FINAL

ENVIRONMENTAL ASSESSMENT

FOR A

COMBINED POWER AND BIOMASS HEATING SYSTEM

FORT YUKON, ALASKA

U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
GOLDEN FIELD OFFICE

In Cooperation with

USDA RURAL UTILITIES SERVICE

DENALI COMMISSION

APRIL 2013

ABBREVIATIONS AND ACRONYMS

ADEC	Alaska Department of Environmental Conservation
AFRPA	Alaska Forest Resources Practices Act
BFE	Base Flood Elevation
BMP	best management practice
BTU	British Thermal Unit
CATG	Council of Athabascan Tribal Governments
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CHP	Combined Heat and Power
CO	carbon monoxide
CO_2	carbon dioxide
CWA	Clean Water Act
dBA	A-weighted decibel
DBH	diameter at breast height
DOE	U.S. Department of Energy
EA	Environmental Assessment
EFH	Essential Fish Habitat
EO	Executive Order
°F	Degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
GHG	greenhouse gas
GZC	Gwitchyaa Zhee Corporation
GZGTG	Gwitchyaa Zhee Gwich'in Tribal Government
GZU	Gwitchyaa Zhee Utility Company
kVA	kilovolt-ampere
kW	kilowatt
mg/m^3	milligram per cubic meter
NEPA	National Environmental Policy Act
NFS	Non-Frost Susceptible
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NO_X	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
O_3	Ozone
OSHA	Occupational Safety and Health Administration
Pb	Lead
$PM_{2.5}$	particulate Matter equal to or less than 2.5 microns in diameter
PM_{10}	particulate Matter equal to or less than 10 microns in diameter
ppb	parts per billion
ppm	parts per million
PSD	Prevention of Significant Deterioration
RCA	Regulatory Commission of Alaska
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasure
SWPPP	Storm Water Pollution Prevention Plan
TCC	Tanana Chiefs Conference
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
$\mu g/m^3$	microgram per cubic meter
VOC	volatile organic compound

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1. Introduction

The Council of Athabascan Tribal Governments (CATG) has been selected to receive Federal funding through the U.S. Department of Energy (DOE) to implement a community combined heat and power (CHP) plant to be constructed by the Gwitchyaa Zhee Utility Company (GZU). GZU, which is owned and operated by the Gwitchyaa Zhee Corporation (GZC), also has been selected to receive financial assistance for the proposed project via grants from the Denali Commission and the U.S. Department of Agriculture Rural Utilities Service (RUS) High Energy Cost Grant Program. As part of the decision-making process, DOE, in cooperation with RUS and the Denali Commission, is conducting an analysis to determine the potential environmental impacts of providing funding to purchase equipment and develop a CHP Plant and district energy system, harvest biomass for use at that plant, and conduct other activities associated with the development and operation of the CHP plant. DOE is the lead Federal agency for the development of this Environmental Assessment (EA), in accordance with 40 Code of Federal Regulations (CFR) § 1501.3. RUS and the Denali Commission have jurisdiction by law and special expertise applicable to the EA effort, as defined at 40 CFR §§ 1508.15 and 1508.26 respectively.

The proposed Combined Power and Biomass Heating System (hereafter also called the proposed project) involves the construction of a new CHP plant containing a diesel-fueled electrical generation plant with a heat recovery system and a high efficiency boiler fired by wood chips, a wood chip storage area, a shop to protect and work on equipment, biomass harvesting equipment, and a district heating loop to distribute heat to local buildings. The proposed CHP plant would replace the existing diesel-fueled power plant in Fort Yukon, and offset 80 to 100 percent of the diesel fuel oil currently used to heat buildings to be served by the heat distribution system. To provide fuel for the new boiler, approximately 1,600 to 2,000 green tons of woody biomass would be harvested each year from surrounding private lands owned by GZC. Operation of the proposed Combined Power and Biomass Heating System would help stabilize volatile fuel prices and provide economic development in Fort Yukon through the development of a local wood products industry.

1.1 Project Location

Fort Yukon is an incorporated community located at the confluence of the Yukon River and the Porcupine River (see **Figure 1-1**), approximately 145 air miles northeast of Fairbanks, Alaska. The community is 8 miles north of the Arctic Circle, at approximately 66° 34’ N Latitude, 145° 16’ W Longitude, and lies at an elevation of 427 feet above mean sea level.

As part of the Alaska Native Claims Settlement Act, the GZC owns approximately 215,000 acres of land in the vicinity of Fort Yukon. Of this, 161,280 acres of land are forested with boreal forest systems and flat topography. A network of wetlands, streams, rivers and lakes is located throughout the forest. Fort Yukon lies within the village boundary of the GZC, which is a part of the Doyon Native Corporation region.

The Gwitchyaa Zhee Gwich’in Tribal Government (GZGTG) serves as the traditional government of Fort Yukon, and is a member of the CATG. The CATG is a consortium of 10 Gwich’in and Koyukon Athabascan tribes settled in Alaskan Native villages in the Yukon Flats region of east-central Alaska. Fort Yukon has a population of approximately 580-700 people and is located in the Fairbanks Recording District, within the Yukon Koyukuk Census Area.

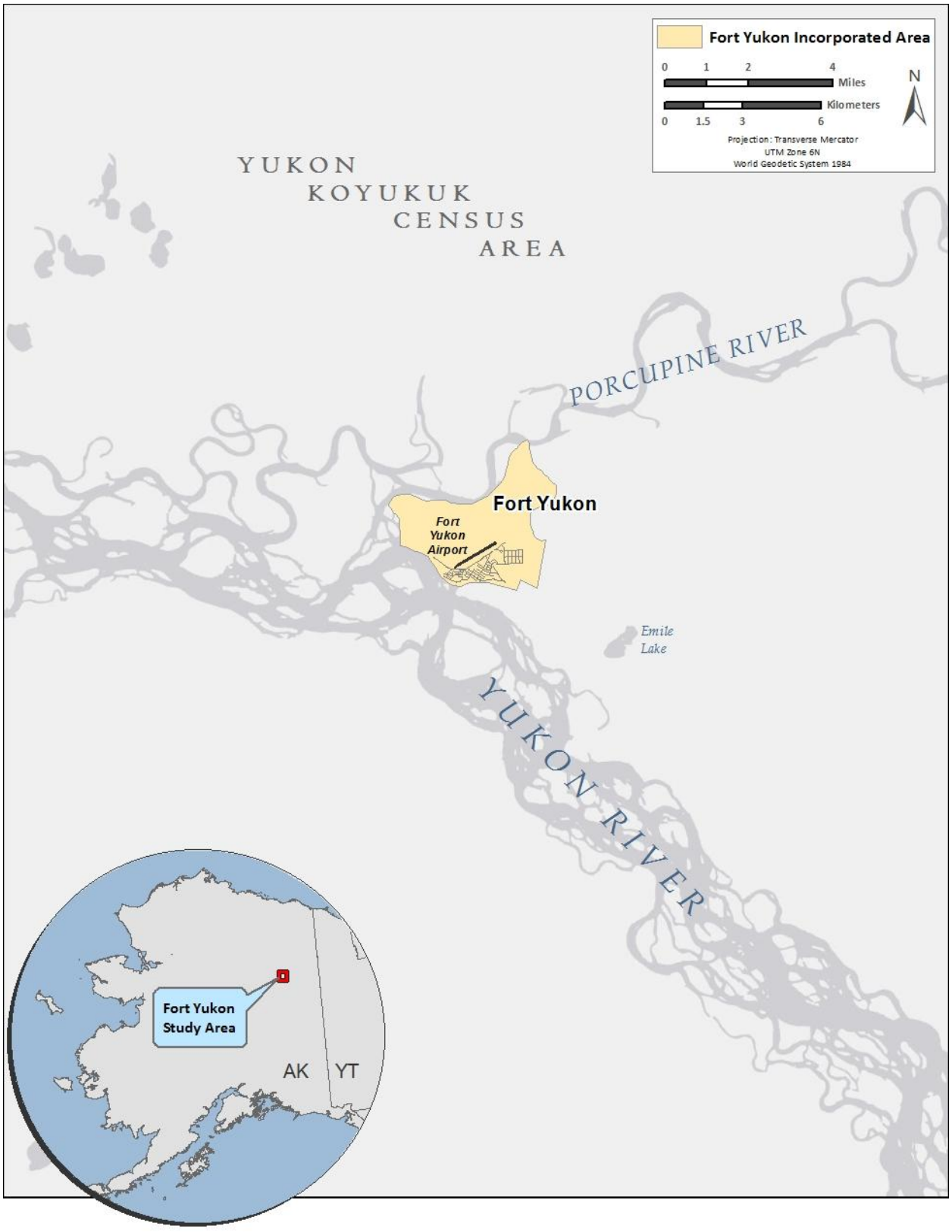

Figure 1-1. Fort Yukon Vicinity Map

Transportation to Fort Yukon is by air year-round, and by barge, during the summer. Heavy cargo is brought in by barge from May through September; there is a barge off-loading area but no dock. The State of Alaska owns and operates a lighted, gravel airstrip in the community.

1.2 Purpose and Need

The purpose of DOE's Proposed Action is to allow the expenditure of Federal grant funds through the Tribal Energy Program for biomass processing and the design and installation of the biomass boiler and heat distribution system at the CHP Plant, and through an award set aside for training, technical support, and harvesting planning (Funding Opportunity Announcement DE-PS36-08GO9802). DOE's Tribal Energy Program, under the Office of Renewable Energy and Energy Efficiency, provides financial and technical assistance that enables tribes to evaluate and develop their renewable energy resources and reduce their energy consumption through efficiency and weatherization. The program also offers education and training opportunities designed to foster clean energy technology adoption, promote green jobs and growth, and strengthen native communities.

Specifically, the Tribal Energy Program's mission is to provide financial and technical assistance to tribes through government-to-government partnerships that:

- Enable tribal leaders to make informed decisions about energy choices
- Bring renewable energy and energy efficiency options to Indian Country
- Enhance human capacity through education and training
- Improve local tribal economies and the environment
- Make a difference in the quality of life of Native Americans.

The need for DOE's Proposed Action is to support the deployment of renewable energy heat and/or power solutions, including the hybridization of existing diesel power systems, in Native Alaskan villages for the specific purpose of reducing fossil fuel consumption. Construction of a CHP plant in Fort Yukon, and the harvesting and use of biomass to support that system would support DOE's mission to reduce the nation's dependency on fossil fuels and meet the provisions set forth in the Energy Independence and Security Act of 2007 by facilitating the use of renewable energy resources (local biomass) and providing Fort Yukon a new efficient power source for heating and electricity. The community currently uses old, inefficient diesel generators to generate electricity. The proposed Combined Power and Biomass Heating System would include new high efficiency diesel generators and also house a wood-fired boiler that would produce up to 3.2 million British Thermal Units (BTUs) per hour. The heat produced from the boiler would reduce the commercial end-users' diesel fuel oil consumption by 80-100 percent. In addition, the new CHP plant would replace an existing power plant in Fort Yukon, which, as described in Section 2.3, is inefficient and in need of substantial repairs.

RUS's Proposed Action will allow the expenditure of Federal grant funds for the installation of the CHP Plant through the purchase and installation of diesel generators, the biomass boiler, heat recovery systems, and associated infrastructure under the agency's High Energy Cost Grant Program (Catalog of Federal Domestic Assistance - CFDA 10.859). The High Energy Cost Program, authorized under Section 19 of the Rural Electrification Act of 1969 (7 U.S.C. 918a), provides grant funds to acquire, construct, extend, upgrade or otherwise improve energy generation, transmission, or distribution facilities serving communities with average home energy costs exceeding 275 percent of the national average. Grant funds may be used for on-grid and off-grid renewable energy projects, energy efficiency and energy conservation projects serving eligible communities.

The Denali Commission's Proposed Action will allow the expenditure of Federal grant funds to upgrade the rural power system and expand alternative and renewable energy infrastructure in Fort Yukon. The

mission of the Denali Commission is to partner with tribal, Federal, state, and local governments and collaborate with all Alaskans to develop basic public infrastructure and enhance the quality of life in Alaska's communities. This action is needed to modernize and develop strong infrastructure and promote sustainability of rural Alaska communities.

1.3 Organization and Objectives of this EA

This chapter explains the purpose and need for the Proposed Action (**Section 1.2**), the requirements of the National Environmental Policy Act (NEPA) and other applicable regulations (**Section 1.3**), and the public involvement process followed during development of the EA (**Section 1.4**). **Chapter 2** discusses DOE's and the cooperating agencies Proposed Actions, the proposed project, and the No Action Alternative. **Chapter 3** describes the affected environment and the potential environmental consequences of the proposed project and the No Action Alternative. **Chapter 4** discusses cumulative impacts.

1.3.1 National Environmental Policy Act

NEPA (42 United States Code [U.S.C.] 4321 et seq.), is a Federal statute requiring the identification and analysis of potential environmental impacts associated with proposed Federal actions before those actions are taken. This requirement applies to decisions about whether to provide different types of Federal financial assistance to recipients. The intent of NEPA is to help Federal agency officials make well-informed decisions based on an understanding of the potential environmental consequences and take actions to protect, restore, or enhance the environment. NEPA established the Council on Environmental Quality (CEQ) that was charged with the development of implementing regulations and ensuring Federal agency compliance with NEPA. The CEQ regulations mandate that all Federal agencies use a prescribed, structured approach to environmental impact analysis. This approach also requires Federal agencies to use an interdisciplinary and systematic approach in their decision-making process. This process evaluates potential environmental consequences associated with a Proposed Action and considers alternative courses of action.

This EA is being conducted in accordance with NEPA; CEQ implementing regulations; and the NEPA implementing regulations of DOE (10 CFR Part 1021), RUS (7 CFR 1794); and the Denali Commission. Federal agencies must evaluate the purpose and need, reasonable alternatives, and the potential environmental impacts of any Proposed Action that could have a significant impact on human health and the environment, including decisions on whether to provide financial assistance to government agencies and private entities. In compliance with these regulations, this EA:

- Examines the potential direct and indirect environmental impacts of the Proposed Action and the No Action Alternative
- Identifies unavoidable adverse environmental impacts of the Proposed Action
- Discusses the relationship between local short-term uses of the human environment and the maintenance and enhancement of long-term productivity
- Characterizes irreversible and irretrievable commitments of resources that would be involved if DOE and its cooperating agencies approved the Proposed Action
- Analyzes past, present, and reasonably foreseeable actions to evaluate potential cumulative impacts.

Federal agencies must meet the requirements of NEPA before making a final decision to proceed with a proposed Federal action that could cause significant impacts to human health or the environment. This

EA provides DOE, the cooperating agencies, and other decision makers the information necessary to make an informed decision about the construction and operation of the proposed project in Fort Yukon. For purposes of comparison, this EA also evaluates the impacts that could occur if the Federal agencies did not authorize funding (the No Action Alternative), under which it is assumed in this EA that the community would not proceed with the proposed project.

1.3.2 Integration of Other Environmental Statutes and Regulations

NEPA is the planning and decision-making process for actions proposed by Federal agencies that involve a study of other relevant environmental statutes and regulations. The NEPA process, however, does not replace procedural or substantive requirements of other environmental statutes and regulations. It addresses them collectively in the form of an EA or Environmental Impact Statement, which enables the decision maker to have a comprehensive view of major environmental issues and requirements associated with the Proposed Action and its alternatives. According to CEQ regulations, the requirements of NEPA must be integrated "with other planning and environmental review procedures required by law or by agency so that all such procedures run concurrently rather than consecutively" (40 CFR Part 1500.2(c)).

In addition to complying with NEPA, CEQ regulations (40 CFR Parts 1500-1508), and relevant agency NEPA implementing regulations, this EA also addresses all applicable laws and regulations, including but not limited to the following:

- Energy Policy Act of 2005
- National Historic Preservation Act (NHPA)
- Archeological Resources Protection Act
- The Noise Control Act of 1972, as amended
- Environmental Justice (Executive Order [EO] 12898)
- Clean Air Act
- Clean Water Act (CWA)
- Coastal Zone Management Act
- Protection of Wetlands (EO 11990)
- Floodplain Management (EO 11988)
- Endangered Species Act
- Pollution Prevention Act
- Resource Conservation and Recovery Act
- Comprehensive Environmental Response, Compensation and Liability Act.

1.3.3 Scope of the Analysis

The EA examines potential effects of the Federal agencies' Proposed Action of funding construction of the CHP plant, the proposed project of constructing and operating the CHP plant and harvesting biomass for use at that plant, and the No Action Alternative on eleven resource areas: geology and soil resources, water resources, biological resources, air quality, noise, land use, cultural and historic resources, socioeconomics and environmental justice, transportation, hazardous materials and waste, and human health and safety. These resource areas were identified as being potentially affected by the proposed project or its alternatives, and include applicable critical elements of the human environment whose review is mandated by EO, regulation, or policy.

1.4 Scoping and Public/Agency Involvement

The provisions of NEPA provide the public an opportunity to participate in the environmental review process. DOE has taken measures to maximize public consultation and input during the preparation of this EA. DOE also coordinated with Federal, state, and local agencies, and project stakeholders, as appropriate. **Appendix A** includes a distribution list of contacts that received an announcement of the intent to prepare this EA and notice of floodplain and wetlands action. DOE also posted on November 7, 2012, a scoping announcement and notice to floodplain and wetlands action on the DOE Golden Field Office Public Reading Room website (http://www.eere.energy.gov/golden/Reading_Room.aspx) to solicit comments. **Appendix B** will include all agency correspondence received.

DOE received two comments in response to the scoping announcement. The Alaska Department of Fish and Game provided comments on the potential impacts of biomass harvesting to fish and terrestrial wildlife, and identified requirements and suggested methods for reducing impacts of harvesting to wildlife. Those impacts and harvest methods are discussed in **Section 3.4**. The Alaska Department of Natural Resources requested that two additional names be added to the distribution list for this EA. Those names were added to the list presented in **Appendix A**.

A Notice of Availability of the Draft EA was published in the *Fairbanks Daily News-Miner* on February 24, 25, and 26, 2013, to solicit comments during a 30-day review period. The Notice was also displayed at the Fort Yukon post office for the duration of the review period and was sent to all contacts in the distribution list (**Appendix A**). The Draft EA was available for review at the Fort Yukon Library and the GZC and CATG offices in Fort Yukon, as well as on the DOE websites (http://energy.gov/nepa/public-comment-opportunities, and, http://www.eere.energy.gov/golden/ Reading_Room.aspx).

DOE received two comments during the Draft EA review period. The U.S Fish and Wildlife Service (USFWS) Fairbanks Fish and Wildlife Office provided comment that no listed threatened, endangered or candidate species, nor any critical habitat, occur within Fort Yukon or its vicinity. The USFWS also suggested additional methods of protecting breeding migratory birds and eagles during biomass harvesting activities. Those methods have been added to the Applicant Committed Measures described in **Section 2.2.5** and are also discussed in **Section 3.4.2**. The Alaska Department of Fish and Game commented on the requirements of the Department's Fish Habitat Permit. These requirements have been added to **Section 2.2.4.** The two Draft EA comment letters are included in **Appendix B**.

1.4.1 Community/Public Involvement

The proposed project has been under consideration for over five years, during which time there have been six facilitated community-planning meetings that included attendees from CATG, GZC, City of Fort Yukon and the GZGTG; five meetings with the GZC Board of Directors; two meetings with the GZC shareholders; and three discussion meetings that included all of the partners and the funding agencies. There have also been four open community meetings to discuss the development of the proposed project. From November 2010 to April 2011 there were monthly update conference calls with agency funders, stakeholders, and grantees.

Development of the Fort Yukon CHP plant has involved extensive community input. The cumulative result of over 50 community discussions between the local Tribal government, local utility, City of Fort Yukon, and CATG is that all entities are in agreement on moving forward with the proposed project, as described in this EA.

1.4.2 Agency Consultations

Consultations regarding the proposed project have been conducted with the USFWS in accordance with Section 7 of the Endangered Species Act and the Alaska State Historic Preservation Officer, the GZGTG, the GZC and Subsidiaries and the CATG in accordance with Section 106 of the NHPA. Copies of correspondence related to these consultations are included in **Appendix B.**

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2. Description of Proposed Action and Alternatives

This section describes the Proposed Action of DOE and the cooperating agencies, the proposed Fort Yukon Combined Power and Biomass Heating System project, and the No Action Alternative.

2.1 Agencies' Proposed Action

The Proposed Action of DOE, RUS, and the Denali Commission, is to provide Federal grant funding for the construction of the Fort Yukon Combined Power and Biomass Heating System.

The Council of Athabascan Tribal Governments (CATG) has been selected to receive Federal funding through DOE to implement a community Combined Biomass Heating System. The GZU has also been selected to receive Federal financial assistance for the proposed project via grants from RUS and the Denali Commission.

The Proposed Action in this EA is to authorize use of Federal funds by the CATG for the proposed project. DOE and the cooperating agencies have not yet authorized the expenditure of Federal funds for the construction of the project; however, DOE has authorized CATG to use a percentage of their Federal funding for preliminary activities, including the preparation of this EA and associated analyses.

2.2 Proposed Project

The goal of the Fort Yukon Combined Power and Biomass Heating System project, also referred to as the proposed project, is to create a system for producing heat and electricity that relies less on imported petroleum products and stabilizes the cost of producing heat and electricity in Fort Yukon, Alaska. To meet that goal, GZU proposes to construct a new CHP plant, district heating system, and associated infrastructure and implement a sustainable biomass harvesting program.

This project is needed to provide a reliable source of electricity and stabilize the price of heat for public and community buildings in Fort Yukon. Fuel oil costs in Fort Yukon have spiked to above $7 per gallon in the past three years, with prices as high as $10.00 per gallon in other remote communities.

The GZC holds full economic use to approximately 214,500 acres of surface estate in the Yukon Flats. The GZC's expansive forest holdings are largely commercially unused, primarily due to the lack of economically viable markets (GZC 2011). Using biomass harvested from those lands for heat production would reduce the use of fuel oil in the community and create a local wood services industry, thus creating local jobs for the underserved minority community of Fort Yukon.

The CHP plant would contain four diesel-powered generators equipped with a heat recovery system and a biomass-fueled boiler to provide heat to local buildings through a district heating system. To supply the biomass boiler with fuel, approximately 80–100 acres of forest would be harvested annually to produce approximately 1,600-2,000 green tons of wood chips. Site development for the proposed project would begin in 2013. As part of the proposed project, the existing GZU power plant would be abandoned. All fuel and other hazardous material would be removed and the fuel tanks, piping, and other infrastructure would be removed in accordance with Alaska and Federal regulations. Future plans for redevelopment of the existing plant site are not part of the scope of this proposed project.

The CHP plant would displace approximately 145,000 gallons of diesel fuel per year used to heat community and public buildings in Fort Yukon. In the first five years of the program, an estimated $4,080,000 would be saved on fuel not used in Fort Yukon. The savings would stay in the community

instead of being exported to oil delivery companies, and would pay for creating jobs, infrastructure, and maintenance and replacement of the new district heating system as needed. An additional benefit of the proposed project would be the support to develop a regional forestry and natural resource program at the CATG Natural Resources Department.

