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Kalispel Indian Reservation
Prevention of Significant Deterioration Program

Class I Redesignation Technical Report
Usk, Washington

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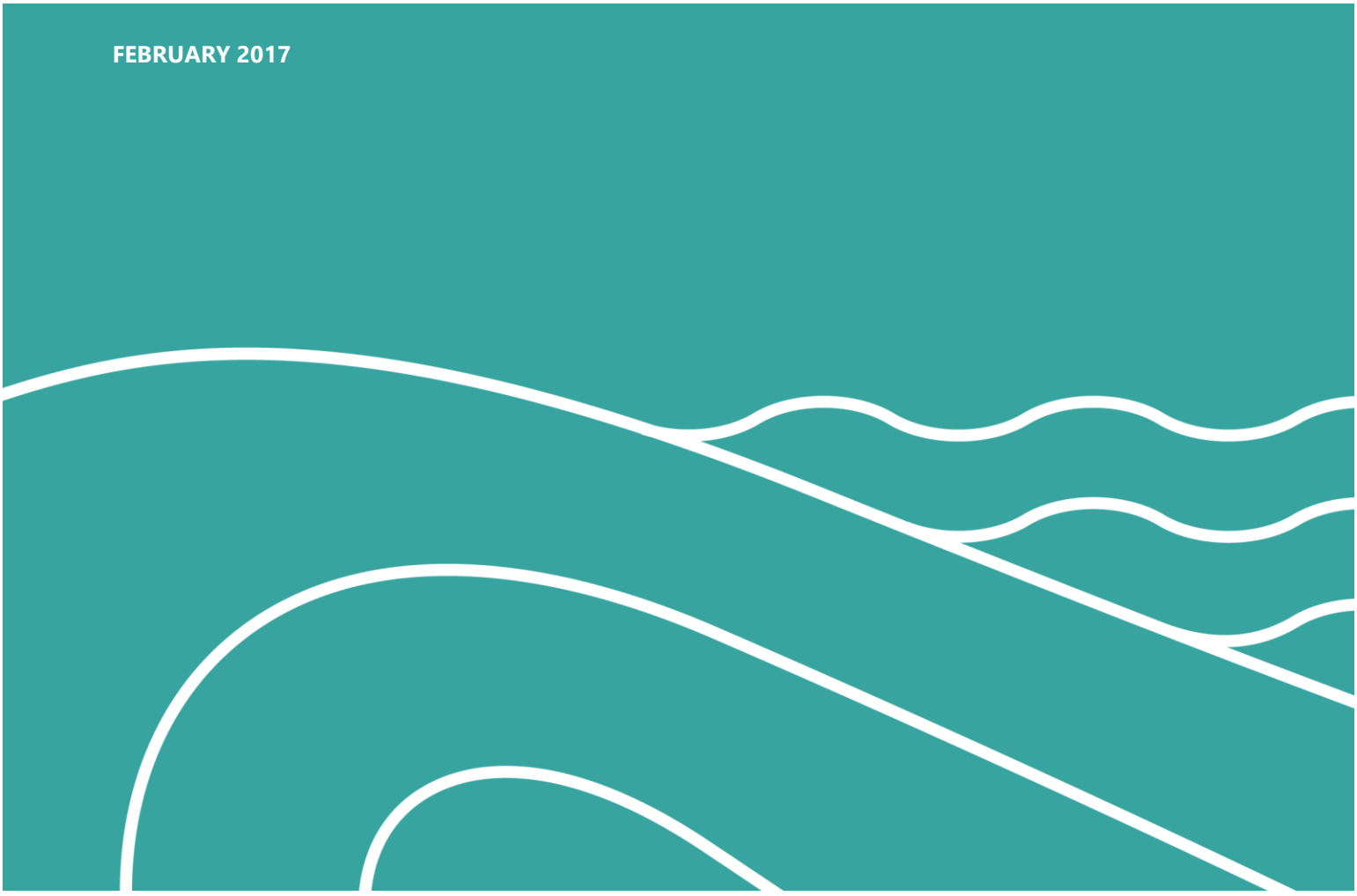

Kalispel Indian Reservation

Clean Air Act
Prevention of Significant Deterioration Program
Class I Redesignation Technical Report

Usk, Washington

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EXECUTIVE SUMMARY

The Kalispel Tribe of Indians (Kalispel Tribe) is proposing to redesignate the Kalispel Indian Reservation (Reservation) a Class I air quality area under the Clean Air Act's Prevention of Significant Deterioration (PSD) program. The purpose of this redesignation is to obtain and provide the most stringent air quality protections available under the PSD program to better protect air quality on and near the Reservation. Protecting air quality is critical to furthering the Tribe's sovereign interest in protecting its people, as well as its natural and cultural resources.

Although the proposed redesignation would apply only within the exterior boundaries of the Kalispel Reservation, it has the potential to impact resources and activities in the surrounding area. The purpose of this Technical Report is to assess the health, environmental, economic, social, and energy effects of the proposed redesignation. This documentation includes descriptions of climate and air quality, fish and wildlife, soils, vegetation, hydrology, human health, energy, and socioeconomic conditions.

Based on the analysis in this Technical Report, redesignation will result in many benefits and few adverse effects. Key benefits of more stringent air quality protection include:

- Reduction in future health problems for Kalispel people and members of the surrounding community.
- Enhanced protection for the health and cultural use of natural resources such as fish, wildlife, and plants.
- Increased worker productivity, higher property values, higher quality of life, and overall improved economic well-being with minimal, if any, damage to local economic vitality.

The analysis also shows that redesignation would have no effect on the largest existing sources of emissions at their current level of operation, is unlikely to limit economic development based on current economic trends, and is unlikely to impact future energy development.

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°F	degrees Fahrenheit
AERMIC	AMS/USEPA Regulatory Model Improvement Committee
AERMOD	AERMIC Model
AMS	American Meteorological Society
AOP	Air Operating Permit
AQCR	Air Quality Control Region
AQRV	Air Quality Related Values
AQS	Air Quality System
ASOS	automated surface observing system
BACT	best available control technology
BEA	Bureau of Economic Analysis
CAA	Clean Air Act
CDC	Center for Disease Control
C.F.R	Code of Federal Regulations
cfs	cubic feet per second
CIG	Climate Impact Group
CO	carbon monoxide
DDT	dichlorodephenyltrichloroethane
Ecology	State of Washington, Department of Ecology
EFSEC	Energy Facility Site Evaluation Council
FARR	Federal Air Rules for Reservations
FDLEP	Fond du Lac Environmental Program
FLM	Federal Land Managers
ft	feet
ha	hectacres
HAP	hazardous air pollutants
IHS	Indian Health Services
IMPROVE	Interagency Monitoring of Protected Visual Environments
IARC	International Agency for Research on Cancer
km	kilometer
KNRD	Kalispel Natural Resource Department
m	meter
µg/m^3	microgram per cubic meter

MDH	Minnesota Department of Health
mph	mile per hour
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NCEI	National Center for Environmental Information
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NO_2	nitrogen dioxide
NOx	nitrogen oxides
NOAA	National Oceanographic and Atmospheric Administration
NSR	New Source Review
OMH	U.S. Department of Health and Human Services, Office of Minority Health
PBTs	persistent bioaccumlative toxics
$PM_{2.5}$	particulate matter, less than 2.5 microns in diameter
PM_{10}	particulate matter, less than 10 microns in diameter
PNC	Ponderay Newsprint Company
ppm	parts per million
PSD	Prevention of Significant Deterioration
Reservoir	Box Canyon Reservoir
RM	river mile
RQF	rescue flight
SO_2	sulfur dioxide
SWSLs	Surface Water Source Limitations
TRI	toxics release inventory
U.S.C.	U.S. Code
USAF	U.S. Air Force
USBR	U.S. Bureau of Reclamation
USDA	U.S. Department of Agriculture
USDC	U.S. Department of Commerce
USDOI	U.S. Department of Interior
USEPA	U.S. Environmental Protection Agency
VOCs	volatile organic compounds
WAGAP	Washington State Gap Analysis Project
WHO	World Health Organization
WI-DNR	Wisconsin Department of Natural Resources
WRCC	Western Regional Climate Center

1.0 INTRODUCTION

1.1 Purpose

The Kalispel Tribe of Indians (Kalispel Tribe or Tribe), a federally recognized tribe, is proposing to redesignate the Kalispel Indian Reservation (Reservation) a Class I air quality area under the Clean Air Act's (CAA) Prevention of Significant Deterioration (PSD) program. The purpose of this redesignation is to reduce allowable air quality degradation on the Reservation for the benefit of the Tribe, Reservation residents, and the cultural and natural resources upon which they rely.

1.2 Clean Air Act and Class I Redesignation

1.2.1 Prevention of Significant Deterioration Program

The CAA's PSD program provides additional air quality protection in areas that have been designated under CAA Section 107 as unclassifiable or in attainment of National Ambient Air Quality Standards (NAAQS; Table 1) (42 U.S.C. §§ 7470, 7471). The PSD program initially classifies such areas as either Class I or Class II, Class I being the more protective designation (42 U.S.C. §§ 7472, 7473). Mandatory Class I areas include the national parks over 6,000 acres, international parks, national wilderness areas, and national memorial parks over 5,000 acres (42 U.S.C. § 7472). Class II areas make up the other PSD areas, unless redesignated, as explained below, by a state or federally recognized tribe.

Regardless of the classification of a PSD area, major new and modified sources located therein or that have the potential to impact air quality of the PSD area must undergo a preconstruction review for each air pollutant they emit. However, only sulfur dioxide, nitrogen dioxide, and particulate matter are evaluated for PSD increments in the preconstruction review (42 U.S.C. §§ 7473, 7475). A primary purpose of this review is to verify that the emissions from the new construction will not cause or contribute to a violation of any PSD increment (i.e., the maximum allowable amount by which the ambient concentration of a particular pollutant can increase above a baseline concentration). The baseline condition is defined as the ambient concentration of a pollutant existing at the time the first complete PSD permit application affecting the area is submitted (42 U.S.C. § 7479). A summary of PSD increment thresholds is presented in Table 2.

To obtain a permit to construct, the project proponent must meet certain requirements for each pollutant, including:

- Installation of Best Available Control Technology (BACT)
- An air quality analysis showing that the emissions from the new construction will not cause or contribute to a violation of a NAAQS
- An air quality analysis showing that the emissions from the new construction will not cause or contribute to a violation of any PSD increment
- Evaluation of whether the source will affect or have an adverse impact on air quality related values in Class I areas
- Additional analyses considering the potential impacts on visibility, vegetation and soils
- Opportunity for public participation through specific public notice requirements and a public comment period

Guidance for Tribes seeking a Class I redesignation can be found in the USEPA guidance document *Guidance for Indian Tribes Seeking Class I Redesignation of Indian Country Pursuant to Section 164(c) of the Clean Air Act* (USEPA 2013 Guidance; USEPA, 2013).

1.2.2 Redesignation

As noted above, the CAA specifically authorizes federally recognized Indian tribes to redesignate Class II areas within the exterior boundaries of their reservations as Class I areas under the PSD program in order to afford more protection for air quality within their sovereign territory (42 U.S.C. § 7474[c]). To do so, the governing body of the Tribe must submit a redesignation request to USEPA consistent with the procedural requirements of 40 C.F.R. § 52.21(g).

- Hold at least one public hearing before submitting the redesignation request.
- Notify states, other tribes, and Federal Land Managers (FLMs) of areas that may be affected by the redesignation at least 30 days before the hearing.
- Consult with local and other sub-state general purpose governments in the area (e.g., cities, counties, local agencies).
- Prepare a description and analysis of the health, environmental, economic, social, and energy effects of the proposed reclassification that must be made available for public review at least 30 days before the required public hearing.
- Consult with any states the reservation is located within and that border the reservation.

As long as these procedural requirements have been met, USEPA will issue a final rule in the Federal Register approving redesignation following notice of proposed rulemaking and an opportunity for public comment (USEPA, 2013).

1.2.3 Current Air Quality Status of the Kalispel Reservation

The Kalispel Reservation and surrounding area, located within the Northern Washington Intrastate Air Quality Control Region (AQCR 227), have been designated by the State of Washington as unclassifiable or in attainment of National Ambient Air Quality Standards, 40 C.F.R. § 81.348, and are therefore Class II air quality areas (42 U.S.C. § 7472[b]). The nearest Class I designated areas are the Spokane Indian Reservation (45 miles), the Cabinet Mountains Wilderness (70 miles), Flathead Indian Reservation (115 miles), Glacier Peak Wilderness Area (170 miles), and North Cascades National Park (180 miles).

Air quality on the Kalispel Reservation is currently regulated by a Federal Implementation Plan for Indian Reservations in USEPA Region 10 (40 C.F.R. § 49.121).

1.3 Technical Report Purpose and Structure

The purpose of this report is to support the Kalispel Tribe's redesignation effort by providing a description and analysis of the health, environmental, economic, social, and energy effects of the proposed reclassification consistent with 40 C.F.R. § 52.21(g).

The structure of this report and the content of each section is shown below.

Report Section	Content
Executive Summary	Executive Summary
Introduction	Purpose Clean Air Act and Class I Redesignation Technical Report Purpose and Structure
Background	Kalispel Tribe of Indians Background Information
Baseline Conditions	General Description Climate and Air Quality Fish and Wildlife Soils Vegetation Hydrology

Report Section	Content
	Human Health Socioeconomics
Impacts of Redesignation	Air Quality Environmental Health Human and Cultural Health Socioeconomics Energy Development
Conclusion	Conclusion
References	References
Glossary	Glossary

2.0 BACKGROUND

The Kalispel Tribe is a sovereign nation whose Reservation is located on the Pend Oreille River approximately 55 miles north of Spokane, Washington in Pend Oreille County. The Reservation includes only a small fraction of the Tribe's adjudicated lands, which consist of approximately 3,700 square miles extending from the Canadian border in northeastern Washington (Figure 1) to the south and east along the Pend Oreille and Clark Fork Rivers to Noxon, Montana. The Kalispel Tribe is committed to the conservation of natural resources within the boundaries of the Kalispel Indian Reservation and their adjudicated lands.

Today, there are more than 400 Tribal members with one-third living on the Reservation, one-third living in Spokane, Washington, and one-third living elsewhere in the United States. Approximately 54 percent of current tribal membership is under 18 years of age.

There are approximately 4,700 acres of land within the exterior boundaries of the Reservation. The land on and around the Reservation is characterized as wooded floodplain and hillsides in the foothills of the Selkirk Range of the Rocky Mountains and is surrounded by National Forest Lands. A portion of the Reservation is inundated by the Box Canyon Reservoir due to the impoundment of the Pend Oreille River by the Box Canyon Hydroelectric Project.

The Kalispel Tribe possesses a rich culture largely derived from their relationship with nature, especially their relationship with the Pend Oreille River. The Kalispel were a seminomadic group of hunters, gatherers, and fishers. Traditionally, all aspects of their tribal life centered on the river.

In the mid-1800s when the U.S. government began relocating tribes to reservation lands, ancestors of the present day Kalispel Tribe had little contact with the U.S. government and did not participate in the treaty process. A treaty was proposed in 1855 and rejected because it did not adequately meet the Tribe's needs. The Tribe's membership dropped throughout this period from more than 3,000 Tribal members (pre-European contact) to fewer than 400 in 1875, and an estimated 100 by 1911 (Velarde Tiller, 2005).

The Reservation was established in 1914 by an executive order made by President Woodrow Wilson. The Reservation included 4,629 acres along the Pend Oreille River—the river that is the heart of their culture. The Tribe is organized under the 1934 Indian Reorganization Act, and its

constitution, bylaws, and corporate charter were ratified in 1938 (and subsequently revised in 1967). A five-member council that consists of a chair, vice-chair, secretary, and two members leads the Tribal government. The Tribe manages Tribal operations through several Tribal departments: Administration, Executive Committee, Community Planning and Development, Public Safety, Social Services, and Natural Resources.

The Kalispel Natural Resources Department (KNRD) is responsible for historic properties, fisheries, wildlife, water, and other natural resources. The KNRD's mission is to safeguard the natural and cultural resources for the health and well-being of the Kalispel people.

3.0 BASELINE CONDITIONS

In order to evaluate the effect of air quality on the Reservation ecosystem including its human population, identification of existing environmental and socioeconomic conditions is needed. Once the baseline conditions are established, the relationship between Tribal air quality conditions and other Tribal resources can be assessed.

Using the best-available information, a baseline assessment of environmental and socioeconomic conditions on the Reservation was performed. This analysis includes descriptions of climate and air quality, wildlife, soils, vegetation, hydrology, human health, and socioeconomics.

3.1 General Description

The Kalispel Indian Reservation is located in a relatively undeveloped, highly scenic area of northeastern Washington characterized by timbered mountains and large, wide river valleys. The Pend Oreille River is considered one of the state's most scenic waterways and provides extremely valuable habitat in eastern Washington. The Reservation is located along approximately 9 miles of the Pend Oreille River (Figure 2).

Lands within the Reservation contain dryland pasture, coniferous woodland, riparian forest, freshwater wetlands, and river frontage. Elevations on the Reservation range from approximately 2,031 feet along the Pend Oreille River to 3,087 feet. The primary body of water is the Pend Oreille River that runs through the Reservation. Other primary drainages in the area include Cee Cee Ah Creek and Calispell Creek (KNRD, 2017).

3.2 Climate and Air Quality

This section presents a baseline description of the climate and the air quality of the Kalispel Reservation and for the region.

3.2.1 Regional Climate

The regional climate regime surrounding the Kalispel Reservation is relatively mild with warm Mediterranean-type summers and humid continental winters. There is a dramatic change in the climate from the Reservation (Cusick, Washington) southward toward the semi-arid region surrounding Spokane, Washington. Moisture from the Pacific Ocean is largely lost as it passes

over the Coast and Cascade Mountain Ranges as it travels eastward through Washington. Orographic lifting (the forced movement of air from low elevation to higher elevations due to topography) of this dry air occurs as it flows through the Columbia Basin toward the Rocky Mountains. The increase in the relative humidity of the air, due to cooling from the increased elevation, results in a gradual increase in precipitation from the lowest section of the basin to the higher elevations along the eastern border of the state. From the east, the Rocky Mountains largely deflect cooler continental air masses moving southward through Canada; however, these cooler air masses occasionally follow the north-south valleys into the Columbia basin. The relatively rapid transition between climate conditions in Spokane, approximately 50 miles to the north, and Cusick results in a 40 percent increase in annual precipitation and increased cloud cover.

The Reservation is located in northeastern Washington. This general geographic area includes the higher elevations of the Okanogan highlands, the Selkirk Mountains, and the lower elevations southward to the vicinity of the Spokane River. This area represents the transition between the Rocky Mountains and the Columbia Basin with elevations in the valleys increasing from 2,000 feet to 6,000 feet along the higher ridges. In Washington, the Rocky Mountains are called the Columbia Mountains and consist of ridges and valleys cut by the Columbia River and its tributaries including the Okanogan River (WRCC, 2016).

Most of the temperature and precipitation records in this area are from stations located in the valleys. The average precipitation increases in a northeasterly direction from 17 inches in the Spokane area to 28 inches in the northeastern corner of the State. Winter season snowfall in the valleys varies, typically ranging between 40 and 80 inches. Both rainfall and snowfall increase along the slopes of the mountains. Cloud coverage typically increases toward the Rocky Mountains from the central Columbia Basin.

3.2.2 Local Climate

Much of Pend Oreille County has a typical Pacific Northwest climate. Weather patterns include cool, wet springs and autumns; dry moderate summers; cool, relatively long winters with alternating periods of severe and moderate temperatures. In general, the Kalispel Reservation experiences weather with the characteristics of a mild, dryer climate during the summer months and a cold, moister climate in the winter.

Climatological data is not directly available for the Kalispel Reservation; however, a nearby climatological station provided data for a comparative estimate. This station (Fairchild 36 RQF) is the U.S. Air Force (USAF) Facility on Tacoma Creek Road. Additional Washington weather stations were also evaluated for contextualizing baseline conditions. These stations were located in Newport, Deer Park, Spokane, and Colbert, Washington. Although data from these stations are presented and discussed, they are not a close analog for climatological conditions at the Kalispel Reservation due to differences in topography and location. They are useful to evaluate regional climate conditions. The stations used represent data from several monitoring networks or programs, including AgriMet, Mesonet, the National Oceanographic and Atmospheric Administration's (NOAA) Earth System Research Laboratory, and the Western Regional Climate Center (WRCC). Monitoring station locations, elevations, and station names and identification are summarized in Table 3, and their relative locations are presented in Figure 3. Both primary station observations and modeled datasets were reviewed.

Weather and climate data were collected from the AgriMet program, a network of automated agricultural weather stations that provide near-real time information for crop-water use modeling and other agricultural applications. The data collected by the U.S. Bureau of Reclamation (USBR)-sponsored network varies for each station. The closest AgriMet weather station to the Kalispel Reservation is located at Deer Park, Washington. The Deer Park station was installed on June 25, 2014 at an elevation of 2,174 feet. Air temperature, evapotranspiration, humidity, wind speed, wind gust, wind direction, and solar radiation data are collected.

Temperature

Mean daily air temperatures are recorded from the U.S. Department of Defense's (DoD) weather station located at the USAF Facility on Tacoma Creek Road (Fairchild 36 RQF). Mean daily air temperature is 84 degrees Fahrenheit (°F) in the summer and 22°F in the winter, and is presented in Figure 4 (WRCC, 2016). A summary of temperature data for the Fairchild 36 RQF station on Tacoma Creek Road is presented in Table 4. General climate data from Newport, Washington (Station 455844, NEWPORT) indicate monthly temperatures for the coldest month, January, range from 18.0°F to 31.7°F (mean of 24.8°F) and the warmest month, July, range from 46.5°F to 85.2°F (mean of 65.8°F) for the period of record from 1909 through 2012 (NCEI, 2016). A summary of monthly averages and extreme temperatures is presented in Table 5.

The dataset from the PRISM Climate Group, using observations from a range of monitoring networks, compiled data and modeled observations for the Kalispel Reservation (PRISM, 2016). Normal temperatures (based on recent statistical adjusted 30-year interval of average weather conditions), evaluated and modeled from 30 years of temperature data, are highest in August with a minimum of 48.8°F and a maximum of 83.8°F. The lowest normal temperatures occur in December with a minimum of 21.4°F and a maximum of 32.3°F. Average values for monthly temperature are shown for the 30-year period from 1981 to 2010 (refer to Table 6). In winter, the average temperature is 27°F to 28°F and the average daily minimum temperature is 20°F to 21°F. In summer, the average temperature is 63°F and the average daily maximum temperature is 79°F.

Precipitation

Total annual precipitation and daily precipitation totals were recorded from the DoD weather station located at the USAF Facility on Tacoma Creek Road (Fairchild 36 RQF) for 2016. Total annual precipitation for 2016 is estimated to be 24 inches. A summary of precipitation data from the Fairchild 36 RQF station on Tacoma Creek Road is presented in Table 4. Total cumulative precipitation and recorded daily precipitation for this period are presented in Figure 4 (WRCC, 2016). Additional data from nearby stations show similar trends. The total annual precipitation is about 26 inches with the largest portion occurring during the climatological winter (9 inches), or 30 to 40 percent at Newport, Washington (NCEI, 2016). The driest portion of the year is the climatological summer (June through August), when approximately 15 percent or 4 inches of precipitation is typically measured. The seasonal snowfall here typically falls between October and April, and averages range from 0.4 inches in October and April to 17 to 18 inches in December and January. Annual precipitation totals (rainfall and snow) average 60 inches. A summary of precipitation data from Newport, Washington (Station 455844 NEWPORT) (NCEI, 2016) is presented in Table 7. Cumulative precipitation and snow totals for the NOAA-ASOS station in Spokane, Washington are presented in Figure 5.

Normal precipitation averages as modeled from the PRISM Climate Group for the Kalispel Reservation, range from 0.83 inches in August to 3.4 inches in December. Approximately 40 percent of the estimated annual precipitation rate of 24 inches per year (PRISM, 2016; Table 6) is estimated to occur in the fall and winter months (November through January). The lowest estimated average precipitation, approximately 15 percent, occurs in the late summer and fall (August through October) (PRISM, 2016).

Wind

Daily average wind speeds are recorded from the DoD weather station located at the USAF Facility located on Tacoma Creek Road (Fairchild 36 RQF). For 2016, daily average wind speeds ranged from 0.59 mile per hour (mph) to 1.91 mph. Maximum gusts for this period range from 12.8 mph to 47.2 mph. Daily average wind speed and maximum gusts are shown along with daily solar radiation intensity for 2016 in Figure 6 and Table 8. The daily average wind speeds for the Deer Park, Washington AgriMet station (DRPW) for the period of October 2015 through September 2016 range from less than 1 mph up to 10 mph with average winds speeds estimated to be 2 to 3 mph. Peak daily wind gusts observed at the Deer Park AgriMet station have exceeded 50 mph during the period of observations (USBR, 2016). A summary of recent daily wind speeds is presented in Table 9. Additional wind speed data collected from the Spokane International Airport station (KGEG) show some higher daily average wind speeds. In addition, data from observed maximums and gusts is also available. A summary of data for the Spokane International Airport station is presented in Table 10.

Wind roses provide a graphical plot of frequency of wind direction and speed. Data for the Fairchild 36 RQF station and the Deer Park AgriMet station have been included. A wind rose summary of annual wind direction and speed is presented in Figure 7 for the Fairchild 36 RQF station for the period of January 1 through December 12, 2016 and the period of January 2010 through December 2016. The average wind speed is 1.4 mph during that period and the primary wind direction is west-southwest (W-SW). Similarly, a wind rose summary of annual wind direction and speed is presented in Figure 8 for the Deer Park AgriMet station for the period of January 31, 1999 through July 31, 2016. The average wind speeds are 5.2 mph during that period and the primary wind directions are from the southwest to the southeast (SW-SE) and north-northeast (N-NE). Additional monthly wind rose diagrams for the Deer Park station for the period of January 31, 1999 through July 31, 2016 are presented in Appendix A.

A comparison of average wind speeds and direction from the Fairchild 36 RQF station to other observation stations closer to the Columbia Basin show a significant difference in wind intensity and direction. The location of the Fairchild 36 RQF station and the physiographic features in the Pend Oreille River valley control wind characteristics more than at other stations. This area is characterized by more calm wind days, lower intensity winds, and predominate wind direction from the west-southwest (W-SW).

Climate Change

The Washington Climate Change Impacts Assessment (CIG-UW, 2009) presents climate scenarios from global climate models that predict that annual average temperatures in the Pacific Northwest may increase by 2.0°F by the 2020s, 3.28°F by the 2040s, and 5.3°F by the 2080s (relative to the 1979 through 1999 average temperatures). Snowpack is projected to decrease by 28 percent across the state by the 2020s, 40 percent by the 2040s, and 59 percent by the 2080s (relative to the 2006 through 2014 average). Due to increased summer temperatures and decreased summer precipitation, areas burned by wildfires will likely increase through the next few decades.

3.2.3 Air Quality

The air quality on the Kalispel Indian Reservation is generally considered to be of good quality with limited emission sources and periodic strong wind dispersion. The Reservation is located within the designated air quality control region of Northern Washington Intrastate AQCR 227, which is classified by USEPA as "Better than national standards" for total suspended particulates (TSP) and sulfur dioxide (40 C.F.R § 81 Subpart C, 2017). For the other NAAQS pollutant criteria, the designated air quality control region is classified as "Unclassifiable/Attainment".

Existing sources of emissions on the Reservation may include dust from trails and roads, and smoke from woodstoves. Nearby sources of emissions may include dust from agricultural activities, smoke from prescribed agricultural and silvicultural burns and intermittent regional seasonal wildfires, and industrial activities from the Vaagen sawmill, the Ponderay Newsprint Company (PNC) facility, and Pend Oreille Valley Railroad. Overall, air releases of recognized carcinogens, developmental toxicants, and reproductive toxicants are among the smallest in the U.S. (based on information for Pend Oreille County, Toxic Release Inventory (TRI) based on zip code 99180; GoodGuide, 2016).

Ambient Air Quality Data

At this time, only limited ambient air quality data is available for the Kalispel Indian Reservation. Air quality information for the Kalispel Reservation and greater Pend Oreille County is limited because there are no permanent or long-term air quality monitoring stations. Air quality stations nearest the Reservation were selected for a comparative estimate of baseline conditions. The stations used to evaluate baseline air quality conditions include locations on the Kalispel

Reservation; Wellpinit, Washington (Wellpinit-Spokane Tribe station); elsewhere on the Spokane Indian Reservation (Spokane Res. [SPOK1]); Usk, Washington (AQS #530510007); Colbert, Washington (Colbert-Greenbluff Road station); Spokane, Washington (Spokane Valley [AQS ID 53-063-0049] and Augusta Road [AQS ID 53-063-0021]); and the Cabinet Mountains in Montana (CABI1). Air quality data have been compiled from these nearby stations, although more urban environments such as Spokane are not a good analog for the conditions on the Reservation due to large increases in the number of sources and greater concentrations of pollutants relative to those present on the Reservation. However, these stations provide some information on regional air quality. A summary of the stations and location information is presented in Table 3. Monitoring station locations are presented in Figure 3. Ambient air quality data for select stations are presented in Tables 11 and 12 and in Figures 9 through 13.

Emissions and Air Pollution

A complete emissions inventory has not been prepared for the Reservation. Limited air quality data has been collected on the Kalispel Indian Reservation. It is suspected that based on land uses, only minimal quantities of air pollution emissions exist on the Reservation and the largest contributor is likely to be dust and combustion by-products related to vehicle use and travel on unpaved areas, and forest and agricultural management practices. These sources are not subject to PSD control by permit. A summary of Pend Oreille County emissions are summarized in Table 13 (Ecology, 2014).

In Usk, Washington, the Vaagen Brothers (Vaagen Brothers Lumber Inc.) operate a small log sawmill that produces studs and rough green lumber in a variety of lengths. The green lumber produced in Usk is sent on to the Colville mill and other facilities for finishing and shipping. The Vaagen sawmill is located east of Highway 20 at Kings Lake Road. There is a log storage yard and mill at this location, as well as a log chipper that is able to produce up to 30 truck loads per day. Activities that may release emissions at this type of facility likely include log yard activities and sawing of green lumber. Particulate and other emissions from this source may affect air quality on the Kalispel Reservation.

The Ponderay Newsprint Company (PNC), located less than 2 miles south of Usk, Washington, was constructed in the mid-1980s along Highway 20. This facility operates large propane-fired boilers and other heavy equipment. Ecology issued facility permits in 2000 as a “back permit” since facility permits were not originally issued in response to the PNC’s filing of their original

Notice of Construction application. The air operating permit (AOP, Order No. 00AQER-1819) was issued in accordance with air quality regulations as they were established in 1985. The permit also limited the nitrogen oxide (NOx) emissions from the plant's three boilers and volatile organic compound (VOC) emissions were limited to 99 tons per year each. Since the issuance of the first permit order, the PNC has had a number of emission violations (2003, 2007, and 2015) and has made several modifications to their permit. Source testing in 2006 indicated the PNC facility's potential to emit VOCs was very close to the 250 tons per year PSD threshold (for Class II areas) resulting in Ecology's limiting of the plant's thermo-mechanical pulping production to less than 598 metric tons per day in order to remain less than the PSD air quality threshold. The most recent air quality violation was due to the lack of permitting of diesel engine operation and for releasing uncontrolled diesel exhaust into the air for more than one year.

The AOP issued by Ecology indicates that the facility has the potential to release the following pollutant emissions: total suspended particulates/particulate matter (PM_{10}), carbon monoxide, NOx, sulfur dioxide, VOCs (related to propane), and methanol (Ecology, 2010). A summary of estimated facility emissions for the PNC is presented in Table 14. The Ponderay Newsprint Company indicated in their Statement of Basis that operations at the facility have the potential to emit VOCs in excess of 100 tons per year and methanol in excess of 10 tons per year (Ecology, 2010). A review of Ecology's online Air Quality Permits for the Eastern Regional Office did not show a current, final AOP for the PNC (accessed December 9, 2016 and January 4, 2017; Ecology, 2017). Legal notices posted by Ecology indicate that the current air quality permit and Notice of Construction Approval Order (14AQ-E565) were to be modified or amended to allow for additional heavy equipment (for the debarking and chipping of logs) and increased truck traffic to and from the PNC facility (Ecology, 2017). The status of the permits for the Ponderay Newsprint Company and compliance with these permits could not be determined.

The Pend Oreille Valley Railroad operates a locomotive repair facility in Usk, Washington. The facility performs a variety of repair services, including sandblasting and painting. These types of activities have the potential to impact air quality, but the details of any such impacts are unknown.

3.3 Fish and Wildlife

This section presents a baseline description of the wildlife resources of the Kalispel Reservation from existing Tribal documents and data from the Washington Department of Fish and Wildlife, Priority Habitats and Species database (WDFW, 2016).

3.3.1 Habitats

The Pend Oreille River corridor is considered to be extremely rich in both wildlife species and habitat, especially in sloughs, open field and shrub sites, and cottonwood habitats. The primary habitat types found on the Reservation include river, shoreline, slough, marsh, pond/swamp, wetland, floodplain meadow, meadow, cattail marsh, aspen stands, cottonwood galleries, shrub-scrub wetlands, mixed conifer forest, and uplands.

Wildlife use riparian zones markedly more than any other habitat type with nearly 80 percent of species being either directly dependent upon or highly associated with them (Thomas et al., 1979). Numerous studies in the western United States have shown that riparian areas have been negatively impacted by human related development activities (Kauffman and Krueger, 1984; Fleishner, 1994; Magilligan and McDowell, 1997; Belsky et al., 1999). Past livestock grazing and other recurring land uses have created vegetation loss, bank sloughing, and erosion along the river and adjacent floodplain meadows, and contributed to the deterioration of the riparian habitat. Currently, grazing activities are very limited and then less than 5 percent of lands on the Reservation are used for this purpose.

The 1997 Washington State Gap Analysis Project (WAGAP) for evaluation of the protection of biodiversity in the State indicates that potential species richness of reptiles, mammals, and birds (particularly raptors, owls, woodpeckers, and flycatchers) is relatively high on the Kalispel Indian Reservation (Cassidy et al. 1997).

3.3.2 Mammals

Studies have identified many taxa of mammals found to occupy shoreline and upland habitats in the Reservation. Large mammals known or expected to occur in the general vicinity of the Kalispel Indian Reservation include the white-tailed deer, mule deer (*Odocoileus hemionus*), moose (*Alces alces*), and Rocky Mountain elk (*Cervus Canadensis*). Other large mammals present on the Reservation include black bear (*Ursus americanus*), cougar (*Felis concolor*), coyote (*Canis latrans*), beaver (*Castor Canadensis*), and otter (*Lutra Canadensis*). Among the large animals on

the Reservation, a number are hunted for food. Observed small mammals found on the Kalispel Reservation are summarized in the KNRD geospatial database. Select data from the Washington Department of Fish and Wildlife, Priority Habitat Survey was available (WDFW, 2016). A summary of select mammals is presented in Table 15.

3.3.3 Birds

The area offers good habitat for an array of bird species. A number of bird species and their habitats have been identified on the Kalispel Indian Reservation through studies conducted in 1989 and 1990, which identified over 115 species of birds using the river corridor with at least 83 species breeding in the area (Hallett and O'Connell, 2006). Waterfowl and shorebirds utilize the waters of the Reservation (Pend Oreille River and wetlands). Data is available summarizing birds present on the Kalispel Reservation through the Tribe's web-enabled geo-database. Select data from the Washington Department of Fish and Wildlife, Priority Habitat Survey was available (WDFW, 2016). A summary of select birds is presented in Table 15.

3.3.4 Reptiles and Amphibians

A summary of data for reptiles and amphibians present on the Kalispel Reservation is available through the Tribe's web-enabled geo-database. Select data from the Washington Department of Fish and Wildlife, Priority Habitat Survey was available (WDFW, 2016). A summary of select reptiles and amphibians is presented in Table 15.

3.3.5 Fisheries

The Pend Oreille River along the Reservation is also known as the Box Canyon Reservoir (Reservoir). The Reservoir is an 88-kilometer-long impoundment (covering approximately 3,500 hectares). It runs from the Box Canyon Dam (north of Ione, Washington) to the Albeni Falls Dam (south of Newport) in Idaho. It was created in 1955 following the construction of the Box Canyon Dam.

Prior to the dam's construction, the Pend Oreille River historically supported native cyprinids (minnows), catostomids (suckers), cottids (sculpin), ictalurids (bullheads), and salmonids (salmon, trout, char, whitefish). The Kalispel Tribe historically depended heavily on fish for subsistence and used a variety of means to catch both anadromous salmonids and resident fishes such as char, trout, chub, whitefish, suckers, and squawfish, now known as Northern Pikeminnow (Bonga, 1978).

Creel census data collected by WDFW from 1946 to 1985 demonstrates the decline in the trout fishery in the Pend Oreille River. Prior to 1958, the river was primarily a cold water fishery with cutthroat trout (*Oncorhynchus clarki*), rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), and whitefish making up most of the creel (Barber et al., 1990). The dam construction resulted in the conversion of the river from a free flowing system to slow moving reservoir. The flooding resulted in the formation of numerous shallow sloughs at the confluences of tributaries and the Pend Oreille River in the Box Canyon Reservoir providing potential spawning areas for warm and cool-water species such as largemouth bass (*Micropterus salmoides*), pumpkinseed (*Lepomis gibbosus*) and yellow perch (*Perca flavescens*) (Bennett and Liter, 1991). As a result, there has been a change in the creel composition to warmer water species since 1958 (WDFW, as cited in Ashe and Scholz, 1992). Because of existing habitat conditions in the Box Canyon Reservoir, management for cold-water species such as native cutthroat and bull trout (*Salvelinus confluentus*) and other introduced salmonid species is generally confined to tributaries and migration corridors.

A number of warmwater fisheries surveys have been conducted over the last three decades. Early surveys indicated that the Reservoir, due to the desirable nature of game fish, has been prey-crowded and dominated by overabundant forage species, including yellow perch and pumpkinseed sunfish, as well as non-game fish such as the northern pikeminnow and tench. Largemouth bass (the Reservoir's primary predator species) were found to be at low density.

A warmwater fisheries survey was conducted in 2004 (WDFW, 2010). A summary of species and relative abundance of fish collected during the most recent study is included in Table 16.

The Box Canyon Reservoir currently has favorable conditions for many species of aquatic vegetation, both native and introduced. Eurasian watermilfoil (*Myriophyllum spicatum*), a predominate macrophyte in the reservoir, has provided spawning habitat and protection from predators for 10 fish species such as yellow perch, tench (*Tinca tinca*), and suckers (*Catostomus spp.*) (Barber et al. 1988 as cited in PUD, 2000). Trout species are now more abundant in tributaries than in the Reservoir.

The substrate in the Reservoir is dominated by mud and silt with a few areas having sand, gravel, or cobble.

3.4 Soils

This section presents a baseline description of the soils of the Kalispel Reservation and for the region. A variety of soil conditions are found throughout Pend Oreille County. Classifications of soils within the Reservation are described below (USDA, 1992).

The riverfront portion of the Reservation and adjoining lowlands have several soil types including Martella silt loam, Cusick silty clay loam, Dalkena fine sandy loam, Anglen silt loam, and Blueslide silt loam.

Although there are many differences in these soil types, the Martella silt loam, Dalkena fine sandy loam, and Anglen silt loam share several general characteristics. The common characteristics include deep to very deep, moderately well drained soils with moderately slow to moderate permeability and high available water capacity, that are soft and impassable for roads and trails when wet, and are subject to compaction in areas that are grazed when the soil is wet. These soils support woodland species of Douglas fir, Ponderosa pine, Western larch, and lodgepole pine and understory species of snowberry, spirea, creambush oceanspray, rose, and thimbleberry.

The Cusick silty clay loam and the Blueslide silt loam have similar characteristics. Both soil types are very deep; are somewhat poorly drained; have moderately slow to very slow permeability; exhibit seasonal wetness; and have limitations for roads such as requiring subgrade for heavy vehicles or loads and opportunity for compaction if standard wheeled vehicles are used when soil is wet. These soils support differing understory plants, but in each case, overgrazing of the understory can cause less desirable plants to increase. Blueslide silt loam is also characterized by its propensity to occasionally flood.

3.5 Vegetation

This section presents a baseline description of the vegetation of the Kalispel Reservation and for the region. Both native and non-native species were present in each habitat type.

The natural vegetation along the riverfront is present in several distinct zones: wetland areas, riverbank/riparian and slough environment, and upland areas (USDA-USDOI, 1995).

The Reservation's wetlands exist primarily in association with the River's large floodplain. These wetlands vary in type and quality throughout. Most of the Reservation's floodplain and associated wetlands are active to riverine floods. Most of the associated hydrology and function are tied directly to the River and its ecology. Wetland vegetation includes sedges and rushes, grasses and forbs, red-osier dogwood, willow, and cottonwood. Most of the wetlands on the Reservation have been largely untouched or manipulated by past land uses. As such, many have been used as reference sites for newly acquired lands under restoration (Hallett and O'Connell, 2006).

The riverbank and riparian zone has species typically adapted to this environment and includes willows, cottonwoods, and aspen. The areas closest to the river are largely devoid of vegetation due to fluctuating water levels and altered flood ecology as a result of the operation of upstream and downstream hydroelectric dams.

The upland zone consists primarily of evergreens, including ponderosa pine, western larch, lodgepole pine, Douglas fir, grand fir, pacific yew, western hemlock, and western white pine species consistent with a mesic temperate forest. The forest understory mainly consists of tufted hairgrass, pine grass, Oregon grape, Saskatoon serviceberry, common snowberry, redtop, rose, and ocean spray. A summary of vegetation is presented in Table 17.

Much of the vegetation on the Reservation occurs in fragmented patches as a result of past flood events and the ecology. Very little evidence exists of human caused impacts to the Reservation's vegetation and habitats, other than control and engineering of the floodplain. These patches have important biological value, but for certain species, the lack of connection presents problems for their life history needs. It is notable that these habitat patches are not renewing due to human caused changes in the floodplain ecology on the Reservation.

The presence of camas (*Camassia quamash*), a member of the lily family, is of extreme cultural importance to the Kalispel Tribe. The camas bulb was historically important as a vegetable staple. Camas is best adapted to wet meadows, but also survives in grassy sagebrush flats and forested hillsides that have deep soils. The camas root still has an important cultural use for the Tribe, and is still used in some social activities. Localized grazing, the elimination of wildfires, and changes in the water regime have caused camas to be reduced in areas across the valley; however, camas is still abundant and available on the Reservation.

3.6 Hydrology

This section presents a baseline description of the hydrology of the Kalispel Reservation and for the region.

The Kalispel Indian Reservation is located on the Pend Oreille River at the lower end of the Clark Fork/Pend Oreille drainage in Washington. The Pend Oreille River begins at the outlet of Lake Pend Oreille, Idaho, and flows westerly into Washington at the town of Newport. At Dalkena, the river turns north at river mile (RM) 77. The river enters British Columbia at RM 16 and empties into the Columbia River immediately downstream of Waneta Dam (PUD, 2000). It contributes about one-third of the natural flow to the Columbia River system (FWEE, 2016). Tributaries of the Pend Oreille River are generally free flowing mountain streams. However, the Calispell Creek watershed is not free flowing due to a small dam, a pumping station, and dikes resulting from land conversion, agricultural practices, infrastructure development, and timber harvest practices. The area near and around the Reservation on the lower portion of the Pend Oreille River is largely agricultural lowland converted from wetland habitat with a large network of drainage ditches and dikes. The movement of water on the Reservation typically originates in the uplands east of Le Clerc Road and flows west toward the Pend Oreille River.

Drainage on the Reservation is interrupted by the railroad dike (dating from the early 20th century) and the road system built to prevent the Pend Oreille River, Calispell Creek, and Tacoma Creek, from inundating the hay fields of the Calispell-Cusick lowlands during high flow. Water is pumped through road culverts at several points, which do not interfere with conveyance, but likely interrupt wildlife movement along the various riparian corridors. The three local diking districts and their infrastructure exert a more significant influence. This infrastructure impedes the conveyance of water and may disrupt wildlife movement of smaller mammals, reptiles, and amphibians. The Reservation's drainage system also includes several backwater sloughs that have shallow, slow-moving water and braided wetland areas that were created by permanent flooding by downstream hydropower facilities. These dikes, ditches, and the Calispell Creek pump station are effective at keeping backwater off agricultural lands, but disconnect the floodplain from the river and the streams.

The primary waters of the Reservation include Cee Cee Ah and Calispell Creeks, as well as portions of the Pend Oreille River. Cee Cee Ah Creek is the only free flowing water within the

Kalispel Indian Reservation with 0.9 miles running through the Reservation to its confluence (inundated by Box Canyon Reservoir) with the east side of the Pend Oreille River. Calispell Creek, on the other hand, is diked and impounded. It meets the Pend Oreille River after running through the west side of the Reservation for 0.5 miles. An unnamed, ephemeral stream runs through about 1.1 miles of pastureland on the Reservation. The two sloughs on the Reservation are the Old Dike Slough (1.0 mile long) and the Pow Wow Slough (1.2 miles long). The Pend Oreille River runs along 9.8 miles of the east side of the Reservation and 0.75 miles along the west side of the Reservation.

Water levels on Box Canyon Reservoir are managed by the Pend Oreille Public Utility District (PUD. The normal elevation of the water surface at Box Canyon Dam is 2,030.6 feet (PUD, 2000). The reservoir has a surface area of 8,850 acres (3,582 ha), with mean depths ranging from 9 feet (3 meters [m]) to 40 feet (13 m) and a flow up to 30,000 cubic feet per second (cfs) (Bennett and Liter 1991, as cited in PUD, 2000). Current rates of discharge for early December are about 22,000 cfs. Median daily discharge rates (for the last 64 years for this period) are about 18,000 cfs (USGS, 2016). The Reservoir extends 55.7 miles from Box Canyon Dam at RM 34.4 to Albeni Falls Dam at RM 90.1 in Bonner County, Idaho (PUD, 2000). The upstream drainage area for the Box Canyon Reservoir is 24,930 square miles. Of this total drainage area, about 24,230 square miles are upstream of Albeni Falls Dam (RM 90.1), and the remaining 700 square miles of the drainage area is between Albeni Falls Dam and Box Canyon Dam (RM 34.4) (PUD, 2000).

The Pend Oreille Watershed, presented in Figure 14, includes a portion of the Pend Oreille River and its numerous tributary creeks and streams. The annual precipitation of the watershed is estimated to be 26 inches per year, near Newport, Washington to more than 55 inches in higher elevation mountainous areas (Ecology, 2012). Only a small fraction of this precipitation becomes groundwater available for human and economic uses. In general, the availability of groundwater within this watershed is very limited by climate and geology. The watershed has administrative restrictions (Surface Water Source Limitation [SWSLs]) which limits most water-source use in the watershed. Groundwater, which is linked to surface water, is also subject to SWSL restrictions.

3.7 Human Health

The Clean Air Act requires the USEPA to set National Ambient Air Quality Standards (NAAQS), which establish maximum allowable concentrations of six "criteria" pollutants in outdoor ambient air. The six pollutants are carbon monoxide (CO), lead (Pb), ground-level ozone (O_3),

nitrogen dioxide (NO_2), particulate matter (PM), and sulfur dioxide (SO_2), all of which have potentially detrimental health effects (USEPA, 2016b). For example, sulfur dioxide causes respiratory problems, can aggravate existing heart diseases and respiratory conditions, causes inflammation of the eyes, can promote respiratory infections, and can lead to premature death. Sulfur dioxide in the air generally also leads to the formation of other sulfur oxides that can react with other compounds in the atmosphere to form small particles contributing to particulate matter. Nitrogen oxides (NOx) can damage lung tissue, decrease lung function, cause or aggravate respiratory diseases, and act as greenhouse gases. Lead can have adverse effects on the nervous, immune, reproductive, developmental, and cardiovascular systems, as well as affecting kidney function and reducing blood's oxygen carrying capacity. Carbon monoxide can reduce oxygen delivery to the body's organs, can contribute to other cardiovascular effects, and can worsen existing heart problems. Ozone, formed from VOCs in combination with NOx, can cause airway irritation, coughing and pain, wheezing and breathing difficulties, aggravation of asthma and increased susceptibility to respiratory illnesses, reduced lung function, and permanent lung damage. Particulate matter can affect the lungs and heart. Small particulate matter (less than 2.5 micrometers [µm] in diameter, $PM_{2.5}$) can lodge deep in lung tissue and cause problems such as: irritation of the airways, coughing, difficulty breathing, decreased lung function, aggravated asthma, development of chronic bronchitis, irregular heartbeat, non-fatal heart attacks, lung cancer, and premature death in those with existing heart or lung disease (USEPA, 2016c).

In addition to the NAAQS criteria pollutants, additional hazardous air pollutants (HAPs) pollutants, such as those known or suspected to cause cancer, other serious health effects, or adverse environmental effects, are regulated under the National Emissions Standards for Hazardous Air Pollutants (NESHAP). The NESHAPs are stationary source standards developed for specific source categories and require the maximum degree of emission reduction that the USEPA determines to be achievable, which is known as the Maximum Achievable Control Technology—MACT standards. The Clean Air Act also includes initiatives targeting emission reductions of persistent bioaccumulative toxics (PBTs) like mercury, DDT (dichlorodiphenyltrichloroethane, a pesticide banned in the United States), and dioxins. Specifically, the USEPA has designed an Agency-wide PBT initiative which employs USEPA's tools—regulation, compliance, enforcement, research, and voluntary action to reduce PBTs that have been identified as priorities.

