Susitna-Watana Hydroelectric Project
(FERC No. 14241)

Air Quality Study
Study Plan Section 15.9

Study Completion Report

Prepared for

Alaska Energy Authority

SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

Prepared by

HMMH

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LIST OF ACRONYMS, ABBREVIATIONS, AND DEFINITIONS

Abbreviation	Definition
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADOT&PF	Alaska Department of Transportation & Public Facilities
AEA	Alaska Energy Authority
ASOS	Automated surface observation systems
BMP	Best Management Practice
CAA	Federal Clean Air Act of 1970
CAAA	Clean Air Act Amendments of 1990
CEA	Chugach Electric Association
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COOP	Cooperative Observer Program
EPA	United States Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
GVEA	Golden Valley Electric Association
HEA	Homer Electric Association
ILP	Integrated Licensing Process
ISR	Initial Study Report
MEA	Matanuska Electric Association
ML&P	Anchorage Municipal Light and Power
MW	Megawatt
NAAQS	National Air Quality Standards
NO_2	Nitrogen Dioxide
NO_X	Nitrogen Oxides

Abbreviation	Definition
NPS	National Park Service
O_3	Ozone
Pb	Lead
PM_{10}/$PM^{2.5}$	Particulate matter less than 10 microns/Particulate Matter less than 2.5 microns
Project	Susitna-Watana Hydroelectric Project
PROMOD	Productive Modeling
RSP	Revised Study Plan
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SPD	study plan determination
TPY	Tons Per Year
ULSD	Ultra-Low Sulfur Diesel
VMT	Vehicle Miles Traveled
VOCs	Volatile Organic Compounds

1. INTRODUCTION

This Study Completion Report, Section 15.9 of the Revised Study Plan (RSP) approved by the Federal Energy Regulatory Commission (FERC) for the Susitna-Watana Hydroelectric Project, FERC Project No. 14241, focuses on assessing the current conditions of the study area against applicable state and national air quality standards and evaluating the Project's air quality impact against these standards.

A summary of the development of this study, together with the Alaska Energy Authority's (AEA) implementation of it through the 2013 study season, appears in Part A, Section 1-6, 8-10 of the Initial Study Report (ISR) filed with FERC in June 2014. As required under FERC's regulations for the Integrated Licensing Process (ILP), the ISR describes AEA's "overall progress in implementing the study plan and schedule and the data collected, including an explanation of any variance from the study plan and schedule." (18 CFR 5.15(c)(1)).

Since filing the ISR in June 2014, AEA has continued to implement the FERC-approved plan for the air quality study. The study team completed the following activities:

- Participated in the October 23, 2014 ISR meeting related to the June 2014 Air Quality ISR facilitated by AEA;
- Reviewed and summarized on-site meteorological data collected by AEA at the Dam site and two nearby locations;
- Updated the climate and meteorology table (Table 5.1-1) to reflect the most recent (i.e. 2014) meteorological data collected from nearby weather stations;
- Updated ambient air quality monitoring tables (Tables 5.1-3 to 5.1-6) to reflect the most recent three-year (2012 to 2014) ambient air quality data collected from nearby Alaska Department of Environmental Conservation (ADEC) and National Park Service (NPS) monitoring locations;
- Reviewed and incorporated relevant information from the AEA Engineering Feasibility Report (MWH, 2014) into the Project emissions qualitative discussion in Section 5.2;
- Reviewed and summarized recent dust control research conducted by the Alaska Department of Transportation and Public Facilities, (ADOT&PF) Research, Development & Technology Transfer and the Alaska University Transportation Center for inclusion in the Best Management Practice section (Section 5.5).

In furtherance of the next round of ISR meetings and FERC's Study Plan Determination (SPD) expected in 2016, this report contains a comprehensive discussion of results of the Air Quality Study from the beginning of AEA's study program in 2012, through 2015. It describes the methods and results of the Air Quality Study, and explains how all Study Objectives set forth in the Commission-approved Study Plan have been met. Accordingly, with this report, AEA has now completed all field work, data collection, data analysis, and reporting for this study.

2. STUDY OBJECTIVES

The primary goal and objective of the air quality analysis is to ensure that the proposed Project does not violate National Ambient Air Quality Standards (NAAQS) per 40 CFR Part 50 and state air quality standards in Alaska Administrative Code (AAC) 18 AAC 50 (under the authority of Alaska Statutes [AS] 46.03 and 46.14). The national and state air quality regulations are designed to maintain and/or improve air quality by controlling or reducing emissions of air pollutants. The air quality impact analysis is subject to the state and national ambient air quality standards and state and national attainment designations (i.e., attainment, non-attainment, maintenance).

The following are the primary objectives of the Air Quality Study:

- Assess the current conditions of the area against applicable state and national air quality standards.
- Review and summarize existing air monitoring data in the area.
- Determine attainment status of the study area (i.e., unclassifiable/attainment, non-attainment, maintenance).
- Quantify short-term (construction) and long-term (operational) emissions.
- If applicable, analyze ground-level impacts using air dispersion models.
- If applicable, evaluate indirect mobile source emissions from additional traffic generated.
- Compare Project emissions to the Without-Project alternative.
- Evaluate potential emission reductions from Railbelt fossil-fuel utility plants if the Project is operating.
- Develop information to be used in the identification of potential mitigation measures, if necessary, to reduce emissions during construction.

3. STUDY AREA

As established by RSP Section 15.9.3, the study area for the Air Quality Study is comprised of the immediate vicinity of the Project area and the greater Railbelt region.

4. METHODS AND VARIANCES

In 2014-2015, AEA implemented components of the Study Plan as described below and incorporated the following information:

- results of AEA Engineering Feasibility Study (MWH, 2014);
- latest available climatological and ambient air quality data; and

- research conducted by state transportation agencies and associated research groups related to fugitive dust control.

4.1. Document Existing Conditions

AEA implemented the methods as described in the Study Plan for documenting existing conditions in the study area (RSP Section 15.9.4.1) with no variances.

Air monitoring reports prepared by the Alaska Department of Environmental Conservation (ADEC) were reviewed to assess the existing conditions of the area. There is little existing ambient monitoring data available for the vicinity of the Project site, so the study team investigated state and National Park Service (NPS) monitoring data to help characterize the air quality within the study area. AEA coordinated with ADEC and NPS to use the most relevant data available to support the existing conditions section. The monitoring data have been compiled and compared to applicable standards for criteria pollutants in tables. Criteria pollutants, as defined by the U.S. Environmental Protection Agency (EPA), are nitrogen dioxide (NO_2), sulfur dioxides (SO_2), carbon monoxide (CO), particulate matter (PM_{10}/$PM_{2.5}$), lead (Pb), and ozone (O_3).

The weather station data was updated from the June 2014 ISR (Section 5.1.2) to include three AEA meteorological measurement locations near the Project site for 2012 to 2014 as well as 2014 data from the other nearby meteorological stations. The ambient air monitoring summary tables in Section 5.1.3.3 of the ISR were also updated to include 2014 measurement data from each monitoring station.

This task has been completed.

4.1.1. Variances

There were no variances in implementing study methods for documenting existing conditions.

4.2. Estimate Project Emissions

AEA implemented the methods as described in the Study Plan for estimating emissions from construction equipment and related activities (RSP Section 15.9.4.2), with the exception of the variance described below (Section 4.2.1).

The study team updated the qualitative assessment of potential Project-related emissions in Section 5.2 of the ISR to provide information on the sources and types of emissions likely to occur during Project construction and operation. This section was updated to reflect relevant information on construction equipment and operations presented in the December 2014 AEA Engineering Feasibility Report (MWH, 2014).

This task was completed with the variance noted below.

4.2.1. Variances

The June 2014 ISR Section 4.2.1 discussed deferring a quantitative analysis of future emissions associated with Project construction until more specific data from the Engineering Feasibility

Report was available. Quantitative analysis requires much more specific and detailed equipment use information than provided in the Engineering Feasibility Report, including but not limited to specific types and number of equipment, duration of activity, engine types, and specific levels of vehicle, aircraft and rail operations. AEA has instead provided a qualitative assessment of Project-related emissions as discussed in Section 5.2.

4.3. Summarize Baseline Fossil Fuel Generation Emissions

The study team summarized baseline fossil fuel generation emissions in the area. Baseline emissions were summarized for Railbelt generating facilities and were comprised of criteria pollutant and greenhouse gas emissions for each generating facility. The team used the emission source data from ADEC to summarize the pollutant emissions along with generation data from AEA.