2.2.1 Construction of the CHP Plant and Distribution System

The proposed CHP plant site would be located within Block 8 of U.S. Survey 2706B, Fort Yukon Town-site Survey. The site would contain the CHP plant housing a diesel-fueled power plant and biomass–fueled boiler. Wood and wood chip processing and storage areas, a shop area to protect and work on equipment, and a diesel storage area would be located adjacent to or near the CHP plant. An underground distribution system would be installed to deliver heat to nearby public facilities (see **Figure 2-1**). GZU anticipates that it would take between 12 and 18 months to construct the CHP plant, heat distribution system, and associated infrastructure.

The CHP plant would be located on a new concrete slab within an 18-foot-tall, 3,200-square-foot, pre-engineered metal building constructed on an elevated gravel pad. That building would consist of a main generation room, a control room for primary electric distribution, a fire alarm/suppression system, and an operator's office. The main generation room would contain four electronically controlled fuel-efficient diesel generators with a total installed capacity of between 1,900 and 2,500 kilowatts (kW), which will meet current and anticipated future demands for electricity in Fort Yukon (CRW 2010). Two of the existing electronically controlled generators currently used in the GZU power plant would be relocated to the CHP plant, and two new electronically controlled fuel-efficient generators would be purchased to replace existing antiquated and inefficient equipment. The generators would be sized so that any two would have sufficient combined capacity to meet normal peak community loads (GZC 2011).

New switchgear, located in the control room, would provide automatic paralleling and load control of the four generating units to maximize generation reliability and fuel efficiency. Critical grade silencers and sound insulated dampers would attenuate noise from the plant. The cooling system would be equipped with new radiators and efficient variable speed motor controls. The CHP plant would be provided with a new fire suppression system, and new engine coolant, fuel, and lube oil piping. A new double wall aboveground fuel tank built and labeled in accordance with Underwriters Laboratory 142 standards would be located adjacent to the CHP plant. The double wall tank would be truck filled, and equipped with redundant overfill protection devices.

The heat utility system would use a combination of two heat sources, recovered heat from the diesel generators and heat generated by the biomass-fired boiler. A heat recovery system, including heat exchangers and distribution systems would be installed with the generators, and would provide approximately 25 to 35 percent of the heat for the system (GZC 2011). The boiler would be fueled with wood chips, would have a rated capacity of 3.2-million BTUs, and would augment the diesel generation recovered heat system and provide heat to meet the district heating system load. The boiler would be equipped with chip storage bins and an automatic chip feed system. The chip storage bins would be installed adjacent to the CHP plant and would hold a minimum of 5,400 cubic feet to provide a 1-week supply of chips at peak boiler firing rate. Additional chip storage of 18,000 cubic feet would be provided outside and adjacent to the boiler building to avoid chipping during the coldest winter periods. Chips would be fed from the chip bin to the boiler via a combination of hydraulically operated augers and conveyors. The chip bin would be filled either from the adjacent chip storage area using heavy equipment or from portable hook-lift chip bins filled offsite. A wood storage and processing yard would be located near the plant site.

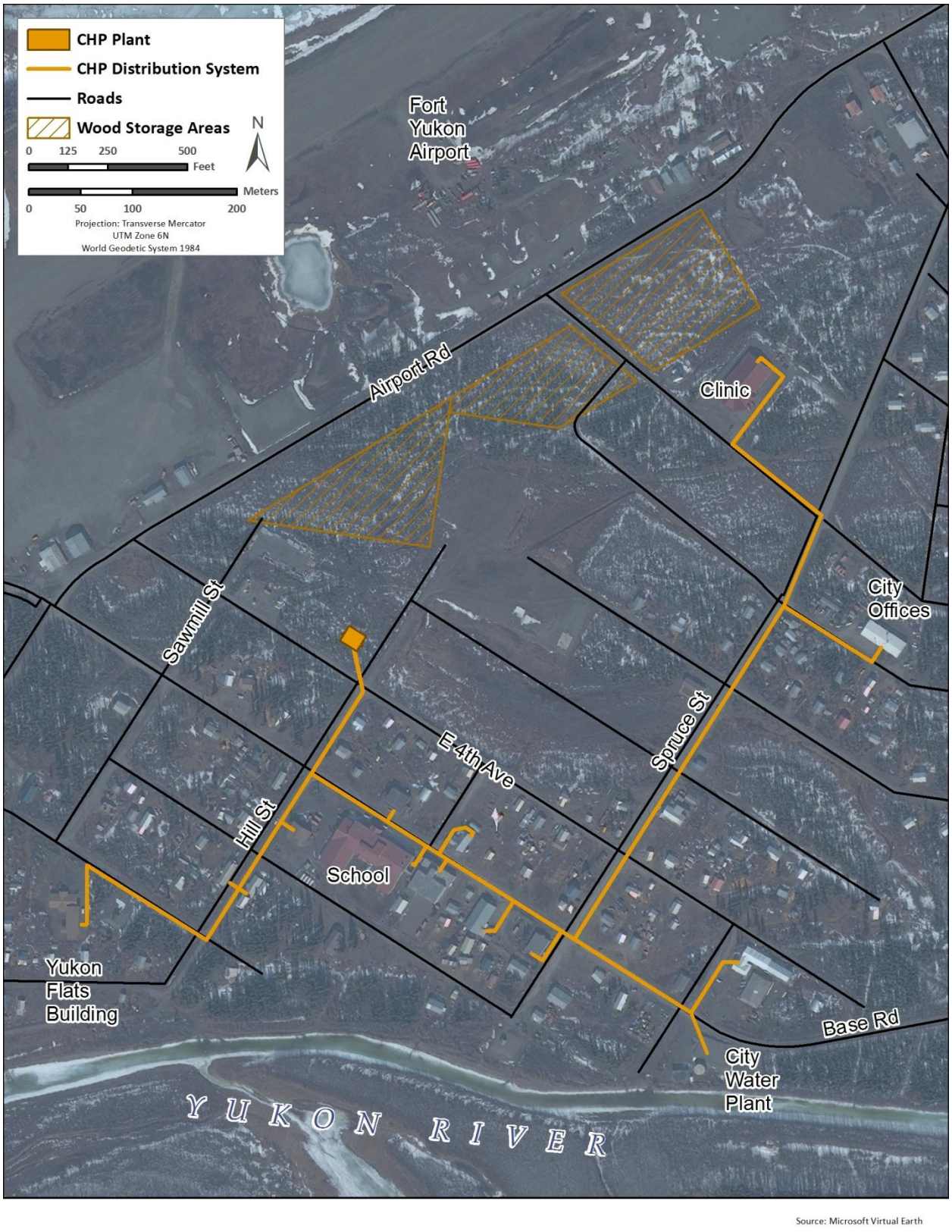

Figure 2-1. Location of CHP Plant and Distribution System

The district heating system would provide heat to public and community buildings located within the Fort Yukon community core (**Figure 2-1**). About 1.3 miles of below-grade, pre-insulated arctic piping would be installed from the CHP facility to the end-user buildings. Trenches excavated to install the piping would be located within existing road and utility right-of-ways, to the maximum extent possible. End-user buildings would be tied into the heating system via a combination of heat exchangers, fan coil units and unit heaters. Each end-user building would be equipped with a BTU energy meter for metering and recording delivered heat. The biomass heating system would offset the use of diesel oil that is currently used to fuel boilers in each of the buildings.

The CHP plant site would be located within the 100-year floodplain, and therefore would be elevated on a gravel pad above the 100-year floodplain to mitigate flood issues and to comply with Federal regulations. The gravel pad and CHP plant foundation would be designed based on geotechnical recommendations. The existing community electric distribution system would be upgraded to tie-in to the new CHP plant. See Section 3.2.2 for additional details on construction of the CHP plant and heat distribution system.

2.2.2 Biomass Harvest

As described in the *Fort Yukon Woody Biomass Fuel Implementation Plan* (RGEGR 2011), which is included as **Appendix C** of this EA, about 80 to 100 acres of forest would be harvested per year during the first 40 to 50 years of the proposed project to provide the approximately 1,600–2,000 tons of wood chips (at 25 percent moisture content) needed to operate the biomass boiler (RBEGR 2011).

For the first five years, all harvesting would take place within five miles of Fort Yukon. **Table 2-1** summarizes the size of areas to be harvested during that period, and **Figure 2-2** shows the location of those areas and the area to be used to initially store and process harvested wood during the initial years of the proposed project. For the remainder of the proposed project, biomass harvesting would occur within 10 miles of the community. Because of uncertainty in the regeneration rates of forests in the area, an adaptive management program would be implemented to monitor forest growth and update the harvest management plan (RGEGR 2011).

After harvesting, forest regeneration would focus on faster growing hardwood stands, creating a series of stands of different ages, structural diversity, and species composition that would have a higher biomass of harvestable timber than the initial, unharvested stands. The *Fort Yukon Biomass Resource Assessment* (TCC 2010) summarizes biomass stocking, timber growth, and sustainability within 5 miles of Fort Yukon, and estimates a forest regeneration rate of 50 to 90 years, depending on site quality. That study focused on the availability and harvest of slow-growing softwood species for use as saw lumber, and the regeneration rate therefore is conservative for the high quality, faster growing stands dominated by hardwoods that are to be harvested to provide fuel for the proposed project (AVI 2007). Other reports, such as a study of balsam poplar in Susitna Valley (Zazada et al. 1981) concluded that it takes an average of about 40 years for hardwood stands to regenerate to approximately 35 tons per acre standing green biomass, primarily through the growth of new shoots from stumps (i.e., coppice regeneration). For this analysis, it is conservatively assumed that the regeneration rate of harvestable biomass would be less than 20 tons per acre over 40 years, and that approximately 4,500 acres would need to be harvested for the proposed project in a 40-year biomass regeneration rotation. This represents approximately 2 percent of the total acreage of land owned by GZC in the area (TCC 2010). After that regeneration period, sufficient woody biomass would be regenerated in the harvested stands to permit a second harvest. If the regeneration rate is greater than assumed, or if additional fast growing trees are planted, the area to be harvested for the project could decrease. In contrast, additional areas might need to be harvested if the regeneration rate is lower. The regeneration rates of harvested stands would be monitored as part of an adaptive management program, and that information would be used to update and improve the harvest management plan for the project.

Table 2-1. Proposed Initial Five Year Biomass Harvest Plan

Year	Harvest Area	Acreage
Year 1	1	49
Year 1	2	83
Year 2	3	30
Year 2	4	14
Year 2	5	55
Year 3	6	32
Year 3	7	29
Year 3	8	35
Year 4	9	20
Year 4	10	31
Year 4	11	42
Year 5	12	48
Year 5	13	32

To avoid affecting soils, wetlands and aquatic areas, and to aid in the transport of harvested wood, most harvest and transportation of woody biomass would occur after freeze up of the ground and area rivers have occurred, and before break up in the spring. Timber in designated wetland areas within a stand would not be harvested, which would create a more diverse stand structure. Transport of harvested wood through wetlands would take place during winter when the ground is frozen, to limit soil impacts. Some harvest would occur during the summer season in select non-wetland areas that are dry enough to support harvest and transport without effecting soils or wetlands.

As further described in the *Woody Biomass Fuel Implementation Plan* (Appendix C), each forest stand would have a specific harvest prescription depending on the composition and age of the trees. The intent of all harvesting activities would be to ensure that appropriate regeneration occurs and that throughout the rotation, diverse stand structures as well as a mosaic of stand ages are developed across the landscape. Depending on current stand structure and age, thinning from below could occur and result in younger, small trees and older large trees left in the stand. This type of harvest would create diverse stand structure with full canopy opening in some areas and shelter wood to seed tree type stand structure in others.

A five-year harvest plan has been approved by the local Lands Committee (GZC 2011). However, because weather, water levels, ice, and resource requirement conditions are subject to change on an annual basis, the plan would be dynamic and might change to some degree on an annual basis. Therefore, the harvest plan would be updated and approved annually as necessary and would continually project out for five years. Field reconnaissance and annual planning would be required to keep the plan current and relevant to the current environmental conditions. All harvesting activities would be in compliance with the Alaska Forest Resources Practices Act (AFRPA) with special attention paid to riparian areas and wetlands.

Harvesting Methodology

Harvest, transport, and tree conversion would be integrated for the proposed project to implement a cost effective wood harvesting system. Harvesting would target mixed hardwood and softwood stands and use whole tree chipping to produce wood chips to fuel the biomass boiler.

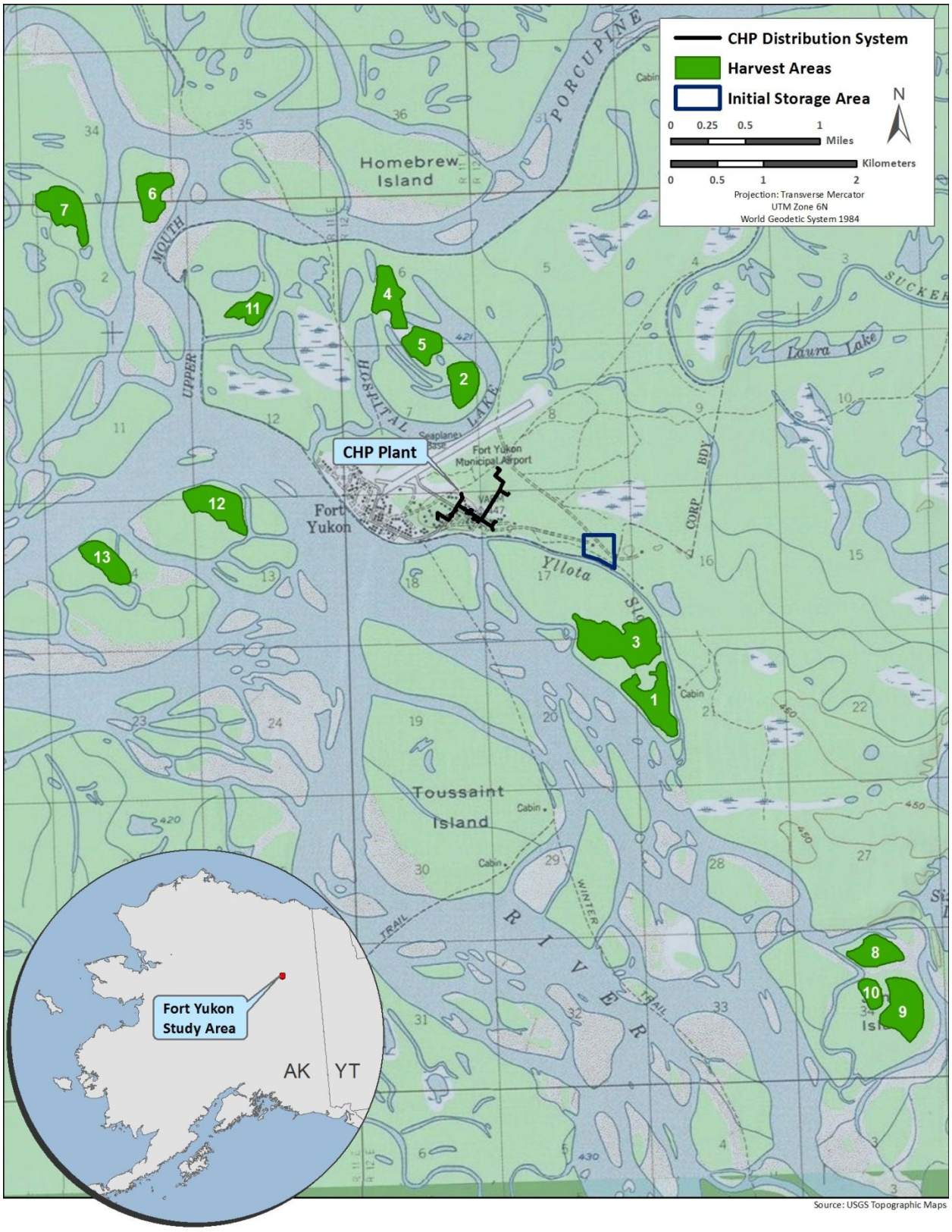

Figure 2-2. Map of Biomass Harvest Areas

The Yukon Flats ecosystem is strongly influenced by disturbance, especially forest fires, flooding, and ice scouring, and the forest therefore is a mosaic of hardwood and softwood stands of varying maturity. In general, hardwood species pioneer disturbed areas and are shade intolerant. Hardwood stands near Fort Yukon are a mix of species including cottonwood, aspen, poplar, and willow, with small amounts of softwoods such as white spruce (*Picea glauca*). Softwood stands are comprised of slower growing and shade tolerant species that replace hardwood stands. Softwood stands in the region are relatively homogenous, are dominated by white spruce, and usually have few hardwoods. Small stands of black spruce (*Picea mariana*) also occur, typically in low areas with permafrost less than 1 meter from the surface.

Because of the fast growth rate and shade intolerance of hardwoods, the management strategy employed in this project would target hardwood dominated stands with intermixed softwoods. Because hardwoods are shade intolerant, harvested stands would be opened by removing hardwoods with a diameter at breast height (DBH) of less than 14 inches and leaving larger hardwoods and patches of softwoods. Opening the canopy would increase infiltration of light on the stumps of hardwoods and promote sprouting of new hardwoods through coppice regeneration.

The equipment used for harvest would be selected based on weight and interchangeability of redundant cutting and hauling attachments. Specifically, the equipment must be able to perform the multiple functions of felling and transporting whole trees, logs, and wood chips.

The proposed harvest equipment would be capable of harvesting trees of 3-inch to 14-inch DBH. Harvesting and wood transport machines of about eight tons gross weight would be used. Gross weight refers to the total weight when the equipment is unloaded. This equipment would be capable of all harvest, processing, and delivery tasks for up to 2,000 tons of green wood per year. The wood would be allowed to dry for one year to reach moisture content of approximately 25 percent prior to chipping.

The physical weight constraints of the proposed harvesting equipment (8 ton gross weight) are due largely to the need to safely transport and operate the equipment over the river systems in the region. During ice-free periods, equipment would be transported by landing craft or barge. Similarly, the carrying capacity of the ice on these rivers and ponds during the winter also encourages the use of lighter machinery to maximize the weight in biomass that can be transported. Based on extensive studies of ice depth measured in the region (Sustainability Inc. 2012, RBEGR 2011), ice thickness during the winter months should be more than adequate to support equipment and biomass weights of up to 20 tons in a load.

The harvesting machine selected for the proposed project would be a Kubota excavator with a biomass harvester and mulcher head. The machine weighs just over eight tons. Since no permanent roads would be developed in the harvesting process, the mulching head would allow development of temporary trails by grinding stumps low to the ground. Chain saws might be used to cut timber in areas that cannot be easily reached with larger equipment; timber would be removed from those areas only during winter. Wood would be cut and loosely piled to allow air-drying for a year to reduce moisture content prior to whole tree chipping.

An agricultural bidirectional tractor adapted for forest application is proposed as the primary piece of equipment for transporting wood fuel to the community. The tractor, with various attachments, would perform a variety of tasks, including loading and unloading a clam bunk or trailer (also pulled by the tractor) to transport whole trees or logs to a staging area near the community; plowing snow or use a snow blower to maintain temporary trails during winter; and, loading trees into the chipper and hauling chips to the boiler storage site with an attached chip trailer.

The road system in this area is limited to within a short distance of the community. Economics severely limit the feasibility of road construction for the harvest activities. All travel routes would be planned in advance and no roads would be built to support harvesting activities. Temporary trails would be developed using the harvest equipment to harvest trees in the trail and to grind stumps to low levels for hauling. Similar to the forest stands, trails would be expected to regenerate to hardwood either through coppice sprouting or through planting of rooted hardwood stock. The transport of wood to the community or staging areas would occur primarily during the winter while the ground and rivers are still frozen. Trails through wetland areas would be limited and only utilized when necessary and then only during frozen periods.

The initial wood storage area shown in **Figure 2-1** would be used during the first two or more years of the proposed project to temporarily store and dry wood prior to being transported to the storage area to be located near the CHP plant. Two Quonset huts located on that site, and an enclosed shed connecting the two huts, would be used to store wood chips and to store and repair equipment. The interior and exterior of these buildings might be modified to, among other things, improve access, strengthen the structures, and create storage areas. The huts were constructed in 1956 as part of a military radar installation located at Fort Yukon. The property is now owned by GZC and the huts are being used to store recyclable material. Up to about 20 acres at that site would be cleared of vegetation and used to store and dry whole logs and to process and chip logs. Other storage areas that are closer to harvest sites to be used in future years might also be used to temporarily store and dry wood.

2.2.3 Operation of the CHP Plant

Once operational, the proposed CHP facility would generate between 3 and 3.5-million kilowatt hours of electricity annually. The new diesel power plant would provide the primary source of electric power, while the heat recovery system, chip-fed boiler, and district heating system would replace the use of individual heating systems in about 15 public and community buildings in Fort Yukon. Each of those buildings would be equipped with a BTU energy meter for metering and recording delivered heat (GZC 2011).

The heat recovered from the diesel generators combined with the heat from the biomass boiler would reduce the community's fossil fuel consumption by up to 145,000 gallons of diesel oil each year. The existing diesel oil-fired boilers in the end-user buildings would remain in place for use during very cold periods when high heat demand exceeds the capacity of the CHP facility. The existing end-user boilers would also operate as standby for maintenance periods or during unplanned system down time.

Diesel fuel for the power plant would be delivered during business hours by the local fuel vendor, stored in the power plant fuel tank, and filtered and delivered to the operating generator. Wood for the biomass boiler would be delivered either as either whole logs or wood chips. Whole logs would be chipped directly into the chip bin. Wood chips would be unloaded from portable chip bins and dumped directly into the chip bin. A feed system would move the chips from the bin to a conveyor system, which would transport the chips to the boiler burner.

Ash from the burned wood chips would be collected in a small drum and disposed of in accordance with local and state regulations. The generator and wood boiler emissions would comply with State of Alaska and U.S. Environmental Protection Agency (USEPA) emissions requirements and do not require supplementary filters or controls.

Typical maintenance activities for the proposed diesel power plant would include periodic oil and filter changes; monitoring of fuel consumption and generator operation; and, top-end and manufacturer recommended service intervals. Typical maintenance activities for the proposed wood boiler would

include emptying the ash collection drum; monitoring combustion temperature, stack temperature, fuel consumption, and boiler operation; checking boiler settings and alarms; greasing augers, gearboxes, and other moving parts; and, checking for wear on conveyors, augers, motors, or gearboxes.

The Primary Operator for the electric utility upgrades associated with the proposed project would be the GZU and the Primary Operator for the heat utility and biomass operations would be the Gwitchyaa Zhee Heat Utility, both of which are wholly-owned subsidiaries of the GZC. The Gwitchyaa Zhee Heat Utility would also be responsible for the use, day-to-day operations and long-term maintenance of the forestry equipment upon its delivery to Fort Yukon.