A 2013 assessment by the World Health Organization's (WHO) International Agency for Research on Cancer (IARC) concluded that outdoor air pollution is carcinogenic to humans, with the particulate matter component of air pollution most closely associated with increased cancer incidence, especially cancer of the lung. An association also has been observed between outdoor air pollution and increase in cancer of the urinary tract/bladder (WHO, 2016). Furthermore, minority populations often experience disproportionate exposure to environmental problems.

The individuals most susceptible to the problems caused by air pollution are children, the elderly, and those with pre-existing health conditions. Demographic data on the U.S. population of American Indians from 2002 shows that roughly one-third (32 percent) of American Indian/Alaska Native population are under the age of 18, compared to the total population, where only 25 percent of Americans are under the age of 18. Another report shows that a substantial percentage (10.3 percent) of American Indians are under the age of five (FDLEP, 2014). Health effects are not always seen immediately, but can develop with chronic exposure.

Health issues related to poor air quality may compound other health problems facing the American Indian population. For example, American Indians suffer diabetes at a rate of 16.5 percent, as compared to a rate of 6.6 percent in non-Hispanic whites (CDC, 2007). Diabetes can lead to complications and associated health problems, such as kidney failure, heart disease, high blood pressure, amputations, blindness, complications in pregnancy, and an increase in incidence of infections, including tuberculosis (CDC, 2007). In addition, American Indians die from diabetes at a rate 190 percent higher than other Americans and have an overall life expectancy that is 4.6 years less than other Americans regardless of race (IHS, 2016). Diabetes sufferers have more to worry about than the disease itself—a study published recently showed that when people with diabetes breathe ultrafine particles, the effects can be very damaging to their cardiovascular and respiratory systems. In fact, having diabetes doubles the risk that a person will contract cardiovascular disease (Watkins, 2003).

Asthma also afflicts American Indians disproportionately. The incidence rate of asthma for American Indian children was 30 percent higher than for white children in 2007 (OMH, 2016). Data from the 2010 Minnesota Student Survey show that American Indian students in grade 12 had the highest prevalence of asthma compared with other groups, and the second highest prevalence among 6th and 9th graders (MDH, 2013). Among users of tribal health care in

Minnesota, 7 percent of preschoolers have asthma, along with 5 percent of school-age children (MDH, 2011). In addition, the incidence rate of asthma for American Indian adults was greater than for white adults in 2004-2008 by 22 percent, and American Indian adults died from asthma at a rate 38 percent higher than for whites in 2013 (OHM, 2016). The CDC analyzed asthma data from 2001-2009 and found that the incidence of asthma increased by 12.3 percent during this period, showing that the problem is only getting worse (Zahran, 2011). A recent article found in the Journal of Epidemiology and Community Health found that asthmas sufferers who were exposed to higher levels of ozone and particulate matter are much more likely to experience poorer asthma control. Long-term exposure to ozone raises the likelihood of having uncontrolled asthma by 69 percent, while long-term exposure to particulate matter increases the risk by 35 percent (Nordqvist, 2011).

3.8 Socioeconomics

The Kalispel Tribe contracted with Power Consulting Incorporated to obtain an analysis of the economic impacts of redesignating the Kalispel Reservation a Class I air quality area. The resulting report, *The Economic Impact of Redesignation of the Kalispel Indian Reservation as a Class I Area under the Clean Air Act's Prevention of Significant Deterioration Program* (Power, 2017), is provided as Appendix B. This section summarizes the most relevant information from that report.

From an economic perspective, the relevant study area includes Pend Oreille, Stevens, and Spokane County (collectively, the Kalispel Reservation Economic Area). Over the last 45 years, the Kalispel Reservation Economic Area has shown significant signs of economic vitality, interrupted during periods of national economic downturns. Real income received by individuals increased three-fold, jobs doubled, and the population increased by 80 percent. The economic sectors responsible for the ongoing sources of economic vitality in the Kalispel Reservation Economic Area include (from largest to smallest percentage of jobs): health services (15.3 percent), retail and wholesale trade (15.3 percent), government (14.7 percent), professional services (13.8 percent), finance-real estate-insurance (9.5 percent), manufacturing (5.8 percent), construction (5.2 percent), utilities and transportation (4.5 percent), agriculture (1.9 percent), and mining (0.3 percent).

Total net labor earnings associated with jobs in the Kalispel Reservation Economic Area in 2014 were almost $12.3 billion dollars. Investment income was $4 billion and transfer payments made

up $5 billion. That is, investment income added about 33 percent to the labor earnings and transfer payments added another 40 percent. As a result, total personal income was 73 percent larger than the net labor earnings of residents in the Kalispel Reservation Economic Area. Labor earnings associated with jobs in the economic area were the source of only 59 percent of total personal income. The other 41 percent of personal income was derived from sources not related to current employment in the Kalispel Reservation Economic Area.

In addition to its relatively large size, non-employment income has another characteristic that makes it economically important. This type of income is mobile and allows a source of income that is not tied to employment at a particular location. Retirees, with their pensions, savings, investments, social security, and Medicare, can reside wherever they choose. Both Pend Oreille and Stevens County have been identified as "retirement destination" counties by the federal government because of the high number of in-migrants 60 and older.

Another source of income to households and individuals in Pend Oreille and Stevens County are the labor earnings of residents associated with jobs that are located outside of those two rural counties, in particular, employment opportunities in the Spokane urban area. These two counties serve as bedroom communities for employers in that Spokane urban area. Almost 7,000 workers living in these two rural counties commute out of their home counties to work. About 5,400 of them commute into Spokane County. The earnings of these out-commuting workers tend to flow back into Pend Oreille and Stevens County, supporting economic activities there. The local economic impact is somewhat similar to having additional jobs located in those rural counties. That inflow of labor earnings due to the out-commuting to work is substantial, averaging over $260 million per year over the five-year period 2010-2014. That represented a 30 percent increase in labor earnings on top of the earnings coming from jobs *in* Pend Oreille and Stevens County filled by residents.

Living in Pend Oreille and Stevens County is attractive because of the social and environmental amenities found there, and workers are willing to tolerate the commute to work in a place that is attractive for its economic opportunity but is not as attractive as a place to live. A higher quality of life in the more rural counties (and likely lower housing costs) leads these workers to live in Pend Oreille and Stevens County and commute out to work. The Tri-County Economic Development District covering Pend Oreille and Stevens County as well as Ferry County asserted

that it was attractive because of the valuable natural amenities and the lower cost of living in those rural counties.

Employment and payroll declined in the aggregate goods producing sectors in the Kalispel Reservation Economic Area between 2001 and 2014. While the services-government sectors added about 36,000 jobs, the goods-producing sectors lost about 5,000 jobs. Separating government and service sector jobs, the service sector expansion was the source of an additional 34,000 jobs and the government sectors were the source of about 2,000 new jobs, all of them in state and local government. Most of the recent sources of economic vitality in the Kalispel Reservation Economic Area are in the services sectors, not in mining and manufacturing.

Over the last four decades, real labor income earned in the traditional export base in the Kalispel Reservation Economic Area has shown almost no net increase. Despite this loss of income from the traditional export base, real income received by residents of the Kalispel Reservation Economic Area almost tripled between 1970 and 2014. Real labor earnings in economic sectors outside of the traditional export base increased 160 percent. The rest of the increase in income flowing to households in the Kalispel Reservation Economic Area came from sources other than current jobs, as non-labor income (e.g., income from retirement programs, return on investments, and government income support programs). These sources of non-employment income quadrupled in size.

This long-run pattern of income flows to households in the Kalispel Reservation Economic Area underlines the importance of focusing on the actual sources of economic vitality in the region rather than focusing attention on the sources of economic vitality in the distant past. These long-run economic trends underline the following as the actual sources of local economic vitality:

- The rise in the importance of the service sectors of the economy including medical, professional, technical, financial, and visitor services.
- The increasingly important role of local government including the Kalispel Reservation government and its business enterprises.
- The increasing importance of retirement income.

- The increasing role of other sources of non-employment income including investment income and government income support programs.

- The importance of households choosing to live in the rural parts of our economic area while commuting out to work in the Spokane urban area.

Forest products manufacturing (paper, plywood, lumber, and other wood fiber building materials mills) has historically played an important role in the Kalispel Reservation Economic Area. A newsprint paper mill is located in Usk just across the river from the Kalispel Reservation. There are several forest product facilities in the Colville-Kettle Falls area of Stevens County in addition to a wood-fired electric generator. There are also a paper mill and numerous forest products manufacturing firms in the Greater Spokane area. The forests and related economic activities were important to the original European-American settlement of northeastern Washington and continue to play an important role in the regional economy.

Forest products manufacturing has been a declining source of employment and income across the United States and Washington state for at least the last forty years. Between 1977 and 2015, Washington forest products jobs were more than cut in half, shedding 40,500 jobs. That included a loss of 30,900 jobs at wood products mills and the associated logging, and a loss of 9,600 jobs at paper mills. Reliable forest products manufacturing job and payroll data at the county level is not readily available for long historical times. More recent data from 1998-2014 for the Kalispel Reservation Economic Area shows that forest products manufacturing employment fell by about 20 percent while total employment in manufacturing activity fell by 30 percent. The manufacturing job losses totaled almost 8,000 jobs. It is important to note that forest products manufacturing was the source of relatively few jobs across the entire Kalispel Reservation Economic Area, about eight-tenths of one percent in 1999 and about one-half of one percent in 2014. This very small direct share of total jobs in the Kalispel Reservation Economic Area is partially due to the large and very diverse economy within the Spokane urban area. Forest products were the direct source of only 0.25 percent of jobs in Spokane County but the source of seven percent of jobs in Pend Oreille County and about six percent of jobs in Stevens County.

No forest products firms are found among Spokane's 60 largest private employers, but the Ponderay Newsprint Company in Usk is among the largest private employers in Pend Oreille

County. In Stevens County, three lumber or plywood firms are among the top 10 private employers. Forest products are an important source of employment in the two rural counties of the economic area. The decline in the relative importance of the forest products industry is due to the decline in employment in those sectors and the ongoing growth of the rest of the economy despite the declines in forest products and other manufacturing.

Changing market conditions within the United States and Canada have also had an impact on the viability of forest products activity in northeastern Washington. The rise of the internet and cable television as sources of news and information have impacted the production runs of the nation's newspapers and their demand for newsprint paper. That is one of the reasons that Ponderay Newsprint in Usk faces an uncertain economic future. That facility is partially owned by several large newspaper chains in the U.S. whose demand for paper is declining. In 2016, the Ponderay Newsprint Company indicated that it had "solid orders for newsprint through 2016 as a result of recent paper mill closures on the West Coast, but future demand for the plant's product was unclear." (Kramer, 2016). Ponderay Newsprint Company informed its electric power supplier that its electricity demand for 2017 might decline dramatically.

Whatever the reason for the decline in the relative importance of forest products manufacturing in the Kalispel Reservation Economic Area, the long historical importance of these industries has led to concern that the loss of part of the region's "economic base" is likely to depress local economic vitality and well-being. The empirical evidence suggests that this is not the case. The positive economic forces have resulted in the expansion of the regional economy and maintaining the vitality of the economic region.

The cities within the Kalispel Reservation Economic Area emphasize the attractive natural settings within and surrounding their communities. It is a central component of their economic development strategy. Local environmental quality and location-specific attractive amenities support local economic vitality in many different ways including:

- Attracting and holding businesses
- Attracting and holding working age residents
- Attracting and holding retirees

- Developing a sustainable visitor economy around local amenities

High quality social, cultural, and natural amenities not only attract new permanent residents but also visitors. The "visitor economy" includes a wide variety of different types of visitors from professional and business meetings to those focused on outdoor recreation to those seeking unique cultural experiences. Despite the fact that the visitor economy is significantly broader than outdoor recreation, the economic contribution of outdoor recreation to the Kalispel Reservation Economic Area is still significant. The job impacts represent 6 percent of employment in Pend Oreille County and 11 percent of employment in Stevens County. For the whole of the Kalispel Reservation Economic Area, the employment impact is about 5 percent of total jobs. The impact on personal income in the economic area is similar, about 6 percent of total personal income. In Stevens County, the income impact is about 9 percent and in Pend Oreille County about 5 percent. The approximate relative size of the impact on state and local tax collections was about 9 percent for the Kalispel Reservation Economic Area, 10 percent for Pend Oreille County, 21 percent for Stevens County, and 8 percent for Spokane County.

The Kalispel Reservation Economic Area is an attractive place to live, work, and do business. It is not a subjective attitude or preference of some residents. The evaluations of the positive and negative values associated with living in a particular area are also important to the economic vitality of cities and more-rural areas. The local quality of life (a general term used for how local social, cultural, human-built, and environmental amenities are valued by residents potential residents, and visitors) is of direct relevance to local economic vitality.

4.0 IMPACTS OF REDESIGNATION

This section analyzes how Class I redesignation of the Kalispel Reservation will impact the baseline environmental, health, and socioeconomic conditions described in the previous section, as well as energy development. A map of the area surrounding the Kalispel Reservation is provided in Figure 15.

4.1 Air Quality

The primary impacts of Class I redesignation will be to limit the allowable increase in particulate matter, sulfur dioxide, and nitrogen dioxide concentrations in ambient air to levels below the increases currently allowable under a Class II designation. The Class I redesignation will limit the allowable increase in sulfur dioxide and nitrogen oxides to levels that are 10 percent of the current Class II increment. For particulate matter, the allowable increase in emissions will be reduced to approximately one quarter of that currently allowable. A summary of the current and proposed allowable increments of the regulated fractions of particulate matter, sulfur dioxide, and nitrogen dioxide is presented below and in Table 2.

Class I Redesignation – Impact on Allowable Increases

Pollutant	Monitoring Period	Class I Increment ($\mu g/m^3$)	Class II Increment ($\mu g/m^3$)	Reduction in Allowable Increases	
				Concentration ($\mu g/m^3$)	Percent
$PM_{2.5}$	Annual	1	4	3	75
	24-Hour	2	9	7	78
PM_{10}	Annual	4	17	13	76
	24-Hour	8	30	22	73
SO_2	Annual	2	20	18	90
	24-Hour	5	91	86	95
	3-Hour	25	512	487	95
NO_2	Annual	2.5	25	22.5	90

$\mu g/m^3$ = microgram per cubic meter

For particulate matter on an annual average basis, the allowable increase of $PM_{2.5}$ will be reduced by 3 $\mu g/m^3$ and the allowable increase of PM_{10} will be reduced by 13 $\mu g/m^3$, 25 percent and 24 percent of the current Class II annual increment, respectively. On a 24-hour maximum basis, the allowable increase of $PM_{2.5}$ will be reduced by 7 $\mu g/m^3$ and the allowable increase of

PM_{10} will be reduced by 22 µg/m^3, 22 percent and 27 percent of the current Class II increment, respectively.

For sulfur dioxide on an annual average basis, the redesignation will reduce the allowable SO_2 increase by 18 µg/m^3 or to a level one-tenth of the currently allowable Class II increment. On a 24-hour maximum basis, the allowable SO_2 increase will be reduced by 86 µg/m^3 (approximately 5 percent of the current allowable increase) and on a 3-hour maximum basis, the allowable SO_2 increase will be reduced by 487 µg/m^3 (about 5 percent of the current allowable increase).

For nitrogen dioxide, the redesignation will reduce the annual allowable increase by 22.5 µg/m^3 or to a level one-tenth of the currently allowable Class II increment.

These reductions in allowable increases are significant and represent substantial levels of additional air quality protection with a Class I redesignation area. Because existing pollution concentrations are low and the air quality is good, redesignation to Class I area is especially important to preserve the existing environmental conditions.

To quantify the impact of Class I redesignation, particulate matter $PM_{2.5}$ continuous monitoring data measured on the Kalispel Reservation was evaluated. Monitoring data for sulfur dioxide and nitrogen oxide has not been collected on the Reservation. Ecology collected $PM_{2.5}$ data at a monitoring station located on the Camas Wellness Center on Le Clerc Road in Cusick, Washington for approximately 4 ½ years (from December 2006 through May of 2011). Concentrations of particulates were reported hourly. These data were not censored (no data excluded), for example, to account for extreme events or wildfires. By including data from extreme events, this quantification represents a more conservative, overestimate of baseline $PM_{2.5}$ conditions on the Kalispel Reservation.

For the reporting period, the dataset is sufficiently complete. The data were used to calculate daily (24-hour) averages and annual averages using guidance provided in Appendix N to 40 C.F.R. §50—Interpretation of the National Ambient Air Quality Standards for $PM_{2.5}$. Daily averages ranged in concentration from 0.5 µg/m^3 to 21.5 µg/m^3. Calculated annual average concentrations ranged from 2.6 µg/m^3 to 4.8 µg/m^3 and were used to calculate 3-year annual averages. The three-year annual average for 2007 through 2009 is 3.8 µg/m^3 and the three-year annual average for 2008 through 2010 is 4.3 µg/m^3. With Class 1 redesignation and the

allowable 1 µg/m^3 increment because baseline for $PM_{2.5}$ has not been triggered, the annual average $PM_{2.5}$ concentrations could not exceed 5.3 µg/m^3 on a three-year annual average basis. Under the current Class II designation, the allowable 4 µg/m^3 increment would allow average $PM_{2.5}$ concentrations up to 8.3 µg/m^3, or some 57 percent [(8.3 µg/m^3 minus 5.3 µg/m^3), divided by 5.3 µg/m^3] greater than allowed with a Class I redesignation.

A redesignation to Class I will limit the allowable increase in toxic pollutants associated with facilities that are sources of criteria pollutants. It will prevent the permitting of industrial facilities that cannot meet the reduced incremental increase in allowable concentrations of particulate matter, sulfur dioxide, and nitrogen oxide and that may otherwise release hazardous air pollutants. Proposed facilities may need to implement BACT to meet the reduced increment limits, which could have the effect of limiting other hazardous pollutants. Thus, the effects will likely be beneficial for controlling increases in toxic air pollutant levels. In addition, because fine particles ($PM_{2.5}$) and sulfur dioxide (SO_2) contribute to reduced visibility (haze) and the formation of smog, a Class I redesignation will better preserve visibility in the region.

The effects of a Class I redesignation on air quality are positive. A Class I redesignation will result in substantially more protection for air quality on the Reservation by placing more stringent limits on allowable degradation.

4.2 Environmental Health

This section examines the impact of the redesignation on the Reservation's environmental health.

4.2.1 Fish and Wildlife

Emissions of sulfur dioxide and nitrogen oxide from power plants and other sources can react in the atmosphere to form weak acids that fall to the Earth as rain, fog, snow or dry particles (USEPA, 2017b). The ecological effects of this acidified precipitation are most clearly observed in streams, lakes, marshes, and other aquatic environments.

The effects of acid rain on ecosystems can cause significant disruption. Some species can be directly affected as pH reaches critical levels (concentrations that result in significant harmful effects). Other species may be disrupted as the ecosystem is damaged and sources of food or habitat are degraded. For many aquatic species, the critical pH levels range from 4 to 6. For

example, most fish eggs cannot hatch at a pH of 5 or lower. A primary food source for juvenile fishes may be mayflies, which have a critical pH level of 5.5. Frogs have a critical pH level of 4. The critical pH level for several fishes species found in Box Canyon Reservoir range from a pH of 4.5 to 5.5: perch (4.5), trout (5), and bass (5.5) (USEPA, 2017c).

Acidic rainwater can have secondary impacts on the environment. Acid rain can leach and mobilize aluminum from clays in soils that flow into lakes and streams. This leaching also depletes aluminum and potentially other soil nutrients, which can negatively impact vegetation. The deposition of sulfur may also increase the rate of mercury methylation in aquatic environments and increase the impact of mercury poisoning on fish and wildlife (USEPA, 2017b).

The impact to fisheries and wildlife on the Reservation resulting from the redesignation of Reservation lands to the PSD Class I status would provide increased protection for fisheries and wildlife. By limiting the release of harmful pollutants (sulfur dioxide, nitrogen dioxide, and particulate matter), the potential for acid forming particulates and gases would be controlled and restricted to levels that would limit further environmental degradation and preserve the ecosystem quality for wildlife on the Kalispel Reservation and the Tribe's adjudicated lands. The overall net impact of the redesignation of Reservation lands to Class I for fisheries and wildlife is positive.

The direct impact to fisheries and wildlife on the Reservation from the redesignation to PSD Class I status is not yet known. The overall reduction of pollutants regulated by the PSD program will benefit fish and wildlife by reducing their exposure to pollution and toxic chemicals directly regulated under the PSD program. This would likely improve or maintain the health of fish and wildlife populations with respect to pollution impacts within the Reservation and the surrounding waters and lands.

4.2.2 Soils

The soils on Reservation lands and those nearby are the primary receptor for particulates and pollution deposited by air and from precipitation impacted by sulfur dioxide, nitrogen oxide, and particulate matter. Once contaminants reach the land surface they interact with the soil, surface water, and organisms to disperse within the Reservation ecosystem. The chemical components of particulate matter (metals, organics, and ions) contribute to many of its ecological effects. Exposure to particulate matter may lead to phytotoxic responses and broader

ecosystem effects, which can occur through resulting changes in soil quality. Pollutants associated with particulate matter can alter energy flow, nutrient cycling, and ecosystem structure. Documented toxic responses have generally been associated with the trace metal content, acidity, salinity, or surfactant properties of the deposited materials (USEPA, 2009).

Acidic rainwater, formed from sulfur dioxide and nitrogen dioxide in the atmosphere, can impact soils by accelerating the leaching and mobilization of aluminum. Once mobilized, aluminum can flow into lakes and streams and expose aquatic organisms to toxic concentrations. Aluminum has been shown to accumulate at higher rates in fish as pH decreases. The bioconcentration factor (BCF), the concentration ratio of a chemical in fish tissue to the chemical in water) for aluminum in brook trout (*Salvelinus fontinalis*) were 215, 123, and 36 at pH 5.3, 6.1, and 7.2, respectively (Cleveland et al., 1991).

The mobilization of mineral nutrients from the soils by acid rain depletes aluminum and potentially other soil nutrients, which can negatively affect vegetation and potentially affect future forest productivity (USEPA, 2017c). Changes in the soil pH can also change the structure of the soil microbiome. As soil becomes more acidic, the number and diversity of microorganisms decreases, resulting in the potential decline of the bioavailability of soil nutrients and negatively affecting vegetation abundance and quality.

The impact to soils on the Reservation resulting from the redesignation of Reservation lands to the PSD Class I status would provide increased protection for soil resources. By limiting the release of harmful pollutants (sulfur dioxide, nitrogen dioxide, and particulate matter), the potential for acid forming particulates and gases would be controlled and restricted to levels that would limit further environmental degradation and preserve soil quality on the Kalispel Reservation and the surrounding area. The overall net impact of the redesignation to a Class I for soils is positive.

The direct impact to soils on the Reservation from the redesignation to PSD Class I status is not yet known. The overall reduction of pollutants regulated by the PSD program will benefit soil quality by reducing exposure to pollution and toxic chemicals directly regulated under the PSD program and those associated with PSD-regulated pollutants, including those harmful to human health and the environment. This would likely improve or maintain the quality of soils within the Reservation and the surrounding waters and lands.

4.2.3 Vegetation

Acid rain and fog, especially at high elevations, may strip nutrients from trees' foliage, leaving them with brown or dead leaves or needles. The damage to tree leaves makes them less able to absorb sunlight, which makes them weak and less able to withstand freezing temperatures (USEPA, 2017c) and potentially more susceptible to disease (viruses, fungi, and insect pests) and damage from drought.

Sulfur dioxide contributes to acid rain formation, which can harm plants by leaching aluminum from the soil. Acid rain also removes other minerals and nutrients that support plant growth from the soil, having an indirect effect on vegetation.

Metals associated with particulate matter from atmospheric deposition can be readily taken up by mosses and lichens (USEPA, 2009). Also, many lichen species are sensitive to SO_2 at average annual concentrations as low as 39 µg/m^3 (USFS, 2017).

Sulfur dioxide can have direct effects on forest species such as Ponderosa pine (*Pinus ponderosa*) and quaking aspen (*Populus tremuloides*), which are found on the Reservation. Once emitted, SO_2 may be transferred to vegetation by deposition at rates that are influenced by meteorological conditions. Ponderosa Pine is a species that has exhibited visible injury as a result of sulfur emissions from industrial point sources. Aspen is a plant species that is relatively sensitive to SO_2 (Bell and Treshow, 2002).

The direct impact to vegetation on the Reservation from the redesignation to PSD Class I status is not yet known. The overall reduction of pollutants regulated by the PSD program will benefit vegetation that is likely to experience a reduced exposure to pollution and toxic chemicals directly regulated under the PSD program and those associated with PSD-regulated pollutants, including those harmful to human health and the environment. This would likely improve or maintain the quality of vegetation with respect to pollution impacts within the Reservation and the surrounding waters and lands.

4.3 Human Health

The proposed redesignation would limit the amounts of the CAA criteria pollutants allowed from new or expanding major sources to only allowable Class I increments, fractions of the current

Class II allowable increases. For example, the Class I annual limits for sulfur dioxide and nitrogen dioxide are one-tenth of the Class II limits. The allowable limit for Class I areas on PM_{10} is one quarter that allowed in Class II areas.

While Class I status only decreases the standards for three types of pollutants (sulfur dioxide, nitrogen oxides, and particulate matter), these standards can help control other pollutants, as well. For instance, particulate matter can be made up of metal particles (such as nickel, manganese, and mercury) which can be toxic. Control of NO_2 can help control the formation of ozone, to which NO_2 is a pre-cursor. Scrubbers installed to control sulfur dioxide can also control sulfuric acid mist, which is corrosive if inhaled. Control of sulfur dioxide can also prevent deposition of this pollutant into local waters. Adding sulfur dioxide to water can lead to increased rates of mercury methylation, and to contamination of fish tissue. The Class I redesignation will support the protection of aquatic resources through the preservation of healthy waterways, which through the consumption of water and aquatic organisms can directly impact human health. In many cases, controlling fine particulates means controlling these toxics. Preserving good air quality will lead to better human health outcomes.

By redesignating the Reservation to Class I status, long-term beneficial impacts on the health of Reservation residents and the surrounding populous will result by limiting the amount of pollution that can come from new or expanding major sources. Air pollution is a major environmental risk to health and reducing air pollution levels will reduce the burden of disease from stroke, heart disease, lung cancer, and both chronic and acute respiratory diseases, including asthma. It is well documented that the lower the levels of air pollution, the better the cardiovascular and respiratory health of a population will be, both long- and short-term (WHO, 2016).

A half-century of research has demonstrated that protecting and improving air quality protects health, reduces premature death, and enhances local quality of life. Air quality is not primarily a matter of aesthetics, although it is that too. Air pollution has serious health consequences that lead to chronic illness and premature death. It keeps students out of school and workers absent from work. Ordinary citizens act to avoid higher levels of air pollution by avoiding areas with higher levels of pollution.

4.3.1 Cultural Health

Tribal cultural practices are rooted in traditional ecological interactions. These practices center on the use of water and other natural resources for the practice of cultural lifeways, which is not typically limited to subsistence use of foods and waters. The well-being of the Tribe is highly dependent on the ability to use their surrounding resources in traditional ways. When the air is polluted, it can be unpleasant and unhealthy to be outside. When the water is contaminated, it cannot be used for traditional ceremonies or fully support culturally significant aquatic resources. When plants cannot grow due to contaminated soil or suffer damage from air pollution, they cannot be gathered for their traditional purposes or for human consumption. Contamination can cause ecosystem decline resulting in the reduction of fish, bird, and animal populations, meaning that opportunities to hunt, trap, or observe these species are lost. The positive impacts of being able to enjoy the sights, smells, and sounds of nature are incalculable.

4.4 Socioeconomics

Analysis in this section is derived from *The Economic Impact of Redesignation of the Kalispel Indian Reservation as a Class I Area under the Clean Air Act's Prevention of Significant Deterioration Program* (Power, 2017), provided as Appendix B.

4.4.1 Existing Economic Activities with the Largest Air Pollution Emissions

The Kalispel Reservation Economic Area emissions from major air pollution sources include several airports, wood product manufacturing facilities, other industrial materials manufacturing (aluminum and brick), and energy generation. Six of the fifteen major air pollution sources in the Kalispel Economic Area are from forest product manufacturing facilities. Ten of fifteen are industrial sources, and five are regional airport/transportation hubs. These major sources are evaluated because the structure of the regional economy could significantly determine the levels and location of air pollution and regulations to prevent further deterioration of air quality or to reduce current levels of air pollution may impose burdens on more heavily polluting industries. Class I redesignation will have no effect on these existing sources unless they seek to expand their emissions. This is because the PSD program effectively "grandfathers-in" existing sources at the time of Class I redesignation at their current levels of air pollution.

4.4.2 Economic Impact of Potential Polluting Facilities

4.4.2.1 Implications of Economic Trends

The Kalispel Reservation Economic Area has been evolving over the last 45 years. These changes have not been unique to northeastern Washington or the Pacific Northwest. These economic changes and trends have important implications for the Kalispel Tribe's efforts to protect air quality on the Reservation from deterioration that would reduce the economic vitality and well-being in the larger economic region. The primary changes include:

- The economy has shifted away from land-based economic activities (forest products and mining) towards lighter manufacturing and services. This also represents a shift from more heavily polluting industries to economic activities with smaller environmental footprints.
- The shift has not undermined the regional economy: employment, income, and population have expanded during the transition. Economic vitality has been maintained.
- New service sector jobs were skilled and well-paid jobs in health care, technical and professional occupations, education, finance, government, utilities, and transportation.
- Sources of income not associated with people's jobs increased significantly. These included retirement and investment income.
- The population of the region increased primarily through the net in-migration of new individuals and families. At least part of that in-migration is associated with individuals and households seeking more-attractive places to live, raise a family, or retire.
- Local natural and social amenities have become increasingly important in determining the geographic distribution of population and economic activities.
- The growth and diversification of the Spokane economy has helped the Kalispel Reservation Economic Area capture and hold income that flows into it, reduce leakage out of the region, and increase overall economic vitality.

These changes increase the importance of local amenities in supporting local economic vitality and well-being. Protecting those amenities, including clean air, complements economic development efforts rather than undermining economic development. Stated differently, these changes make the Kalispel Tribe's efforts to redesignate their Reservation as a Class I PSD air quality area consistent with larger regional efforts to maintain and improve quality of life as a positive economic strategy as well as an environmental health strategy.

4.4.2.2 Facilities Likely to Violate Class I Air Quality Limits

The modeling of hypothetical air pollution sources within the Kalispel Reservation Economic Area, but approximately 50 kilometer (km) south of the Kalispel Reservation in northern Spokane County indicated that potential new energy development sources within the region would not interfere with maintaining air quality below the Class I PSD increment (see Section 4.5 below).

New industrial activities that produce more intense air pollution or are located closer to the Kalispel Reservation could potentially violate the stricter Class I increment thresholds. In this case, this type of facility could not be permitted unless it took steps to reduce its air pollution or sited the facility in a location that did not violate Class I increments on the Kalispel Reservation.

There currently are no proposed facilities seeking air quality permits that might be impacted by Class I redesignation of the Kalispel Reservation. That makes the analysis of how a Class I redesignation might or might not limit a particular type of economic activity in the economic region speculative. Evaluation of the actual benefits and costs associated with a new pollution source requires detailed information on the air pollution associated with it, the meteorological patterns connecting the site of the emissions and the Kalispel Reservation, as well as the economic benefits it might offer the local economy. Without that detailed information, it is not possible to evaluate whether there would be net costs or net benefits associated with that proposed new pollution source.

4.4.2.3 The Potential Economic Benefits or Costs of Blocking the Permitting of an Industrial Facility

The Class I redesignation does not categorically ban any particular type of industrial operation. It focuses instead on whether a facility's emissions would violate Class I increments. Industrial facilities have a broad range of technologies they can deploy for their production processes and

to control their air pollution emissions. Industrial facilities also control where to locate and the scale of production to pursue. Those business choices will determine the impact that the operations will have on air quality both at the facility and an area beyond the facility. Complying with regulations restricting air quality impacts is part of the business analysis that guides a business to consider particular technology choices, scale of production, and particular locations for their operations. Environmental restrictions are part of a broad range of economic considerations a new facility evaluates.

Conceptually one can analyze the economic costs and benefits associated with a relatively large industrial facility that could employ 200 workers located close to the Kalispel Reservation. That is the approximate size of the existing Ponderay Newsprint Company facility and a potential site for the HiTest Sand silicon facility. While it is possible that a heavily polluting industry would be unlikely to locate a facility close to a Class I air quality area, there could be other economic considerations that made such a location especially profitable and might justify the investment in extraordinary pollution controls to meet those stricter emission limits. If that occurred, the community would receive the economic benefits of the new facility while protecting the natural amenities that support a high quality of life.

If the Class I redesignation prevented the permitting of a facility and the facility could have been permitted if Class II status had been retained, that does not necessarily mean that the Class I redesignation will cost the local economy 200 jobs and the payroll and tax revenues associated with the facility. For instance, if some of the pollution control costs were reduced by locating the facility further from the Class I area but within commuting distance of the potential workforce, the economic impact might not be much different between the two sites. Industrial facilities typically draw workers from a broad geographic area, especially if those facilities pay above average wages to workers with particular or higher levels of skills and experience. Workers in the Kalispel Reservation Economic Area have already demonstrated their willingness to commute considerable distances from their preferred residences to where their jobs are.

Another alternative is that the economic opportunity associated with a facility would be replaced by other economic opportunities that are more consistent with the ongoing trajectory of economic growth in the Kalispel Reservation Economic Area. Job and income growth over the last half-century in the Kalispel Reservation Economic Area has not come primarily from large industrial facilities with significant levels of air pollution. The Class I redesignation might actually

catalyze investment near the Reservation because it would give entrepreneurs more certainty that the area could not be converted into a polluted industrial site. The Class I redesignation is unlikely to limit the location of jobs in the fastest growing sectors of the economy or the most numerous economic activities adjacent to or within the Kalispel Reservation.

Economic and health costs associated with air pollution have demonstrated that reductions in air pollution are valuable to people and enhance the economic vitality of regions. Many of the residents of the Kalispel Reservation Economic Area have chosen to reside there because of the quality of life, including environmental quality. Protecting that environmental quality can be seen as an important part of an economic development strategy.

The net benefits or net costs of Class I redesignation is determined by an evaluation of the probability that the stricter protection against air quality deterioration on the Reservation will force significant numbers of industrial facilities from locating within the Kalispel Reservation Economic Area and that these lost economic opportunities are not replaced or exceeded by other economic developments. Economic losses also have to be weighed against the value of keeping air quality from deteriorating as much as it otherwise would have on the Reservation and in the surrounding area.

Overall, the characteristics of the Kalispel Reservation Economic Area provided in this report indicate that the likelihood of Class I redesignation having a net negative impact on local economic vitality and well-being is quite low. The potential conflicts between economic vitality and environmental quality are small and shrinking because of the changes in the sources of economic value, jobs, and income within the regional economy.

4.5 Energy Development

An energy impact analysis is required by 40 C.F.R. § 51.166 to support the Tribe's redesignation request. To fulfill this requirement, the Tribe contracted with Air Resource Specialists to perform this analysis. The evaluation and results of the energy impact analysis are presented in the *Energy Impact Analysis in Support of Class I Redesignation Final Technical Report* (ARS, 2017). provided as Appendix C.

In performing the energy impact assessment, air quality dispersion modeling has been applied to two hypothetical energy development projects located outside the Reservation to ascertain

whether or not such projects would meet the Class I PSD increments on the Reservation. The Class I PSD increments would become enforceable under the Clean Air Act assuming that the proposed redesignation to Class I status were approved. In this manner, the project assesses whether or not redesignation of the Kalispel Reservation lands to Class I status under the PSD program would hinder potential future energy development in the region.

The energy projects evaluated for this study included a hypothetical natural gas/oil-fired turbine electric generating plant and a hypothetical biomass-fired electric generating plant. Both projects were sited at the same hypothetical location in close proximity and less than 50 km to the south of the Reservation. The hypothetical plants have been modeled after similar projects constructed in Minnesota and Wisconsin. Although the projects analyzed for this report are hypothetical in nature, the information used for each hypothetical energy development project was based on "real-world" examples of new energy development in terms of expected emissions and emission release characteristics. Due to the proximity to the Reservation, the dispersion model selected for the Energy Impact Analysis was the AMS/USEPA Regulatory Model Committee (AERMIC) model or AERMOD (USEPA, 2004; USEPA, 2015).

The hypothetical combustion turbine project was a 315 megawatt (MW) electric generating combustion turbine, fired by natural gas with fuel oil as a backup. The hypothetical biomass-boiler project was a 50 MW plant. The hypothetical project locations were modeled at the Deer Park, Washington airport, located about 50 km south of the Kalispel Reservation.

The air quality impact from each hypothetical project was compared to the applicable Class I PSD increments for the pollutants of concern. Based on the hypothetical projects evaluated, the air dispersion modeling demonstrated that the hypothetical project emissions would not interfere with maintaining the Class I PSD increments on the Kalispel Reservation.

5.0 CONCLUSION

The foregoing analysis demonstrates that redesignation of the Kalispel Reservation as a Class I air quality area will further the Kalispel Tribe's sovereign interest in protecting the health of its people and resources. Redesignation will also provide a variety of off-Reservation environmental and socioeconomic benefits and is expected to have minimal, if any, negative impacts on the economic vitality of the surrounding area. The Kalispel Tribe accordingly intends to proceed with the redesignation of the Kalispel Reservation as a Class I area.

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7.0 GLOSSARY

30-Year Normals – average values for temperature and precipitation computed over the preceding 30 years. The current dataset covers the period from 1981 through 2010.

airshed – part of the atmosphere that behaves in a coherent way with respect to the dispersion of emissions

aquifer – a saturated geological material that is sufficiently permeable to yield water in significant quantities to a well or spring

average weather – weather and climate conditions that describe expected weather a location is likely to get; not statistically based.

bioconcentration factor – the concentration ratio of a chemical in fish (or other animal tissue/plant material) to the chemical in water (or other media).

clay – a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

confining unit or confining bed – a lower permeability geologic material that restricts the movement of groundwater and limits the usefulness of the unit as a groundwater source

critical levels – concentrations that result in significant harmful effects.

increment – the maximum allowable amount by which the ambient concentration of a particular pollutant can increase above a baseline concentration. Establishes the amount of air quality degradation that is allowed to occur in a particular area.

loam – soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

mesic – (of an environment or habitat) containing a moderate amount of moisture.

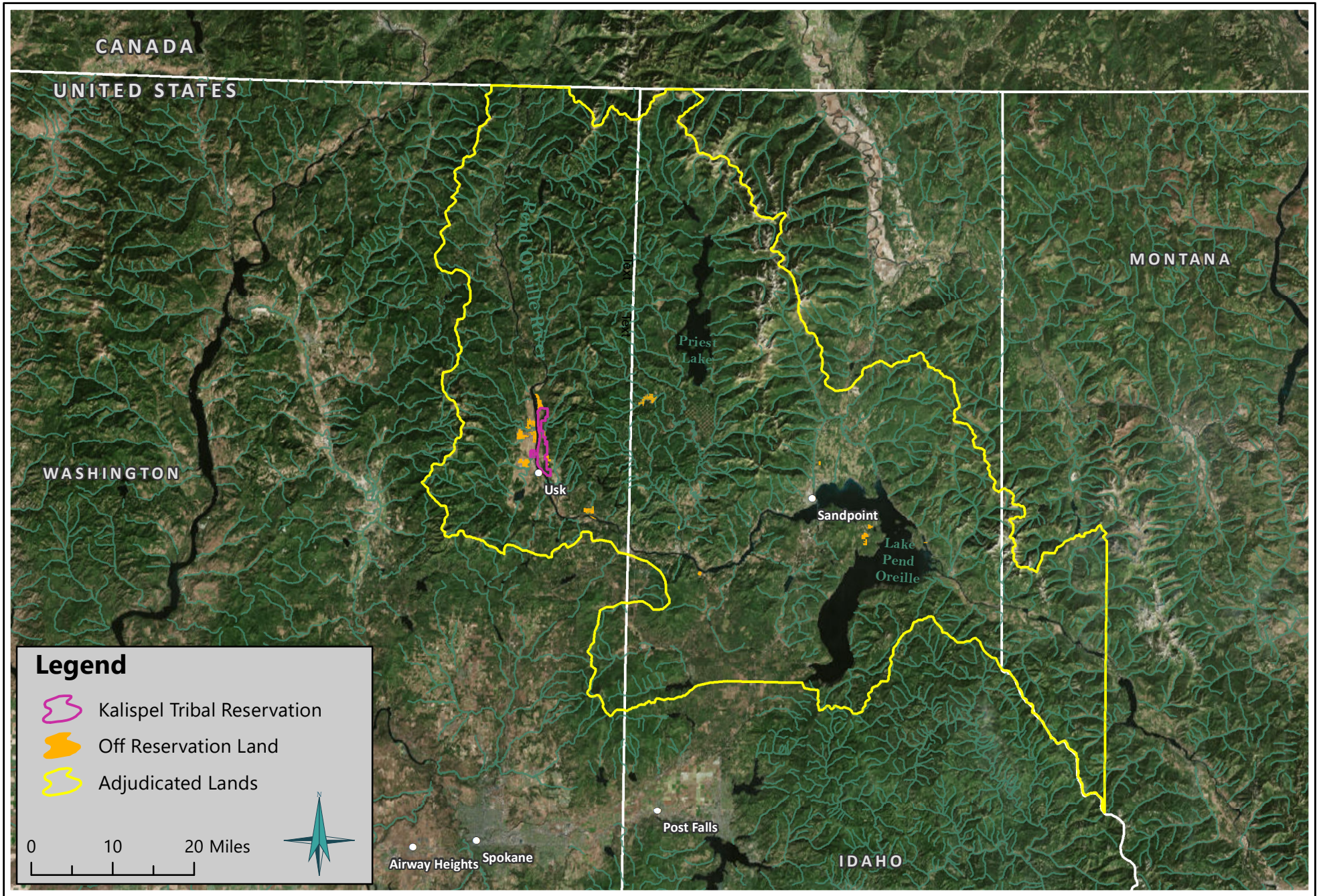
opportunity cost – loss of potential gain from other alternatives when one alternative is chosen

orthographic lift – when an air mass if forced from a low elevation to a higher elevation as it moves over rising terrain. As the air mass gains altitude, it cools (adiabatically), which can raise the relative humidity increasing the presence of clouds and possibility precipitation.

silt – a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

wind rose – a circular diagram showing the relative frequency of wind direction and speed from a place over a certain time period.