As noted in the Study Plan, in preparing this summary, the study team did not conduct additional monitoring or data collection at existing power generation sites because the source emission and generation data were already summarized by ADEC and AEA for the Railbelt region.

AEA implemented the methods as described in the Study Plan for summarizing baseline fossil fuel generation emissions (RSP Section 15.9.4.3). No additional information was collected in 2014, therefore, no changes were made to this section from the June 2014 ISR.

This task has been completed.

4.3.1. Variances

There were no variances in implementing study methods for summarizing fossil fuel generation emissions during 2013. However, the team did not utilize information identified by HDR in Section 7.3.1.2 of the Data Gap Analysis as contemplated in the Study Plan (RSP Section 15.9.4.3) because emissions and generation data from ADEC and AEA were available for the Railbelt region.

4.4. Analyze and Compare Emissions

AEA implemented the methods as described in the Study Plan for comparing future estimated With-Project emissions to emissions estimated for Without-Project emissions. The study team compared the potential emissions from other Railbelt fossil-fueled facilities to provide the equivalent annual generation of power as the Project if the Project is not implemented, or the installation of new generation facilities for the future using a similar fuel mix to the current Railbelt facilities.

The study team prepared an initial emissions comparison of the With-Project and Without-Project scenarios. The With-Project emissions displacement from the Project was estimated by calculating a pollutant-specific pound per megawatt hour based on the Railbelt utilities' generation and emission data obtained from AEA and ADEC. The Without-Project emissions assumed emissions from the With-Project scenario would not be displaced, but rather generated within the Railbelt region to meet the additional demand.

AEA implemented the methods as described in the Study Plan for comparing future estimated With-Project emissions to emissions estimated for Without-Project emissions (RSP Section 15.9.4.4). No additional information was collected in 2014, therefore, no changes were made to this section from the June 2014 ISR.

This task has been completed.

4.4.1. Variances

There were no variances in implementing study methods for comparing future estimated With-Project emissions to emissions estimated for Without-Project emissions during 2014.

4.5. Identify Best Management Practices

The study team prepared an initial list of best management practices to reduce air emissions related to the construction and operation of the Project. These best management practices were identified based on an Internet review of mitigation measures developed and/or employed for other similar construction activities along with reviewing dust mitigation measures conducted by ADEC and the Alaska University Transportation Center.

The study team updated theinitial list of best management practices presented in the Air Quality ISR (Section 5.5) in 2014 to reduce air emissions related to the construction and operation of the Project. This list was updated to include the results of the latest studies conducted by ADOT&PF and affiliated transportation research facilities regarding dust control of unpaved surfaces.

This task has been completed.

4.5.1. Variances

There were no variances in implementing study methods for identifying best management practices during 2014.

5. RESULTS

5.1. Existing Conditions

AEA gathered existing meteorological and air quality information to document baseline conditions of the study area. Air quality is dependent on a combination of many factors, including the type and amount of pollutants emitted, the size and topography of the air basin, and prevailing meteorological conditions. The significance of the pollutant concentration is determined by comparing a certain area’s conditions with federal and state air quality standards. The existing conditions of the study area are summarized and presented in this section.

5.1.1. Meteorology and Climate

Due to its large size, Alaska has a diverse climate that is characterized by wide temperature ranges and weather conditions. This diversity can be attributed to Alaska's high latitude location, variable topographical features, and ocean influence, including moving ice.

The geographical landscapes of Alaska have a significant effect on the state's climate. As shown in Figure 5.1-1, there are five principal climatic zones that characterize the climate of Alaska: Maritime, Maritime Continental, Transitional Maritime and Continental, Continental, and Arctic. The Project area falls primarily within the Transitional Maritime and Continental climate zone.

Conditions within the Transitional Maritime and Continental climate are best described as a sub-arctic climate consisting of mild temperatures compared to Alaska standards, which is due mainly to the proximity of the coast. Precipitation tends to be lighter compared to the maritime regions; however, there tends to be more snow in the winter compared to the southeast.

The Project site lies in the Susitna River valley with the Alaska Range to the north and the Talkeetna Mountains to the south. These topographical features can also influence weather and precipitation and contribute to temperature inversions, which can lead to pollution and smog. Temperature inversions are an increase in temperature with height and typically occur during the winter months when the lower levels of the atmosphere are extremely cold and the temperature increases with height, which can trap airborne pollutants closer to the ground surface.

In order to characterize the climate and the meteorology of the study area, a review of nearby weather station data was conducted.

5.1.2. Weather Station Data

There are three weather stations operated by AEA within 45 miles of the Watana Dam site collecting meteorological data including temperature and precipitation. The three sites are identified as Watana Dam, Indian River and Oshetna River locations. The Watana Dam site has data collected from August 2012 to November 2014 and does not include precipitation data. The Oshetna and Indian River sites have data collected from September 2012 to November 2014 and include temperature and precipitation data.

There are also automated surface observing systems (ASOS) stations maintained in the area of the Project site by the National Weather Service and NPS, along with the Cooperative Observer Program (COOP), a volunteer-based monitoring system. The closest stations representative of the Project site were Talkeetna, Gulkana, Denali National Park Headquarters, Palmer, and Big Delta. Figure 5.1-2 shows the station locations relative to the Project site and Table 5.1-1 shows the climate statistics from each station. Information pertaining to each station was obtained from the National Weather Service data climate page (http://pafg.arh.noaa.gov/cliMap/ akClimate.php). Meteorological data for the three Watana sites was provided by Tetra Tech, Inc.

Table 5.1-1 has been updated to include the three AEA sites and 2014 data for the other stations. The table shows the average annual minimum temperature ranging from 11.7°F to 28.4°F and the maximum average temperature ranging from 33.7°F to 46.7°F. Annual average precipitation totals range from 6.5 to 16.9 inches, with the highest totals found at Talkeetna and the Denali National Park Headquarters location and the lowest totals at Palmer and the Indian River and Oshetna River locations.

5.1.3. Ambient Air Quality

5.1.3.1. Air Quality Standards

Pursuant to the Federal Clean Air Act of 1970 (CAA), the EPA established National Ambient Air Quality Standards (NAAQS) for major pollutants known as "criteria pollutants" (see Table 5.1-2). Currently, EPA regulates six criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter, and lead (Pb). Particulate matter (PM) is organized in two particle size categories: particles with a diameter less than 10 micrometers (PM_{10}) and those with a diameter of less than 2.5 micrometers ($PM_{2.5}$). ADEC has established ambient air quality standards under 18 AAC 50.010 and these standards are similar to the NAAQS for criteria pollutants; however, ADEC also includes an 8-hour standard for ammonia and a 30-minute standard for reduced sulfur.

Table 5.1-2 shows the primary and secondary NAAQS for the criteria pollutants along with the ADEC ambient air quality standards. The NAAQS are two-tiered. The first tier (primary) is intended to protect public health; the second tier (secondary) is intended to prevent further degradation of the environment. Section 176(c) of the CAA requires federal agencies to ensure that all of their actions conform to applicable implementation plans for achieving and maintaining the NAAQS. Federal actions must not cause or contribute to any new violation of any standard, increase the frequency or severity of any existing violation, or delay timely attainment of any standard.

5.1.3.2. Attainment Classifications

The standards in Table 5.1-2 apply to the concentration of a pollutant in outdoor ambient air. EPA designates all areas in the U.S. as attainment, unclassifiable, nonattainment, or maintenance with respect to the NAAQS. If the air quality in a geographic area is equal to or is better than the national standard, it is called an "attainment area." Areas where air quality does not meet the national standard are called "non-attainment areas." Once the air quality in a non-attainment area improves to the point where it meets the standards and the additional redesignation requirements in the CAA [Section 107(d) (3)(E)], EPA redesignates the area as a "maintenance area." Any areas that cannot be classified based on available information as meeting or not meeting the NAAQS are considered unclassifiable; however, these areas are functionally equivalent to attainment areas.

The Clean Air Act Amendments (CAAA) of 1990 require states to designate the status of all areas within their borders as being in or out of compliance with the NAAQS. The CAAA further define non-attainment areas for ozone based on the severity of the violation as marginal, moderate, severe, and extreme. In an effort to further improve the nation's air quality, EPA has classified additional areas as attainment/non-attainment for a new 2008 8-hour ozone standard. The new 2008 8-hour ozone standard is listed in Table 5.1-2.

Each state is required to draft a state implementation plan (SIP) to further improve the air quality in non-attainment areas and maintain the air quality in attainment or maintenance areas. The SIP outlines the measures the state will take in order to improve air quality.

