.

Table 3-21 Percentage of In-State Alaska Native Population Living in Urban and Rural Areas*

Year	Urban	Rural
1950	5%	95%
1960	13%	87%
1970	21%	79%
1980	23%	77%
1990	28%	72%
2000	29%	71%

*Alaska Native population living in Anchorage, Fairbanks, Juneau, Ketchikan, or Sitka.

Source: Martin, Stephanie, Killorin, Mary, and Steve Colt, May 12, 2008, Fuel Costs, Migration, and Community Viability, Prepared for Denali Commission, Anchorage: Institute of Social and Economic Research.

While the general trend since 1950 has been out-migration from rural areas, there were periods during the late 1970s, early 1980s, and early 1990s when there was in-migration to rural Alaska. In-migration during the late 1970s and early 1980s was likely due to schools being constructed in rural communities at the time.[74] This increased educational opportunities for youth and created construction and teaching jobs for adults. Another possible reason for in-migration during this period was an increase in village housing construction and the adoption of the PCE program, which reduced the cost of electricity in rural Alaska.[75]

Research by the ADLWD found that there has been a gradual out-migration from predominately Alaska Native areas to more urban locations in Alaska, notably to Anchorage.[76] Of the roughly 40 communities analyzed by the ADLWD, the only study area community evaluated was Ambler. The study concluded that Ambler had a net population loss to Anchorage of 20 people over the 2000–2009 period, equating to an average annual migration from Ambler to Anchorage of approximately 2 percent per year.

[73] Martin, Stephanie, Killorin, Mary, and Steve Colt, May 12, 2008, Fuel Costs, Migration, and Community Viability, Prepared for Denali Commission, Anchorage: Institute of Social and Economic Research. April.

[74] Martin, Stephanie, Killorin, Mary, and Steve Colt, May 12, 2008, Fuel Costs, Migration, and Community Viability, Prepared for Denali Commission, Anchorage: Institute of Social and Economic Research. April.

[75] Ibid.

[76] Alaska Department of Labor and Workforce Development, February 2010, Alaska Economic Trends: Anchorage Migration.

In addition to Ambler, the ADLWD study evaluated nine other NWAB and YKCA communities. These communities are assumed to serve as a reasonable proxy for study area communities given their location and similar size. According to the study, each year YKCA communities lost between 1.4 percent and 5.7 percent of their populations to Anchorage, while the NWAB communities lost between 1.7 percent and 3.4 percent of their populations to Anchorage (**Table 3-22**).

Table 3-22 Movement between Select Majority Native Alaskan Communities and Anchorage

Place	Population			Movement To/from Anchorage				
	2000	2008	Change	Average Annual % To	Cumulative % To	Total To	Total From	Net Movement
NWAB								
Kotzebue	3,082	3,126	44	3.39%	30.5%	948	627	−321
Noorvik	634	642	8	2.35%	21.2%	135	89	−46
Selawik	772	846	74	1.70%	23.9%	124	97	−27
Kiana	388	383	−5	2.02%	18.2%	70	43	−27
Ambler	309	259	−50	2.07%	18.7%	53	33	−20
YKCA								
McGrath	401	317	−84	5.17%	46.5%	167	103	−64
Grayling	194	152	−42	5.65%	50.9%	88	38	−50
Shageluk	129	102	−27	5.19%	46.8%	54	23	−31
Holy Cross	227	194	−33	3.33%	29.9%	63	34	−29
Galena	675	580	−95	1.36%	12.3%	77	48	−29

Source: Alaska Department of Labor and Workforce Development, February 2010, Alaska Economic Trends: Anchorage Migration.

The Red Dog Aqqaluk Extension environmental impact statement (EIS) evaluated the out-migration of Red Dog Mine employees from the NWAB and found that Teck Alaska employees accounted for a small proportion of total out-migration from the borough.[77] On average, from 1992 through 2007, nearly 450 people migrated out of the NWAB each year and Teck Alaska employees accounted for 20 of these 450 people (approximately 4 percent of the total). Most of those leaving the NWAB each year (203 people) were students, self-employed, and unemployed individuals. The Red Dog Aqqaluk Extension EIS also found that the proportion of Teck Alaska employees who moved from the NWAB was slightly higher than that of other categories. From 1992 to 2007, a slightly larger share of Teck Alaska employees moved from the NWAB, with out-migration rates ranging from 15 percent to over 25 percent. Out-migration rates for other groups ranged from 7 percent to 14 percent.

As illustrated in **Table 3-23**, over the 1992–2007 period, the number of those leaving the NWAB increased; however, due to offsetting increases in NWAB population from births and in-migration over this timeframe, the proportion of those moving from the NWAB has remained relatively constant.

[77] Red Dog Mine Extension, Aqqaluk Project Final Supplemental EIS, October 2009, Prepared by Tetra Tech, Website (http://dnr.alaska.gov/mlw/mining/largemine/reddog/pdf/rdseis2009vol1.pdf) accessed December 3, 2014.

Table 3-23 Out-Migration of NWAB Residents, 1992–2007

Year	Residents 16 to 64	Migrants Out of NWAB	Out-migration Rate
1992	3,309	381	12%
1993	3,384	349	10%
1994	3,541	468	13%
1995	3,522	440	12%
1996	3,533	402	11%
1997	3,627	452	12%
1998	3,676	451	12%
1999	3,755	460	12%
2000	3,856	519	13%
2001	3,787	476	13%
2002	3,843	416	11%
2003	3,977	428	11%
2004	4,074	523	13%
2005	4,115	518	13%
2006	4,101	463	11%
2007	4,193	465	11%

Source: Red Dog Mine Extension, Aqqaluk Project Final Supplemental EIS, October 2009, Prepared by Tetra Tech, Website (http://dnr.alaska.gov/mlw/mining/largemine/reddog/pdf/rdseis2009vol1.pdf) accessed December 3, 2014.

4 Major Operational Metal Mines in Alaska

There are currently six major mines operating in Alaska: Red Dog Mine, Fort Knox Mine, Greens Creek Mine, Pogo Mine, Kensington Mine, and the Usibelli Coal Mine (**Table 4-1**). In addition to these major mining operations there are also over 180 rock, sand, and gravel mining operations and more than 300 placer mining operations throughout the state.[78] Furthermore, there are many mining exploration projects underway including the UKMP, Chuitna Coal Project, Wishbone Hill Project, Donlin Gold Project, Pebble Project, Livengood Project, Niblack Project, and a number of others.[79] This section provides additional information for the major metal mines currently operating, with specific focus on historical production statistics and employment.

Table 4-1 Summary of Major Alaska Metal Mines in Production

Mine	Production Start	Material Produced	Type of Mine	Annual Employment (2013)	Annual Mill Throughput Tons (2013)	Annual Output (2013)
Red Dog	1989	Zinc, lead, and silver	Open pit	550	4,230,000	607,704 tons of zinc; 106,594 tons of lead; and 6.1 million oz. of silver
Fort Knox	1996	Gold	Open pit	629	14,000,000	428,822 oz. of gold
Greens Creek	1989	Silver, gold, lead, and zinc	Underground	390	805,322	7.4 million oz. of silver; 57,457 oz. of gold; 57,614 tons of zinc; and 20,114 tons of lead
Pogo Gold Mine	2006	Gold	Underground	329	875,351	315,886 oz. of gold
Kensington Mine	2010	Gold	Underground	300	553,717	114,821 oz. of gold

Sources: Alaska Department of Natural Resources and Alaska Department of Commerce, Community and Economic Development, Alaska's Mineral Industry 2013, Special Report 69, Website (http://137.229.113.30/webpubs/dggs/sr/text/sr069.pdf) accessed November 28, 2014.

Alaska Miners Association, January 2012, The Economic Impacts of Alaska's Mining Industry, Prepared by McDowell Group, Website (http://www.alaska.edu/files/bor/120412Ref04_AK_Mining_Industry_Economic_Impacts.pdf) accessed November 28, 2014.

[78] Alaska Miners Association, January 2013, The Economic Benefits of Alaska's Mining Industry, Prepared by McDowell Group, Website (https://dl.dropboxusercontent.com/u/2335359/AMA%20mcdowell%20reports/mining2013web%281%29.pdf) accessed November 28, 2014.

[79] Resource Development Council, Alaska's Mining Industry, Website (http://www.akrdc.org/issues/mining/overview.html#Anchor-Major-3800) accessed November 29, 2014.

4.1 Red Dog Mine

Red Dog Mine is a zinc and lead mine located on NANA lands 82 miles north of Kotzebue in the NWAB. It is the world's largest producer of zinc. The mine is owned and operated by Teck Alaska, a wholly owned subsidiary of Teck Resources, Limited. NANA and Teck Alaska entered a joint-venture agreement to develop the mine in 1982. In 2013, the mine produced 607,704 tons of zinc, 106,594 tons of lead, and 6.1 million ounces of silver, while employing 550 workers (**Table 4-2**).

The joint-venture agreement included provisions for preferential hire for qualified NANA shareholders, with the goal of 100 percent shareholder hire by 2001. NANA and Teck Alaska have implemented community outreach activities to make shareholders more aware of job opportunities at the mine and provided educational and employment incentives. By 2010, 53 percent (220 employees) of the mine's full-time workforce were NANA shareholders.[80]

Table 4-2 Red Dog Mine Production Statistics, 1989–2013

Year	Ore Milled (million tons)	Total Concentrate Produced (million tons)	Contained Zinc (tons)	Contained Lead (tons)	Silver (million oz.)	Employees
1989	0.03	0.01	-	-	-	228
1990	1.00	0.44	191,981	31,187	1.60	350
1991	1.60	0.52	234,510	43,815	1.46	331
1992	1.58	0.47	231,363	15,960	1.38	349
1993	1.87	0.54	255,149	24,788	1.51	376
1994	2.34	0.66	328,160	32,775	1.84	391
1995	2.49	0.75	358,676	55,715	3.62	397
1996	2.31	0.77	357,680	65,886	4.30	417
1997	2.13	0.80	373,097	69,284	4.27	479
1998	2.75	1.02	490,461	80,193	5.20	466
1999	3.28	1.21	574,111	97,756	6.21	539
2000	3.37	1.21	585,030	91,557	5.84	536
2001	3.56	1.22	570,980	105,000	5.90	559
2002	3.49	1.37	637,800	118,880	6.75	560
2003	3.48	1.41	638,569	137,679	7.70	388
2004	3.25	1.34	610,900	128,970	7.22	508
2005	3.40	1.33	626,112	112,766	1.97	449
2006	3.57	1.38	614,538	136,135	7.62	457
2007	3.73	1.43	633,511	146,152	11.55	459
2008	3.31	1.37	567,911	135,143	7.50	475
2009	3.73	1.45	642,096	144,954	8.12	413

[80] Haley, S. and David Fisher, 2012. Shareholder Employment at Red Dog Mine. University of Alaska Anchorage, Institute of Social and Economic Research, Website (http://www.iser.uaa.alaska.edu/Publications/2012_04-reddogworkingpaper2012-2.pdf). Accessed November 6, 2014.

Year	Ore Milled (million tons)	Total Concentrate Produced (million tons)	Contained Zinc (tons)	Contained Lead (tons)	Silver (million oz.)	Employees
2010	3.94	1.30	593,043	121,144	6.78	550
2011	4.05	1.18	572,208	84,033	5.19	586
2012	3.94	1.13	529,157	95,282	5.89	530
2013	4.24	na	607,704	106,594	6.10	550

na = not available

- = no concentrate produced

Source: Alaska Department of Natural Resources and Alaska Department of Commerce, Community and Economic Development, Alaska's Mineral Industry 2013, Special Report 69, Website (http://137.229.113.30/webpubs/dggs/sr/text/sr069.pdf) accessed November 28, 2014.

In addition to employing regional shareholders, the Red Dog Mine provides substantial benefits for the NWAB and other Native Alaskan regional corporations (**Table 4-3**). Red Dog Mine has been the sole private financial contributor to the NWAB in the form of payment in lieu of taxes (PILT), which provides support for projects such as schools and economic development. In 2012, the Red Dog Mine contributed $13.0 million to the NWAB in PILT and had paid a total of $111 million since making the first payment in 1991.[81]

Table 4-3 Red Dog Mine PILT, Royalties, and NANA 7(i) Distributions (million dollars)

Year	PILT	Royalties	NANA/Red Dog 7(i) Distribution
2008	$10.9	$212.2	$122.0
2009	$6.7	$38.8	$23.0
2010	$6.2	$146.3	$83.4
2011	$9.7	$169.9	$82.0
2012	$13.0	$124.7	$76.4
2013	-	$143.3	$93.5

- = unknown

Sources: NANA Regional Corporation. 2010. Red Dog by the Numbers. NANA Regional Corporation, Website (http://nana.com/regional/resources/red-dog-mine/red-dog-faq/) accessed November 14, 2014.

Alaska Miners Association, 2009-2013, The Economic Impacts of Mining in Alaska, Prepared by McDowell Group, Website (http://alaskaminers.org/economic-impact/) accessed November 28, 2014.

As previously described, ANCSA divided Alaska into 12 regional corporations, while a thirteenth corporation was created for Alaska Natives living outside of Alaska. Alaska Natives became shareholders of their regional corporation when the law passed in 1971. As part of the 7(i) and 7(j) provisions of ANCSA, regional corporations are required to distribute 70 percent of new revenue earned on subsurface developments of their lands to their shareholders. Since 1989, Red Dog Mine operations have provided NANA with approximately $1 billion in proceeds, of which $608 million was distributed to ANCSA corporations for redistribution to their shareholders.[82]

[81] NANA Regional Corporation. 2010. Red Dog by the Numbers. NANA Regional Corporation, Website (http://nana.com/regional/resources/red-dog-mine/red-dog-faq/). Accessed November 14, 2014.

[82] Bradner, Tim, July 2014, Red Dog Lead, Zinc Mine Marks 25 Years, $1 Billion in Royalties, Alaska Journal of Commerce, Website (http://www.alaskajournal.com/Alaska-Journal-of-Commerce/July-Issue-4-2014/Red-Dog-lead-zinc-mine-marks-25-years-1B-in-royalties/) accessed November 29, 2014.

4.2 Fort Knox Mine

The Fort Knox Mine is operated by Fairbanks Gold Mining Incorporated, a wholly owned subsidiary of the Kinross Gold Corporation. Fort Knox is an open-pit mine located on State of Alaska and Alaska Mental Health Trust Land approximately 25 miles northeast of Fairbanks.[83] In 2013 the mine produced 418,822 ounces of gold and employed 629 workers. **Table 4-4** provides more detail on the mine's production.

A recent economic impact study of the Fort Knox Mine found that all mine employees were residents of the Fairbanks North Star Borough (FNSB).[84] The study also found that in 2010, the State of Alaska collected $5.7 million in mining license tax from the Fort Knox Mine and $5.4 million in corporate income tax, employment taxes, and other fees. Furthermore, the mine provided the FNSB $4.7 million in property and business property taxes that same year.