Figures



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Reservation and Adjudicated Lands

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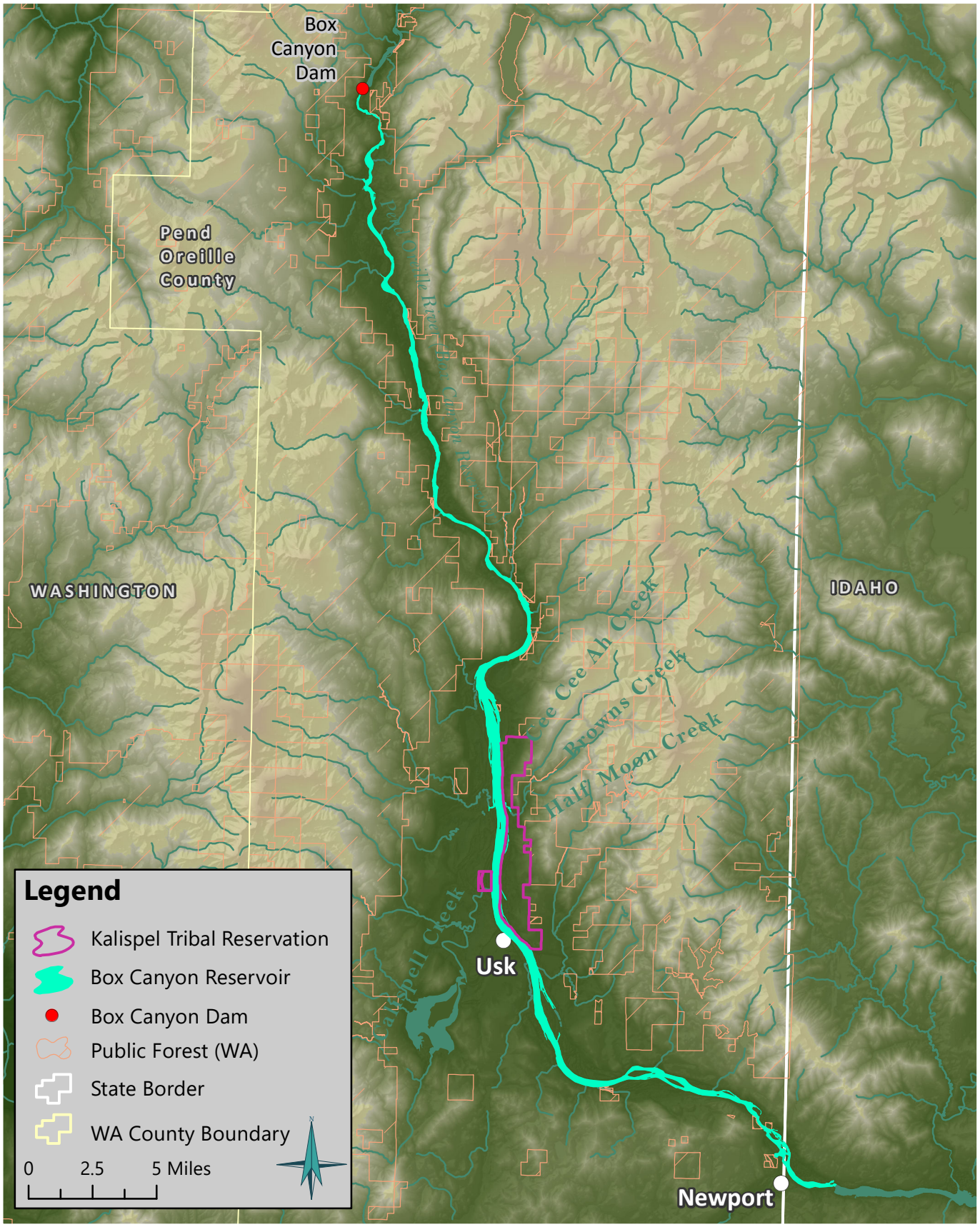

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Pend Oreille River Valley
Geographic Features

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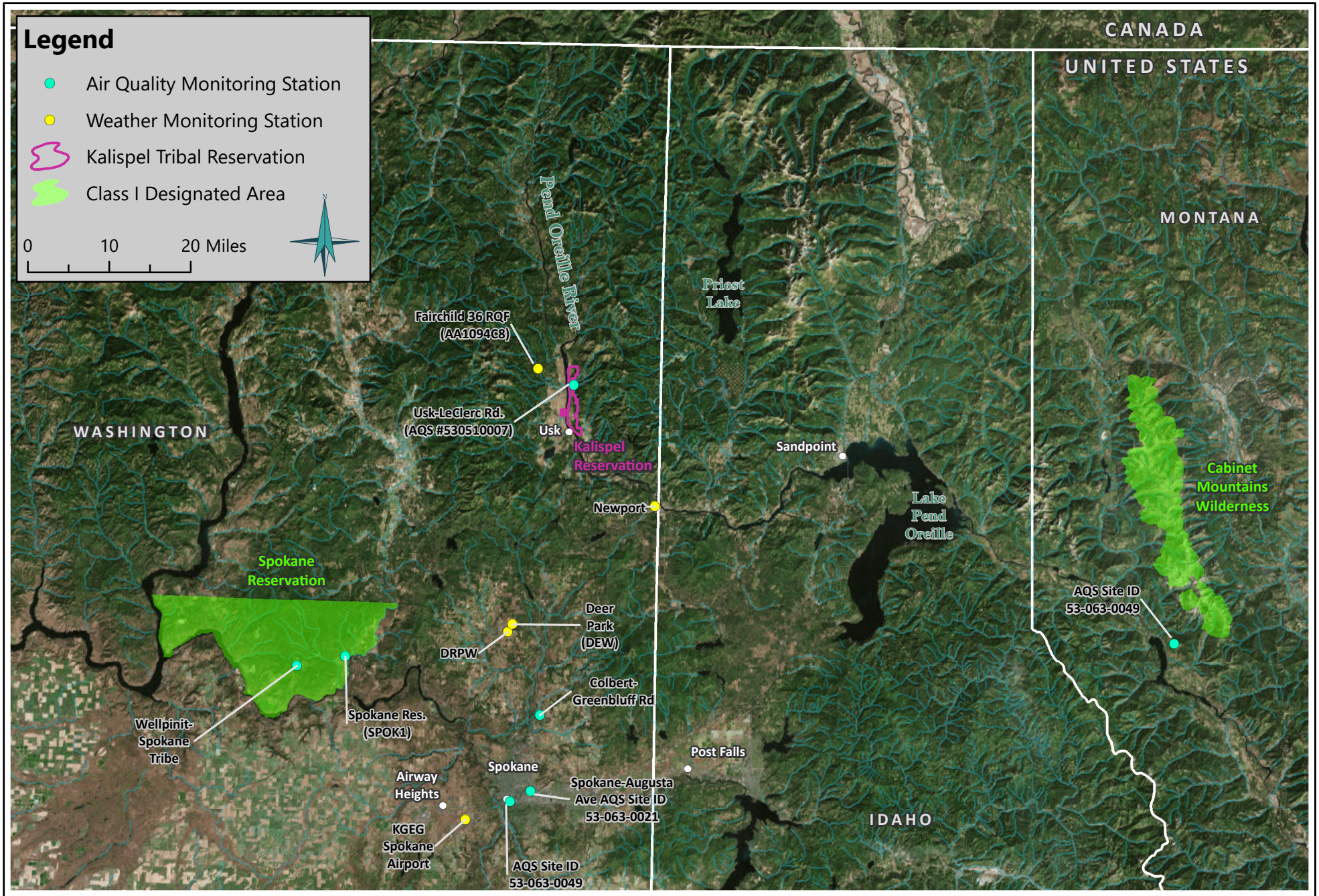

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Monitoring Stations and Class I Areas

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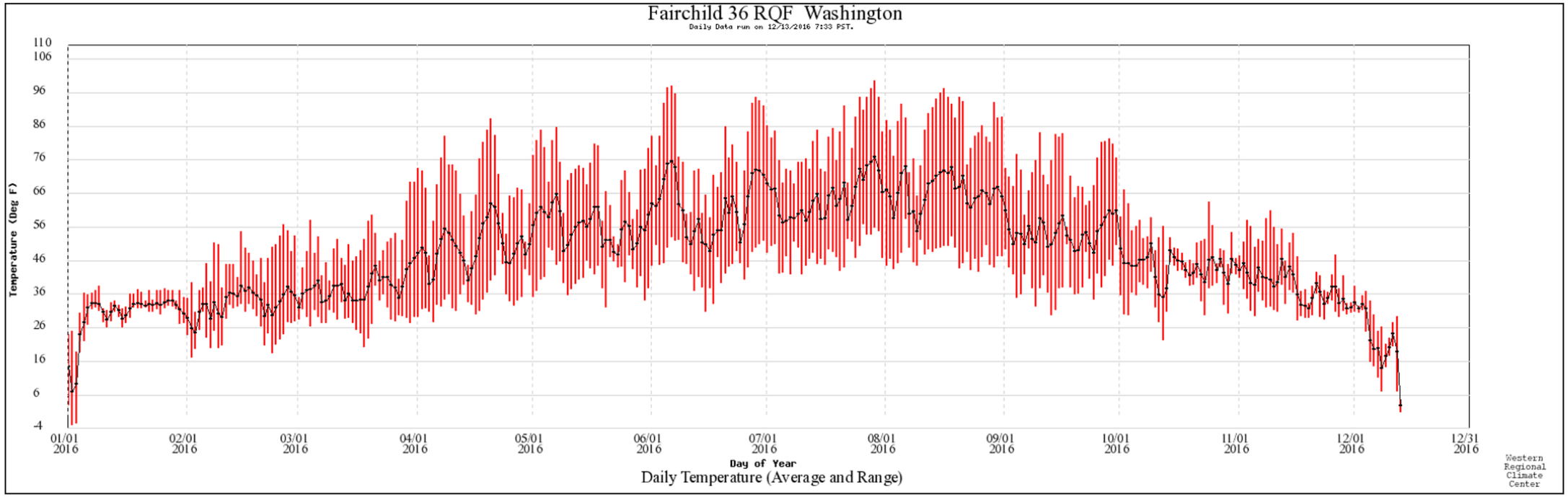
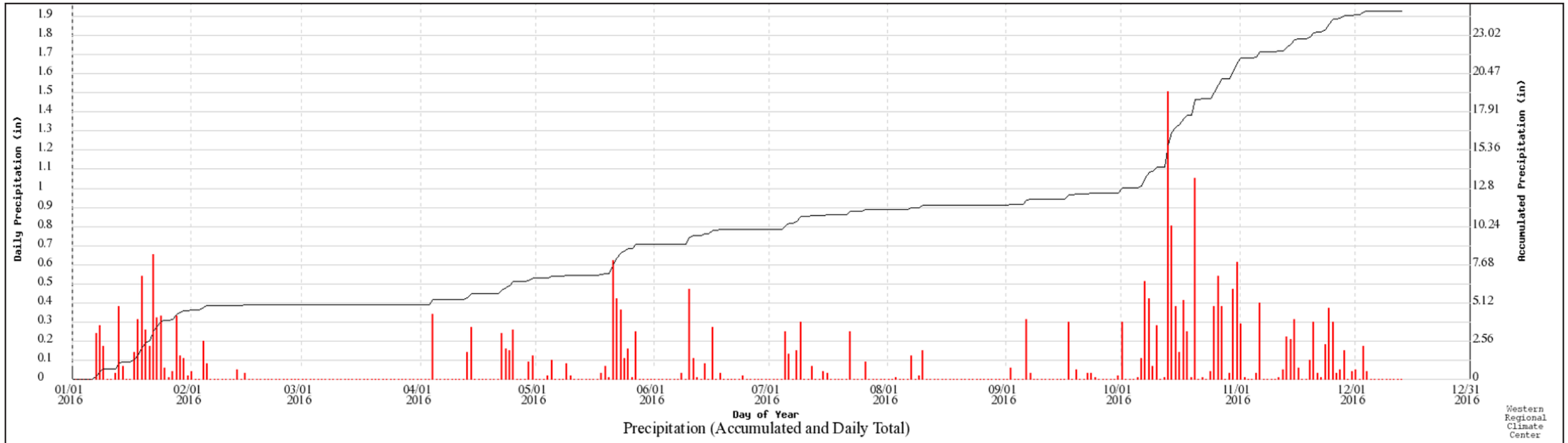
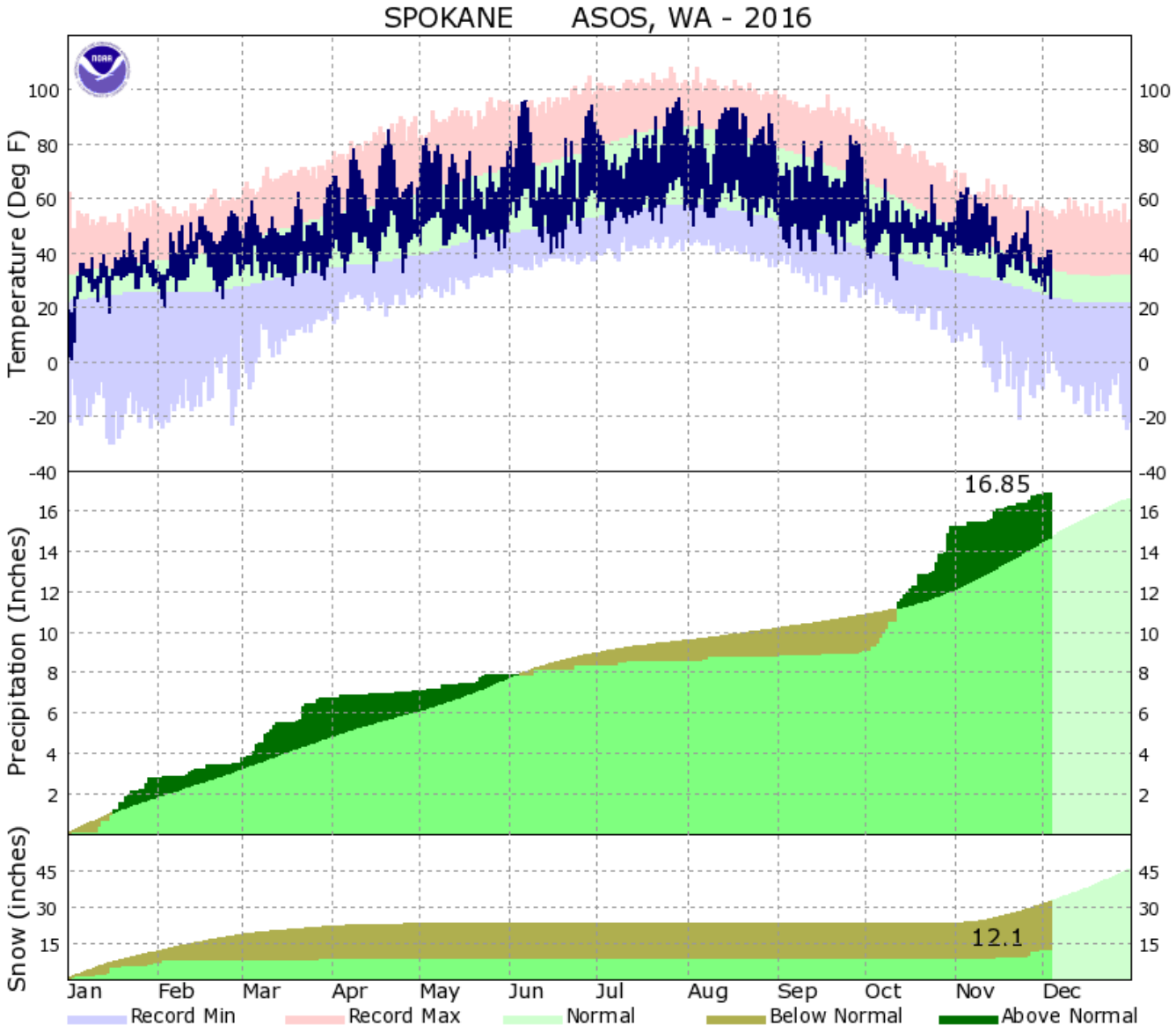


Daily Temperature (Average and Range)

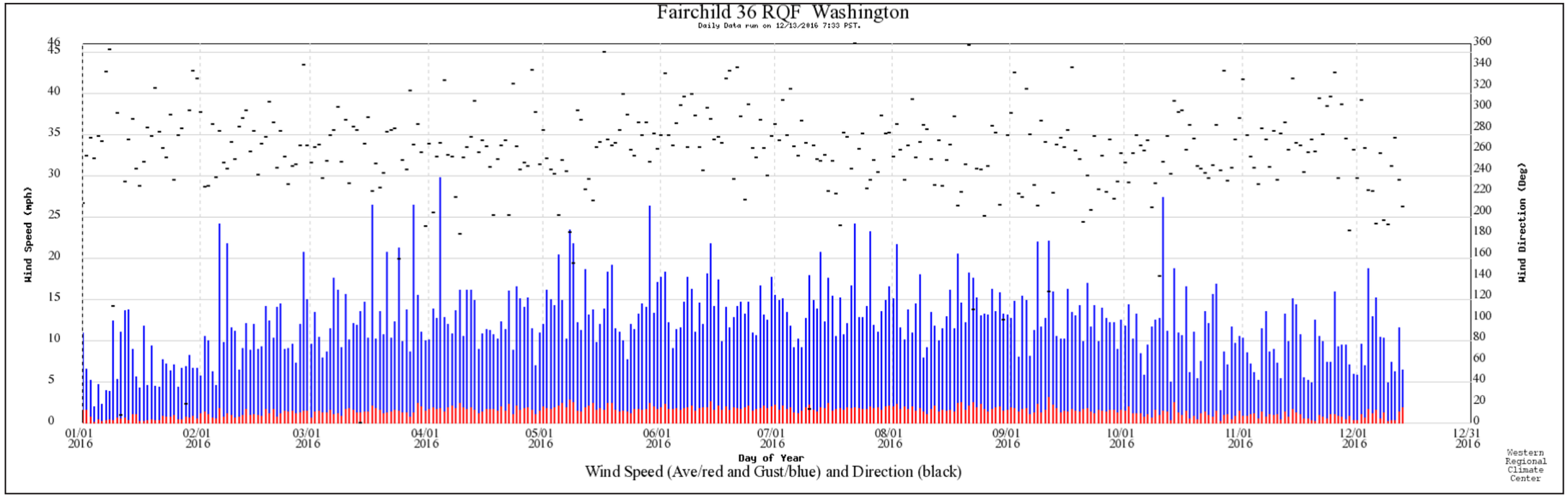


Precipitation (Accumulated and Daily Total)

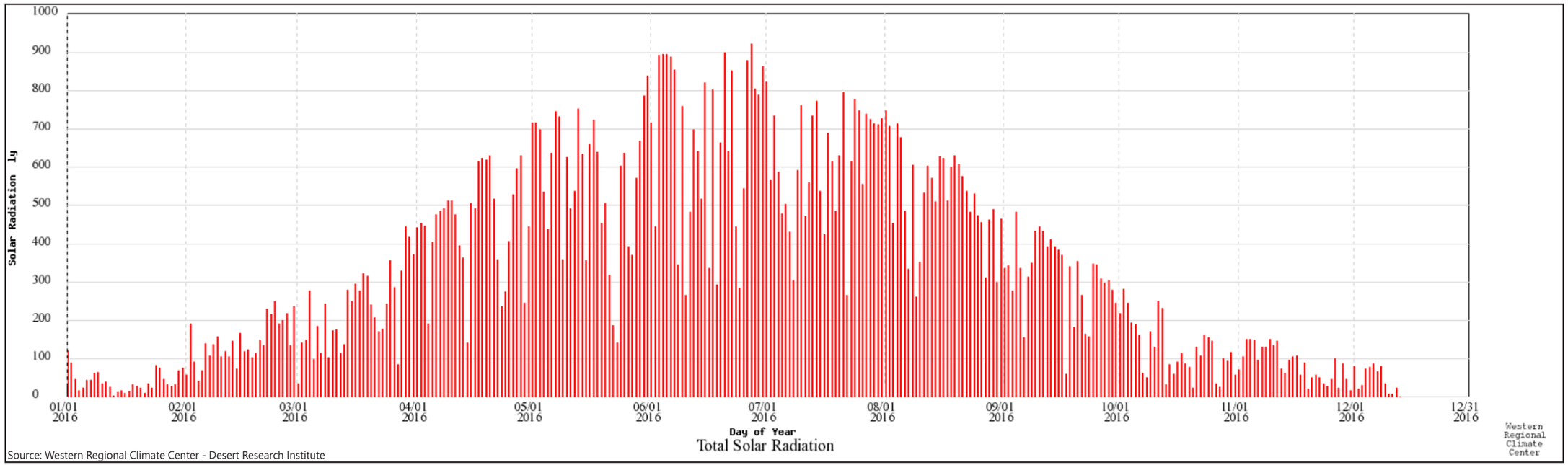
Source: Western Regional Climate Center - Desert Research Institute



RIDOLFI Environmental	Clean Air Act Prevention of Significant Deterioration Program Class I Redesignation Technical Report	February 2017	Figure 5
	Prepared for the Kalispel Tribe of Indians	Temperature and Precipitation Ranges - Spokane, Washington	

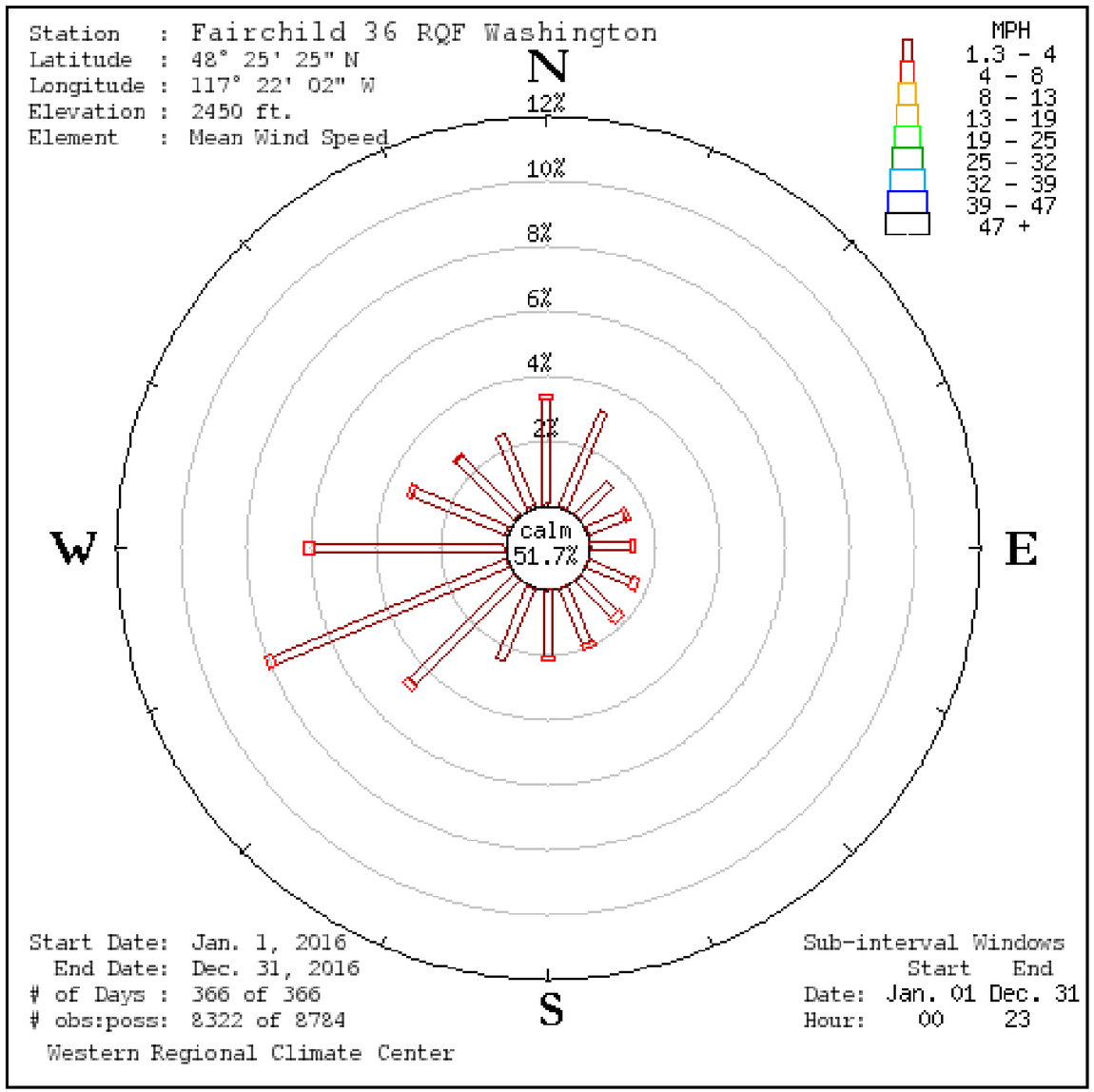


Wind Speed (Ave/red and Gust/blue) and Direction (black)



Total Solar Radiation

Source: Western Regional Climate Center - Desert Research Institute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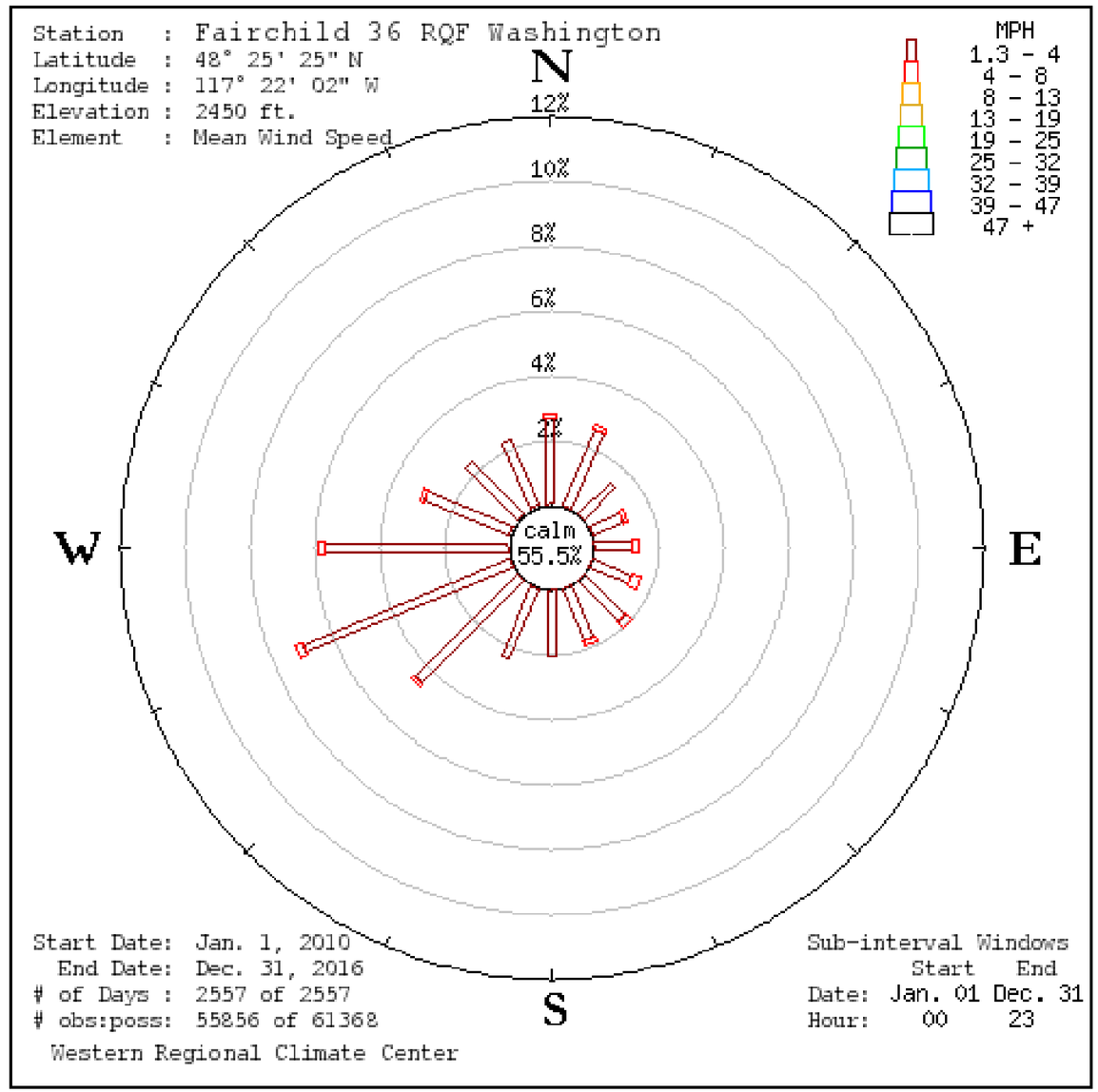
Longitude : 117° 22' 02" W
Elevation : 2450 ft.
Element : Mean Wind Speed
MPH
1.3 - 4
4 - 8
8 - 13
13 - 19
19 - 25
25 - 32
32 - 39
39 - 47
47 +
N
W
E
S
12%
10%
8%
6%
4%
2%
calm
51.7%
Start Date: Jan. 1, 2016
End Date: Dec. 31, 2016
# of Days : 366 of 366
obs:poss: 8322 of 8784
Sub-interval Windows
Start End
Date: Jan. 01 Dec. 31
Hour: 00 23
Western Regional Climate Center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Latitude : 48° 25' 25" N
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Element : Mean Wind Speed
MPH
1.3 - 4
4 - 8
8 - 13
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Start Date: Jan. 1, 2010
End Date: Dec. 31, 2016
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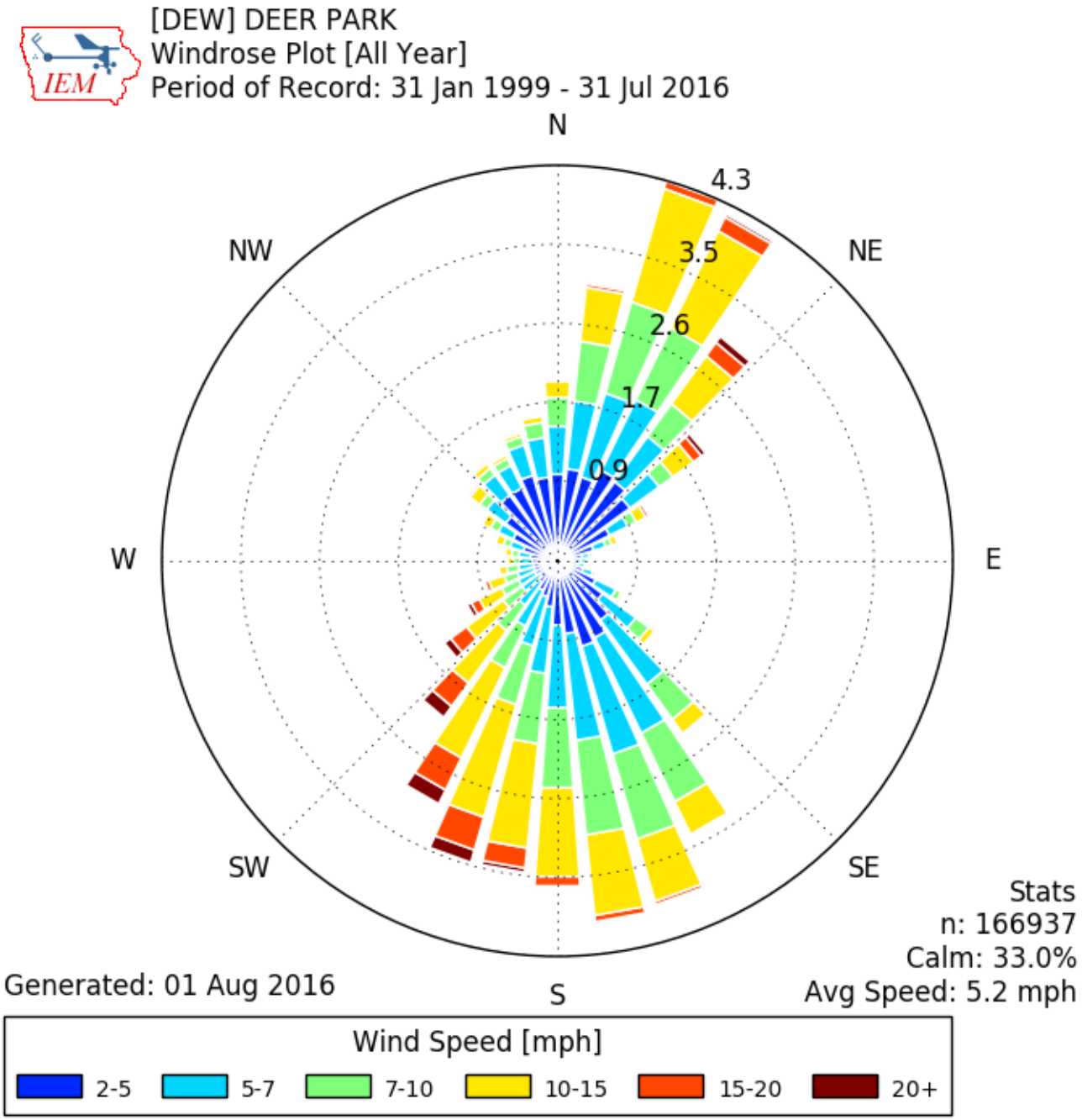
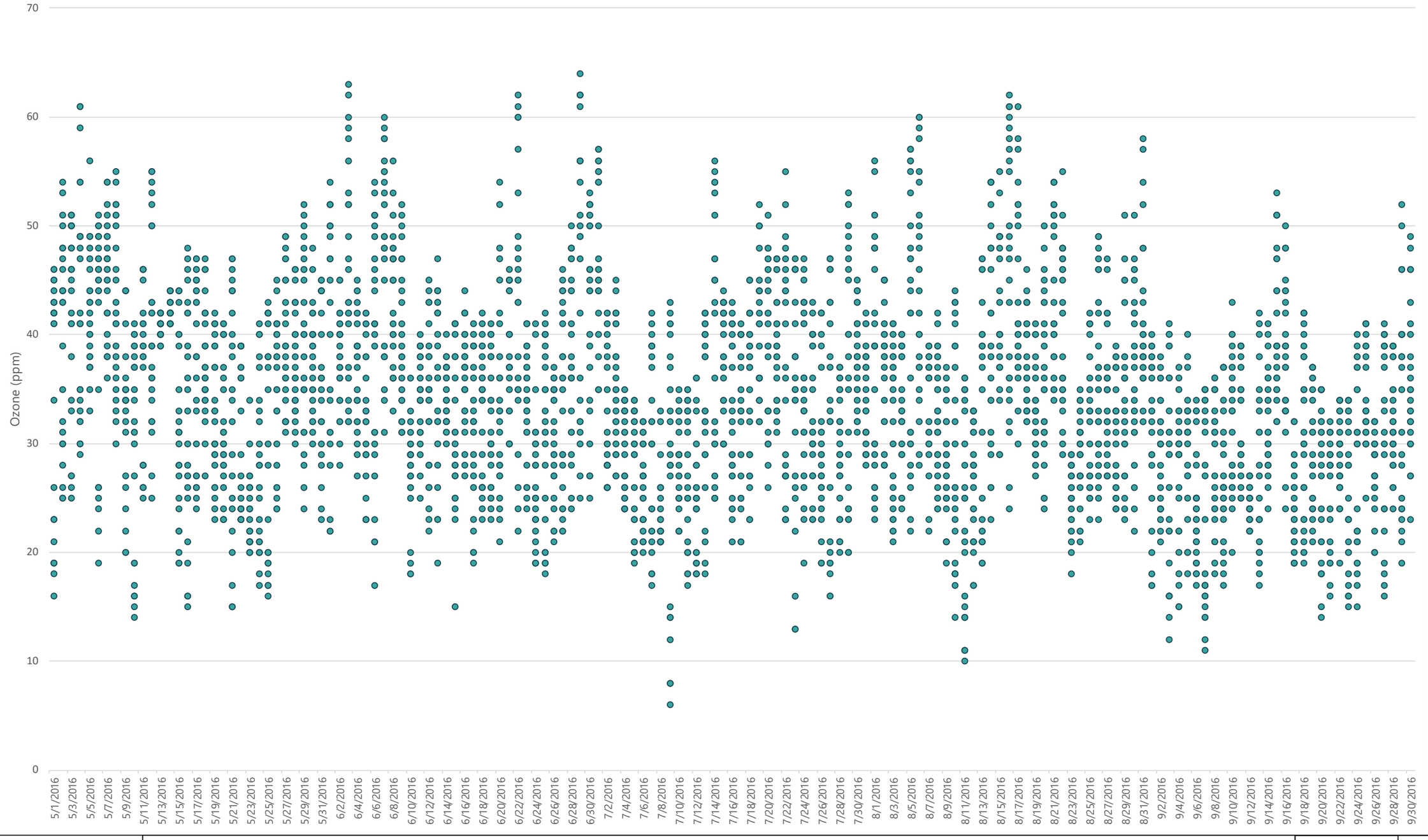
Hour: 00 23
Western Regional Climate Center



RIDOLFI Environmental	Clean Air Act Prevention of Significant Deterioration Class I Redesignation	February 2017	Figure 8
	Prepared for the Kalispel Tribe of Indians	Annual Wind Rose - Deer Park, Washington	



Data Source: EPA Station Augustus Road

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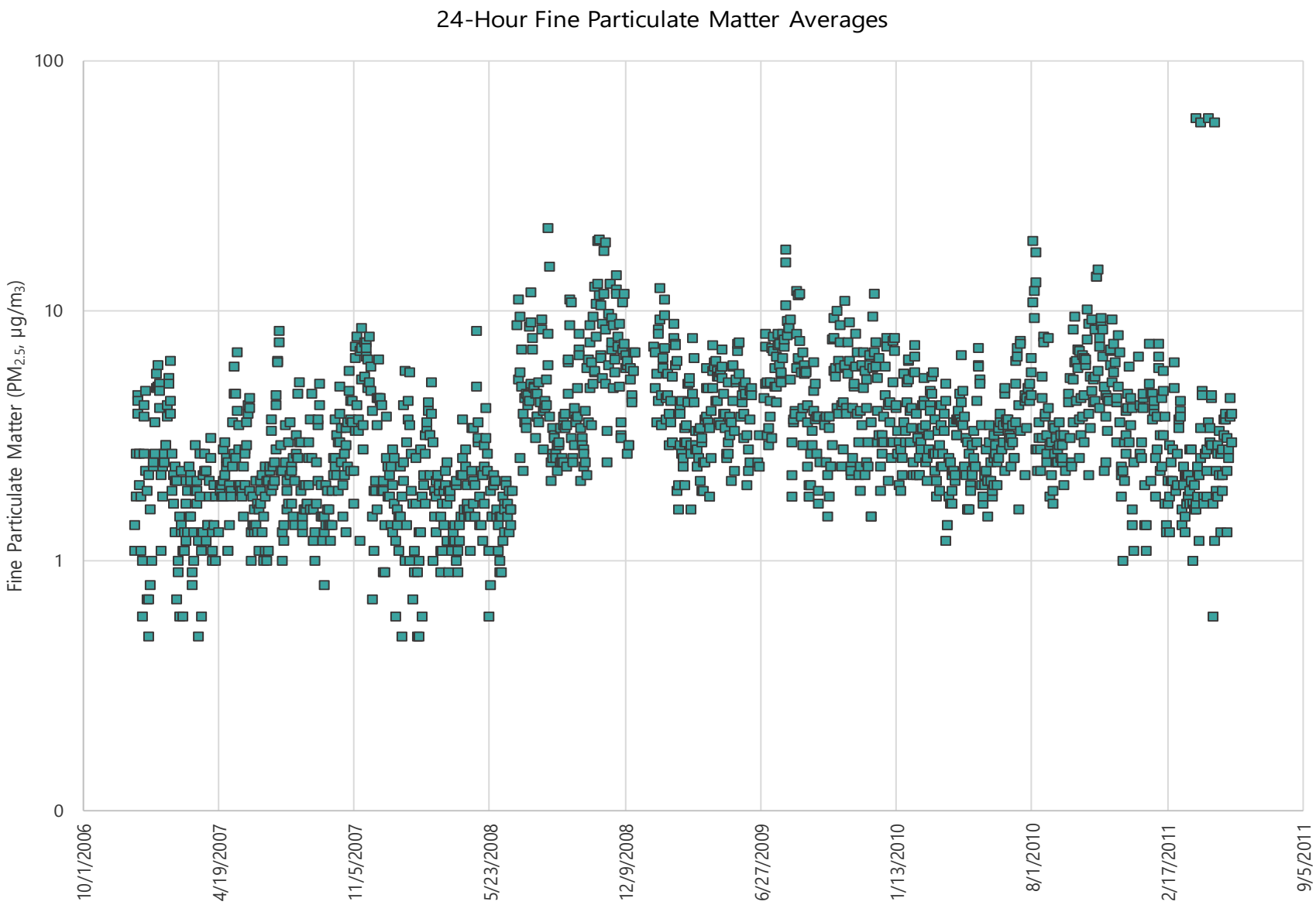
Ozone -
Spokane, Washington



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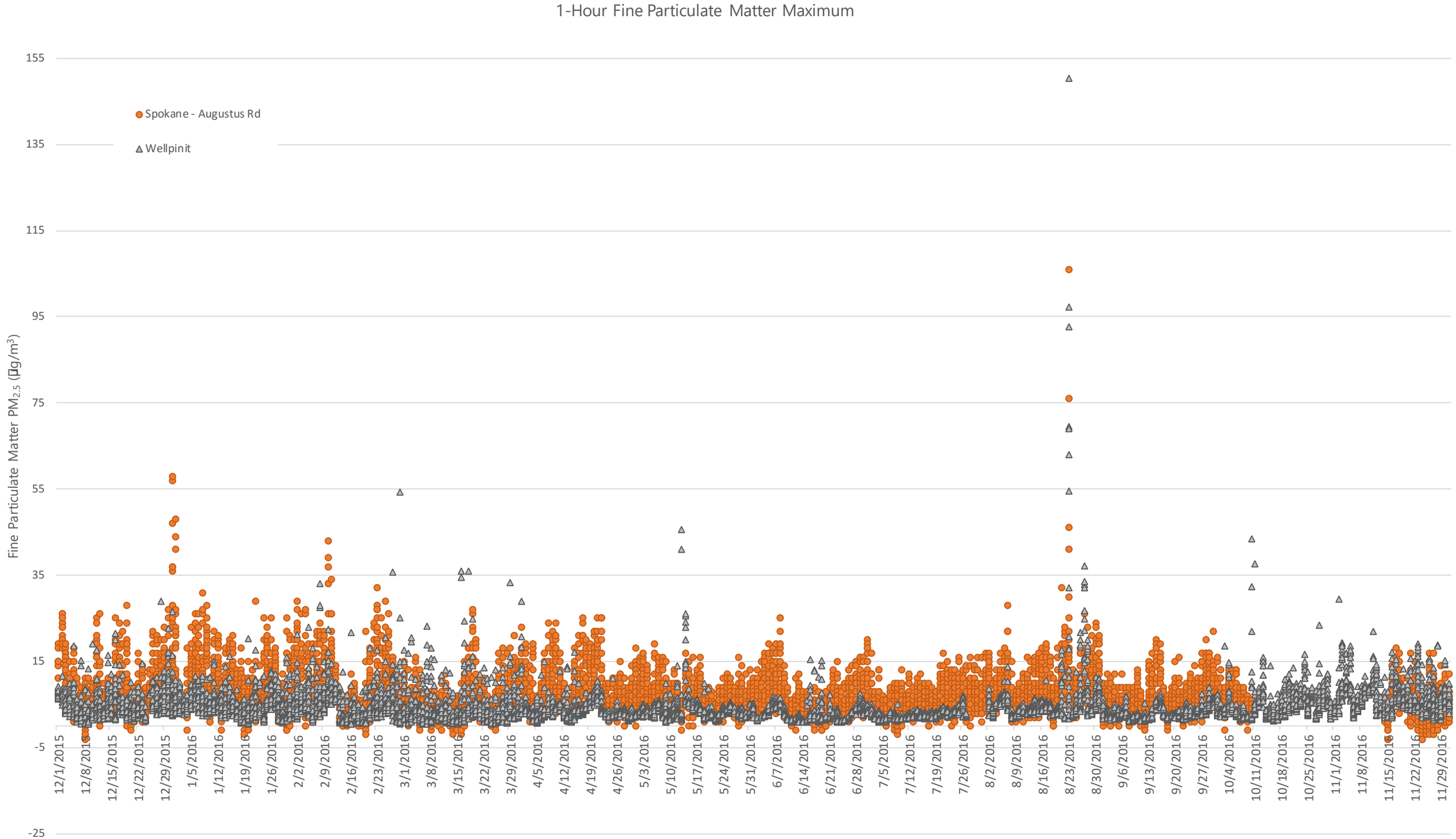
Fine Particulate Matter
$PM_{2.5}$ - Usk, Washington



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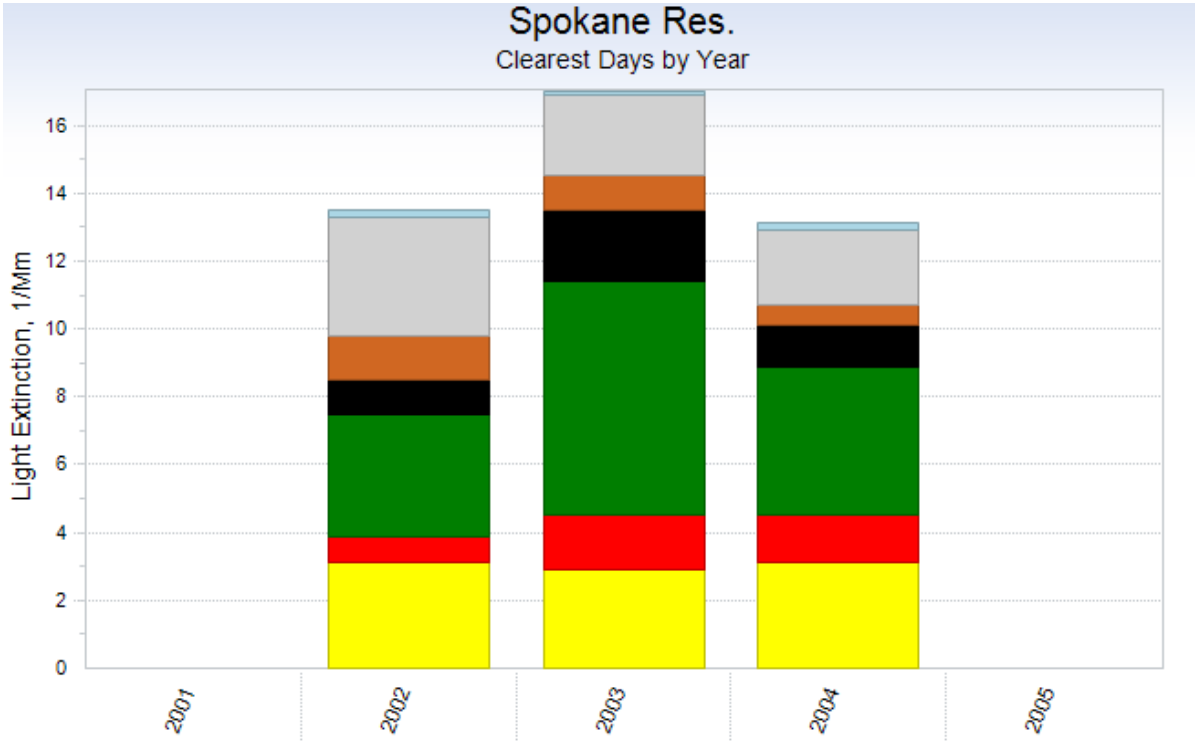
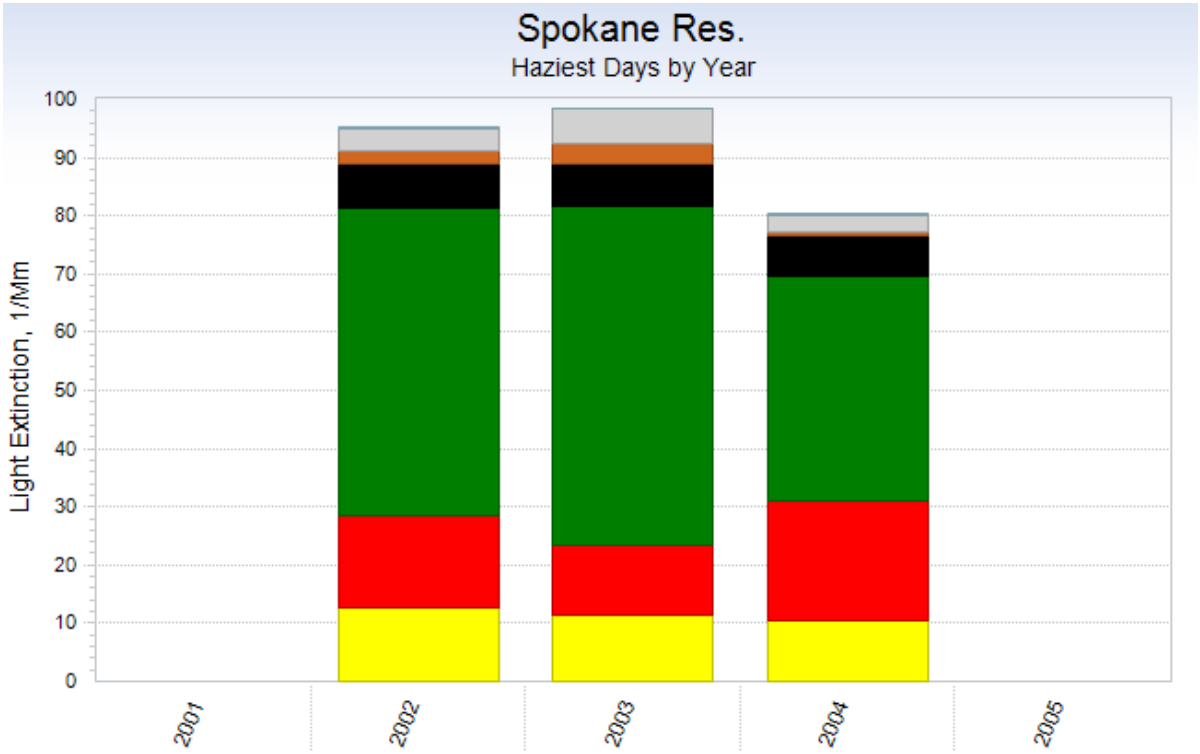
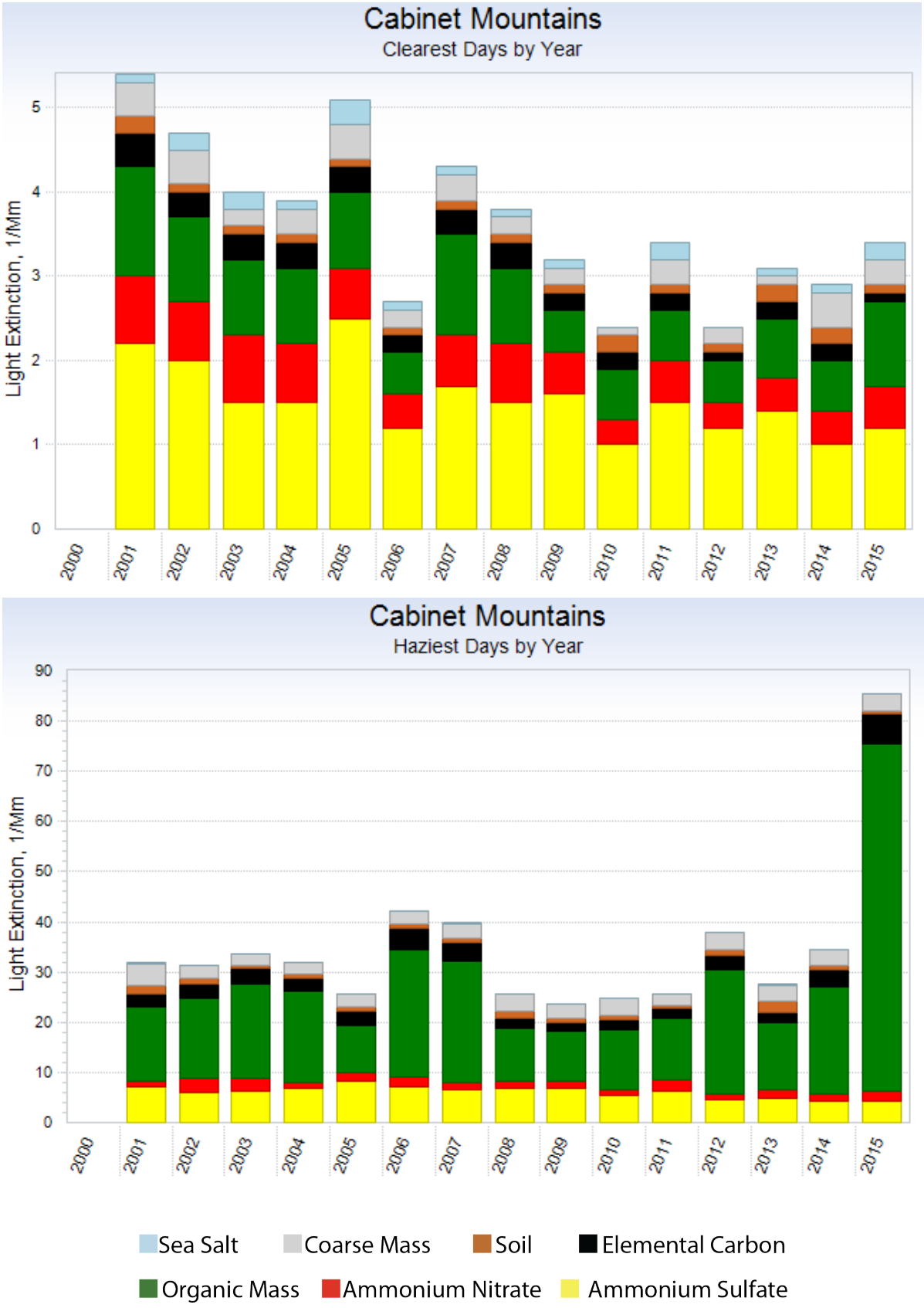
Fine Particulate Matter $PM_{2.5}$ - Spokane and Wellpinit, Washington





Sea Salt | Coarse Mass | Soil | Elemental Carbon
Organic Mass | Ammonium Nitrate | Ammonium Sulfate

RIDOLFI Environmental	Clean Air Act Prevention of Significant Deterioration Program Class I Redesignation Technical Report	February 2017 | Figure 12
	Prepared for the Kalispel Tribe of Indians	Visibility - Spokane Reservation, Washington



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	Prepared for the Kalispel Tribe of Indians	Visibility - Cabinet Mountains Wilderness, Montana

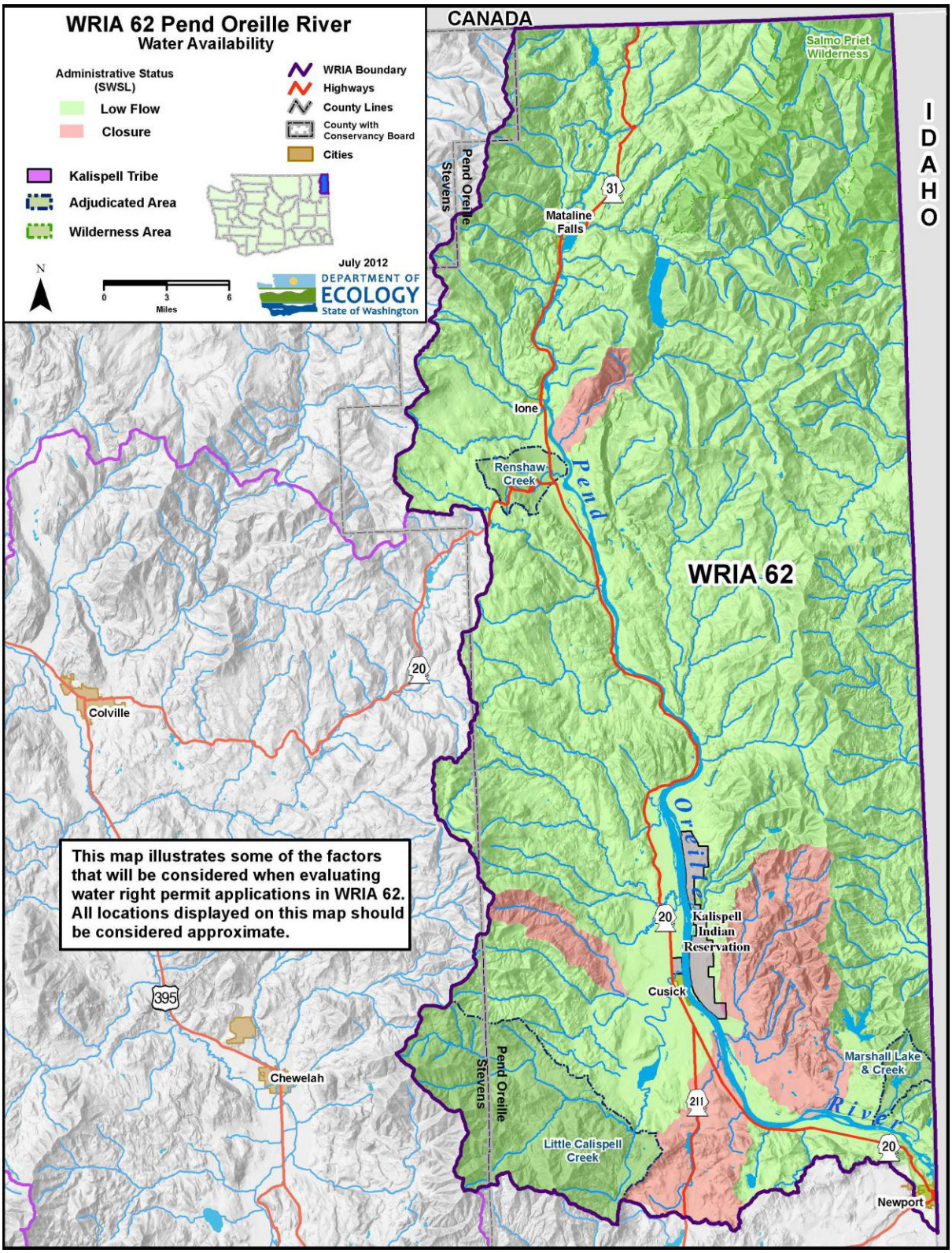
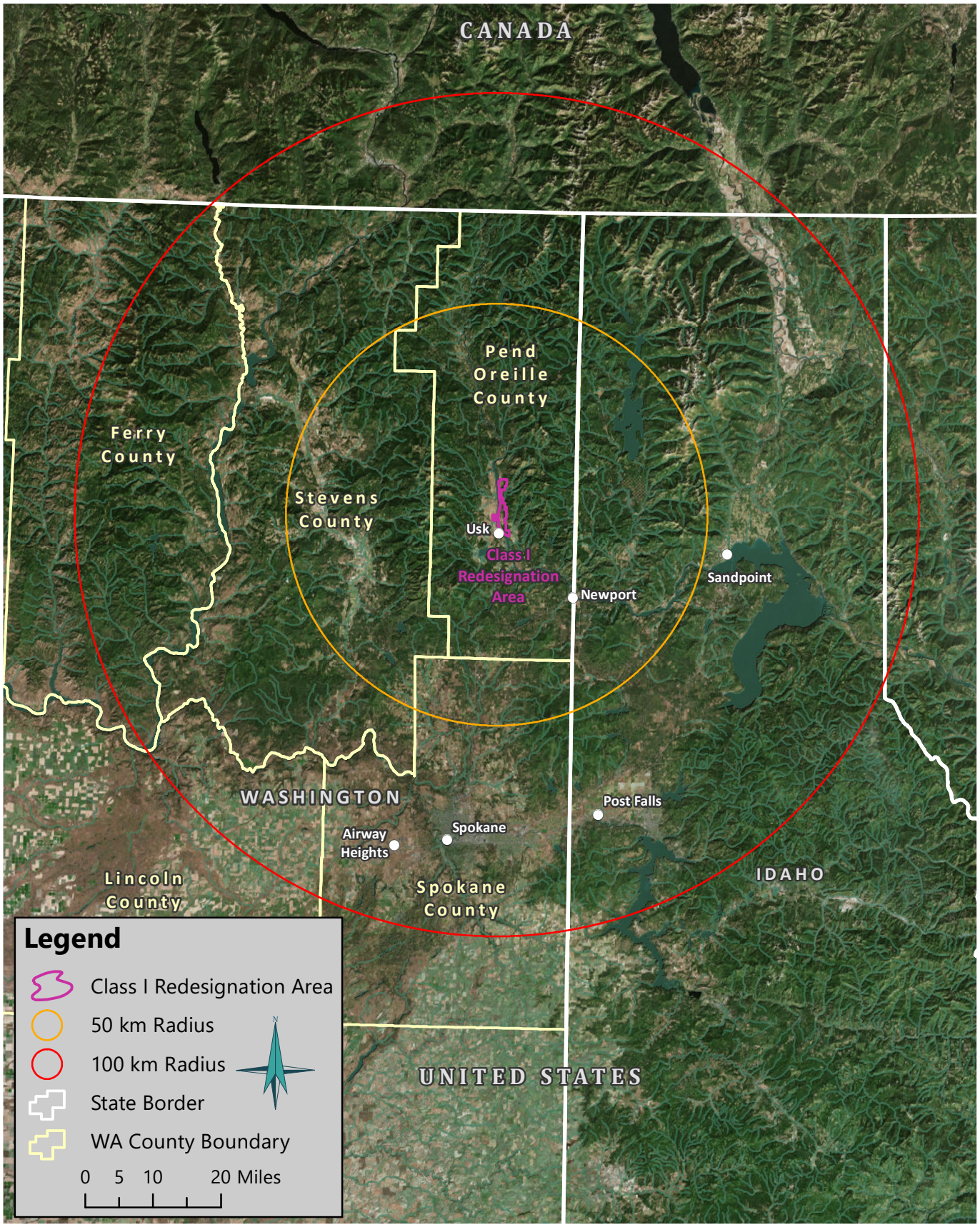


Image Source: State of Washington, Department of Ecology (Ecology). 2012. Pend Oreille Watershed, WRIA 62, Focus on Water Availability. Water Resources Program. Available: http://pendoreilleco.org/wp-content/uploads/2016/06/1111066.pdf. Accessed December 12, 2016. August.