The study area is currently designated as unclassifiable or attainment under 18 AAC 50.015 and the EPA Green Book with respect to all criteria pollutants. Some areas of Alaska are designated unclassifiable due to the limitations in the scope of the ambient monitoring networks. However, as discussed above, these areas are considered to have ambient concentrations that are below the levels established by the NAAQS. The closest non-attainment designated area is located in the Fairbanks-North Pole urban area, which is designated as non-attainment for $PM_{2.5}$. The Eagle River area of Anchorage and the City of Juneau are designated by EPA as a maintenance area for PM_{10}. In addition, both the Municipality of Anchorage and the Fairbanks-North Pole area are designated as a maintenance areas for CO. EPA has taken steps to reduce particulate emissions through various actions including the Clean Diesel Program to reduce emissions from highway, non-road, and stationary diesel engines, and the Fine Particle Implementation Rule, which defines requirements for states in areas not meeting the NAAQS to reduce fine particulate matter. Figure 5.1-3 shows the non-attainment and maintenance areas within the state.

As part of the 1990 amendments to the CAA, EPA has developed two conformity regulations for transportation and non-transportation projects in non-attainment and maintenance areas. Transportation projects are governed by the "transportation conformity" regulations (40 CFR Parts 51 and 93). Non-transportation projects are governed by the "general conformity" regulations (40 CFR Parts 6, 51, and 93) described in the final rule for Determining Conformity of General Federal Actions to State or Federal Implementation plans. Because the Project is located in an unclassifiable or attainment area, the EPA Conformity rules do not apply.

5.1.3.3. Summary of Representative Monitoring Data

To characterize the background air quality in the vicinity of the Project area, air quality data from ADEC, EPA, and NPS were reviewed at the closest most representative monitoring stations. This air quality data presented in the June 2014 ISR was updated to include the most recent 3-year period of air quality data available from 2012 to 2014.

The Project area is sparsely populated; therefore, there are very few criteria monitoring stations in the immediate area. Fairbanks and Anchorage are the largest cities in the vicinity of the Project site. Anchorage is located approximately 120 miles to the southwest of the Project, while Fairbanks is located approximately 140 miles to the north-northeast of the Project site. There are smaller cities located nearby that have ADEC monitoring stations, such as Palmer and Wasilla located 88 miles to the south of the Project site. NPS also operates an ozone measurement site at Denali National Park Headquarters and is located approximately 75 miles to the northwest of the Project site. Figure 5.1-4 shows the AEA Susitna Project relative to the closest ADEC and NPS air monitoring locations. The data from these measurement locations are considered to be reasonably representative of the Project site and were used to determine background air quality of the Project area.

Table 5.1-3 presents the updated monitored data for 2012 to 2014 from the Denali and Wasilla/Palmer area for ozone and particulate matter (PM_{10} and $PM_{2.5}$). Table 5.1-4 presents the updated monitored data from Anchorage for carbon monoxide (CO), ozone, particulate matter (PM), and lead, while Table 5.1-5 presents the updated monitoring data from Fairbanks. Table 5.1-6 summarizes the highest concentrations from all the representative stations and is used to establish the background air quality of the Project area. These tables summarize the most recent publicly available monitoring data in the vicinity of the Project and are considered to be reasonably representative of the Project site.

The updated measured levels from the ADEC and the NPS monitoring stations are all below the NAAQS except for the 24-hour PM_{10} at Palmer (213 micrograms per cubic meter [ug/m^3]) and at Anchorage (155 µg/m^3) along with the annual $PM_{2.5}$ concentration at Fairbanks (50 µg/m^3). These exceedances occur mostly during the winter months when inversions are common and when fossil fuel and wood burning activities are at their highest. The combination of the mobile source, fossil fuel, and wood burning activities, along with the very cold conditions that contribute to inversions, tend to trap the pollutants near ground level and create high ground-level concentrations of particulate matter.

5.2. Project Emissions

This section was updated to include information presented in the AEA Engineering Feasibility Report (MWH, 2014) relevant to construction and operational equipment including aircraft and rail operations.

Specific information on construction equipment, along with other Project construction details such as air and rail schedules, are not yet available. Therefore, Project-related emissions from construction equipment and related activities are discussed qualitatively in this section.

5.2.1. Construction Equipment Emissions

As discussed in Section 4.2 above, detailed design criteria on construction equipment and vehicle traffic volumes along with other Project construction details such as air and rail schedules, are not yet available. However, the Engineering Feasibility Report (MWH, 2014) provides a general description of the engineering and construction schedules expected during construction of the Project. Therefore, information from the Engineering Feasibility Report related to emissions from construction equipment and related activities are discussed qualitatively in this section.

Construction activities are estimated to last approximately 8 years and eight months after a notice to proceed is given. The majority of the construction activity is expected to occur during a 5 to 6 month construction season with some activity also expected to occur during the wintertime periods. The typical project schedule would be a seven day work week consisting of two 10-hour shifts. No construction activities will commence until after the award of the FERC license and associated approvals by FERC as well as the issuance of local, state and federal permits (i.e. Clean Air Act, , Clean Water Act. etc.).

The major activities associated with construction of the Project include:

- Main Access Road Construction
- Railroad Offloading Facility Construction

- Site Development (for infrastructure)
- Supply and Erect Camp
- Main Civil Works Construction
- Turbine and Generator Supply
- Transmission Line and Interconnection Construction
- Site and Reservoir Clearing
- Air Transport Services
- Railroad Operations
- Camp Operation
- Medical Services

The schedule with anticipated dates for each activity is presented in the Engineering and Construction Schedules (Section 14) of the Engineering Feasibility Report (MWH, 2014).

Air quality emissions from construction activities associated with automobiles and trucks are divided into on-road and non-road equipment. On-road vehicles include cars, trucks, and motorcycles that use gas or diesel fuel. Emission factors for these types of vehicles are typically estimated using EPA mobile models that incorporate vehicle information (e.g., vehicle and fuel types) for the area. The emission factors generated by the mobile models are multiplied by the vehicle miles traveled (VMT) to estimate tons per year per pollutant.

Non-road construction equipment consists of cranes, excavators, bulldozers, etc. This type of equipment generally uses diesel fuel and its emission factors are also typically estimated using EPA emission models based on the type of equipment. The emission factor generated is then applied to the equipment horsepower rating and anticipated hourly use to estimate tons per year per pollutant.

As shown in Table 13.3-3 of the Engineering Feasibility Report, typical large construction equipment expected for the project are, but not limited to cranes, agitators, water tankers, dump trucks, concrete pumps, flat beds, and scrapers.

Typical emissions from construction equipment include nitrogen oxides (NOx), CO, particulates, SO_2, and volatile organic compounds (VOCs), and are estimated based on the type of equipment (i.e., on-road or non-road) and on the equipment's anticipated level of use. Fuel consumption by construction equipment varies depending on the type of equipment, the type of activity, and the duration of the use.

Construction of the Project could result in a temporary increase in emissions of some pollutants (e.g., PM_{10}/$PM_{2.5}$ and nitrogen oxides) due to the use of construction equipment powered by diesel fuel and a temporary increase in fugitive emissions from operation of earth-moving equipment. Project construction would also require the transportation of people, equipment, and materials to and from the construction worksite, which could result in a temporary increase in rail, air, and road traffic volumes as well as emissions associated with these transportation modes.

5.2.2. Fugitive Dust Emissions

In addition to emissions from construction equipment burning fuel, construction activities can also result in fugitive dust emissions from earthmoving activities. Fugitive dust emissions can result from the following:

- Grading
- Moving soil and digging
- Loading/unloading trucks
- Moving trucks on unpaved surfaces
- Wind eroding stockpiles

The amount of dust generated from construction activities is a function of a variety of factors including soil type, moisture content, activity, vehicle type, wind speed, precipitation, and roadway characteristics. Fugitive dust generation will be greater during dry periods where precipitation is at a minimum and when the soils are dryer and prone to be released into the air when disturbed. During the winter months, frozen ground and snow cover are present, which tends to minimize the release of fine particles from disturbed areas. Fugitive dust emissions in tons per year are typically estimated using EPA emission factors (or similar publications) based on the total area disturbed and the type of activity on those areas.

5.2.3. Transportation-Related Emissions

Section 13 of the AEA Engineering Feasibility Report (EFR) (MWH, 2014) presents a summary of construction operations and transportation related activities. A quantitative estimate of emissions from these construction operations and transportation related activities would require a detailed construction schedule and information on workforce and material sources along with vehicle trip volumes. This information was not available during 2014; therefore, a qualitative analysis of transportation related sources is discussed in this section based on a review of relevant information contained in the Engineering Feasibility Study.