In addition to providing fiscal benefits to the state and borough, in 2010 the Fort Knox Mine spent approximately $171.4 million with Alaska private sector vendors. This represented approximately 62 percent of Fort Knox total spending on goods and services in 2010. In all, it was found that while approximately 500 people were directly employed by the mine, there were an additional 550 jobs supported throughout Alaska by the Fort Knox Mine for a total employment effect of 1,050.[85]

Table 4-4 Fort Knox Mine Production Statistics, 1996–2013

Year	Mined Ore and Waste (million tons)			Milled Ore (million tons)			Gold Produced (oz.)	Employees
	Fort Knox	True North	Total	Fort Knox	True North	Total		
1996	16.7	Na	16.7	0.8	-	0.8	16,085	243
1997	32.4	Na	32.4	12.2	-	12.2	366,223	249
1998	33.3	Na	33.3	13.7	-	13.7	365,320	245
1999	30.4	Na	30.4	13.8	-	13.8	351,120	253
2000	35.6	Na	35.6	15.0	-	15.0	362,929	253
2001	26.0	8.4	34.4	13.3	2.4	15.7	411,220	360
2002	24.6	11.5	36.0	11.9	3.4	15.3	410,519	360
2003	30.6	12.7	43.3	11.5	3.6	15.1	391,831	316
2004	44.2	3.8	48.0	12.9	1.7	14.6	338,334	427
2005	63.2	-	63.2	14.4	-	14.4	329,320	411
2006	51.1	-	51.1	14.8	-	14.8	333,383	406
2007	45.9	-	45.9	14.0	-	14.0	338,459	399
2008	46.3	-	46.3	15.1	-	15.1	329,105	449
2009	27.6	-	27.6	17.9	-	17.9	263,260	500
2010	42.4	-	42.4	14.6	-	14.6	349,729	525

[83] Fairbanks Gold Mining, Incorporated, October 2011, Socioeconomic Impacts of the Fort Knox Mine, Prepared by the McDowell Group, Website (http://dnr.alaska.gov/mlw/mining/largemine/fortknox/pdf/fkeconrpt.pdf) accessed November 28, 2014.

[84] Fairbanks Gold Mining, Incorporated, October 2011, Socioeconomic Impacts of the Fort Knox Mine, Prepared by the McDowell Group, Website (http://dnr.alaska.gov/mlw/mining/largemine/fortknox/pdf/fkeconrpt.pdf) accessed November 28, 2014.

[85] Fairbanks Gold Mining, Incorporated, October 2011, Socioeconomic Impacts of the Fort Knox Mine, Prepared by the McDowell Group, Website (http://dnr.alaska.gov/mlw/mining/largemine/fortknox/pdf/fkeconrpt.pdf) accessed November 28, 2014.

Year	Mined Ore and Waste (million tons)			Milled Ore (million tons)			Gold Produced (oz.)	Employees
	Fort Knox	True North	Total	Fort Knox	True North	Total		
2011	34.6	-	34.6	14.9	-	14.9	289,794	522
2012	63.1	-	63.1	14.6	-	14.6	359,948	565
2013	63.3	-	63.3	14.0	-	14.0	428,822	629

na = not available

- = Not reported

Source: Alaska Department of Natural Resources and Alaska Department of Commerce, Community and Economic Development, Alaska's Mineral Industry 2013, Special Report 69, Website (http://137.229.113.30/webpubs/dggs/sr/text/sr069.pdf) accessed November 28, 2014.

4.3 Pogo Mine

The Pogo Mine is owned by Sumitomo Metal Mining Pogo LLC, a joint venture between Sumitomo Metal Mining Company (85 percent) and Sumitomo Corporation (15 percent). Pogo Mine is an underground mine located on State of Alaska land approximately 90 miles southeast of Fairbanks and 38 miles northeast of Delta Junction. Access to the site required the construction of a 49-mile access road (Shaw Creek Hillside All-Season Access Road).[86] In 2012, the Pogo Mine produced 315,886 ounces of gold and had 335 employees. **Table 4-5** contains more information on the mine's production. In 2012, Pogo Mine paid $24.2 million in taxes to the state, including $5.9 million in mining license tax and $4.8 million in production royalty payments.[87] Pogo Mine also spent $127.2 million with Alaska vendors and suppliers, which represented 50 percent of the mine's overall spending in 2012.[88]

Table 4-5 Pogo Mine Production Statistics, 2006–2013

Year	Ore Mined (tons)	Ore Milled (tons)	Gold Recovered (oz.)	Employees
2006	447,129	338,000	113,364	477
2007	715,665	715,400	259,820	339
2008	882,400	818,237	347,219	285
2009	944,823	930,836	389,808	272
2010	900,585	947,189	383,434	300
2011	892,725	929,020	325,708	310
2012	815,922	875,351	315,886	335
2013	-	-	337,393	-

na = not available

- = Not reported

[86] U.S. Bureau of Land Management, Teck-Pogo, Inc. Pogo Road Project, Final Decision, Website (http://dnr.alaska.gov/mlw/mining/largemine/pogo/pogo_18dec03/Pogo_ROW_FF.pdf) accessed November 28, 2014.

[87] Bradner, Tim, Pogo Still State's Top Gold Mine, Boosting Interior Economy, Alaska Journal of Commerce, Website (http://issuu.com/morrisalaska/docs/2014_fbx_alliance_web/26) accessed December 23, 2014.

Freeman, Kurt, January 26, 2014, Could Alaska Host Rare Critical Metal, Petroleum News, Website (http://www.petroleumnews.com/mnpdfarch/768489572.pdf) accessed December 23, 2014.

[88] Bradner, Tim, Pogo Still State's Top Gold Mine, Boosting Interior Economy, Alaska Journal of Commerce, Website (http://issuu.com/morrisalaska/docs/2014_fbx_alliance_web/26) accessed December 23, 2014.

Source: Alaska Department of Natural Resources and Alaska Department of Commerce, Community and Economic Development, Alaska's Mineral Industry 2013, Special Report 69, Website (http://137.229.113.30/webpubs/dggs/sr/text/sr069.pdf) accessed November 28, 2014.

4.4 Greens Creek Mine

Greens Creek Mine is owned by Hecla Mining Company and is located on Admiralty Island in Southeast Alaska. The mine is underground and produces silver, gold, lead, and zinc and has been in production since 1989. **Table 4-6** contains more information on the mine's production. The mine is located on U.S. Forest Service and private patented land.[89] Drilling efforts over the past 10 years have replaced production and added new reserves and resources for the mine.[90] In 2013, the mine reported a total of 390 employees. Most of the mine's employees reside in Juneau and commute daily to the site by boat and then bus.[91] Two-thirds of the mine's employees live in Juneau, while the remaining one-third live in other Southeast Alaska communities.[92] In 2010, Hecla Mining Company paid $1.3 million in local property taxes and more than $9.0 million in state mining license tax for the Greens Creek operation.[93]

Table 4-6 Greens Creek Mine Production Statistics, 1989–2013

Year	Ore Milled (tons)	Contained Metal					Employees
		Zinc (tons)	Lead (tons)	Copper (tons)	Gold (oz.)	Silver (million oz.)	
1989	264,600	187,007	9,585	-	23,530	5.2	235
1990	382,574	37,000	16,728	-	38,103	7.6	265
1991	380,000	41,850	16,900	-	37,000	7.6	238
1992	365,000	40,500	16,500	-	32,400	7.1	217
1993	77,780	9,500	3,515	-	7,350	1.7	217
1994	-	-	-	-	-	-	-
1995	-	-	-	-	-	-	-
1996	135,000	9,100	4,200	193	7,480	2.5	265
1997	493,000	46,000	19,000	1,300	56,000	9.7	275
1998	540,000	58,900	22,700	1,300	60,572	9.5	275
1999	578,358	68,527	25,503	1,400	80,060	10.3	275
2000	619,438	84,082	31,677	1,400	128,709	12.4	275
2001	658,000	63,903	22,385	1,400	87,583	10.9	275

[89] Alaska Department of Natural Resources, Mining, Land & Water, Greens Creek Mine, Website (http://dnr.alaska.gov/mlw/mining/largemine/greenscreek/) accessed November 29, 3014.

[90] Hecla Mining Company, 2014, Greens Creek, Website (http://www.hecla-mining.com/operations/operations_greenscreek.php) accessed November 28, 2014.

[91] Alaska Miners Association, January 2012, The Economic Impacts of Alaska's Mining Industry, Prepared by McDowell Group, Website (http://www.alaska.edu/files/bor/120412Ref04_AK_Mining_Industry_Economic_Impacts.pdf) accessed November 28, 2014.

[92] Ibid.

[93] Hecla Mining Company, November 30, 2011, 2011 NWMA 117th Annual Meeting Presentation, Website (http://www.hecla-mining.com/investors/documents/NWMA_HeclaPresentationSocialResponsibility_Web_11-30-11.pdf) accessed December 26, 2014.

Year	Ore Milled (tons)	Contained Metal					Employees
		Zinc (tons)	Lead (tons)	Copper (tons)	Gold (oz.)	Silver (million oz.)	
2002	733,507	80,306	27,582	1,600	102,694	10.9	262
2003	781,200	76,200	24,800	-	99,000	11.7	295
2004	805,789	69,115	21,826	-	86,000	9.7	265
2005	717,600	58,350	18,600	-	72,800	9.7	265
2006	732,176	59,429	20,992	-	62,935	8.9	245
2007	732,227	62,603	21,029	-	68,006	8.6	276
2008	734,910	58,224	18,562	-	67,269	7.1	336
2009	790,871	70,379	22,253	-	67,278	7.5	321
2010	800,397	74,496	25,336	-	68,838	7.2	343
2011	772,069	66,050	21,055	-	56,818	6.5	364
2012	789,569	64,249	21,074	-	55,496	6.4	386
2013	805,322	57,614	20,114	-	57,457	7.4	390

- = Not reported

Source: Alaska Department of Natural Resources and Alaska Department of Commerce, Community and Economic Development, Alaska's Mineral Industry 2013, Special Report 69, Website (http://137.229.113.30/webpubs/dggs/sr/text/sr069.pdf) accessed November 28, 2014.

4.5 Kensington Mine

The Kensington Mine is owned by Coeur Alaska Incorporated, a wholly owned subsidiary of Coeur Mining Incorporated. The mine is located on a 12,400-acre site on the east side of Lynn Canal, approximately 45 miles north/northwest of Juneau.[94] The mine is located on U.S. Forest Service and private land.[95] The Kensington Mine is an underground mining operation, and ore from the mine is sold to third-party smelters. Production at the mine began in 2010. In 2013, the mine processed 555,717 tons of ore and produced 114,821 ounces of gold.[96] The mine reported 300 total employees as of December 1, 2013, which included both production and development employees.[97] Of Kensington Mine's employees, 70 percent are from Alaska and half are from Southeast Alaska.[98]

[94] Coeur Mining, Inc., Kensington, Alaska, Website (http://www.coeur.com/mines-projects/mines/kensington-alaska#.VHldGjHF81M) accessed November 28, 2014.

[95] Alaska Department of Natural Resources, Mining, Land and Water, Kensington Gold Mine, Website (http://dnr.alaska.gov/mlw/mining/largemine/kensington/) accessed November 28, 2014.

[96] Alaska Department of Natural Resources and Alaska Department of Commerce, Community and Economic Development, Alaska's Mineral Industry 2013, Special Report 69, Website (http://137.229.113.30/webpubs/dggs/sr/text/sr069.pdf) accessed November 28, 2014.

[97] Ibid.

[98] Stigall, Russell, April 12, 2012, Kensington Mine Continues to Grow, Juneau Empire, Website (http://juneauempire.com/local/2012-04-13/kensington-mine-continues-grow) accessed December 26, 2014.

5 State and Local Government Mining Revenue

The mining industry pays revenues to the State of Alaska through claim rentals, production royalties, payments in lieu of labor, coal land rental, coal royalties, lease sale bonus payments, material sales, miscellaneous fees, fuel taxes, corporate income taxes, and mining license taxes. Municipalities receive revenue from the mineral industry from property taxes, PILT, severance taxes, and sales taxes. **Table 5-1** lists the estimated revenues paid to the state and municipalities. The revenue estimates are incomplete and serve as a minimum estimate of state and municipal revenue from mining activity in Alaska.[99] As illustrated in **Table 5-1**, it is estimated that the mining industry was responsible for nearly $142.5 million in state and municipal revenues in 2013, which is 14 percent higher than total state and municipal mining-related revenues in 2012 and double the amount collected by the state and municipalities in 2008.[100]

[99] Alaska Department of Natural Resources and Alaska Department of Commerce, Community and Economic Development, Alaska's Mineral Industry 2013, Special Report 69, Website (http://137.229.113.30/webpubs/dggs/sr/text/sr069.pdf) accessed November 28, 2014.

[100] Ibid.

Table 5-1 Reported and Estimated Revenues Paid to the State of Alaska and Municipalities by Alaska's Mineral Industry

	2008	2009	2010	2011	2012	2013
State Mineral Rents and Royalties						
State claim rental	$4,626,000	$6,280,000	$7,771,000	$8,499,000	$7,951,000	$7,508,000
Production royalties	$1,519,000	$1,840,000	$1,592,000	$5,416,000	$8,982,000	$9,809,000
Annual labor	$380,000	$483,000	$158,000	$760,000	$357,000	$543,000
Subtotal	$6,526,000	$8,603,000	$9,520,000	$14,676,000	$17,291,000	$17,859,000
State coal rents and royalties	$1,800,000	$2,237,000	$2,501,000	$3,063,000	$3,111,000	$3,082,000
State Material Sales						
Mental Health	$38,000	$171,000	$109,000	$90,000	$2,000	−$8,000
Division of Land	$2,818,000	$4,324,000	$201,000	$1,240,000	$1,735,000	$4,965,000
State Pipeline Coordinator's office	$182,000	$180,000	$6,000	$310,000	$31,000	$341,000
Subtotal	$3,038,000	$4,674,000	$316,000	$1,639,000	$1,768,000	$5,298,000
State Mining Miscellaneous Fees[1]	$144,000	$272,000	$616,000	$5,553,000	$866,000	$359,000
Other Fees						
AIDEA facilities use fees[2]	$16,190,000	$15,918,000	$14,807,000	$13,500,000	$12,600,000	$11,986,000
State fuel taxes	$428,000	$878,000	$126,000	$741,000	$585,000	$952,000
State corporate income tax	$12,981,000	-$2,559,000	$81,790,000	$15,020,000	$26,577,000	$26,812,000
Mining license tax	$16,044,000	$29,725,000	$43,338,000	$44,480,000	$40,696,000	$46,788,000
State Total	$57,178,000	$59,749,000	$153,015,000	$73,741,000	$80,458,000	$86,538,000
Payments to Municipalities	$12,599,000	$12,388,000	$14,238,000	$20,378,000	$21,529,000	$29,412,000
Total	$69,777,000	$72,136,000	$167,253,000	$119,050,000	$125,023,000	$142,549,000

1 Includes filing fees, bid bonus, penalty fees, exploration incentive app filing fee, bond pool payment, surface mine investment interest, surface coal mining app fee, and Annual Placer Mining Application (APMA) mining fees.

2 Includes payments by Teck Alaska and Minto Explorations Ltd. for the use of the DeLong Mountain Transportation System and the Skagway Ore Terminal, respectively.

Source: Alaska Department of Natural Resources and Alaska Department of Commerce, Community and Economic Development, Alaska's Mineral Industry 2013, Special Report 69, Website (http://137.229.113.30/webpubs/dggs/sr/text/sr069.pdf) accessed November 28, 2014.