RIDOLFI Environmental	Clean Air Act Prevention of Significant Deterioration Program Class I Redesignation Technical Report	February 2017 | Figure 14
	Prepared for the Kalispel Tribe of Indians	Pend Oreille Watershed



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Class I Redesignation Area

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Tables

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Table 1: U.S. Environmental Protection Agency National Ambient Air Quality Standards

Pollutant	Primary/Secondary	Averaging Time	NAAQS Level	NAAQS Form/Time Period
Carbon Monoxide (CO)	Primary	8 hours	9 ppm	Not to be exceeded more than once per year
		1 hour	35 ppm	
Lead (Pb)	Primary and Secondary	Rolling 3 month average	0.15 µg/m^3	Not to be exceeded
Nitrogen Dioxide (NO_2)	Primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Primary and Secondary	1 year	53 ppb	Annual Mean
Ozone (O_3)	Primary and Secondary	8 hours	70 pp	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution ($PM_{2.5}$)	Primary	24 hours	35 µg/m^3	98th percentile, averaged over 3 years
	Primary	1 year	12.0 µg/m^3	Annual mean, averaged over 3 years
	Secondary	1 year	15.0 µg/m^3	Annual mean, averaged over 3 years
Particle Pollution (PM_{10})	Primary and Secondary	24 hours	35 µg/m^3	98th percentile, averaged over 3 years
	Primary and Secondary	24 hours	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)	Primary	1 hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

Notes:

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m^3 as a calendar quarter average) also remain in effect.

(2) The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O_3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 CFR 50.4(3)). A SIP call is an USEPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the require NAAQS.

µg/m3 = microgram per cubic meter

NAAQS = National Ambient Air Quality Standards

ppb = parts per billion

ppm = parts per million

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Table 2: Prevention of Significant Deterioration Program Increment Thresholds

Pollutant	Class I Increment ($\mu g/m^3$)	Class II Increment ($\mu g/m^3$)	Class III Increment ($\mu g/m^3$)
Particulate Matter			
$PM_{2.5}$, Annual arithmetic mean	1 [b]	4 [b]	34
$PM_{2.5}$, 24-hour Maximum	2 [a]	9 [a]	60
PM_{10}, Annual arithmetic mean	4 [a]	17 [a]	34
PM_{10}, 24-hour maximum	8 [a]	30 [a]	60
Sulfur Dioxide			
Annual arithmetic mean	2 [b]	20 [b]	40
24-hour maximum	5 [a]	91 [a]	182
3-hour maximum	25 [a]	512 [a]	700
Nitrogen Dioxide			
Annual arithmetic mean	2.5 [b]	25 [b]	50

Notes:

[a] Concentrations not to be exceeded more than once per year.

[b] Concentration not to be exceeded.

CFR = Code of Federal Regulations

$\mu g/m^3$ = microgram per cubic meter

NAAQS = Nation Ambient Air Quality Standards

PM = particulate matter

PSD = Prevention of Significant Deterioration

NAAQS are found in 40 CFR Part 50.

PSD Class I and Class II Ambient Air Increments are found in 40 CFR 52.21(c).

PSD Significant Emission Rates are found in 40 CFR 52.21(b)(23)(i)

The PM2.5 Class I and Class II Significant Impact Levels are from 40 CFR 52.21(k)(2).

The PM_{10}, SO_2 and NO_2 Class I Significant Impact Levels are based on the July 23, 1996 proposed rulemaking (61 FR 38249).

The Class II Significant Impact Levels are found in 40 CFR 51.165(b)(2).

The PSD Monitoring Deminimis Concentrations are found in 40 CFR 52.21(i)(5)(i).

The Ohio Modeling Significant Emission Rates and the Ohio Acceptable Incremental Impact are found in Ohio EPA's Engineering Guide No. 69.

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Table 3: Monitoring Station Details

Station Location	Station Name	Source Agency	Type	Distance* (miles)	Location			
					Latitude	Longitude	Elevation (ft.)	Data Available
1981 LeClerc Road North, Usk, Washington	Usk-LeClerc Rd. (AQS #530510007)	WA Ecology	Air Quality	3.02	48.39583	-117.27220	2,515	***PM $_{2.5}$***
U.S. Air Force Facility on Tacoma Creek Rd. Washington	Fairchild 36 RQF (AA1094C8)	DoD	Weather/Climate	5.95	48.42361	-117.36722	2,450	***Solar radiation, wind (average, direction, max, gust), mean air temperature, relative humidity, precipitation, barometric pressure, heating and cooling days***
Newport, Washington	NEWPORT (455844)	NCEI of NOAA (formerly NCDC and NWS)	Weather/Climate	16.21	48.18333	-117.05000	2,140	***Temperature, precipitation***
Deer Park Airport, Deer Park, Washington	DEER PARK (DEW)	Iowa Environmental Mesonet (IEM)/WA_ASOS/AgriMet	Weater/Climate	27.38	47.96889	-117.42111	1,220	***Wind direction, wind speed***
Deer Park, Washington	DRPW	ArgiMet	Weather/Climate	28.36	47.95464	-117.43352	2,174	***Wind*** , temperature, evapotransiration
Colbert, Washington	Colbert-Greenbluff Rd	WA Ecology/SRCAA	Weather/Climate & Air Quality	37.79	47.80823	-117.34327	1,893	$PM_{2.5}$, wind speed, wind direction
Spokane Reservation, Washington	Spokane Res. (SPOK1)	IMPROVE	Air Quality	40.73	47.90450	-117.86090	1,811	Metals, ions, EC, OC, ***visibility***
Wellpinit, Washington	Wellpinit-Spokane Tribe	WA Ecology/SRCAA	Air Quality	45.72	47.88528	-117.98865	2,438	***PM $_{2.5}$*** , light scatter
3104 E Augusta Ave, Spokane, WA	Spokane-Augusta Ave AQS Site ID 53-063-0021	USEPA	Weather/Climate & Air Quality	47.21	47.67248	-117.36485	1,919	***Ozone, PM $_{2.5}$, PM $_{10}$, wind direction, wind speed, temperature***
Spokane-Spokane Valley, WA	AQS Site ID 53-063-0049	USEPA	Air Quality	48.74	47.65378	-117.41799	1,925	***CO***
Spokane International Airport, Spokane , Washington	KGEG	ArgiMet	Weather/Climate	51.95	47.62000	-117.53400	2,376	***Temperature*** , precipitation, ***wind***
Cabinet Mountains Wilderness Area, Montana	CABI1, MT; Site 75	IMPROVE	Air Quality	80.05	47.94590	-115.67090	4,727	Std. visual range, ions, EC, PM_{10}, $PM_{2.5}$, OC, SO_4, salts, aerosol extinction, soil, NO_3, relative humidity, visual range, ***visibility***
Spokane, Washington	Spokane, Washington	ASOS-NOAA	Weather/Climate	80.05	47.40000	-117.20000	1,922	***Temperature, precipitation, snowfall***

Notes:

* Distance from Kalispel Reservation
CO = carbon monoxide
EC = Elemental carbon
OC = Organic carbon
PM = Particualte matter
RQF = Rescue Flight
m = meter
ft. = feet
N= North
W = West
WA = Washington
DoD = U.S. Department of Defense
IEM = Iowa Environmental Mesonet
NOAA = National Oceanic and Atmospheric Administration
SRCCA = Spokane Regional Clean Air Agency
IMPROVE = Interagency Monitoring of Protected Visual Environments
NCEI = Nation Centers for Environmental Information, NOAA
NWS = National Weather Service
NCDC = National Climatic Data Center
USEPA = U.S. Environmental Protection Agency
Italicized, bolded data is presented in report. Other data is available.

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Table 4. Temperature and Precipitation Data - Fairchild 36 RQF, Washington

Date	Average Air Temperature					Precipitation
	Deg F					in.
(mmm-yy)	Avg.	Avg. Daily Max.	Max.	Avg. Daily Min.	Min.	Total
Jan-14	27.09	34.92	48.5	21.36	5.1	2.39
Feb-14	22.85	35.07	53.7	13.32	-15.49	2.82
Mar-14	34.04	46.51	59.4	25.47	9.6	4.38
Apr-14	43.06	58.47	77.1	29.71	25.1	2.33
May-14	54.15	70.28	82.6	38.95	29	1.21
Jun-14	58.25	72.8	88.3	44.43	36.8	3.03
Jul-14	70.05	89.71	101.7	51.5	40.6	0.09
Aug-14	66.13	84.76	99.6	51.12	45.4	1.73
Sep-14	56.4	76.16	90.4	41.52	27	0.55
Oct-14	46.8	60.66	80.7	36.22	27.7	0
Nov-14	30.36	40.01	54.5	23.47	3.1	1.56
Dec-14	27.65	34.12	46.1	22.86	-1.499	2.58
Jan-15	27.93	33.7	42.7	23.03	2	2.59
Feb-15	33.32	45.04	52.2	26.48	15.5	3.72
Mar-15	39.5	54.57	70.6	28.63	9	0.14
Apr-15	44.16	60.4	79.3	29.54	22.7	0
May-15	57.35	74.45	85.8	41.63	28.6	0
Jun-15	67.39	85.54	106.8	48.69	36	0
Jul-15	69.6	87.93	102.1	50.93	39.2	0.01
Aug-15	67.22	86.17	102.9	49.4	38.1	0.59
Sep-15	53.71	72.31	91.7	38.81	30.1	0.49
Oct-15	47.81	63.46	78.1	36.81	26.3	1.25
Nov-15	30.92	40.53	55	23.82	4.1	1.75
Dec-15	28.05	33.45	48.5	24.53	6.6	0.03
Jan-16	29.43	33.88	38.4	26.4	-2.999	4.58
Feb-16	33.1	45.47	56.7	25.81	17.2	0.4
Mar-16	37.84	50.6	69.3	29.27	20.3	0
Apr-16	50.05	68	88	35.37	27.7	1.77
May-16	55.94	71.1	85.4	41.64	32	2.26
Jun-16	61.53	77.94	97.9	45.02	30.8	1.02
Jul-16	64.54	81.77	99.4	48.48	42	1.31
Aug-16	66.17	85.8	97.2	47.83	42.8	0.3
Sep-16	54.38	72.83	84	40.49	29.8	0.84
Oct-16	43.88	52.27	67	37.11	22.3	8.71
Nov-16	38.03	46.11	60.7	32.67	28.2	3.15
Dec-16	23.23	28.05	38.2	17.53	0.9	0.26

Notes:

Avg. = average
Max. = maximum
mmm = three digit month
In. = inch
Min. = minimum
yy = two digit year

Data from the Fairchild 36 RQF station in Washington (http://www.raws.dri.edu/cgi-bin/wea_mnsimts2.pl).

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Table 5: Temperature Ranges and Extremes - Newport, Washington

Parameter	Month (°F)											
	January	February	March	April	May	June	July	August	September	October	November	December
Monthly Averages												
Maximum	31.7	38.30	48.1	59.2	68.7	75.4	85.2	84.2	73.4	58.2	40.9	32.9
Minimum	18.0	20.5	25.6	31.2	37.9	43.7	46.5	44.4	38.5	32.3	27.2	21.4
Mean	24.8	29.4	36.9	45.2	53.3	59.5	65.8	64.3	56.0	45.2	34.0	27.2
Extremes												
Hightest Mean	35.6	40.9	43.1	51.8	60.6	66.3	72.0	70.1	63.7	51.2	40.7	33.5
Lowest Mean	3.9	11.9	25.8	39.5	46.8	52.3	60.8	58.8	48.4	39.9	21.8	17.1
Number of Days												
Max. Temp >90 °F	0.0	0.0	0.0	0.0	0.4	1.9	10.4	8.7	1.4	0.0	0.0	0.0
Max. Temp >32 °F	14.3	4.8	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.1	3.5	13.2
Min. Temp <32 °F	29.0	26.1	25.8	18.3	7.8	1.3	0.3	0.9	6.2	16.1	22.7	28.4
Max. Temp <0 °F	3.9	2.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.8

Notes:

°F = degree Fahrenheit

Data collected at Newport, Washington station (455844, NEWPORT).

Period of record: 1909 through December 2012

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Table 6: 30-Year Normals - Usk, Washington

Month	Temperature (°F)			Precipitation	
	Minimum	Maximum	Mean	Inches	% of total
January	22.4	33.5	27.9	2.71	11
February	23.2	39.3	31.2	1.85	8
March	27.9	48.6	38.2	2.28	10
April	32.9	58.2	45.6	1.87	8
May	39.8	67.4	53.6	2.09	9
June	46	74.1	60.1	1.94	8
July	50	83.3	66.6	1.05	4
August	48.8	83.8	66.3	0.83	3
September	41.3	73.4	57.3	1.03	4
October	33.5	57.8	45.7	1.65	7
November	28.3	41.1	34.7	3.22	13
December	21.4	32.3	26.9	3.4	14
Annual Totals	**34.6**	**57.7**	**46.2**	**23.92**	**100**

Notes:

°F = degree Farenheit

% = percent

30-Yr Normals estimated for Usk, Washington from the PRISM Climate Group (PRISM, 2016).

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Table 7: Average Precipitation Record - Newport, Washington

Parameter	Month (inches)											
	January	February	March	April	May	June	July	August	September	October	November	December
Monthly Precipitation												
Mean	3.2	2.29	2.32	1.79	2.08	1.86	0.90	0.98	1.34	2.11	3.54	3.54
High	7.86	5.93	6.31	4.47	5.73	4.76	5.13	3.56	7.92	8.25	8.34	6.94
Low	0.02	0.00	0.10	0.29	0.29	0.38	0.00	0.00	0.00	0.08	0.47	0.55
Maximum												
1-Day	1.64	1.70	2.46	1.32	2.90	1.77	1.62	1.46	1.80	2.10	1.96	3.50
Snowfall												
Mean	18.8	10.3	4.4	0.4	0.0	0.0	0.0	0.0	0.0	0.4	6.3	17.3
High	73.0	38.8	23.0	5.0	0.0	0.0	0.0	0.0	2.0	10.0	30.4	48.0

Notes:

Data collected at Newport, Washington station (455844, NEWPORT).

Period of record: 1909 through December 2012

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Table 8. Wind and Climate Data - Fairchild 36 RQF, Washington

Date	Solar Radiation	Mean Wind Speed	Mean Wind Direction	Maximum Wind Gust	Average Relative Humidity		
	ly	mph	Degree	mph	%		
(mmm-yy)	Total	Average	Average	Maximum	Average	Maximum	Minimum
Jan-14	2008	1.026	264.9	34.4	86.86	100	45.7
Feb-14	3569	1.498	250.1	27	74.74	100	25.4
Mar-14	6636	1.421	261.9	23.9	75.81	100	16.9
Apr-14	12119	1.837	254.5	28.3	65.91	100	14.4
May-14	17719	1.818	265.9	25.4	63.02	99.9	15.2
Jun-14	17807	1.818	261.6	22.8	62.74	100	9.3
Jul-14	21650	1.762	263.2	19	53.73	96.8	9
Aug-14	15215	1.674	245.6	32.6	59.76	100	7.7
Sep-14	9966	1.718	241.5	26.5	62.92	100	13.6
Oct-14	5095	1.308	252.1	23.8	77.16	100	16.5
Nov-14	2411	1.288	241	23.2	79.97	100	18.6
Dec-14	1406	0.6949	252.2	16.7	88.08	100	46.4
Jan-15	1560	0.6061	260.7	12.8	90.41	100	65
Feb-15	3683	1.073	251.7	16.3	79.02	100	18
Mar-15	7191	1.395	247.8	22.4	74.22	100	19.7
Apr-15	13383	1.818	256.7	22.8	62.8	99.7	11.4
May-15	19545	1.905	254	21	54.65	100	12.6
Jun-15	22440	1.827	258.9	24.9	51.15	99.8	12.7
Jul-15	21483	1.896	251.5	26.7	46.78	99.8	5.7
Aug-15	15072	1.884	256	24.5	41.02	99.7	6.3
Sep-15	9200	1.59	248.3	20	61.42	100	16.7
Oct-15	5197	1.355	245.4	28.7	70.04	100	20.7
Nov-15	2635	1.36	251.4	29.3	83.82	100	32.8
Dec-15	684.8	0.8149	268.4	47.2	88.15	100	45.9
Jan-16	1232	0.5919	274.9	13.7	89.87	100	61.9
Feb-16	4096	1.14	263.3	24.1	85.02	100	34.4
Mar-16	6982	1.384	262.8	26.4	76.77	100	21
Apr-16	13481	1.688	258.2	29.8	67.15	100	14.6
May-16	17428	1.85	261.8	26.3	62.17	100	14.7
Jun-16	20099	1.827	276.4	21.8	58.88	99.8	14.5
Jul-16	19039	1.743	259.5	24.1	60.16	99.9	14.7
Aug-16	16207	1.776	251.8	21.6	49.75	99.5	12.2
Sep-16	9469	1.599	250.4	22.1	62.67	100	18.4
Oct-16	3853	1.077	260	27.4	83.88	100	25.5
Nov-16	2542	0.8293	270.5	15.9	90.99	100	59.7
Dec-16	581.9	0.8739	235.6	18.7	82.62	100	40.9

Notes:

% = percent
degree = cardinal direction in degrees
ly = Langley (unit of energy distribution over an area)
mmm = three digit month
mph = mile per hour
yy = two digit year

Data from the Fairchild 36 RQF station in Washington (http://www.raws.dri.edu/cgi-bin/wea_mnsimts2.pl)

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Table 9: Average Daily Wind Speed - Deer Park, Washington

Day	Month-Year (mmm-yy)											
	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16
1	4.11	4.00	3.89	1.21	3.01	1.86	4.81	2.22	3.05	2.98	4.37	3.22
2	1.86	2.23	2.20	1.13	3.28	2.60	1.75	3.70	2.53	4.36	3.09	4.71
3	2.20	4.04	4.06	2.06	3.12	2.59	1.82	2.90	5.31	4.05	1.53	2.10
4	1.03	1.42	3.70	1.29	2.82	3.42	2.46	2.55	4.06	2.92	3.67	1.28
5	1.12	1.46	2.57	1.76	2.98	4.29	3.79	3.36	3.07	2.57	2.90	1.44
6	2.08	2.80	1.38	3.45	3.92	2.72	6.26	2.11	2.21	2.36	2.68	1.62
7	2.53	4.12	1.38	1.61	2.33	2.96	3.78	2.71	2.92	2.98	2.64	2.77
8	2.91	2.80	0.94	1.90	1.63	2.18	3.80	3.95	2.97	2.68	3.47	1.49
9	1.91	5.47	0.71	1.58	3.26	3.37	4.35	4.00	2.83	2.34	1.83	3.36
10	2.26	3.37	2.64	0.97	3.55	3.78	2.45	3.19	3.17	2.43	3.11	3.14
11	4.23	1.44	1.41	2.56	5.45	2.69	2.63	3.86	4.32	2.06	5.84	3.69
12	2.67	2.88	2.54	1.92	3.62	3.67	3.92	2.68	2.85	2.32	7.12	2.62
13	5.79	2.62	1.19	2.85	3.95	3.83	10.37	3.99	2.92	1.96	4.12	2.09
14	2.53	0.53	4.25	1.61	3.85	4.27	8.64	5.00	1.86	2.24	1.88	6.06
15	2.34	2.61	1.76	3.36	3.50	1.96	2.74	2.66	4.59	1.86	1.91	3.30
16	2.88	2.66	3.07	3.08	1.92	1.70	1.88	3.86	2.45	1.70	2.12	3.55
17	12.62	5.22	3.11	5.66	3.25	2.50	2.46	4.15	4.35	1.86	3.59	3.88
18	3.51	3.00	1.76	4.58	4.43	2.77	3.32	3.89	3.75	5.25	3.64	1.49
19	0.96	0.91	4.36	2.80	5.14	1.45	5.15	3.20	2.34	6.38	3.08	2.39
20	2.15	1.14	2.80	3.23	2.91	2.59	4.62	5.27	2.23	1.71	2.57	2.05
21	1.15	3.05	2.84	2.24	2.33	1.74	2.87	3.61	2.42	3.80	5.89	0.91
22	1.20	0.76	1.82	1.57	4.06	4.18	4.36	1.88	3.55	3.00	5.25	2.51
23	0.74	1.80	4.29	1.56	4.00	3.16	2.79	3.87	2.35	3.07	2.71	4.96
24	4.01	2.56	1.61	2.40	4.86	4.34	1.41	4.93	1.61	5.35	1.74	4.46
25	4.20	0.93	1.04	1.70	2.28	1.81	2.45	2.58	1.65	2.80	1.80	2.56
26	3.93	1.71	0.98	2.02	1.51	2.60	3.80	2.48	3.34	2.16	2.43	2.83
27	3.45	2.33	1.25	3.17	2.51	2.52	5.49	3.70	3.12	4.38	2.05	1.58
28	1.99	0.11	1.66	3.13	2.72	4.91	3.68	2.15	3.08	2.79	3.07	2.04
29	1.30	0.32	2.70	3.40	4.79	1.57	4.03	2.02	1.85	3.10	1.60	3.49
30	1.70	0.93	2.25	--	1.93	2.81	2.09	3.58	4.09	2.19	2.03	4.19
31	--	1.66	1.21	--	1.89	--	--	--	4.80	1.87	--	3.28
Average	2.85	2.29	2.30	2.41	3.25	2.90	3.80	3.34	3.09	2.95	3.12	2.87
Maximum	12.62	5.47	4.36	5.66	5.45	4.91	10.37	5.27	5.31	6.38	7.12	6.06
Minimum	0.74	0.11	0.71	0.97	1.51	1.45	1.41	1.88	1.61	1.70	1.53	0.91
Max. Gust	42.9	50.6	33.6	41.8	39.1	33.6	51.9	30.0	38.5	29.5	33.3	43.8

Notes:
max. = maximum
Data collected at the Deer Park, Washington AgriMet (DRPW) station in 2015 and 2016.

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Table 10. Wind Speed Averages and Maximums - Spokane, Washington

Parameter	Month											
	January	February	March	April	May	June	July	August	September	October	November	December
Daily Average (mph)												
Wind Speed	8.5	8.2	10.0	9.3	9.2	9.1	8.4	8.0	7.7	8.1	8.1	8.1
Maximum 2-Min	17.3	16.6	20.1	19.7	19.8	19.0	18.2	17.9	16.7	17.2	16.8	17.1
Peak Gust	20.5	19.6	24.1	23.9	24.1	23.3	23.0	22.5	20.6	20.7	20.3	20.1
Maximum (mph)												
Daily Average	25.0	29.6	23.9	26.7	20.4	19.6	20.7	15.9	20.8	23.1	30.3	27.5
2-Minute Average	48	44	46	46	44	62	41	46	38	46	52	69
Peak Gust	55	53	55	54	48	77	53	54	47	53	63	69
Average Number of Days												
Peak Gust >30 mph	5.4	4.2	7.8	6.9	6.5	5.5	4.6	4.1	3.6	4.8	5.5	5.5
Peak Gust >40 mph	1.9	1.1	1.8	1.0	0.9	0.4	0.5	0.6	0.2	0.6	1.6	1.9
Peak Gust >50 mph	0.3	0.2	0.3	0.2	0.0	0.1	0.2	0.2	0.0	0.1	0.2	0.2

Notes:

mph = miles per hour

Data collected at the Spokane International Airport (KGEG), Washington station.

Period of record: July 1996 through December 2008

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Table 11. Maximum 8-Hour Carbon Monoxide - Spokane Valley, Washington

Month & Year (mmm-yy)	Monthly Maximum Daily 8-Hr Maximum [CO] (ppm)
NAAQS	**9**
Jan-14	1.7
Feb-14	Not Measured
Mar-14	0.9
Apr-14	1
May-14	1.6
Jun-14	1
Jul-14	0.6
Aug-14	0.9
Sep-14	1.3
Oct-14	1.4
Nov-14	2.2
Dec-14	1.6
Jan-15	1.9
Feb-15	1.7
Mar-15	1.7
Apr-15	1.7
May-15	0.9
Jun-15	0.7
Jul-15	0.7
Aug-15	1.7
Sep-15	1.3
Oct-15	1.6
Nov-15	2.9
Dec-15	1.6
Jan-16	1.6
Feb-16	2
Mar-16	1.1
Apr-16	1.3
May-16	1
Jun-16	0.9

Notes:

[CO] = carbon monoxide concentration
mmm = three digit month
ppm = parts per million
yy = two digit year

Data summarized from values collected at the AQS Site ID 53-063-0049 Spokane-Spokane Valley, Washington.

National Ambient Air Quality Standard for carbon monoxide is 9 ppm for 8-hour maximum. Exceednace threshold one time per year.

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Table 12: Summary of Air Quality Data - Spokane, Washington

Year	Parameter Name	Duration Description	Pollutant Standard	Units of Measure	Number of Observation	Primary Exceedance Count	Secondary Exceedance Count	Mean	Standard Deviation	Weighted Mean	Minimum Value	First Maximum Value	Second Maximum Value	Third Maximum Value	Fourth Maximum Value	50th Perecentile	75th Perecentile	90th Perecentile	95th Perecentile	98th Perecentile	99th Perecentile
2014	Outdoor Temperature	1 Hour		°F	8631	.	.	52.6	18.6		-2	101	101	100	100	52	66	77	83	91	94
2015	Outdoor Temperature	1 Hour		°F	5004	.	.	52.4	19.2		12	108	108	108	107	49	66	81	88	96	99
2014	Ozone	1 Hour	1-hour Daily	ppm	2861	0	0	0.048	0.012		0.027	0.078	0.074	0.071	0.07	0.047	0.056	0.064	0.067	0.071	0.074
2014	Ozone	8 Hour	8-Hour	ppm	2924	0	0	0.042	0.010		0.019	0.07	0.063	0.061	0.06	0.041	0.049	0.057	0.059	0.061	0.063
2015	Ozone	1 Hour	1-hour Daily	ppm	2962	0	0	0.050	0.010		0.026	0.068	0.068	0.068	0.067	0.05	0.057	0.064	0.066	0.068	0.068
2015	Ozone	8 Hour	8-Hour	ppm	3010	0	0	0.045	0.010		0.022	0.064	0.063	0.062	0.062	0.045	0.053	0.059	0.061	0.062	0.063
2014	PM_{10} Total 0-10µm STP	1 Hour		µg/m^3 (25 °C)	8423	.	.	19.8	18.9		-6	723	289	268	266	15	25	38	49	67	82
2014	PM_{10} Total 0-10µm STP	24 Hour	24-hour	µg/m^3 (25 °C)	350	0	0	19.3	11.9	19.2	2	80	79	71	69	16	26	33	38	60	69
2015	PM_{10} Total 0-10µm STP	1 Hour		µg/m^3 (25 °C)	7060	.	.	22.1	26.6		-38	959	922	415	377	17	28	43	56	81	99
2015	PM_{10} Total 0-10µm STP	24 Hour	24-hour	µg/m^3 (25 °C)	291	0	0	21.6	14.8	23.3	3	129	84	64	60	18	26	42	53	59	64
2014	$PM_{2.5}$ - Local Conditions	1 Hour		µg/m^3 (LC)	5503	.	.	10.0	7.3		0	87.2	86.4	83.6	82.8	8.4	12.4	18	22.6	30.2	36.8
2014	$PM_{2.5}$ - Local Conditions	24 Hour	24-hour	µg/m^3 (LC)	227	1	1	9.94	5.69	9.6	0.8	36.3	33	29.5	29	8.6	12.2	16.5	21.7	28.4	29.5
2014	$PM_{2.5}$ - Local Conditions	24 Hour	24-hour	µg/m^3 (LC)	57	1	1	7.25	5.73	7.1	1.2	37	19	16.4	16	6.4	10.2	13.3	16.4	19	37
2015	$PM_{2.5}$ - Local Conditions	24 Hour	24-hour	µg/m^3 (LC)	65	0	0	8.02	4.92	7.4	1.5	20.9	20.6	20.6	17.7	9.2	12.5	14.9	20.6	20.9	20.9
2015	$PM_{2.5}$ - Local Conditions	1 Hour		µg/m^3 (LC)	2061	.	.	8.04	5.87		-6.4	40.9	37.6	35.1	35	6.8	10.6	15.2	19.4	25.7	29.6
2015	$PM_{2.5}$ - Local Conditions	24 Hour	24-hour	µg/m^3 (LC)	83	0	0	7.90	4.63	9.3	1.6	23.6	21.9	19.6	19.6	6.9	9.4	15	18	21.9	23.6
2015	$PM_{2.5}$ - Local Conditions	1 Hour		µg/m^3 (LC)	2106	.	.	11.30	10.31		-3	91	88	85	77	8	15	21	28	44	58
2015	$PM_{2.5}$ - Local Conditions	24 Hour	24-hour	µg/m^3 (LC)	85	3	3	11.15	8.04	11.1	1.8	50	36.8	36.6	25	8.9	12.3	22.5	24.1	36.8	50
2014	Wind Direction - Resultant	1 Hour		AZ	8540	.	.	172.22	102.21		0	360	360	360	360	189	239	328	348	355	358
2015	Wind Direction - Resultant	1 Hour		AZ	5004	.	.	172.85	107.39		0	360	360	360	360	186	251	336	350	356	358
2014	Wind Direction - Scalar	1 Hour		AZ	8540	.	.	171.76	102.80		0	360	360	360	360	188	240	327	348	355	357
2015	Wind Direction - Scalar	1 Hour		AZ	5004	.	.	170.78	107.60		0	360	360	360	360	184	249	334	350	356	358
2014	Wind Speed - Resultant	1 Hour		Knots	8631	.	.	4.25	3.03		0	20.3	19.3	19.2	18.9	3.5	5.7	8.4	10.2	12.8	14.2
2015	Wind Speed - Resultant	1 Hour		Knots	5005	.	.	3.77	2.61		0	17.3	17.3	17.1	15.7	3.1	5	7.2	9	10.9	12.3
2014	Wind Speed - Scalar	1 Hour		Knots	8631	.	.	4.67	3.00		0.3	20.8	19.4	19.3	19.1	3.9	6.1	8.9	10.6	13.1	14.7
2015	Wind Speed - Scalar	1 Hour		Knots	5004	.	.	4.21	2.60		0	17.9	17.8	17.6	16.2	3.6	5.5	7.6	9.6	11.4	12.8

Notes:
°F = degree Fahrenheit
AZ = azimuth
LC = local conditions
µg/m^3 = microgram per cubic meter
PM = particulate matter
STP = standard temperature and pressure conditions
Data from the USEPA AirData Air Quality Monitoring Network (AQS Site 53-063-0021, Spokane-Augusta Ave).

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Table 13: Estimated Emission Sources - Pend Oreille County

Emission Source	Emission Code	$PM_{2.5}$	$DSPM_{2.5}$	PM_{10}	SO_2	Nox	VOC	CO	NH_3
		tpy	tpy	tpy	tpy	tpy	tpy	tpy	tpy
Aircraft: military, commercial, general aviation	Air	0		0	0	0.1	0	6	
Recreational boats	Boat	1	0.11	1	0.1	17.2	69	206	
Construction	Const	65		528			79		
Commercial fuel use: natural gas, oil, LPG	F_Comm	0		0	0	0.2	0	0	0
Resdiential fuel use: natural gas, oil, LPG	F_Res	0	0.02	0	0.4	1.9	0	1	0.08
Fertilizer application	FERT								48.14
Wildfires	Fire	10		12	1	1.9	26	111	1.83
Food and Kindred Products	Food	4		4			1	2	
Aviation gas storage and transport, petroleum gas can, bulk plants, and truck transport	Gas_Trans						8		
Gasoline stations	GassTN						24		
Livestock wastes	LIVE								40.53
Structure and motor vehicle fires, cremation, dental alloy production, bench scale reagents, fluorescent lamps	Misc	0		0	0	0.1	0	1	
Natural Emissions from soil and vegetation	NAT					73.9	22,892	4,461	
Nonroad mobile, except locomotives	NRM	19	3.62	20	0.3	63.8	606	1,486	
Agricultural and silvicultural burning	OB_NonRes	204		225		55.2	85	1,601	
Resdiental outdoor burning; yard waste, trash	OB_Res	4		5	0.2	0.9	3	18	
Onroad mobile sources	ORM	14	6.74	16	1.2	460.1	275	3,364	5.75
Publicaly owned treatment works	POTW						0		0.02

Table 13: Estimated Emission Sources - Pend Oreille County

Emission Source	Emission Code	$PM_{2.5}$	$DSPM_{2.5}$	PM_{10}	SO_2	Nox	VOC	CO	NH_3
		tpy	tpy	tpy	tpy	tpy	tpy	tpy	tpy
Point sources	PT	4		4	13	27	142	1	2
Pave and unpaved roads	Roads	146		1,319					
Locomotives	RR	1	1.05	1	0.3	46.2	2	5	0.01
Woodstoves, fireplaces, inserts	RWC	39		39	0.6	4.2	47	275	2.19
Commercial marine vessels	Ship								
Dry cleaning, graphic arts, surface coating: industrial	Solv						22		
Agricultural tilling and havesting	Till_Harv	10		58					

Notes:

CO = carbon monoxide

$DSPM_{2.5}$ = diesel fine particulate matter (<2.5µm)

LPG = liquified petroleum gas

µm = micrometer

NH_3 = ammonia

NOx = nitrogen oxides

$PM_{2.5}$ = fine particulate matter (<2.5 µm)

PM_{10} = particulate matter (<10 µm)

SO_2 = sulfur dioxide

typ = tons per year

VOCs = volatile organic compounds

Ecology. 2014. Washington State 2011 County Emissions Inventory. Air Quality Program.

Table 14: Ponderay Newsprint Company Permit Limits

Pollutant	Quantity (tpy)
Particulate matter (PM_{10})	4
Sulfur dioxide (SO_2)	13
Nitrogen oxides (NOx)	27
Volatile organic compounds (VOCs)	142

Notes:

tpy = tons per year

USEPA (2014) Final Report: Washington Department of Ecology Title V Program Review (2nd Round), Region 10. September 22.

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Table 15: Summary of Terrestrial Animal Species

Species	Scientific Name	Threatened/Endangered Species Status
Mammals		
American Badger	*Taxidea taxus*	
Bighorn Sheep	*Ovis canadensis*	
Deermouse	*Peromyscus maniculatus*	
Elk	*Cervus canadensis*	
Fisher	*Martis pennanti*	Endangered
Gray wolf	*Canis lupus*	Endangered
Grizzly bear	*Ursus arctos*	Endangered
Lynx	*Lynx canadensis*	Threatened
Marten	*Martes americana*	
Masked shrew	*Sorex cinereus*	
Meadow vole	*Microfus pennsylvanicus*	
Montana vole	*Microfus montanus*	
Moose	*Alces alces*	
Mountain goat	*Oreamnos americanus*	
Northern Flying Squirrel	*Glaucomys sabrinus*	
Northwest white-tailed deer	*Odocoileus virginianus ochrourus*	
Red-backed vole	*Rmyodes gapperi*	
Red-tailed Chipmunk	*Tamias reficaudus*	
Rocky Mountain Mule deer	*Odocoileus hemionus hemionus*	
Townsend's Big-eared Bat	*Corynorhinus townsendii*	Candidate
Vagrant Shrew	*Sorex vagrans*	
Western jumping shrew	*Zapus princeps*	
Wolverine	*Gulo gulo*	Candidate
Woodland Caribou	*Rangifer tarandus*	Endangered
Birds		
American bittern	*Botaurus lentiginosus*	
American coot	*Fulica americana*	
American crow	*Corvus brachyrhynchos*	
American goldfinch	*Carduelis tristis*	
American kestrel	*Falco sparverius*	
American redstart	*Setophaga ruticilla*	
American robin	*Turdus migratorius*	
American wigeon	*Anas americana*	
Bald eagle	*Haliaeetus leucocephalus*	
Bank swallow	*Riparia riparia*	
Barn swallow	*Hirundo rustica*	
Barrow's goldeneye	*Bucephala islandica*	
Belted kingfisher	*Ceryle alcyon*	
Bewick's wren	*Thyromanes bewickii*	
Black tern	*Childonias niger*	
Black-billed Magpie	*Pica pica*	
Blacked-capped chickadee	*Peocile atricapilla*	

Table 15: Summary of Terrestrial Animal Species

Species	Scientific Name	Threatened/Endangered Species Status
Blue-winged teal	*Anas discors*	
Bobolink	*Dolichonyx oryzivorus*	
Brewer's blackbird	*Euphagus cyanocephalus*	
Brown-headed cowbird	*Molothrus ater*	
Bufflehead	*Bucephala albeola*	
Bullock's oriole	*Icterus bullockii*	
Calliope Hummingbird	*Stellula calliope*	
Canada goose	*Branta canadensis*	
Canvasback	*Aythya valisineria*	
Cedar waxwing	*Bombycilla cedrorum*	
Chipping sparrow	*Spizella passerina*	
Cinnamon teal	*Anas cyanoptera*	
Cliff swallow	*Petrochelidon pyrrhonota*	
Common goldeneye	*Bucephala clangula*	
Common merganser	*Mergus merganser*	
Common raven	*Corvus corax*	
Common snipe	*Gallinago gallinago*	
Common yellowthroat	*Geothlypis thrichas*	
Double-crested cormorant	*Phalacrocorax auritus*	
Downey woodpecker	*Picoides pubescens*	
Dusky flycatcher	*Empidonax oberholseri*	
Eastern kingbird	*Tyrannus tyrannus*	
European starling	*Sturnus vulgaris*	
Evening grosbeak	*Coccothraustes vespertinus*	
Fox sparrow	*Passerella iliaca*	
Gadwall	*Anas strepera*	
Gray catbird	*Dumetella carolinensis*	
Great blue heron	*Ardea herodias*	
Green-winged teal	*Anas crecca*	
Harlequin duck	*Histrionicus histrionicus*	
Hooded merganser	*Lophodytes cucullatus*	
Killdeer	*Charadrius vociferus*	
Least flycatcher	*Empidonax minimus*	
Lesser scaup	*Aythya affinis*	
Lincoln's sparrow	*Melospiza lincolnii*	
MacGillivray's Warbler	*Oporonis tolmiei*	
Mallard	*Anas platyrhynchos*	
Marsh wren	*Cistothorus palustris*	
Mountain chickadee	*Peocile gambeli*	
Mourning dove	*Aenaida macroura*	
Nashville warbler	*Dendroica petechia*	
Northern flicker	*Colaptes auratus*	
Northern harrier	*Circus cyaneus*	

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Table 15: Summary of Terrestrial Animal Species

Species	Scientific Name	Threatened/Endangered Species Status
Northern shoveler	*Anas clypeata*	
Orange-crowned warbler	*Vermivora celata*	
Osprey	*Pandion haliaetus*	
Ped-billed grebe	*Podilynbus podiceps*	
Pileated woodpecker	*Dryocopus pileatus*	
Pine siskin	*Carduelis pinus*	
Pintail	*Anas acuta*	
Red crossbill	*Loxia curvirostra*	
Red-breasted Nuthatch	*Sitta canadensis*	
Red-eyed vireo	*Vireo olivaceus*	
Redhead duck	*Aythya americana*	
Red-naped sapsucker	*Sphyrapicus nuchalis*	
Red-winged blackbird	*Agelaius phoeniceus*	
Ring-billed gull	*Larus delawarensis*	
Ring-necked duck	*Aythya collaris*	
Ring-necked peasant	*Phasianus colchicus*	
Ruddy duck	*Oxyura jamaicensis*	
Ruffed grouse	*Bonasa umbellus*	
Savannah sparrow	*Passerculus sandwichensis*	
Shoveler	*Anas clypeata*	
Song sparrow	*Melospiza melodia*	
Sora	*Porazana carolina*	
Spotted towhee	*Pipilo maculatus*	
Spotted sandpiper	*Actitis macularia*	
Stellar's jay	*Cyanocitta stelleri*	
Swainson's thrush	*Catharus ustulatus*	
Tree swallow	*Tachycineta bicolor*	
Tundra swan	*Cygnus columbianus*	
Turkey vulture	*Cathartes aura*	
Violet-green swallow	*Tachycineta thalassina*	
Virginia rail	*Rallus limicola*	
Warbling vireo	*Vireo gilvus*	
Western meadowlark	*Sturnella neglecta*	
Western tanager	*Piranga ludoviciana*	
Western wood-pewee	*Contopus sordidulus*	
Willow flycatcher	*Empidonax traillii*	
Wilson's phalarope	*Pahlaropus tricolor*	
Wilson's warbler	*Wilsonia pusilla*	
Wood duck	*Aix sponsa*	
Yellow warbler	*Dendroica petechia*	
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	
Yellow-rumped warbler	*Dendroica coronata*	

Table 15: Summary of Terrestrial Animal Species

Species	Scientific Name	Threatened/Endangered Species Status
Amphibians and Reptiles		
Bullfrog	*Lithobates catesbeianus*	
Columbia spotted frog	*Rana luteiventris*	Candidate
Long-toed salamander	*Ambystoma macrodactylum*	
Pacific treefrog	*Pseudacris regilla*	
Western toad	*Anaxyrus boreas*	Candidate
Insects		
Silver-bordered fritillary	*Bolaria selene myrina*	Candidate

Sources:

Washington Department of Fish and Wildlife (WDFW). 2016. PHS on the Web. Available: http://apps.wdfw.wa.gov/phsontheweb/#. Accessed December 9, 2016

Kalispel Tribe of Indians, Kalispel Natural Resource Department, Fish and Wildlife Management Plan (2002).

Kalispel Tribe of Indians, Kalispel Natural Resource Department, Geospatial Database. Accessed. January 9, 2017.