There are two routes for access to the project site under consideration at this time, the Denali Corridor route and the Gold Creek route. Engineering studies to date have not identified a preferred access route because environmental analysis has not been undertaken. A third potential route, the Chulitna route, has been eliminated from further consideration. Though a final decision has not been made, the EFR construction methodology and project estimate have been prepared assuming the Gold Creek route will be used. Consequently, this study will also use the Gold Creek route in its qualitative analysis of the impacts from the project on air quality.

A main access road will be constructed approximately 50 miles long from a rail sliding located at Gold Creek. Construction will include clearing, grubbing, excavation and culverts and stringing the temporary power lines. The main access road will provide site access for construction operations of the Project including motor vehicles, construction equipment, and trucks providing materials and supplies.

A railroad offloading facility will be constructed at Gold Creek consisting of the construction of two sidings, each approximately 4,500 feet long. Included in the construction of the offloading facility includes clearing and grubbing activities, creating of storage areas, parking areas, fuel storage, offices and maintenance shops. The rail line will be used to ship large pieces of equipment to the site such as the transformer, stay rings, draft tube as well as supplies and construction equipment.

The construction of the main access road and the railroad offloading facility would result in emissions from heavy equipment engine exhaust, motor vehicle exhaust from transporting equipment and fugitive dust from roadway and ground disturbance. The construction activity will likely result in increased emissions in the vicinity of the activity during the construction period, however this activity is expected to be temporary in nature and emissions are not expected to result in an exceedance of the NAAQS within the local airshed. AEA has identified best management practices (BMPs) for heavy duty truck engine exhaust and fugitive dust emissions from roadway and ground disturbances to further limit air quality impacts during construction periods including guidelines developed by the EPA and the ADOT&PF and research collaboratives for unpaved roadways.

An operational airport will be constructed at the Dam site to allow passenger flights from Anchorage, Talkeetna and Fairbanks to efficiently transport workers to and from the site. Installation and construction will include all landing and navigational aids, radar, lighting, and fuel depot. The airport would also support cargo flights to and from Anchorage and Fairbanks. Upon commencement of the Project, the airport will remain a functional airport to support the operations and maintenance of the facility.

The construction of the airport will result in an increase in emissions from heavy duty equipment engine exhaust, motor vehicle exhaust from transporting workers to and from the site along with fugitive dust from vehicular traffic and disturbance of ground materials. This activity is expected to be temporary in nature and emissions are not expected to result in an exceedance of the NAAQS within the local airshed. AEA has identified BMPs to minimize heavy duty truck engine exhaust and fugitive dust emissions along roadways and from ground disturbances to further limit air quality impacts during construction periods including guidelines developed by the EPA and the ADOT&PF and research collaboratives for unpaved roadways. Emissions from aircraft operations are also expected, however, these emissions are not expected to be significant or cause an exceedance of the NAAQS.

5.2.4. Operations-Related Emissions

Air pollutant emissions associated with operation and maintenance activities (employee, delivery vehicle trips, and miscellaneous point sources) after construction would be minimal compared to those associated with construction activities. As Project details are finalized, an analysis will be conducted to quantify the emissions associated with the operation and maintenance activities.

5.3. Baseline Fossil Fuel Generation Emissions

Fossil fuel generation emissions were summarized to determine the baseline emissions from the Railbelt electrical generating facilities. The Railbelt electric generating facilities are comprised of seven utilities and serve most of the Alaska population.

Baseline emissions were summarized for Railbelt generating facilities and were comprised of criteria pollutant and greenhouse gas emissions for each generating facility. The baseline fossil fuel generations emissions are summarized and presented in this section.

Figure 5.3-1 shows the Alaska energy regions, including the Railbelt. The Railbelt generally extends from Homer to Fairbanks and includes the study area. The seven utilities that comprise the Railbelt energy region include:

- Chugach Electric Association (CEA)
- Golden Valley Electric Association (GVEA)
- Anchorage Municipal Light and Power (ML&P)
- Homer Electric Association (HEA)
- Seward Electric System
- Matanuska Electric Association (MEA)
- Aurora Energy, LLC

Four of the utilities—CEA, GVEA, ML&P, and Aurora Energy—operate units that generate electricity for the Railbelt. HEA operates the Nikiski generating plant for CEA, while Seward Electric purchases power from CEA. MEA began self-generation in its 171-megawatt (MW) Eklutna Generating Station in May 2015.

The Railbelt electrical fleet uses mostly natural gas to generate electricity, followed by oil, coal, and hydroelectric sources. There is some wind generation, including the Fire Island site; however, wind power was a relatively small percentage of the fleet in 2011. Existing hydroelectric generation sources are from Bradley Lake, Eklutna Lake and Cooper Lake.

Table 5.3-1 documents net generation in the Railbelt for 2011 by fuel type, and the percentage of power generated by fuel type. The table also documents the total generation from Railbelt facilities compared to total generation by all Alaska energy regions. The majority of electricity generated in the region in 2011 was generated from natural gas (74 percent) followed by oil (11 percent), coal and hydroelectric (8 percent each). Less than one percent of generation was from renewable sources (i.e., wind, biomass, etc.).

The Railbelt accounts for approximately 77 percent of total electrical generation in Alaska, including 99 percent of the natural gas-based generation and 100 percent of coal-fired generation. The Railbelt also accounts for approximately half of the oil-generated electricity in the state, and 30 percent of the hydroelectric power generation is in the Railbelt. Given that the majority of the

Alaska population is in the Railbelt, electrical generation and subsequent emissions are the highest in the state. Figure 5.3-2 shows the Railbelt power generation by fuel type for 2011.

Baseline emissions were summarized for Railbelt generating facilities based on 2011 operating data (ADEC 2012, AEA 2012b). The emissions are comprised of criteria pollutants (e.g., SO_2, NO_x, PM_{10}/$PM_{2.5}$, VOC) and greenhouse gas emissions (e.g., carbon dioxide [CO_2]) for each generating facility. Table 5.3-2 shows the emissions summary for each Railbelt utility including the total emissions for each pollutant.

5.4. Comparison of Emissions

A comparison of estimated With-Project and Without-Project emissions, or potential emission displacement from the Railbelt fossil fuel facilities and/or emissions reduction within the Railbelt area, was estimated based on projected Project electrical generation and baseline emission generating data. The Without-Project emissions scenario summarizes the potential emissions from future Railbelt fossil fuel facilities to provide the equivalent annual generation power as the Project, assuming the Project is not implemented. The Without-Project emissions estimate assumes future electrical generation with a fuel mix similar to the current Railbelt facilities. The With-Project and Without-Project emissions are summarized in this section.

Section 15.1.2.1 of the Engineering Feasibility Report (MWH, 2014) summarizes the results of the production modeling (PROMOD) simulations with and without the Project. The PROMOD results support the conclusions in the ISR which show that with the Project, a large reduction in the use of gas and oil by the utilities as well as a reduction in the thermal peaking units over time. With the addition of the Project and the expected reduction in oil and natural gas generation, emissions from fossil fuels are also expected to decrease.

5.4.1. With-Project Emissions

The Project is estimated to generate approximately 2,800,000 MWh (megawatt hours) annually of clean, renewable electricity for the Railbelt region. This is approximately 55 percent of the current Railbelt electric demand. To estimate potential emission displacement (reduction) from the Project, a pollutant-specific pound per megawatt hour (lb-MWh) emission rate was calculated based on the 2011 Railbelt generation data. The pollutant-specific displacement rate was calculated by taking the total Railbelt emissions for each pollutant (see Table 5.3-2) and dividing it by the total MWh. Table 5.4-1 presents the resultant lb/MWh displacement emission rate for each pollutant based on 2011 Railbelt generation and emissions data.

Table 5.4-2 presents the expected emission displacement in tons per year (TPY) in the Railbelt region once the Project is in operation. The emissions displacement was estimated assuming the 2011 Railbelt emissions rate in lbs/MWh and the expected electrical production of 2,800,000 MWh from the Project. The potential displacement is approximately 55 percent of the baseline emissions based on 2011 operating data.

The Project would eliminate the need to build new fossil fuel plants or increase capacity from baseline plants to supply up to 2,800,000 MWh , and thus eliminate the air pollution and greenhouse gas emissions associated with the displaced fossil fuel generation.