5.1 State Revenues

The mining industry pays revenues to the State of Alaska through claim rentals, production royalties, payments in lieu of labor, coal land rental, coal royalties, lease sale bonus payments, material sales, miscellaneous fees, fuel taxes, corporate income taxes, and mining license taxes. Additional information on these sources of state revenue is provided below.

5.1.1 Mining License Tax

The State of Alaska levies a mining license tax on mining net income and the royalties received from mining properties in Alaska.[101] Rock, sand, and gravel mining operations are not required to obtain a mining license or file a mining license tax. Furthermore, new mining operations are exempt from the mining license tax for a period of 3.5 years after production begins.[102] The tax rate on mining net income is as follows:

> No tax if net income is $40,000 or less;

> $1,200 plus 3% over $40,000;

> $1,500 plus 5% over $50,000; and

> $4,000 plus 7% over $100,000.

In 2013, the state collected $46.8 million in mining license tax.

5.1.2 Annual Claim Rental

In 1989, the State of Alaska enacted a mineral location Annual Rental Law, Alaska Statute 38.05.211, which requires locators and holders of state mining locations to pay an annual cash rental.[103] The annual rental requirements apply to mining claims, leasehold locations, upland mining leases, offshore mining leases, and prospecting sites on state land. **Table 5-2** provides the annual rental for each location, while **Table 5-3** provides the annual rental for each lease. In 2013, the state received $7.5 million in mining claim rent.

Table 5-2 Annual Rental for Each Location

Number of Years for Location	Quarter-Section Size Meridian, Township, Range, Section, and Claim (MTRSC) Location (160 Acres)	Quarter-Section Size MTRSC Location (40 Acres)	Traditional Mining Claim or Leasehold Location
New claims (Day 1–September 1)	$140	$35	$35
1 through 5	$140	$35	$35
6 through 10	$280	$70	$70
11 or more	$680	$170	$170

Source: Alaska Department of Natural Resources, Division of Mining, Land and Water, October 2014, Fact Sheet Annual Rent, Website (http://dnr.alaska.gov/mlw/factsht/mine_fs/annualre.pdf) accessed November 29, 2014.

[101] Alaska Department of Revenue, Tax Division, Mining License Tax, Website (http://www.tax.alaska.gov/programs/programs/index.aspx?60610) accessed November 29, 2014.

[102] Alaska Department of Revenue, Tax Division, Mining License Tax FAQs, Website (http://www.tax.alaska.gov/programs/programs/help/faq/faq.aspx?60610) accessed November 29, 2014.

[103] Alaska Department of Natural Resources, Division of Mining, Land and Water, October 2014, Fact Sheet Annual Rent, Website (http://dnr.alaska.gov/mlw/factsht/mine_fs/annualre.pdf) accessed November 29, 2014.

Table 5-3 Annual Rental for Each Lease

Number of Years of Lease	Rental Amount Per Acre for Mining Lease
New Lease (Day 1–September 1)	$0.88
1 through 5	$0.88
6 through 10	$1.74
11 or more	$4.25

Source: Alaska Department of Natural Resources, Division of Mining, Land and Water, October 2014, Fact Sheet Annual Rent, Website (http://dnr.alaska.gov/mlw/factsht/mine_fs/annualre.pdf) accessed November 29, 2014.

5.1.3 Production Royalty

The State of Alaska requires the holders of state mining locations to pay a production royalty on all revenues received from minerals produced on state land.[104] The production royalty requirement applies to all revenues received from minerals produced from a state mining claim or mining lease during each calendar year. Payment of royalty is in exchange for and to preserve the right to extract and possess the minerals produced. The production royalty is 3 percent of net income and must be made by anyone that is:

> Owning, leasing, and operating a mining property,

> Owning a mining property and receiving lease fees, royalty payments based on production, or a combination of lease fees and royalty payments from the property,

> Leasing a mining property from another person and operating the property, or

> Possessing a mineral interest, whether an economic or production interest, in a producing property, including royalty, receiving lease fees, working or operating interest, net profits, overriding royalties, carried interests, and production payments.

In 2013, the mining industry generated $9.8 million in production royalties for the state.

5.1.4 Annual Labor

Each year, a minimum of $100 worth of work is required for each 40-acre claim and $400 worth of labor is required for each 160-acre claim.[105] The holder of a mining claim, leasehold location, or mining lease may make a cash payment to the State of Alaska equal to the value of labor required ($100 or $400 per claim). In 2013, payments in lieu of annual labor from mining activity generated $543,000 for the state.

5.1.5 Coal Rents and Royalties

In 2013, the State of Alaska received $2.5 million from coal rents and royalties. Coal royalties are based on the adjusted gross value of coal and are set at:

> 5 percent for noncompetitive leases,

> No less than 5 percent for competitive leases where royalty is a bid variable, and

[104] Alaska Department of Natural Resources, June 2013, Fact Sheet: Production Royalty, Website (http://dnr.alaska.gov/mlw/factsht/mine_fs/producti.pdf) accessed November 28, 2014.

[105] Alaska Department of Natural Resources, May 2014, Fact Sheet: Annual Labor, Website (http://dnr.alaska.gov/mlw/factsht/mine_fs/annualla.pdf) accessed November 28, 2014.

> No less than 5 percent or more than 12 percent for competitive leases where royalty is not a bid variable.[106]

5.1.6 Material Sales

The State of Alaska sells rock, sand, and gravel from its lands. Other mineral commodities included in this category are riprap, limestone, slate, and peat. In 2013, material sales on state lands generated $5.3 million of revenue for the state.[107]

5.1.7 Other Miscellaneous State Mining Fees

This category of state mining income includes filing fees, bid bonus, penalty fees, exploration incentive application filing fee, bond pool payment, surface mine investment interest, surface coal mining application fee, and Annual Placer Mining Application (APMA) mining fees. In 2013, revenue from these sources generated $359,000 in revenue for the state.[108]

5.1.8 State Fuel Tax

The State of Alaska levies a motor fuel sales tax at the rate of $0.08 per gallon for highway use. Fuel used for heating and power plants is not taxable.[109] In 2013, it was estimated the mining industry generated $952,000 in fuel tax revenue for the state.[110]

5.1.9 Corporate Net Income

The State of Alaska assesses corporate income taxes on all corporations having net income from mining operations in the state. In 2013, it was estimated the mining industry generated $26.8 million in corporate income tax revenue for the state. **Table 5-4** below provides the corporate tax rates for the tax year beginning on or after September 26, 2013.

[106] Alaska Department of Natural Resources and Alaska Department of Commerce, Community and Economic Development, Alaska's Mineral Industry 2013, Special Report 69, Website (http://137.229.113.30/webpubs/dggs/sr/text/sr069.pdf) accessed November 28, 2014.

[107] Ibid.

[108] Ibid.

[109] Alaska Department of Revenue, Motor Fuel Tax FAQs, Website (http://www.tax.alaska.gov/programs/programs/help/faq/faq.aspx?60210) accessed November 30, 2014.

[110] Alaska Department of Natural Resources and Alaska Department of Commerce, Community and Economic Development, Alaska's Mineral Industry 2013, Special Report 69, Website (http://137.229.113.30/webpubs/dggs/sr/text/sr069.pdf) accessed November 28, 2014

Table 5-4 Corporate Tax Rates for Tax Years Beginning on or After September 26, 2013

Net Revenue at Least	Net Revenue Less Than	Base Tax	Plus	Of Amount Over
$0	$25,000	$0	0.0%	$0
$25,000	$49,000	$0	2.0%	$25,000
$49,000	$74,000	$480	3.0%	$49,000
$74,000	$99,000	$1,230	4.0%	$74,000
$99,000	$124,000	$2,230	5.0%	$99,000
$124,000	$148,000	$3,480	6.0%	$124,000
$148,000	$173,000	$4,920	7.0%	$148,000
$173,000	$198,000	$6,670	8.0%	$173,000
$198,000	$222,000	$8,670	9.0%	$198,000
222,000 or more		$10,830	9.4%	$222,000

Source: Alaska Department of Revenue, Tax Division, January 1, 2014, Instructions for Forms 6000 and 6020 2013 Alaska Corporation Net Income Tax Return, Website (http://www.tax.alaska.gov/programs/documentviewer/viewer.aspx?5786f) accessed November 28, 2013.

5.1.10 Alaska Industrial Development and Export Authority Payments

AIDEA, a state-owned private corporation, receives payments for the transportation of ore from the Red Dog Mine along the DeLong Mountain Transportation System (DMTS). The DMTS is a 52-mile haul road connecting the Red Dog Mine to a port along the Chuchki Sea.[111] AIDEA financed the construction of DMTS and receives payments from the mine's operator (Teck Alaska) for its use. Construction of the DMTS cost $180 million and then an additional $85 million for improvements, for a total cost of $265 million. As of June 2011, the state has received more than $342 million in user fees from the Red Dog Mine.[112] AIDEA also receives lease payments from Minto Exploration Limited for the use of the Skagway Ore Terminal in Southeast Alaska. In 2013, AIDEA was paid approximately $12 million for the use of the DMTS and the Skagway Ore Terminal.[113]

5.2 Local Government Revenues

Local governments receive revenue from the mineral industry from property taxes, PILT, severance taxes, and sales taxes. In 2013, it was estimated that the mining industry provided $29.4 million to local governments throughout Alaska.[114] This section provides additional information on mechanisms used by local governments to generate revenue from the mining industry.

[111] AIDEA, July 2014, Delong Mountain Transportation System, Website (http://www.aidea.org/Portals/0/PDF%20Files/PFS_DMTS.pdf) accessed November 30, 2014.

[112] Alaska Miners Association, January 2012, The Economic Impacts of Alaska's Mining Industry, Prepared by McDowell Group, Website (http://www.alaska.edu/files/bor/120412Ref04_AK_Mining_Industry_Economic_Impacts.pdf) accessed November 28, 2014.

[113] Alaska Department of Natural Resources and Alaska Department of Commerce, Community and Economic Development, Alaska's Mineral Industry 2013, Special Report 69, Website (http://137.229.113.30/webpubs/dggs/sr/text/sr069.pdf) accessed November 28, 2014.

[114] Ibid.

5.2.1 Property Tax

Property tax revenues from mining operations are an important source of revenue for the FNSB and the City and Borough of Juneau. Recent property tax payments to these local taxing authorities were:

> In 2012, Fort Knox mine paid $5.2 million in property taxes to the FNSB.[115]

> In 2013, Kensington Mine and Greens Creek Mine paid a combined $1.6 million in property taxes to the City and Borough of Juneau.[116]

5.2.2 Payment in Lieu of Taxes

As previously described, the Red Dog Mine has been the sole private financial contributor to the NWAB in the form of PILT, which funds projects such as schools and economic development. Under its agreement with Teck Alaska, the NWAB receives a quarterly PILT payment with the annual amount paid increasing by $100,000 every year. In addition to the base payment, the NWAB also receives a zinc price escalator payment. The payment is levied based on the average annual price of zinc (London Metal Exchange settlement price). Based on a 1996 index price of 60 cents per pound, the mine pays $50,000 annually for every $0.01 per pound that the current zinc price exceeds the index price. For example, if the average annual price of zinc was 70 cents in a given year, then the mine would pay $250,000 (10 cents multiplied by $50,000). By 2012, cumulative PILT to the NWAB by the Red Dog Mine totaled $111.0 million since 1991 (see **Section 7.5.7** for additional information).

5.2.3 Severance Tax

The Denali Borough implements a $0.05 per ton severance tax on the gross production of coal and limestone and $0.05 per cubic yard of gravel.[117] In 2014, the Denali Borough received approximately $95,000 in severance tax revenue.[118]

5.2.4 Sales Tax

Mining companies pay sales taxes to local governments in certain jurisdictions throughout Alaska. The Greens Creek Mine paid approximately $277,000 in sales taxes in 2010.[119] No sales taxes are collected within the study area.

5.2.5 Rock, Sand, and Gravel Production

Local governments also receive revenues from the sale of rock, sand, and gravel from locally owned or leased rock quarries. It is estimated that statewide the annual municipal revenue generated from these sales is approximately $250,000.[120]

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[115] Alaska Miners Association, January 2013, The Economic Impacts of Alaska's Mining Industry, Prepared by McDowell Group, Website (https://dl.dropboxusercontent.com/u/2335359/AMA%20mcdowell%20reports/mining2013web%281%29.pdf) accessed November 28, 2014.

[116] City and Borough of Juneau, June 2014, Juneau Economic Baseline Report, Website (http://www.juneaueconomicplan.org/sites/default/files/JNU%20Economic%20Development%20Report%20Executive%20Summary%20FINAL%20June%2030.pdf) accessed November 28, 2014.

[117] Denali Borough, Ordinance No. 90-04, An Ordinance Establishing a Severance Tax on Coal, Gravel and Limestone, Website (http://www.denaliborough.govoffice.com/) accessed November 28, 2014.

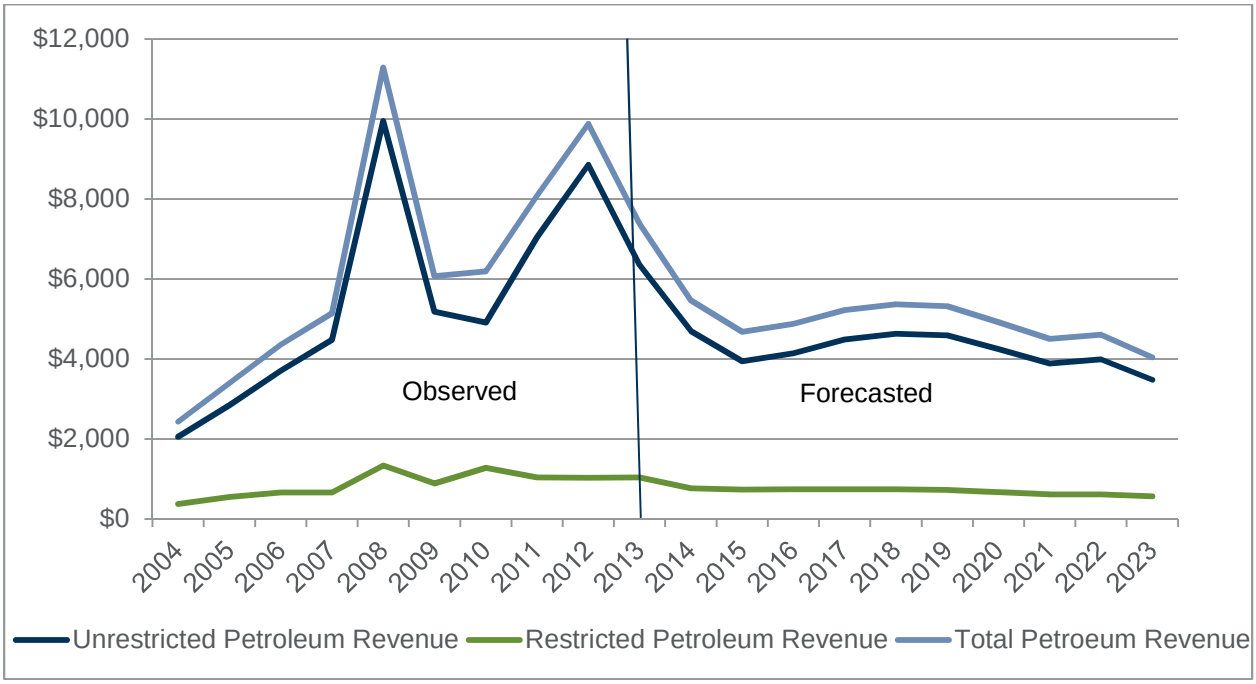
[118] Denali Borough, Ordinance No. 14-04, An Ordinance for the Denali Borough to Establish and Adopt the Budget for Fiscal Year 2015, Website (http://www.denaliborough.govoffice.com/) accessed November 28, 2014.