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Table 16: Summary of Fish Species

Species	Scientific Name	Species Composition		Native
		% by lb.	% by wt.	
Tench	*Tinca tinca*	6.77	33.24	No
Largescale Sucker	*Catostomus macrocheilus*	2.89	12.46	Yes
Largemouth Bass	*Micropterus salmoides*	7.94	12.19	No
Yellow Perch	*Perca flavescens*	27.4	7.79	No
Northern Pikeminnow	*Ptchocheilus oregonensis*	10.67	7.77	Yes
Peamouth	*Mylocheilus caurinus*	7.15	7.1	Yes
Pumpkinseed Sunfish	*Lepomis gibbosus*	27.79	7.08	No
Brown Bullhead	*Ameiurus nebulosus*	1.79	3.89	No
Northern Pike	*Esox lucius*	0.17	2.13	No
Longnose Sucker	*Catostomus macrocheilus*	0.53	2.02	Yes
Black Crappie	*Pomoxis migromaculatus*	5.58	1.76	No
Brown Trout	*Salmo trutta*	0.27	0.79	No
Mountain Whitefish	*Prosopium williamsoni*	0.41	0.71	Yes
Smallmouth Bass	*Microterus dolomieui*	0.2	0.54	No
Bridgelip Sucker	*Catostomus columbianus*	0.05	0.2	Yes
Walleye	*dion vitreum vitreum*	0.01	0.08	No
Lake Whitefish	*Coregonus clupeaformis*	0.01	0.08	No
Eastern Brook Trout	*Salvelinus fontinalis*	0.04	0.05	No
Redside Shiner	*Richardsonius balteatus*	0.15	0.04	Yes
Rainbow Trout	*Oncorhynchus mykiss*	0.06	0.02	No
Unidentified Sucker		0.06	0.02	
Chiselmouth	*Acrocheilus alutaceus*	0.04	0.01	Yes
Cutthroat Trout	*Oncorhynchus clarki lewisi*	0.01	0.01	Yes
Sculpin Spp.	*Cottus spp.*	0.01	0.00	Yes
Bull Trout	*Salvelinus confluentus*			Yes
Pygmy Whitefish	*Prosopium coulteri*			Yes
Kokanee	*Oncorhynchus nerka*			No
Lake Trout	*Salvelinus namaycush*			No
Channel Catfish	*Ictalurus punctatus*			No
Black Bullhead	*Ictalurus melas*			No
Tiger Muskie	*Esox lucius x E. masquinogy*			No
Bluegill	*Lepomis macrochirus*			No
Burbot	Lota lota			Yes
Longnose Dace	Rhinichthys cataractae			Yes

Notes:

% = percent

lb. = pound

wt. = weight .com/

2004 Warmwater Fisheries Survey of Box Canyon Reservoir, Pend Oreille County, Washington (WDFW, 2010)

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Table 17: Summary of Vegetation

Common Name	Scientific Name	Plant Type	Invasive or Noxious Plant
Alkali plantain	*Plantago eriopoda*	Herb	
Alsike clover	*Trifolium hybridum*	Herb	
American bird's-foot trefoil	*Acmispon americanus*	Field cover	
American vetch	*Vicia americana*	Field cover	
Arrowhead	*Sagittaria*	Field cover	
Arumleaf arrowhead	*Sagittaria cuneata*	Field cover	
Aster	*Symphyotrichum species*	Field cover	
Baldhip rose	*Rosa gymnocarpa*	Shrub	
Balsalm poplar	*Populus balsamifera*	Tree	
Bedstraw	*Galium species*	Field cover	
Bigleaf lupin	*Lupinus polyphyllus*	Herb/Field cover	
Black cottonwood	*Populus trichocarpa*	Tree	
Black hawthorn/Douglas' thornapple	*Crataegus douglasii*	Shrub/tree	
Blue-wild rye	*Elymus glaucus*	Shrub	
Bulb-bearing water-hemlock	*Cicuta bulbifera*	Field cover	
Bulrush	*Scirpus validus*	Herb	
Bunchberry dogwood	*Cornus canadensis*	Shrub	
Bur-reed	*Sparganium*	Aquatic	
Buttercup	*Ranunculus species*	Field cover	
Camas	*Camassia quamash*	Herb	
Canada goldenrod	*Solidago canadensis*	Field cover	
Canada thistle	*Cirsium arvense*	Field cover	
Chamisso sedge	*Carex pachystachya*	Grass, sedge, rush	
Cheatgrass	*Bromus tectorum*	Grass, sedge, rush	*Yes*
Chickweed	*Microsteris gracilis*	Herb	
Cinquefoil	*Potentilla gracilis*	Herb	
Cinquefoil	*Potentilla sp.*	Herb	
Cleavers	*Galium aparine*	Herb	
Climbing nightshade	*Solanum dulcamra*	Herb	
Clover	*Trifolium species*	Herb	
Columbia brome	*Bromus vulgaris*	Grass, sedge, rush	
Common cattail	*Typha latifolia*	Herb	
Common dandelion	*Taraxacum officinale*	Herb	*Yes*
Common elodea	*Elodea canadensis*	Aquatic	
Common hornwort, coon's tail, coontail	*Ceratophyllum demersum*	Aquatic	
Common tansy	*Tanacetum vulgare*	Field cover	
Cottonwoods	*Populus*	Tree	
Creeping oregongrape	*Berberis repens*	Shrub	
Creeping spike-rush	*Eleocharis palustris*	Shrub	
Curly dock	*Rumex crispus*	Herb	
Curly leaf (or curly-leaved) pondweed	*Potamogeton crispus*	Aquatic	*Yes*
Daggerleaf rush	*Juncus ensifolius*	Grass, sedge, rush	
Deptford pink	*Dianthus armeria*	Herb	*Yes*
Douglas's spirea	*Spiraea douglaii*	Field cover	
Eel-grass pondweed	*Potamogeton zosteriformis*	Aquatic	
Eurasian wter-milfoil	*Myriophyllum spicatum*	Aquatic	*Yes*
False Solomon's Seal	*Smilacina racemosa*	Herb	
Fendler's pennycress	*Noccaea fendleri*	Field cover	
Fern leaf pondweed	*Potamogeton robbinsil*	Aquatic	

Table 17: Summary of Vegetation

Common Name	Scientific Name	Plant Type	Invasive or Noxious Plant
Field chickweed	*Cerastium arvense*	Field cover	
Field mint	*Mentha arvensis*	Field cover	
Field woodrush	*Luzula multiflora*	Field cover	
Floating leaf pondweed	*Potamodeton natans*	Aquatic	
Flowering rush	*Butomus umbellatus*	Grass, sedge, rush	*Yes*
Fringed loosestrife	*Lysimachia ciliata*	Field cover	
Garden Bird's-foot trefoil	*Lotus corniculatus*	Field cover	
Graceful Cinquefoil	*Potentilla gracilis*	Field cover	
Grand fir, giant fir, lowland white fir, interior grand fir	*Abies grandis*	Tree	
Grass-leaved pondweed	*Potamogeton gramineus*	Aquatic	
Great duckweed	*Spirodela polyrhiza*	Herb	
Green/Sitka alder	*Alnus sinuata*	Tree	
Hazlenut	*Corylus cornuta*	Shrub	
Heal-all	*Prunella bulgaris*	Herb	*Yes*
Herbal speedwell	*Veronica officinalis*	Herb	
Hop clover	*Medicago lupulina*	Herb	
Horsetail, common; Scouring-rush	*Equisetum hyemale*	Grass, sedge, rush	
Hybrid of Eurasian and northern milfois	*Myriophyllum spicatum X Myriophyllum sibiricum*	Aquatic	
Illinois pondweed	*Potamogeton illinoensis*	Aquatic	
Japenese cheatgrass	*Bromus japonicus*	Grass, sedge, rush	*Yes*
Kentucky bluegrass	*Poa bulbosa*	Grass, sedge, rush	*Yes*
lodgepole pine	*Pinus contorta*	Tree	
Lomatium	*Lomatium species*	Herb	
Longleaf pondweed	*Potamogeton nodosus*	Aquatic	
Lotus	*Lotus purshiana*	Herb	
Marsh skullcap	*Scutellaria galericulata*	Herb	
Meadow arnica	*Arnica chamissonis*	Shrub	
Meadow Foxtail	*Alopecurus pratensis*	Grass, sedge, rush	
Meadowrue	*Thalictrum species*	Field cover	
Modest buttercup	*Ranunculus verecundus*	Herb	
Mountain tansymustard	*Descurainia incana*	Field cover	
Mountain tarweed	*Madia glomerata*	Field cover	
Mr. Sweet-cicely	*Osmorhiza chilensis*	Herb	
Mullein	*Verbascum thapsus*	Field cover	
Muskwort	*Chara*	Aquatic	
Naked-stemmed bulrush	*Schoenoplectus*	Grass, sedge, rush	
Narrowleaf bur-reed	*Sparganium angustifolium*	Aquatic	
Narrowleaf Collomia	*Collomia linearis*	Field cover	
Nootka rose	*Rosa nutkana*	Shrub	
Northern bedstraw	*Galium boreale*	Herb	
Northern watermilfoil	*Myriohyllum sibiricum*	Auqatic	
Orange balsam	*Impantiens aurella*	Herb	
Orange Hawkweed	*Hieracium aurantiacum*	Herb	
Orange honeysuckle	*Lonicera ciliosa*	Herb	
Orchard grass	*Dactylis glomerata*	Herb	*Yes*
Oregon grape	*Mahonia aquifolium*	Shrub	
Paintbrush	*Castilleja species*	Field cover	
Pestle Parsnip	*Lomatium nudicaule*	Field cover	

Table 17: Summary of Vegetation

Common Name	Scientific Name	Plant Type	Invasive or Noxious Plant
Phlox	*Polemoniaceae spp.*	Herb	
Poa	*Poa species*	Grass, sedge, rush	
Ponderosa/bull pine	*Pinus ponderosa*	Tree	
Pondweed 1	*Potamogeton*	Aquatic	
Prairie sage	*Artemisia ludoviciana*	Field cover	
Purple loosestrife	*Lythrum salicaria*	Aquatic	*Yes*
Quackgrass	*Agrophyron repens*	Grass, sedge, rush	*Yes*
Quaking aspen	*Populus tremuloides*	Tree	
Queen's cup	*Clintonia uniflora*	Herb	
Red clover	*Trifolium pratense*	Field cover	
Red fescue	*Festuca rubra*	Grass, sedge, rush	
Red-osier dogwood	*Cormus stolonifera*	Shrub	
Redtop	*Agrostis alba*	Grass, sedge, rush	*Yes*
Reed canarygrass	*Phalaris arundinacea*	Grass, sedge, rush	*Yes*
Ribbon-leaf pondweed	*Potamogeton epihydrus*	Aquatic	
Richardson's pondweed	*Potamogeton richardsonii*	Aquatic	
Rigid hedge-nettle	*Stachys rigida*	Herb	
Rush	*Juncus*	Grass, sedge, rush	
Sago pondweed	*Stuckenia pectinata*	Aquatic	
Sedge	*Carex vulpinoidea*	Grass, sedge, rush	
Serviceberry	*Amelanchier alnifolia*	Shrub	
Skunk cabbage	*Lysichitum americanum*	Herb	
Slender Pondweed	*Potamogeton pusillus*	Aquatic	
Small forget-me-not	*Myosotis laxa*	Herb	
Small fruited bulrush	*Scirpus microcarpus*	Aquatic/Field cover	
Smartweed	*Persicaria species*	Field cover	
Smooth brome	*Bromus inermis*	Grass, sedge, rush	
Smooth scouring-rush	*Equisetum laevigatum*	Grass, sedge, rush	
Snowberry	*Symphoricarpos albus*	Shrub	
Softstem bulrush	*Schoenoplectus tabernaemontani*	Grass, sedge, rush	
Spike-rush	*Eleocharis*	Grass, sedge, rush	
Spirea	*Spiraea douglasii*	Shrub	
Spotted knapweed	*Centaurea stoebe*	Field cover	
Spreading wood-ferm	*Dryopteris austriaca*	Herb	
St. John's wort	*Hypericum perforatum*	Herb	
Starry false Solomon's seal	*Maianthemum stellatum*	Field cover	
Starry Solomon-plum	*Smilacina stellata*	Herb	
Sulfur cinquefoil	*Potentilla recta*	Field cover	
Sulfur lupine	*Lupinus sulphureus*	Herb	
Sweep's brush rush	*Luzula campestris*	Herb	
Sweet cicely	*Osmorhiza berteroi*	Field cover	
Tall oregongrape	*Bereris aquifolium*	Shrub	
Thistle	*Cirsium spp.*	Herb	
Tiger-lily	*Lilium columbaianum*	Field cover	
Timothy grass	*Phleum pratense*	Grass, sedge, rush	*Yes*
Unknown mint	*Labiatae species*	Herb	
Unknown Sedge	*Carex species*	Grass, sedge, rush	
Utah honeysuckle	*Lonicera utahensis*	Shrub	
Vetch	*Vicia americana*	Herb	

Table 17: Summary of Vegetation

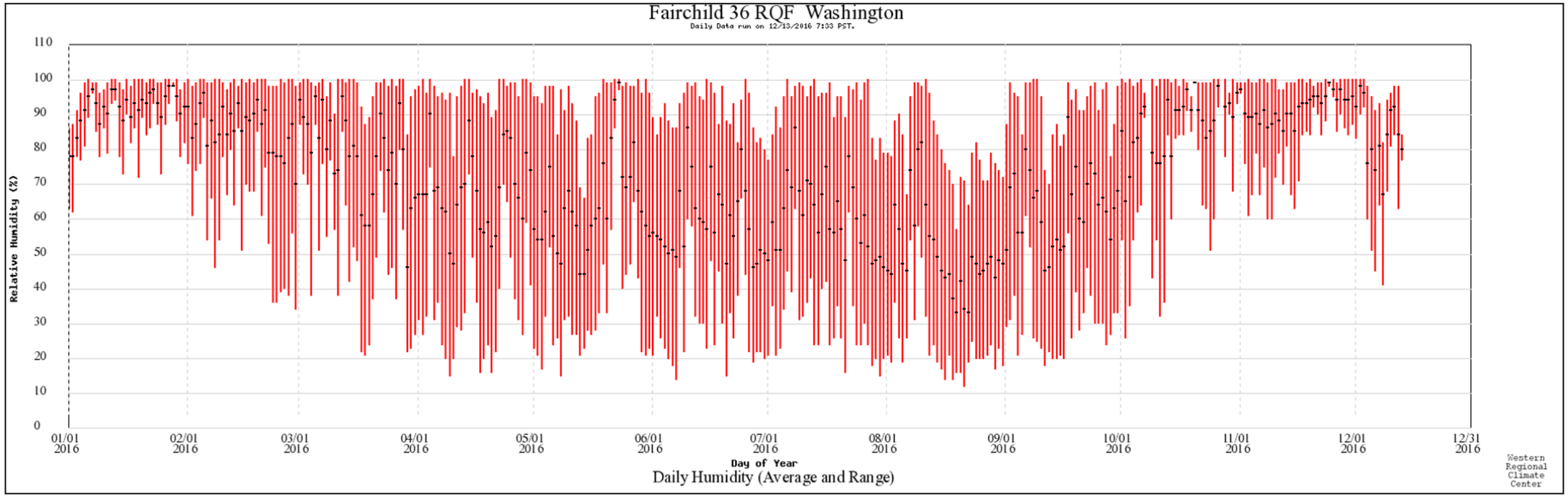
Common Name	Scientific Name	Plant Type	Invasive or Noxious Plant
Water hemlock	*Cicuta*	Aquatic	
Water horsetail	*Equisetum fluviatile*	Field cover	
Water knotweed, water smartweed	*Persicaria amphibia*	Aquatic	
Water smart weed	*Polygonum amphibium*	Herb	
Water star-grass	*Heteranthera dubia*	Aquatic	
Water-buttercup	*Ranunculus aquatilis*	Herb	
Waterpepper	*Polygonum hydropiperiodes*	Herb	
Waterplantain	*Alisma*	Aquatic	
Waterweed	*Elodea*	Aquatic	
Westerm mountain asher	*Symphyotrichum spathulatum*	Field cover	
Western larch	*Larix occidentalis*	Tree	
Western meadowrue	*Thalictrum occidentale*	Field cover	
Western water-hemlock	*Cicuta douglasii*	Aquatic	
Wheat sedge	*Carex atherodes*	Grass, sedge, rush	
Wheatgrass	*Agropyron species*	Grass, sedge, rush	
White paintbrush	*Castilleja nivea*	Shrub	
Wild strawberry	*Fragaria virginiana*	Field cover	
Willow	*Salix species*	Tree	
Woodland strawberry	*Fragaria vesca*	Field cover	
Wood's rose	*Rosa woodsii*	Shrub	
Woolly sedge	*Carex pellita*	Grass, sedge, rush	
Yarrow	*Achillea millefolium*	Herb	
Yellow clover	*Trifolium aureum*	Field cover	
Yellow flag	*Iris pseudacorus*	Field cover	Yes

Sources:

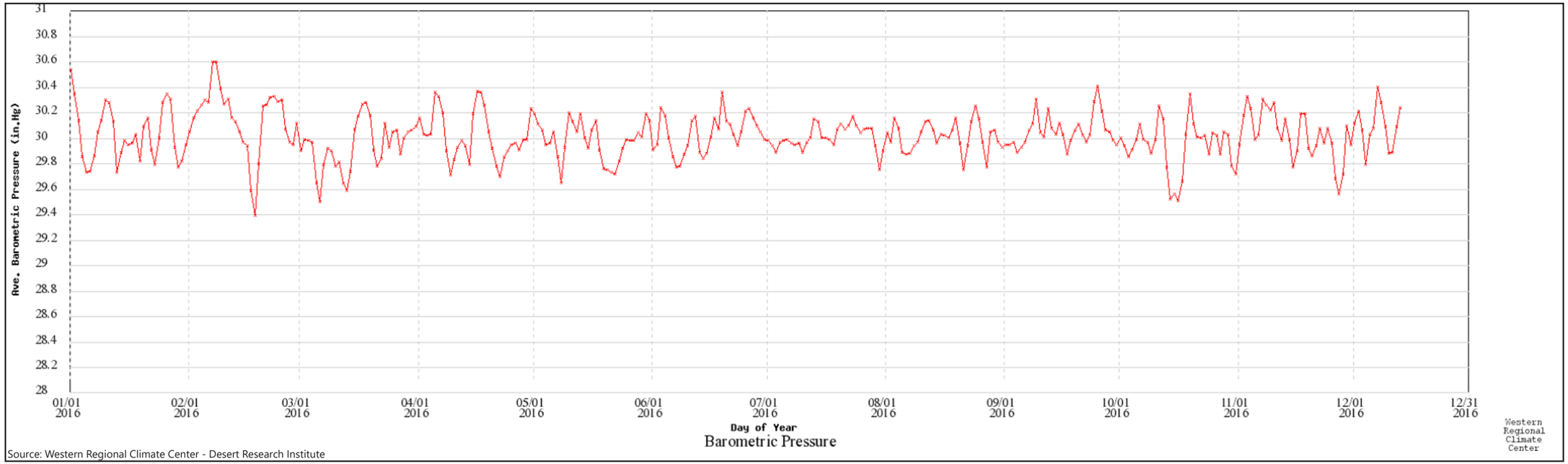
Ecology - https://fortress.wa.gov/ecy/coastalatlas/tools/LakeDetail.aspx

Kalispel Geospatial Database Viewer (KNRD, 2017)

Appendix A:
Additional Data

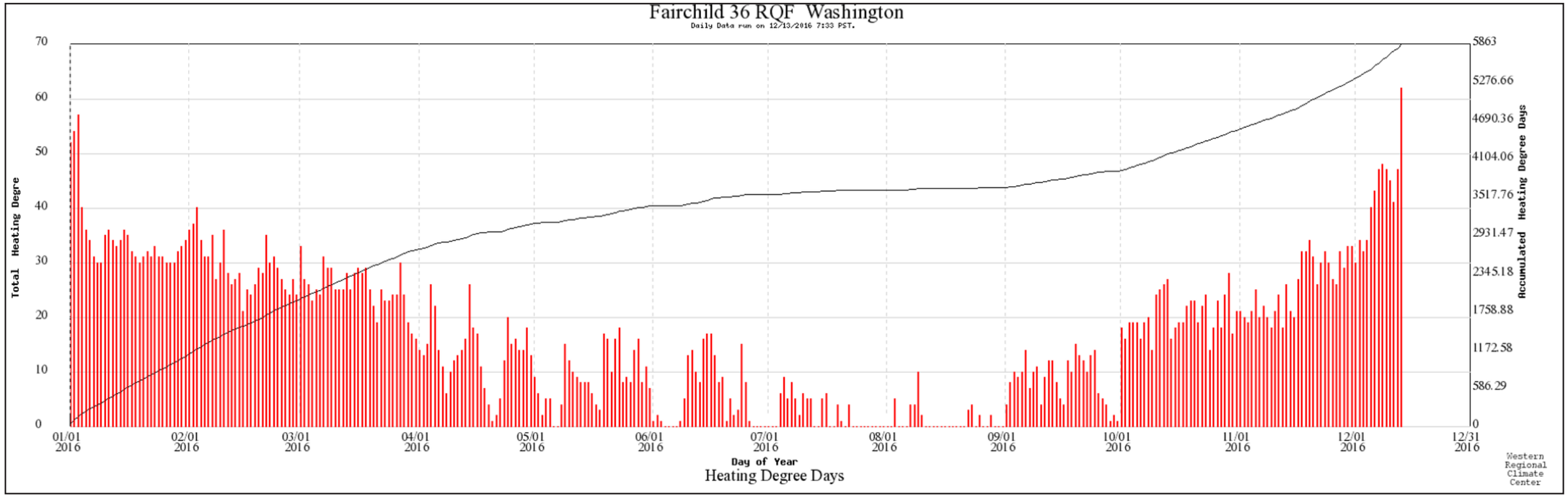


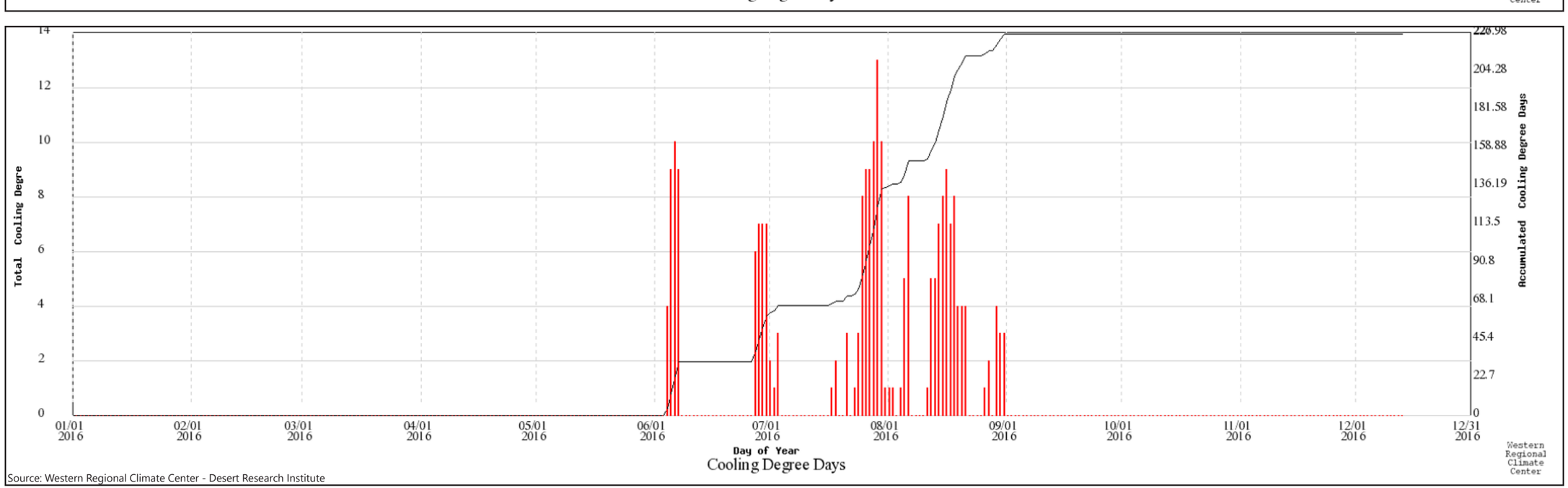
Daily Humidity (Average and Range)



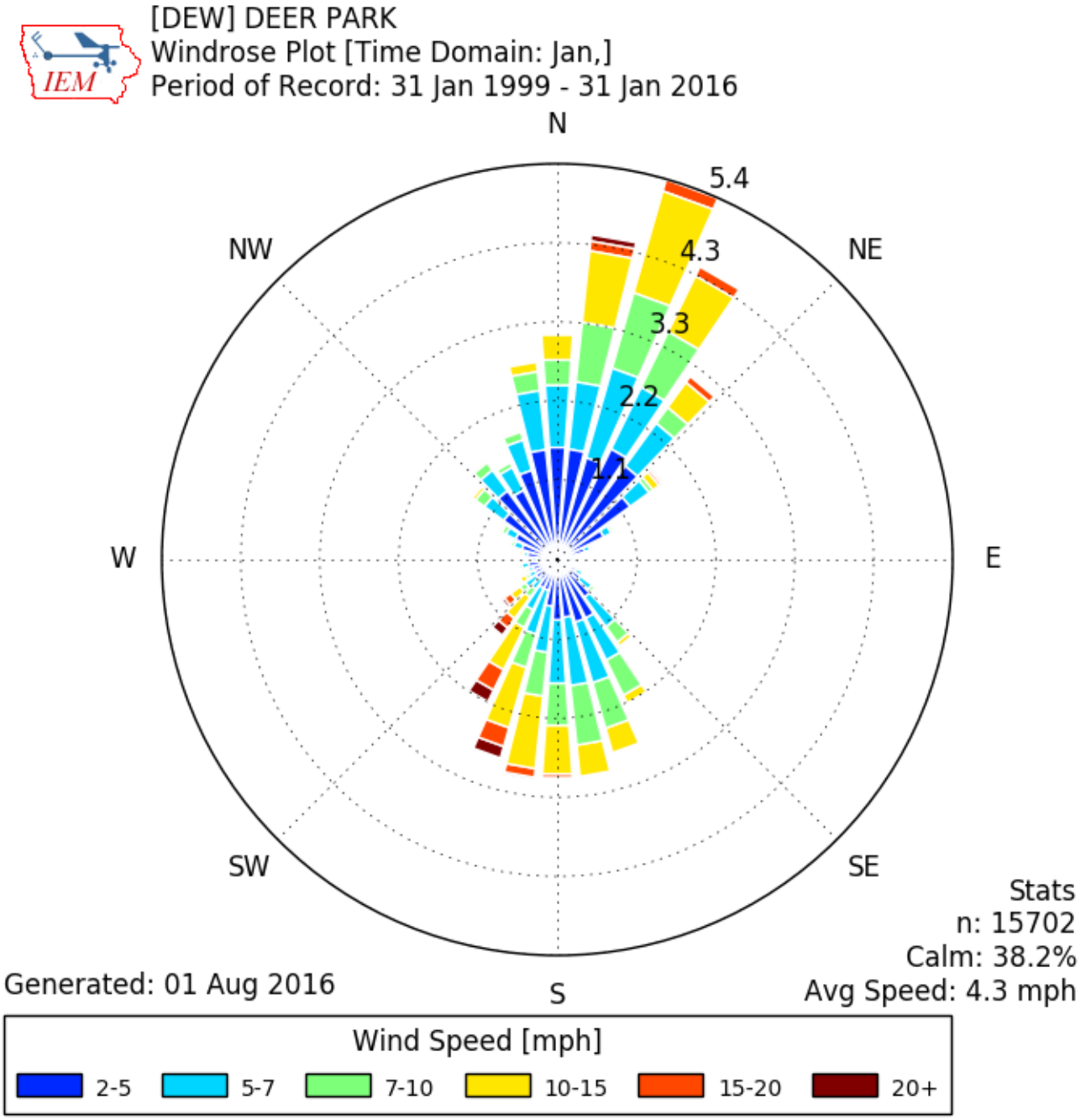
Barometric Pressure

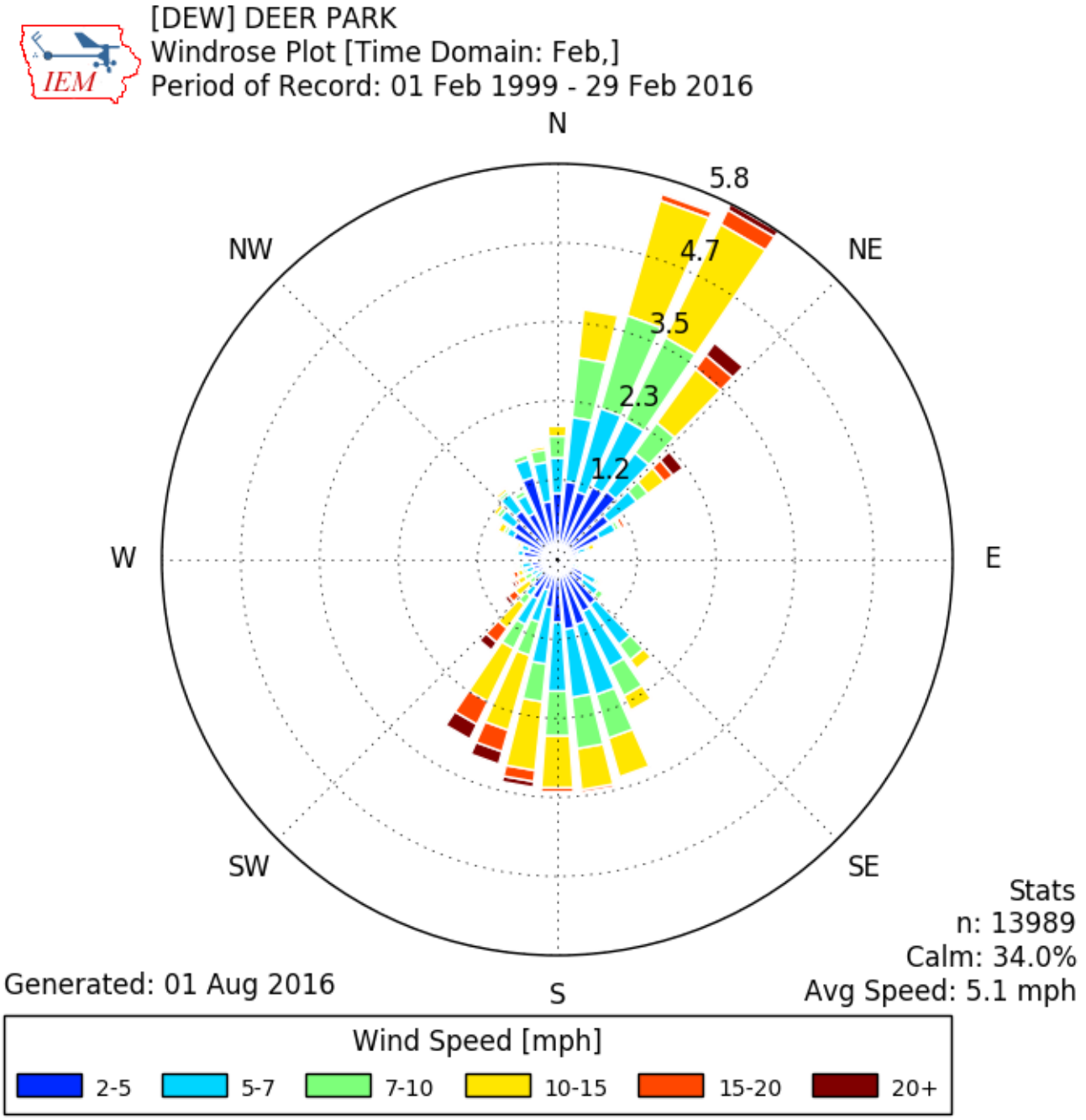
Source: Western Regional Climate Center - Desert Research Institute

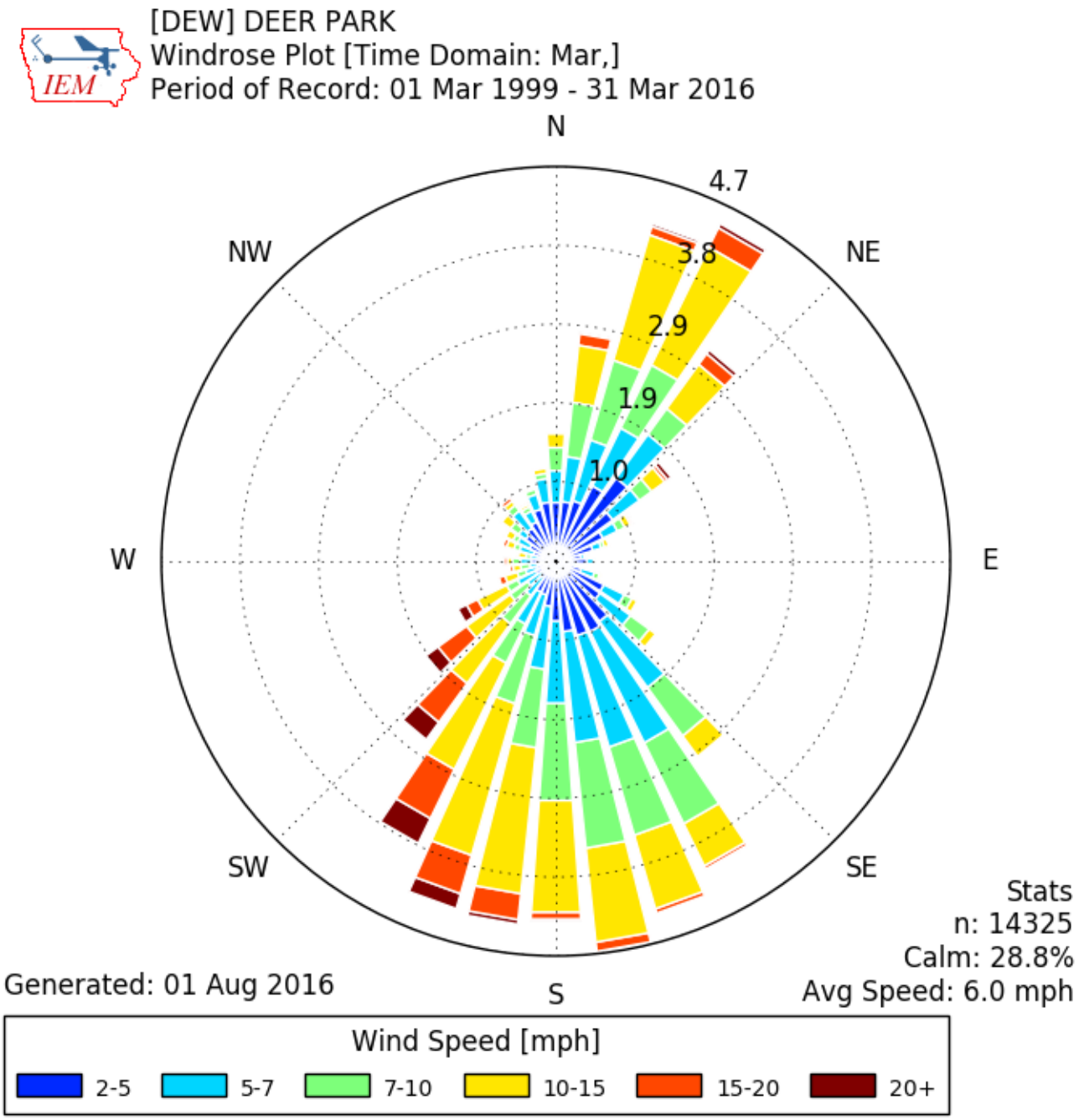




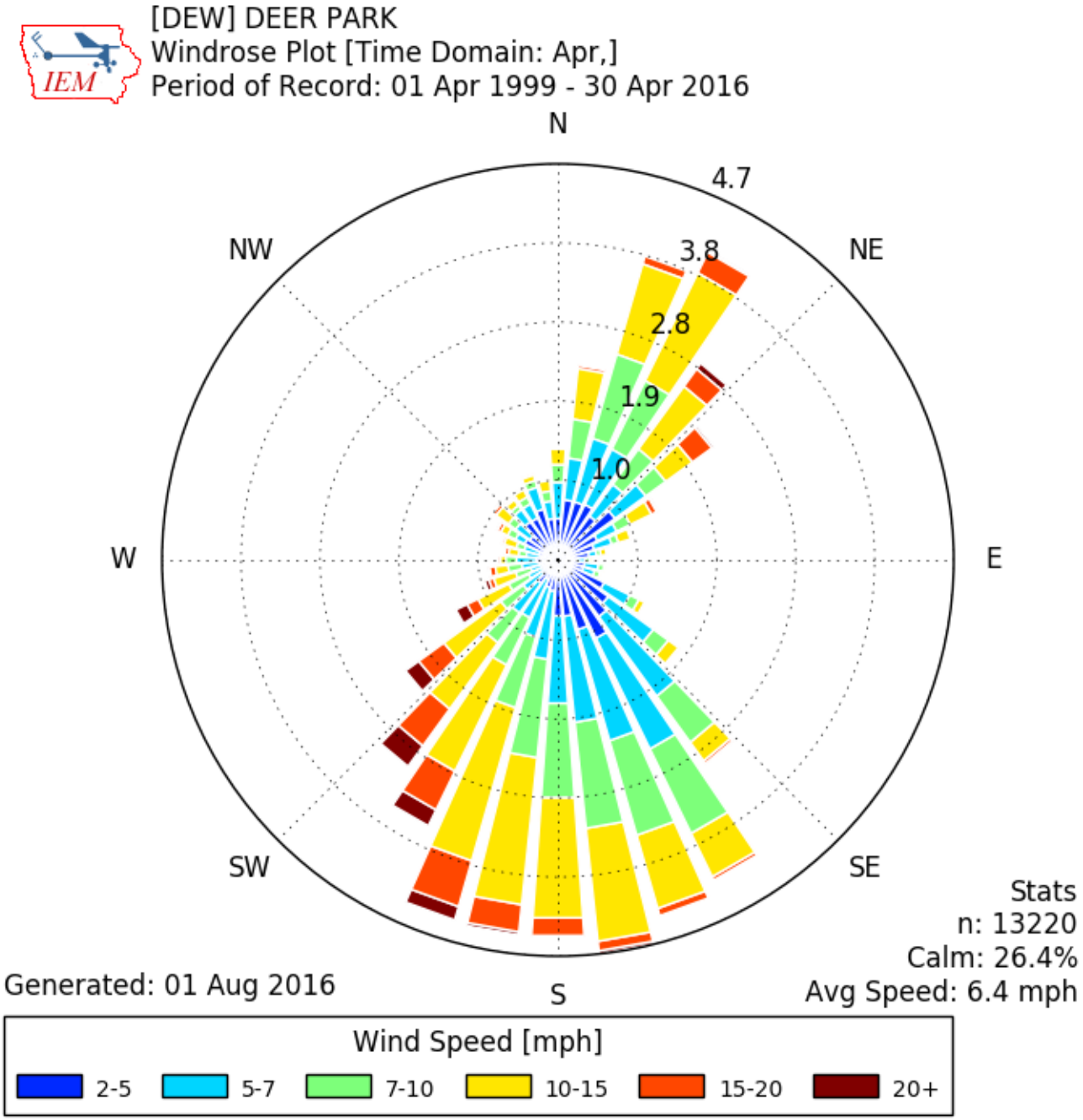
Source: Western Regional Climate Center - Desert Research Institute


[DEW] DEER PARK
Windrose Plot [Time Domain: Jan,]
Period of Record: 31 Jan 1999 - 31 Jan 2016
N
NE
E
SE
S
SW
W
NW
5.4
4.3
3.3
2.2
1.1
Stats
n: 15702
Calm: 38.2%
Avg Speed: 4.3 mph
Generated: 01 Aug 2016
Wind Speed [mph]
2-5
5-7
7-10
10-15
15-20
20+

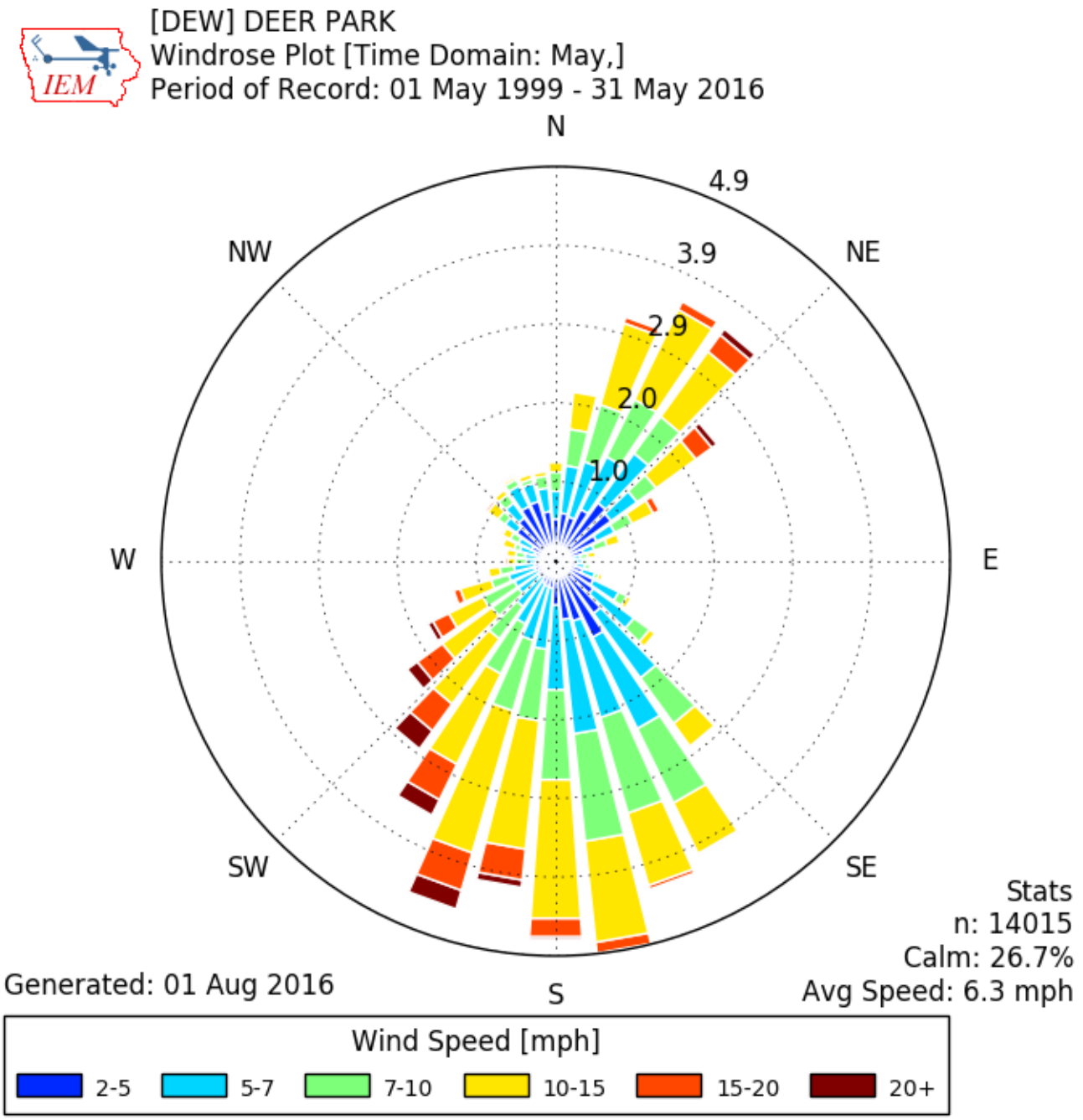

[DEW] DEER PARK
Windrose Plot [Time Domain: Feb,]
Period of Record: 01 Feb 1999 - 29 Feb 2016
N
NE
E
SE
S
SW
W
NW
5.8
4.7
3.5
2.3
1.2
Stats
n: 13989
Calm: 34.0%
Avg Speed: 5.1 mph
Generated: 01 Aug 2016
Wind Speed [mph]
2-5
5-7
7-10
10-15
15-20
20+

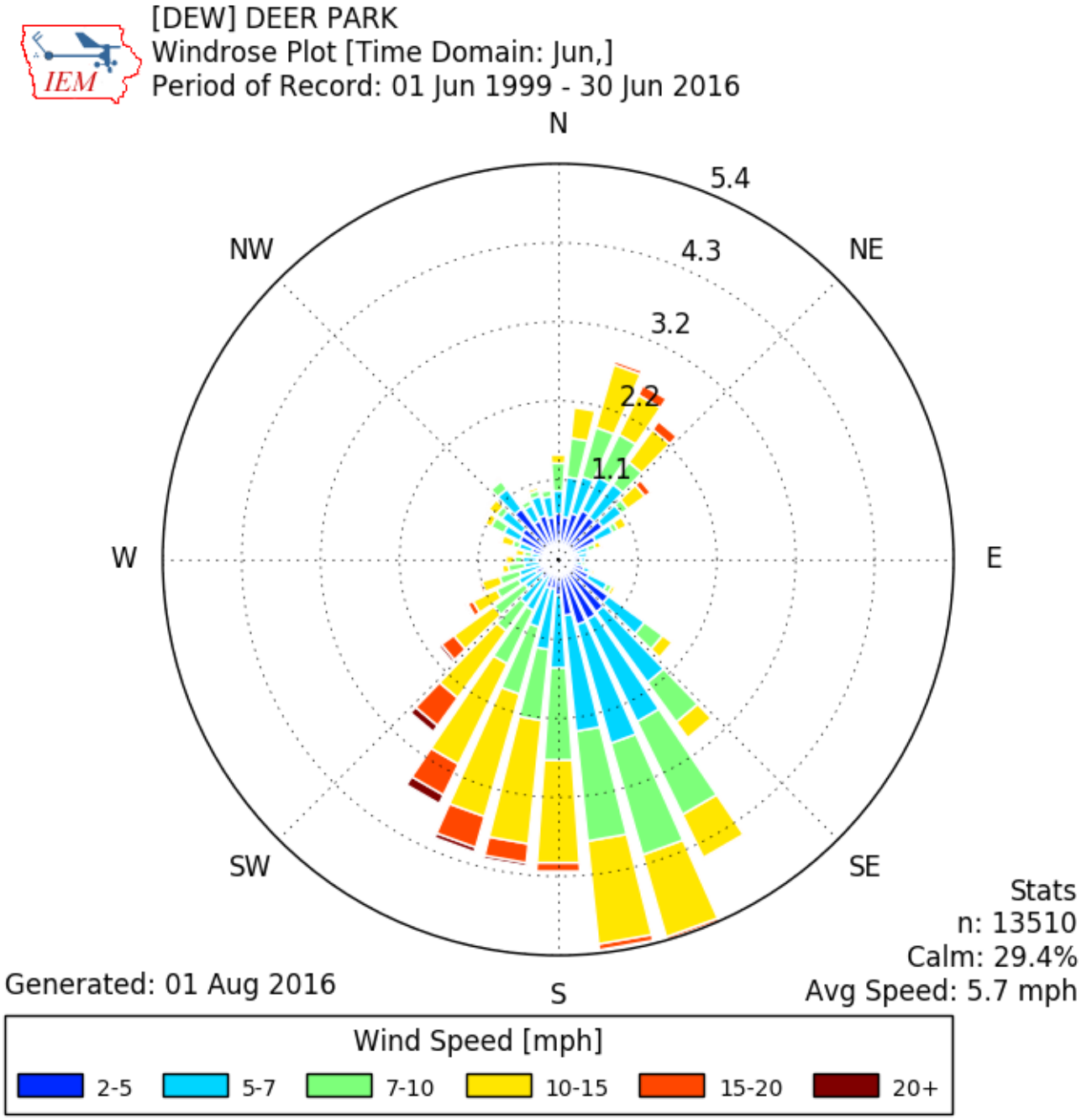


RIDOLFI Environmental	Clean Air Act Prevention of Significant Deterioration Program Class I Redesignation Technical Report	Appendix A
	Prepared for the Kalispel Tribe of Indians	Monthly Wind Roses, Deer Park