5.4.2. Without-Project Emissions

The Project is expected to generate 2,800,000 MWh of clean electricity for the Railbelt region. If the Project is not constructed, the additional energy is assumed to be generated within the Railbelt region through new plants or increased capacity from baseline plants. Assuming the same 2011 fuel mix for the region, the expected emissions displacement from the generation of electricity With-Project would not occur and would be generated within the Railbelt region from a mix of fossil fuel generation along with some renewables. Under this scenario, emissions detailed in Table 5.4-2 would not be displaced, but rather generated within the Railbelt region to meet the additional demand.

5.5. Identification of Best Management Practices

In general, emissions from engine exhaust from construction equipment can be reduced by minimizing idle times for heavy-duty truck engines, installing emissions control devices to reduce diesel exhaust, and using ultra-low sulfur diesel (ULSD) or biodiesel (EPA 2006).

In addition to construction equipment BMPs, other BMPs could minimize or mitigate fugitive dust emissions during construction activities (EPA 1999):

- Irrigation: Applying water to surface areas
- Calcium chloride: Applying chemicals or palliatives to surfaces
- Tillage: Roughening the soil and bringing clods to the surface before wind erosion starts
- Vegetative coverings: Temporary seeding and mulching bare soil to prevent wind erosion
- Barriers: Using solid board fences, snow fences, burlap fences, crate walls, bales of hay, and similar material to control air currents and blown soil
- Adhesives: Using spray-on adhesives to form an impenetrable surface (used if other methods prove to be difficult to work with)

These BMPs presented in the ISR Section 5.5 were updated to include the latest research and recently released dust control field guidance from the ADOT&PF and associated research collaboratives. The ADOT&PF Research, Development & Technology Transfer and the Alaska University Transportation Center recently released the “Dust Control Field Guide for Gravel Driving Surfaces” in July of 2015 for use in evaluating dust control methods for unpaved surfaces. The guideline discusses evaluating the current road conditions before choosing the right candidate for dust control materials. Paramount to dust control is evaluating the condition of the roadway prior to dust control application including:

- evaluating the surface materials.
- evaluating the cross section or crown of the roadway to adequately remove water, and
- proper drainage and roadway stability to support a permanent driving surface.

The guidebook also discusses the types of dust control palliatives and methods for selecting the right palliative for the specific road conditions in order to maximize dust control based on methods proposed by Jones and Surdahl (2014) and modified by the State of Alaska's experience with such methods (Barnes and Connor 2014). Dust palliatives are substances applied to the road surface to reduce airborne dust and can include water, water absorbing products, petroleum and non-petroleum based products, and polymer products. The ADOT&PF and associated research groups have experience with many different types of palliatives including salt and brines, petroleum and non-petroleum based organics, synthetics polymers, electrochemical products, clay additives, and mulch and fiber mixtures. However, the palliatives most commonly used in Alaska are water and calcium chloride. Other research has shown that along with water and calcium chloride, synthetic fluids and polymers are also conducive to controlling dust in Alaska (Barnes and Conner, 2014).

Prior to the release of the ADOT&PF dust control field guide, the Alaska University Transportation Center under the sponsorship of the ADOT&PF conducted research for managing dust to reduce fugitive impacts from vehicles on unpaved roads and runways. The report titled "Managing Dust on Unpaved Roads and Airports" released in October of 2014 provides a more in depth study to the proper gradation of the roadway and details the types and effectiveness of different palliatives available to manage dust on unpaved roads and runways. One of the most effective techniques to reducing fugitive dust is reducing vehicle speeds. Increasing vehicle speed results in increased fugitive dust. Reducing vehicle speed not only reduces fugitive dust but also allows for a greater longevity of the roadway and subsequently the dust palliatives used, thereby enhancing the effectiveness of the dust control palliatives.

Based on the research and guidelines developed by the ADOT&PF and research collaboratives for unpaved roadways, the following BMPs should be added to the list previously provided:

- Reducing vehicle speeds;
- Using the right surface materials consisting of well-graded gravel;
- Engineering the right cross section, or crown, to adequately remove water;
- Implementing good drainage (i.e. ditch, culvert, etc.) to remove water away from the roadside; and
- Engineering good year to year stability to support permanent driving surface and enhance the effectiveness of the dust control palliatives.

6. DISCUSSION

All of the objectives of the air quality study as identified in Section 2 of the June 2014 Air Quality Study ISR have been addressed.

The current conditions of the area were documented under the Existing Conditions (Section 5.1.2) where meteorological data from nearby weather stations and stations operated by AEA were reviewed and summarized including the most recent data available (through 2014). Similarly, existing air monitoring data were summarized from nearby representative monitoring stations operated by ADEC, EPA and the NPS for the most recent 3-year period available (2012 to 2014) and summarized in Section 5.1.3.3. The updated measured levels from the ADEC and the NPS monitoring stations are all below the NAAQS except for the 24-hour PM_{10} at Palmer (213 micrograms per cubic meter [ug/m^3]) and at Anchorage (155 $\mu g/m^3$) along with the annual $PM_{2.5}$ at Fairbanks (50 $\mu g/m^3$).

The attainment status classification of the area was evaluated based on the latest EPA designation and discussed in Section 5.1.3.2. The study area is currently designated as unclassifiable or attainment under 18 AAC 50.015.

Construction emissions (short-term) and operational emissions (long-term) were qualitatively assessed in Section 5.2 based on data presented in the December 2014 AEA Engineering Feasibility Report pertaining to construction and operational equipment including aircraft and rail operations. The Engineering Feasibility Report provided a general description of the engineering and construction schedules to allow for a qualitative discussion of construction emissions. Detailed information on construction equipment and traffic volumes along with other Project construction details such as air and rail schedules were not available in 2014. Therefore, a quantitative assessment of air emissions was not prepared as noted in the variance section of the methods discussion.

The construction of the Project would result in emissions from heavy equipment, motor vehicles transporting equipment and fugitive dust from roads and ground disturbance. The construction activity will likely result in increased emissions in the vicinity of the activity during the construction period, however this activity is expected to be temporary in nature and emissions are not expected to result in an exceedance of the NAAQS within the local airshed. AEA has identified best management practices (BMPs) for heavy duty truck engine and fugitive dust emissions to further limit air quality impacts during construction periods including guidelines developed by the ADOT&PF and research collaboratives for unpaved roadways.

Baseline fossil fuel generation from seven Railbelt energy facilities was estimated and summarized in Section 5.3 of the June 2014 ISR for criteria pollutant and greenhouse gas emissions. Baseline emissions data for each facility was based on operating data obtained from the most recent available data from ADEC and AEA for 2011 operating conditions. A comparison of With-Project and Without-Project emissions was estimated in Section 5.4.1 and 5.4.2 of the ISR based on projected Project electrical generation. The Without-Project emissions assumes future electricity demands would be generated from the Railbelt facilities assuming a fuel mix similar to the current generation which is primarily natural gas fired (74%) followed by oil (11%) coal (8%), hydropower (8%) and other renewables (<1%). A pound per megawatt hour (lb/MWh) emission displacement rate for each pollutant was calculated based on the Railbelt emissions data and the Railbelt power net generation rate for 2011. The project is expected to generate 2,800,000 MWh of clean electricity for the Railbelt region. The potential emission displacement was approximately 55 percent of the 2011 baseline emissions for the Railbelt region with the Project. Without the Project, the additional energy would be generated within the Railbelt region through construction of new power plants or increased capacity from baseline plants where the majority of the generation is based on fossil fuels as discussed above. Section 15.1.2.1 of the Engineering Feasibility Report cites PROMOD results that support the conclusions in the ISR which show that with the Project, a large reduction in the use of gas and oil by the utilities as well as a reduction in the thermal peaking units over time are expected which would lead to a reduction in fossil fuel emissions within the Railbelt.

Section 5.5 of the June 2014 ISR presented the initial list of BMPs based on a review of EPA resources for controlling emissions from construction equipment and stormwater management plans for controlling dust emissions. This list was updated based on a review of additional research and recently released dust control field guidance from the ADOT&PF and associated research collaboratives. After a review of the research and guidance, five additional BMPs were identified for controlling fugitive dust emissions in 2014 and are presented above in Section 5.5

7. CONCLUSION

From 2012 to 2014, AEA completed a thorough review of all available data in order to address the primary objectives of the Air Quality Study. The primary goal and objective of the air quality analysis was to ensure that the proposed Project does not violate National Ambient Air Quality Standards (NAAQS) and state air quality standards in Alaska Administrative Code (AAC). The data was used to assess the current conditions of the area against applicable state and national air quality standards and identify mitigation measures to reduce emissions during construction. The study compared Project emissions to the without Project alternative and evaluated potential emission reductions from Railbelt fossil fuel utility plants assuming the Project was operating. The field work, data collection, data analysis, and reporting for this Air Quality Study successfully met all study objectives in the FERC-approved Study Plan with the stated variances. The results of this Air Quality Report are reported herein and earlier by AEA in the Air Quality Study Plan ISR Part A: Sections 1-6, 8-10. With this report, AEA has now completed the Air Quality Study Plan.