The Primary Operators would be responsible for the long-term sustainability of the facilities for the benefit of the local community. All project facilities would be maintained according to an Operating Plan, all manufacturers' recommendations for maintenance, and all state and Federal laws, codes and regulations governing operation. A valid Certificate of Public Convenience and Necessity for the CHP facility would be maintained by the GZU. Additionally, accounting records of the facility would conform to the Uniform System of Accounts prescribed by the Federal Energy Regulatory Commission, as modified for loan recipients of RUS. GZU rates and tariffs would be set following the procedures and policies of the Regulatory Commission of Alaska (RCA) (GZC 2011).

2.2.4 Permits and Approvals

Construction and operation of the Fort Yukon Combined Power and Biomass Heating System project would require permits and approvals from various regulatory agencies. A summary of the permits and approvals that would be required prior to construction and implementation of the system is provided below.

U.S. Army Corps of Engineers

A CWA Section 404 Permit is not required under normal silvicultural practices. However, the AFRPA requires specific best management practices (BMPs) for any harvesting operations that occur within a wetland. The majority of harvesting activities requiring operation in or crossing a wetland would be conducted when the ground is frozen and all AFRPA BMPs would be implemented.

If any abutments into the river are installed as part of the proposed project, the action might require a permit from the U.S. Army Corps of Engineers (USACE) and the state. No such abutments are anticipated for this project; however, GZC or other responsible parties will obtain this permit if plans are changed and permit is required.

Alaska Department of Fish and Game

Any activity or project that is conducted below the ordinary high water mark of a stream used by anadromous fishes, in addition to most activities within the limits of the ordinary high water mark of resident fish bearing waterbodies, requires a Fish Habitat Permit from the Alaska Department of Fish and Game, including use of wheeled, tracked, or excavating equipment or log-dragging equipment in the bed of such a stream; construction of ice bridges or roads; and pumping of water to augment ice thickness to assure safe over-ice travel. Should any qualifying activities associated with the proposed project, including use of heavy machinery, be conducted below the ordinary high water mark of a stream used by anadromous or resident fishes, a Fish Habitat Permit would, accordingly, be obtained and adhered to.

Alaska Department of Natural Resources, Division of Forestry

The AFRPA requires a Plan of Operations to be submitted to the Alaska Department of Natural Resources Division of Forestry when commercial timber harvest exceeding 5 acres in area occurs. These plans are regularly submitted by commercial operators and typically result in review and authorization to proceed within 45 days. A Plan of Operations would be prepared and submitted for the proposed project.

Alaska Department of Environmental Conservation, Division of Air Quality

The Alaska Department of Environmental Conservation (ADEC) regulates the operation of diesel power plants within the state. Power plants with the potential to emit more than 100 tons of dioxides per year (roughly equating to a diesel power plant with a generation capacity greater than 540 kW) require ADEC operating permits. Although the proposed CHP plant would not emit more than 100 tons of dioxides per year, the plant would require coverage under an ADEC Pre-approved Emission Limit permit.

Alaska Department of Environmental Conservation, Division of Water

ADEC authorizes wastewater discharges within the state. Construction of the proposed project would require coverage under, and compliance with, ADEC's General Permit for Discharges from Large and Small Construction Activities, as per the Alaska Pollutant Discharge System as authorized by the CWA. As part of the compliance, a Notice of Intent and Storm Water Pollution Prevention Plan (SWPPP) would be submitted to ADEC prior to commencement of construction activities.

Regulatory Commission of Alaska

Public utilities must obtain a Certificate of Public Convenience and Necessity from the RCA before commencement of service to the public. The certificate describes the authorized service area and scope of operations of the utility. The GZU was issued a certificate by the RCA on January 1, 1965 (CPCN #63). The RCA requires that a utility update their certificate after any major facility upgrades or operational changes. To update the certificate, the utility must complete and submit the RCA form entitled "Application for a New or Amended Certificate of Public Convenience and Necessity."

Alaska Department of Public Safety, Division of Fire Prevention

Before construction of the proposed CHP plant begins, a set of stamped construction drawings must be submitted, along with the appropriate fee, to the State of Alaska, Department of Public Safety, Division of Fire Prevention (Fire Marshal) for plan review and approval. After review and approval, the Fire Marshal issues a Plan Review Permit to verify compliance with applicable building, fire, and life safety codes. Review times depend upon the agency's work load; a typical review will take up to a month to complete.

2.2.5 Applicant Committed Measures

The proposed project would implement and use applicant committed measures and BMPs to avoid or minimize potential impacts from the construction and operation of the CHP facility and heat distribution system in Fort Yukon and biomass harvest operations. Specific applicant committed measures and BMPs that the proposed project would implement are discussed below.

CHP Facility and Distribution System

- The proposed project would use BMPs to control erosion and sedimentation at the project site. A SWPPP would be prepared for the project site in accordance with state and USEPA requirements

and a Notice of Intent would be filed. The project would comply with all Alaska Construction General Permit requirements.

- A Spill Prevention Control and Countermeasure (SPCC) plan for the new diesel fuel tank and lube oil storage area would be prepared and implemented in accordance with USEPA requirements.
- Sound attenuating devices (muffled equipment, insulated ducts, etc.) and engineering solutions would be implemented in the CHP facility to minimize emitted sound both during construction and operation activities.
- An earthen berm with native spruce trees would be constructed along the boundary of 4th Avenue to reduce noise and visual impacts of the CHP facility.
- A new 600-foot-long access road off of Airport Road would be constructed so that equipment delivering logs and wood chips to the CHP facility would not pass through the adjacent neighborhoods when entering or exiting the CHP facility.
- A perimeter fencing around the CHP facility would be constructed for enhanced security and to help prevent unauthorized access to the site.
- Construction activities, transport of biomass, and other dust-generating activities that would occur in Fort Yukon during the summer would be coordinated with the dust abatement programs that currently occur for projects within Fort Yukon, and dust reduction techniques recommended by ADEC, such as applying water or chemical suppressants, monitoring, establishing speed limits, and revegetating, will be implemented as necessary.

Biomass Harvest

As described in Section 2.2.2 and Appendix C, an adaptive management program would be developed and implemented to monitor timber regeneration and revised harvest plans based on the results of that monitoring.

The AFRPA details BMPs for the following primary forestry topics: Riparian Zone Establishment; Road Construction; Timber Harvesting; Reforestation; Forest Fire Protection; and General Provisions. Each of these sections has multiple subsections and detailed BMPs. The following is one example of many BMPs required by AFRPA for Riparian Management in the region where Fort Yukon is located. All applicable BMPs required by AFRPA would be implemented.

Private forest land adjacent to the following types of waters and located in Region III is subject to the riparian protection standards established in this subsection:

(1) along a Type III-A water body, harvest of timber may not be undertaken within 66 feet of the water body;

(2) along a Type III-B water body, harvest of timber may not be undertaken within 33 feet of the water body; between 33 feet and 66 feet from the water body, up to 50 percent of standing white spruce trees having at least a nine-inch DBH may be harvested without requiring a variation;

(3) along a Type III-C water body, harvest of timber within 100 feet of the water body must be located and designed primarily to protect fish habitat and surface water quality as determined by the commissioner with due deference to the Department of Fish and Game.

Prior to the initiation of any harvest undertaken as part of the proposed project, training on the details of the AFRPA BMPs would be conducted within Fort Yukon for the CATG Natural Resources Department, whose personnel would be responsible for enforcement of the AFRPA BMPs during all stages of harvest and reforestation. The AFRPA BMPs would be consulted and followed during all stages of the harvest and reforestation process.

To minimize impacts to nesting birds, USFWS recommendations regarding maintaining buffers around nests would be implemented. To avoid disturbing nesting migratory birds, surveys for active nests would be conducted prior to any harvesting to be conducted during the nesting season, and a 75-foot buffer would be established around active nests. Aerial or ground surveys, as appropriate, would be conducted for bald eagle nests within and surrounding harvest areas, and no harvest activities would be conducted within 660 feet of active eagle nests or within 330 feet of any inactive eagle nest.

To minimize impacts to soils and wetlands, most harvesting and hauling of wood would occur from November to March, when the ground is frozen. Harvest activities and hauling when soils are not frozen would only occur in upland areas with dry soils. No harvesting would occur in wetlands.

To protect cultural resources during harvesting, the GZC and CATG Natural Resources Department would determine if harvest areas contain sensitive tribal resources prior to harvesting a site. If such resources are determined to occur, harvesting would be excluded from the affected areas. Should any item of potential archaeological significance be discovered during development of the project area, the Alaska State Historic Preservation Office would be notified immediately. If any historically or culturally significant materials or artifacts were to be unearthed, activities would halt immediately and not resume until consultation with the State Historic Preservation Office has been completed, in accordance with 36 CFR 800.13.

2.3 No Action Alternative

Under the No-Action Alternative, DOE, RUS, and the Denali Commission would not authorize the use of Federal funds for the proposed project. As a result, CATG and GZU could delay the proposed project in its entirety as it sought other funding sources, reduce the scope of the project and continue, or abandon the project if it could not obtain other funding. If CATG and GZU did proceed without Federal financial assistance, and assuming the scope of the project remained the same, the potential impacts would be essentially identical to those this EA identifies. However, DOE's ability to achieve its objectives cited in the Funding Opportunity Announcement DE-PS36-08GO9802 would be impaired.

Although CATG might proceed with the proposed project if the Federal agencies did not authorize expenditures, for the purposes of this EA, it is assumed that the proposed project would not proceed under the No-Action Alternative. This approach provides a basis of comparison for the potential impacts of the proposed project.

Thus, under the No Action Alternative, diesel fuel oil would continue to be used to operate boilers to heat public and community buildings in Fort Yukon. Annual fuel usage would continue at current levels and not be reduced by up to 145,000 gallons annually. Additionally, the No Action Alternative would eliminate the development of a local wood products industry and diminish the potential for economic development in the community.

Fort Yukon's existing power plant consists of an aging, steel-frame structure with a galvanized metal roof and a slab-on-grade foundation. The power plant's slab-on-grade concrete foundation has experienced differential settlement and significant cracking. The building's exterior skin has multiple tears and patches. The building's roof sheathing is severely corroded, and the roof eaves have ice damage. The

roof leaks, allowing rain and snow to enter the building. The building is insulated via foil-backed fiberglass batts. Many of the batts are damaged and /or detached from the walls, which are coated with oil and soot. Lighting within the facility is very poor. The power plant has multiple clear space violations. Many of the supporting mechanical systems such as ventilation, fuel handling, and cooling are considered inadequate and due for replacement.

The existing power plant facility houses four Caterpillar generator sets, including two 475 kW Caterpillar 3456 generators, a 500 kW Caterpillar 3508 generator, and a 500 kW Caterpillar 3412 generator. The Caterpillar 3456 generators were installed new in 2010 and 2011, respectively, while the remaining units are more than 20 years old and have undergone multiple rebuilds. With the exception of the Caterpillar 3456 generators, the remaining generator sets have exceeded their intended useful service life. Similarly, the switchgear in the existing plant is outdated and incompatible with the proposed improvements.

Each generator set is cooled via a dedicated radiator; venting is provided by overhead shop doors which are manually opened and closed to regulate building temperature. A 500-gallon single wall interior day tank provides fuel to all of the engines. The day tank is filled from an exterior 21,000-gallon single wall aboveground storage tank (AST) via a pump located inside the plant. All generator sets at the plant operate at 240 volts.

Power is conveyed to the distribution system via a switchgear array located along the west wall of the plant. The existing electric distribution system is in poor condition. The entire community is served via a 2400/4160 volt overhead distribution system which is operated and maintained by the GZU. Primary voltage originates at a three-phase 1000 kilovolt-ampere (kVA) pad-mounted step-up transformer located west of the power plant. Three phase, 5 kVA class overhead high voltage lines extend to the north and south, feeding the community distribution system. The North and South lines each start as three-phase four-wire systems, but in some areas the lines branch to two-phase three-wire or one-phase two-wire systems. The North distribution line is approximately 5 miles long, while the South line is approximately 6 miles long. The North and South lines cross at East Third Street and Spruce Street. A total of 368 distribution poles and 268 service poles support the lines. Most of the poles are located on private property and are in fair to good condition.

Significant electrical deficiencies within the power plant and distribution system include the following: the switchgear and panel boards do not have placards defining protective gear requirements and flash protection distances; sections of the medium voltage switchgear have been abandoned in place, but continue to be energized; and, portions of the current distribution system consist of “driftwood” poles and many of the transformers are in poor physical condition and exhibit evidence of overheating and corrosion.

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3. Affected Environment and Environmental Consequences

All potentially relevant resource areas were initially considered for analysis in this EA. In compliance with NEPA and CEQ implementing regulations, this EA focuses on the resource areas most likely to be affected by the alternative evaluated, including geology and soil resources, water resources, biological resources, air quality, noise, land use, cultural and historic resources, socioeconomics and environmental justice, transportation, hazardous materials and waste management, and human health and safety. For each of those resources, the affected environment is first described and the environmental consequences of the proposed project and No Action Alternative are then discussed. Some environmental resources that are often analyzed in an EA have been omitted from this analysis. The basis for such exclusions is given in the section below.

3.1 Resource Areas Dismissed From Further Analysis

Groundwater

Groundwater consists of subsurface hydrologic resources. It is an essential resource that functions to recharge surface water and is used for drinking, irrigation, and industrial processes. Groundwater typically can be described in terms of depth from the surface, aquifer or well capacity, water quality, recharge rate, and surrounding geologic formations. Groundwater resources in the Yukon Flats Basin have not been studied or developed to any degree, given the abundance of surface water and the sparse human population. However, groundwater quality is generally considered to be good. Some local contamination of groundwater near Fort Yukon is related to Fort Yukon Long Range Radar Site and the former White Alice Communication Site. The U.S. Air Force is in the process of cleanup at the Fort Yukon Long Range Radar Site (USFWS 2010). There are no Sole Source Aquifers located near or around the project area.

Water to be used for operation of the CHP plant would come from the existing municipal wells and water treatment and storage system, and the proposed project would not alter groundwater hydrology or quantity. Any potential impacts to groundwater quality from the use of hazardous materials or petroleum products would be fully mitigated, and are discussed under the Hazardous Materials and Waste Management section. Therefore, this resource area is dismissed from further analysis.

Intentional Destructive Acts

DOE considers intentional destructive acts (i.e., acts of sabotage or terrorism) in all of its EAs and environmental impact statements (DOE 2006). Construction and operation of the proposed project would not involve the transportation, storage, or use of radioactive, explosive, or toxic materials. The proposed Fort Yukon Combined Power and Biomass Heating System project would not offer any particularly attractive targets of opportunity for terrorists or saboteurs to inflict adverse impacts on human life, health, or safety. Therefore, this resource area is dismissed from further analysis.

3.2 Geology and Soil Resources

3.2.1 Affected Environment

The Yukon Flats is a vast geographical basin in east-central interior Alaska encompassing over 7 million acres. The area consists of mostly flat to undulating lowlands dotted with shallow lakes, sloughs, and meandering and braided streams. Elevation is about 300 feet above mean sea level in the west and 600 to 900 feet above mean sea level in the north and east. The Yukon River is the principal drainage, dropping

only 200 feet in elevation in 300 miles as it meanders across the Yukon Flats. The lower stretches of the Yukon's tributaries are intricately braided streams with meandering channels, swelling in flood stage to cover vast areas. The Yukon Flats are surrounded by uplands consisting of river terraces, alluvial fans, and flood plain deposits that rest on bedrock. The overall topography is gently rolling. Elevations in the uplands do not generally exceed 1,200 to 1,300 feet above mean sea level (USFWS 2008).

Recent and Pleistocene Epoch (the last 160 million years) alluvial, alluvial fan, lacustrine (lake), glacial, and eolian (wind-blown) deposits cover most of the surface of the Yukon Flats Basin. Seismic data and geophysical modeling using gravity and magnetic data indicate that there may be at least 15,000 to 20,000 feet of Paleocene-Oligocene-Tertiary (65.5 million to 1.8 million years ago) sedimentary deposits in the basin (USFWS 2010).

The Yukon Flats are located at the juncture of two large fault systems, the Tintina Fault System and the Kaltag-Porcupine Fault Zone. Both fault systems are composed of a series of right-lateral faults; however, no faults classified as active have been confirmed in the Yukon Flats area. The nearest active fault is the Denali Fault located about 250 miles to the south. The last major earthquake that occurred on the Denali Fault was a 7.9-magnitude event in 2002 (USFWS 2010). More commonly, earthquakes in the vicinity of Fort Yukon typically range from 3 to 4.5 in magnitude on the Richter scale (CRW 2010).

Parent materials for soils in the area are generally well sorted floodplain terrace and alluvial fan deposits commonly associated with streams and rivers. Additionally, the Yukon Flats are underlain by fine lake sediments thought to be the result of a late tertiary lake (AVI 2007). As much as 100 feet of alluvial deposits overlie 300 feet of lake sediments. Soils are generally silty and sandy loams varying significantly depending on the stage of development, how well drained the soils are, depth of permafrost, and existence and depth of any overlying peat layer. Permafrost is discontinuous throughout the area; areas immediately adjacent to the Yukon River and associated sloughs are generally free of permafrost and support the better forest stands in the area (AVI 2007).

Soil patterns are somewhat complex owing to the randomness of parent material deposition, stream and river course scars, and associated periodic flooding. The better drained, more permafrost free soils support bottomland spruce/balsam poplar forests characterized by tall stands of white spruce and balsam poplar. The less developed and poorer drained permafrost soils support thickets of willow, alder, and birch and a variety of smaller shrubs, forbs, grasses, ferns, and mosses (AVI 2007).

Occurrence of lightning-ignited wildfire is common throughout the ecoregion, and individual burns average about 2.6 square miles in the upper Yukon Flats. Soils in this ecoregion are very susceptible to wildfire alteration, due to the relatively warm and shallow permafrost. Organic mat disturbance from wildfire can warm soils, significantly lower permafrost tables, alter soil properties and hydrology, and change vegetation composition (AVI 2007). Soil borings taken at the proposed CHP facility site indicate that the site consists of silt and fine sandy silt beneath surface organics. Frozen soil was encountered near 6.5 feet below grade in 2009 (CRW 2010).

3.2.2 Environmental Consequences of the Proposed Project

Protection of unique geological features, minimization of soil erosion, and the siting of facilities in relation to potential geologic hazards are considered when evaluating potential effects of a proposed project on geology and soil resources. Generally, adverse effects can be avoided or minimized if proper erosion-control measures and BMPs are incorporated into project development. A proposed project could have a significant effect with respect to geology and soil resources if any the following were to occur:

- Alteration of the lithology, stratigraphy, and geological structure that control groundwater quality, distribution of aquifers and confining beds, and groundwater availability
- Changes to the soil composition, structure, or function within the environment.

Construction of the CHP Plant and Distribution System

The proposed construction of the CHP plant, access road, biomass wood storage areas, and the heat distribution system would involve total ground disturbance of about 10 acres of land in Fort Yukon. The land required to accommodate construction of these facilities would be cleared and graded as needed; only pre-approved workspace would be cleared. The CHP plant would ultimately be housed on a concrete slab within a 3,200 square foot (0.07 acre) pre-engineered metal building constructed on an elevated gravel pad. The gravel pad and CHP plant foundation would be developed based on geotechnical recommendations.

The proposed CHP plant site lies below the 100-year floodplain and subsurface soils consist of predominantly frozen soils. To prevent unacceptable thaw-related settlement under building foundations, unstable soils would be removed and replaced with non-frost susceptible (NFS) structural fill prior to installation of the plant's foundation. Site preparation would include over excavation and placement of locally available 3-inch minus NFS material. The building pad area would be elevated to above the Base Flood Elevation (BFE) of 450 feet. The side slopes of the fill pad would be no steeper than a 2:1 ration and would be vegetated to reduce soil erosion. An earthen berm with spruce trees would be constructed along the southwesterly boundary of the site, along 4th Avenue, to act as a noise barrier and screen the adjacent road.

The wood storage area would be approximately 9.2 acres in size. The ice rich soils excavated and removed from beneath the proposed CHP plant location would be spread across the wood storage area and permitted to thaw. The completely thawed material would be capped with 3-inch minus NFS fill material to provide a stable surface for equipment to deliver and handle the wood, as well as for wood storage. The wood storage area finished grade would be approximately 5 feet above existing grade, above historic annual springtime flood elevations.

As part of the district heating system, below-grade, preinsulated arctic piping would be routed from the CHP facility to the end-user buildings. Work associated with the CHP plant and its distribution system would be performed within existing road and utility right-of-ways, to the maximum extent possible. Undeveloped areas along the distribution pipeline corridor would be trenched and then backfilled following pipeline installation. The pipeline would be pressure tested with water prior to being put into service, as per regulations and design specifications of the pipe.

Construction equipment to be used during site preparation for the CHP plant and related facilities would likely include backhoes, earth scrapers, motor graders, heavy haul trucks, large tractors, concrete trucks, and a concrete paver. As with almost any construction project involving the use of heavy equipment, there is some risk of an accidental fuel or chemical spill, and the potential contamination of soils. Fuel products (petroleum, oils, lubricant) would be needed to operate and fuel excavation equipment. To reduce the potential for soil contamination, fuels would be stored and maintained in a designated equipment staging area. A person(s) designated as being responsible for equipment fueling would closely monitor the fueling operation, and an emergency spill kit containing absorption pads, absorbent material, a shovel or rake, and other cleanup items would readily be available on site in the event of an accidental spill. Following these precautions, the potential for an accidental chemical or fuel spill to occur and result in adverse impacts on soils would be negligible.

The use of the construction equipment would also physically disturb underlying soils. Soil disturbance is defined as anything that causes the impairment of physical, chemical, and biological properties and processes, such as erosion, compaction, displacement, rutting, burning, loss of organic matter, and mass movement of soil (DeLuca 2001, USDA 2005). Heavy equipment results in soil compaction, reducing the porosity and conductivity of the soil. Such compaction is likely to slightly increase the amount of surface runoff in the immediate area of the CHP plant and wood storage area. Stabilization of the soils would be required to prevent sediment runoff impacts to the Yukon or Porcupine Rivers, which could possibly temporarily degrade water quality. Protection of water resources from potential surface runoff is discussed in detail in **Section 3.2.2**, Water Resources.

Soils found on relatively flat land with relatively low rates of runoff, such as those found at the proposed project location, are not extremely likely to be displaced or create a situation where large amounts of sediment run off into nearby surface waters. Nonetheless, the conversion of previously unpaved land to developed surface will result in some unquantifiable amount of soil disturbance and compaction. The impacts to soils from the proposed project construction activities are expected to be short-term and minor.

Construction of the CHP plant and other facilities would not alter any geological resources.

Biomass Harvest

Much of the annual biomass hauling would occur between November and early March, when the ground is completely frozen. Hauling over frozen ground is not anticipated to result in any impacts to underlying soils. Harvest activities and hauling when soils are not frozen would only occur in upland areas with dry soils to minimize soil rutting and compaction.

The soils within ten miles of Fort Yukon are crossed with streams, rivers, sloughs, and saturated wetlands, making those soils vulnerable to disturbance by large machinery. Only very select harvest sites and transportation routes would be utilized during summer. Inappropriately designed bank access points can become areas where increased erosion would occur. Development of all bank access points and wetlands crossings would follow the BMPs stipulated in AFRPA to eliminate potential rutting and wetland degradation.