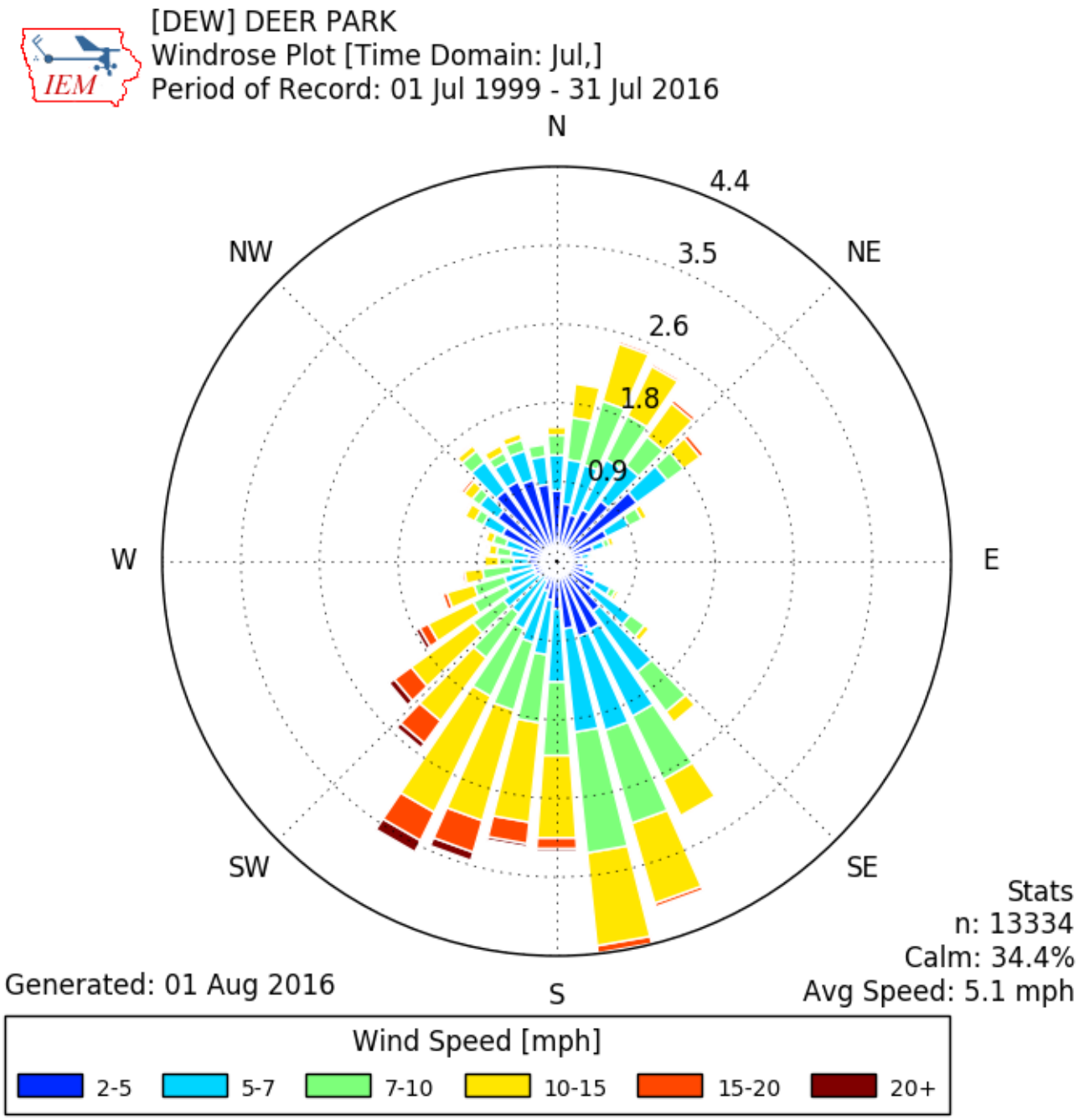


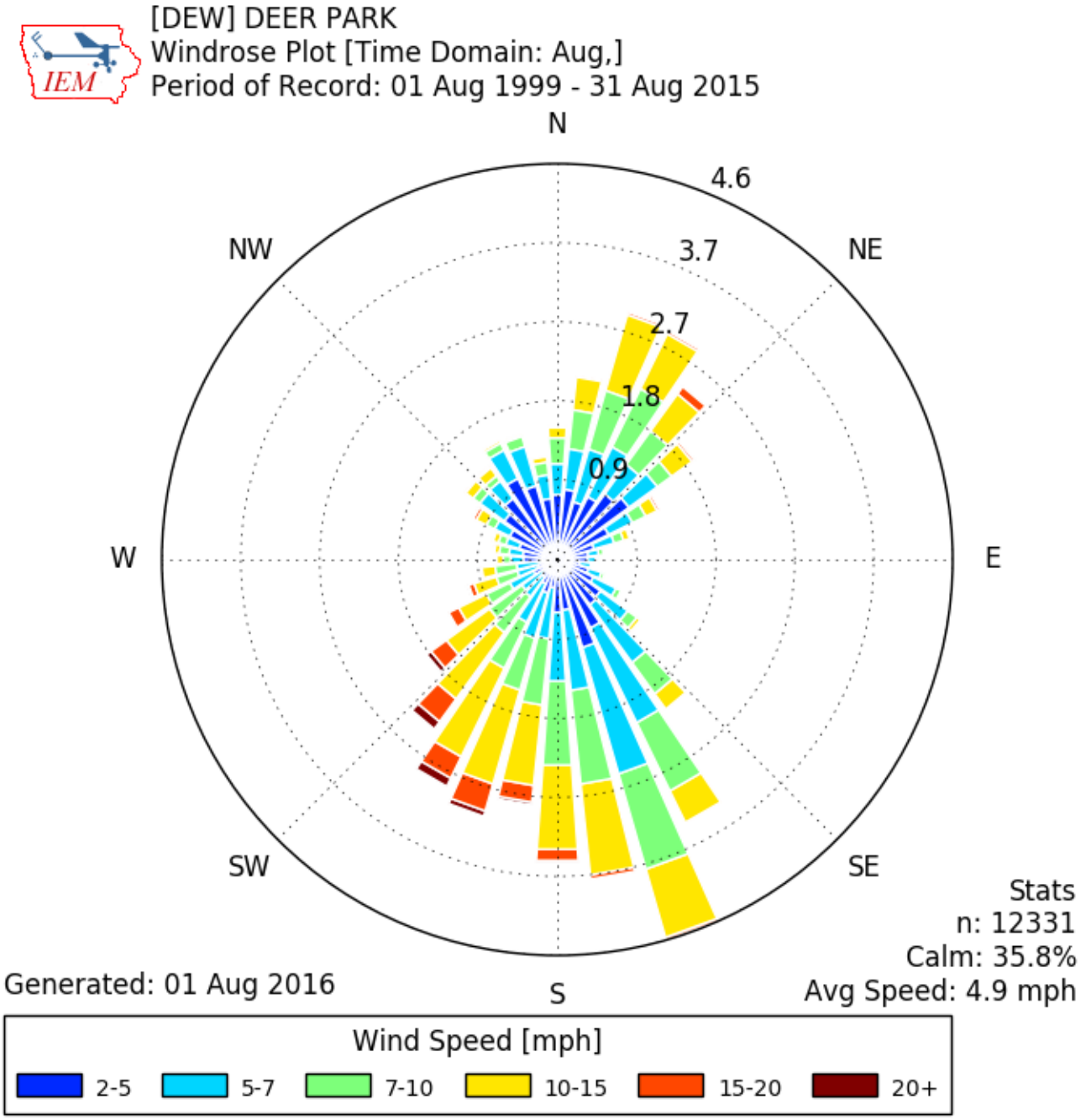
RIDOLFI Environmental	Clean Air Act Prevention of Significant Deterioration Program Class I Redesignation Technical Report	Appendix A
	Prepared for the Kalispel Tribe of Indians	Monthly Wind Roses, Deer Park


[DEW] DEER PARK
Windrose Plot [Time Domain: May,]
Period of Record: 01 May 1999 - 31 May 2016
N
NE
E
SE
S
SW
W
NW
4.9
3.9
2.9
2.0
1.0
Stats
n: 14015
Calm: 26.7%
Avg Speed: 6.3 mph
Generated: 01 Aug 2016
Wind Speed [mph]
2-5
5-7
7-10
10-15
15-20
20+

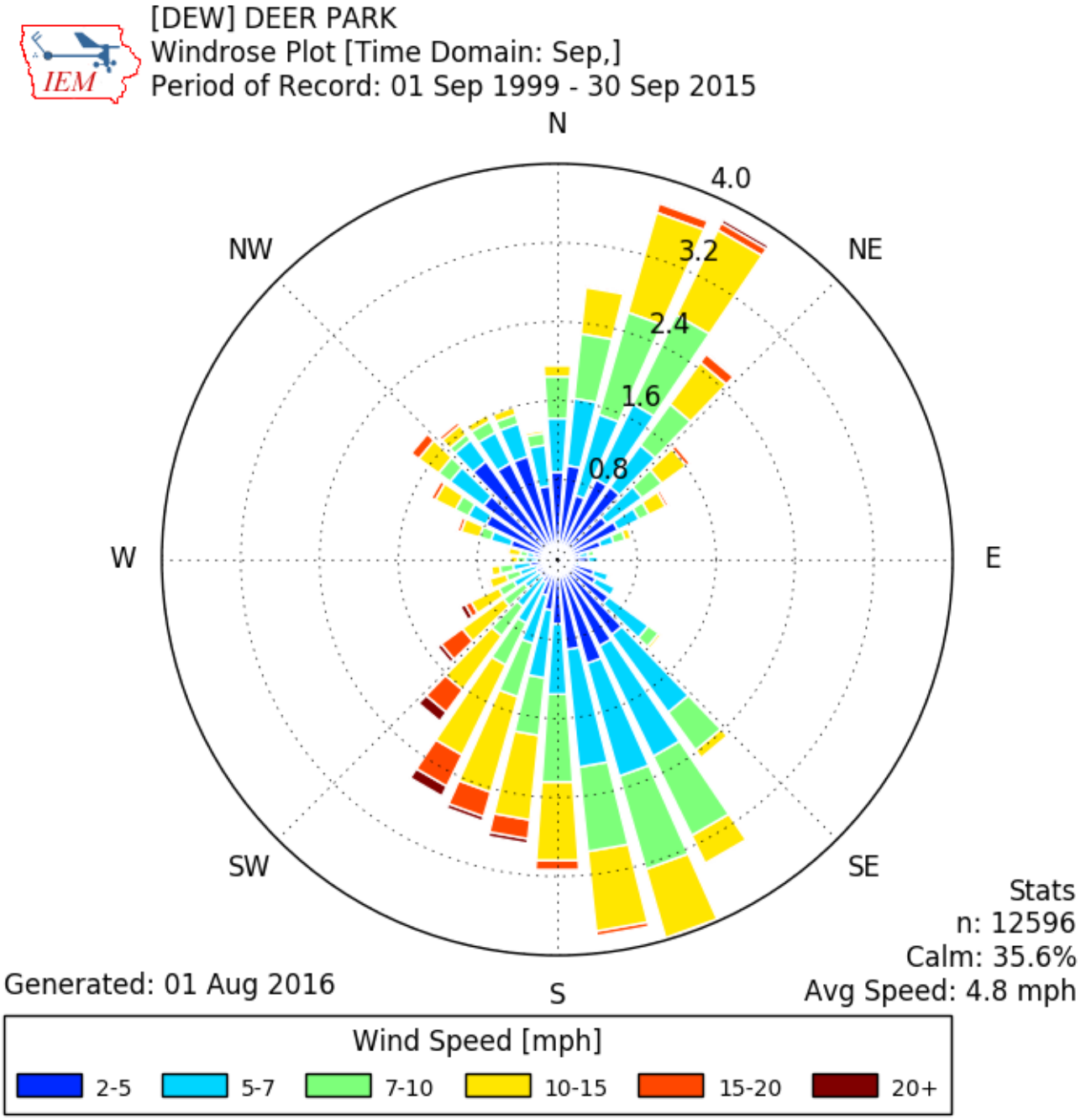


RIDOLFI Environmental	Clean Air Act Prevention of Significant Deterioration Program Class I Redesignation Technical Report	Appendix A
	Prepared for the Kalispel Tribe of Indians	Monthly Wind Roses, Deer Park

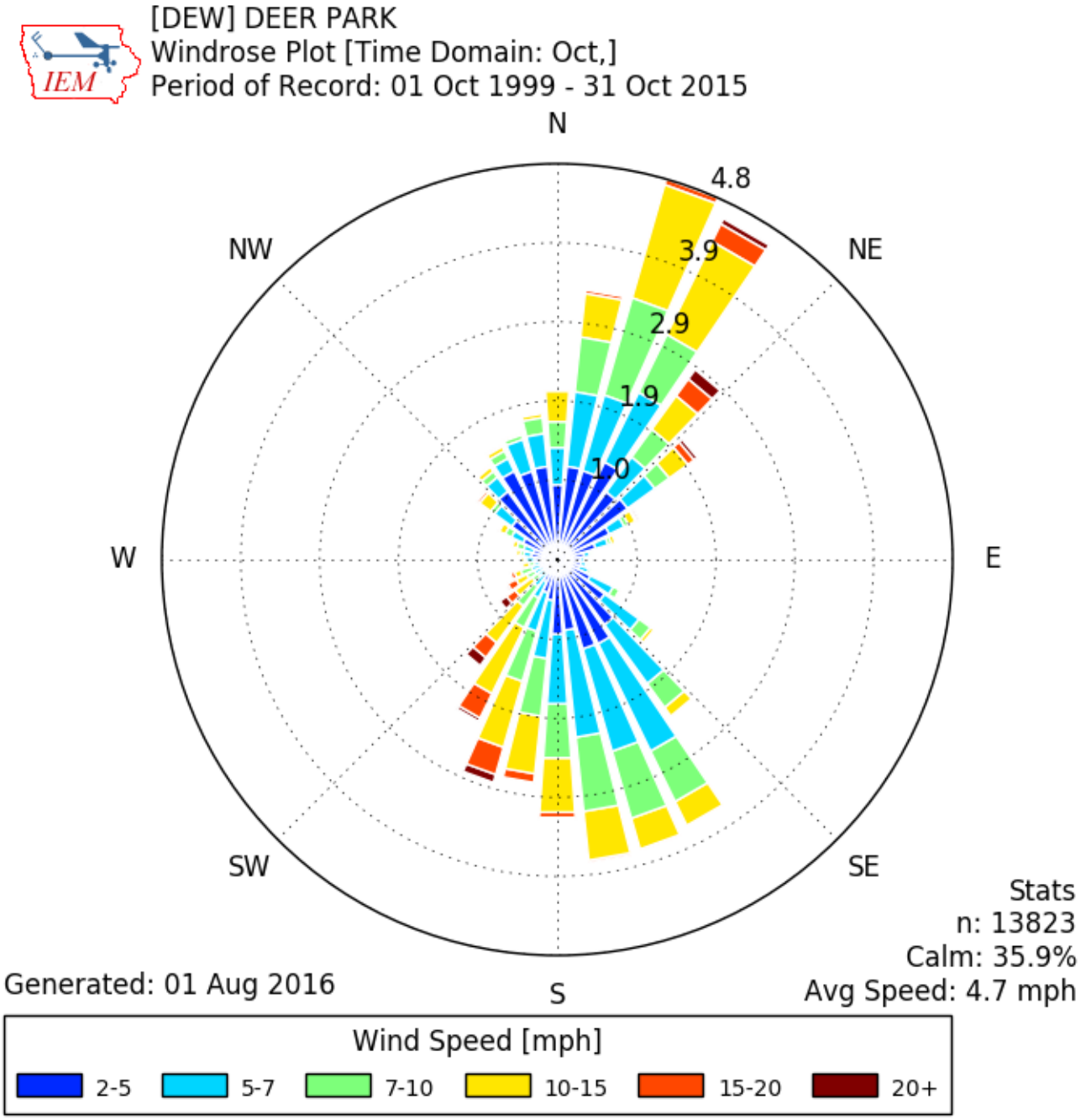

[DEW] DEER PARK
Windrose Plot [Time Domain: Jul,]
Period of Record: 01 Jul 1999 - 31 Jul 2016
N
NE
E
SE
S
SW
W
NW
4.4
3.5
2.6
1.8
0.9
Stats
n: 13334
Calm: 34.4%
Avg Speed: 5.1 mph
Generated: 01 Aug 2016
Wind Speed [mph]
2-5
5-7
7-10
10-15
15-20
20+



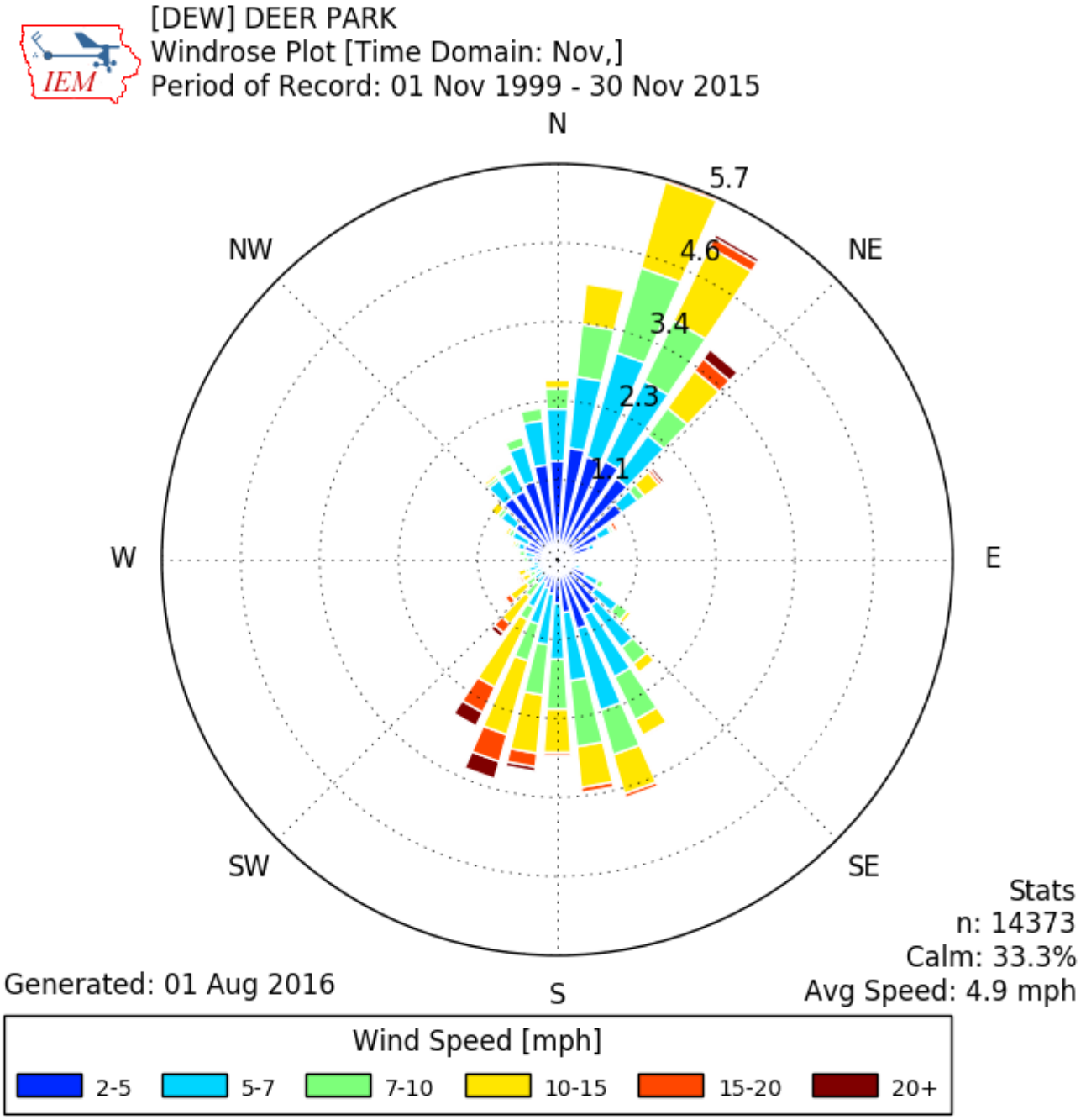
RIDOLFI Environmental	Clean Air Act Prevention of Significant Deterioration Program Class I Redesignation Technical Report	Appendix A
	Prepared for the Kalispel Tribe of Indians	Monthly Wind Roses, Deer Park

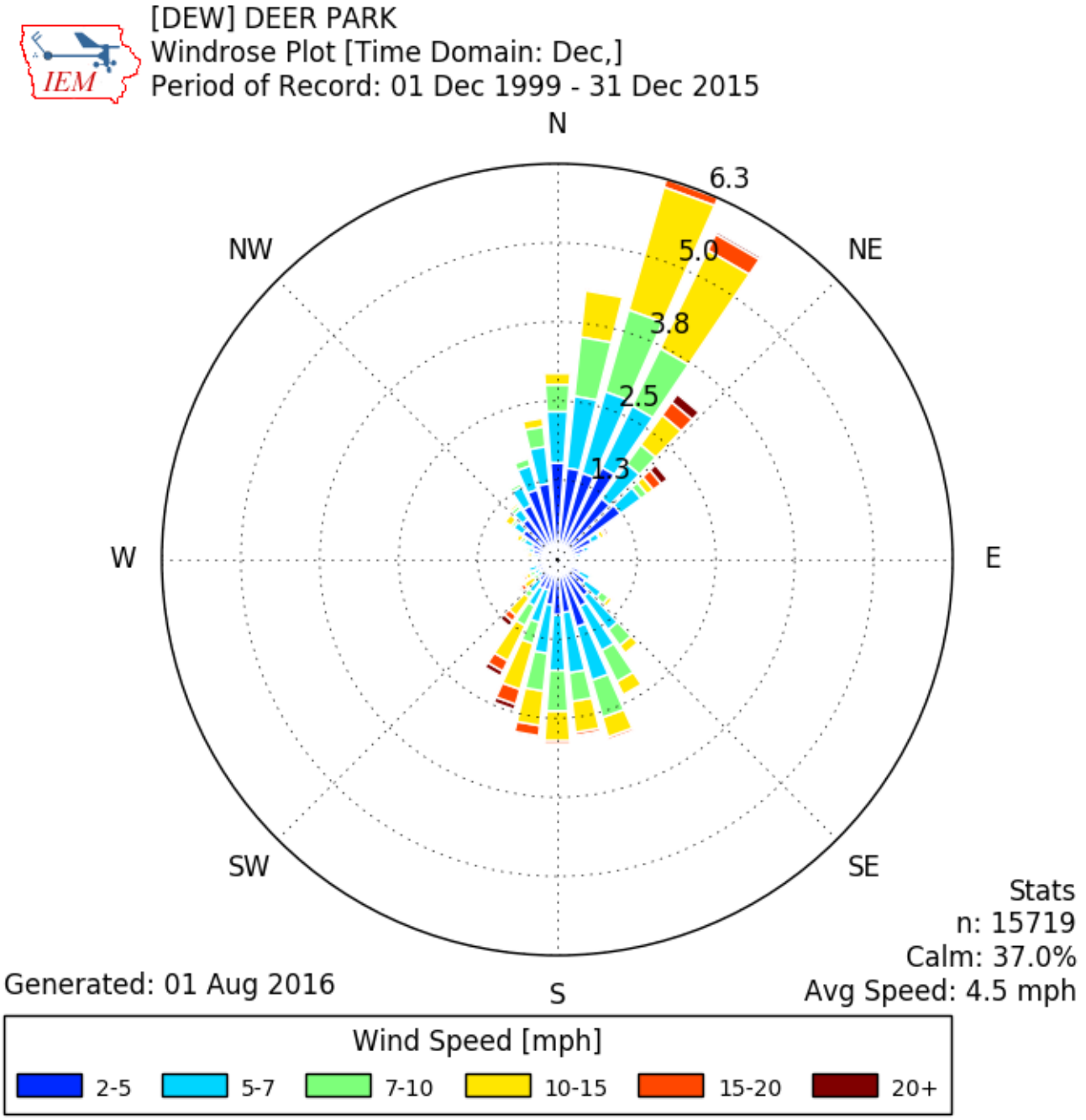


RIDOLFI Environmental	Clean Air Act Prevention of Significant Deterioration Program Class I Redesignation Technical Report	Appendix A
	Prepared for the Kalispel Tribe of Indians	Monthly Wind Roses, Deer Park



RIDOLFI Environmental	Clean Air Act Prevention of Significant Deterioration Program Class I Redesignation Technical Report	Appendix A
	Prepared for the Kalispel Tribe of Indians	Monthly Wind Roses, Deer Park


[DEW] DEER PARK
Windrose Plot [Time Domain: Nov,]
Period of Record: 01 Nov 1999 - 30 Nov 2015
N
NE
E
SE
S
SW
W
NW
5.7
4.6
3.4
2.3
1.1
Stats
n: 14373
Calm: 33.3%
Avg Speed: 4.9 mph
Generated: 01 Aug 2016
Wind Speed [mph]
2-5
5-7
7-10
10-15
15-20
20+


[DEW] DEER PARK
Windrose Plot [Time Domain: Dec,]
Period of Record: 01 Dec 1999 - 31 Dec 2015
N
NE
E
SE
S
SW
W
NW
6.3
5.0
3.8
2.5
1.3
Stats
n: 15719
Calm: 37.0%
Avg Speed: 4.5 mph
Generated: 01 Aug 2016
Wind Speed [mph]
2-5
5-7
7-10
10-15
15-20
20+

RIDOLFI
Environmental

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
1/1/2014	0.4	19	79	5
1/2/2014	1.3	24	100	15
1/3/2014	1	24	100	11
1/4/2014	0.7	24	100	8
1/5/2014	1	24	100	11
1/6/2014	1.1	24	100	13
1/7/2014	0.6	24	100	7
1/8/2014	1.2	24	100	14
1/9/2014	0.9	24	100	10
1/10/2014	0.8	24	100	9
1/11/2014	0.6	24	100	7
1/12/2014	0.5	24	100	6
1/13/2014	0.5	24	100	6
1/14/2014	1.7	24	100	19
1/15/2014	1.4	24	100	16
1/25/2014	0.4	24	100	5
1/26/2014	0.6	24	100	7
1/27/2014	0.7	24	100	8
1/28/2014	0.9	24	100	10
1/29/2014	0.9	24	100	10
1/30/2014	0.9	24	100	10
1/31/2014	1	24	100	11
3/6/2014	0.6	24	100	7
3/7/2014	0.8	24	100	9
3/8/2014	0.9	24	100	10
3/9/2014	0.5	24	100	6
3/10/2014	0.7	24	100	8
3/11/2014	0.7	24	100	8
3/12/2014	0.9	24	100	10
3/13/2014	0.9	24	100	10
3/14/2014	0.7	24	100	8
3/15/2014	0.7	24	100	8
3/16/2014	0.6	24	100	7
3/17/2014	0.4	24	100	5
3/18/2014	0.4	24	100	5
3/19/2014	0.6	24	100	7
3/20/2014	0.7	24	100	8
3/21/2014	0.8	24	100	9
3/23/2014	0.4	24	100	5
3/25/2014	0.7	24	100	8
3/26/2014	0.6	24	100	7
3/27/2014	0.6	24	100	7

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
3/28/2014	0.9	24	100	10
3/29/2014	0.6	24	100	7
3/30/2014	0.5	24	100	6
3/31/2014	0.6	24	100	7
4/1/2014	0.6	24	100	7
4/2/2014	0.6	24	100	7
4/3/2014	0.6	24	100	7
4/4/2014	0.6	24	100	7
4/5/2014	0.5	24	100	6
4/6/2014	0.4	24	100	5
4/7/2014	0.7	24	100	8
4/8/2014	0.6	24	100	7
4/9/2014	0.4	24	100	5
4/10/2014	0.5	24	100	6
4/11/2014	0.4	24	100	5
4/12/2014	0.3	24	100	3
4/13/2014	0.4	24	100	5
4/14/2014	0.5	24	100	6
4/15/2014	0.9	24	100	10
4/16/2014	0.8	24	100	9
4/17/2014	1	24	100	11
4/18/2014	0.5	24	100	6
4/19/2014	0.4	24	100	5
4/20/2014	0.5	24	100	6
4/21/2014	0.5	24	100	6
4/22/2014	0.5	24	100	6
4/23/2014	0.5	21	88	6
4/24/2014	0.7	24	100	8
4/25/2014	0.6	24	100	7
4/26/2014	0.4	24	100	5
4/27/2014	0.4	24	100	5
4/28/2014	0.6	24	100	7
4/29/2014	0.6	24	100	7
4/30/2014	0.7	24	100	8
5/1/2014	0.7	24	100	8
5/2/2014	0.6	24	100	7
5/3/2014	0.4	24	100	5
5/4/2014	0.4	24	100	5
5/5/2014	0.6	24	100	7
5/6/2014	0.6	24	100	7
5/7/2014	0.5	24	100	6
5/8/2014	0.8	24	100	9

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
5/9/2014	0.4	24	100	5
5/10/2014	0.4	24	100	5
5/11/2014	0.4	24	100	5
5/12/2014	0.9	24	100	10
5/13/2014	0.9	24	100	10
5/14/2014	1.6	24	100	18
5/15/2014	0.8	24	100	9
5/16/2014	0.7	24	100	8
5/17/2014	0.4	24	100	5
5/18/2014	0.4	24	100	5
5/19/2014	0.6	24	100	7
5/20/2014	0.6	24	100	7
5/21/2014	0.6	24	100	7
5/22/2014	0.6	24	100	7
5/23/2014	0.8	24	100	9
5/24/2014	0.3	24	100	3
5/25/2014	0.3	24	100	3
5/26/2014	0.2	24	100	2
5/27/2014	0.5	24	100	6
5/28/2014	0.8	24	100	9
5/29/2014	0.7	24	100	8
5/30/2014	0.6	24	100	7
5/31/2014	0.7	24	100	8
6/1/2014	0.6	24	100	7
6/2/2014	0.5	24	100	6
6/3/2014	0.7	24	100	8
6/4/2014	0.8	24	100	9
6/5/2014	0.4	24	100	5
6/6/2014	0.5	24	100	6
6/7/2014	0.5	24	100	6
6/8/2014	0.5	24	100	6
6/9/2014	0.5	24	100	6
6/10/2014	0.6	24	100	7
6/11/2014	0.4	24	100	5
6/12/2014	0.6	24	100	7
6/13/2014	0.6	24	100	7
6/14/2014	0.6	24	100	7
6/15/2014	0.5	24	100	6
6/16/2014	0.4	24	100	5
6/17/2014	0.8	24	100	9
6/18/2014	1	24	100	11
6/19/2014	0.7	24	100	8

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
6/20/2014	0.7	24	100	8
6/21/2014	0.6	24	100	7
6/22/2014	0.6	24	100	7
6/23/2014	0.6	24	100	7
6/24/2014	0.5	24	100	6
6/25/2014	0.4	24	100	5
6/26/2014	0.8	24	100	9
6/27/2014	0.7	24	100	8
6/28/2014	0.5	24	100	6
6/29/2014	0.4	24	100	5
6/30/2014	0.4	24	100	5
7/1/2014	0.4	24	100	5
7/2/2014	0.6	24	100	7
7/3/2014	0.6	24	100	7
7/4/2014	0.4	24	100	5
7/5/2014	0.4	24	100	5
7/6/2014	0.4	24	100	5
7/7/2014	0.4	24	100	5
7/8/2014	0.5	24	100	6
7/9/2014	0.6	24	100	7
7/10/2014	0.4	24	100	5
8/1/2014	0.5	24	100	6
8/2/2014	0.6	24	100	7
8/3/2014	0.3	24	100	3
8/4/2014	0.7	24	100	8
8/5/2014	0.7	24	100	8
8/6/2014	0.7	24	100	8
8/7/2014	0.7	24	100	8
8/8/2014	0.7	24	100	8
8/9/2014	0.7	24	100	8
8/10/2014	0.7	24	100	8
8/11/2014	0.9	24	100	10
8/12/2014	0.9	24	100	10
8/13/2014	0.7	24	100	8
8/14/2014	0.6	24	100	7
8/15/2014	0.8	24	100	9
8/16/2014	0.7	24	100	8
8/17/2014	0.7	24	100	8
8/18/2014	0.8	24	100	9
8/19/2014	0.8	24	100	9
8/20/2014	0.7	24	100	8
8/21/2014	0.5	24	100	6

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
8/22/2014	0.6	24	100	7
8/23/2014	0.6	24	100	7
8/24/2014	0.6	24	100	7
8/25/2014	0.8	24	100	9
8/26/2014	0.8	24	100	9
8/27/2014	0.7	24	100	8
8/28/2014	0.5	24	100	6
8/29/2014	0.6	24	100	7
8/30/2014	0.4	24	100	5
8/31/2014	0.4	24	100	5
9/1/2014	0.5	24	100	6
9/2/2014	0.6	24	100	7
9/3/2014	0.6	24	100	7
9/4/2014	0.7	24	100	8
9/5/2014	0.9	24	100	10
9/6/2014	1	24	100	11
9/7/2014	0.9	24	100	10
9/8/2014	0.5	24	100	6
9/9/2014	0.5	24	100	6
9/10/2014	0.2	24	100	2
9/11/2014	0.3	24	100	3
9/12/2014	0.6	24	100	7
9/13/2014	0.7	24	100	8
9/14/2014	0.8	24	100	9
9/15/2014	1	24	100	11
9/16/2014	1.1	24	100	13
9/17/2014	1.3	24	100	15
9/18/2014	1.3	24	100	15
9/19/2014	0.7	24	100	8
9/20/2014	0.9	24	100	10
9/21/2014	0.9	24	100	10
9/22/2014	1	24	100	11
9/23/2014	0.7	24	100	8
9/24/2014	0.6	24	100	7
9/25/2014	0.6	24	100	7
9/26/2014	0.8	24	100	9
9/27/2014	0.7	24	100	8
9/28/2014	0.4	24	100	5
9/29/2014	0.9	24	100	10
9/30/2014	0.9	24	100	10
10/1/2014	0.7	24	100	8
10/2/2014	0.7	24	100	8

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
10/3/2014	1.4	24	100	16
10/4/2014	1.4	24	100	16
10/5/2014	0.9	24	100	10
10/6/2014	0.8	24	100	9
10/7/2014	1.1	24	100	13
10/8/2014	1.2	24	100	14
10/9/2014	1.3	24	100	15
10/10/2014	1.2	24	100	14
10/11/2014	0.5	24	100	6
10/12/2014	0.5	24	100	6
10/13/2014	0.9	24	100	10
10/14/2014	0.9	24	100	10
10/15/2014	0.8	24	100	9
10/16/2014	0.9	24	100	10
10/17/2014	0.9	24	100	10
10/18/2014	0.8	24	100	9
10/19/2014	0.7	24	100	8
10/20/2014	0.8	24	100	9
10/21/2014	0.6	24	100	7
10/22/2014	0.9	24	100	10
10/23/2014	1	24	100	11
10/24/2014	0.9	24	100	10
10/25/2014	0.6	24	100	7
10/26/2014	0.3	24	100	3
10/27/2014	1.1	24	100	13
10/28/2014	1	24	100	11
10/29/2014	0.8	24	100	9
10/30/2014	0.7	24	100	8
10/31/2014	1.2	24	100	14
11/1/2014	0.7	24	100	8
11/2/2014	0.5	24	100	6
11/3/2014	1	24	100	11
11/4/2014	0.6	24	100	7
11/5/2014	0.9	24	100	10
11/6/2014	1.3	24	100	15
11/7/2014	1.5	24	100	17
11/8/2014	1.4	24	100	16
11/9/2014	1.1	24	100	13
11/10/2014	0.7	24	100	8
11/11/2014	0.6	24	100	7
11/12/2014	0.5	24	100	6
11/13/2014	1.2	24	100	14

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
11/14/2014	1.3	24	100	15
11/15/2014	1.6	24	100	18
11/16/2014	1.2	24	100	14
11/17/2014	2.2	24	100	25
11/18/2014	2.1	24	100	24
11/19/2014	1.8	24	100	20
11/20/2014	1.8	24	100	20
11/21/2014	1.7	24	100	19
11/22/2014	1	24	100	11
11/23/2014	0.4	24	100	5
11/24/2014	0.9	24	100	10
11/25/2014	0.7	24	100	8
11/26/2014	1.6	24	100	18
11/27/2014	1.4	24	100	16
11/28/2014	0.3	24	100	3
11/29/2014	0.4	24	100	5
11/30/2014	0.5	24	100	6
12/1/2014	0.9	24	100	10
12/2/2014	0.7	24	100	8
12/3/2014	0.7	24	100	8
12/4/2014	0.8	24	100	9
12/5/2014	0.8	24	100	9
12/6/2014	1	24	100	11
12/7/2014	0.8	24	100	9
12/8/2014	0.8	24	100	9
12/9/2014	1.4	24	100	16
12/10/2014	1.6	24	100	18
12/11/2014	1.5	24	100	17
12/12/2014	1.3	24	100	15
12/13/2014	0.8	24	100	9
12/14/2014	0.8	24	100	9
12/15/2014	1	18	75	11
12/16/2014	0.6	24	100	7
12/17/2014	0.6	24	100	7
12/18/2014	1	24	100	11
12/19/2014	0.8	24	100	9
12/20/2014	0.8	24	100	9
12/21/2014	0.5	24	100	6
12/22/2014	1.2	24	100	14
12/23/2014	1	24	100	11
12/24/2014	0.5	24	100	6
12/25/2014	0.5	24	100	6

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
12/26/2014	0.7	24	100	8
12/27/2014	0.7	24	100	8
12/28/2014	0.7	24	100	8
12/29/2014	0.4	24	100	5
12/30/2014	0.7	24	100	8
12/31/2014	1.1	24	100	13
1/1/2015	0.6	19	79	7
1/2/2015	0.8	24	100	9
1/3/2015	0.6	24	100	7
1/4/2015	1	24	100	11
1/5/2015	1.9	24	100	22
1/6/2015	1.4	24	100	16
1/7/2015	1	24	100	11
1/8/2015	0.9	24	100	10
1/9/2015	1.2	24	100	14
1/10/2015	1.1	24	100	13
1/11/2015	0.6	24	100	7
1/12/2015	1	24	100	11
1/13/2015	0.9	24	100	10
1/14/2015	0.7	24	100	8
1/15/2015	1	24	100	11
1/16/2015	1.4	24	100	16
1/17/2015	1.3	24	100	15
1/18/2015	0.7	24	100	8
1/19/2015	1.2	24	100	14
1/20/2015	1.1	24	100	13
1/21/2015	0.7	24	100	8
1/22/2015	1	24	100	11
1/23/2015	1.1	24	100	13
1/24/2015	0.8	24	100	9
1/25/2015	0.7	24	100	8
1/26/2015	1.3	18	75	15
1/27/2015	1.2	24	100	14
1/28/2015	0.8	24	100	9
1/29/2015	1	24	100	11
1/30/2015	0.8	24	100	9
1/31/2015	0.6	24	100	7
2/1/2015	0.6	24	100	7
2/2/2015	0.9	24	100	10
2/3/2015	0.8	24	100	9
2/4/2015	0.6	24	100	7
2/5/2015	1.5	24	100	17

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
2/6/2015	0.9	24	100	10
2/7/2015	0.5	24	100	6
2/8/2015	0.6	24	100	7
2/9/2015	0.8	24	100	9
2/10/2015	1	24	100	11
2/11/2015	1.1	24	100	13
2/12/2015	1.6	24	100	18
2/13/2015	1.7	24	100	19
2/14/2015	1.7	24	100	19
2/15/2015	1.2	24	100	14
2/16/2015	1.3	24	100	15
2/17/2015	1.5	24	100	17
2/18/2015	1.6	24	100	18
2/19/2015	1.7	24	100	19
2/20/2015	0.9	24	100	10
2/21/2015	0.9	24	100	10
2/22/2015	0.9	24	100	10
2/23/2015	1.1	24	100	13
2/24/2015	1.3	24	100	15
2/25/2015	1.3	24	100	15
2/26/2015	0.8	24	100	9
2/27/2015	0.6	24	100	7
2/28/2015	1	24	100	11
3/1/2015	1.3	24	100	15
3/2/2015	0.7	24	100	8
3/3/2015	0.6	24	100	7
3/4/2015	1.1	24	100	13
3/5/2015	1.4	24	100	16
3/6/2015	1.7	24	100	19
3/7/2015	1.6	24	100	18
3/8/2015	1.1	24	100	13
3/9/2015	0.8	24	100	9
3/10/2015	1.6	24	100	18
3/11/2015	1.4	24	100	16
3/12/2015	0.7	24	100	8
3/13/2015	0.8	24	100	9
3/14/2015	0.8	24	100	9
3/15/2015	0.8	24	100	9
3/16/2015	0.6	24	100	7
3/17/2015	0.9	24	100	10
3/18/2015	0.7	24	100	8
3/19/2015	1.1	24	100	13

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
3/20/2015	1.1	20	83	13
3/21/2015	1.1	24	100	13
3/22/2015	0.4	24	100	5
3/23/2015	0.7	24	100	8
3/24/2015	0.8	24	100	9
3/25/2015	0.8	24	100	9
3/26/2015	1.1	24	100	13
3/27/2015	1	24	100	11
3/28/2015	0.7	24	100	8
3/29/2015	0.5	24	100	6
3/30/2015	0.9	24	100	10
3/31/2015	0.8	24	100	9
4/1/2015	0.8	24	100	9
4/2/2015	0.7	24	100	8
4/3/2015	0.8	24	100	9
4/4/2015	0.5	24	100	6
4/5/2015	0.6	24	100	7
4/6/2015	0.7	24	100	8
4/7/2015	0.4	24	100	5
4/8/2015	0.5	24	100	6
4/14/2015	0.5	24	100	6
4/15/2015	0.6	24	100	7
4/16/2015	0.7	18	75	8
4/17/2015	0.7	24	100	8
4/18/2015	0.7	24	100	8
4/19/2015	0.8	24	100	9
4/20/2015	0.6	24	100	7
4/21/2015	0.7	24	100	8
4/22/2015	0.5	24	100	6
4/23/2015	0.7	24	100	8
4/24/2015	0.7	24	100	8
4/25/2015	0.6	24	100	7
4/26/2015	0.6	24	100	7
4/27/2015	0.7	24	100	8
5/1/2015	0.7	24	100	8
5/2/2015	0.5	24	100	6
5/3/2015	0.6	24	100	7
5/4/2015	0.5	24	100	6
5/5/2015	0.4	24	100	5
5/6/2015	0.5	24	100	6
5/7/2015	0.4	24	100	5
5/8/2015	0.5	24	100	6

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
5/9/2015	0.6	24	100	7
5/10/2015	0.6	24	100	7
5/11/2015	0.4	24	100	5
5/12/2015	0.3	24	100	3
5/13/2015	0.9	24	100	10
5/14/2015	0.5	24	100	6
5/15/2015	0.5	24	100	6
5/16/2015	0.6	24	100	7
5/17/2015	0.5	24	100	6
5/18/2015	0.4	24	100	5
5/19/2015	0.3	24	100	3
5/20/2015	0.5	24	100	6
5/21/2015	0.5	24	100	6
5/22/2015	0.6	24	100	7
5/23/2015	0.4	24	100	5
5/24/2015	0.4	24	100	5
5/25/2015	0.6	24	100	7
5/26/2015	0.8	24	100	9
5/27/2015	0.6	24	100	7
5/28/2015	0.6	24	100	7
5/29/2015	0.7	24	100	8
5/30/2015	0.5	24	100	6
5/31/2015	0.5	24	100	6
6/1/2015	0.7	24	100	8
6/2/2015	0.6	24	100	7
6/3/2015	0.6	24	100	7
6/4/2015	0.5	24	100	6
6/5/2015	0.5	24	100	6
6/6/2015	0.6	24	100	7
6/7/2015	0.5	24	100	6
6/8/2015	0.5	24	100	6
6/9/2015	0.4	24	100	5
6/10/2015	0.5	24	100	6
6/11/2015	0.4	24	100	5
6/12/2015	0.2	24	100	2
6/13/2015	0.2	24	100	2
6/14/2015	0.3	24	100	3
6/15/2015	0.2	24	100	2
6/16/2015	0.4	24	100	5
6/17/2015	0.4	24	100	5
6/18/2015	0.4	24	100	5
6/19/2015	0.2	24	100	2

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
6/20/2015	0.2	24	100	2
6/21/2015	0.2	24	100	2
7/9/2015	0.7	24	100	8
7/10/2015	0.7	24	100	8
7/11/2015	0.6	24	100	7
7/12/2015	0.4	24	100	5
7/13/2015	0.6	24	100	7
7/14/2015	0.6	24	100	7
7/15/2015	0.5	24	100	6
7/16/2015	0.4	24	100	5
7/17/2015	0.5	24	100	6
7/18/2015	0.5	24	100	6
7/19/2015	0.5	24	100	6
7/20/2015	0.5	24	100	6
7/21/2015	0.4	24	100	5
7/22/2015	0.5	24	100	6
7/23/2015	0.5	24	100	6
7/24/2015	0.4	24	100	5
7/25/2015	0.3	24	100	3
7/26/2015	0.3	24	100	3
7/27/2015	0.4	24	100	5
7/28/2015	0.5	24	100	6
7/29/2015	0.5	24	100	6
7/30/2015	0.7	24	100	8
7/31/2015	0.7	24	100	8
8/1/2015	0.8	24	100	9
8/2/2015	0.9	24	100	10
8/3/2015	0.8	24	100	9
8/4/2015	0.6	24	100	7
8/5/2015	0.5	24	100	6
8/6/2015	0.5	24	100	6
8/7/2015	0.9	24	100	10
8/8/2015	0.7	24	100	8
8/9/2015	0.6	24	100	7
8/10/2015	0.7	24	100	8
8/11/2015	0.7	24	100	8
8/12/2015	0.9	24	100	10
8/13/2015	0.9	24	100	10
8/14/2015	0.8	24	100	9
8/15/2015	0.5	24	100	6
8/16/2015	0.5	24	100	6
8/17/2015	0.7	24	100	8

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
8/18/2015	0.8	24	100	9
8/19/2015	0.9	24	100	10
8/20/2015	0.6	24	100	7
8/21/2015	1.7	24	100	19
8/22/2015	1	24	100	11
8/23/2015	1.1	24	100	13
8/24/2015	1.1	24	100	13
8/25/2015	0.8	24	100	9
8/26/2015	1.3	24	100	15
8/27/2015	1.3	24	100	15
8/28/2015	1	24	100	11
8/29/2015	0.9	24	100	10
8/30/2015	0.3	24	100	3
8/31/2015	0.6	24	100	7
9/1/2015	0.6	24	100	7
9/2/2015	0.5	24	100	6
9/3/2015	0.5	24	100	6
9/4/2015	0.4	24	100	5
9/5/2015	0.5	24	100	6
9/6/2015	0.5	24	100	6
9/7/2015	0.6	24	100	7
9/8/2015	0.8	24	100	9
9/9/2015	0.8	24	100	9
9/10/2015	0.9	24	100	10
9/11/2015	1.1	24	100	13
9/12/2015	1.1	24	100	13
9/13/2015	0.9	24	100	10
9/14/2015	0.5	24	100	6
9/15/2015	0.6	24	100	7
9/16/2015	0.8	24	100	9
9/17/2015	0.7	24	100	8
9/18/2015	0.8	24	100	9
9/19/2015	0.7	24	100	8
9/20/2015	0.3	24	100	3
9/21/2015	0.7	24	100	8
9/22/2015	0.7	24	100	8
9/23/2015	0.9	24	100	10
9/24/2015	1.3	24	100	15
9/25/2015	1.3	24	100	15
9/26/2015	1	24	100	11
9/27/2015	0.7	24	100	8
9/28/2015	1	24	100	11

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
9/29/2015	1.3	24	100	15
9/30/2015	1.3	24	100	15
10/1/2015	1.4	24	100	16
10/2/2015	1.4	24	100	16
10/3/2015	0.5	24	100	6
10/4/2015	0.6	24	100	7
10/5/2015	1.1	24	100	13
10/6/2015	1.1	24	100	13
10/7/2015	0.8	24	100	9
10/8/2015	0.5	24	100	6
10/9/2015	1	24	100	11
10/10/2015	0.7	24	100	8
10/11/2015	0.5	24	100	6
10/12/2015	0.7	24	100	8
10/13/2015	0.7	24	100	8
10/14/2015	1	24	100	11
10/15/2015	1	24	100	11
10/16/2015	1	24	100	11
10/17/2015	0.8	24	100	9
10/18/2015	0.7	24	100	8
10/19/2015	1	24	100	11
10/20/2015	1.2	24	100	14
10/21/2015	1.4	24	100	16
10/22/2015	1.4	24	100	16
10/23/2015	1.6	24	100	18
10/24/2015	1.5	24	100	17
10/25/2015	0.7	24	100	8
10/26/2015	0.7	24	100	8
10/27/2015	0.5	24	100	6
10/28/2015	0.8	24	100	9
10/29/2015	1	24	100	11
10/30/2015	0.6	24	100	7
10/31/2015	0.5	24	100	6
11/1/2015	0.4	24	100	5
11/2/2015	0.8	24	100	9
11/3/2015	1.1	24	100	13
11/4/2015	1.3	24	100	15
11/5/2015	1.1	24	100	13
11/6/2015	1	24	100	11
11/7/2015	0.9	24	100	10
11/8/2015	0.8	24	100	9
11/9/2015	0.7	24	100	8

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
11/10/2015	1.2	24	100	14
11/11/2015	0.7	24	100	8
11/12/2015	0.9	24	100	10
11/13/2015	0.5	24	100	6
11/14/2015	0.8	24	100	9
11/15/2015	0.8	24	100	9
11/16/2015	0.7	24	100	8
11/17/2015	0.4	24	100	5
11/18/2015	0.5	24	100	6
11/19/2015	1.3	24	100	15
11/20/2015	2.1	24	100	24
11/21/2015	2.8	24	100	32
11/22/2015	2.9	24	100	33
11/23/2015	2.9	24	100	33
11/24/2015	1	24	100	11
11/25/2015	1.5	24	100	17
11/26/2015	1.6	24	100	18
11/27/2015	1.7	24	100	19
11/28/2015	1.6	24	100	18
11/29/2015	0.3	24	100	3
11/30/2015	0.5	24	100	6
12/1/2015	0.3	24	100	3
12/2/2015	0.7	24	100	8
12/3/2015	1.2	24	100	14
12/4/2015	1	24	100	11
12/5/2015	1	24	100	11
12/6/2015	0.6	24	100	7
12/7/2015	0.8	24	100	9
12/8/2015	0.6	24	100	7
12/9/2015	0.5	24	100	6
12/10/2015	0.6	24	100	7
12/11/2015	1	24	100	11
12/12/2015	0.8	24	100	9
12/13/2015	0.5	24	100	6
12/14/2015	0.8	24	100	9
12/15/2015	0.7	24	100	8
12/16/2015	0.6	24	100	7
12/17/2015	0.6	24	100	7
12/18/2015	1.4	24	100	16
12/19/2015	1.1	24	100	13
12/20/2015	0.7	24	100	8
12/21/2015	1.1	24	100	13