8. LITERATURE CITED

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9. TABLES

Table 5.5-1. Available Regional Climate Summaries Representative of the Project Site

Station	January	February	March	April	May	June	July	August	September	October	November	December	Annual [1]
Talkeetna (2003-2014) Automated													
Average Min Temperature (^{o}F)	4.50	9.77	9.81	24.46	35.94	51.27	56.78	53.59	43.84	25.61	10.28	8.84	27.89
Average Max Temperature (^{o}F)	20.11	27.61	31.97	46.46	59.33	73.94	74.78	71.32	63.97	41.87	25.05	24.06	46.70
Average Precipitation (inches)	1.18	0.58	0.45	0.66	0.77	1.08	2.17	3.37	3.05	1.66	0.61	1.34	16.92
Gulkana (2002-2014) Automated													
Average Min Temperature (^{o}F)	-6.15	-4.37	-2.65	19.60	34.52	41.97	46.36	42.31	29.61	17.47	-3.22	-8.23	17.27
Average Max Temperature (^{o}F)	8.05	17.01	26.89	44.07	59.57	67.28	68.40	65.26	50.80	33.58	11.59	6.45	38.25
Average Precipitation (Inches)	0.79	0.47	0.37	0.25	0.48	0.96	1.58	1.18	0.94	0.58	0.55	0.62	8.76
Denali Park Headquarters (1923-2003) Automated													
Average Min Temperature (^{o}F)	-5.63	-3.22	1.16	12.37	29.71	38.82	42.85	39.26	30.79	12.25	1.30	-4.42	16.27
Average Max Temperature (^{o}F)	7.65	11.51	18.00	29.16	52.19	62.45	65.52	60.61	50.22	25.90	13.34	7.94	33.71
Average Precipitation (Inches)	0.55	0.45	0.33	0.37	0.78	2.17	2.90	2.54	1.56	0.80	0.49	0.56	13.50
Palmer (2005-2014) Automated													
Average Min Temperature (^{o}F)	6.72	11.55	15.13	28.11	38.32	46.64	50.52	48.73	41.04	28.39	13.74	11.51	28.37
Average Max Temperature (^{o}F)	20.43	26.93	32.86	46.11	59.47	64.32	66.64	64.77	56.09	42.23	27.19	25.32	44.36
Average Precipitation (Inches)	0.50	0.45	0.17	0.19	0.38	0.65	1.03	0.91	0.99	0.46	0.35	0.43	6.51
Big Delta (1945-2014) FAA ASOS													
Average Min Temperature (^{o}F)	-10.10	-5.89	1.94	20.90	37.31	48.13	51.35	46.63	36.01	18.86	-0.01	-7.98	19.76
Average Max Temperature (^{o}F)	4.57	12.18	24.92	41.43	58.08	67.93	70.35	65.83	53.79	32.98	14.51	6.93	37.79
Average Precipitation (Inches)	0.34	0.28	0.22	0.28	0.82	2.18	2.60	1.74	1.22	0.64	0.47	0.43	11.24
Watana Dam Site (2012-2014) Automated													

Average Min Temperature (^{0}F)	12.50	5.10	6.50	14.10	32.90	49.10	51.70	45.00	36.10	13.10	8.20	0.70	22.90
Average Max Temperature (^{0}F)	20.90	17.20	23.30	30.90	49.60	58.50	61.00	58.70	48.30	22.90	17.50	9.50	34.90
Average Precipitation (Inches) [2]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indian River (2012-2014) Automated													
Average Min Temperature (^{0}F)	15.80	8.90	7.50	15.80	33.10	50.90	49.40	47.70	9.90	26.80	13.80	4.70	23.70
Average Max Temperature (^{0}F)	26.10	26.30	32.10	39.70	55.40	66.10	66.70	62.50	52.30	39.70	25.10	17.30	42.40
Average Precipitation (Inches)	0.80	0.25	0.70	0.80	0.40	0.80	0.60	0.25	0.60	0.80	0.40	0.25	6.78
Oshetna River (2012-2014) Automated													
Average Min Temperature (^{0}F)	-1.90	-14.60	-12.80	1.20	27.50	40.80	45.30	40.40	31.40	5.70	-6.00	-16.90	11.70
Average Max Temperature (^{0}F)	12.80	11.50	24.80	34.10	52.90	63.70	65.20	61.10	50.10	33.60	9.80	-3.70	34.60
Average Precipitation (Inches)	0.90	0.25	0.51	0.30	0.51	0.70	0.80	0.60	0.63	0.80	0.25	0.25	6.72

Note:

1 Annual Precipitation is the sum of the monthly averages.

2 N/A denotes information not available.

Table 5.5-2. National Ambient Air Quality Standards

Pollutant	Averaging Time	Primary Standards[1,2]	Secondary Standards[1,3]	ADEC Ambient Air Quality Standards
CO	8-hour	9 ppm (10 mg/m^3)	None	10 mg/m^3
	1-hour	35 ppm (40 mg/m^3)	None	40 mg/m^3
Lead[4]	Rolling 3-Month Average[5]	0.15 μg/m^3	Same as Primary	0.15 μg/m^3
NO2	Annual Arithmetic Mean	0.053 ppm (100 μg/m^3)	Same as Primary	100 μg/m^3
	1-hour	0.100 ppm (188 μg/m^3)[6]	None	188 μg/m^3[6]
PM_{10}	Annual Arithmetic Mean	None	None	None
	24-hour	150 μg/m^3	Same as Primary	150 μg/m^3
$PM_{2.5}$	Annual Arithmetic Mean	12 μg/m^3[8]	15 μg/m^3	15 μg/m^3[9]
	24-hour	35 μg/m^3	Same as Primary	35 μg/m^3
O3	8-hour (2008 standard)	0.075 ppm	Same as Primary	0.075 ppm
	8-hour (1997 standard)	0.08 ppm	Same as Primary	None
SO_2	1-hour	75 ppb (196 μg/m^3)[7]	None	196 μg/m^3[7]
	3-hour	None	0.5 ppm (1,300 μg/m^3)	1,300 μg/m^3
	24-hour	None	None	365 μg/m^3[10]
	Annual	None	None	80 μg/m^3[11]
Ammonia	8-Hour	N/A	N/A	2.1 mg/m^3[12]
Reduced Sulfur Compounds	30-Minute	N/A	N/A	50 μg/m^3[13]

Notes:

1 National standards (other than ozone, particulate matter, and those based on annual averages) are not to be exceeded more than once per year. The ozone standard is attained when the fourth highest 8-hour concentration in a year, averaged over three years, is equal to or is less than the standard. For PM10, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 μg/m^3 is equal to or is less than one. For PM2.5 the 24-hour standard is attained when 98% of the daily concentrations, averaged over three years, are equal to or are less than the standard.

2 Primary Standards: Levels necessary to protect public health with an adequate margin of safety.

3 Secondary Standards: Levels necessary to protect the public from any known or anticipated adverse effects.

4 Lead is categorized as a "toxic air contaminant" with no threshold exposure level for adverse health effects determined.

5 National lead standard, rolling three-month average: final rule signed October 15, 2008.

6 To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010).

7 Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

8 EPA updated the NAAQS for PM2.5 to strengthen the primary annual standard to 12 μg/m^3.

9 An annual arithmetic mean concentration of 15.0 μg/m^3, with this standard being attained when the three-year average of the annual arithmetic mean concentration is less than or equal to 15.0 μg/m^3.

10 The 24-hour average of 365 μg/m^3 not to be exceeded more than once each year.

11 Annual mean not to be exceeded.

12 To attain this standard, the 8-hour average of 2.1 mg/m^3, averaged over any consecutive eight hours not to be exceeded more than once each year.

13 For reduced sulfur compounds, expressed as sulfur dioxide: 30-minute average of 50 μg/m^3 not to be exceeded more than once each year.