Careful planning and timing of harvesting and hauling operations would be critical to successfully employing the AFRPA BMPs for soil conservation management in forest applications. Forest harvesting would be conducted according to pre-harvest planning designs and locations based on the annual harvest plan. Planning and close supervision of harvesting operations would be needed to protect site integrity and enhance regeneration. Special care would be taken with any summer harvesting to avoid saturated soils to the maximum extent possible.

Short-term, minor impacts on soil would occur from soil-disturbing activities associated with biomass harvesting and hauling during summer months. Soils could be compacted, which would result in a disturbance to and modification of soil structure.

No geological resources would be altered during harvesting of biomass.

3.2.3 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, there would be no change from existing conditions. Construction activities, and biomass harvesting and hauling, would not occur. No impacts on geology or soil resources would be anticipated.

3.3 Water Resources

3.3.1 Affected Environment

Fort Yukon is located at the confluence of the Yukon and the Porcupine Rivers, within the Yukon River Basin, which drains 330,000 square miles of land in northwestern Canada and central Alaska. In the vicinity of Fort Yukon, the Yukon Flats area is characterized as a relatively flat, marshy basin floor marked by flood plains, terraces, alluvial fans, and small areas of sand dunes. Many braided and meandering streams traverse the area, while numerous thaw ponds, oxbow lakes, and meander scars pattern the ground. Surface water in streams, lakes, and bogs is abundant throughout the majority of the region (AVI 2007).

Because the Yukon River drains relatively undisturbed terrain, and continuously suspends, transports, and re-deposits sediment, the Yukon River is still considered relatively pristine (USFWS 2010). However, some localized effects to water quality of the Yukon River Basin have been documented. These effects are due to atmospheric processes, gold placer mining, old military sites used during the Cold War, and sewage lagoons. Nonetheless, no waters in the vicinity of Fort Yukon are considered impaired (USFWS 2010).

Waters of the United States are defined within the CWA, as amended, and jurisdiction is addressed by the USEPA and USACE. In addition, wetlands are protected under EO 11990, *Protection of Wetlands*, the purpose of which is to reduce adverse impacts associated with the destruction or modification of wetlands. This order directs Federal agencies to provide leadership in minimizing the destruction, loss, or degradation of wetlands. **Figures 3-1** and **3-2** show the location of wetlands within Fort Yukon and its vicinity that are identified in the USFWS National Wetlands Inventory. There are no wetlands within or near the proposed locations of the CHP plant or wood storage areas, or within the areas to be disturbed for installation of the district heating system. There are, however, wetlands within or adjacent to some of the areas to be harvested.

The hydrologic cycle of the Yukon Flats occurs in a chronological order: freeze-up in the fall, declining winter flows to baseflow conditions, break-up (often with ice jams, and overbank flooding), summer flows with storm and drought events, returning to freeze-up. The timing, magnitude, and duration of the hydrologic cycle vary annually due to weather and climatic conditions. The depth of snowpack has a substantial impact on the minimum winter flow (USFWS 2010). The Yukon River and some of its tributaries are prone to flooding; the major flood hazard is from ice jams during spring break-up. Major floods due to ice jams have occurred at Fort Yukon in 1949, 1972, 1982, 1989, and 2009 (USFWS 2010). Yukon River tributaries can also flood in the summer rainy season.

EO 11988, *Floodplain Management*, requires Federal agencies to determine whether a proposed project would occur within a floodplain. DOE policy and procedures for discharging their responsibilities under the EO are described in 10 CFR 1022, *Compliance with Floodplain and Wetland Environmental Review Requirements*. The following descriptions of floodplains and wetlands, and analysis of potential impacts to those surface water features, address the requirements in 10 CFR 1022 for a floodplain and wetlands assessment.

Floodplains are areas of low-level ground along rivers, stream channels, or coastal waters, which provide a broad area to inundate and store floodwaters temporarily. This reduces flood peaks and velocities and the potential for erosion. In their natural vegetated state, floodplains slow the rate at which the incoming overland flow reaches the main water body. Floodplains are subject to periodic or infrequent inundation due to rain or melting snow. Flood potential is evaluated by the Federal Emergency Management Agency

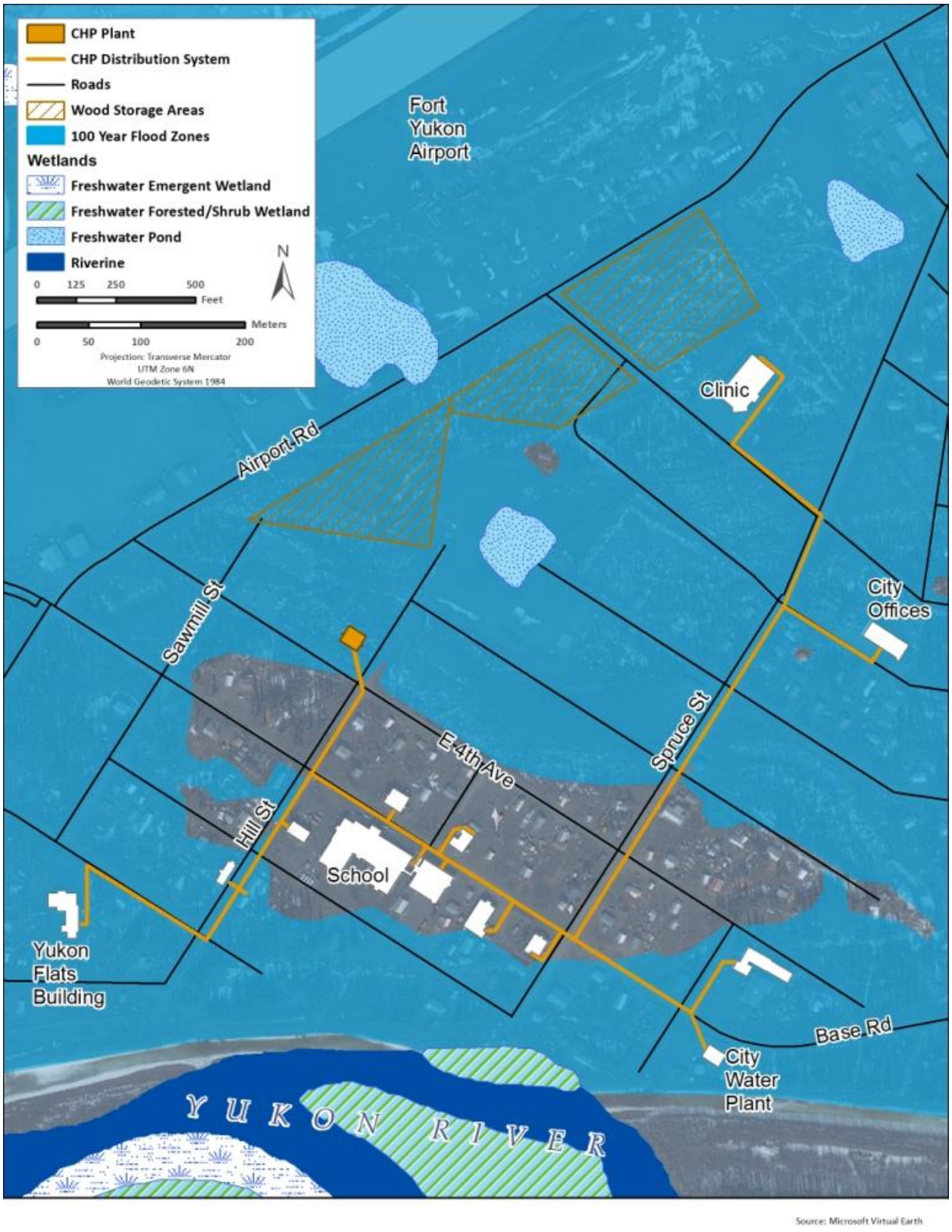

Figure 3-1. Hydrological Features in the Vicinity of the CHP Plant

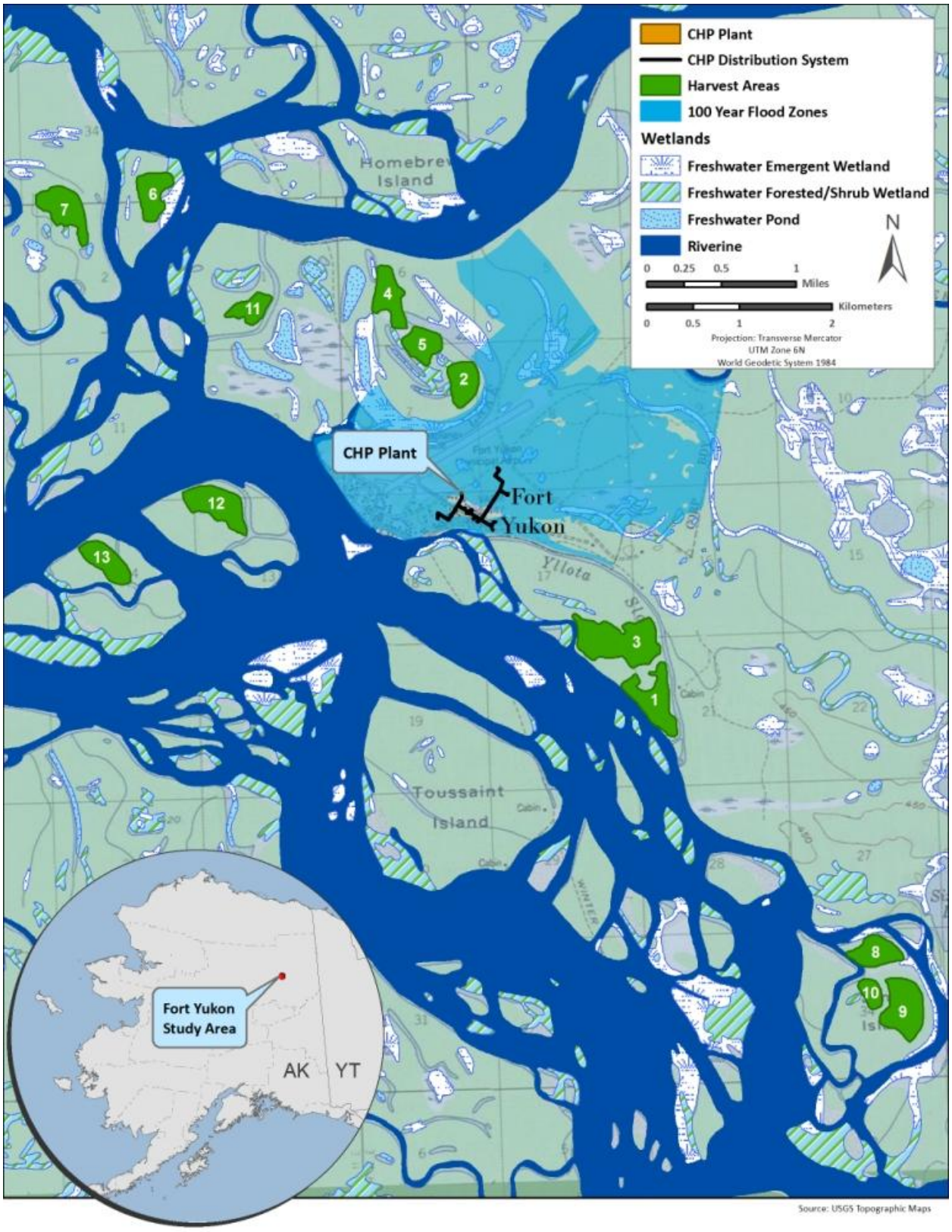

Figure 3-2. Hydrological Features in the Vicinity of the Biomass Harvest Areas

(FEMA), which defines the 100-year floodplain. The 100-year floodplain is the area that has a 1 percent chance of inundation by a flood event in a given year. Federal, state, and local regulations often limit floodplain development to passive uses, such as recreational and preservation activities, to reduce the risks to human health and safety.

According to the USACE *Alaskan Communities Flood Hazard Data*, Fort Yukon and its immediate vicinity are subject to frequent flooding from the Porcupine and Yukon Rivers. Flooding is typically a result of ice damming in mid-May (CRW 2010). **Figures 3-1** and **3-2** show the location of the 100-year floodplain in Fort Yukon and its vicinity, as defined by FEMA.

The Coastal Zone Management Act of 1972 declares a national policy to preserve, protect, and develop, and, where possible, restore or enhance the resources of the Nation's coastal zone. The Division of Coastal & Ocean Management was dissolved on July 1, 2011 with the sunset of the Alaska Coastal Management Program. Regardless, the proposed project is located in interior Alaska and is not in a Coastal Management Zone. Additionally, there are no wild and scenic rivers in Fort Yukon or its vicinity.

Potable water in Fort Yukon, and to be used at the CHP plant, is derived from two wells, and is treated and stored in an 110,000-gallon tank. A combination of piped water, water delivery, and individual wells serve households in the community. Residents use a flush/haul system, septic tanks, honey buckets, and outhouses for sewage disposal. Approximately half of all homes have plumbing. The piped water system and household septic tanks were installed in 1984 (USFWS 2010).

3.3.2 Environmental Consequences of the Proposed Project

Evaluation criteria for effects on water resources are based on water availability, quality, and use; existence of floodplains; and associated regulations. A proposed project would have significant effects on water resources if it were to do one or more of the following:

- Substantially reduce water availability or supply to existing users
- Exceed safe annual yield of water supply sources
- Substantially adversely affect water quality or wetlands
- Endanger public health by creating or worsening flooding or other health hazard conditions
- Threaten or damage unique hydrologic characteristics
- Violate established laws or regulations adopted to protect water resources.

Construction of the CHP Plant and Distribution System

General construction impacts associated with the proposed project could affect water resources by increased stormwater runoff being generated from the construction locations which could carry sediment and contamination loads into vicinity surface waters during times of heavy rain, and by contamination from construction activities infiltrating area soils and percolating down into the groundwater. Increased stormwater runoff occurs from developed sites as vegetation is removed and as the amount of impervious surface area increases. Typically, sediment erosion rates from construction sites are 10 to 20 times greater than those from agricultural lands, and 1,000 to 2,000 times greater than those of forest lands. The first flush of rains after a long dry period carries silt from exposed soils, and pollutants deposited on pavement, into surface waterbodies, posing a risk of contaminating water and harming aquatic life.

The National Pollutant Discharge Elimination System (NPDES) under the CWA prohibits the discharge of any pollutant, including sediments, to waters of the United States. Since the estimated total area of ground disturbance would be greater than 1 acre, the development phase of the project would require

coverage under USEPA's Region 10 NPDES General Permit for Stormwater Discharges from Construction Activities. ADEC is responsible for administering the USEPA NPDES program in the state. The chief components of the Alaska Pollutant Discharge Elimination System General Permit for Discharges from Large and Small Construction Activities (permit AKR100000) are a construction Notice of Intent and development and adherence to a site specific SWPPP. Both the Notice of Intent and SWPPP must be submitted to and approved by the ADEC prior to site development. SWPPPs contain measures to reduce soil erosion and prevent pollution from petroleum, oil, and lubricants, and other chemicals or hazardous/toxic materials at construction sites.

In addition to adherence to all permit stipulations, incorporation and maintenance of standard construction erosion and sediment controls, including vegetative stabilization practices, structural practices, stormwater management practices required by the site-specific SWPPP, and other controls as necessary, would occur throughout the construction phase of the proposed project. Implementation of these practices and controls would minimize erosion at the construction sites and sediment runoff to all water resources in the vicinity of the proposed construction areas.

The proposed location of the CHP plant, much of the heat distribution system, and the wood storage areas are within the 100-year floodplain. DOE floodplain regulations (10 CFR 1022) require consideration of alternative sites and actions to avoid adverse impacts and incompatible development in floodplains. Because most developed areas in Fort Yukon, including the facilities to be serviced by the heat distribution system, are within the 100-year floodplain, it would not be practicable to locate the CHP plant and other aspects of this project outside of the floodplain. Therefore, alternative locations outside of the floodplain are not a viable option. To minimize the risk of flooding, the CHP plant would be elevated on an earthen pad about 8 feet above the BFE of 450 feet. The wood storage area would also be elevated approximately 5-feet above existing grade but not above the BFE, and wood and equipment stored there could be washed away or damaged during severe flooding. However, the wood storage area would be well above historic annual springtime flood elevations. In addition, the existing drainages across the CHP plant and wood storage areas would remain at pre-construction elevations to avoid disrupting the flow of floodwaters and minimize impacts to adjacent properties.

Constructing the earthen pads for the CHP plant and wood storage would result in a small loss of floodwater storage area within that floodplain, which could cause an increase in the elevation of floodwater in the area. Any increase in the elevation of floodwater resulting from the presence of those facilities would be small, and associated impacts of flooding would be negligible, because the pads would be small relative to the size of the floodplain in the area (Figure 3-2) and because the floodplain within and near Fort Yukon is unconfined. Therefore, the proposed project would be designed to minimize potential harm to or within the floodplain, would negligibly increase the risk or severity of flooding of other properties, and would only minimally affect the natural and beneficial floodplain values in the area.

No wetlands are located within the areas proposed for development of the CHP plant, the heat distribution system, and the wood storage areas. Implementation of this alternative is not likely to have more than a minor temporary impact on water quality in the proposed project vicinity. The implementation and adherence to all permit conditions and BMPs is expected to minimize adverse impacts to water quality.

Operational impacts to water resources from the addition of impervious surface area associated with the CHP plant would be long-term and minor, as the surface area of the CHP plant would be very small relative to surrounding undisturbed areas. No impacts to potable water supplies or groundwater resources would occur. Overall impacts to water resources from implementation of the proposed project would be negligible to minor.

Biomass Harvest

Wetlands are common in the area surrounding Fort Yukon, and are present within and adjacent to some of the timber stands proposed for harvesting (Figure 3-2). Timber within those wetlands would not be harvested. To avoid disturbing soils within and adjacent to wetlands, any activities that must occur within wetlands, and the harvest and transportation of most woody biomass, would be scheduled for periods when the ground and surface waters are frozen. As required by the AFRPA, biomass harvesting during the remainder of the year would occur only in select non-wetland areas that are dry enough to support harvesting without adversely impacting soils or wetlands. In addition, only very select transportation routes would be utilized during summer and all stream-bank access points and wetlands crossings would be developed following the BMPs stipulated in AFRPA to eliminate potential rutting and wetland degradation.

A CWA Section 404 Permit from the USACE is not required under normal silvicultural practices. However, the AFRPA requires specific BMPs be implemented for any harvesting operations that occur within a wetland or other waterbody. Streamside management zones would be established adjacent to natural perennial streams, lakes, ponds, and other standing waters and saturated wetlands as required by the AFRPA. Examples of BMPs required by the AFRPA that would be observed and followed during project activities include:

- Ensure that planned harvest activities or chemical use do not contribute to problems of cumulative effects in watersheds of concern
- Select the harvesting method to minimize soil disturbance and hydrologic impacts to the wetland. In seasonally flooded wetlands, all harvesting activities and transportation will be conducted in months when the ground is frozen
- Use low-ground-pressure tires or tracked machines and concentrate skidding to a few primary skid trails to minimize site disturbance, soil compaction, and rutting
- Suspend ground skidding harvesting operations when soils become saturated.

A portion of the harvest areas are located within the 100-year floodplain. Timing of operations and storage of harvested wood would recognize the annual potential for areas to flood. No permanent structures would be placed within the floodplain during activities associated with the biomass harvest, and as a result, negligible impacts to floodplains are anticipated from these activities. Impacts to water resources, including surface water quality and wetlands, from biomass harvesting would be short-term and minor.

3.3.3 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, the proposed CHP plant and the heat distribution system would not be constructed and biomass harvesting would not occur. Therefore no impacts to water resources are expected to occur. No operational changes would occur that would impact water resources, including surface water, groundwater, wetlands, or floodplains. Thus, the No Action alternative would not result in any impacts to water resources. However, the existing power plant would continue to be at risk of flooding. That plant is located in the floodplain about 6 feet below the BFE. It is not on a raised pad, and is at risk of seasonal flooding every year.

3.4 Biological Resources

3.4.1 Affected Environment

Fort Yukon is located within the Yukon Flats National Wildlife Refuge. The refuge boundary encloses approximately 8,630,000 acres of Federal lands and an additional 2,500,000 acres of selected and conveyed lands. The predominant land cover type on the Yukon Flats National Wildlife Refuge is a mixture of open spruce forests, shrubs, and bogs. This ecoregion extends from the Yukon Flats eastward into Canada's Old Crow basin. Several factors influence the overall complexity of refuge habitats including: wildland fire, sediment deposition during periodic flooding, a braided drainage system, and discontinuous permafrost (USFWS 2008).

The weather on the refuge is similar to that of Fairbanks, Alaska, and is referred to as "continental subarctic," characterized by great seasonal extremes of temperature and daylight. A dry continental sub-arctic climate prevails throughout the region, with warm summers and long cold winters. The mountains which surround the ecoregion isolate it from the weather systems affecting the neighboring regions. Consequently, summer temperatures tend to be higher and winter temperatures tend to be much colder. The Yukon River remains frozen from early October through late May (AVI 2007).

Wildfires are a common event in the Yukon Flats. Like much of the interior Alaskan taiga forest, wildfires are an important part of the forest disturbance regime in the Yukon Flats. Periodic drying and flooding of shallow wetlands along with wildland fire help maintain diversity and productivity. Since 1981, Yukon Flats has had over 260 lightning-caused fires burn in excess of 2.5 million acres (AVI 2007).

Vegetation

Plant communities in the region are shaped by frequent summer storms that produce very little rain, but numerous lightning strikes. These "dry" storms cause numerous wildfires resulting from lightning strikes.

Occasional flooding also shapes the landscape and creates habitat diversity. The area has a short growing season, averaging 81 days at Fort Yukon. The average date of the last killing frost in the spring is June 1; the average date for the first killing frost in the fall is August 21. However, this short growing season is punctuated by 84 days of continuous sunlight and twilight from May 13 to August 4; though officially in Fort Yukon the sun fails to fall below the horizon between June 5 and July 7 (AVI 2007).

Forest vegetation within the Yukon Flats National Wildlife Refuge is characterized by five common tree species. White spruce reaches its optimum growth adjacent to stream channels, but is also found on a diversity of sites up to treeline. Black spruce typically grows in open stands and is common on sites with restricted drainage, such as muskeg and northfacing slopes (usually with a shallow thaw zone). White birch (*Betula papyrifera*) is characteristically an upland species, and often occurs mixed with white spruce. Quaking aspen (*Populus tremuloides*) predominates on well to extremely well drained south-facing slopes, while balsam poplar (*Populus balsamifera*) is primarily a riparian species forming forest communities often associated with white spruce.

Spruce-dominated coniferous forests cover the majority of the Yukon Flats landscape and occupy a variety of site conditions. White spruce forests occur on warmer, drier sites on hillsides, in timberline areas, and along rivers. Black spruce is found in similar areas but has higher tolerance for poorly drained soils and extends into bottomlands and other wet areas.