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
12/22/2015	0.9	24	100	10
12/23/2015	0.9	24	100	10
12/24/2015	0.8	24	100	9
12/25/2015	0.5	24	100	6
12/26/2015	0.6	24	100	7
12/27/2015	0.5	24	100	6
12/28/2015	0.7	24	100	8
12/29/2015	0.8	24	100	9
12/30/2015	0.8	24	100	9
12/31/2015	1.6	24	100	18
1/1/2016	0.9	19	79	10
1/2/2016	0.9	24	100	10
1/3/2016	0.8	24	100	9
1/4/2016	0.7	24	100	8
1/5/2016	0.7	24	100	8
1/6/2016	1	24	100	11
1/7/2016	1.1	24	100	13
1/8/2016	1.1	24	100	13
1/9/2016	1	24	100	11
1/10/2016	0.7	24	100	8
1/11/2016	1	24	100	11
1/12/2016	1.1	24	100	13
1/13/2016	0.9	24	100	10
1/14/2016	1.1	24	100	13
1/15/2016	1.3	24	100	15
1/16/2016	1	24	100	11
1/17/2016	0.9	24	100	10
1/18/2016	1	24	100	11
1/19/2016	1	24	100	11
1/20/2016	0.9	24	100	10
1/21/2016	1.2	24	100	14
1/22/2016	1.6	24	100	18
1/23/2016	1.5	24	100	17
1/24/2016	0.8	24	100	9
1/25/2016	1.3	24	100	15
1/26/2016	1.4	24	100	16
1/27/2016	1.1	24	100	13
1/28/2016	1	24	100	11
1/29/2016	1.1	24	100	13
1/30/2016	1	24	100	11
1/31/2016	0.9	24	100	10
2/1/2016	1.1	24	100	13

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
2/2/2016	1.2	24	100	14
2/3/2016	1.2	24	100	14
2/4/2016	1.3	24	100	15
2/5/2016	1.3	24	100	15
2/6/2016	1	24	100	11
2/7/2016	1.1	24	100	13
2/8/2016	1.8	24	100	20
2/9/2016	2	24	100	23
2/10/2016	2	24	100	23
2/11/2016	1.5	24	100	17
2/12/2016	1	24	100	11
2/13/2016	0.7	24	100	8
2/14/2016	0.8	24	100	9
2/15/2016	0.8	24	100	9
2/16/2016	1.2	24	100	14
2/17/2016	1	24	100	11
2/18/2016	0.8	24	100	9
2/19/2016	1.2	24	100	14
2/20/2016	1	24	100	11
2/21/2016	1	24	100	11
2/22/2016	1.2	24	100	14
2/23/2016	1.4	24	100	16
2/24/2016	1.4	24	100	16
2/25/2016	1.6	24	100	18
2/26/2016	1.5	24	100	17
2/27/2016	1.2	24	100	14
2/28/2016	0.8	24	100	9
2/29/2016	0.9	24	100	10
3/1/2016	1.1	19	79	13
3/2/2016	0.9	24	100	10
3/3/2016	0.8	24	100	9
3/4/2016	1	24	100	11
3/5/2016	0.8	24	100	9
3/6/2016	0.4	24	100	5
3/7/2016	0.6	24	100	7
3/8/2016	0.7	24	100	8
3/9/2016	0.6	24	100	7
3/10/2016	0.5	24	100	6
3/11/2016	0.8	24	100	9
3/12/2016	0.7	24	100	8
3/13/2016	0.4	24	100	5
3/14/2016	0.3	24	100	3

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
3/15/2016	0.5	24	100	6
3/16/2016	0.5	24	100	6
3/17/2016	0.6	24	100	7
3/18/2016	0.6	24	100	7
3/19/2016	0.7	24	100	8
3/20/2016	0.8	24	100	9
3/21/2016	0.8	24	100	9
3/22/2016	1.1	24	100	13
3/23/2016	0.9	24	100	10
3/24/2016	0.7	24	100	8
3/25/2016	0.8	24	100	9
3/26/2016	0.9	24	100	10
3/27/2016	0.8	24	100	9
3/28/2016	1	24	100	11
3/29/2016	1	24	100	11
3/30/2016	1	24	100	11
3/31/2016	1	24	100	11
4/1/2016	1.2	24	100	14
4/2/2016	1.3	24	100	15
4/3/2016	1	24	100	11
4/4/2016	1	24	100	11
4/5/2016	0.8	24	100	9
4/6/2016	0.6	24	100	7
4/7/2016	0.7	24	100	8
4/8/2016	0.9	24	100	10
4/9/2016	0.7	24	100	8
4/10/2016	0.6	24	100	7
4/11/2016	0.8	24	100	9
4/12/2016	0.8	24	100	9
4/13/2016	0.8	24	100	9
4/14/2016	0.9	24	100	10
4/15/2016	1.1	24	100	13
4/16/2016	1	24	100	11
4/17/2016	1	24	100	11
4/18/2016	1	24	100	11
4/19/2016	1	24	100	11
4/20/2016	1.3	24	100	15
4/21/2016	1.3	24	100	15
4/22/2016	1	24	100	11
4/23/2016	1	24	100	11
4/24/2016	0.8	24	100	9
4/25/2016	0.9	24	100	10

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
4/26/2016	0.9	24	100	10
4/27/2016	0.8	18	75	9
4/28/2016	0.7	24	100	8
4/29/2016	1	24	100	11
4/30/2016	0.8	24	100	9
5/1/2016	0.8	24	100	9
5/2/2016	0.9	24	100	10
5/3/2016	1	24	100	11
5/4/2016	0.9	24	100	10
5/5/2016	0.6	24	100	7
5/6/2016	0.5	24	100	6
5/7/2016	0.5	24	100	6
5/8/2016	0.4	24	100	5
5/9/2016	0.7	24	100	8
5/10/2016	0.6	24	100	7
5/11/2016	0.6	24	100	7
5/12/2016	0.4	24	100	5
5/13/2016	0.2	24	100	2
5/14/2016	0.4	24	100	5
5/15/2016	0.5	24	100	6
5/16/2016	0.6	24	100	7
5/17/2016	0.5	24	100	6
5/18/2016	0.5	24	100	6
5/19/2016	0.5	24	100	6
5/20/2016	0.4	24	100	5
5/21/2016	0.4	24	100	5
5/22/2016	0.3	24	100	3
5/23/2016	0.8	24	100	9
5/24/2016	0.5	24	100	6
5/25/2016	0.5	18	75	6
5/26/2016	0.4	24	100	5
5/27/2016	0.4	24	100	5
5/28/2016	0.4	24	100	5
5/29/2016	0.4	24	100	5
5/30/2016	0.3	24	100	3
5/31/2016	0.5	24	100	6
6/1/2016	0.5	24	100	6
6/2/2016	0.4	24	100	5
6/3/2016	0.4	24	100	5
6/4/2016	0.5	24	100	6
6/5/2016	0.6	24	100	7
6/6/2016	0.5	24	100	6

Table A-3: Carbon Monoxide Concentrations - Spokane-Spokane Valley, Washington

Date	Daily Max 8-hour CO Concentration (ppm)	Daily Observation Count	Percent Complete	Daily AQI Value
6/7/2016	0.6	24	100	7
6/8/2016	0.6	24	100	7
6/9/2016	0.4	24	100	5
6/10/2016	0.8	24	100	9
6/11/2016	0.6	24	100	7
6/12/2016	0.6	24	100	7
6/13/2016	0.6	24	100	7
6/14/2016	0.5	24	100	6
6/15/2016	0.5	24	100	6
6/16/2016	0.5	24	100	6
6/17/2016	0.5	24	100	6
6/18/2016	0.4	24	100	5
6/19/2016	0.4	24	100	5
6/20/2016	0.5	24	100	6
6/21/2016	0.5	24	100	6
6/22/2016	0.7	24	100	8
6/23/2016	0.7	24	100	8
6/24/2016	0.8	24	100	9
6/25/2016	0.6	24	100	7
6/26/2016	0.6	24	100	7
6/27/2016	0.7	24	100	8
6/28/2016	0.9	24	100	10
6/29/2016	0.8	24	100	9
6/30/2016	0.8	24	100	9

Notes:

Spokane-Spokane Valley, WA (AQS Site ID 53-063-0049)

AQI = Air Quality Index

CO = carbon monoxide

Max = maximum

ppm = parts per million

Appendix B:
Power Consulting Incorporated Economic Report

The Economic Impact of Redesignation of the Kalispel Indian Reservation as a Class I Area under the Clean Air Act's Prevention of Significant Deterioration Program

A Report Prepared for
The Kalispel Tribe of Indians

by

Power Consulting Incorporated

Thomas Michael Power
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February 3, 2017

About the Authors:

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He received his undergraduate degree in Physics from Lehigh University and his MA and PhD in Economics from Princeton University.

Donovan S. Power received his undergraduate degree in Geosciences at the University of Montana and his Master of Science in Geology from the University of Washington. He has been the Principal Scientist at Power Consulting, Inc. for the past ten years.

The Economic Impact of Redesignation of the Kalispel Indian Reservation as a Class I Area Under the Clean Air Act's Prevention of Significant Deterioration Program

Executive Summary

The Kalispel Tribe of Indians (Kalispel Tribe or Tribe) is proposing to redesignate the Kalispel Indian Reservation as a Class I area under the Clean Air Act's Prevention of Significant Deterioration (PSD) program. The Tribe contracted with Power Consulting to provide a description and analysis of the economic effects of the Class I redesignation as required by federal regulations. This report provides that analysis.

The conceptual and empirical analysis provided in the main body of this report supports the following conclusions about the likely economic impact of the Kalispel Reservation being redesignated as a Class I air quality area.

i. An analysis of workers' commuting patterns to work and other relevant factors identified the integrated economic area in which the Kalispel Reservation is embedded. That economic area includes Pend Oreille, Stevens, and Spokane Counties. In this report that economic region is labeled the Kalispel Reservation Economic Area**.**

ii. The available evidence indicates that Class I air quality redesignation and other efforts to protect and enhance air quality, while improving local health and well-being, do not damage local economic vitality.

iii. A half-century of research has demonstrated that protecting and improving air quality protects health, reduces premature death, increases worker productivity, enhances local quality of life, boosts local property values, and otherwise enhances local economic well-being as well as local economic vitality.

iv. Structural changes in the Kalispel Reservation Economic Area over the last several decades have decreased the likelihood that Class I air quality redesignation would limit economic development.

v. The analysis of the economy of the Kalispel Reservation Economic Area identified several sources of ongoing regional economic vitality. They include:

- Rapid growth in health care, other professional and technical services, local and state government, finance, utilities and transportation, and visitor services.

- Rapid growth in sources of income unrelated to current employment including retirement and investment income. By 2014 less than 60 percent of total income received by individuals and households was associated with current employment.
- For the two rural counties in the Kalispel Reservation Economic Area, Pend Oreille and Stevens County, residents commuting out to jobs in Spokane County brought a substantial flow of income back into the rural counties of their residence. This income associated with commuting out to work added 30 percent to the total labor earnings in these two rural counties.

vi. That same economic transformation of the Reservation area economy has also increased the value of clean air to local economic vitality while decreasing the likelihood that more stringent air quality standards would constrain local economic vitality.

vii. It is possible that Class I air quality redesignation of the Kalispel Reservation could block the development of heavily polluting industrial facilities within the Kalispel Reservation Economic Area if such facilities are not willing or able to clean up their air emissions. This could potentially lead to the loss of the jobs, payroll, and government revenues that might have come from having such an industrial facility in the local economic area. However, Class I redesignation of the Kalispel Reservation would not necessarily have this consequence since such a polluting facility might well be able to locate elsewhere in the Kalispel Reservation Economic Area and/or change the pollution characteristics and scale of the polluting facility. Choosing an alternative location and/or technology could avoid violating the Class I designation of the Reservation while continuing to provide expanded economic opportunity to the Kalispel Reservation Economic Area. Based on economic trends within this economic area, it is also likely that any economic benefits associated with heavily polluting industrial facilities would be offset by other forms of economic development that have smaller environmental footprints and would be less likely to impair amenities that contribute to local economic vitality and well-being.

Table of Contents

I. Introduction to and Outline of This Report

The Kalispel Tribe of Indians is proposing to redesignate the Kalispel Reservation a Class I air quality area under the Clean Air Act's Prevention of Significant Deterioration (PSD) program. In support of this proposal, the Kalispel Tribe has contracted with Power Consulting to provide a "description and analysis" of the economic effects of the proposed redesignation as required by the Clean Air Act.[1]

1. Class I Redesignation of the Kalispel Reservation

The Kalispel Tribe is pursuing Class I redesignation of its Reservation in order to protect the health and quality of life of its members and other residents of the Reservation and the region surrounding the Reservation.[2] Avoiding air quality deterioration also helps to protect water quality, the health of fish, wildlife, and natural systems, and the natural and cultural heritage of the Reservation and the larger region. These outcomes, in turn, will affect the *economic vitality* of the Reservation area, including the surrounding counties, and the *economic well-being* of the residents of that area.[3]

An analysis of the economic effects of imposing stricter limits on air quality deterioration requires consideration of both the benefits that would result from less air pollution and the costs associated with maintaining that cleaner air. This involves identifying and quantifying the avoided costs of air pollution on residents and businesses, e.g. diminished health, life expectancy, comfort, quality of life, and overall economic vitality, as well as the potential costs air quality protection may impose on more heavily polluting commercial business activity, e.g. the potential loss of the jobs, income, and local tax revenues those businesses might have created.

In order to understand the potential economic impacts of Class I redesignation of the Kalispel Reservation, this report analyzes the benefits and costs described above based on the character of the current economy and the ways in which that economy is changing. Context is critical to the economic analysis because the potential costs depend on the prevalence of industrial activities that may be impacted by the redesignation in the Kalispel Reservation economic area.

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[1] 40 CFR 51.166(g)(2)(iii), 52.21(g).

[2] The Kalispel Tribe's interest in protecting quality of life is shared throughout the region. Tri-County Economic Development District, June 26, 2013. Page 54. http://tricountyedd.com/wp-content/uploads/2013/03/CEDS-2013-2017_2016-Update_Final.pdf ("The Tri-County area will have a diverse economy able to support the highest quality of life that is sustainable and attractive.").

[3] The term *economic vitality* is used to refer to various measures of the level of economic activity such as employment, income, value of production, etc. These measures primarily focus on commercial or market economic activity. *Economic well-being* is used to refer to how well off people perceive themselves to be. That sense of well-being is not only associated with commercial or market activity. Many important sources of well-being are non-commercial or non-market in character, e.g. environmental, cultural, intimate, family, and ethical values.

2. Organization of This Report

Section II of this report describes the economic value and impacts of protecting air quality. It begins by looking at impacts on local economic vitality from Class I designations in National Parks and National Wilderness Areas—the only mandatory Class I areas under the Clean Air Act. The section then looks at how "people voting with their feet" as they pursue cleaner air can be used to determine the value they place on cleaner air. It also looks more broadly at the benefits and costs associated with enforcement of the 1990 amendments to the Clean Air Act. Section II concludes with a discussion of the impacts of air quality regulation on local economic well-being and local economic vitality.

Section III focuses on the regional economy in which the Kalispel Reservation is embedded. Based on the flow of workers between residences and work as well as shopping patterns, a *Kalispel Reservation Economic Area* is identified: the three adjacent counties of Pend Oreille, Stevens, and Spokane. The section provides both a contemporary snap-shot view of that economy as well as a review of the changes that have taken place in that economy over the last forty-five years with a close-up view of trends over the last decade and a half.

That detailed economic analysis lays the basis for Section IV: an analysis of the likely economic impact of adopting stricter air emission standards to protect the Kalispel Reservation from a deterioration of air quality. That section concludes with a discussion of the economic importance of local environmental amenities in attracting and holding businesses, working-age residents, retirees, and visitors. This brings the report full circle to an explanation of why Class I air quality designation has not served as a barrier to local economic vitality in areas adjacent to the original mandatory Class I air quality areas.

II. The Economic Value and Local Economic Impact of Clean Air

1. Economic Impacts of Mandatory Class I Air Quality Designations

The Clean Air Act mandated that all National Parks and larger federally classified National Wilderness Areas be designated Class I air quality areas. All other areas were assigned Class II air quality status as the default designation. This dichotomy provides a natural experiment of sorts to see what the impact of such stricter air quality regulations, as well as the many other restrictions on commercial and non-commercial activities associated with National Parks and Wilderness, have had on local economic vitality.

In most settings, an economic choice involves weighing both costs and benefits. Placing restrictions on the types of activities that can take place in a particular location can be expected to reduce the production of some economic values while encouraging the production and protection of other economic values. What the impact will be on the overall level of economic vitality and well-being will depend on the net impact, a comparison of the gains and losses. On the negative side may be lost economic value because potentially productive activities could not take place at locations close to the

protected area. As a result, employment and income and the total commercial productivity of the economy may be lower. On the other hand, if the restrictions on economic activity were put in place to protect a “gift of nature” that was highly valued by people and that enhanced their quality of life, those restrictions on some economic activities may have prevented the loss of important values (i.e. costs) and maintained the area as one that attracted visitors, residents, and compatible economic activities serving them.

Whether the environmental restrictions associated with National Parks and Wilderness Areas on net had positive or negative impacts on local economic well-being or vitality is an empirical question that cannot be settled conceptually. One has to study how people and businesses actually respond to restrictions on economic activity that are imposed to protect air, water, landscapes, and wildlife as well as human and ecosystem health.

The higher level of environmental protection afforded by National Parks and Wilderness Areas, environmental regulations that extend far beyond Class I air quality restrictions, provides an opportunity to test the impact of some of the most stringent levels of environmental protection found in the nation. National Parks quite severely limit private economic activity and other developments that might significantly damage the natural landscapes the National Park was intended to protect. In addition, hunting is prohibited, and permits are usually required for remote camping and activities off of designated trails. In Wilderness Areas, no motorized or even mechanized travel is allowed and no motorized equipment can be used. In addition, new human structures are banned. Hunting is allowed but mechanical devices cannot be used to remove game.

Despite the many restrictions in National Parks and Wilderness Areas, economic indicators from the counties containing these Class I areas suggest that landscape preservation measures have, on net, stimulated local economic vitality. A 2001 study by the authors analyzed various indicators of local economic vitality for all counties in the lower forty-eight states in which large National Parks were located.[4] “Large” was defined as parks with at least 250,000 acres. There were 22 such parks located in 45 counties. The indicators of local economic vitality that were used were growth in population, employment, real per capita income, and aggregate real income. Since most large National Parks are not found in densely settled urban areas, the economic vitality of these National Parks counties was compared to the overall economic vitality of all non-metropolitan counties in the United States.

The results of this comparison demonstrated that the National Park counties had much higher levels of economic vitality, with rates of growth of population, employment, and real income two to four times higher than found in non-metropolitan counties as a whole. See Table 1.

[4] Power, T., The Economic Impact of the Proposed Maine Woods National Park & Preserve. Prepared for RESTORE: The North Woods. September 2001.

Table 1.

Economic Vitality in All Counties Associated with National Parks Larger Than 250,000 Acres				
Measure of Economic Vitality	Percentage Change 10 Years 1989-1998	Percentage Change 30 Years 1969-1998	Growth Relative to US 10 Years 1989-1998	Growth Relative to US 30 Years 1969-1998
Population	24%	135%	2.5	3.9
Jobs	34%	205%	2.0	2.7
Aggregate Real Income	37%	255%	1.7	2.2
Real Per Capita Income	11%	52%	0.9	0.9
Source: US Dept. Commerce BEA-REIS				

Whatever the impact of the stricter environmental restrictions on air, water, land, and wildlife use, it did not appear to be retarding local economic vitality in adjacent communities.[5]

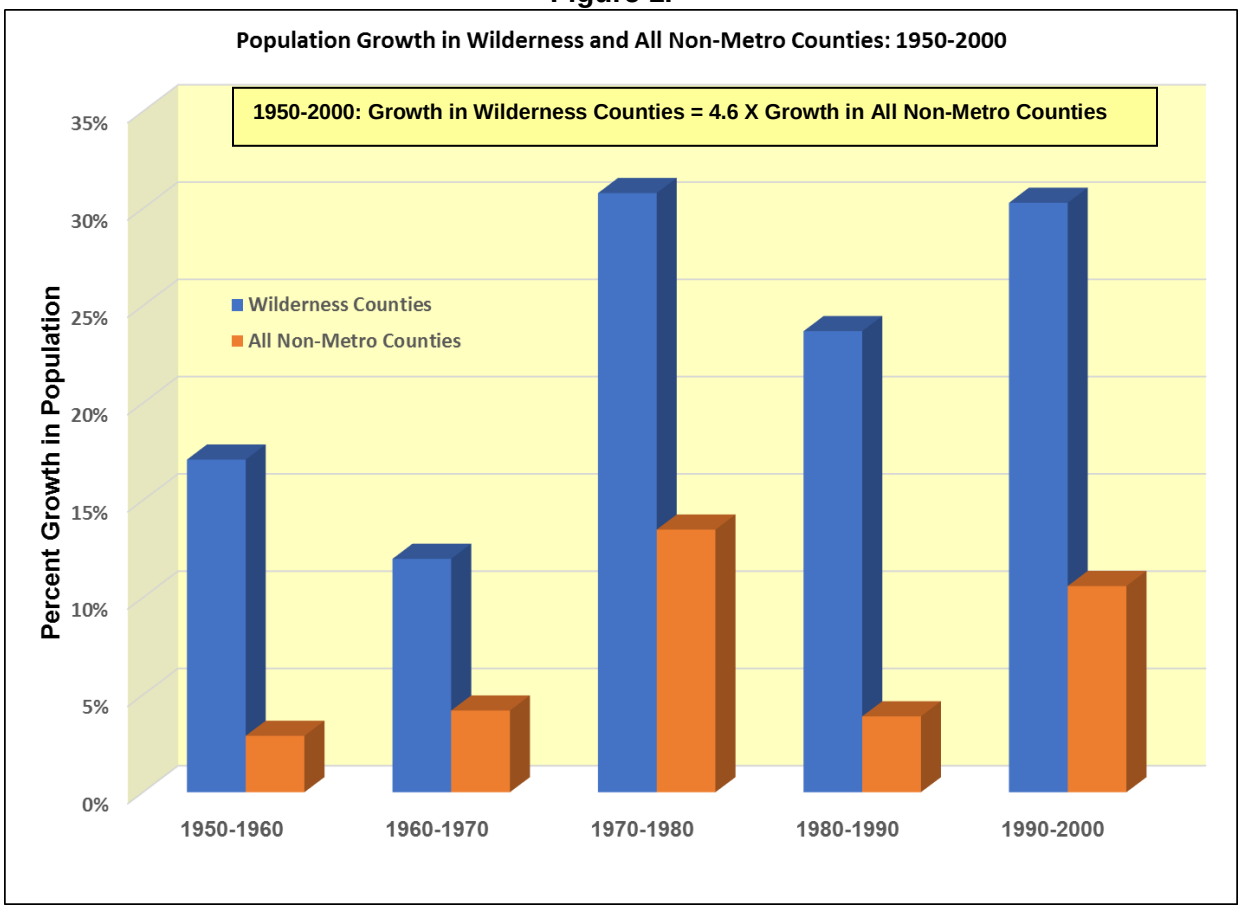
Similar results were found by Homes and Hecox who compared rural counties with and without National Wilderness Areas in them.[6] They found that "there is a significant positive correlation between the percent of land in designated wilderness and population, income, and employment growth." Similar to the findings of the authors of the current report, Homes and Hecox found that there was almost a two-fold increase in annual average growth in income and employment for rural counties with National Wilderness Areas compared to rural counties without wilderness.

Other analysis of National Wilderness Areas also indicates higher levels of economic vitality compared to all non-metropolitan areas. Over the last half-century, the population growth rates in National Wilderness counties has been two to six times that of non-metropolitan counties as a whole. The decade-by-decade comparison between 1950 and 2000 is shown in Figure 1. For the period as a whole, population growth rates in the Wilderness Counties were almost five times those in non-metro counties as a whole.

[5] Ibid. Chapter III, The Role of National Parks in Promoting Local Economic Vitality. It will be noted that in the table above, per capita income *was* somewhat lower in the National Park counties. This is what economists would expect in areas that are attractive to residents. They will draw a somewhat excess labor supply that is willing to sacrifice a certain amount of income to be able to gain access to the higher local quality of life. Local home prices and the local cost of living may also be higher, another cost of gaining access to valuable local amenities.

[6] Holmes, P., and Hecox, W. Does Wilderness Impoverish Rural Regions? *International Journal of Wilderness.* Volume 10 number 4. December 2004.

Figure 1. [7]



A 2007 study of "the effects of wilderness on population and employment growth in the eleven western states" reviewed the impact of restrictions regarding the commercial development of natural landscapes on the economic vitality of communities within commuting distance of those protected landscapes.[8] The degree of protection imposed on different landscapes distinguished among four classifications. The most restrictive classification included National Parks, National Wilderness Areas, and Nature Preserves. At the other end of the spectrum were landscapes with no known public or private institutional mandates or legally recognized easement that would prevent conversion from natural habitat to human-chosen habitats.[9] The conclusions of that study were consistent with the analyses cited above:

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[7] Rudzitis, G., and Johnson, R. The Impact of Wilderness and Other Wildlands on Local Economies and Regional Development Trends. *Wilderness Science in a Time of Change Conference—Volume 2: Wilderness within the Context of Larger Systems,* RMRS-P-15-VOL 2. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, 2000. Table 1, page 15.

[8] Silbaugh, Matthew Larson. *"*Evaluating the Effects of Wilderness on Population and Employment Growth in the Eleven Western States.*"* Master Thesis, The University of Montana. 2007. http://scholarworks.umt.edu/etd/396/ One of the current authors, T.M. Power, served on the thesis committee that guided that study and approved the thesis.

[9] Ibid. p. 59.

> The empirical evidence suggest that population is attracted to land with a conservation mandate, and that this population increases employment. There is also additional evidence that employment opportunities increase as a direct result of protected landscapes. In addition to these primary findings, population was attracted to a more diverse set of conservation land in the 1990s than in the 1980s, but the positive effect of conservation land on employment decreased in the 1990s. Nonetheless, there is no evidence that any sector of employment is harmed by land management policies with a conservation mandate.[10]

The foregoing discussion underlines the fact that strict environmental regulation does not necessarily impede local economic vitality. The Kalispel Reservation may not contain a landscape of comparable *national* significance to a National Park or Wilderness Area, but neither does it have the degree of environmental restriction. Accurately assessing the net economic impact of redesignating the Kalispel Reservation a Class I airshed requires discussion of the commodity at issue: clean air. That is the focus of the next section.

2. The Economic Value of Clean Air

Air pollution can, among other things, drastically change visibility by creating a haze that blocks or obscures vistas and generally diffuses sunlight. But it can also impact human health and longevity. The EPA briefly outlines the impact of air pollution on human health by saying:

> Short- and/or long-term exposure to air pollution has been associated with a wide range of human health effects including increased respiratory symptoms, hospitalization for heart or lung diseases, and even premature death. Hazardous (or toxic) air pollutants, may cause cancer or other serious health effects, such as reproductive effects or birth defects.[11]

These aesthetic and health impacts are widely recognized and, where possible, people have systemically avoided the air pollution responsible for these problems at substantial cost to themselves. This can be seen in how people treat air pollution when they go about purchasing or renting a place to live. For instance, the Los Angeles area, in past decades was infamous for its air pollution. But not all of that metropolitan area suffers equally from the pollution. Because of the city's rolling terrain and the presence of the Pacific Ocean, some neighborhoods regularly have good air quality while others suffer. This allows a pairing of neighborhoods with similar housing and socioeconomic and community characteristics but significant differences in air quality. In such situations, statistical analysis can be carried out to isolate the impact of air quality alone on

[10] Ibid. p. ii.
[11] EPA. Human Health, Environmental and Economic Assessments. https://www.epa.gov/air-quality-management-process/human-health-environmental-and-economic-assessments

property values when other characteristics of the property such as crime rates, housing density, age of house, income levels, etc. are statistically held constant.

Economists have been using these statistical tools to study the damage done by air pollution for many decades. This report presents studies going as far back as the late 1970s using data from the 1960s as well as more recent studies. All of these studies document the economic value of clean air, not as judged by environmental advocates or government agencies, but as indicated by the actual economic sacrifices ordinary people make to escape air pollution.

A 1995 study provided a review of twenty-five separate studies of the impact of air quality on property values across the United States.[12] These analyses indicated that, when buying housing in higher-income neighborhoods, families were willing to pay the equivalent of about $587 per month more for better air quality. For lower-income neighborhoods, the figure was about $170 per month for the same air-quality improvement.[13] The air-quality improvement represented a reduction of about 60 percent in both nitrogen dioxide and suspended particulate. If one assumes that low-income households have the same ability to enjoy clean air as their more affluent fellow citizens but simply do not have the income to express that desire as strongly when bidding in housing markets, then the value of clean air in the high-income neighborhoods might be taken as indicating the relative economic importance of clean air when income does not limit expression of that importance.

The Los Angeles region has become a symbol of an affluent lifestyle built around materialism and commercialism. Yet, as mentioned above, Southern Californians have been willing to spend considerable shares of their income pursuing cleaner air: $587 per month is $7,000 per year and $210,000 over the life of a 30-year mortgage. These voluntary payments to gain access to clean air provide empirical evidence of the economic value of clean air to these people, and presumably, to most of the rest of the population. Studies of other cities have produced similar results as have studies of higher pay that has to be offered to highly mobile professionals to get them to locate in more heavily polluted areas.[14]

A 2005 study by Chay and Gladstone[15] looked at the implementation of the Clean Air Act in the 1970s and compared “nonattainment” counties that were being regulated for their total suspended particulate (TSP) to those that were not. The increased air quality regulation in nonattainment communities led a large drop in air pollution which coincided

[12] Smith, K., and Huang, J. Can Markets Value Air Quality? A Meta-Analysis of Hedonic Property Value Models. *Journal of Political Economy* 103(1):209-227. 1995.
[13] Brookshire, F. et al. Valuing Public Goods: A Comparison of Survey and Hedonic Approaches. *American Economic Review*. 72(1): 165-177. 1982. Values restated in 2010 dollars.
[14] Harrison, J., and Rubinfeld, L. Hedonic Housing Prices and the Demand for Clean Air. *Journal of Environmental Economics*. 5: 81-102. 1978; Bayless, M. Measuring the Benefits of Air Quality Improvements: A Hedonic Salary Approach. *Journal of Environmental Economic and Management*. 9: 81-99. 1982; Cropper, M. The Value of Urban Amenities. *Journal of Regional Science*. 21(3): 359-374. 1981.
[15] Chay, K. and Greenstone, M. Does Air Quality Matter? Evidence from the Housing Market. *Journal of Political Economy.* Vol. 113, No. 2. April 2005.

with a substantial increase in property values. "Welfare calculations suggest that the mid-1970s TSPs nonattainment designation provided a $45 billion aggregate gain for homeowners in nonattainment counties." The study went on to show that home prices went up in the nonattainment counties by 4.8 percent in the 1970s and 3.9 percent in the 1980s, resulting in $80 billion of aggregate economic gains in the 1970s and $50 billion of benefits in the 1980s.[16]

If these older results are applied to all American households or workers, improved air quality is worth hundreds of billions of dollars nationwide.

More recent studies have focused on the question of whether adopting more stringent air quality standards has a negative impact on local economic vitality. In 1996 Michael E. Porter wrote an influential article that concluded that environmental regulation did not reduce the economic competitiveness of firms and regions subject to more stringent regulation.[17] What became the "Porter Hypothesis" argued that firms react in an entrepreneurial fashion to the stricter pollution regulations. Those regulations forced them to study their production processes and retool. In doing so, their innovations and investments not only reduce pollution emissions but also increase the productivity of their overall production processes, actually increasing their competitiveness. This is not a startling result. Economists have long argued that competition among firms does not just force firms out of business because their profit margins have been reduced. That competition also forces all firms to innovate and find new ways of reducing costs and improving quality so that they can survive. The "Porter Hypothesis" simply extends that response to pressures on profits from environmental regulations.

A 2010 study reviewing the economic benefits of the Clean Air Act by the Small Business Majority and the Main Street Alliance[18] found the Porter Hypothesis applied readily to the Clean Air Act. Between 1977 and 1991, the Clean Air Act led to the creation of 1.3 million jobs while creating technologies like the catalytic converter that is now ubiquitous on automobiles. While key industry groups have routinely decried the cost of implementation,[19] and the EPA itself has often overestimated the costs of compliance with the Clean Air Act, the reality has been compliance costs well below those predicted by industry and government organizations.[20] Other studies have

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[16] Davis, M. Cleaner Air Results in Higher Home Prices. The National Bureau of Economic Research. http://www.nber.org/digest/mar99/w6826.html

[17] Porter, M. and Van der Linde, C. Toward a New Conception of the Environmental-Competitiveness Relationship. *Journal of Economic Perspectives* 9(4):97-118. 1996.

[18] Van Atten, C. and Hoffman-Andrews, L. The Clean Air Act's Economic Benefits: Past, Present and Future. A collaborative effort between the Main Street Alliance and the Small Business Majority. October, 2010. https://grist.files.wordpress.com/2010/10/benefits-of-caa-literature-review-final-10-04-2010.pdf

[19] "Key industry groups during the 1990 reauthorization of the CAA [Clean Air Act] estimated that controls for volatile organic compounds (VOCs) would cost $14.8 billion per year. However, due to technology innovation and other factors, EPA estimates that the costs of control will be no more than $962 million in 2010." Ibid.

[20] "EPA itself has routinely overstated the future costs of its regulations—including portions of the CAA. Harrington, Morgenstern and Nelson examined EPA's cost projections and found that in 14 cases, the costs of implementing the rules was less than predicted; costs were higher in only 3 cases." Ibid.

confirmed that stricter air quality regulation can be associated with higher levels of local economic vitality. [21]

A 2009 study focusing on the "birth" of new industrial facilities by county found that the impact of stricter EPA regulation that accompanies an area being in "nonattainment" of Clean Air Act standards was very small across all plants in the nonattainment counties. The impact of that higher level of environmental regulation *did,* however*,* have a significant impact on high-polluting firms such as petroleum refineries, iron, steel, and paper mills, and glass and wood products manufacturing firms. For all firms, the number of new firms was reduced by 4 percent due to the more stringent regulation, but for high-polluters, the number of new firms was cut in half. These high-polluting firms represented only about 8 percent of all new firms,[22] so the vast majority of firms were not affected and may have benefited as a result of less competition for industrial sites and those sites being more attractive because the air was cleaner.

Growing areas in the United States have shown themselves to be quite flexible in avoiding technologies that burden the growing areas with high levels of pollution. In addition, mobile households have tended to move away from high pollution areas to lower pollution areas. The results of this dynamic are that the exposure of the general population to the air pollution coming from coal fired power plants has been significantly reduced. The electric generation serving growing regions tends to either not burn coal or build coal-fired generators that are more efficient and cleaner. As a result, relatively lower air pollution levels have been compatible with ongoing economic growth.[23]

The impact of high pollution levels inhibiting county population growth and the growth that followed when regulations reduced pollution has been documented in the counties surrounding Los Angeles. One study focused on the twenty-year period from 1980 to 2000. Over that time period environmental regulation sharply reduced pollution levels in some of the Los Angeles suburbs. Those suburbs that experienced the largest pollution reductions saw population growth "soar."[24] Analysis of all of the factors that might explain that population growth such as reductions in crime rates, improvements in commuting times to work, changes in relative housing costs, and overall growth in the Los Angeles metropolitan economy were analyzed along with changes in pollution levels. The conclusion was that:

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[21] Nondo, C. An Empirical Analysis of the Interactions between Environmental Regulations and Economic Growth. College of Agriculture, Natural Resources and Design, West Virginia University. 2009. A research paper of the same title summarizes the results of this PhD dissertation. The research paper was co-authored by Chali Nondo, Peter V. Schaeffer, Tesfa G. Gebremedhin, and Jerald J. Fletcher. Research Paper 2010-13.

[22] Condliffe S. and Morgan, O. The Effects of Air Quality Regulations on the Location of Pollution Intensive Manufacturing Plants. *Journal of Regulatory Economics*. 36(1):83-93. 2009.

[23] Kahn, M. Regional Growth and Exposure to Nearby Coal Fired Power Plant Emissions. *Regional Science and Urban Economics,* 39(1):15-22. 2009.

[24] Kahn, M. Smog Reduction's Impact on California County Growth. *Journal of Regional Science*. 40(3):565-582. 2000. pp. 265 and 279.

> Quality of life is an important determinant of household location patterns. If a location's quality of life improves, it may experience population growth and increasingly attract migrants who chose not to live there in the past. In this paper I argue that high ozone levels in the Los Angeles suburbs have played a role in discouraging growth in the areas. As Clean Air Act regulation reduced smog problems, the Los Angeles suburban counties became increasingly attractive places to live. Cheap land and access to higher quality of life have encouraged in-migration.

Of course, the opposite scenario is also possible: air quality is allowed to deteriorate and the population moves away because of that, harming the local economy.

Economists continue to study the impact of polluting facilities on housing values and the character of neighborhoods. A 2010 study explored the impact of power plants opening in neighborhoods in the United States during the 1990s. A total of 92 power plant locations were studied along with the approximately 205,000 housing units within two miles of the location of those plants. Compared to neighborhoods with similar housing and demographic characteristics, neighborhoods within two miles of the power plants experienced a 3 to 7 percent decrease in housing values and rents with some evidence of larger decreases in property values within one mile and for larger capacity generating plants. Neighborhoods close to the plants also changed. There were modest but statistically significant decreases in mean household income, educational attainment, and the proportion of homes that were owner occupied.[25]

A 2008 study used the federal requirement that industrial facilities report their releases of chemicals which then are reported in the Toxics Release Inventory (TRI). The study sought to see how residents of relatively small neighborhoods within a particular metropolitan area reacted to their neighborhood having a facility with such toxic releases or the closing of a facility that had been making such releases. Economic theory would suggest that areas where such toxic releases increased would lose population and that the population remaining would tend to shift towards having lower incomes as the higher income residents moved out. The opposite should be true of areas where toxic emissions had decreased or ended. They should gain population and the average income of the population should rise.

This study focused on migration *within* a metropolitan area, from one neighborhood to another. This type of migration is less costly and risky to residents since they do not necessarily have to change jobs, leave existing support systems, or move to a largely unknown economy and social setting. The study found that people did in fact "vote with their feet" in responses to changes in pollution levels. They tended to move away from areas where pollution was increasing and towards areas where pollution had decreased. In addition, there was also some evidence of average incomes falling in

[25] Davis, L. The Effect of Power Plants on Local Housing Values and Rents: Evidence from Restricted Census Microdata. Lucas W. Davis. Paper presented at the 2008 Association of Environmental and Resource Economists Summer Workshop, Berkeley, California, June 21-22, 2008. May 2010 version available at http://faculty;.haas.berkeley.edu/ldavis/pp.pdf , p. 1.

neighborhoods facing increased pollution and rising in neighborhoods where pollution was decreasing.[26] Changes in property values were not studied.

3. The Economic Benefits and Costs of Enforcing the Clean Air Act

The Clean Air Act Amendments of 1990 required the EPA to periodically report on the economic benefits and costs associated with the application and enforcement of those amendments.[27] EPA released its most recent economic analysis in March of 2011.[28] That analysis looked only at the incremental impacts of the 1990 amendments.

The study looked at the regulation of two types of particulate (PM 10 and PM 2.5), nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), ozone, and volatile organic compounds (VOC). The direct costs of implementing the stricter standards on the emissions of these pollutants were estimated based on the cost to firms to comply with the new limits. For 2010 the cost was projected to total $53 billion per year. Ten years later in 2020 the compliance costs were projected to be $65 billion per year. The national impacts on total economic output and labor productivity were estimated by reflecting these higher costs of production in a national economic model.

The air quality benefits were measured by studying the damage that would have been caused by the additional pollution released had the Clean Air Act not been amended in 1990. The impacts of higher levels of pollution were measured by the higher death rates and the larger number of sick days taken by workers and students. These health impacts were expressed in monetary terms using earlier estimates by economists of the losses associated with premature death and reduced ability to work, go to school, or live an active life due to periodic illness. Health treatment costs including admissions to hospitals and emergency room were also included. These health costs that cleaner air avoided were substantial and dominated by the losses associated with premature death. By 2010 the Clean Air Act Amendments of 1990 were expected to avoid 160,000 premature deaths an year. By 2020, 230,000 premature deaths are projected to be avoided per year. The monetary cost associated with those avoided premature deaths was projected by 2020 to total **$1.8 *trillion* per year.** The avoided costs of sickness associated with the reduced pollution were estimated to be $77 billion per year. See Figure 2. [29]

There are other pollution costs that were avoided. The emissions of sulfur can lead to acid rain that damages crops, forests, and lakes. The emission of nitrogen oxides can lead to deposition of reactive nitrogen that can disturb natural systems. Particulate emissions can cause light scattering that reduces visibility, eliminating scenic vistas and some of the value of outdoor recreation. The depletion of stratospheric ozone allows ultraviolet light to damage natural vegetative systems. Finally, air pollution can cause

[26] Banzhaf, S., and Walsh, R. Do People Vote with Their Feet? An Empirical Test of Tiebout's Mechanism. *American Economic Review*. 98(3):843-863. 2008.
[27] Section 812.
[28] EPA. The Benefits and Costs of the Clean Air Act from 1990 to 2020, Final Report. March 2011.
[29] Ibid. p. 19.

the deterioration of structures, equipment, and infrastructure, leading to higher maintenance costs or shorter lives for equipment and structures. All of these have been studied carefully over the years and economic estimates of that damage developed. These estimated annual avoided damages that would have been caused by pollution, projected to the year 2020, involved $11 billion in annual savings to agricultural and forest productivity, $8 billion in savings to ecological systems, $67 billion in savings associated with improved visibility, and $110 billion in avoided damage to materials.[30]

When the avoided health and non-health damages are summed, the avoided damages in 2010 were estimated to be $1.3 *trillion*. In 2020 the estimated damages avoided because of the Clean Air Act Amendments of 1990 would total about $2 *trillion.* See Figure 2.

Figure 2.

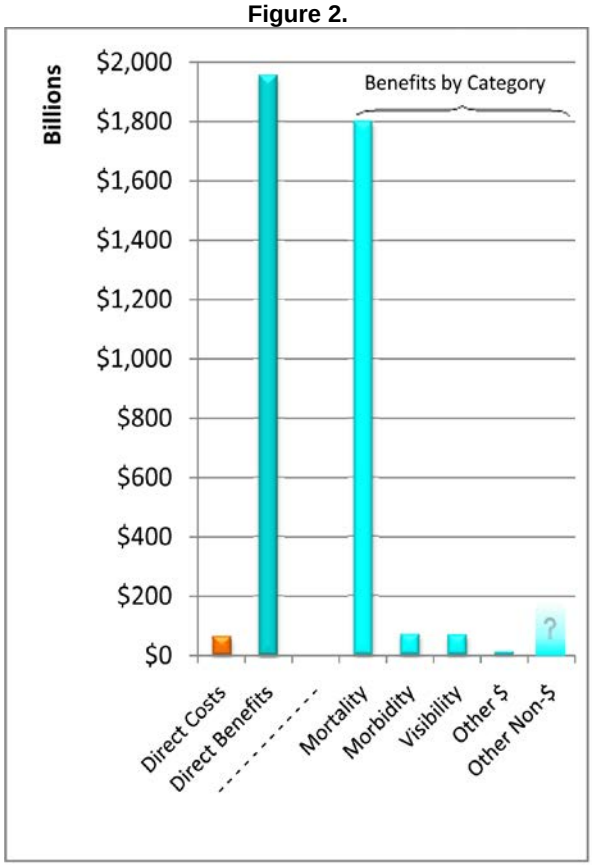

Exhibit 11. Year 2020 Primary Central Estimates of direct costs and direct benefits with breakdown of benefits by effect category. (In billions of year 2006 dollars). The two leftmost bars show the extent to which total benefits exceed total costs, and the bars to the right provide the breakdown of benefits by category of effect. The third bar shows the extent to which mortality reduction benefits exceed all other effects, including total costs. The Other Non-$ bar to the right is intended to emphasize the extensive benefit endpoints which could not be monetized, and the question mark indicates the potential value of these effects is unknown.

[30] Ibid. Chapter 6, Ecological and Other Welfare Benefits.

The discounted present value of the annual benefits from the Clean Air Act Amendments of 1990 from 1990 projected to 2020 totaled $12 *trillion* using a 5 percent discount rate. The direct costs of implementing the required air pollution control measures had a discounted present value of $380 billion over that 30-year period. The benefits were 32 times the size of the costs.[31] The economic benefits exceed the costs and the passage and enforcement of these air pollution control regulations can be evaluated as economically rational.

Many of the benefits of the Clean Air Act are harder to quantify than the costs. However, even the two most easily quantifiable benefits outweigh the costs. As the EPA put it:

> The broader economy is also improved overall by the 1990 Clean Air Act Amendments and related programs. While virtually all the costs of these programs could be incorporated, only two beneficial effects of cleaner air could be captured in the economy-wide model: improvements in worker productivity due to improved health, and savings on costs of medical care for some pollution-related health problems. Nevertheless, these two beneficial effects alone more than offset the economy-wide costs of investing in air pollution controls as both overall economic growth and the measurable economic welfare of American households are shown to be improved by the 1990 Clean Air Act Amendments. [32]

It should be noted that when both the costs of businesses complying with the Clean Air Act and the cost savings from the benefits of reduced air pollution are taken into account, overall economic growth is largely unaffected. Initially there is a very slight slowdown in the economy (0.2 percent) which approaches zero in 2015 and turns into a very slight positive impact in 2020 (+0.02%). So, on net, economic well-being is substantially improved while the rate of commercial economic growth is hardly affected.

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[31] Ibid. Chapter 7, Comparison of Benefits and Costs.

[32] EPA. The Benefits and Costs of the Clean Air Act from 1990 to 2020. March, 2011. Page 28. See also Van Atten, C. and Hoffman-Andrews, L. The Clean Air Act's Economic Benefits: Past, Present and Future. A collaborative effort between the Main Street Alliance and the Small Business Majority. October, 2010. https://grist.files.wordpress.com/2010/10/benefits-of-caa-literature-review-final-10-04-2010.pdf ("The Clean Air Act has left an important legacy of widespread economic benefits across both urban and rural communities and businesses large and small. Furthermore, the Act has led to environmental advancements which improve public and worker health. It has also led to the creation of millions of jobs, and has spurred important technological innovations and new industries that have been exported around the world.").

III. The Economic Characteristics of the Kalispel Reservation Economic Area

1. Defining the Kalispel Reservation Economic Area

In order to analyze the likely impact of Class I redesignation of the Kalispel Reservation on the larger regional economy in which the Kalispel Reservation is embedded, it is necessary to define the geographic area that is linked to the Kalispel Reservation and the geographic area containing significant sources of air pollution that might be constrained by the Class I redesignation. An appendix to this report lays out the analysis that lead to the identification of the *Kalispel Reservation Economic Area* that this report will use in analyzing the likely economic impacts of Class I redesignation. This section will provide a brief summary of the conclusions of that analysis.

A. The Kalispel Reservation Economy

The Kalispel Indian Reservation is located in southern Pend Oreille County, WA, which, in turn, is located in the extreme northeast corner of the state of Washington along the Idaho and British Columbian borders. The headquarters of the Kalispel Tribe is located near Usk, Washington, about 50 miles, an hour's drive, north of the city of Spokane, Washington. See Figure 3 below.

Ideally, the economy of the Kalispel Reservation itself would be separately analyzed and the impact of Class I redesignation discussed. Unfortunately, reliable socioeconomic data is not available for the Kalispel Reservation. The decennial census (i.e. the 2010 Census) no longer collects such socioeconomic information. Instead, the U.S. Census Bureau collects that type of data annually through the American Community Survey that continuously samples the U.S. population. This provides reliable data for geographic areas such as cities and counties as long as those geographic areas have large populations. The Census Bureau combines several years of data for areas with smaller populations in an effort to improve the reliability of the data, averaging up to five years of data together. Even with that 5-year averaging, the demographic and socioeconomic data estimates for the Kalispel Reservation are unreliable, producing values that often are not statistically different from zero. For that reason, those unreliable estimated values are not presented in this report.

B. Economic Areas Defined by the U.S. Government

The U.S. Bureau of Economic Analysis analyzes the economic connections among counties and defines multi-county areas linked to each other by worker commuting patterns. Pend Oreille County is linked to the Spokane City and County economies by strong flows of workers from Pend Oreille County into Spokane County. Stevens County, the county bordering Pend Oreille County to the west is also part of the Spokane Metropolitan Statistical Area because of even stronger flows of workers between Spokane and Stevens Counties.

C. The Tri-County Economic Development District in Northeastern Washington

The U.S. Economic Development Administration (EDA), part of the U.S. Department of Commerce, supports regional economic development across the nation. Part of the EDA's program encourages groups of counties to work together in planning and implementing joint economic development activities. In northeastern Washington three rural counties, Pend Oreille, Stevens, and Ferry, have formed the Tri-County Economic Development District for that purpose. This grouping of counties does not appear to be tied to economic connections among those counties. Rather, the grouping appears to be based on the fact that these three counties are adjacent to each other and have similar problems as rural counties making a transition from economies built primarily on land-based natural resource activities to more diversified economies.

Data on workers commuting among these three counties indicates few economic connections. For instance, Ferry County has almost no economic connection with Pend Oreille County. No Pend Oreille residents are estimated to work in Ferry County and no Ferry County residents are estimated to work in Pend Oreille County. For that reason, Ferry County is not included in the Kalispel Reservation Economic Area.