Table 5.1-3. Observed Ambient Air Quality Concentrations – Denali National Park and MSB Ambient Monitors

Pollutant	Location	Averaging Period	2014	2013	2012	Background Level	NAAQS
Ozone[1]	Wasilla	8-Hour	0.045	n/a	0.048 ppm	0.048 ppm	0.075 ppm
PM_{10}[2]	Palmer	24-Hour	213 μg/ m^3	84 μg/ m^3	121 μg/ m^3	213 μg/ m^3	150 μg/ m^3
$PM_{2.5}$[1,3]	Wasilla	24-Hour	19 μg/ m^3	16 μg/ m^3	23 μg/ m^3	23 μg/ m^3	35 μg/ m^3
		Annual	3.8 μg/ m^3	4.0 μg/ m^3	5.8 μg/ m^3	5.8 μg/ m^3	12 μg/ m^3
Ozone[4]	Denali National Park	8-Hour	0.058 ppm	0.052 ppm	0.052	0.058 ppm	0.075 ppm

Source: http://www.epa.gov/airquality/airdata/ad_rep_mon.html

Notes:

1 Represents the ADEC 100 West Swanson Ave Monitoring Location.

2 Represents the ADEC South Gulkana Street Monitoring Location.

3 Represents the ADEC 100 West Swanson Ave for 2010.

4 Represents the Denali National Park Headquarters Monitoring Station.

Table 5.1-4. Observed Ambient Air Quality Concentrations from Anchorage Ambient Monitors

Pollutant	Location	Averaging Period	2014	2013	2012	Background Level	NAAQS
Lead[1]	Anchorage	3-Month	n/a	n/a	0.07 μg/m^3	0.07 μg/m^3	0.15 μg/m^3
CO[2]	Anchorage	1-Hour	4.8 ppm	5.2 ppm	7.4 ppm	7.4 ppm	35 ppm
		8-Hour	2.8 ppm	4.0 ppm	5.5 ppm	5.5 ppm	9 ppm
Ozone[3]	Anchorage	8-Hour	n/a	n/a	0.046 ppm	0.046 ppm	0.075 ppm
PM_{10}[4]	Anchorage	24-Hour	155 μg/m^3	120 μg/m^3	115 μg/m^3	155 μg/m^3	150 μg/m^3
$PM_{2.5}$[2]	Anchorage	24-Hour	19.0 μg/m^3	20.2 μg/m^3	28.0 μg/m^3	28.0 μg/m^3	35 μg/m^3
		Annual	6.1 μg/m^3	4.9 μg/m^3	6.6 μg/m^3	6.6 μg/m^3	12 μg/m^3

Source: http://www.epa.gov/airquality/airdata/ad_rep_mon.html

Notes:

1 Represents the ADEC Merrill Field Drive Monitoring Station.

2 Represents the ADEC 3201 Turnagain Street Monitoring Station.

3 Represents the ADEC 3000 East 16th Avenue Monitoring Station.

4 Represents ADEC 3335 E. Tudor Road Monitoring Station.

Table 5.1-5. Observed Ambient Air Quality Concentrations from Fairbanks Ambient Monitors

Pollutant	Location	Averaging Period	2014	2013	2012	Background Level	NAAQS
SO_2[1]	Fairbanks	1-Hour	42.0	46.0 ppb	51.0 ppb	51 ppb	75 ppb
		24-Hour	26.0	24.0 ppb	32.0 ppb	32 ppb	140 ppb
CO[2]	Fairbanks	1-Hour	5.5 ppm	5.9 ppm	6.7 ppm	6.7 ppm	35 ppm
		8-Hour	2.9 ppm	3.2 ppm	3.6 ppm	3.6 ppm	9 ppm
Ozone[1]	Fairbanks	8-Hour	0.044	0.048 ppm	0.048 ppm	0.048 ppm	0.075 ppm
PM_{10}[1]	Fairbanks	24-Hour	74 µg/ m^3	95 µg/ m^3	83 µg/ m^3	95 µg/ m^3	150 µg/ m^3
$PM_{2.5}$[3]	Fairbanks	24-Hour	31.6 µg/ m^3	39.0 µg/ m^3	50.0 µg/ m^3	50.0 µg/ m^3	35 µg/ m^3
		Annual	10.3 µg/ m^3	11.9 µg/ m^3	10.8 µg/ m^3	11.9 µg/ m^3	12 µg/ m^3

Source: http://www.epa.gov/airquality/airdata/ad_rep_mon.html

Notes:

1 Represents the ADEC 809 Pioneer Road Monitoring Station.

2 Represents the ADEC Federal Building/2nd & Cushman Monitoring Station.

3 Represents the ADEC 675 7th Street Monitoring Station.

Table 5.1-6. Worst Observed Ambient Air Quality Concentrations

Pollutant	Location	Averaging Period	Worst Background Levels 2012-2014	NAAQS
SO_2[1]	Fairbanks	1-Hour	51 ppb	75 ppb
		24-Hour	32 ppb	140 ppb
CO[2]	Anchorage	1-Hour	7.4 ppm	35 ppm
		8-Hour	5.5 ppm	9 ppm
Ozone[3]	Wasilla	8-Hour	0.058 ppm	0.075 ppm
PM_{10}[4]	Palmer	24-Hour	213 µg/m^3	150 µg/m^3
$PM_{2.5}$[5]	Fairbanks	24-Hour	50.0 µg/m^3	35 µg/m^3
		Annual	11.9 µg/m^3	12 µg/m^3
Lead[6]	Anchorage	3-Month	0.07 µg/m^3	0.15 µg/m^3

Notes:

1 Represents the ADEC 809 Pioneer Road Monitoring Station.

2 Represents the ADEC 3201 Turnagain Street Monitoring Station.

3 Represents the Denali National Park Monitoring Location.

4 Represents the ADEC South Gulkana Street Monitoring Location.

5 Represents the ADEC 675 7th Street Monitoring Station.

6 Represents the ADEC Merrill Field Drive Monitoring Station.

Table 5.3-1. Railbelt Energy Region Net Generation Summary[1]

Energy Region	Oil (MWh)	Gas (MWh)	Coal (MWh)	Hydroelectric (MWh)	Wind (MWh)	Total (MWh)
Railbelt	561,271	3,730,696	387,160	394,831	1,549	5,075,507
Percent of Railbelt Region	11%	74%	8%	8%	<1%	100%[2]
Total Alaska Energy Regions	1,023,521	3,785,927	387,160	1,331,640	21,382	6,549,640
Railbelt Percent of Total Alaska Regions	55%	99%	100%	30%	7%	77%

Notes:

1 Net Generation data obtained from Alaska Energy Statistics (AEA 2012b)

2 Total does not sum due to rounding error.

Table 5.3-2. Railbelt Electric Generation Emission Summary by Utility

Utility	CO (TPY)[1]	NOx (TPY)[1]	PM10 (TPY)[1]	PM2.5 (TPY)[1]	SO2 (TPY)[1]	VOC (TPY)[1]	CO_2 (TPY)[1]
CEA	941.5	3,606	99.6	n/a	26.5	29.4	1,492,161
GVEA	335.9	1,289.7	218.7	218.7	895.79	6.2	647,191
ML&P	446.9	1,897.6	41.3	41.3	0.43	13.3	698,302
HEA	2	455	12		6	4	213,863
Aurora Energy, LLC	458.8	792.6	83.3	7.8	838.5	2.7	381,005
MEA	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Seward Electric	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total	2,185	8,041	455	268	1,767	56	3,432,522

Notes:

1 2011 emissions were obtained from ADEC website.

2 CO_2 emissions were obtained from Alaska Energy Statistics (AEA 2012b).

3 N/A denotes no emissions.

Table 5.4-1. Estimated 2011 Power Generation Emission Rate[1] in Railbelt Region

Utility	CO (lb/MWh)[1]	NOx (lb/MWh)[1]	PM10 (lb/MWh)[1]	PM2.5 (lb/MWh)[1]	SO2 (lb/MWh)[1]	VOC (lb/MWh)[1]	CO_2 (lb/MWh)[1]
Railbelt Emissions (lb/MWh)	0.86	3.17	0.18	0.11	0.70	0.02	1,352.58

Notes:

1 Emissions were derived from total emission per pollutant divided by the total MWh produced for the Railbelt in 2011.

Table 5.4-2. Estimated Emission Displacement for the Project based on 2011 Net Generation and Emission Data

Utility	CO (TPY)[1]	NOx (TPY)[1]	PM10 (TPY)[1]	PM2.5 (TPY)[1]	SO2 (TPY)[1]	VOC (TPY)[1]	CO_2 (TPY)[1]
Potential Emission Offsets with Project (TPY)	1,205	4,436	251	148	975	31	1,893,616
Percent Reduction from 2011 Railbelt Emissions	-55%	-55%	-55%	-55%	-55%	-55%	-55%

Notes:

1 Emissions were derived from Railbelt emissions (lb/MWh) and estimated Project generation of 2,800,000 MWh.

2 AEA has also used PROMOD, based upon economic dispatch of generation, Railbelt utility-specific generation equipment data and equipment retirement schedules, to model CO_2 emissions in the future for the with-project and the without-project scenarios. The results of that study anticipate CO_2 emissions in 2034 will result in a 50% reduction or a decrease of approximately 1.38 million metric tonnes per year for the with-project scenario.