River meanders support a continuous succession of colonizing willow (*Salix* spp.) and alder (*Alnus* spp.), followed by balsam poplar and quaking aspen, which are eventually replaced by spruce. Recently disturbed sites, areas near timberline, north-facing slopes, and wetter areas support scrub communities dominated by willow, alder, and dwarf birch (*Betula* spp.). Bottomland bogs and other extremely wet areas are occupied by scrub-graminoid communities, including willow, dwarf birch, Labrador-tea (*Ledum decumbens*), bush cinquefoil (*Potentilla fruticosa*), and sedges (*Eriophoum vaginatum* and *Carex* spp.). Wildfire keeps a continuous mosaic of successional communities present, including herbaceous communities, scrub communities, and broadleaf, coniferous, and mixed forests (AVI 2007).

Common understory shrubs include bog birch (*Betula pumila*), Labrador-tea, crowberry (*Empetrum* spp.), and blueberry (*Vaccinium* spp.). Feathermosses are common. Many wet depressions are dominated by alder and willow swamp communities. The low shrub layer typically includes currants (*Ribes* spp.), high and low bush cranberries (*Viburnum opulus*). Bluejoint (*Calamagrostis canadensis*), sedge (*Carex* spp.), and horsetail (*Equisepum* spp.) are common herbs. Sedge tussock communities dominate the coldest, wettest sites on the Yukon Flats. Mosses and berries are present here. Shrub communities of willow and alder are most abundant on riparian sites. Dwarf shrubs, such as leatherleaf (*Chamaedaphne calyculata*) and bog rosemary (*Andromeda polifolia*), are typical of poorly drained organic soil, while others like prickly rose (*Rosa acicularis*), highbush cranberry (*Viburnum edule*), and soapberry (*Shepherdia canadensis*) are characteristic of well drained mineral soils in forests (AVI 2007).

Figure 3-3 shows the land cover by dominant vegetation within Fort Yukon and its vicinity according to the U.S. Geological Survey's National Land Cover Database.

Wildlife

The rich habitats of the interior Alaskan lowlands support moose (*Alces alces*), black bear (*Ursus americanus*), brown bear (*Ursus arctos*), wolf (*Canis lupus*), and caribou (*Rangifer tarandus granti*). Smaller mammals include wolverine (*Gulo gulo*), lynx (*Lynx canadensis*), red fox (*Vulpes vulpes*), beaver (*Castor canadensis*), snowshoe hare (*Lepus americanus*), mink (*Neovision vison*), muskrat (*Ondatra zibethicus*), weasel (*Martes* spp.), marten (*Martes* spp.), red squirrel (*Tamiasciurus hudsonicus*), and porcupine (*Erethizon dorsatum*). Moose are found in relatively low numbers throughout the refuge. In winter, they congregate in the Yukon River valley where they find shelter and food. In summer, they are found dispersed throughout the refuge, typically near ponds and marshes (AVI 2007).

In May 2002 a final cooperative moose management plan was published for the Yukon Flats Region. The plan demonstrated that the current status of moose populations in the region is one of the lowest densities in the state at 0.2 moose per sq. mi. Since 2002 the CATG Resource Department has implemented the plan with a goal of increasing moose densities within the Yukon Flats Region (AVI 2007).

Caribou and sheep (*Ovis dalli dalli*) are found in low densities in the upland regions on the periphery of the refuge. Black and grizzly (*Ursus arctos horribilis*) bears occur throughout the refuge, with the more abundant black bears found primarily in the forested lowlands. Wolves are also an important component of the ecosystem and are found throughout the refuge. Furbearer resources are rich and include beaver, fox, lynx, marten, muskrat, riverotter (*Lutra canadensis*), weasel, and wolverine. Millions of migrating birds use the Yukon Flats as a spring resting location before continuing to their breeding areas. The Yukon Flats is noted as one of the most densely populated duck nesting regions in North America. Over two million duck that migrate through each of the four major North American flyways are produced in the area in good nesting years. In addition to ducks, some Canada Geese (*Branta canadensis*) and white-fronted Geese (*Anser albifrons*) also nest in the Refuge (AVI 2007).

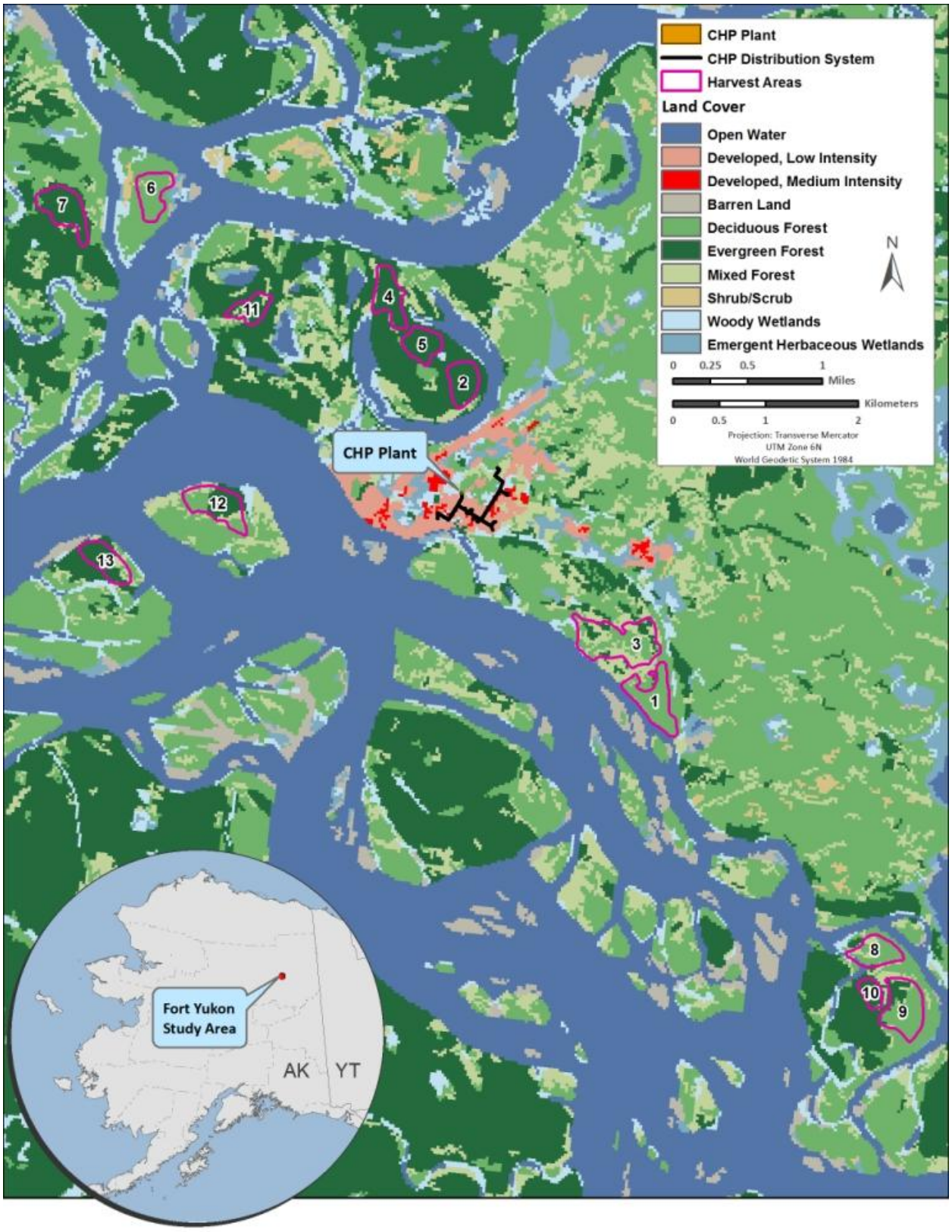

Figure 3-3. Land Cover in the Vicinity of the Biomass Harvest Areas

The Yukon Flats is also an important fall staging area for waterfowl and sandhill cranes (*Grus canadensis*). About 200,000 sandhill cranes from breeding grounds in western Alaska, eastern Siberia and the Yukon Territory congregate in the Yukon Flats wetlands before they begin their southern migration along the Central Flyway. Upland birds include northern hawk-owls (*Surnia ulula*), great horned owls (*Bubo virginianus*), ruffed grouse (*Bonasa umbellus*), spruce grouse (*Falcipennis Canadensis*), boreal chickadees (*Parus hudsonicus*), and redpoles (*Carduelis flammea*). Thirteen bird species including boreal chickadees, great gray owls (*Strix nebulosa*), spruce grouse, three-toed woodpeckers (*Picoides dorsalis)* and ravens (*Corvus corax*) call Yukon Flats home year round (AVI 2007).

No reptiles are found in the area. Only one amphibian, the wood frog (*Rana sylvatica*), inhabits the area. This small frog is commonly found along shorelines and it hibernates in shallow depressions in the upper layer of the previous year's dead vegetation (USFWS 2008).

The Yukon River hosts the longest upstream migrating chinook (*Oncorhynchus tshawytsha*) and chum (*Oncorhynchus keta*) Pacific salmon stocks in the world. Some headwater stocks migrate over 1,840 miles (2960 km) to reach their spawning grounds in the Yukon and northern British Columbia. Chinook and chum salmon use a wide variety of spawning habitats including small streams, larger rivers and lake outlets, or waters intermediate to these within the Yukon River drainage. The river also supports coho salmon (*Oncorhynchus kisutch*) as far as the Porcupine River drainage, pink salmon (*Oncorhynchus gorbuscha*), and sockeye salmon (*Oncorhynchus nerka*) closer to the mouth. Other fish supporting the region include northern pike (*Esox lucius*), burbot (*Lota lota*), and Arctic grayling (*Thymallus arcticus*) (AVI 2007). The *Catalog of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes* (ADFG 2008), which was developed under Alaska Statutes 16.05.871(a), lists the reach of the Yukon River at Fort Yukon as important for Chinook, coho, and chum salmon, sheefish (*Stenodus leucicthyes*), and whitefish, and identifies areas adjacent to Toussaint Island as spawning habitat for sheefish.

Special Status Species

Under the Endangered Species Act (16 U.S.C. 1536), an "endangered species" is defined as any species in danger of extinction throughout all or a significant portion of its range. A "threatened species" is defined as any species likely to become an endangered species in the foreseeable future. The USFWS and National Marine Fisheries Service (NMFS) also maintain a list of species considered to be candidates for possible listing under the Act.

The USFWS Alaska Region lists eight federally endangered or threatened species and three candidate species that may occur in Alaska. On March 26, 2013, the USFWS Fairbanks Fish and Wildlife Office indicated that none of these listed or candidate species occur within Fort Yukon or its vicinity. Additionally, there is no critical habitat for any listed species within Fort Yukon or its vicinity. NMFS lists 13 federally endangered or threatened marine species and no candidate marine species as occurring in Alaska. All species listed by NMFS are marine mammals and turtles that occur in coastal Alaska (NMFS 2012). No critical habitat for any listed marine species occurs within Fort Yukon or its vicinity.

The Alaska Department of Fish and Game also maintains a list of state-protected endangered species. None of the five species currently classified by that agency as endangered (3 whales, an albatross, and the Eskimo curlew [*Numenius borealis*]) occur in or near the project area.

The Migratory Bird Treaty Act of 1918 (16 U.S.C. 703–712), as amended, and EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, require Federal agencies to minimize or avoid impacts on migratory birds. Bald and golden eagles are protected under the Bald and Golden Eagle

Protection Act, which prohibits the "take" of bald or golden eagles in the United States. Based on information provided by the USFWS Fairbanks Fish and Wildlife Office, forested riverine habitat in the region surrounding Fort Yukon is suitable nesting and/or foraging habitat for bald eagles.

Pursuant to Section 303(a)(7) of the Magnuson-Stevens Fisheries Conservation and Management Act (16 U.S.C. 1801 et seq.), regional fishery management councils must identify essential fish habitat (EFH) used by all life history stages of each managed species in fishery management plans. EFH is defined as habitats that are necessary to the species for spawning, breeding, feeding, or growth to maturity. Based on review of NMFS' Alaska EFH data, all EFH areas in Alaska are within oceanic and coastal regions of the state and no EFH areas have been designated within or in the vicinity of Fort Yukon.

3.4.2 Environmental Consequences of the Proposed Project

The significance of effects on biological resources is based on (1) the importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource, (2) the proportion of the resource that would be affected relative to its occurrence in the region, (3) the sensitivity of the resource to proposed activities, and (4) the duration of ecological effects. A habitat perspective is used to provide a framework for analysis of general classes of effects (e.g., noise, human disturbance).

The proposed project could directly or indirectly cause potential impacts on biological resources. Direct impacts were evaluated by identifying the types and locations of potential ground disturbing activities in correlation to biological resources. Indirect impacts were evaluated by identifying potential habitat damage or degradation of habitats which could be associated with construction or harvesting activities.

Construction of the CHP Plant and Distribution System

Vegetation at the proposed CHP plant site and wood storage areas is largely comprised of thick shrub and spruce trees up to 30 feet high, while vegetation along the proposed heat distribution system is sparse, as the majority of the corridor is located in existing utility and road right-of-ways.

Under the proposed project, approximately 9.2 acres of shrub would be cleared for use as wood storage areas, while approximately 0.1 acres would be permanently developed and replaced with impervious surfaces to accommodate the CHP plant. About 1 acre, most of which has been previously disturbed for road construction and utility rights of ways, would be temporarily disturbed during pipeline installation activities. Any disturbed areas that are not developed would be revegetated following construction activities. These areas are all within the developed area of Fort Yukon and are small relative to the vegetated areas in the surrounding region. Thus, impacts to vegetation from the proposed construction activities would be minor.

Most wildlife species that occur within the proposed project areas in Fort Yukon are adapted to living in disturbed areas and co-existing with human activity. Many of these same species are also mobile generalist species that use a variety of interspersed and fragmented habitats and range over wide areas for food and cover. The most common species to occur there are small mammals and migratory birds. Therefore, it is anticipated that most wildlife species would be able to avoid the construction disturbance associated with the proposed project by relocating to adjacent minimally disturbed areas. Earth-moving activities may result in some unavoidable mortality to burrowing and less mobile fauna, but these impacts should be minimal. Any leaks and spills of fuels would be minimized by following BMPs. Impacts to wildlife from construction activities are anticipated to be negligible to minor.

The construction and operation of the CHP plant and associated facilities was evaluated by the USFWS Fairbanks Fish and Wildlife Field Office for potential effects to threatened or endangered species. On

March 1, 2012, the USFWS concurred that there are no threatened or endangered species present within the proposed project area where the CHP plant and heating distribution system would be constructed and operated (**Appendix B**). In addition, no state-listed species occur in or near the project area. DOE and the cooperating agencies therefore conclude that construction and operation of the CHP plant and associated facilities would not affect any species listed or proposed for listing as threatened or endangered.

Biomass Harvest

The proposed biomass harvest program would be based on sustainable practices and would include a forest regeneration program, as required by AFRPA. The AFRPA requires regeneration to fully stocked stands within 7 years after harvest.

As further described in the Woody Biomass Fuel Implementation Plan (Appendix C), sustainable regeneration of harvested stands would require a regeneration monitoring program and adaptive management, including surveying harvest units annually until a fully stocked stand is regenerated. Regeneration techniques, although well known and documented, must consider local dynamic conditions of weather, varying types of soil and vegetation and dynamic animal populations. Thus, various regeneration techniques would be attempted, monitored, and adapted through time to insure that fully stocked stands are created after harvest (RBEGR 2011).

As part of the effort to develop the biomass harvest program in Fort Yukon, the TCC Forestry Department conducted a biomass resource assessment in 2010 (TCC 2010). The purpose of the assessment was to build a model forest inventory that would serve to estimate biomass stocking, growth, sustainable harvest, and cost housed in a geographic information system and relational database. The inventory was built with currently available information that included significant forest stand cruising information previously developed by the TCC Forestry Department. Cover type was interpreted from high-resolution satellite imagery for an area within a 5-mile radius of Fort Yukon, and combined with ownership data, interpreted site class information, defined management restrictions, forest inventory information, cost parameters, and an array of parameters and assumptions used to estimate annual growth of various types of stands. The model produced an estimate of 462,958 green tons of standing woody biomass within the initial 5-mile radius project area, with an estimated sustainable annual allowable harvest of 9,517 tons. These estimates included all land ownership including native allotments. When only GZC lands were used, the annual allowable harvest was 6,089 tons per year within the initial five-mile radius. The proposed project would use approximately 2,000 green tons annually, consisting of trees with a DBH of less than 14 inches, and comprising approximately 33% of the annual sustainable harvest within a five-mile radius on GZC private lands.

As in all natural or anthropogenic forest disturbances, changes in successional stage and forest structure impact wildlife species differently. During implementation of this project, late successional species such as birds that nest in mature forests would be negatively impacted immediately following harvest, and early successional species such as moose and other mammals that live and feed in young forest stands would be positively impacted. At the landscape scale in this primarily naturally disturbed forest landscape, the landscape scale disturbances created through biomass harvesting would be within the natural range of ecosystem disturbance to which wildlife in the region has adapted.

Care would be taken to observe the cyclical snowshoe hare populations that occur naturally in this region. Periods of high hare populations would likely require measures that deter the hare from clipping the spruce seedlings. It may be necessary on occasion to plant seedlings with tree protectors installed at time of planting in order to reduce the hare population's negative influence on the reforestation efforts.

Forest management has the potential to negatively impact sensitive species, including bald eagles, goshawks, and other nesting migratory birds, at the harvest site scale. To comply with the Migratory Bird Treaty Act and avoid disturbing nesting birds, surveys for active nests would be conducted prior to any harvesting to be conducted during the nesting season, and a 75-foot buffer would be established around active nests. To comply with the Bald and Golden Eagle Protection Act, aerial or ground surveys, as appropriate, would be conducted for bald eagle nests within and surrounding harvest areas, and no harvest activities would be conducted within 660 feet of active eagle nests or within 330 feet of any inactive eagle nest.

Transportation of harvested wood across and on streams would occur primarily during winter, and BMPs required by the AFRPA, such as those listed in **Section 2.2.5**, would be implemented to preserve riparian areas and protect important fish habitat. Thus, impacts to fish and fish habitat would be negligible. GZC or other responsible organizations would obtain a Fish Habitat Permit from the Alaska Department of Fish and Game prior to use of machinery within fish bearing waters.

No state or federally listed threatened or endangered species occur within or near Fort Yukon or the biomass harvest areas; therefore, this proposed project would have no effect on threatened or endangered species. Impacts to biological resources from construction activities associated with the proposed project would be short-term and minor. Harvesting activities would result in negligible to minor short- and long-term, adverse and beneficial impacts.

3.4.3 Environmental Consequences of the No Action Alternative

The No Action Alternative would not result in any impacts to wildlife or vegetation, including those listed as threatened, endangered, or proposed species, as no construction, CHP plant development, or biomass harvesting activities would occur.

3.5 Air Quality

3.5.1 Affected Environment

Air quality in interior Alaska where Fort Yukon is located is considered to be relatively pristine, but is affected by both natural and man-made emission sources. Natural sources include wildland fires and windblown dust. Man-made sources include stationary and mobile sources from vehicles and equipment, wood-burning stoves, and industrial facility emissions (USFWS 2010).

Ambient Air Quality Standards. In accordance with Federal Clean Air Act requirements, the air quality in a given region or area is measured by the concentration of criteria pollutants in the atmosphere. The USEPA has developed numerical concentration-based standards, or National Ambient Air Quality Standards (NAAQS), for pollutants that have been determined to affect human health and the environment. The NAAQS represent the maximum allowable concentrations for ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter (including particulate matter equal to or less than 10 microns in diameter [PM_{10}] and particulate matter equal to or less than 2.5 microns in diameter [$PM_{2.5}$]), and lead (Pb) (40 CFR Part 50). The Clean Air Act also gives the authority to states to establish air quality rules and regulations. The State of Alaska, via the ADEC Division of Air Quality, has adopted the NAAQS and adheres to all Federal emission standards for hazardous air pollutants (HAPs). **Table 3-1** presents the NAAQS.

Table 3-1. National and State Ambient Air Quality Standards

Pollutant	Averaging Time	Primary Standard		Secondary Standard
		Federal	State	
CO	8-hour [a]	9 ppm (10 mg/m^3)	Same as Federal	None
	1-hour [a]	35 ppm (40 mg/m^3)	Same as Federal	None
Pb	Rolling 3-Month Average [b]	0.15 µg/m^3 [c]	Same as Federal	Same as Primary
	Quarterly Average	1.5 µg/m^3 [c]	Same as Federal	Same as Primary
NO_2	Annual [d]	53 ppb [e]	Same as Federal	Same as Primary
	1-hour [f]	100 ppb	Same as Federal	None
PM_{10}	24-hour [g]	150 µg/m^3	Same as Federal	Same as Primary
$PM_{2.5}$	Annual [h]	15 µg/m^3	Same as Federal	Same as Primary
	24-hour [(6)]	35 µg/m^3	Same as Federal	Same as Primary
O_3	8-hour [i]	0.075 ppm [j]	Same as Federal	Same as Primary
SO_2	1-hour [k]	75 ppb [l]	Same as Federal	None
	Annual (Arithmetic Average)	0.03 ppm	Same as Federal	None
	24-hour	0.14 ppm	Same as Federal	None
	3-hour [a]	None	Same as Federal	0.5 ppm (1300 µg/m^3)

Sources: USEPA 2012b

Notes: Parenthetical values are approximate equivalent concentrations.

1. Not to be exceeded more than once per year.
2. Not to be exceeded.
3. Final rule signed 15 October 2008. The 1978 lead standard (1.5 µg/m^3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved. The USEPA designated areas for the new 2008 standard on 8 November 2011.
4. Annual mean.
5. The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of cleaner comparison to the 1-hour standard.
6. 98th percentile, averaged over 3 years.
7. Not to be exceeded more than once per year on average over 3 years.
8. Annual mean, averaged over 3 years.
9. Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years.
10. Final rule signed 12 March 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, the USEPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.
11. 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
12. Final rule signed 2 June 2010. The 1971 annual (0.3 ppm) and 24-hour (0.14 ppm) SO_2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved. The USEPA expects to designate areas for the new 2010 standard by 2 June 2012.

Key: ppm = parts per million; ppb = parts per billion; mg/m^3 = milligrams per cubic meter; µg/m^3 = micrograms per cubic meter

Although O_3 is considered a criteria pollutant and is measureable in the atmosphere, it is not often considered a regulated pollutant when calculating emissions because O_3 is typically not emitted directly from most emissions sources. Ozone is formed in the atmosphere by photochemical reactions involving sunlight and previously emitted pollutants or O_3 precursors. The O_3 precursors consist primarily of nitrogen oxides (NO_x) and volatile organic compounds (VOCs) that are directly emitted from a wide range of emissions sources. For this reason, regulatory agencies attempt to limit atmospheric O_3 concentrations by controlling NO_x and VOC pollutants.