[119] Alaska Miners Association, January 2013, The Economic Impacts of Alaska's Mining Industry, Prepared by McDowell Group, Website (https://dl.dropboxusercontent.com/u/2335359/AMA%20mcdowell%20reports/mining2013web%281%29.pdf) accessed November 28, 2014.

[120] Ibid.

5.3 Projection of State Revenue from Oil and Gas

The Alaska general fund pays for most state services, such as the education system, transportation, and public health and safety. In 2013, 92 percent ($6.4 billion) of the state general fund ($6.9 billion) was provided through levies on oil production revenues. Thus, oil production is critical for state funding and the state's economy. For example, without oil production, the number of jobs in Alaska would be roughly half of existing levels.[121] Oil production in Alaska peaked in 1988 at 738 million barrels.[122] Since then oil production has declined by a considerable margin (falling to 188 million barrels of production in 2013). Despite this, the increase in oil prices over this timeframe has offset the effect of declining production on state budget revenues. **Figure 5-1** illustrates the observed restricted, unrestricted, and total petroleum revenues from 2004 through 2013 along with projections through 2023.[123]



Source: Alaska Department of Revenue, Fall 2013, Revenue Sources Book, Website (http://www.tax.alaska.gov/programs/documentviewer/viewer.aspx?1048r) accessed November 28, 2014.

Alaska Department of Revenue, Spring 2014, Revenue Sources Book, Website (http://www.tax.alaska.gov/programs/documentviewer/viewer.aspx?1048r) accessed November 28, 2014.

Figure 5-1 Historical and Projected Petroleum Revenue to the State ($ millions)

Table 5-5 provides additional information on historical and projected petroleum revenues for the state. In 2013, 92 percent of the state general fund revenue was derived from petroleum revenue, whereas by 2023, it is anticipated that 82 percent of the state's general fund will be from petroleum revenue.

[121] Goldsmith, Scott, February 2011, Oil Pumps Alaska's Economy to Twice the Size-But What's Ahead, Institute of Social and Economic Research, University of Alaska Anchorage, Website (http://iser.uaa.alaska.edu/Publications/oiltransformfinal.pdf) accessed November 30, 2014.

[122] U.S. Energy Information Administration, Petroleum & Other Liquids, Crude Oil Production, Website (http://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbl_a.htm) accessed November 30, 2014.

[123] Unrestricted revenue is available for state discretionary spending and can be appropriated for any purpose, while restricted revenue is precluded from being spent for any purpose since this revenue is restricted by the constitution, state or federal law, trust or debt restrictions, customary practice or other restrictions.

Table 5-5 Historical and Projected Petroleum Revenue to the State ($ millions)

Year	Unrestricted Petroleum Revenue	Restricted Petroleum Revenue	Total Petroleum	Percent of Total Unrestricted General Fund Revenue Derived from Petroleum
2004	$2,054.1	$372.7	$2,426.8	88%
2005	$2,849.6	$545.5	$3,395.1	89%
2006	$3,699.2	$659.7	$4,358.9	88%
2007	$4,481.4	$660.3	$5,141.7	87%
2008	$9,956.0	$1,332.1	$11,288.1	93%
2009	$5,181.0	$888.2	$6,069.2	89%
2010	$4,912.9	$1,281.2	$6,194.1	89%
2011	$7,048.9	$1,041.2	$8,090.1	92%
2012	$8,857.8	$1,026.5	$9,884.3	93%
2013	$6,352.0	$1,036.1	$7,388.1	92%
2014	$4,697.9	$765.7	$5,463.6	89%
2015	$3,945.9	$730.1	$4,676.0	87%
2016	$4,144.3	$738.8	$4,883.1	87%
2017	$4,483.9	$740.1	$5,224.0	88%
2018	$4,629.0	$738.5	$5,367.5	88%
2019	$4,591.4	$724.3	$5,315.7	88%
2020	$4,249.1	$668.0	$4,917.1	86%
2021	$3,882.8	$616.4	$4,499.2	85%
2022	$3,990.1	$616.9	$4,607.0	85%
2023	$3,476.5	$562.9	$4,039.4	82%

Sources: Alaska Department of Revenue, Fall 2013, Revenue Sources Book, Website (http://www.tax.alaska.gov/programs/documentviewer/viewer.aspx?1048r) accessed November 28, 2014.

Alaska Department of Revenue, Spring 2014, Revenue Sources Book, Website (http://www.tax.alaska.gov/programs/documentviewer/viewer.aspx?1048r) accessed November 28, 2014.

6 Methodology and Data

Chapter 6 discusses methods and data used to estimate economic impacts of developing overall mining operations in the District and AMDIAR. To estimate total economic impacts, Cardno conducted a three-step analysis. An overview of the methodology and data used is provided below, and they are discussed in more detail in the remainder of the chapter.

1. **Develop Economic Impact Models**: Step 1 involved developing an economic model of the state and region using IMPLAN software and 2012 IMPLAN data (the most recent data available).
2. **Identify Model Inputs and Gather Data:** In this task, data from AIDEA, DOWL HKM, and mining company representatives were collected and evaluated to identify the change in demand for labor and goods and services in both the region and state's economy.
3. **Estimate Economic Impacts**: Data for construction and operating expenditures were used to estimate direct jobs and income. Once direct impacts were determined, the regional economic impact model was used to estimate the total jobs and income impact, including the ripple effects (indirect and induced) throughout other economic sectors as money is recirculated in the economy.

Section 6.1 provides a basic overview of the economic impact model, and **Section 6.2** summarizes data sources and assumptions used when applying the model to mine and road development in the District. Lastly, **Section 6.3** presents the results of the analysis at the state and District level.

6.1 Overview of Economic Impact Analysis

Constructing and operating the mines and the road will stimulate the state and regional economy. Expenditures on materials and labor needed to build and operate mines and the AMDIAR would create and support jobs and income for Alaskan construction companies, material providers, other directly related industries, and state and local governments.

To understand how a business activity such as constructing and operating a road or mine impacts a regional economy, it helps to understand how different sectors or industries are linked to each other throughout an economy. For example, mines in Alaska need energy, labor, and equipment to produce and sell raw minerals. Mines purchase these items from firms or contractors in the state or import them from other U.S. states or internationally. In turn, businesses that sell inputs to the mines purchase items needed to operate their own industries, and so on throughout the supply chain. These are referred to as backward linkages. In contrast, businesses that purchase raw minerals from the mines for further processing are forward linkages in the supply chain. The supply chain ends when a final good or service is either consumed in a regional economy or leaves as an export.

Most businesses import some goods and materials from outside of a local economy. Money spent on imports is a "leakage" from a local economy, which in the case of mine construction may be large due to the specialized nature of large-scale infrastructure projects. For example, mine developers import much of their heavy excavation machinery, which is highly specialized, from outside of Alaska. Likewise, many businesses export their products to foreign markets. Export revenues are important for economic growth since the foreign payments for exports are "new" money injected into the regional economy rather than existing money recirculating. Similarly, attracting foreign capital to develop resources in an area such as mineral deposits is new money and grows an economy.

As noted above, new projects affect businesses throughout a region (even seemingly unrelated businesses). This effect is known as a multiplier effect. The size of a multiplier effect or the extent to which new money generated by exports is able to expand the local economy is largely dependent on how much of the money is spent and re-spent in the local economy. A proportion of money received by an

industry is spent to procure local supplies, and then these local suppliers re-spend that money. If there are few local suppliers, much of the money will leak from a local economy, and the multiplier effect will be smaller. In other words, the size of the multiplier effect depends on how local businesses are linked and how much leakage occurs in the form of imported inputs.

The household sector is linked to all sectors as it provides the labor and management for local businesses. Changes that affect household income typically have greater impacts on a local economy when compared to changes in the sales of other sectors because households typically spend most of their income locally in retail and service industries.

This study uses an economic model known as IMPLAN to develop this understanding of the local economy, including the sectors that exist in a local area, the links among them, and the level of economic activity. The remainder of this section describes the IMPLAN model and the approach used to measure the total impacts of mine and road development expenditures in the state and region.

6.2 IMPLAN Modeling System and Data

IMPLAN is a software tool and database that allow economists to construct economic input-output (I-O) models.[124] I-O models are constructed based on the concept that all industries within an economy are linked together; the output of one industry becomes the input of another industry until all final goods and services are produced. I-O models can be used to both analyze the structure of a regional economy and to estimate the total economic impact of projects or policies. For this analysis, a 2012 economic impact model for the FNSB economy was constructed using IMPLAN. Separate analyses were conducted to help estimate impacts for the construction phase of the project.

The key model outputs used in this analysis are income and employment. Total income is the sum of labor income (including employee and proprietor income and all payroll and benefits) and gross operating surplus or profit. It is equivalent to value added (a measure of the contribution to gross domestic product [GDP] of a proposed enterprise) less taxes paid. Employment represents the annual average number of employees, whether full or part-time, of businesses producing output.

IMPLAN has some limitations. One of the most important is that I-O models assume that resources that become unemployed or employed due to a change in final demand have no alternative employment. This is likely the most important assumption in our analysis as it assumes that increased economic activity associated with the project will increase local employment—when in fact, if existing workers can increase productivity, then new jobs may not be created but output would be higher. For this reason, throughout the analysis we identify the number of jobs *supported* by the project, rather than the number of jobs *created.*

Another assumption is that of fixed proportions: for any good or service, all inputs are combined in fixed proportions that are constant regardless of the level of output. Hence, there is no substitution among production inputs and no economies of scale are possible. Also, each production function incorporates fixed technology, so for example the same proportion of labor and capital are used. This limitation could have implications on our predicted future employment and income estimates if the inputs for the mining industry change over time. I-O models do not incorporate model price effects that might be important to a region. Regardless of the level of production, it is assumed that price and returns per unit of production are constant.

Finally, the IMPLAN database contains 509 sectors at the national level. While this is a large number of sectors, some sectors contain a wide range of products or services and the production functions reflect the average or aggregate production technology for the goods or services produced.

[124] The IMPLAN model consists of commercial software and region-specific economic data, which is maintained and distributed by the Minnesota IMPLAN Group, Inc.

6.3 Data and Sources of Impact

To measure economic impacts, one must identify or estimate the amount of expenditures and mix of goods and services purchased regionally to construct and operate the project. This mix of goods and services is like a recipe, with the ingredients measured in dollars—so many dollars for gravel, so many dollars for various labor and management skills, and so on. This section highlights the assumptions used to derive the estimated project-related expenditures anticipated to occur in the region and state, which will subsequently affect the regional and statewide economy. The economic parameters of the project and related assumptions, including spending estimates, sources of purchased materials, use of local labor, and other values were defined through communication with DOWL HKM, NovaCopper representatives, regional road construction experts, and literature review of other relevant mining operations data, and then used as inputs to the IMPLAN model.

6.3.1 AMDIAR

The approach to calculating the state and regional impacts for the AMDIAR is very similar to that of the Arctic Mine. DOWL HKM provided project construction cost (i.e., expenditure) broken out by major items (**Table 6-1**).[125] Depending on whether a 10 percent contingency or 25 percent contingency estimate was assumed, capital costs estimates for the road ranged from a total of $304.9 to $346.5 million dollars, respectively. Labor costs, which are needed to estimate direct employment and income for construction workers, are built into the total estimates. Therefore, Cardno estimated the labor portion by using the ratio of labor to materials costs for road construction (external access roads) for the Arctic Mine (i.e., 28 percent). The analysis assumes the remainder is for materials such as steel, concrete, and piping. **Table 6-2** allocates material costs to specific commodities.

As is the case with the Arctic Mine, only a portion of materials would be sourced to in-state businesses. Based on an interview with the former district manager for the Alaska DOT&PF Dalton Highway District, Cardno estimated the portion of materials that contractors would buy in Alaska.[126] Based on this conversation, it was determined that materials such as steel abutments, pilings, guardrails, concrete, calcium carbide, and delineated pipe would likely come from out of state. However, all of the fill and gravel would come from borrow sites in the state, and it is likely that the labor contractors would be Alaskan companies. DOWL HKM cost estimates indicate that 36 percent of fill would come from Native and federal borrow sites, and 64 percent would come from state-owned sites, as would the same proportion of fill expenditures and royalties.

Estimates of operating and maintenance impacts were based upon input from DOWL HKM, which estimates these costs to range between $8 million and $10 million per year.[127] Annual operating and maintenance expenditure of $9 million is assumed for this analysis, while it is also assumed that the operating and maintenance contract would be sourced to an in-state firm.

Lastly, as is the case with the Arctic Mine, the construction contracts and in-state material purchases would go to firms outside of the District; however, the analysis assumes that District residents would fill a portion of construction jobs, and earn the associated income. These workers would spend a small portion of this income in the District, which would stimulate some regional economic activity.

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[125] Total AMDIAR reclamation costs are estimated to be approximately $70.8 million. Given the length of time anticipated between AMDIAR construction and reclamation (approximately 50 years), the underlying structure of the economy would likely differ from the IMPLAN model utilized in the current research. Therefore, job and income effects associated with AMDIAR reclamation have not been included in our research findings. However, if AMDIAR construction multipliers accurately depict economic conditions at the time of reclamation, it is estimated that approximately 800 total jobs would be supported statewide during the AMDIAR reclamation phase.

[126] Stuller, Dwight, former District Manager Dalton Highway District, Alaska DOT&PF, Personal communication with Lee Elder, Cardno, November 25, 2014.

[127] Hansen, Kristen and Gene Weglinski, DOWL HKM, Personal communication with Lee Elder, Cardno, January 9, 2015.

Table 6-1 Summary of AMDIAR Construction Costs ($ millions)

Item	Total Capital Costs
Clearing	$4.7
Excavation	$60.1
Embankment	$93.2
Aggregate	$6.8
Turnout	$0.1
Large bridges	$28.1
Medium bridges	$10.2
Small bridges	$1.2
Large culverts	$2.2
Medium culverts	$2.2
Minor culverts	$68.1
Subtotal	$277.2
Contingency (10%)	$27.7
Contingency (25%)	$69.3
Total	$304.9 to $346.5

Source: DOWL HKM estimates.

Table 6-2 Total AMDIAR Construction Costs by Labor and Materials for IMPLAN Input

Item	Total Expenditures[1]	In-state Expenditures[2]
Excavation and embankment materials (including royalties)	$113.8	$113.8
Aggregate	$4.9	$4.9
Steel (bridges)	$22.8	$0
Cement (bridges)	$5.7	$0
Piping (culverts)	$26.1	$0
Cement (culverts)	$26.1	$0
Contract labor costs	$77.6	$77.6
Total	$277.1	$196.3

1 DOWL HKM estimates.

2 Cardno estimates based on DOWL HKM totals.

6.3.2 Arctic Mine Construction and Operation

Impacts for mine development were estimated for several planned or proposed mines including the Arctic, Sun, Bornite, and Smucker Projects. Documentation and discussions regarding the Arctic Mine provided the basis for estimating impacts of mine construction and operation, particularly the Arctic PEA.[128] This

[128] A significant amount of data regarding costs, revenues, and mine volumetric output came from the Arctic PEA.

report provided a basis for estimating the economic impacts of the Arctic Project and for the other mines given that there are not well-developed capital and operating costs and similar metrics for these sites.