10. FIGURES

Figure 5.1-1. Alaska Climate Zones

Figure 5.1-2. Weather Station Data Locations Representative of the Project Site

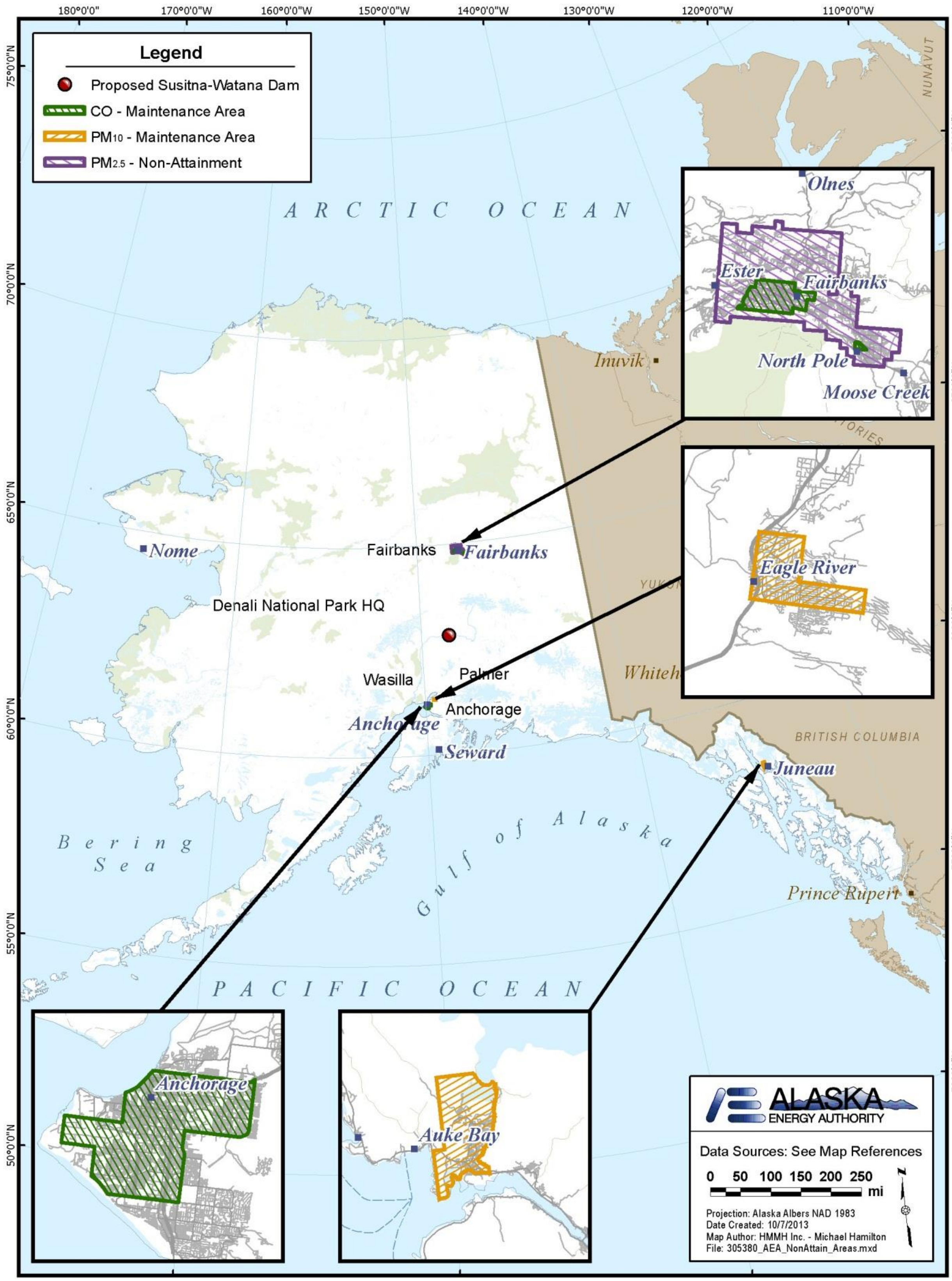

Figure 5.1-3. Alaska Non-Attainment and Maintenance Areas Relative to Project Site

Figure 5.1-4. ADEC and National Park Service Air Monitoring Locations

Figure 5.3-1. Alaska Energy Regions

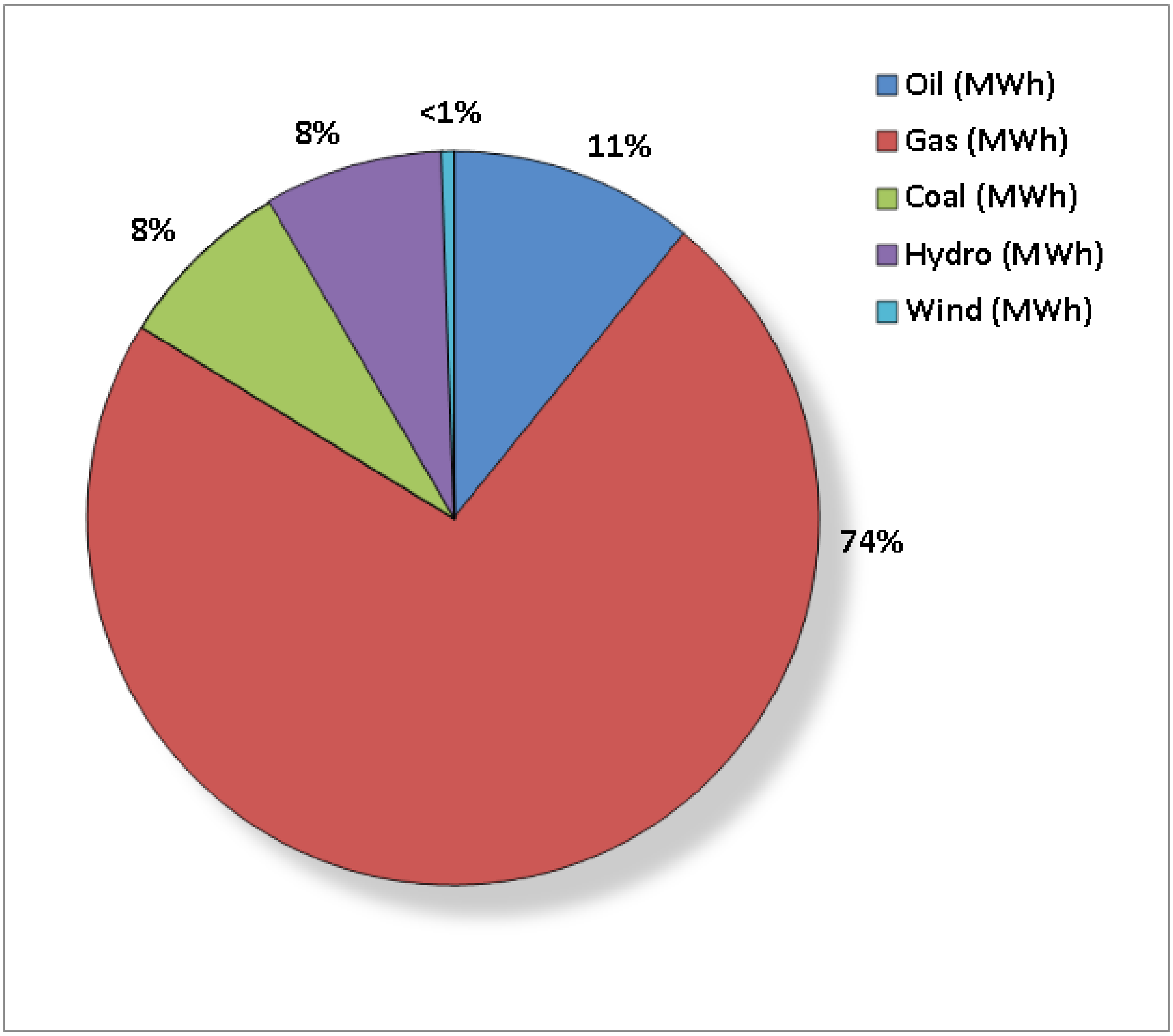

Figure 5.3-2. Railbelt Power Generation in 2011 by Fuel Type