The USEPA classifies the air quality in an air quality control region (AQCR) according to whether the concentrations of criteria pollutants in ambient air exceed the NAAQS. Areas within each AQCR are therefore designated as either "attainment," "nonattainment," "maintenance," or "unclassified" for each of the six criteria pollutants. Attainment means that the air quality within an AQCR is better than the NAAQS. Fort Yukon is considered in attainment for all criteria pollutants (USFWS 2010, ADEC 2012, USEPA 2012a).

Greenhouse Gas Emissions. Greenhouse Gases (GHGs) are gaseous emissions that trap heat in the atmosphere. These emissions occur from natural processes and human activities. The most common GHGs emitted from human activities include carbon dioxide (CO_2), methane, and nitrous oxide. GHGs are primarily produced by the burning of fossil fuels and through industrial and biological processes. On 22 September 2009, the USEPA issued a final rule for mandatory GHG reporting from large GHG emissions sources in the United States. The purpose of the rule is to collect comprehensive and accurate data on CO_2 and other GHG emissions that can be used to inform future policy decisions. In general, the threshold for reporting is 25,000 metric tons or more of CO_2 equivalent emissions per year but excludes mobile source emissions. CEQ issued draft NEPA guidance in February 2010 regarding the inclusion of analysis of GHG emissions in NEPA documents. The guidance indicates 25,000 metric tons of direct CO_2-equivalent GHG emissions could provide a useful, presumptive, threshold for discussion and disclosure of GHG emissions. However, the guidance does not propose this as an indicator of a threshold of significant effects, but rather as an indicator of a minimum level of GHG emissions that could warrant some description in the appropriate NEPA analysis involving direct emissions of GHGs.

Regional Air Quality

Arctic haze, ice fog, and strong and persistent temperature inversions can adversely impact air quality of the Yukon Flats. Arctic haze refers to the visible haze layers observed in arctic Canada and Alaska, far from any known sources of pollution. Evidence from meteorological studies indicates that the pollution comprising arctic haze originates in industrial regions of the world, mainly in Europe and Russia (USFWS 2010). Arctic haze occurs during winter and early spring, when the arctic air mass covering the top of the globe expands into industrial areas and traps airborne contaminants within its circumpolar boundary. Even in haze conditions, pollutants are in low concentrations. The arctic air mass is cold, stable, and relatively dry, so there is limited opportunity for pollution to be removed from the air through rain or snowfall.

Ice fog occurs when air temperatures are -30ºF or colder, when existing atmospheric water vapor or water vapor emitted into the atmosphere (e.g., from vehicle exhaust or generators) condenses onto small particles and forms droplets that freeze to form tiny ice crystals (USFWS 2010).

The strong and persistent, ground-based temperature inversions known to occur in the Yukon Flats inhibit atmospheric mixing and lead to accumulation of pollutants emitted below the inversion. Pollutants emitted in a region that has a strong inversion become trapped in the inversion, and travel and dilute very little. It is expected that localized areas of poor short-term air quality occur in the Fort Yukon region near pollution sources during strong and persistent, ground-based temperature inversions. This effect is

expected to be most pronounced near population centers where emissions from combustion sources (wood-burning stoves, vehicles, and diesel-fired power generation) are concentrated (USFWS 2010).

A September 19, 2012, review of the ADEC on-line air permits shows only two stationary sources (the Fort Yukon Long Range Radar site and the GZU's existing power plant in Fort Yukon) within the Yukon Flats area operating combustion equipment that requires an ADEC air permit. Both of these sources operate under pre-approved emission limits for small stationary diesel engine installations (i.e., diesel engine driven electrical power plants), which hold potential emissions from this type of stationary source to less than 100 tons per year of nitrogen oxides. The limit for the Fort Yukon Long Range Radar site permit (permit AQ0382PL201P (PAL000394)) is 200,000 gallons of fuel per year, while the limit of the GZU diesel plant permit (AQ0002PL201P (PAL000002) is 300,000 gallons of fuel per year (ADEC 2012).

Additionally, in 2010 Fort Yukon was documented as being highly affected by dust releases (ADEC 2010). Sources of dust in rural Alaska include dirt roads and traffic, exposed riverbeds and shorelines, unvegetated lots, unpaved airfields, gravel pits and stockpiles, and glacier river dust. Dusty days occur primarily in June, July, and August, with averages above 20 days each month. For fall and spring months, 19 dusty days each month is typical. The fewest dusty days occur in winter (ADEC 2010).

3.5.2 Environmental Consequences of the Proposed Project

The environmental consequences on local and regional air quality conditions near a proposed Federal action are determined based on the increases or decreases in regulated air pollutant emissions and existing conditions and ambient air quality. The evaluation criteria are dependent on whether the proposed project is located in an attainment, nonattainment, or maintenance area for criteria pollutants. Other evaluation criteria include whether major New Source Review air quality construction permitting is triggered or Title V operating permitting is triggered. All of these evaluation criteria are discussed in the following paragraphs.

Construction of the CHP plant and the distribution system, as well as biomass harvesting and transportation, would generate emissions and dust from operation of equipment. Because construction would occur over a relatively short period between 12 to 18 months, emissions from construction equipment and soil-disturbing activities would be temporary. Harvesting would occur in remote areas and emissions from the approximately two to four pieces of harvesting and hauling equipment operated in those areas would have negligible effects on air quality in the area. However, construction activities and the transport and processing of biomass in Fort Yukon could contribute to the high concentrations of airborne dust and other particulate matter that occur in Fort Yukon during the summer. Minimization of dust emissions during construction and while transporting and processing biomass would be addressed by the biomass advisory task group in Fort Yukon, which is composed of the GZGTG, the GZC, CATG and the City of Fort Yukon. The task group would approve travel routes and timing for delivery of wood, as well as timing of construction. Most biomass delivery would occur in winter when roads are frozen, and dust emissions from that activity would be minimal. Any deliveries occurring in summer months, as well as construction activities, would be coordinated with the dust abatement programs that currently occur for projects within Fort Yukon. Dust reduction techniques recommended by ADEC include implementing local watering plans; road paving and chemical dust suppressing agents; increased environmental monitoring; establishing speed limits; and vegetation plans (ADEC 2010).

The proposed CHP plant would consist of a new power plant and a biomass wood boiler. The new power plant would contain electronically controlled fuel-efficient diesel generators with a total installed capacity of between 1,900 kW and 2,500 kW. Two of the existing electronically controlled generators currently used in the GZU power plant (475 kW Caterpillar 3456 generators) would be reused, and two new electronically controlled fuel-efficient generators would be purchased to replace the other two existing antiquated and inefficient generators. New switchgear, located in the control room, would provide

automatic paralleling and load control of the four generating units to maximize generation reliability and fuel efficiency. Therefore, the new CHP plant would be more fuel efficient and would result in lower air emissions, including GHG emissions, than the existing plant.

As with the existing power plant operating in Fort Yukon, the proposed diesel power plant in the CHP facility would emit less than 100 tons per year of all criteria pollutants, and would operate under an ADEC Pre-approved Emission Limit permit. This type of permit limits annual fuel use, and is applicable in Alaska for power plants that have the potential to emit less than 100 tons per year of NOx.

The biomass wood boiler would be a KOB Pyrtec 720, 950, or similar model boiler, and would not require an ADEC operating permit, as the boiler's capacity would be rated at 3.2-million BTUs. This capacity is below the state and Federal permitting threshold of 10-millon BTU per hour. Similarly, stack emissions would be less than the allowable state and USEPA emissions levels. Specifically, the biomass boiler would have the following annual emissions based on manufacturer specifications applicable to burning 2,000 tons of wood chips per year (KOB 2006):

- 4.5 tons CO
- 1.3 tons SO_x
- 1.3 tons NO_x
- 0.9 tons PM
- 0.14 tons VOCs.

Operation of the boiler at the CHP plant would replace use of up to 145,000 gallons per year of diesel fuel used in small boilers in the public and community buildings to be served by the district heating system. An estimate of emissions from those individual boilers has not been calculated; however, emissions from the new, well maintained wood-fueled boiler would be lower than emissions from the numerous older, small boilers. DOE therefore anticipates that operation of the new CHP plant would reduce emissions of GHG and other pollutants, and have a negligible to minor beneficial impacts to air quality in Fort Yukon.

General Conformity. The General Conformity Rule applies only to significant actions in nonattainment or maintenance areas. The Fort Yukon area has been designated as in attainment for all criteria pollutants. Therefore, the General Conformity Rule does not apply to the proposed project and a General Conformity determination is not required.

Other Air Quality Regulations. Fort Yukon is not located within a nonattainment area for any pollutant; therefore, nonattainment New Source Review permitting would not apply.

Federal Prevention of Significant Deterioration (PSD) regulations apply in attainment areas to a major stationary source, (i.e., source with the potential to emit 250 tons per year of any regulated pollutants), and a significant modification to a major stationary source, (i.e., change that adds 15 to 40 tons per year to the facility's potential to emit depending on the pollutant). Additional PSD major source and significant modification thresholds apply for GHGs. The proposed CHP plant would not be a major stationary source, as the plant would emit less than 100 tons per year of any regulated pollutant. Therefore, PSD regulations and Title V Air permitting are not applicable to the proposed project and the anticipated emissions from the CHP plant were not evaluated for PSD and Title V permitting impacts.

In summary, implementation of the proposed project would have both short- and long-term negligible to minor adverse and beneficial effects to air quality. Short-term adverse effects would result from dust and air emissions during construction and biomass harvesting and transportation. Long-term negligible to minor beneficial effects would result from a reduction in operating emissions by replacing the existing power plant in Fort Yukon with a lower emission, more efficient power generation system, and by

replacing numerous small diesel-fueled boilers with a single wood-fired boiler. Emissions from the proposed project would not exceed applicability thresholds, or contribute to a violation of any Federal, state, or local air regulation.

3.5.3 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, the existing power plant would continue to operate under an ADEC Pre-approved Emission Limit permit for a small stationary diesel engine installation. Air quality emissions from that power plant likely would increase over time as the power plant continues to operate with increasingly aged and inefficient equipment.

3.6 Noise

3.6.1 Affected Environment

Sound is defined as a particular auditory effect produced by a given source, for example the sound of rain on a rooftop. Noise and sound share the same physical aspects, but noise is considered a disturbance while sound is defined as an auditory effect. Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying.

Although human response to noise varies, measurements can be calculated with instruments that record instantaneous sound levels in decibels. A-weighted decibel (dBA) is used to characterize sound levels that can be sensed by the human ear. "A-weighted" denotes the adjustment of the frequency range to what the average human ear can sense when experiencing an audible event. The threshold of audibility is generally within the range of 10 to 25 dBA for normal hearing. The threshold of pain occurs at the upper boundary of audibility, which is normally in the region of 135 dBA (USEPA 1981a). **Table 3-2** compares common sounds and shows how they rank in terms of the effects of hearing. As shown, a whisper is normally 30 dBA and considered to be very quiet while an air conditioning unit 20 feet away is considered an intrusive noise at 60 dBA. Noise levels can become annoying at 80 dBA and very annoying at 90 dBA. To the human ear, each 10 dBA increase seems twice as loud (USEPA 1981b).

Table 3-2. Sound Levels and Human Response

Noise Level (dBA)	Common Sounds	Effect
10	Just audible	Negligible
30	Soft whisper (15 feet)	Very quiet
50	Light auto traffic (100 feet)	Quiet
60	Air conditioning unit (20 feet)	Intrusive
70	Noisy restaurant or freeway traffic	Telephone use difficult
80	Alarm clock (2 feet)	Annoying
90	Heavy truck (50 feet) or city traffic	Very annoying; Hearing damage (8 hours)
100	Garbage truck	Very annoying
110	Pile drivers	Strained vocal effort
120	Jet takeoff (200 feet) or auto horn (3 feet)	Maximum vocal effort

140	Carrier deck jet operation	Painfully loud

Source: USEPA 1981b

Under the Noise Control Act of 1972, the Occupational Safety and Health Administration (OSHA) established workplace standards for noise. The minimum requirement states that constant noise exposure must not exceed 90 dBA over an 8-hour period. The highest allowable sound level to which workers can be constantly exposed is 115 dBA and exposure to this level must not exceed 15 minutes within an 8-hour period. The standards limit instantaneous exposure, such as impact noise, to 140 dBA. If noise levels exceed these standards, employers are required to provide hearing protection equipment that will reduce sound levels to acceptable limits.

The ambient noise environment in Fort Yukon is affected mainly by sounds from wildlife, weather and other natural causes, automobile traffic (primarily from all terrain vehicles and pickup trucks) and occasional air traffic.

3.6.2 Environmental Consequences of the Proposed Project

Noise impact analyses typically evaluate potential changes to the existing noise environment that would result from implementation of a proposed project. Potential changes in the acoustical environment can be beneficial (i.e., if they reduce the number of sensitive receptors exposed to unacceptable noise levels or reduce the ambient sound level), negligible (i.e., if the total number of sensitive receptors to unacceptable noise levels is essentially unchanged), or adverse (i.e., if they result in increased sound exposure to unacceptable noise levels or ultimately increase the ambient sound level). Projected noise effects were evaluated qualitatively for the alternatives considered.

The proposed construction and biomass harvesting and transportation activities would generate temporary increases in noise in and within the vicinity of Fort Yukon. Noise would be generated by construction equipment, harvesting equipment and by wood chipping equipment. Individual pieces of heavy equipment typically generate noise levels of 80 to 90 dBA at a distance of 50 feet (see **Table 3-3)**. With multiple items of equipment operating concurrently, noise levels can be relatively high during daytime periods at locations within several hundred feet of active construction sites. The zone of relatively high construction noise levels typically extends to distances of 400 to 800 feet from the site of major equipment operations. Locations more than 1,000 feet from construction sites seldom experience appreciable levels of construction noise.

Table 3-3. Noise Levels Associated with Outdoor Construction

Construction Phase	dBA L_{eq} at 50 feet from Source
Ground Clearing	84
Excavation, Grading	89
Foundations	78
Structural	85
Finishing	89

Source: USEPA 1974

Although construction-related noise effects would be minor, contractors and construction workers would limit construction to occur primarily during normal weekday business hours, and properly maintaining construction equipment mufflers. Noise effects on construction personnel could be limited by ensuring all personnel wear adequate personal hearing protection to limit exposure and ensure compliance with Federal health and safety regulations.

Noise from biomass harvesting activities could temporarily affect wildlife. Disturbance to, and displacement of, wildlife could lead to a temporary reduction in wildlife harvest by making the harvest more difficult, costly, and time consuming for subsistence hunters. These effects would be temporary.

Wood may be processed and chipped at the harvest sites, initial storage location adjacent to the Quonset huts, and wood storage area in Fort Yukon. The harvest areas are considered remote from the community of Fort Yukon, and the noise emissions from activities in these areas should not cause a disturbance to the community. The initial wood storage area is located approximately 1,500 feet southeast from the nearest residence and 4,800 feet east of the Fort Yukon School. Due to the distance, it is not anticipated that noise emissions from activities in this areas would cause a disturbance to the community.

The proposed location of the CHP plant is in close proximity to the airport, and is located approximately 200 feet northwest of the nearest residence and approximately 500 feet northwest of the Fort Yukon School. Residents, as well as students and staff at the school, could experience noise levels during construction noise that would be disruptive or annoying, particularly if construction were to occur while school is in session. Those high noise levels would occur for short periods during the 12- to 18-month construction period.

Operation of saws, a wood chipper, and other equipment would cause a temporary nuisance to people in nearby residences, schools, and other facilities. The transportation of wood to the wood storage areas and the processing of chips on site would also produce noise. The loudest single piece of equipment during operations would be the wood chipper, estimated to produce 104 decibels at a distance of 3 feet (Cummins Bridgeway 2013). Noise from operation of the CHP plant would be minimized by use of critical grade mufflers and the siting and orientation of the power plant and wood boiler exhaust. An earthen berm with native spruce trees would be constructed along the boundary of 4th Avenue to further reduce noise from the CHP plant. Thus, sound levels from operation of the CHP plant likely will be lower than current levels from the existing power plant.

The community has developed a biomass advisory task group composed of the GZGTG, GZC, CATG, and the City of Fort Yukon and experienced fire wood haulers that would approve the travel routes and timing for delivery of wood into Fort Yukon.

The Fort Yukon City Code does not include noise ordinances for a public facility or utility infrastructure. In the past, the City has, however, posted restrictions for loud equipment use between a certain time period (e.g. restrictions on the operation of such equipment between the hours of 12 am to 6 am). Wood chipping activities associated with the proposed project would generally take place during normal business hours and would comply with any restrictions imposed by the City. If a noise complaint on any aspect of the proposed project was received during construction or operation activities, the complaint would be received either directly or indirectly via the City Clerk and investigated by the GZC General Manager. The City Clerk, City Manager, City Council and GZC Board of Directors may be involved in helping satisfactorily resolve any complaints. Overall, the proposed project would result in temporary, minor increase in noise during transport and processing of biomass in Fort Yukon and a long-term, beneficial decrease in noise from implementation of measures to reduce sound levels during operation of the new CHP plant.

3.6.3 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, the proposed project would not be implemented and no associated activities, including construction, harvesting, or operation of the CHP plant, would occur. The existing power plant would continue to operate and the ambient noise environment would not change from existing conditions.

3.7 Land Use

3.7.1 Affected Environment

The Yukon Flats National Wildlife Refuge boundary encloses approximately 8,630,000 acres of Federal lands and an additional 2,500,000 acres of selected and conveyed lands. In addition to Fort Yukon, the non-refuge lands belong to Doyon Native Corporation, the villages of Beaver, Birch Creek, Chalkyitsik, Circle and Stevens Village, State of Alaska, and individual Native allotment holders (USFWS 2008). There are no major industries in the Refuge or surrounding area. Most uses involve harvesting of natural resources, particularly subsistence harvest of fish and wildlife and some small-scale wood cutting, primarily for firewood (USFWS 2010).

Fort Yukon lies within the village boundary of the GZC, which is a part of the Doyon Native Corporation region. As part of the Alaska Native Claims Settlement Act, the GZC owns approximately 215,000 acres of land within the Yukon Flats, in the vicinity of Fort Yukon. Of this, 161,280 acres of land are forested with boreal forest systems and flat topography. A network of wetlands, streams, rivers and lakes is located throughout the forest.

Within Fort Yukon, the proposed CHP facility site is located south of the Fort Yukon airport, and north of the intersection of Hill Street and Fourth Avenue. The site is largely undeveloped, with the majority of the area covered by thick shrub vegetation with spruce trees up to 30 feet high. A gravel fill pad, located behind the gas station on 4th Avenue, covers the northwestern portion of the property, and has been used as a staging area for materials.

3.7.2 Environmental Consequences of the Proposed Project

The proposed CHP plant would be constructed on a partially undeveloped site owned by the GZC within Fort Yukon. The plant would be elevated on a gravel pad above the 100-year floodplain to mitigate flood issues and to comply with Federal codes. An earthen berm with native spruce trees would be constructed along the boundary of 4th Avenue to reduce the visual impacts of the CHP facility. Work associated with the heat distribution system would be performed within existing road and utility right-of-ways, to the maximum extent possible.

The proposed biomass harvest activities would also occur on lands that are owned by the GZC and managed in cooperation with the GZGTG. Interspersed throughout the GZC holdings are numerous privately owned Native Allotments. Some of the allotments have been surveyed and all have been documented using a geographic information system. Care would be taken to not conduct unauthorized activities on any Native Allotments. It would be necessary to obtain permission from the owner to access harvest units that involve crossing an Allotment.

Biomass harvesting would create a different visual dynamic in the forests, similar to the dynamic caused by regional fires. Stands would be thinned from below, harvesting stems between 3-14 inches in diameter and creating a partially harvested stand, leaving smaller and larger trees within the unit. As required by

the AFRPA, buffers would be required along all waterways, which would not only reduce the risks for erosion, but also reduce the visual effects from the ground and from boats on the Yukon River.

No impacts to land ownership would occur from the proposed project. Impacts to land use from biomass harvesting would be short-term and negligible. Construction of the CHP plant would be the only permanent conversion of land use. The impacts to land use from the construction and operation of the plant would be long-term and negligible.

3.7.3 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, the proposed CHP Plant and its associated distribution system would not be constructed. No biomass harvesting would occur. Therefore, no changes in land use would occur from this alternative.

3.8 Cultural and Historic Resources

"Cultural resources" is an umbrella term for many heritage-related resources defined in several Federal laws and EOs, including the NHPA, the Archeological and Historic Preservation Act, the American Indian Religious Freedom Act, the Archaeological Resources Protection Act, and the Native American Graves Protection and Repatriation Act. The NHPA focuses on cultural resources such as prehistoric and historic sites, buildings and structures, districts, or other physical evidence of human activity considered important to a culture, a subculture, or a community for scientific, traditional, religious, or other reasons. Such resources might provide insight into the cultural practices of previous civilizations or retain cultural and religious significance to modern groups. Section 106 of the NHPA (36 CFR Part 800) requires Federal agencies to assess and determine the potential effects of their proposed undertakings on historic properties (e.g., sites, buildings, structures, and objects) and to develop measures to avoid or mitigate any adverse effects. Historic properties are cultural resources that are listed in or eligible for listing in the National Register of Historic Places.

3.8.1 Affected Environment

Native Americans within the Yukon Flats at the time of European contact included several bands of Athabascan Indians, largely nomadic hunters dependent on fisheries resources and big game, primarily moose and caribou. Fort Yukon became an important trade center for the Gwich'in Indians, who inhabited the vast lowlands of the Yukon Flats and River valleys (GZC 2011). To determine whether any tribal organizations with historic ties to the project area were aware of any properties of traditional religious and cultural significance within the area, and to invite those organizations to participate in the consultation process specified by the NHPA, DOE sent letters to three organizations (**see Appendix B**). None of the tribal organizations responded with information about historic properties or expressed an interest in participating in the consultation process.

Fort Yukon was founded in 1847, by Alexander Murray, as a Canadian outpost in Russian Territory. Native Americans within the Yukon Flats at the time of European contact included several bands of Athabascan Indians, largely nomadic hunters dependent on fisheries resources and big game, primarily moose and caribou. Fort Yukon became an important trade center for the Gwich'in Indians, who inhabited the vast lowlands of the Yukon Flats and River valleys (GZC 2011).

The Hudson Bay Company, a British trading company, operated at Fort Yukon from 1846 until 1869. In 1867, the United States purchased Alaska, and two years later it was determined that Fort Yukon was on American soil. At that time, Moses Mercier, a trader with the Alaska Commercial Company, took over operation of the Fort Yukon Trading Post. A post office was established in 1898. The fur trade of the

1800s, the whaling boom on the Arctic coast (1888-1904) and the Klondike gold rush spurred economic activity and provided some economic opportunities for the residents. However, major epidemics struck the Fort Yukon population from the 1860s until the 1920s and in 1949 a flood damaged or destroyed many homes in Fort Yukon. During the 1950s, a White Alice radar site and an Air Force station were established. Fort Yukon incorporated as a city in 1959 (GZC 2011).