Estimated capital costs (**Tables 6-3** and **6-4**) from the Arctic PEA form the basis for model inputs for construction impacts. In total, the mine would cost about $717 million dollars to build with about 19 percent of total cost allocated for direct labor costs, 31 percent for materials, 25 percent for construction and mechanical equipment, and nearly 22 percent for owner's contingency and engineering, procurement, construction, and management (EPCM). The major expenditure categories (**Table 6-4**) used as inputs into the IMPLAN model are direct labor, materials, and freight transportation. Construction and mechanical equipment are not included given that most of these items are highly specialized for mining operations and are not produced in Alaska. It is also highly uncertain as to whether the EPCM contractor would be an Alaskan firm, and therefore, EPCM was not included in input, nor were owner's costs or contingencies.[129]

The next step in the process involved estimating the proportion of each expenditure category (direct labor, materials, and freight and transportation) selected for analysis that would come from businesses within the state and within the District. For materials and freight transportation, Cardno relied on parameters generated using the IMPLAN system. With regional economic models constructed using IMPLAN software and data, users can estimate the amount of a good or service that would be purchased regionally using Local Purchase Coefficients (LPCs). For instance, a sector might have an estimated LPC of 0.50, which indicates that 50 percent of expenditure on products or services produced by the sector would come from local businesses, while the remainder would be imported. To make this estimation, material expenditures were allocated to IMPLAN sectors based on detailed cost data in the Arctic PEA, and for each sector, an LPC was generated for both the state and District. Sectors with LPCs of zero and the associated expenditure were eliminated from the model. For freight and transportation, the analysis relied on the default LPC as well. For construction labor, the percentage of state and local residents versus non-resident workers is based on publically available historical data from the Red Dog Mine, which shows that on average approximately 75 percent of the mine's employees are Alaska residents, and nearly 30 percent are residents in Northwestern Alaska.[130] This ratio is applied to both mine construction and operation.

In terms of capital expenditures (i.e., costs), it is very unlikely that a significant amount (if any) will occur in the region. However, a substantial number of regional residents will become mine workers, both contract and permanent, during the construction and operating phases of the mine, and thus direct labor income will accrue to the region. These figures are reported in **Section 7** (Results).

Table 6-3 Summary of Arctic Mine Construction Costs by Construction Process

Item	Total ($ millions)
Direct	
Overall site	$83
Open pit mining	$120
Mineralized material handling	$17
Process	$122

[129] EPCM (engineering, procurement, and construction management) is a common form of contracting arrangement for very large projects within the infrastructure, mining, resources and energy industries. In an EPCM arrangement, the client selects a head contractor who manages the whole project on behalf of the client. The EPCM contractor coordinates all design, procurement and construction work and ensures that the whole project is completed as required and on time. The EPCM contractor may or may not undertake actual site work, and EPCM contractors are often large multi-national engineering and construction firms.

[130] Red Dog Mine Extension, Aqqaluk Project Final Supplemental EIS, October 2009, Prepared by Tetra Tech, Website (http://dnr.alaska.gov/mlw/mining/largemine/reddog/pdf/rdseis2009vol1.pdf) accessed December 3, 2014.

Item	Total ($ millions)
Tailings and water management	$21
On-site infrastructure	$49
Airstrip	$14
External access roads	$27
Temporary services	$23
Indirect Costs	
Indirect construction	$54
Spares	$4
Freight and logistics	$22
Commissioning and start-up	$2
EPCM	$47
Owner's costs	$20
Contingency	$92
Total	$717

Source: Arctic PEA.

Table 6-4 Summary of Arctic Mine Construction Costs by Major Expenditure Type and Estimated Portion of Expenditures in Alaska

Item	Total Costs[1] ($ millions)	In-state Expenditures[2] ($ millions)
Direct labor costs	$131	$99
Indirect labor costs	$2	$0
Materials	$225	$53
Construction equipment	$41	$0
Mechanical equipment	$131	$0
Freight and logistics	$22	$19
EPCM	$47	$0
Contingency and owner's costs	$110	$0
Total	$717	$171

1 Source: Arctic PEA.

2 Cardno estimates.

Statewide impacts of mine operation were estimated using default IMPLAN model parameters for the sector and the estimated annual output and resource value for the mine. According to the Arctic PEA, the life of mine (LOM) resource value is $7,870 million dollars, and the operating life is 12 years. Thus, on average the annual revenues for the mine are about $650 million per year, which serves as an input into IMPLAN Sector 23 "Mining copper, nickel, lead, and zinc." Based on total annual revenues (i.e., mine output measured in dollars), the IMPLAN model estimates direct annual employment requirements, annual labor income, and value added (i.e., gross state product for Alaska). However, since the Arctic PEA does report direct labor requirements for annual operations, the IMPLAN output values were calibrated to match the figures in the PEA.

6.3.3 Other Potential Mine Construction and Operation

To estimate the potential economic impacts of other mineral resources in the region, the approach relied on production and cost metrics from secondary data sources including the Arctic PEA. The basic steps involved:

1. Determining the productive capacity of each mine,
2. Based on production metrics and current mineral prices, estimating capital costs and annual output in dollars (i.e., gross annual revenues),
3. Using capital costs for each mine and IMPLAN outputs for the Arctic Mine to approximate construction cost impacts, and relying on annual output to estimate impacts for annual operations and maintenance of the mines.

Table 6-5 summarizes LOM mill feed and payable mineral amounts recovered based on various publications. Using these data and mineral prices in the Arctic PEA's financial analysis, the LOM and annual resource value were determined for each mine (**Table 6-6**). For surface mines (Smucker and the Ruby Creek portion of Bornite Mine), capital costs are based on a 2002 Bureau of Land Management (BLM) report that provides high level planning estimates for different types of and sizes of copper deposits in the Koyukuk Mining District.[131] These figures were adjusted for inflation using producer price indices from the U.S. Bureau of Labor Statistics. For underground mines (Sun and South Reef portion of Bornite Mine), the estimates were derived using a PEA conducted for the Caribou Massive Sulfide deposit in New Brunswick, Canada, which is a similar type of deposit to the Sun and South Reef Bornite sites.[132] Based on the Caribou Massive Sulfide PEA, the ratio of capital costs per ton of mill feed was estimated and applied to the mill feed estimates for the other mines. According the cost schedules in the BLM report, capital costs increase more or less proportionately with the resource size. LOM estimates are based on the same sources for each mine.

Estimating the regional and state-level impacts for each mine is difficult given that the data sources relied upon do not provide the same level of detail as the Arctic PEA; therefore, the impacts use the same multipliers as those of the Arctic PEA and the same assumptions regarding the distribution of regional versus state employment in the District. Overall, the figures for other mines should be considered rough estimates, and may be refined in the future as more comprehensive mine feasibility studies or mine EIS studies become public.

[131] James R. Coldwell, Economic Prefeasibility Studies of Mining in the Koyukuk Mining District, Northern Alaska BLM-Alaska Technical Report 38, BLM/AK/ST-02/003+3091+932, February 2002.

[132] Trevali Mining Corporation, Technical Report on Preliminary Economic Assessment for the Caribou Massive Sulphide Zinc-Lead-Silver Project, Bathurst, New Brunswick, Canada. SRK Project Number 3CT020.002, May 13, 2014.

Table 6-5 Mill Feed and Payable Mineral Production Estimates for Planned or Potential Mines

Mine	Mine Type	Mill Feed (millions of tons)	Copper (1000s of tons)	Zinc (1000s of tons)	Lead (1000s of tons)	Silver (1000s of ounces)	Gold (1000s of ounces)
Arctic[1]	Surface	39.4	814	1117	189	46,549	629
Bornite[2]	Surface and	78.8	531	-	-	-	-
	Underground	62.3	1,210	-	-	-	-
Sun[3]	Underground	19.9	601	201	32,800	103	601
Smucker[4]	Surface	10.4	40	389	135	36,100	255

[1] Source: Arctic PEA.

[2] Source: NovaCopper, April 1, 2014, NI 43-101 Technical Report on the Bornite Project, Northwest Alaska, USA, Prepared by BD Resource Consulting, Inc., SIM Geological Inc. and International Metallurgical & Environmental Inc., Website (http://www.novacopper.com/i/pdf/reports/Technical_Report_Bornite_Project_1April2014.pdf) accessed November 3, 2014.

[3] Source: Andover Mining Corporation, September 30, 2013, Technical Report on the Sun Project, Brooks Range, Alaska, Prepared by Mine Development Associates.

[4] Source: NovaCopper, April 1, 2014, NI 43-101 Technical Report on the Bornite Project, Northwest Alaska, USA, Prepared by BD Resource Consulting, Inc., SIM Geological Inc. and International Metallurgical & Environmental Inc., Website (http://www.novacopper.com/i/pdf/reports/Technical_Report_Bornite_Project_1April2014.pdf) accessed November 3, 2014.

Table 6-6 Estimated Life of Mine, Capital Costs, Annual Gross Revenues for District Mining Prospects

Mine	LOM (years)	Capital Costs ($ millions)	Annual Gross Revenues ($ millions)
Arctic[1]	12.0	$718	$655
Bornite[2]	21.2	$1,903	$238
Sun[2]	6.3	$368	$275
Smucker[2]	5.0	$189	$457

[1] Source: Arctic PEA.

[2] Cardno estimates based on data published in: 1) James R. Coldwell, Economic Prefeasibility Studies of Mining in the Koyukuk Mining District, Northern Alaska BLM-Alaska Technical Report 38, BLM/AK/ST-02/003+3091+932, February 2002; and 2) Trevali Mining Corporation, Technical Report on Preliminary Economic Assessment for the Caribou Massive Sulphide Zinc-Lead-Silver Project, Bathurst, New Brunswick, Canada. SRK Project Number 3CT020.002, May 13, 2014.

6.4 Household Savings

Although the purpose of the AMDIAR is to provide transportation access to the District to promote economic development by supporting mineral exploration and mine development, the road would also provide opportunities for some study area communities to reduce the costs of transporting fuel to their communities. This could potentially lower the cost of living in these communities and provide opportunities for new small community businesses. Although the proposed road would have controlled access, local communities could hire commercial transportation providers to deliver fuel or freight to staging areas where the communities could access it by building their own access road to the AMDIAR or by transporting goods over a snow/ice road in the winter. Local residents could hire existing freight companies to make these deliveries or form their own transportation companies to provide these services.

While not the primary purpose of this project, the potential for increased commercial access to local communities would result in substantial benefits in terms of the cost of living in these communities.[133]

6.4.1 Lower Cost Home Heating Fuel

Lower home heating expenditures are expected to generate sizable savings for study area households in areas able to contract for heating oil deliveries using the AMDIAR. Estimated heating oil savings for study area residential users is provided in **Table 7-13**. This analysis assumed that study area communities, with the exception of Huslia and Hughes, would be able to receive shipments of heating fuel from commercial heating fuel distributors. This would require the construction of an access point from the AMDIAR to specific communities, which is not a component of the currently proposed project or included in this analysis.[134] Despite this, it is reasonable to assume that at some future date, study area communities would develop access to the ADMIAR so that delivery of fuel could occur. However, given the distance that Huslia and Hughes are from AMDIAR, the possibility of these communities having any future access to AMDIAR is unlikely. Therefore, this analysis assumes that households in these two communities would not experience home heating fuel cost savings due to AMDIAR.

As provided in **Table 6-7**, recent research on Alaska fuel prices found the prices of heating fuel and gasoline in communities located on the road system were 67.8 percent the cost of fuel in communities located off the road system.[135] Based on this study, Cardno assumes that access to AMDIAR would lower average heating oil prices by 32.1 percent for all communities in the study area, with the exception of Huslia and Hughes.[136]

Table 6-7 On and Off Road System Gasoline and Heating Fuel Average Prices (July 2014)

Interior Communities	On Road System	Off Road System	Difference (dollars)	On Road System Price Difference (percent)
Heating Fuel Average	$4.42	$6.52	$2.10	67.8%
Gasoline Average	$4.86	$7.17	$2.31	67.8%

Source: Alaska Department of Commerce, Community and Economic Development, Research and Analysis Section, July 2014, Alaska Fuel Price Report: Current Community Conditions, Table 4, Website (http://commerce.state.ak.us/dnn/Portals/4/pub/Fuel_Price_Report_Jul_2014.pdf) accessed November 17, 2014.

6.4.2 Lower Cost Electricity

As previously described, diesel fuel is used to generate all electricity in the study area. Lower electricity expenditures, due to lower cost diesel fuel, would generate savings for households in communities that can contract for heating oil deliveries. Calculations in **Table 6-8** use the most recent residential rates and PCE rates for FY 2013 as the baseline. The price of fuel for the baseline 2013 PCE formula (see **Table A-1**) was adjusted to be 32.1 percent less than current diesel prices in each community. The resulting PCE rates are provided in **Table 6-8**. Annual residential electricity expenditures are approximations since residential rates, PCE rates, and effective rates change throughout the fiscal year. Despite this, estimated

[133] Tuttle, Maryellen, DOWL HKM, Personal communication with Lee Elder, Cardno, October 27, 2014.

[134] The saving benefits presented here are representative of benefit to the local community. The costs of communities connecting to AMDIAR would likely be high. From a broader economic perspective the net benefit of these savings would not be positive until the stream or present value of annual savings outweighed the costs of connecting.

[135] Alaska Department of Commerce, Community and Economic Development, Research and Analysis Section, July 2014, Alaska Fuel Price Report: Current Community Conditions, Table 4, Website (http://commerce.state.ak.us/dnn/Portals/4/pub/Fuel_Price_Report_Jul_2014.pdf) accessed November 17, 2014.

[136] Alaska Department of Commerce, Community and Economic Development, Research and Analysis Section, July 2014, Alaska Fuel Price Report: Current Community Conditions, Table 4, Website (http://commerce.state.ak.us/dnn/Portals/4/pub/Fuel_Price_Report_Jul_2014.pdf) accessed November 17, 2014.

average annual electricity payments assuming lower priced diesel are assumed to be a reasonable estimate of annual residential electricity payments.

Table 6-8 Average Annual Household Electricity Payments with Lower Priced Diesel

Community	Average Annual Use (kWh)	Average Annual PCE Eligible kWh	Average Annual Non-PCE Eligible kWh	Estimated Residential Rate	Estimated PCE Rate	Estimated Effective Rate	Average Annual Residential Electricity Payment*
				Dollars per kWh			
Allakaket/ Alatna	3,220	3,074	146	$0.58	$0.37	$0.21	$728
Bettles/ Evansville	3,910	3,080	830	$0.55	$0.34	$0.21	$1,095
Ambler	5,639	3,779	1,861	$0.52	$0.32	$0.19	$1,688
Shungnak	6,266	4,312	1,954	$0.55	$0.41	$0.14	$1,698
Kobuk	4,907	3,547	1,360	$0.55	$0.41	$0.14	$1,260
Average	4,902	3,618	1,284	$0.55	$0.37	$0.18	$1,333

Source: Adapted from Alaska Energy Authority, Power Cost Equalization Program: Statistical Data by Community, Reporting Period: July 1, 2012 to June 30, 2013, Website (http://www.akenergyauthority.org/PDF%20files/pcereports/FY13StatisticalRptComt.pdf) accessed November 22, 2014.

6.5 Community Connection to the Mine Grid

The Arctic PEA estimates an electricity cost of $0.32 per kWh to produce power on-site. This does not take into consideration the infrastructure costs to connect the mine to local communities. This would increase the per kWh cost for electricity from the mine. For communities to switch to an alternative electricity source, the mine would likely have to offer competitively priced electricity to communities. In general, regional residents are currently paying an effective rate of approximately $0.20 per kWh. To offer competitive rates, the mine would have to offer electricity that is eligible for the PCE program.

If the mine wished to provide electricity to local communities, they would need the approval of the Regulatory Commission of Alaska (RCA). Mine operators would have to apply to the RCA for a Provisional Certificate of Public Convenience.[137] If approved, the mine would be classified as a regulated or non-regulated utility. The classification as a non-regulated utility would require that the mine meet certain applicable exclusions.[138] Regardless, it is conceivable that if the mine were to seek approval and be approved to become a utility, it could offer electricity to study area residents and could do so with PCE subsidized rates.[139]

To estimate the cost advantages of the mine offering electricity to study area communities, Cardno evaluated how lower heating fuel cost could affect Shungnak and Kobuk (the two closest villages to the proposed Arctic Mine). Currently these two villages have fuel costs of $0.39 per kWh, while the Arctic Mine is anticipating a fuel cost of $0.32 per kWh. If fuel costs for Shungnak and Kobuk were lowered to the expected fuel costs for the mine within the PCE rate calculation provided in **Appendix A,** the effective rate in Shungnak and Kobuk would be $0.14 per kWh, whereas the effective rate in these communities is $0.18 per kWh currently. Therefore, assuming constant mine fuel costs and absent of any analysis of

[137] Knudsen, Claire, Utility Tariff Analyst II, Regulatory Commission of Alaska, Personal communication with Lee Elder, Cardno, December 5, 2014.

[138] AS 42.05.711

[139] Knudsen, Claire, Utility Tariff Analyst II, Regulatory Commission of Alaska, Personal communication with Lee Elder, Cardno, December 5, 2014.

infrastructure development costs, there appears to be cost advantages for residents of Shungnak and Kobuk to connect to the Arctic Mine's power grid.[140] Despite this, as provided in **Table 6-8**, the effective rate for Shungnak and Kobuk is expected to be $0.14 per kWh with access to the AMDIAR and the assumed delivery of lower cost diesel. Therefore, a more detailed analysis on the likely benefits and costs of developing infrastructure to connect these communities to AMDIAR as well as the costs and benefits of connecting communities to the mine's power grid is warranted. It should be pointed out, the saving benefits presented here are representative of benefit to the local community, while the costs of communities connecting to the mine's power grid would likely be high. From a broader economic perspective the net benefit of these savings would not be positive until the stream of benefits or the present value of annual savings outweighed the costs of connecting.

6.6 Tax Revenue to the State of Alaska

In the absence of detailed financial information for prospective District mining projects, this analysis relies heavily upon the Arctic PEA to estimate tax revenues generated from other prospective District mines. For example, the ratio of Arctic Mine's anticipated mining license payments and corporate income taxes to gross revenue was used to estimate state mining license payments and corporate income taxes for the other identified District prospects.

The process of estimating the mining license payments and corporate income tax payments for other prospective mines necessitated estimating mineral production estimates for these mines since the gross revenue was used as the scalar for mining license and corporate income taxes. Therefore, the Arctic Mine's ratio of marketable mineral production to estimated mineral resources serves as a proxy for the amount of marketable material to be produced from each prospective mine. For example, the Arctic Mine has total copper resources of nearly 2.0 million pounds (indicated and inferred), but would produce and sell 1.6 million pounds of copper. In other words, 79.9 percent of the Arctic Mine's total estimated copper resource would be produced and sold. This same production rate of 79.9 percent was used to approximate the marketable quantity of copper and other metals for the other mines. Production rates for other mines will differ from the Arctic Mine's; however; in the absence of more detailed operational information for the other mines, this approach provides a reasonable rough approximation of the other mines' production (**Table 6-9)**.

Table 6-9 Estimated Mineral Production and Gross Revenue Estimates, LOM

	Copper (lbs.)	Lead (lbs.)	Zinc (lbs.)	Silver (oz.)	Gold (oz.)	Gross Revenue ($ billion)
Arctic						
Mineral resources	1,952,708,000	442,578,000	2,624,328,000	45,300,000	610,000	na
Production	1,560,829,000	309,006,000	2,134,509,000	34,023,000	369,000	$7.9
Bornite						
Mineral resources	2,413,489,000	-	-	-	-	na
Production	1,929,138,000	-	-	-	-	$5.6
Sun						

[140] Connection to the mines grid seemingly has cost advantages, but these calculations do not take into consideration for the additional cost that would undoubtedly result from providing a distribution network to the villages and would warrant further investigation as to if cost advantages actually exist when considering all costs.

	Copper (lbs.)	Lead (lbs.)	Zinc (lbs.)	Silver (oz.)	Gold (oz.)	Gross Revenue ($ billion)
Mineral resources	360,543,000	402,420,000	1,200,299,000	32,784,000	103,000	na
Production	288,187,000	280,968,000	976,269,000	24,623,000	62,000	$2.6
Smucker						
Mineral resources*	79,366,000	269,845,000	777,790,000	39,806,000	281,000	na
Production	63,439,000	188,405,000	632,619,000	29,897,000	170,000	$1.8
Total						
Mineral resources	4,806,106,000	1,114,843,000	4,602,417,000	117,890,000	994,000	na
Production	3,841,593,000	778,379,000	3,743,397,000	88,543,000	601,000	$17.8

- = unavailable

na = not applicable

Assumes copper price of $2.90/lb, lead price of $0.90/lb, zinc price of $0.65/lb, gold price of $1,300/oz. and silver price of $22.70/oz.

*The historical resource estimate for Smucker is considered relevant but not reliable.

Sources: Arctic PEA.

NovaCopper, April 1, 2014, NI 43-101 Technical Report on the Bornite Project, Northwest Alaska, USA, Prepared by BD Resource Consulting, Inc., SIM Geological Inc. and International Metallurgical & Environmental Inc., Website (http://www.novacopper.com/i/pdf/reports/Technical_Report_Bornite_Project_1April2014.pdf) accessed November 3, 2014.

Andover Mining Corporation, September 30, 2013, Technical Report on the Sun Project, Brooks Range, Alaska, Prepared by Mine Development Associates.

Estimated annual rental payments for prospective mines were based on the number of claims held by each mine owner, the age of the claim, and the size of each claim (40 acres or 160 acres). This information is obtained from the Arctic PEA for the Arctic Mine, while claim information for the Sun and Smucker Projects is from the Alaska Department of Natural Resources.[141] Estimation of production royalty payments to the State of Alaska relied on estimated corporate income taxes paid by the Arctic Mine over the life of the project ($158.0 million). It was assumed that the operation would fall within the 9.4 percent tax bracket, which implies a total taxable net income of $1.7 billion over the life of the project. The estimated total taxable net income is subsequently multiplied by the production tax rate of 3 percent to estimate production royalties. This same process was replicated for the Sun and Smucker Projects; the Bornite Mine will not have any production royalty payments to the state since this mine would not be located on state lands.

The Arctic Mine is anticipated to purchase $14.7 million in fuel at the price of $1.19/liter. This is equivalent to 12.5 million liters or 3.3 million gallons of fuel over the life of the project. Assuming the current fuel tax rate of $0.08 per gallon, the Arctic Mine is anticipated to pay $261,000 in fuel taxes to the state over the LOM. The quantity of fuel used by the Arctic Mine equates to 0.01 gallons per ton of the mine's estimated resources. Therefore, it was assumed that the other prospective District mines would also use 0.01 gallons per ton of their respective estimated resources, and this ratio was used to determine the total amount of fuel used by each mine. The tax rate of $0.08 per gallon was assumed to estimate each mine's fuel taxes.

[141] Alaska Department of Natural Resources, Information Resource Management, November 5, 2014, Alaska DNR State Mining Claims, Website (http://dnr.alaska.gov) accessed December 2, 2014.

It is necessary for AIDEA to collect sufficient toll payments to recover the cost of AMDIAR construction, operation, and the cost of their debt financing. It is anticipated that a 4 percent loan on the project's construction would be sufficient to recover the yield on a 30-year municipal bond. This analysis uses AMDIAR construction and operation cost data provided by DOWL HKM and then assumes road users will be charged a fee to recover these costs as well as pay the interest on a 4 percent loan with a 30-year term. The construction costs, operation costs and the interest payments on the loan are summed and equal the total expected toll payments made to AIDEA over the 30-year life of the project.

The NWAB receives no sales tax or property tax revenue and relies heavily upon PILT payments from the Red Dog Mine. It is anticipated that future mining developments would provide the borough a similar PILT payment as has historically been provided by the Red Dog Mine. This analysis therefore uses historical data on PILT payments to the NWAB by Teck Alaska for the Red Dog operation to estimate future payments from mining operations within the borough. Actual future PILT payments to the NWAB will rely on a number of factors and considerations. Despite this, it is reasonable to assume future PILT payments to the borough by additional mining operations will be similar to the existing Red Dog operation payments. Historical Red Dog Mine PILT payments have been escalated to reflect the value of historical payments to the NWAB in 2014 dollars.

7 Results

This chapter presents the expected short- and long-term income and employment (full- and part-time jobs) that AMDIAR and the major District mining projects would support. In addition to the job and income effects of AMDIAR and the major District mining projects, this chapter also evaluates other regional benefits of AMDIAR, including:

> fiscal impacts of District mining development on the region and state,

> the household and public facilities heating fuel and electricity cost savings resulting from the availability of lower cost fuel,

> study area cost savings associated with connecting to the mine power grid,

> revenue to ANCSA corporations resulting from aggregate sales, and

> regional mining employment effects upon out-migration.

These impacts are measured for the region (NWAB and YKCA) and for the state. The analysis includes the construction and operations phases of AMDIAR and each mining project. Phase I construction of AMDIAR is anticipated to begin in 2019 and last for 2 years, while Phase II construction is anticipated to start in 2021 and last for 1 or 2 years. For the purposes of estimating annual employment and income effects, Phase II is assumed to last for 1 year. Phase III of AMDIAR construction is likely to begin in 2031 and last for 1 year. Overall, this analysis assumes construction of AMDIAR would last for a period of 4 years, with a total construction cost of $277.2 million (see **Table 6-1**).[142] The construction phases for the Bornite, Sun, and Smucker Mines were each assumed to be equivalent to the Arctic Mine's construction period, or a duration of 2 years.

This chapter first summarizes the total economic benefits from AMDIAR construction and operation throughout the state and region. Subsequent subsections provide more detailed benefit estimates for each component (AMDIAR and the individual mines).

Increased economic activity would provide employment and income at the AMDIAR site and the mine sites (direct effects)[143] and support employment and income at businesses supplying goods and services to AMDIAR and the mines (indirect impacts) and their employees (induced effects).[144]

7.1 AMDIAR Construction and Operation Economic Impacts

Table 7-1 provides annual employment estimates for construction of AMDIAR. It is estimated that a total of 1,335 jobs will be directly supported by the construction of the AMDIAR over the entire construction phase. Provided the AMDIAR construction phase is 4 years in duration, the average direct construction employment is projected to be 334 jobs annually. Of these 334 jobs, it is estimated that 40 regional residents will be employed annually. It is estimated that construction-related spending for materials and services will support an additional 35 jobs throughout Alaska annually, while AMDIAR construction

[142] AMDIAR's construction contingency estimates were excluded from analysis within the IMPLAN analysis. Therefore, the reported results should be considered a conservative estimate of employment and income impacts from AMDIARs construction.

[143] Direct effects are effects on the sector with the initial change in economic output, which in this case is the construction and power generation sector.

[144] Indirect effects are changes in industries that provide inputs to sectors with increased economic output. Induced effects are changes in industries that provide goods and services to employees in directly and indirectly affected industries (i.e. changes due to increased household income and associated spending).

employee spending will support an additional 118 jobs each year. Overall, it is estimated that 486 jobs will be supported annually during the AMDIAR construction phase.

Table 7-1 AMDIAR Construction Annual Average Employment Impacts

	Non-Residents	AK Residents Other than NWAB/YKCA	NWAB/YKCA Residents	Total
Direct effect	30	263	40	334
Indirect effect	0	35	0	35
Induced effect	0	115	3	118
Total effect	30	413	43	486

Assumes 4-year road construction phase.

Project development includes initial capital costs required to construct AMDIAR.

Annual average values correspond to the construction period years (Years 2019, 2020, 2021, and 2031).

Totals may not sum due to rounding.

Source: Cardno 2014 (based on IMPLAN modeling)

Table 7-2 illustrates the total annual employment estimates related to AMDIAR operations. It is estimated that a total of 43 jobs will be directly supported by AMDIAR operations. Furthermore, AMDIAR expenditures for goods and services during operations will support eight additional jobs throughout Alaska, while AMDIAR employee expenditures will support 17 additional jobs throughout the state annually. Overall, it is estimated that 68 jobs will be supported annually by AMDIAR operations.

Table 7-2 AMDIAR Operations and Maintenance Employment Impacts

	Non-Residents	AK Residents Other than NWAB/YKCA	NWAB/YKCA Residents	Total
Direct effect	10	19	13	43
Indirect effect	0	8	0	8
Induced effect	0	16	1	17
Total effect	10	43	14	68

Direct project operations represent road operations and maintenance.

Totals may not sum due to rounding.

Source: Cardno 2014 (based on IMPLAN modeling)

7.2 Economic Impacts of Ambler Mining Projects Construction and Operation

Table 7-3 provides a summary of the estimated employment and income impacts associated with the construction of each major District mining project. Of all mines considered in this analysis, the construction of the Bornite Mine is expected to support the greatest number of jobs throughout the state with an estimated 5,557 total jobs and $384.9 million in income. Assuming a 2-year construction timeframe, the Bornite Mine will support an average of 2,778 jobs throughout the state each year. The Arctic Mine is estimated to support a total of 2,095 jobs and $145.1 million in income, or 1,048 jobs and $72.6 million in income annually. Construction of the Sun Mine is estimated to support 1,073 jobs and $74.3 million in income throughout the state, or an annual average of 537 jobs and $37.2 million of

income. The Smucker Mine is anticipated to support a total of 553 jobs throughout the state and a total of $38.3 million in income. This represents a total of 277 jobs per year and $19.2 million in income over the Smucker Mine's assumed 2-year construction period.

Table 7-3 Summary of Economic Effects of Mining Project Construction (Statewide)

	Labor Income ($ millions)			Employment (jobs)		
	Direct	Indirect and Induced	Total	Direct	Indirect and Induced	Total
Arctic Project	$103.3	$41.8	$145.1	1,340	755	2,095
Annual average	$51.6	$20.9	$72.6	670	378	1,048
Bornite Project	$273.9	$111.0	$384.9	3,553	2,004	5,557
Annual average	$137.0	$55.5	$192.4	1,777	1,002	2,778
Sun Project	$52.9	$21.4	$74.3	686	387	1,073
Annual average	$26.5	$10.7	$37.2	343	193	537
Smucker Project	$27.3	$11.0	$38.3	354	199	553
Annual average	$13.6	$5.5	$19.2	177	100	277

Annual average assumes 2-year construction phase.