Travel on the Yukon River in the early 1900's was provided by wood fueled steam driven sternwheelers. Cordwood harvested along the Yukon River for fueling these ships provided some local economic opportunity while these classic vessels plied the interior waters of Alaska and northern Canada. The Yukon River once had the largest fleet of riverboats north of the Mississippi River. There were steamboats on the Yukon River every summer from 1869 to 1955. For decades cordwood was bought along the river at five to seven dollars per cord (AVI 2007).

3.8.2 Environmental Consequences of the Proposed Project

Fort Yukon contains two properties currently listed on the National Register of Historic Places; the Old Mission House and the Sourdough Inn (also known as the New Sourdough Hotel). These properties are located 0.25 to 0.5 miles from the proposed location of the CHP plant and would not be directly affected by construction of that plant. In addition, replacement of the existing power plant with the new CHP plant would not substantially change the view or otherwise change the setting near those historic properties. On February 14, 2012, the Alaska State Historic Preservation Office under the Alaska Department of Natural Resources Office of History and Archaeology confirmed that no historic properties would be affected by the proposed CHP plant and the heat distribution system (**see Appendix B**).

The Quonset huts at the initial storage area were constructed in 1956 as part of the Fort Yukon Long Range Radar System. This site was determined to be eligible for listing on the National Register of Historic Places as part of the Aircraft Control and Warning System in a Memorandum of Agreement signed by the U.S. Air Force, Alaska State Historic Preservation Office, and U.S. Advisory Council on Historic Preservation in 1998. The preservation strategy identified in that Agreement was to document the facilities prior to planned demolition. The site that includes the Quonset huts was document in accordance with the Agreement, along with many other sites associated with the Long Range Radar System. Rather than demolish the Quonset huts as planned, the parcel to be used for initial storage, including the huts, was deeded to the GZC. Those structures are now used to store recyclable materials. There is a road through the property on which the huts are located and much of the surrounding area has been disturbed in the past for military operations and other activities.

Up to 20 acres at the initial storage area would be cleared by cutting trees and other vegetation at or near ground level. No soil-disturbing activities would be required to clear vegetation and no structures will be disturbed. Whole logs would be stored in the cleared areas and those logs would be processed and chipped there. Wood chips would be stored inside, and possibly outside of, the huts and equipment and other materials required for the project might be stored and repaired there. The exterior of the huts might need to be modified, and repairs or modifications (e.g., construction or installation of chip storage bins) would be required to the inside of the huts. Use of the Quonset huts and surrounding land in this manner would be consistent with past uses of the site and would not change the character of the property's use or substantially modify the physical features of the property's setting. Based on this information, and because this site has been preserved through approved documentation, DOE has determined that alteration and use of the facility would not have an adverse effect on any historic properties. On January 30, 2013, the Alaska State Historic Preservation Office issued concurrence in a finding of no adverse effect to historic properties from the proposed harvesting activities and use of the initial storage area (**see Appendix B**).

The harvest areas proposed for this project (**Figure 2-1**) are located on islands or other areas adjacent to channels of the braided river system surrounding Fort Yukon and are subject to periodic flooding and the associated addition and removal of surface soils. Therefore, it is unlikely that there are buried or above-ground cultural resources or other historic properties at the harvest sites. As described in Section 3.2.2, soil disturbances during biomass harvesting will be minimal, in part because most harvesting and hauling will occur when the ground is frozen and because timber will be cut at or near ground level without disturbing the soil. Thus, any buried cultural resources that do occur in the harvest areas would not be disturbed.

An adaptive management program is being established by the CATG Natural Resources Department to continually improve the inventory model and all aspects of the proposed biomass harvest and forest regeneration. Prior to harvesting a site, the GZC and CATG Natural Resources Department would determine if the area contains sensitive tribal resources. If such resources are determined to occur, harvesting would be excluded from the affected areas. Should any item of potential archaeological significance be discovered during development of the project area, the Alaska State Historic Preservation Office would be notified immediately. If any historically or culturally significant materials or artifacts were to be unearthed, activities would halt immediately and not resume until consultation with the State Historic Preservation Office has been completed, in accordance with 36 CFR 800.13. With the understanding that the preceding steps would be taken, DOE has concluded that historic properties and other cultural resources would not be adversely affected by the proposed project.

3.8.3 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, no new areas of Fort Yukon would be developed as part of the proposed proposal, and no biomass harvesting or transportation would occur. As a result, no impacts are anticipated to occur from this alternative to historic properties or other cultural resources.

3.9 Socioeconomics and Environmental Justice

3.9.1 Affected Environment

Fort Yukon consists of between 580-700 people and is located in the Fairbanks Recording District, within the Yukon Koyukuk Census Area. Specifically, the 2010 U.S. census estimated that the community of Fort Yukon had 583 year round residents (GZC 2011). The GZGTG serves as the traditional government of Fort Yukon, and approximately 86% of the population is Alaska Native (USFWS 2010). Most residents are descendants of the Yukon Flats, Chandalar River, Birch Creek, Black River and Porcupine River Gwich'in Athabascan tribes (GZC 2011).

The 2005-2009 American Community Survey estimated that 68 percent of the resident population of Fort Yukon, 16 years and older, was in the workforce. The survey established that the average median household income was $34,250 and the per capita income was $19,254. About 18.2% of all residents, and 16.2 percent of all families, had incomes below the poverty level (GZC 2011).

In general, the economies of Yukon Flats communities are characterized by few full-time jobs, limited opportunities to earn cash, and high participation rates in wild food harvests for personal consumption. Household incomes are often acquired from a variety of income sources including seasonal or part-time jobs, such as fire fighting, along with Permanent Fund dividend checks and government transfers (USFWS 2010). Fort Yukon has the largest number (28) of business licenses of any community in the Yukon Flats (USFWS 2010).

City, state, and Federal agencies, CATG, the GZGTG, and the GZC are the primary employers in Fort Yukon. The school district is the largest employer. The U.S. Air Force operates a White Alice Communications System in the community, and the Bureau of Land Management operates an emergency fire-fighting base at the airport. Winter tourism is becoming increasingly popular in the area, as Fort Yukon experiences spectacular Northern Lights (GZC 2011).

The GZC holds full economic use to approximately 214,500 acres of surface estate in the Yukon Flats. The GZC's expansive forest holdings are largely untapped, commercially, primarily due to the lack of economically viable markets (GZC 2011). In contrast to the low income per capita, the Yukon Flats area has some of the highest energy costs in North America; gasoline, fuel oil and electrical power costs have all seen dramatic increases in recent years. GZC owns and operates GZU, Fort Yukon's electric power company, which constitutes a significant portion of GZC's business activities. GZU is an economically regulated utility by the Regulatory Commission of Alaska and, as such, the utility's rates and tariffs are set following the Commission's procedures, policies and approval processes (GZC 2011).

Subsistence activities are an important component of Fort Yukon's economy. Residents rely on subsistence foods and trapping and Native handicrafts provide income. One of the paradoxes of subsistence is that cash is needed to engage in a subsistence lifestyle. In the Yukon Flats, a large proportion of a household's cash income is used to purchase and maintain equipment such as boats, outboard motors, snowmobiles, and four wheelers (USFWS 2010).

Subsidence foods are an essential part of the culture as well as the economy. In the spring, muskrat, goose, duck, and crane hunting occur, as well as net fishing for whitefish. In the summer, Chinook salmon, pike, grayling, small game, waterfowl, and game birds are harvested. In the fall, late run chum and coho and berries are harvested, while moose, caribou, and black bear are hunted. The majority of Fort Yukon's households have been found to hunt, use, give, and receive subsistence resources (USFWS 2010).

The trapping harvest is poorly documented, but it has long been a source of cash income for residents of the Yukon Flats and an important component of the local economy. Some residents also use fur and hides to make parka ruffs, moccasins, or Alaska Native handicrafts for personal use and for sale. An e-commerce project (www.ArcticWays.com) to facilitate the sale of traditional crafts from remote villages has been established. People use moose and caribou hides, wood, and other natural materials to make moccasins, vests, gloves, snowshoes, and fish spears for sale via the Internet. The Web site is based in Fort Yukon under the CATG (USFWS 2010).

3.9.2 Environmental Consequences of the Proposed Project

The proposed project would displace approximately 145,000 gallons of heating oil used annually in Fort Yukon for a gross annual savings of $870,000 in diesel fuel oil costs at a conservative $6 per gallon. In the first five years of the program, $4,350,000 would be saved on 725,000 gallons of heating fuel not used in the community. The savings would stay in Fort Yukon instead of being exported to fuel delivery companies and would pay for creating jobs, infrastructure, maintenance and replacement of the new district heating system, as needed.

Short-term employment opportunities associated with the construction of the CHP plant, heat distribution system and wood storage areas would be offered to the local labor force when possible. The project's construction manager would import skilled craftsmen, with appropriate certifications, to perform specialty work only (such as pipe welding and electrical panel installation). However, other positions including laborers and equipment operators would be filled locally to the greatest practical extent. Ten to twelve temporary jobs would be created during construction activities.

An additional benefit of the proposed project would be the support to develop a regional forestry and natural resource program under the CATG Natural Resources Department. The Program would develop capacity for sustainable forest and subsistence wildlife management. A total of 4-5 long-term harvest and forest management jobs would be created. The project would help facilitate estimated population growth and infrastructure development in Fort Yukon over the next 10 to 20 years.

Stabilized energy costs for the school and clinic would help maintain the cost of education and health care in Fort Yukon. Replacing existing facilities and extending electrical distribution would provide reliable, long-term, code compliant electrical generation for community and school facilities and for community residents. The proposed project is designed to provide as many residents in Fort Yukon as possible with long-term access to reasonably priced electric power. The benefits of establishing a sustainable energy program are as important as they are varied. The use of local wood supplies for heat and electrical power generation would reduce the fuel oil payments that are currently being exported out of the region. The stabilization and reduction of energy costs would positively affect every household in the community. The result of the project would be a positive impact to minority and low-income populations by creating local jobs and reducing reliance on imported fuel.

The proposed project is not anticipated to have any measurable impacts on traditional use and subsistence hunting and fishing. Due to select forest clearing, moose habitat would potentially be improved locally, so the moose population may increase closer to the community, increasing the ease of harvest. Overall, the proposed project would result in long-term, moderate to major, beneficial impact to socioeconomics and environmental justice issues in Fort Yukon.

3.9.3 Environmental Consequences of the No Action Alternative

Under the No Action alternative, the existing power plant would continue to operate. Fuel costs are likely to continue escalating, with no guarantees of stabilization. Fuel oil costs in Fort Yukon have spiked to above $7 per gallon in the past three years, with prices as high as $10.00 per gallon reported in other remote communities. The volatile and high cost of fuel to the residents and community of Fort Yukon would result in long-term, moderate negative impacts to area socioeconomics and environmental justice issues.

3.10 Transportation

3.10.1 Affected Environment

Fort Yukon is accessible by air, year-round, and by barge, during the summer months. Heavy cargo is brought in by barge, from the end of May through mid-September. There is a barge off-loading area, but no dock. Riverboats and skiffs are used for recreation, hunting, fishing and other subsistence activities. An FAA-approved, state-owned 5,810-foot long by 150-foot wide lighted gravel airstrip is available and serviced by bush airlines. Hospital Lake, adjacent to the airport, is used by float planes (GZC 2011).

There are 17 miles of local roads in Fort Yukon and over 100 automobiles and trucks. The municipal transit bus system provides transportation throughout the town. The community is not connected to an external road system (USFWS 2010). Snow machines and dog sleds are used on area trails or the frozen river, which becomes an ice road to area villages during the winter (GZC 2011).

3.10.2 Environmental Consequences of the Proposed Project

A 600-foot-long, unpaved access road to the CHP plant would be established off of Airport Road so that equipment delivering logs and wood chips to the CHP facility would not pass through the adjacent neighborhoods when entering or exiting the CHP facility. However, no new roads would be constructed for biomass harvesting activities, as economics severely limit the feasibility of road construction for the harvest activities. All travel routes would be planned in advance. Temporary trails would be developed using the harvest equipment to harvest trees in the trail and to grind stumps to low levels for hauling. Similar to the forest stands, trails would be expected to regenerate to hardwood either through coppice sprouting or through planting of rooted hardwood stock.

Much of the annual harvest would be hauled in the cold winter months of November through early March. For those harvest areas that require crossing water, the delivery schedule would take into account the ice thicknesses for the particular haul route and time of the winter.

Hauling cargo over ice is a common practice throughout the Arctic. Most wood hauling in interior Alaska is done during the winter when rivers have frozen over. However, there is a personal safety issue as well as an environmental issue if machinery were to break through the ice while in route to or from Fort Yukon. A considerable amount of useful information and experience has been developed on how to haul on ice efficiently and safely. In addition, there is a significant amount of local knowledge of river ice conditions. There are several local wood haulers that use both trucks and skidders to move wood along river corridors. Ice travel around Fort Yukon using snow machine and other light trucks is common, as is wood hauling for firewood. The local knowledge of ice conditions has served the community well for light to moderately heavy transport of wood. There is an experienced work force in Fort Yukon that has had training developing ice roads while working on the North Slope in the oil fields.

There are annual ice thickness temporal records for Fort Yukon that date back several decades. This data indicates that during extensive periods each winter, the ice thicknesses at the point of measurement exceeded the required capacity to haul wood fuel safely. Ice strength equations and tables established by the U.S. Army Cold Regions Research and Engineering Laboratory and others correlate ice thickness and other parameters to the load carrying capacity of the ice. Procedures for measuring thickness and determining ice quality are also given. Properly applied, this information can empower the managers of the biomass harvest with the ability to safely haul wood fuel and equipment over river ice for three to four months out of the year.

General procedures for determining ice thickness and load capacity include drilling holes with a drill and ice auger. The technique is to drill a hole and check the ice thickness every 150 feet or so along the intended path. This would be done more frequently if the ice thickness is quite variable or over strong currents. Noting whether the ice in each hole is clear (sometimes called black ice) or white (due to air bubbles—sometimes called snow ice) allows determination of ice strength relative to thickness. On rivers, the ice thickness and quality can change a lot in a short distance; operators must be particularly alert to variations in ice thickness due to bends, riffles or shallows, and junctions with tributaries along the planned travel route. For both rivers and lakes, warm inflows from springs can create areas of thinner ice. The ice near shores can either be thinner (due to warm groundwater inflow or the insulating effect of drifted snow) or thicker (due to the candledipping effect of variable water levels). Measures of the snow cover thickness on the ice cover may reveal highly variable ice thicknesses.

Scheduling strategies employed in hauling over ice are dependent on annual weather and water conditions. For example, the 8-ton machine proposed as part of this project would need clear ice with a thickness of at least 13 inches in order to safely transit, according to ice strength calculations. A full load would include an additional 10 tons of woody biomass for a total load of 18 tons, which would require

approximately 18 inches of ice thickness. Based on studies of ice depth in the region (Sustainability Inc. 2012, RBEGR 2011), ice thickness during the winter can support weights of up to 20 tons; thus, the machine weights anticipated are not expected to be a limiting factor for hauling over ice. Wood fuel loads would be hauled on and towed from the field with a tractor vehicle.

Establishing safe routes to cross a river on ice is another strategy that has the capacity to reduce risk and increase efficiency of wood hauling. Limiting the distance equipment and wood fuel is hauled over ice reduces the risk of an accident or production interruption due to inadequate ice thickness. A single crossing over a relatively short stretch of river can more easily be monitored for safe ice conditions than longer stretches over river segments that may have varying ice thicknesses and quality. Ice thickness can also be managed on a specific crossing site fairly readily by employing ice road construction and maintenance techniques that will increase ice thickness. This is an easier task for a 200-yard river crossing than a 10-mile long river route. Hauling across stretches of ice where the operator is highly confident of its capacity to support the load weights is vital.

Provided all appropriate safety precautions are taken when determining the location and timing of river crossings, no impacts to transportation are anticipated to result from these proposed crossings. Because the proposed project would only involve establishment of one 600-foot-long access road within Fort Yukon, temporary increases in traffic associated with construction and hauling activities, and the establishment of temporary trails for harvesting activities, the proposed project is anticipated to result in overall negligible impacts to existing transportation systems and routes.

3.10.3 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, existing conditions would remain the same and no construction, harvesting, or hauling activities would occur. Accordingly, no impacts to transportation would occur.

3.11 Hazardous Materials and Waste Management

3.11.1 Affected Environment

A hazardous substance, pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. §9601(14)), is defined as: "(A) any substance designated pursuant to section 1321(b)(2)(A) of Title 33; (B) any element, compound, mixture, solution, or substance designated pursuant to section 9602 of this title; (C) any hazardous waste having the characteristics identified under or listed pursuant to section 3001 of Resource Conservation and Recovery Act of 1976, as amended, (42 U.S.C. §6921); (D) any toxic pollutant listed under section 1317(a) of Title 33; (E) any Hazardous Air Pollutant listed under section 112 of the Clean Air Act (42 U.S.C. §7412); and (F) any imminently hazardous chemical substance or mixture with respect to which the Administrator of the USEPA has taken action pursuant to section 2606 of Title 15. The term does not include petroleum, including crude oil or any fraction thereof, which is not otherwise specifically listed or designated as a hazardous substance, and the term does not include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas)."

Hazardous materials are defined by 49 CFR 171.8 as "hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table (49 CFR 172.101), and materials that meet the defining criteria for hazard classes and divisions" in 49 CFR Part 173. Transportation of hazardous materials is regulated by the U.S. Department of Transportation regulations within 49 CFR Parts 105–180.

Hazardous waste is defined in 42 U.S.C. §6903, as "a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed."

Fort Yukon generates an estimated 473 tons of solid waste per year. Solid wastes generated in Fort Yukon have historically been collected and disposed at a local landfill, near the end of the airport runway. Hazardous waste materials generated in the community are kept separate from solid waste and ultimately removed by a licensed contractor for disposal at a certified (Level 1) hazardous waste landfill. As described in **Section 4.1**, Cumulative Impacts, there are plans for development of a new 40-acre landfill in Fort Yukon.

3.11.2 Environmental Consequences of the Proposed Project

Impacts on hazardous materials or solid and hazardous waste would be considered significant if the proposed project resulted in noncompliance with applicable Federal or state regulations, or increased the amounts generated or procured beyond current community waste management procedures and capacities.

Construction of the proposed CHP plant and heat distribution system would generate some amount of non-hazardous solid waste, including metal piping, fiberglass insulation, paper, plastics, glass, and other typical construction waste. Due to the remote location of Fort Yukon, and high cost of transportation, waste materials would generally not be recycled. Materials removed from the project site would be placed in a trash receptacle or other suitable container and transported to the local landfill for proper disposal in accordance with state and Federal regulations.

When relocating the two newer generators from the existing power plant to the proposed CHP plant, the construction manager would ensure that all pipes, valves, and other fluid containers would be drained and purged prior to disassembly and relocation. A drip pan or other suitable device would be used when disassembling and moving pipes, valves or other materials to contain any inadvertent spill. Once operational, typical maintenance activities for the proposed diesel power plant would include periodic oil and filter changes; monitoring of fuel consumption and generator operation; and, top-end and manufacturer recommended service intervals. Typical maintenance activities for the proposed wood boiler would include emptying the ash collection drum; monitoring combustion temperature, stack temperature, fuel consumption, and boiler operation; checking boiler settings and alarms; greasing augers, gearboxes, and other moving parts; and, checking for wear on conveyors, augers, motors, or gearboxes. Maintenance of harvesting and hauling equipment would be completed in an enclosed shop area and would also generate used oil, oil filters, grease and lubricants. An SPCC plan for the new diesel fuel tank and lube oil storage area within the CHP plant would be prepared and implemented in accordance with USEPA requirements.

Used oil generated from the proposed project would be collected and reused after filtering, using a used-oil blender that blends clean and filtered used oil. Drained oil filters, air filters, and used lubricants and grease which cannot be reused, would be disposed of in the local landfill, as currently occurs. Operation of the biomass boiler would produce approximately 35 tons, or about 400 cubic yards, of ash per year based on manufacturer specifications applicable to burning 2,000 tons of wood chips per year (KOB 2006). The ash would be collected in a small drum and would either be disposed of at the local landfill in accordance with applicable regulations or reused as a soil amendment. No hazardous wastes would be generated by the proposed project.

The amount of ash and other wastes that would be produced per year by the CHP is small relative to the total of about 473 tons of solid waste generated by the community annually and disposed in the local landfill. Thus, wastes generated from the proposed project are not anticipated to have an effect on the long-term capacity of existing or planned (**see Section 4.1**) landfills.

3.11.3 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, no new hazardous materials or solid wastes would be utilized, stored, or disposed of in Fort Yukon. The existing conditions would remain the same. Periodic oil and filter changes of the power plant generators would continue, and wastes would be reused when possible or disposed of at the local landfill. No impacts on hazardous materials and waste management would be expected to occur from implementation of the No Action Alternative.

3.12 Human Health and Safety

3.12.1 Affected Environment

Health care services for Fort Yukon are organized under the Alaska Tribal Health Compact; both the TCC and the CATG belong to the Compact (USFWS 2010). Health care services are provided through the Interior Alaska Service Area of the Indian Health Service, with delivery split between TCC and CATG. The CATG operates the Yukon Flats Health Center located in Fort Yukon. Services include primary ambulatory care, emergency care, dental services, community health aides, and a health education program (USFWS 2010). In addition, CATG assists the TCC in coordinating other health programs in the region such as the Community Health Aid Program, the Community Health Representative Program, Emergency Air Ambulance, and Mental Health/Alcohol services (GZGTG 2010).

A regional outpatient clinic is located within the Chief Andrew Isaac Health Center in Fairbanks, part of the Fairbanks Memorial Hospital. Inpatient care is provided under contract with the Fairbanks Memorial Hospital, and some specialty needs and conditions require that the patients be sent to the Alaska Native Medical Center in Anchorage. The TCC provides a variety of services in Fairbanks including optometry, dental care, environmental health support, family recovery, mental health care, and counseling (USFWS 2010).

The State of Alaska Department of Health and Social Services estimated in 2000 that life expectancy for Alaska Natives was approximately 7 years shorter than for U.S. residents as a whole. Prevalent health problems in Alaska Native villages include substance abuse, mental health problems, tobacco use, cancer, and public safety (USFWS 2010). Alaska Natives also suffer unintentional injury mortality at 3.3 times the U.S. rate, as well as disproportionately high rates of homicide, suicide, sexual assault, child abuse/neglect, and domestic violence (USFWS 2010).

Village public safety officers, individuals trained as first responders to crimes and other threatening situations, are responsible for law enforcement and public safety in communities such as Fort Yukon. However, in 2005 the Alaska Native Health Board estimated that approximately three times the existing number of safety officers is needed to ensure public safety (USFWS 2010).

3.12.2 Environmental Consequences of the Proposed Project

An impact to human health and safety would be considered significant if the proposed project resulted in the following:

- Substantially increase risks associated with the safety of construction personnel or the local community
- Substantially hinder the ability to respond to an emergency
- Introduce a new health or safety risk for which the community is not prepared or does not have adequate management and response plans in place.

The proposed project would involve construction activities, operation of the CHP plant, and harvesting, hauling and chipping wood. The construction project manager responsible for construction of the CHP plant and the heat distribution system would be responsible for compliance with the applicable OSHA regulations governing construction activities (29 CFR 1910 and 1926), and any additional site-specific safety measures that concern occupational hazards at the project site for all construction workers and site visitors. The general worker safety standards covered in OSHA regulations include walking-working surfaces, means of ingress and egress, operation of power equipment, adequate ventilation, noise exposure controls, fire protection, and electrical equipment safeguards.

Once the proposed CHP plant is operational, OSHA procedures would continue to be followed to minimize worker exposure to health and safety risks. These would include warning systems and alarms to detect elevated temperature/pressure in the generator equipment. Additionally, a new fire suppression system would be installed and maintained in the plant.

The wood chips would have a moisture content of 25 to 35 percent; therefore, the risk of an explosion of resuspended dust in the CHP plant would be very low. General housekeeping practices, such as cleaning of the conveyors and feed system, would be implemented to minimize concentrations of resuspended dust in the facility.

The annual harvest sequence would begin midspring for those areas accessible without river crossings and just after breakup as soon as river transport is possible for those areas requiring access by river. The intent would be to begin felling and stacking woody biomass as early in the year as possible. When possible, the felling would start as soon as temperatures have warmed enough to be able to operate the felling head efficiently and safely (snow depth and temperature), which may be as early as March. In some cases these activities would have to be completed after break up. The felling and stacking operation would entail the use of the Kubota excavator with a felling/mulching head and a Fecon forest crawler with brush grapple attachment. The Fecon would be fitted with a grapple rake and work behind the Kubota and stack the trees in loose stacks so as to facilitate air drying of the trunk and limbs. For operator safety purposes, the piling would be carried out simultaneously by the Fecon working in the same general vicinity. The configuration and juxtaposition of the stacks would facilitate efficient feeding of the chipper, which would be carried out later in the season. The chipper would be a self-propelled, remotely controlled tracked whole tree chipping unit with a drum chipping head. The chipper would be fed and controlled from the excavator. The use of the heavy equipment during harvesting and chipping activities is anticipated to pose minimal risk to equipment operators, provided all equipment specifications and applicable OSHA regulations are followed.

The methodology for determining ice thickness and safe transport of equipment and biomass over frozen waterbodies is discussed in **Section 3.10.2,** Transportation. Most wood hauling in interior Alaska is done during the winter when rivers have frozen over. However, there is a personal safety risk if machinery were to break through the ice during biomass harvesting or hauling activities. This risk is considered minor provided proper measurements of thickness and quality of ice quality are determined at appropriate intervals during all water crossings. Following the practices outline in **Section 3.10.2** should ensure that wood fuel and equipment should be able to be safely hauled over river ice for three to four months out of the year.

Harvesting in non-ice season would occur when the rivers are at a low enough level as to not endanger workers or equipment. Workers would receive applicable training, be protected through appropriate controls and oversight, and follow standard industrial and protective engineering practices, including the use of personal protective clothing and equipment, as specified in applicable OSHA regulations. No environmental health risks or safety risks associated with the proposed project would disproportionately affect children. Overall impacts to human health and safety from the proposed project would be minor.

3.12.3 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, no construction, harvesting or hauling activities would occur. There would be no new risks to human health and safety. Existing conditions would remain the same, and therefore, no impacts to human health and safety would occur.

4. Cumulative Impacts

4.1 Cumulative Impacts

CEQ regulations stipulate that the cumulative effects analysis in an EA should consider the potential environmental effects resulting from "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (40 CFR 1508.7). CEQ guidance in considering cumulative effects affirms this requirement, stating that the first steps in assessing cumulative effects involve defining the scope of the other actions and their interrelationship with a proposed action. The scope must consider other projects that coincide with the location and timetable of a proposed action and other actions. Cumulative effects analyses must also evaluate the nature of interactions among these actions.

To identify cumulative effects, the analysis needs to address two fundamental questions:

1. Does a relationship exist such that affected resource areas of the proposed project or alternatives might interact with the affected resource areas of past, present, or reasonably foreseeable actions?
2. If such a relationship exists, then are there any potentially significant effects not identified when the proposed project is considered alone?

The scope of the cumulative effects analysis involves both timeframe and geographic extent in which effects could be expected to occur, and a description of what resources could be cumulatively affected. All relevant past, present and reasonably foreseeable future activities in and around the vicinity of Fort Yukon were initially considered for potential cumulative effects, and activities that could have additive environmental effects on those identified associated with the proposed project are addressed in the below impacts section.

4.1.1 Actions Considered with Potential Cumulative Impacts

In 1950, the population of Fort Yukon was reported as 446. By 1990, the population had risen to 580 and by 2000 it was at 595 (CRW 2010). Fort Yukon is estimated to experience an average population growth of one percent in future years, resulting in a population of 647 in 2019. The resulting increase in electrical demand, assuming 20 additional households are constructed by the design year, is approximately 20 kW (175,000 kW hours) per year (CRW 2010).

The following four past, present, or reasonably foreseeable projects in Fort Yukon might have additive environmental effects to those associated with the proposed project.

City of Fort Yukon Water and Sewer Project

Fort Yukon, in cooperation with the Alaska Native Health Consortium is in the final stage of implementing a community water and sewer project for Fort Yukon. To date, the water and sewer project has constructed a new washeteria/water treatment plant, sewage treatment lagoon, buried arctic pipe water distribution and gravity sewage collection pipelines, and multiple sewage lift stations and force mains. Construction of additional piped improvements and service connections will continue for the foreseeable future (CRW 2010).

As residences and community buildings are added to the system over the coming years, it is anticipated that usage (and electrical demand) will gradually increase. It has been estimated that water/sewer improvements will result in an additional 60 kW average demand and consume approximately

525,000 kW hours in the design year (CRW 2010). The water and sewer project will be managed by the City of Fort Yukon. Construction was completed on the project in the fall of 2012. In 2013, the final task, residential hookups, will be completed. The district-heating loop that would be implemented as a part of the proposed project would utilize the same easements established by the water and sewer project.

New Landfill

A new 40-acre landfill meeting state and Federal regulations as a Class III category landfill is planned to be developed near the new sewer lagoon. On June 7, 2012, ADEC posted a notice to issue Solid Waste Disposal Permit Number SW3A092-17 to the City of Fort Yukon to operate the new Class III Community Municipal Solid Waste Landfill. The new landfill would include a solid waste disposal cell, an enhanced burn unit, a storage area for used appliances, a stockpile of cover materials, and drainage controls, within a fenced area surrounded by 6-foot berms.

Airport Improvements

The Alaska Department of Transportation and Public Facilities is in the process of extending the runway, and rehabilitating the aprons and safety areas, at the airport in Fort Yukon. However, the upgrades will reportedly not affect the current airport electrical demand (CRW 2010).

Wood Harvesting

Annual wood harvesting to meet a variety of needs occurs in the vicinity of Fort Yukon by tribal members and individual vendors approved by the GZGTG. The individual wood vendors travel between 4 to 12 miles from the community to a GZGTG-designated harvest area. Most of the harvest areas are approximately 12 miles northeast of Fort Yukon. Each vendor selects less than 5 acres per area, per season, where they are permitted to do selective cutting only. No clear cutting is permitted, and each vendor is directed to take dry trees only. The vendors use hand operated chainsaws to fell trees. Though the number of tribal members and approved individual wood vendors engaged in harvesting activities is subject to fluctuate, these harvesting activities are anticipated to continue in the foreseeable future.

4.1.2 Cumulative Impacts Analysis

The ongoing water and sewer improvement projects, as well as any future increases in population within Fort Yukon, will likely increase the demand for heating and electricity in the community. The proposed CHP plant has been designed to meet that increase in demand (GZC 2011).

As described in **Section 3**, the proposed project would result in negligible to minor direct and indirect adverse impacts on the environment, and would have beneficial impacts on air quality and socioeconomics in the region. Because the direct and indirect impacts of the project would be small, the contribution of the proposed project to the cumulative effects from all reasonably foreseeable future projects generally also would be small. Based on the current conditions and analysis of potential effects of the proposed project described in **Section 3**, and the above description of reasonably foreseeable future actions, DOE has concluded that the proposed project could contribute to the cumulative adverse effects on biological resources, concentration of resuspended particles in the air, and noise levels, but otherwise would have no more than a negligible cumulative effect.

The proposed project would involve harvesting within five miles of Fort Yukon for the first five years and within 10 miles of the community for the remaining lifetime of the project. The proposed harvesting activities would result in negligible to minor short- and long-term, adverse and beneficial impacts to biological resources. Cumulatively, the proposed harvesting activities would contribute no more than

minor impacts to other ongoing harvest activities due to the vastness of forested tracts within the region and the sustainable harvesting methods employed.

Development of the CHP plant and associated infrastructure would require the conversion and use of about 10 acres of land in Fort Yukon. That conversion, plus implementation of other reasonably foreseeable projects, would result in the loss of vegetation and wildlife habitat in Fort Yukon. Because the projects are planned to occur within and near developed areas, and because Fort Yukon is surrounded by large undeveloped areas, the projects would result in a very small loss of habitat for biological resources in the region.

If the proposed project, landfill, and other reasonably foreseeable projects were to be constructed at the same time, they would cumulatively increase the concentration of airborne dust and other resuspended particles, which are high in Fort Yukon during some summer periods (**see Section 3.5.1**). This could result temporarily in unhealthy air quality conditions in and near Fort Yukon. As described in **Section 3.5**, mitigation measures will be implemented to minimize the resuspension of dust during construction and operation of the proposed project.

As described in **Section 3.6**, construction and installation of the CHP plant, wood storage area, and district heating system, and operation of saws, wood chippers, and other equipment to process and transport biomass, would temporarily increase noise levels in residential and community areas of Fort Yukon. If other construction activities were to occur at the same time, noise levels in Fort Yukon temporarily could be disruptive to activities in the community.

4.2 Irreversible/Irretrievable Commitment of Resources

A commitment of resources is irreversible when its primary or secondary impacts limit the future options for a resource or limit those factors that are renewable only over long periods of time. Examples of nonrenewable resources are minerals, including petroleum, and cultural resources. An irretrievable commitment of resources refers to the use or consumption of a resource that is neither renewable nor recoverable for use by future generations. While a proposed project might result in the loss of a resource that is irretrievable, the action might be reversible.

Irreversible and irretrievable commitments of resources are primarily related to construction activities. Resources consumed during construction of the proposed project, including fossil fuels and construction materials, would be committed for the life of the project. Nonrenewable fossil fuels would be irretrievably lost through the use of gasoline- and diesel-powered construction equipment during construction activities, and the diesel generators in the CHP plant, once it is operational. The expenditure of Federal funding from DOE, RUS and the Denali Commission would also be irreversible.

4.3 The Relationship between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity

Short-term use of the environment is that used during the life of a proposed project, whereas long-term productivity refers to the period of time after the project has been decommissioned, the equipment removed, and the land reclaimed and stabilized. The proposed project would involve a very small change in land use to accommodate the CHP plant. The short-term use of the site for the proposed project would not affect the long-term productivity of the area. If it is decided at some time in the future that the project has reached its useful life, components of the CHP plant and distribution system could be decommissioned and the site would be available for other uses.

Short-term degradation of air quality related to construction, harvesting, hauling and operation activities would occur in Fort Yukon. Air quality is considered a renewable resource; when activities that produce emissions cease, the local air quality returns to its original natural condition. Soils potentially affected by construction, harvesting and hauling would cover relatively small areas. Cessation of activities would, in most cases, allow soils to eventually re-establish. While the formation of soils is a very slow process, short-term uses generally would have a very small long-term effect. However, soils lost through the construction of permanent facilities would essentially be a permanent impact.

Economic benefits would accrue from job creation and increased fuel independence. Economic benefits, including any decrease in Fort Yukon's dependency on foreign oil, and increases in employment and associated personal income would occur over the operational period of the CHP plant. However, these increases would occur only for the duration of the activities.

4.4 Unavoidable Adverse Impacts

Unavoidable adverse impacts associated with the proposed project include:

- Long-term loss of approximately 10 acres of land within Fort Yukon for use by the wood storage areas and the area access road, as well as the CHP plant
- A temporary increase in noise and dust levels during construction
- Soil compaction and rutting during summer harvest and hauling activities
- Construction of a structure within the floodplain and the associated negligible loss of floodwater storage area.

The impacts from construction activities would be temporary. Soil compaction and rutting associated with biomass harvesting, as well as construction in the floodplain, would be considered to result in long-term impacts. Overall, impacts of the proposed project on the human and natural environment would be minor.

5. References

ADEC 2010 Alaska Department of Environmental Conservation (ADEC), Division of Air Quality. 2010. Air Non-Point Mobile Source; Dust in Rural Communities. Available online at: <http://www.dec.alaska.gov/air/anpms/comm/rural_pm10.htm>. Data accessed 4 September 2012.

ADEC 2012 Alaska Department of Environmental Conservation (ADEC), Division of Air Quality. 2012. Air Permits, Approvals and Public Notices. Data available online at: <http://dec.alaska.gov/Applications/Air/airtoolsweb/PermitsApprovalsAndPublicNotices > Data accessed 19 September 2012.

ADFG 2008 Alaska Department of Fish and Game. 2008. Anadromous Waters Atlas Quad No. 113 (FOR) Fort Yukon C-3. Available online at: <http://www.adfg.alaska.gov/sf/SARR/AWC/index.cfm?ADFG=main.home>. Data accessed 3 December 2012.

AVI 2007 Alaska Village Initiatives (AVI). 2007. A Forest Stewardship Plan. Prepared for Gwichyaa Zee Corporation. July 2007.

Cummins Bridgeway 2013 Cummins Bridgeway, LLC. 2013. Email Correspondence from Edward 'Gus' Scott, Electrical Engineer and Cummins Bridgeway Representative, regarding noise emissions from wood chipper. February 06, 2013.

CRW 2010 CRW Engineering Group (CRW). 2010. Conceptual Design Report: Rural Power System Upgrade Project, Fort Yukon, Alaska. Prepared for State of Alaska/Alaska Energy Authority. June 1, 2010.

DeLuca 2001 DeLuca, T.H. 2001. Assessment of the USFS Soil Quality Standards and the Application of those Standards to the Pink Stone Environmental Impact Statement. A Report to The Ecology Center, Inc.

GZC 2011 Gwichyaa Zee Corporation (GZC). 2011. Draft Business Operating Plan: Fort Yukon Combined Heat and Power Project. September 2011.

GZGTG 2010 Gwichyaa Gwich'in Tribal Government (GZGTG). 2010. Biennial Gwich'in Gathering. Available online at: < www.fortyukon.org>. Accessed 11 August 2012.

KOB 2006 KOB and Schaefer GmbH. 2006. Pyrtec 720 Boiler Specifications. Laboratory Testing Conducted by TUV SUV Industries Service GmbH, Fuel and Heating Engineering Department, DIN Laboratory. Certified Translation from German.

NMFS 2012 National Marine Fisheries Service, Northwest Region. 2012. Endangered, Threatened, Proposed, Candidate and Delisted Species in Alaska. February 2012.

RBEGR 2011 Rural Business Enterprise Grant Report (RBEGR). 2011. Draft Fort Yukon Woody Biomass Fuel Implementation Plan. March 2011.

Sustainability, Inc. 2012 — Sustainability, Inc. 2012. Review Draft Environmental Assessment, Section 1: Fort Yukon Biomass Harvesting Project. Prepared for Gwitchyaa Zhee Native Corporation and Council of Athabascan Tribal Governments. January 31, 2012.

TCC 2010 — Tanana Chiefs Conference (TCC). 2010. Fort Yukon Biomass Resource Assessment. Tanana Chiefs Conference Forestry Program, Fairbanks, Alaska. September 2010.

USDA 2005 — U.S. Department of Agriculture (USDA): Soil Resource Management. 2005. National Program 202: Soil Resource Management Assessment Team Meeting. USDA-ARS. Available online at: <http://ars.usda.gov/sp2UserFiles/Program/202/202Assessment2004/202AssessmentReportFinal.pdf>.

USEPA 1974 — U.S. Environmental Protection Agency (USEPA). 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.* EPA 550/9-74-004. March 1974.

USEPA 1981a — USEPA. 1981. Noise Effects Handbook. *A Desk Reference to Health and Welfare Effects of Noise.* Office of Noise Abatement and Control. October 1979, Revised July 1981. Available online: <http://nonoise.org/epa/Roll7/roll7doc27.pdf>. Accessed 3 March 2010.

USEPA 1981b — USEPA. 1981. *Noise and its Measurement.* January 1981. Available online: <http://nonoise.org/epa/Roll19/roll19doc49.pdf>. Accessed 3 March 2010.

USEPA 2012a — USEPA. 2012. Green Book Nonattainment Areas for Criteria Pollutants. Available online: <http://www.epa.gov/oar/oaqps/greenbk/>. Accessed 23 July 2012.

USEPA 2012b — USEPA. 2012. *National Ambient Air Quality Standards (NAAQS).* Available online: <http://www.epa.gov/air/criteria.html>. Data accessed 24 July 2012.

USFWS 2008 — U.S. Fish and Wildlife Service (USFWS), Alaska Region. 2008. Yukon Flats National Wildlife Refuge. July 22, 2008. Available online: <http://alaska.fws.gov/nwr/yukonflats/wildland.htm>. Accessed 26 August 2012.

USFWS 2010 — USFWS, Alaska Region. 2010. Proposed Land Exchange Yukon Flats National Wildlife Refuge Final Environmental Impact Statement. February 2010. Available online: <http://yukonflatseis.ensr.com/Yukon_Flats/documents_FEIS.htm>. Accessed 26 August 2012.

USFWS 2012 — USFWS, Alaska Region. 2012. Endangered, Threatened, Proposed, Candidate and Delisted Species in Alaska. February 2012.

Zazada et al. 1981 — Zasada, J. C., L. A. Viereck, M. J. Foote, R. H. Parkenson, J. O. Wolff, and L. A. Lankford. 1981. Natural regeneration of balsam poplar following harvesting in the Susitna Valley, Alaska. Forestry Chronicle 57:57-65.

APPENDIX A

SCOPING DISTRIBUTION LIST

APPENDIX A
Scoping Distribution List

Federal Agencies

Richard Albright, Office Director
Office of Air, Waste, and Toxics
Environmental Protection Agency

Sarah Conn, Field Supervisor
U.S. Fish and Wildlife Service
Fairbanks Field Office

Ted Swem, Endangered Species Branch Chief
U.S. Fish and Wildlife Service
Fairbanks Field Office

Christy Everett
CEOP-CO-R-NF
Field Office Supervisor
U.S. Army Corp of Engineers
Fairbanks Regulatory Field Office

Victor Ross, Acting North Branch Supervisor
U.S. Army Corps of Engineers
Department of Army
Regulatory Branch

James W. Balsiger, Regional Administrator
NOAA, National Marine Fisheries
Alaska Region Headquarters

Jeanne Hanson, Assistant Regional Director for
Habitat Conservation
National Marine Fisheries Service
NMFS Alaska Region

Robert Jess, Refuge Manager
Yukon Flats National Wildlife Refuge

Federal Emergency Management Agency,
Region X

Federal Emergency Management Agency
Alaska Area Office

State Agencies

Larry Hartig, Commissioner
State of Alaska
Department of Environmental Conservation

Bill Morris, Fish and Game Coordinator
Alaska Department of Fish and Game

Steve Titus, Regional Director
Department of Transportation
Northern Region Headquarters

Randy Bates, Director
Alaska Department of Fish and Game
Division of Habitat

Brent Goodrum, Director
Department of Natural Resources
Division of Mining, Land and Water

Alan Fetters, Project Manager
Alaska Energy Authority
Rural Energy Group, Rural Power Systems
Upgrades

AJ Wait, Manager of Permitting
Department of Natural Resources

James Schwarber
Department of Natural Resources
Division of Forestry

Doug Hanson
Department of Natural Resources
Division of Forestry Northern Region

Judith Bittner, Chief Officer
Department of Natural Resources
Office of History and Archaeology

Tom Crafford, Director
Department of Natural Resources
Office of Project Management and Permitting

Margaret Moody, Airport Leasing Specialist II
Transportation & Public Facilities

Moses Coss, Engineering Associate II
Alaska Department of Environmental Conservation

Local Governments

Twila Strom, Mayor
City of Fort Yukon Council

Thomas Knudson, 2nd Deputy
City of Fort Yukon Council

Shirley Fields, 1st Deputy
City of Fort Yukon Council

Vickie Thomas, Secretary/Treasurer
City of Fort Yukon Council

Clarence Alexander
City of Fort Yukon Council

Georgianna Engler
City of Fort Yukon Council

Paul Shewfelt
City of Fort Yukon Council

Yukon Flats RC&D
Fort Yukon Office

Yukon Flats RC&D
Fairbanks Office

Nancy James, President
Yukon Flats School District

Earla Hutchinson, Secretary/Treasurer
Yukon Flats School District

Laurie Thomas
Yukon Flats School District

Margaret Henry
Yukon Flats School District

David Bridges
Yukon Flats School District

Lance Whitwell
Yukon Flats School District

Cecilia Wiehl
Yukon Flats School District

Native American and Tribal Organizations

Doyon, Limited

Tanana Chief Conference

Simon Francis Sr., Traditional Chief
Gwichyaa Gwich'in Tribal Government

Nancy James, First Chief
Gwichyaa Gwich'in Tribal Government

Edward Alexander, Second Chief
Gwichyaa Gwich'in Tribal Government

Christine Rifredi, Member
Gwichyaa Gwich'in Tribal Government

Andrew Firmin
Gwichyaa Gwich'in Tribal Government

Connie Fields
Gwichyaa Gwich'in Tribal Government

Tony Peter
Gwichyaa Gwich'in Tribal Government

Laurie Thomas, President
Gwitchyaa Zhee Corporation and Subsidiaries

Gerald Carroll, Vice-President
Gwitchyaa Zhee Corporation and Subsidiaries

Mary Beth Solomon, Secretary/Treasurer
Gwitchyaa Zhee Corporation and Subsidiaries

Vicky Thomas, Board Member
Gwitchyaa Zhee Corporation and Subsidiaries

James Kelly, Board Member
Gwitchyaa Zhee Corporation and Subsidiaries

Michelle Peter
Gwitchyaa Zhee Corporation and Subsidiaries

Alma Herbert
Gwitchyaa Zhee Corporation and Subsidiaries

Randy Mayo, Chairman
Council Of Athabascan Tribal Governments

Jonathan John, Vice-Chairman
Council Of Athabascan Tribal Governments

Rhonda Pitka, Secretary/Treasurer
Council Of Athabascan Tribal Governments

Ben Stevens
Executive Director
Council of Athabascan Tribal Governments

John S. Jonas, Member
Council Of Athabascan Tribal Governments

Stephanie Herbert, Member
Council Of Athabascan Tribal Governments

Elaine Evans, Member
Council Of Athabascan Tribal Governments

Bryan Maracle, Natural Resources Director
Natural Resources Office
Council of Athabascan Tribal Governments

Fannie Carroll, General Manager
Gwitchyaa Zhee Corporation