Monetary values are reported in constant 2014 dollars.

Totals may not sum due to rounding.

Table 7-4 provides a summary of the estimated employment and income impacts associated with the operation of each major District mining project. As provided below, the greatest number of direct operation employees is anticipated for the Arctic Mine, with an estimated 482 employees earning $51.6 million of income each year of operations. The three other mines (Bornite, Sun, and Smucker) each have similar direct employment estimates, ranging between 324 and 374 jobs directly supported by each mine's operations. In total, the operation of the Arctic Mine is estimated to support a total of 1,002 jobs and $102.0 million of income throughout the state each year of operation. The statewide operational employment effects of the Bornite, Sun, and Smucker Mines is estimated to be 672 jobs, 778 jobs, and 735 jobs, respectively. These impacts are expected to occur each year over the life of each prospective mine. It is assumed the Arctic Mine and Sun Mine both have a 12-year life. The Bornite Mine is assumed to have a 21.2-year life, and the Smucker Mine is assumed to have a 5-year life.

Table 7-4 Summary of Average Annual Economic Effects of Mining Project Operations (Statewide)

	Labor Income ($ millions)			Employment (jobs)		
	Direct	Indirect and Induced	Total	Direct	Indirect and Induced	Total
Arctic Project	$51.6	$50.5	$102.0	482	519	1,002
Bornite Project	$34.6	$33.9	$68.5	324	349	672
Sun Project	$40.1	$39.2	$79.3	374	403	778
Smucker Project	$37.9	$37.0	$74.9	354	381	735

Monetary values are reported in constant 2014 dollars.

Totals may not sum due to rounding.

7.2.1 Arctic Mine

Table 7-5 provides the annual employment estimates for construction of the Arctic Mine. It is estimated that a total of 1,340 jobs will be directly supported by the construction of the Arctic Mine over the entire construction phase. Assuming the Arctic Mine construction phase is 2 years, the average annual direct construction employment is projected to be 670 jobs per year. Further, of these 670 jobs, it is estimated that 120 regional residents will be employed annually during the construction phase. It is also estimated that construction spending related to materials and services will support an additional 137 jobs throughout Alaska annually, while employee spending will support an additional 240 jobs during the construction period. Overall, it is estimated that 1,048 jobs will be supported annually during the construction of the Arctic Mine.

Table 7-5 Arctic Mine Construction Average Annual Employment Impacts

	Non-Residents	AK Residents Other than NWAB/YKCA	NWAB/YKCA Residents	Total
Direct effect	90	460	120	670
Indirect effect	0	137	0	137
Induced effect	0	231	9	240
Total effect	90	829	129	1,048

Assumes 2-year mine construction phase.
Totals may not sum due to rounding.

Table 7-6 provides the total annual operational employment for the Arctic Mine. It is estimated that a total of 482 jobs will be directly supported by Arctic Mine operations. Operational expenditures for goods and services by the mine will support an additional 297 jobs throughout Alaska, while mine employee expenditures will support an additional 223 jobs throughout the state annually. Overall, it is estimated that 1,002 jobs will be supported annually during the Arctic Mine operations phase.

Table 7-6 Arctic Mine Operations Annual Employment Impacts

	Non-Residents	AK Residents Other than NWAB/YKCA	NWAB/YKCA Residents	Total
Direct effect	113	217	151	482
Indirect effect	0	297	0	297
Induced effect	0	208	15	223
Total effect	113	722	166	1,002

Totals may not sum due to rounding.

7.2.2 Bornite Project

Table 7-7 provides the annual employment estimates for construction of the Bornite Mine. It is estimated that a total of 3,553 jobs will be directly supported by the construction of the Bornite Mine over the entire construction phase. Assuming the Bornite Mine construction phase is 2 years, the average annual direct construction employment is projected to be 1,777 jobs per year. Further, of these 1,777 jobs, it is estimated that 318 regional residents will be directly employed each year during the construction phase. It is also estimated that construction spending related to materials and services will support an additional 364 jobs throughout Alaska annually, while employee spending will support an additional 638 jobs during the construction period. Overall, it is estimated that 2,778 jobs in Alaska will be supported annually during the construction of the Bornite Mine.

Table 7-7 Bornite Mine Construction Average Annual Employment Impacts

	Non-Residents	AK Residents Other than NWAB/YKCA	NWAB/YKCA Residents	Total
Direct effect	238	1,221	318	1,777
Indirect effect	0	364	0	364
Induced effect	0	614	24	638
Total effect	238	2,199	342	2,778

Assumes 2-year mine construction phase.

Totals may not sum due to rounding.

Table 7-8 illustrates the total annual operational employment for the Bornite Mine. It is estimated that a total of 324 jobs will be directly supported by Bornite Mine operations. Operational expenditures for goods and services by the mine will support an additional 199 jobs throughout Alaska, while mine employee expenditures will support an additional 149 jobs throughout the state annually. Overall, it is estimated that 672 jobs will be supported annually during the Bornite Mine operations phase.

Table 7-8 Bornite Mine Operations Annual Employment Impacts

	Non-Residents	AK Residents Other than NWAB/YKCA	NWAB/YKCA Residents	Total
Direct effect	76	146	102	324
Indirect effect	0	199	0	199
Induced effect	0	140	10	149
Total effect	76	485	111	672

Totals may not sum due to rounding.

7.2.3 Sun Project

Table 7-9 provides the annual employment estimates for construction of the Sun Mine. It is estimated that a total of 686 jobs will be directly supported by the construction of the Sun Mine over the entire construction phase. If the Sun Mine construction phase is 2 years, the average annual direct construction employment is projected to be 343 jobs per year. Of these 343 jobs, it is estimated that 61 regional residents will be employed annually during the construction phase. It is also estimated that construction spending related to materials and services will support an additional 70 jobs throughout Alaska annually, while employee spending will support an additional 123 jobs during the construction period. Overall, it is estimated that 537 jobs will be supported annually during the construction of the Sun Mine.

Table 7-9 Sun Mine Construction Average Annual Employment Impacts

	Non-Residents	AK Residents Other than NWAB/YKCA	NWAB/YKCA Residents	Total
Direct effect	46	236	61	343
Indirect effect	0	70	0	70
Induced effect	0	119	5	123
Total effect	46	425	66	537

Assumes 2-year mine construction phase.

Totals may not sum due to rounding.

Table 7-10 illustrates the total annual operational employment for the Sun Mine. It is estimated that a total of 374 jobs will be directly supported by Sun Mine operations. Operational expenditures for goods and services by the mine will support an additional 230 jobs throughout Alaska, while mine employee expenditures will support an additional 173 jobs throughout the state annually. Overall, it is estimated that 778 jobs will be supported annually during the Sun Mine operations phase.

Table 7-10 Sun Mine Operations Annual Employment Impacts

	Non-Residents	AK Residents Other than NWAB/YKCA	NWAB/YKCA Residents	Total
Direct effect	88	169	117	374
Indirect effect	0	230	0	230
Induced effect	0	161	11	173
Total effect	88	561	129	778

Totals may not sum due to rounding.

7.2.4 Smucker Project

Table 7-11 provides the annual employment estimates for construction of the Smucker Mine. It is estimated that a total of 354 jobs will be directly supported by the construction of the Smucker Mine over the entire construction phase. Assuming the Smucker Mine construction phase is 2 years, the average annual direct construction employment is projected to be 177 jobs per year. Further, of these 177 jobs, it is estimated that 32 regional residents will be employed annually during the construction phase. It is also estimated that construction spending related to materials and services will support an additional 36 jobs throughout Alaska annually, while employee spending will support an additional 63 jobs during the construction period. Overall, it is estimated that 277 jobs will be supported annually during the construction of the Smucker Mine.

Table 7-11 Smucker Mine Construction Average Annual Employment Impacts

	Non-Residents	AK Residents Other than NWAB/YKCA	NWAB/YKCA Residents	Total
Direct effect	24	122	32	177
Indirect effect	0	36	0	36
Induced effect	0	61	2	63
Total effect	24	219	34	277

Assumes 2-year mine construction phase.

Totals may not sum due to rounding.

Table 7-12 illustrates the total annual operational employment for the Smucker Mine. It is estimated that a total of 354 jobs will be directly supported by Smucker Mine operations. Operational expenditures for goods and services by the mine will support an additional 218 jobs throughout Alaska, while mine employee expenditures will support an additional 163 jobs throughout the state annually. Overall, it is estimated that 735 jobs will be supported annually during the Smucker Mine operations phase.

Table 7-12 Smucker Mine Operations Annual Employment Impacts

	Non-Residents	AK Residents Other than NWAB/YKCA	NWAB/YKCA Residents	Total
Direct effect	83	160	111	354

	Non-Residents	AK Residents Other than NWAB/YKCA	NWAB/YKCA Residents	Total
Indirect effect	0	218	0	218
Induced effect	0	153	11	163
Total effect	83	530	122	735

Totals may not sum due to rounding.

7.3 Household Heating Oil Expenditures

Lower prices for heating oil are expected to result in reduced heating oil expenditures by study area residents in those communities able to contract for heating oil deliveries using the AMDIAR. Cardno assumes that access to the AMDIAR would lower average heating oil prices by 67.9 percent for all communities in the study area except Huslia and Hughes.[145] Given the most recent heating oil prices for these communities and the existing levels of household consumption, Cardno estimates that the availability of lower cost fuel will save study area residents approximately $589,000 each year (**Table 7-13**).

Table 7-13 Estimated Annual Household Heating Oil Savings

Community	Residential Customers	Savings (per gallon)	Average Household Savings	Total Residential Heating Savings
YKCA				
Bettles/Evansville	34	$2.40	$1,519	$52,000
Allakaket/New Allakaket/Alatna	69	$2.25	$1,428	$99,000
NWAB				
Kobuk	41	$3.11	$2,412	$99,000
Shungnak	66	$2.96	$2,295	$151,000
Ambler (Jan 2013)	81	$3.00	$2,325	$188,000
Total	291	$2.76*	$2,023*	$589,000

*Weighted averages.

7.4 Electricity Expenditures

Table 7-14 provides the total estimated savings on electricity costs for study area residents, community facility customers, and other non-PCE-eligible customers including state and federal buildings. Cardno assumes that access to the AMDIAR would lower average diesel fuel prices by 67.9 percent for all communities in the study area except Huslia and Hughes.[146] The availability of lower priced diesel fuel and resulting lower price of electricity would save residential customers approximately $54,000 annually, community facility customers $37,000 annually, and state and federal customers $183,000 per year.

[145] Alaska Department of Commerce, Community and Economic Development, Research and Analysis Section, July 2014, Alaska Fuel Price Report: Current Community Conditions, Table 4, Website (http://commerce.state.ak.us/dnn/Portals/4/pub/Fuel_Price_Report_Jul_2014.pdf) accessed November 17, 2014.

[146] Ibid.

Table 7-14 Average Annual Household Electricity Savings Due to Lower Priced Diesel

Community	Residential Savings	Community Facility Savings	Non-PCE-Eligible Customer Savings
Allakaket/Alatna*	$4,000	$10,000	$65,000
Bettles/Evansville*	$4,000	$3,000	$47,000
Ambler	$17,000	$10,000	$59,000
Shungnak/Kobuk	$29,000	$14,000	$12,000
Total	$54,000	$37,000	$183,000

Source: Adapted from Alaska Energy Authority, Power Cost Equalization Program: Statistical Data by Community, Reporting Period: July 1, 2012 to June 30, 2013, Website (http://www.akenergyauthority.org/PDF%20files/pcereports/FY13StatisticalRptComt.pdf) accessed November 22, 2014.

Adapted from Regulatory Commission of Alaska, May 2, 2013, TA828-2, Alaska Power Company Validated Tariff Sheets, Website (http://rca.alaska.gov/RCAWeb/ViewFile.aspx?id=282C7F6B-6FCA-410E-B537-2EBCBD24A8DC) accessed November 22, 2014.

7.5 State Government Spending

As a result of lower cost electricity in the study area, it is expected that PCE program expenditures would decline. **Table 7-15** provides the total PCE program savings resulting from lower diesel prices. In FY 2013, approximately $1.1 million in PCE payments were made to study area communities, whereas a reduction in the price of diesel and the subsequent decrease in the price of electricity would save the state $391,000 in annual PCE payments.

Table 7-15 State PCE Savings for Study Area

Community	Savings for Residential PCE Payment	Saving for Community PCE Payments	Savings for Community Facilities Payments	Total State PCE Savings
Allakaket/Alatna*	$47,000	$7,000	$53,000	$107,000
Bettles/Evansville*	$14,000	$2,000	$16,000	$32,000
Ambler	$31,000	$21,000	$51,000	$103,000
Shungnak/Kobuk	$48,000	$27,000	$75,000	$149,000
Total	$140,000	$57,000	$195,000	$391,000

Source: Adapted from Alaska Energy Authority, Power Cost Equalization Program: Statistical Data by Community, Reporting Period: July 1, 2012 to June 30, 2013, Website (http://www.akenergyauthority.org/PDF%20files/pcereports/FY13StatisticalRptComt.pdf) accessed November 22, 2014.

Adapted from Regulatory Commission of Alaska, May 2, 2013, TA828-2, Alaska Power Company Validated Tariff Sheets, Website (http://rca.alaska.gov/RCAWeb/ViewFile.aspx?id=282C7F6B-6FCA-410E-B537-2EBCBD24A8DC) accessed November 22, 2014.

7.6 State and Local Revenue Impacts

This section provides the estimated government revenues related to the development of the District mining projects. Given the uncertainty regarding the timing of each mine's development, the timings of state and local payments are not estimated. Rather, results are generally presented in terms of the LOM, with the exception of mineral rent payments and PILT payments. **Table 7-16** below provides a summary of state and local tax revenue estimated to be generated occur as a result of District mine development. For those payments in which a LOM estimate is provided (mining license, corporate income taxes, production royalty, and fuel taxes), the total LOM payments to the state over the life of the four major District mining projects are estimated to be $698.6 million. This does not include the annual estimated payments for claim rental ($637,000) on state lands. PILT to the NWAB is estimated to be $6.5 million (2014 dollars) in the first year these payments would be made by each of the prospective mines.

Furthermore, it is estimated that AIDEA will receive approximately $1.0 billion in toll payments for the use of the AMDIAR over the 30-year life of the road. This remainder of this section has additional mine- and road-specific details related to each of these payments.

Table 7-16 Summary of State and Local Government Revenue Across all Mines

Payment Type	Payment
Mining license, LOM	$261,189,000
Corporate income tax, LOM	$357,697,000
Production royalty, LOM	$78,289,000
Fuel taxes, LOM	$1,400,000
AIDEA toll payments, life of road	$1,000,000,000
Claim Rental (annual, once payment max. achieved)	$637,000
NWAB PILT (1st Year, each mine)	$6,500,000

7.6.1 Mining License Tax

The Arctic Project's anticipated Alaska mining license tax payments will be $115.4 million over the LOM, which equates to approximately 1.5 percent of the total gross revenue of the mine. Applying this same percentage to estimated gross revenue for the other prospective mines, it is estimated that the Bornite Mine will generate $82.0 million for the state, the Sun Mine will generate $82.0 million, and the Smucker Mine will generate $26.3 million in mining tax revenue over the life of each respective mine (**Table 7-17**).

Table 7-17 Estimated Mining License Tax Payments, LOM

Mining Project	Gross Revenue	Alaska Mining License Tax Payments
Arctic	$7,870,864,000	$115,400,000
Bornite	$5,594,500,000	$82,025,000
Sun	$2,558,378,000	$37,510,000
Smucker	$1,790,652,000	$26,254,000
Total	$17,814,394,000	$261,189,000

7.6.2 Corporate Net Income Tax

The Arctic Mine estimates of State of Alaska corporate income tax payments total $158.0 million over the LOM, which equates to approximately 2.0 percent of the total gross revenue of the mine. Applying this same percentage to estimated gross revenue for the other prospective District mines, it is estimated that the Bornite Mine will generate $112.3 million in state corporate tax revenue, the Sun Mine will generate $51.4 million, and the Smucker Mine will generate $35.9 million over the life of each respective mine (**Table 7-18**).

Table 7-18 Estimated Corporate Income Tax Payments, LOM

Mining Project	Gross Revenue	Alaska Corporate Income Tax Payments
Arctic	$7,870,864,000	$158,000,000
Bornite	$5,594,500,000	$112,304,000
Sun	$2,558,378,000	$51,357,000

Mining Project	Gross Revenue	Alaska Corporate Income Tax Payments
Smucker	$1,790,652,000	$35,946,000
Total	$17,814,394,000	$357,607,000

7.6.3 Annual Claim Rental

The annual rental requirements apply to mining claims, leasehold locations, upland mining leases, offshore mining leases, and prospecting sites on state land. **Table 7-19** below provides the estimated annual rental claim for each prospective District mine and is based upon the number of claims held by each mine owner, the age of the claim, and the size of each claim (40 acres or 160 acres). As illustrated below, total state claim rental payments in 2014 are estimated to be approximately $298,000, and assuming these claims are still held by the existing owner, it is anticipated the owners of these claims will provide the state $637.0 million in 2025. State rental claim payments in 2035 are anticipated to be the same as in 2025.

Table 7-19 Select Annual Claim Rental Projections

Mining Project	2014	2025	2035
Arctic	$245,000	$476,000	$476,000
Bornite	$0	$0	$0
Sun	$48,000	$156,000	$156,000
Smucker	$5,000	$5,000	$5,000
Total	$298,000	$637,000	$637,000

7.6.4 Production Royalty

The estimation of production royalty payments to the State of Alaska relied on the estimated corporate income taxes paid by the Arctic Mine over the life of the project ($158.0 million). It was assumed that the operation would fall within the 9.4 percent tax bracket, which implies a total taxable net income of $1.7 billion over the life of the project. The estimated total taxable net income was subsequently multiplied by the production tax rate of 3 percent to arrive at the estimated production royalties provided in **Table 7-20** below. The Bornite Mine will not have any production royalty payments to the state since this mine would not be located on state lands.

Table 7-20 Production Royalty Payment Estimates, LOM

Mining Project	Estimated Taxable Net Income	Production Royalty Estimates
Arctic	$1,680,851,000	$50,426,000
Bornite	na	Na
Sun	$546,351,000	$16,391,000
Smucker	$382,400,000	$11,472,000
Total	$2,609,602,000	$78,289,000

na = not applicable.

7.6.5 State Fuels Tax

The Arctic Mine is anticipated to purchase $14.7 million in fuel at the price of $1.19/liter. This is equivalent to 12.5 million liters or 3.3 million gallons of fuel over the life of the project. Assuming the current fuel tax rate of $0.08 per gallon, the Arctic Mine is anticipated to pay $261,000 in fuel taxes to the state over the

LOM. The quantity of fuel used by the Arctic Mine equates to 0.01 gallons per ton of the mine's estimated resources. Therefore, it was assumed that the other prospective District mines will also use 0.01 gallons per ton of their respective estimated resources, and this ratio was used to determine the total amount of fuel used by each mine. The tax rate of $0.08 per gallon was assumed to estimate each mine's fuel taxes provided in **Table 7-21**.

Table 7-21 Fuel Tax Payment Estimates, LOM

Mining Project	Fuel Tax Payments
Arctic	$261,000
Bornite	$936,000
Sun	$133,000
Smucker	$69,000
Total	$1,400,000

7.6.6 AIDEA Toll Payments

It is necessary for AIDEA to collect sufficient toll payments to recover the cost of AMDIAR construction, operation, and maintenance and the cost of their debt financing. Total AMDIAR construction costs are estimated to be between $304.9 and $346.5 million (see **Table 6-1**), while total operating and maintenance costs are estimated to be $270 million over the life of AMDIAR, or a total of between $574.9 and $616.5 million (in 2014 dollars). Assuming the current municipal bond yield of 2.75 percent on 30-year municipal bonds[147], the total cost of these funds to AIDEA would be $270.0 to $289.5 million. Therefore, the total cost of construction, operation, and maintenance, and the cost of funds for AIDEA, would be between $844.9 and $906.0 million over the 30-year life of AMDIAR.

It is anticipated that a 4.0 percent loan on the project's construction would be sufficient to account for the yield on a 30-year municipal bond. Assuming a 4.0 percent loan with a 30-year term, AIDEA would receive between $413.2 and $443.0 million in interest from road users over a 30-year period. In addition to this interest, road users would also repay AIDEA for the construction, operation, and maintenance of AMDIAR as described above ($574.9 to $616.5 million). Consequently, this analysis estimates that AIDEA would collect between $988.1 million and $1.1 billion of toll payments over the 30-year life of AMDIAR.

In consideration of AIDEA's expenditures and gross revenue from expected tolls, the total net revenue of AMDIAR is between $143.2 and $153.5 million over the 30-year life of AMDIAR and the project exhibits a net present value of $84.3 to $90.4 million assuming a discount rate of 3.9 percent.[148]

7.6.7 Payments to Local Governments

As previously described, this analysis uses historical data on PILT payments to the NWAB by Teck Alaska for the Red Dog operation to estimate future payments from mining operations within the borough. Actual future PILT payments to the NWAB will rely on a number of factors and considerations. Despite this, it is reasonable to assume future PILT payments by additional mining operations will be similar to existing Red Dog Mine payments. Historical Red Dog PILT payments in **Table 7-22** have been escalated to reflect the value of anticipated PILT payments in 2014 dollars.

[147] Bloomberg, January 15, 2015, US Government Bonds: US Municipal Bonds, Website (http://www.bloomberg.com/markets/rates-bonds/government-bonds/us/) accessed January 15, 2015.

[148] US Office of Management and Budget, Circular A-94 Appendix C, Website (http://www.whitehouse.gov/omb/circulars_a094/a94_appx-c) accessed January 15, 2015.

Table 7-22 Historical Red Dog PILT Payments and Estimated Future PILT Payments

Historical Red Dog Payments			Future Mining Project NWAB PILT Payments		
Year	Annual PILT	Cumulative Nominal	Year	Annual PILT (2014 $)	Cumulative (2014 $)
1991	$3.8	$3.8	1	$6.5	$6.5
1992	$1.2	$4.9	2	$1.9	$8.4
1993	$1.4	$6.3	3	$2.2	$10.6
1994	$1.6	$7.8	4	$2.5	$13.1
1995	$1.8	$9.6	5	$2.7	$15.8
1996	$2.0	$11.5	6	$2.9	$18.7
1997	$3.7	$15.2	7	$5.5	$24.2
1998	$2.5	$17.8	8	$3.7	$27.9
1999	$2.9	$20.7	9	$4.2	$32.1
2000	$3.5	$24.2	10	$5.0	$37.1
2001	$4.4	$28.5	11	$6.1	$43.2
2002	$4.2	$32.7	12	$5.7	$48.9
2003	$4.8	$37.5	13	$6.3	$55.2
2004	$5.9	$43.4	14	$7.6	$62.8
2005	$6.1	$49.5	15	$7.7	$70.5
2006	$6.3	$55.9	16	$7.7	$78.1
2007	$8.6	$64.5	17	$10.2	$88.4
2008	$10.9	$75.4	18	$12.4	$100.7
2009	$6.7	$82.1	19	$7.5	$108.2
2010	$6.2	$88.3	20	$6.8	$115.0
2011	$9.7	$98.0	21	$10.3	$125.4
2012	$13.0	$111.0	22	$13.6	$138.9

Sources: Red Dog Mine Extension, Aqqaluk Project Final Supplemental EIS, October 2009, Prepared by Tetra Tech, Website (http://dnr.alaska.gov/mlw/mining/largemine/reddog/pdf/rdseis2009vol1.pdf) accessed December 3, 2014.

NANA Regional Corporation. 2010. Red Dog by the Numbers. NANA Regional Corporation, Website (http://nana.com/regional/resources/red-dog-mine/red-dog-faq/), accessed November 14, 2014.

Bureau of Labor Statistics, Consumer Price Index, Website (http://www.bls.gov/cpi/data.htm) accessed November 14, 2014.

7.7 Out-Migration Effects

It is difficult to quantify how additional employment opportunities may affect study area residents migration decisions; however, research suggests that employment opportunities play a central role in a person's decision to move or to stay in a region. Research conducted as part of the Red Dog Aqqaluk Extension EIS found that out-migration rates from the NWAB for Teck Alaska employees (15 percent to over 25 percent annually) was slightly higher than for other NWAB groups, including students, the self-employed, and the unemployed (each with 7 percent to 14 percent rate of migration annually).

The source for a slightly higher rate of out-migration is uncertain, but could be related to the ease with which Red Dog Mine employees can commute from Anchorage.[149] The Long Distance Commuting (LDC) Program at the Red Dog Mine provides free transportation between Anchorage (and other villages) to the mine site. Recent international migration research finds that economic development in an area reduces out-migration, but only after countries reach upper middle incomes.[150] Therefore the impacts of economic development may not be realized until incomes within the NWAB reach this income threshold. Nonetheless, the effects of mine development upon out-migration warrant further evaluation to understand the long-term effects of economic development. In the absence of employment alternatives and given the need for income, NWAB and YKCA residents will benefit from the perspective of at least having employment alternatives. Local employment alternatives would provide area residents the ability to work locally and, if they so desired, to remain in the region.

7.8 Regional Native Corporation Gravel Sales

The construction of AMDIAR will require 23.6 million cubic yards of material for a total cost of $160.2 million, which includes labor and the material expense.[151] Based on the Arctic PEA, it is assumed the ratio of labor to material for the mine access road is 28 percent. This ratio was used to estimate that of the total $160.2 million in material cost, $44.9 million will be for labor and $115.4 will be for the outright purchase of material. The proportion of this material to be sourced from Native-owned lands was provided by DOWL HKM, which estimated that 64 percent of road material will be sourced from State of Alaska lands ($73.8 million)[152], while 36 percent will be acquired from federal or Native-owned lands ($41.5 million).

Further refinement of the proportion of material expenditures going to the federal government or Native corporations was based on the number of potential federal borrow sites (5 BLM sites) and those borrow sites located on Native lands (11 sites).[153] Given that five sites, or 31 percent, of the total 16 federal/Native borrow sites are federally owned, it was assumed that 31 percent of the total $41.5 million spent on material, or $13.0 million, would be for material owned by the federal government. Eleven of the total 16 federal/Alaskan Native borrow sites, or 69 percent of the total federal/Alaskan Native borrow sites, are Alaskan Native owned. Therefore, it is assumed that 69 percent of the total $41.5 million spent on material from federal/Alaskan Native borrow sites, or $28.6 million, will go to Alaskan Native entities.

In summary, during construction of AMDIAR, it is estimated that material sales will generate $73.8 million for the State of Alaska, $28.6 million for Native corporations, and $13.0 million for the federal government.

[149] Haley, Sharman, Fay, Ginny, Griego, Hannah and Ben Saylor, Red Dog Mine Extension Aqqaluk Project, Appendix G Social Conditions, Institute of Social and Economic Research, Website (http://www.iser.uaa.alaska.edu/Publications/8%28a%29/background%20info/RedDog-Appendix_G.pdf) accessed December 5, 2014.

[150] Clemens, Michael, March 2014, Does Development Reduce Migration, Working Paper 359, Center for Global Development, Website (http://www.cgdev.org/sites/default/files/does-development-reduce-migration_final_0.pdf) accessed December 5, 2014.

[151] Weglinski, Gene, DOWL HKM, Personal Communication with Lee Elder, Cardno, October 23, 2014.

[152] The state could possibly waive the royalty fee for materials excavated from state land. If this occurs then state revenue from gravel sales would be zero rather than the $73.8 million reported here.

[153] Weglinski, Gene, DOWL HKM, Personal Communication with Lee Elder, Cardno, November 6, 2014.

APPENDIX

A

PCE RATE CALCULATION EXAMPLE

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Appendix A

Table A-1 provides an example of the PCE rate calculation for Allakaket/Alatna. As illustrated in **Table A-1**, the PCE rate of $0.5524 as reported in row "I" relies on multiple factors. Fuel power costs factor into the PCE rate calculation provided in row B; therefore a change in diesel fuel prices will affect the PCE rate, which has implications on consumer electricity expenditures and ultimately PCE program expenditures within the study area.

Table A-1 Allakaket/Alatna Power Cost Equalization Rate Calculation Example, FY 2013

	Rate ($/kWh)	Amendment to Allowable Costs	
A. Non-Fuel Power Costs	$0.3178	NON-FUEL COSTS (A)	
B. Fuel Power Costs	$0.4067	Allowable Non-Fuel Costs	$1,013,342
C. Total Power Costs (A+B)	$0.7245	Twelve Month Total kWh Sales	3,194,164
D. Total Costs less Base Rate 0.143/kWh	$0.5815	Regulatory Cost Charge (RCC)	$0.000578
E. 95% of D	$0.5524	Total Non-Fuel Power Costs	$0.3178
F. Statutory Maximum (1-0.143*0.95)	$0.8142	FUEL COSTS (B)	
G. Lesser of E or F	$0.5524	Current Fuel Price	$6.10
H. Customer Class Rate (see below)	$0.6283	Estimated Fuel Consumption (gallons)	13,634
I. Power Cost Equalization (Lesser of G or H) Assumes full program funding	$0.5524	Purchased Power	0
Calculation of Average Customer Class Rate (H)*		Estimated kWh Sales	140,672
		Balancing Account Balance	($25,960)
		Total Fuel Power Costs	$0.4067
Rate	$0.3391	**Surcharge Calculation (K)**	
Customer Charge	$12.46	Total Estimated Fuel Power Costs	$83,167
COPA	$0.4067	Balancing Account Balance	($25,960)
RCC	$0.000578	Total	$57,207
Total Rate	$0.7713	Estimated Sales	140,672
Total	$385.64	Projected Cost of Power	$0.4067
Average Rate	$0.7713	Base Cost of Power	$0.0000
Average Rate less base rate	$0.6283	Cost of Power Adjustment (COPA)	$0.4067

*The Customer Class Rate is the ((((Energy Rate + COPA + RCC)*500kWh) + Customer Charge)/500kWh) - PCE Base

Source: Regulatory Commission of Alaska, May 2, 2013, TA828-2, Alaska Power Company Validated Tariff Sheets, Website (http://rca.alaska.gov/RCAWeb/ViewFile.aspx?id=282C7F6B-6FCA-410E-B537-2EBCBD24A8DC) accessed November 22, 2014.