D. Adjacent Counties to the West and East of Pend Oreille County

The three-county grouping that has the strongest number of economic connections due to out- and in-commuting of workers is Pend Oreille, Spokane, and Stevens Counties. However, measured by the connections with Pend Oreille County, Stevens County has weaker connections than does Bonner County that is adjacent to Pend Oreille County to the east in Idaho. However, the industrial facilities in the Colville-Kettle Falls part of Stevens County to the west of Pend Oreille County, like economic activities in northern Spokane County are more likely to be impacted by the Kalispel Reservation's Class I designation than Bonner County is because the Kalispel Reservation tends to be downwind from pollution sources in Spokane and Stevens Counties and upwind from pollution sources in Bonner County.

For these reasons, we define the economic area in which the Kalispel Reservation is most strongly embedded to be the adjacent counties of Pend Oreille, Spokane, and Stevens. See Figure 3 below and the Appendix at the end of this report.

Figure 3: Kalispel Reservation Economic Area
Pend Oreille, Stevens, & Spokane Counties

Kalispel Reservation Economic Area is outline in red.
Concentric circles are 10 to 50 km (6 to 31 miles) in radius

2. Analyzing the Sources of Local Economic Vitality

There are several important analytical steps that should be included in any complete analysis of the economic impact of Class I redesignation of the Kalispel Reservation on the vitality of the surrounding economic area.

A. Look at All of the Sources of Income Flowing into a Local Economy

Residents, local leaders, and visitors often puzzle over what it is that makes the economy "tick" in a particular local area. Given that economies change and evolve over time, with different sectors expanding or contracting, the answer to this question of what the "engine" is of a local area's economy may vary depending on whether the focus is

on the past, the present, or the expected future. The answer as to what is or is not energizing the local economy may also vary depending on the sectors of the local economy in which the respondent has the most experience. Since it is not always possible to clearly visualize all the sources of local economic activity, it is important to gather contemporary data on *all* sources of income flowing to local residents. This does not mean focusing exclusively on where residents work and what they get paid as a result of that employment. Besides those income flows associated with being hired to do a job (labor earnings), there are significant other sources of income flowing into any local economy.

The other major, sometimes overlapping, sources of income flowing into a local economy include:

i. The earnings of the self-employed who technically "work for themselves."

ii. The earnings of resident workers who commute out of the local economy to work elsewhere, bringing income back into the local economy.

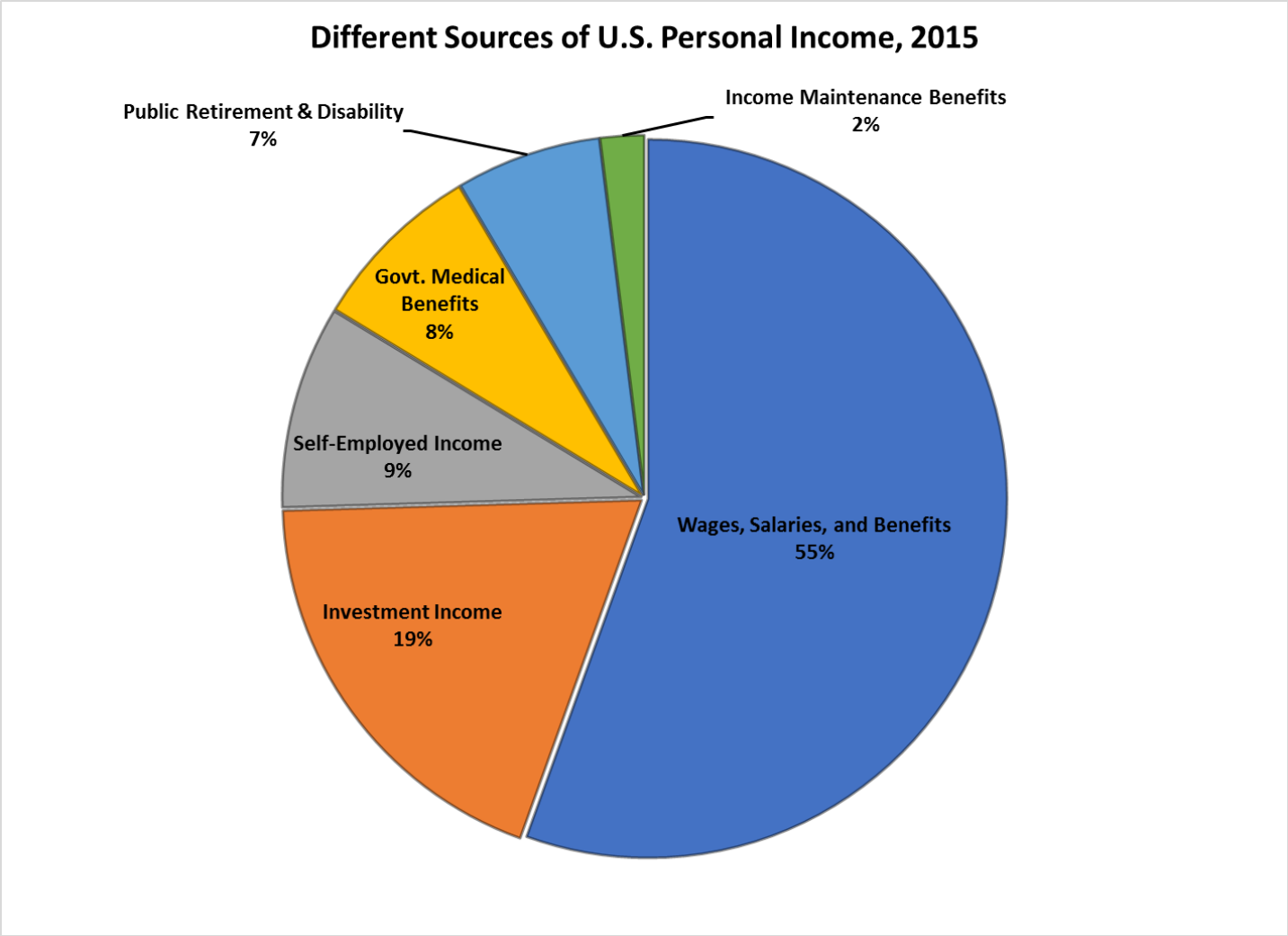
iii. Income from investments: dividends, interest, and rents.

iv. Retirement income associated with private and public pension programs. Social Security is the dominant federal public pension program. State and local government employees and the military are covered by pension programs as are many retired employees of national corporations. A significant part of dividend, interest, and rental income is also likely to be associated with personal savings for retirement.

v. Income support payments to residents from federal and state government agencies: unemployment compensation, Social Security disability payments, food stamps (SNAP), Medicare and Medicaid payments to health care providers, and income support payments to low income households ("welfare" payments).

Wages and salaries, including benefits, make up just more than half (55 percent) of the total income flowing to households in the U.S. Focusing only on labor income and payrolls can lead to close to half of the sources of income to individuals and households being ignored. See Figure 4 below.

Figure 4.



Source: U.S. BEA Personal Income and Employment by Major Component, Table SA4, United States

The income not associated with current employment in the economy is called *non-labor income* to distinguish it from wages, salaries, benefits, and the income of the self-employed. One important aspect of most non-labor income is that it typically follows the recipient. The receipt of retirement checks, dividends, rent, and interest payments, Medicare insurance reimbursement, etc. are not interrupted by a person's decision to change their place of residence. People "carry" those income sources with them. That is one reason that some areas have promoted themselves as attractive retirement locations. A retired couple brings "outside" income into the local economy just as a new firm might, stimulating the local economy.

B. Express All Economic Measures in Relative Terms

Figure 4 above expresses the *relative* importance of various source of personal income by comparing the relative size of each of those income sources. If instead, the sum of

the non-labor sources of income simply had been stated as $6.8 trillion dollars, few people would be able to understand how large that income flow was except for the fact that it had “trillion dollars” associated with it. By putting that value in the context of all wage and salary payments in the U.S. economy and comparing it to the other sources of income, the relative importance is more easily understood.

C. Look at the Relative Importance of Each Source of Income over Time

Economies are dynamic. They are constantly changing, and the relative importance of different sources of income and employment are changing too. The sources of new jobs and income is an empirical question that the analysis of data can clarify. Past history does not dictate the future, but the study of it can reveal important trends about what is making the local economy “tick” *now.*

D. Consider the Nexus between Local Infrastructure and Economic Vitality

The widely accepted economic base view of the local economy highlights two sources of “multiplier” or spillover effects that support local economic vitality. One is the set of economic activities that draws “new” money into the local economy where it circulates, being spent and re-spent, creating new jobs and income. That involves the second source of the multiplier effect: For that income to be spent and re-spent in the local economy, there has to be an infrastructure of locally oriented businesses that capture that new spending. If that locally oriented commercial infrastructure is not in place, the new spending will quickly “leak out” of the local economy, minimizing its overall impact. The dynamics of new income stimulating the local economy involves both the economic activity that brings in the new income and the locally oriented businesses that capture and re-circulate that income. The development of the latter may be more important to actual integrated economic development than enlarging the existing export-oriented sectors of the local economy.

E. Evaluate Labor Supply and Demand

In most economic settings, the interaction of supply and demand determines market outcome. This is true of the operation of labor markets and the determination of wages: labor supply and labor demand both matter. The relative importance of labor supply and labor demand in any particular setting is an empirical question.

The local labor supply and the cost of hiring it, is partially determined by how attractive a particular location is to workers and their families. Areas which workers and their families might prefer to avoid would have to pay high wages to attract the needed workforce. On the other hand, locations that are attractive to workers and their families would be able to attract the needed workforce without bidding wages up as high.

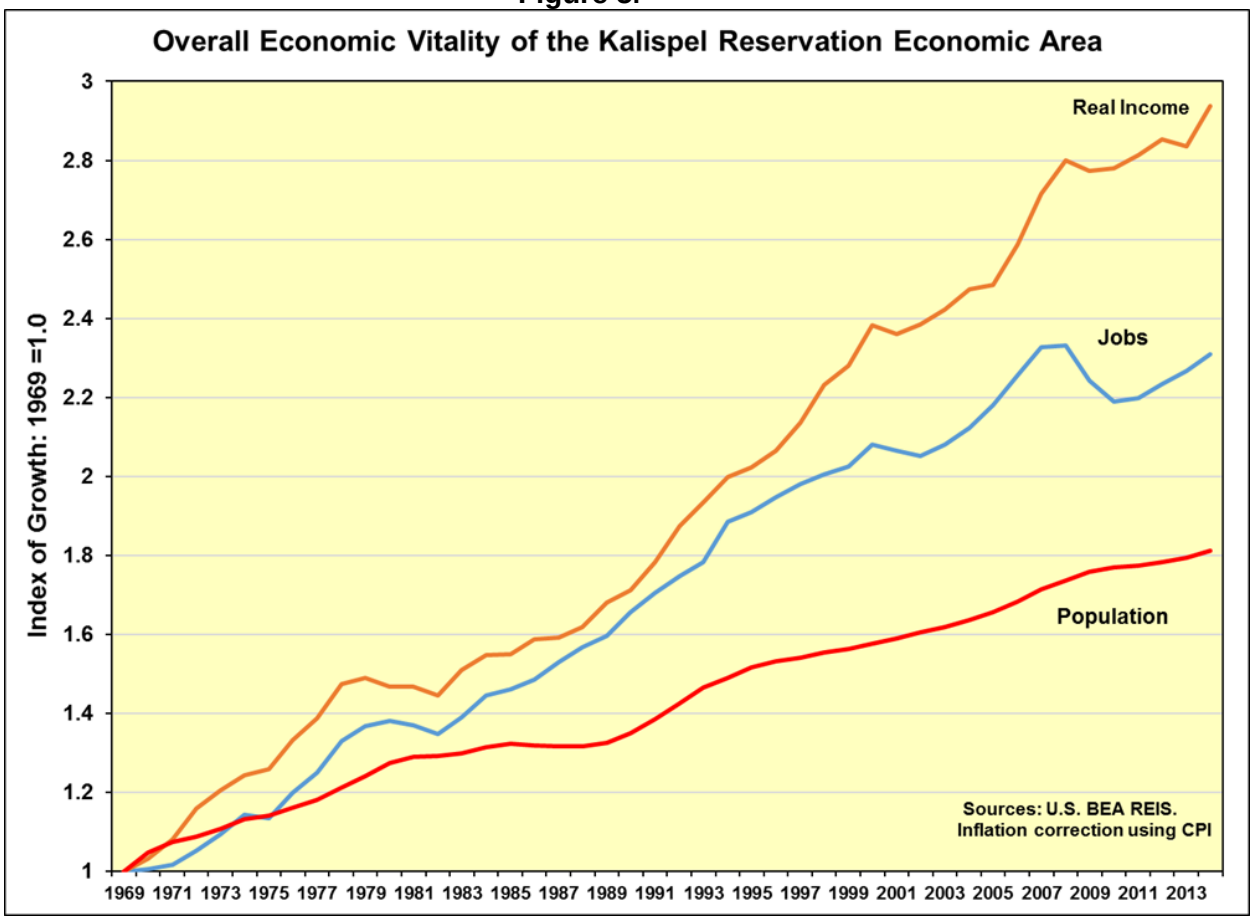
F. Isolate the Economic Activity Likely to Be Affected by Redesignation

Class I redesignation may both discourage the location of highly polluting economic activities close to the Class I area as well as attract economic activities that benefit from higher air quality and environmental quality in general. In that sense, Class I redesignation could, conceptually, have a negative, positive, or mixed impact on local economic vitality and well-being. An analysis of the economic trends in the local economy in terms of the air pollution emissions associated with new jobs and income can clarify the likely impacts. Only new industrial activities with relatively high air pollution emissions are likely to be affected by Class I redesignation.

3. The Sources of Economic Vitality in the Area Surrounding the Kalispel Reservation

Over the last 45 years, the Kalispel Reservation Economic Area has shown significant signs of economic vitality, interrupted during periods of national economic downturns. Real income received by individuals increased three-fold, jobs doubled, and the population increased by 80 percent. See Figure 5 below.

Figure 5.



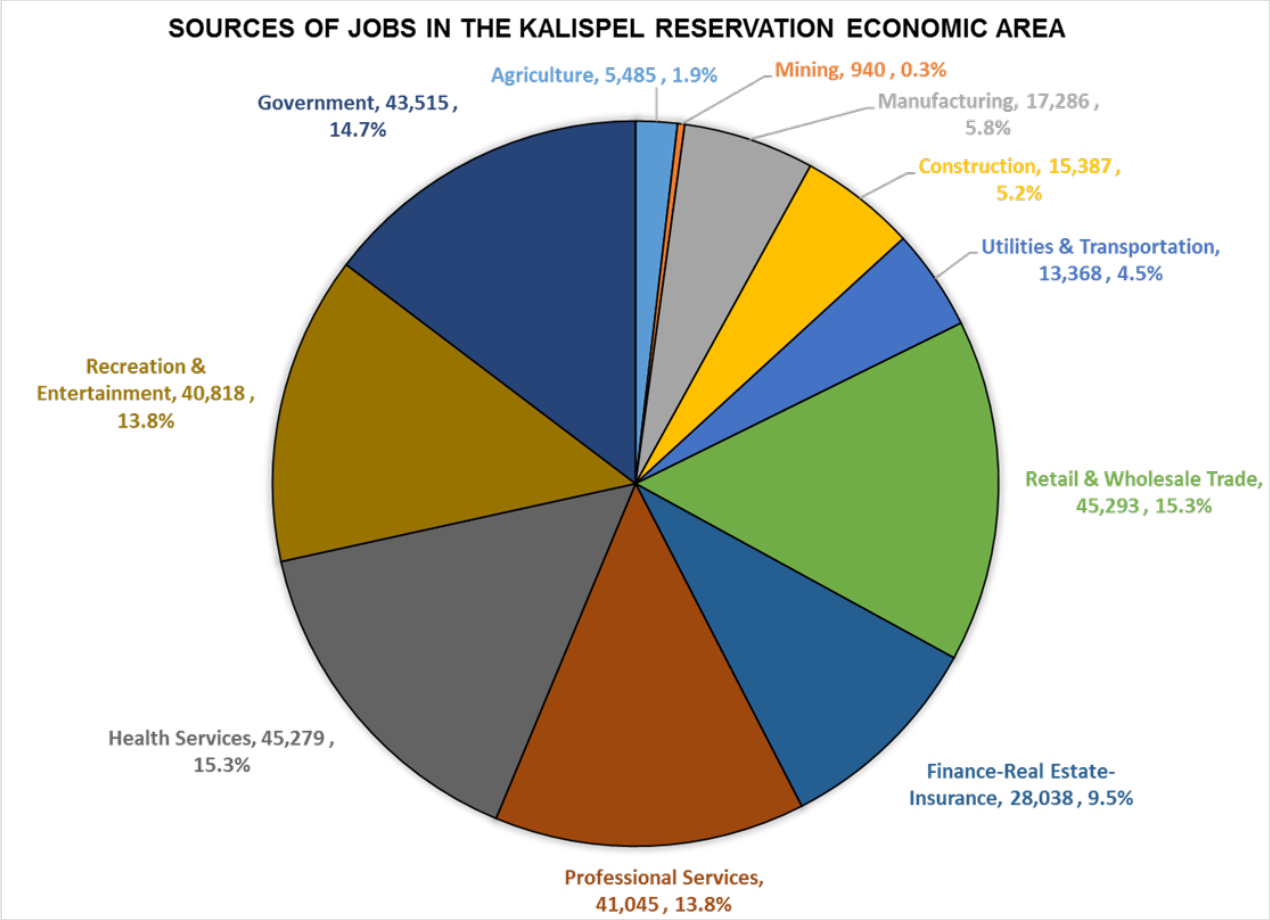
It is important to understand what sectors of the economy have been responsible for the ongoing economic vitality of the Kalispel Reservation Economic Area despite the difficulties in many of the historically important economic sectors over the last several decades. The Tri-County Economic Development District stated in 2013: "The region has transitioned to an economic base led by the services industry sector, as seen by the sector's increasing importance with respect to total employment and income shares."[33] The analysis below will confirm that characterization.

A. 2014 Snapshot of the Kalispel Reservation Economic Area

i. The Sources of Jobs

The Kalispel Reservation Economic Area is relatively diverse in terms of its distribution of jobs. See Figure 6 below.

Figure 6.



[33]Op. cit "Tri-County Economic Development District Comprehensive Economic Development Strategy 2013-2017," June 26, 2013, page 8.

The export-oriented sectors (manufacturing including forest products, agriculture, and mining) are directly the source of 8 percent of all jobs. Five industrial sectors each provide about 15 percent of the total jobs: health services, retail & wholesale trade, government, professional services, and recreation and entertainment. Each of these five sectors provide about 45,000 jobs. Almost three-quarters of all jobs are found in those five sectors.

Some of these industrial groupings tend to have relatively low wages associated with them, for instance, Retail Trade and Recreation & Entertainment. Others are relatively well-paid, e.g. manufacturing, health services, other professional services, and government.

ii. The Sources of Workers' Earnings

If the relative importance of the various sectors of the economy is measured in terms of the contribution they make to the total wages, salaries, and benefits paid to workers in the Kalispel Reservation Economic Area, the picture is somewhat different because of the differences in pay among the jobs and the difference in the prevalence of part-time jobs in the different economic sectors. Some sectors of the economy provide more full-time jobs and the annual pay per job varies from industry to industry. For instance, while recreation and entertainment provided almost 14 percent of total jobs, it was the source of only about 4 percent of labor income. Many of these jobs are part-time and seasonal and pay relatively low, entry-level, wages. Similarly, while agriculture provides 1.9 percent of jobs, it is only the source of 0.4 percent of labor earnings. This is partly because many agricultural jobs are part-time or seasonal and, for many farm workers, not highly paid. In addition, when farm commodity prices are low, the net income to farm and ranch owners can be low or actually negative as it was in 2014 in the Kalispel Reservation Economic Area.

At the other extreme are government jobs that make up less than 15 percent of total jobs but are the source of almost 21 percent of labor earnings. A similar pattern is found for manufacturing jobs that make up less than 6 percent of total jobs but are the source of over 8 percent of labor earnings. Both government and manufacturing jobs have above average pay associated with them. See Table 2 below.

Table 2

The Relative Importance of Different Industarial Sectors of the Kalispel Reservation Economic Area, 2014		
Sector of the Economy	Percent of Total Jobs	Percent of Labor Income
Agriculture	1.9%	0.4%
Mining	0.3%	0.2%
Manufacturing	5.8%	8.2%
Construction	5.2%	6.0%
Utilities and Transport	4.5%	5.5%
Retail & Wholesale Trade	15.3%	12.7%
Finance, Insurance, & Real Estate	9.5%	8.1%
Professional Services	13.8%	17.6%
Health Services	15.3%	16.9%
Recreation & Entertainment	13.8%	3.9%
Government	14.7%	20.5%
Source: US Dept Comm. BEA REIS		

B. The Sources of Rising Incomes

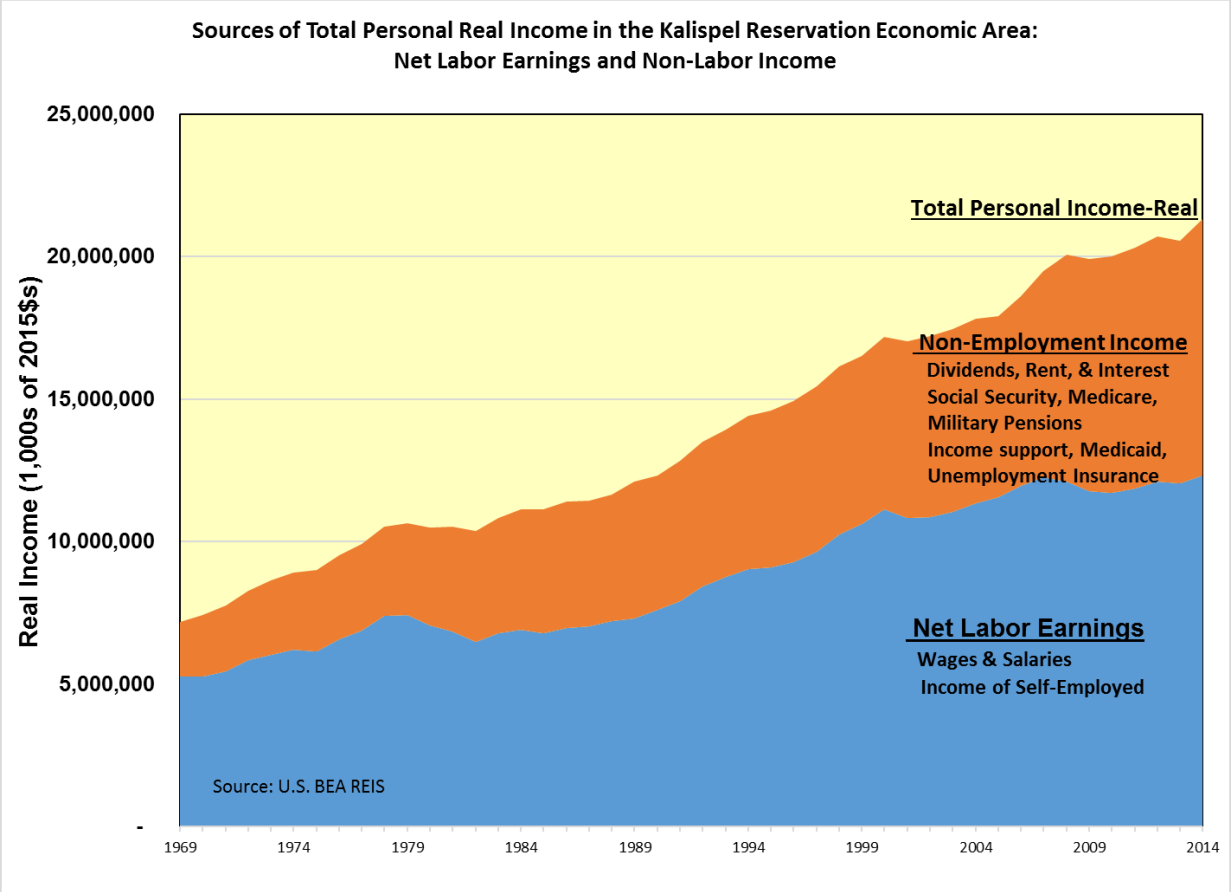
i. Non-Employment Income: Investment, Retirement, and Other Income

As discussed above, labor earnings, the pay received from current jobs, are not the only source of income to individuals and households. Income is also received from investments in stocks, bonds, and real estate in the form of dividends, interest, and rent. Some of this investment income is also retirement income flowing from pension plans. In addition, people receive income from government-run programs such as Social Security, Medicare, Medicaid, Food Stamps, Unemployment Compensation, other government support programs, and military pensions. These collectively are labeled *transfer payments* in the national economic accounts because they involve the government collecting revenues from one group of people and transferring it to another group of people in a form that is not tied to *current* wages or salaries (although workers are likely to have paid into these programs during their working lives).

Investment income and transfer payments represent substantial flows of income. Total net labor earnings associated with jobs in the Kalispel Reservation Economic Area in 2014 were almost $12.3 billion dollars. Investment income was $4 billion and transfer payments made up $5 billion. That is, investment income added about 33 percent to the labor earnings and transfer payments added another 40 percent. As a result, total personal income was 73 percent larger than the net labor earnings of residents in the Kalispel Reservation Economic Area. Put slightly differently, labor earnings associated with jobs in the economic area were the source of only 59 percent of total personal income. The other 41 percent of personal income was received from sources not related to current employment in the Kalispel Reservation Economic Area. For that reason,

investment income and transfer payments are often called *non-employment income.* Figure 7 below shows the relative size of that non-employment income compared to the net labor earnings in the Kalispel Reservation Economic Area.

Figure 7.



In addition to its relatively large size, non-employment income has another characteristic that makes it economically important. This type of income is “footloose” in the sense that it follows people to wherever they choose to reside. For that reason, it makes people more mobile because they have a source of income that is not tied to employment opportunities at any particular location. Retirees are, arguably, the most “footloose” of our citizens since they are not tied to a particular job in a particular place. Their pensions, savings, investments, social security, and Medicare will follow them to whatever residential location they choose. Both Pend Oreille and Stevens Counties have been identified as “retirement destination” counties by the federal government because of the high number of in-migrants 60 and older. [34]

[34] 2015 ERS County Typology Codes Update, Economic Research Service, U.S. Department of Agriculture. A county is labeled a retirement destination county if the number of residents 60 years and older grew by 15 percent or more between 2000 and 2010.

The Tri-County Economic Development District also noted this in its Comprehensive Economic Development Strategy 2013-2017: “The region's natural beauty and outdoor recreational resources and lower costing real estate, increasingly attract elderly retired persons as visitors and as in-migrants, who spend money in the area.”[35]

The history of Stevens County posted on the county government website described this transformation of the local economy in a similar way:

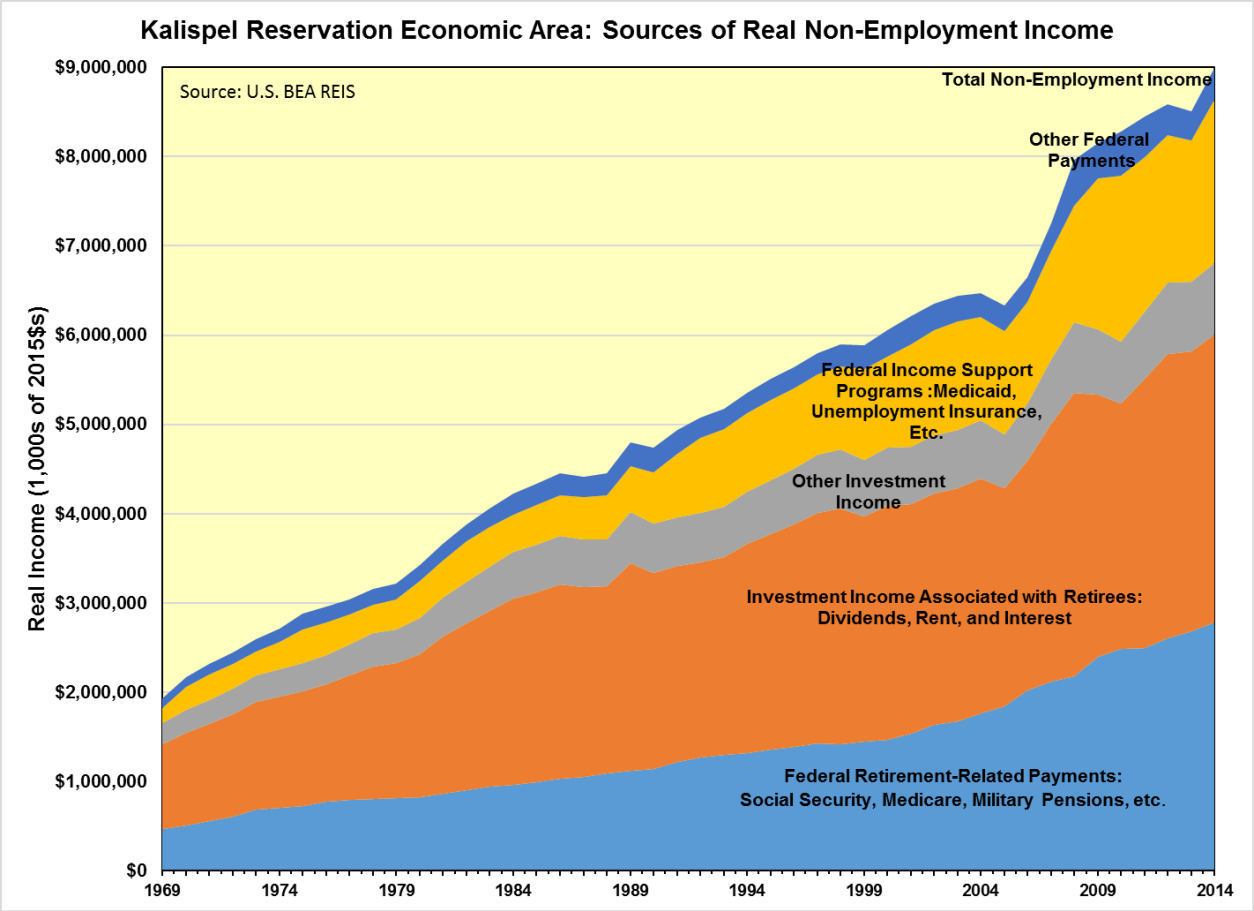
> Many [Stevens] county residents found employment in the Spokane area, but more Spokane workers moved to Stevens County, accepting long commutes as the price for rural lifestyles. They built homes, and highways to Spokane filled with commuters even before dawn. As Colville’s population declined, new developments sprouted in the south part of the county. Retirees from urban areas all over the country found the same attractions and built their homes in the wide valleys and among the conifers. [36]

The income that retirees bring to the community where they settle is reported in the federal statistics as investment income (dividends, rent, and interest) and in federal retirement programs (Social Security, Medicare, and military pensions and public health care reimbursement). An analysis of how investment income has varied with respect to Social Security and Medicare payments in different counties can be used to estimate the percentage of investment income that is retirement-related. Some of the investment income, of course, accrues to younger households because of their savings and investments. That part of investment income that is associated with retirees in any given county has been labeled *retiree investment income*. When that is combined with the income from federal retirement programs, the sum provides an estimate of the annual income retirees bring to the Kalispel Reservation Economic Area. See Figure 8 below.

In the bottom two layers of the chart, the two retirement-related non-employment income streams are shown. The combination of those retirement-related income streams slopes significantly upward between 1979 and 2014. The other large and increasing form of non-employment income is associated with federal income support programs, including Medicaid and Unemployment Insurance. As a result of the Great Recession, those federal income support payments increased significantly after 2008.

[35] Tri-County Economic Development District, “Comprehensive Economic Development Strategy 2013-2017, p. 8.
[36] Wilma, D. Stevens County-Thumbnail History. Posted on the Stevens County website. Accessed 12/4/2016. http://www.historylink.org/File/7995

Figure 8.



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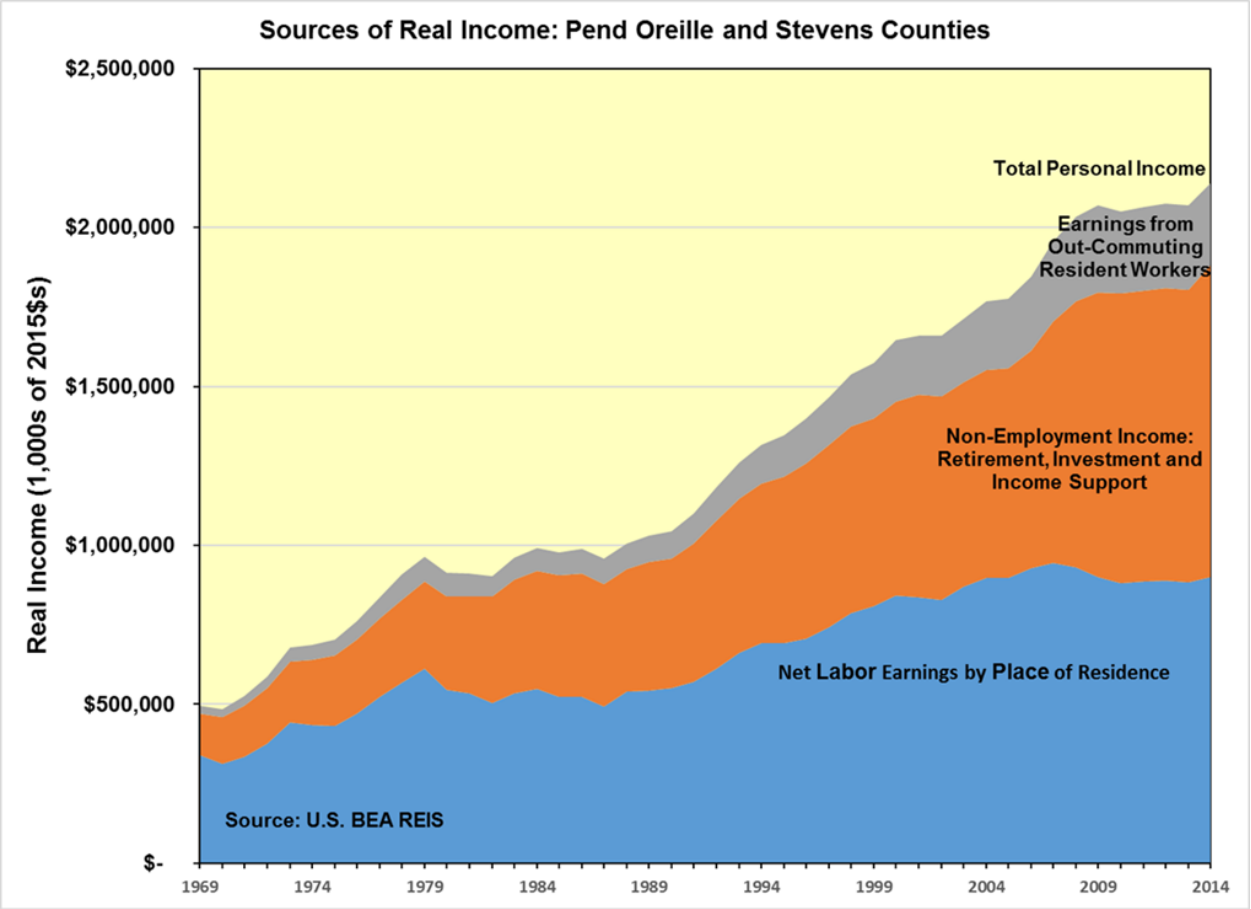
ii. Income from Commuting Out to Work

There is one other source of income to households and individuals in Pend Oreille and Stevens Counties: the labor earnings of residents associated with jobs that are located outside of those two rural counties, in particular, employment opportunities in the Spokane urban area. As mentioned earlier, to a certain extent these two counties serve as “bedrooms” for employers in that Spokane urban area. Almost 7,000 workers living in these two rural counties commute out of their home counties to work. About 5,400 of them commute into Spokane County. See Table 1-A in the Appendix.

The earnings of these out-commuting workers tend to flow back into Pend Oreille and Stevens Counties, supporting economic activities there. The local economic impact is somewhat similar to having additional jobs located in those rural counties. That inflow of labor earnings due to the out-commuting to work is substantial, averaging over $260

million per year over the five-year period 2010-2014. [37] That represented a 30 percent increase in labor earnings on top of the earnings coming from jobs *in* Pend Oreille and Stevens Counties filled by residents. See Figure 9 below.

Figure 9.



The labor earnings brought into Pend Oreille and Stevens Counties by residents who commute out to work is the equivalent of all government payrolls in Pend Oreille and Stevens Counties, twice as high as all manufacturing payrolls, and three times as high as all health care payrolls in those two counties. Workers who reside in these two rural counties but work outside those counties have a significant economic impact on the counties of their residence.

[37] That $260 million annual flow into the two counties to the north from out-commuting is a *net* figure. The slightly offsetting loss of income from those two counties due to Spokane workers commuting into those counties is subtracted from the out-commuting gains. The gain to these two rural counties due to out-commuting is a loss to the Spokane urban area because the wages earned by the commuting workers are lost to the northern rural counties. That is a relatively small loss to Spokane County because of the large size of its economy but very sizable gains to the rural counties. The out-commuting of Spokane County residents to work in Pend Oreille and Stevens Counties partially offsets worker commuting going the other way, but the flow into Spokane is much larger than the flow out of Spokane County.

There are two quite different ways that one can describe this out-commuting to work. One is that living in Pend Oreille and Stevens Counties is attractive because of the social and environmental amenities found there, and workers are willing to tolerate the commute to work in a place that is attractive for its economic opportunity but is not as attractive as a place to live. A higher quality of life in the more rural counties (and, probably, lower housing costs) lead these workers to live in Pend Oreille and Stevens Counties and commute out to work.

The other way to describe this commuting is that the Pend Oreille and Stevens County economies are so weak that they cannot provide all of their residents with employment opportunities. This weakness *forces* many residents to commute into the Spokane urban area to work. From that perspective, the commute is a cost associated with the poor economic performance of the more rural economies. This description, however, does not explain why these workers who are commuting do not just live closer to their jobs by moving out of the rural counties to Spokane. There has to be some characteristics of living in the Spokane urban area that workers seek to avoid by living in these rural counties and suffering the costs of commuting. Put the other way, there must be some perceived advantage of living in the rural areas. The Tri-County Economic Development District covering Pend Oreille and Stevens Counties as well as Ferry County asserted that it was the valuable natural amenities and the lower cost of living in those rural counties.[38]

C. Recent Job and Payroll Gains and Losses: 2001-2014

Table 3 shows the expanding and contracting sectors of the Kalispel Reservation Economic Area from 2001-2014.[39] It provides data on both changes in the number of jobs as well as changes in real labor earnings. Table 3 divides the economy into dichotomous aggregates: goods (agriculture, mining, manufacturing, and construction) and services/government. Popular economic discussions often contrast goods production with services production and the shift from a goods to a services economy.

Employment and payroll declined in the aggregate goods producing sectors in the Kalispel Reservation Economic Area between 2001 and 2014, an 11 percent loss in jobs and a 12 percent loss in real payroll. For the combined aggregate of services and government there was a 16 percent gain in jobs and a 21 percent gain in real payroll. Since the combined services-government sectors had almost seven times as many employees as the goods producing sectors, these percentage changes understate the impacts of these changes in the Kalispel Reservation Economic Area. While the services-government sectors added about 36,000 jobs, the goods-producing sectors lost about 5,000 jobs. Separating government and service sector jobs, the service

[38] Op. cit. p. 8

[39] Because of a decision to change how economic activity in the United State is divided into sectors or industries, there is a break in the data between 2000 and 2001 and the earlier data is not strictly comparable with the later data. For highly aggregated data this is not as problematic. For individual industries, the two data sets often are simply not comparable. Only the 2001 to 2014 period data were used so as to avoid that data problem when reporting on individual economic sectors.

sector expansion was the source of an additional 34,000 jobs and the government sectors were the source of about 2,000 new jobs, all of them in state and local government.

Table 3.

Sources of New Jobs and Income, Kalispel Reservation Economic Area, 2001-2014						
	Growth in Real Labor Earnings			Growth in Jobs		
Type of Economic Activity	Thousands of 2015 Dollars		% Change	Number of Jobs		% Change
	2001	2014		2001	2014	
Goods Production	$2,378,701	$2,082,572	-12.4%	44,053	39,098	-11.2%
Agriculture	$77,149	$55,187	-28.5%	5,554	5,485	-1.2%
Mining	$30,058	$31,231	3.9%	552	940	70.3%
Construction	$823,020	$844,932	2.7%	15,502	15,387	-0.7%
Manufacturing	$1,448,474	$1,151,222	-20.5%	22,445	17,286	-23.0%
Services and Government	$9,974,655	$12,040,557	20.7%	221,494	257,436	16.2%
Utilities and Transportation	$677,543	$774,992	14.4%	11,550	13,368	15.7%
Retail & Wholesale Trade	$1,778,967	$1,795,655	0.9%	44,478	45,293	1.8%
Finance, Insurance, & Real Estate	$1,007,274	$1,143,543	13.5%	21,362	28,038	31.3%
Health Services	$1,669,259	$2,391,853	43.3%	32,578	45,279	39.0%
Other Professional Services	$1,881,882	$2,484,659	32.0%	47,650	57,192	20.0%
Entertainment & Recreation	$463,133	$550,313	18.8%	22,273	24,671	10.8%
Local & State Government	1,847,541	2,143,813	16.0%	31,748	34,222	7.8%
Federal Government	649,056	755,728	16.4%	9,855	9,373	-4.9%
Services only	$7,478,058	$9,141,015	22.2%	179,891	213,841	18.9%
Total Real Earnings and Jobs	$12,353,356	$14,123,129	14.3%	265,547	296,534	11.7%
Source: U.S. BEA REIS						

Most of the recent sources of economic vitality in the Kalispel Reservation Economic Area are in the services sectors, not in mining and manufacturing. Given the generally lower air pollution associated with the services sectors, this implies that there is likely to be less potential conflict between economic vitality and protecting air quality in the future.

Service jobs, like manufacturing, forestry, or construction jobs, include many low paid, even minimum-wage, jobs. But like these other sectors, services also include many high-paid professional and technical jobs. Education, for instance, can include day care workers who are paid minimum wages but also include well paid professionals and administrators. Health services include relatively low paid orderlies, laundry, and cafeteria workers as well as physicians, nurses, and other medical technologists.

Table 4 below lists the sectors of the Kalispel Reservation Economic Area that were the source of job growth over the last decade and a half. During that time period, total jobs in the Kalispel Reservation Economic Area increased by about 31,000. The economic

sectors listed in Table 4 had job growth of about 36,000. Some of that job growth was offset by industries where jobs declined.

The Table 4 list is led by health services whih include hospitals, medical clinics, the offices of health professionals, etc. Health services added almost 13,000 jobs. However, health services are just one of the professional and technical service industries. Those professional and technical service sectors also include legal, education, social, management, computer, business, administrative, and repair services among many others. As Table 4 shows those other professional services added over 9,500 jobs. Financial services, including banks, investment firms, insurance, and real estate, also saw significant job growth adding almost 6,700 jobs. Local and state government activities in the Kalispel Reservation Economic Area added almost 2,500 jobs. Many of these jobs are also filled by professionals including police, fire fighters, public health, teachers, road and highway repair, planning, etc. Entertainment and recreation includes eating and drinking establishments, theaters, stadiums, and other sports and entertainment venues. It also includes a broad range of outfitters and guides. Utilities include the operation, extension, and repair of water, natural gas, and electrical delivery systems, whether privately or publicly owned. Transportation includes railroads, trucking, and airlines. Together utilities and transportation added about 1,800 jobs.

Table 4.

Job Gains in Service and Government Sectors	
Kalispel Reservation Economic Area	
2001-2014	
Health Services	12,701
Other Professional Services	9,542
Finance, Insurance, Real Estate	6,676
Local and State Government	2,474
Entertainment and Recreation	2,398
Utilities and Transportation	1,818
Retail and Wholesale Trade	815
Total for These Sectors	36,424
Source: U.S. BEA REIS	

This is *not* a list primarily of low-paid minimum wage “burger flippers.” That particular type of food service job would make up *part* of the entertainment and recreation sector. Similarly, relatively low wage jobs can be found in retail trade establishments, the “stores” in which people shop. But “low wage” would not be an accurate characterization of all of the growing service sectors of the Kalispel Reservation Economic Area.

The changes in the American economy over the last half-century have often been described in terms of a “shift to services” or the rise of a “services economy.” The growth of almost all of the services sectors in the Kalispel Reservation Economic Area shows that this national trend has also transformed that area.

D. Summary of the Long-Term Trends

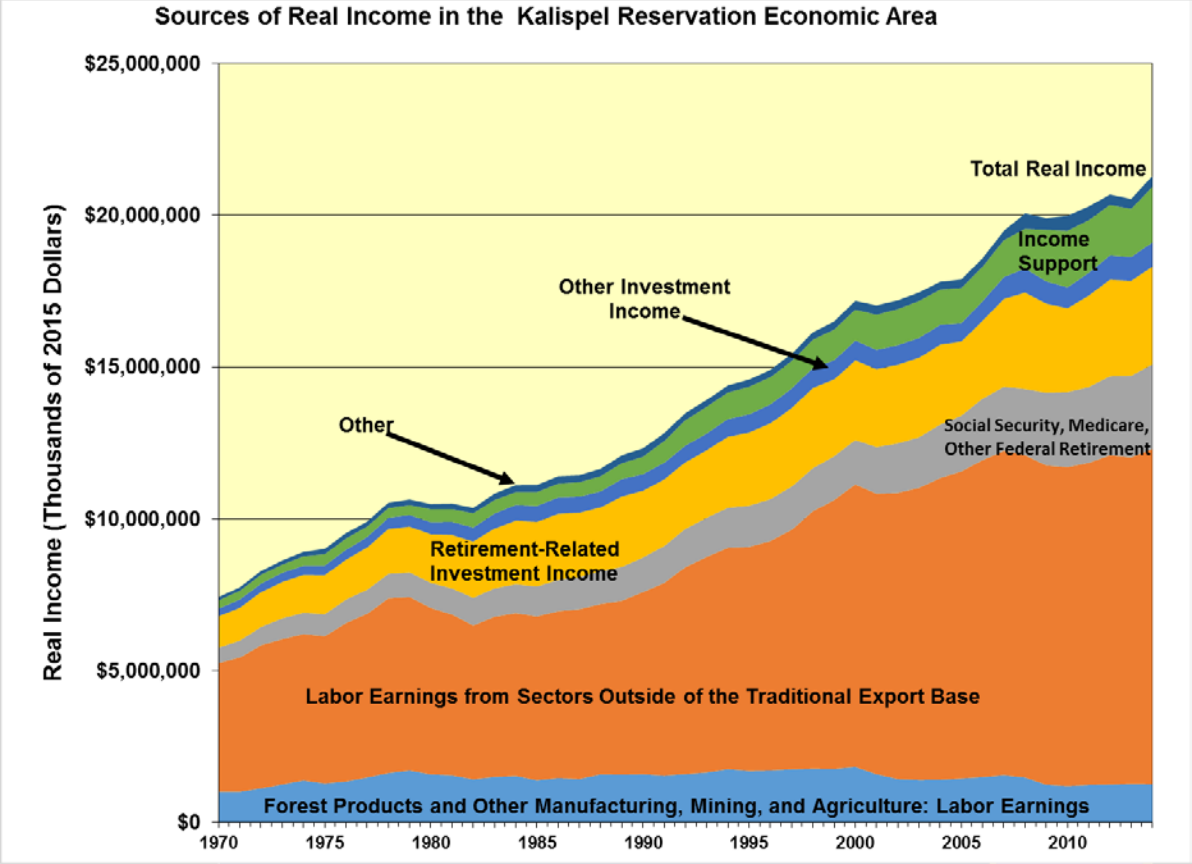
Over the last four decades, 1973-2014, real labor income earned in the traditional export base in the Kalispel Reservation Economic Area has shown almost no net increase. After reaching a peak in the late 1970s the real income from these land-based economic activities fluctuated until 2000 when, with some additional fluctuations, real labor earnings in these sectors steeply declined back to 1973 levels when measured in dollars of constant purchasing power.

Despite this loss of income from the traditional export base, real income received by residents of the Kalispel Reservation Economic Area almost tripled between 1970 and 2014. Real labor earnings in economic sectors outside of the traditional export base increased 160 percent. The rest of the increase in income flowing to households in the Kalispel Reservation Economic Area came from sources other than current jobs, what has been labeled non-labor income above, e.g. income from retirement programs, return on investments, and government income support programs. These sources of non-employment income quadrupled in size. This was possible primarily because of the growth in retirement and investment income. See Figure 10 below.

This long-run pattern of the income flows to households in the Kalispel Reservation Economic Area underlines the importance of focusing on the actual sources of economic vitality in the region rather than focusing attention on the sources of economic vitality in the distant past. These long-run economic trends underline the following as the actual sources of local economic vitality:

a. The rise in the importance of the service sectors of the economy including medical, professional, technical, financial, and visitor services.
b. The increasingly important role of local government including the Kalispel Reservation government and its business enterprises.
c. The increasing importance of retirement income.
d. The increasing role of other sources of non-employment income including investment income and government income support programs.
e. The importance of households choosing to live in the rural parts of our economic area while commuting out to work in the Spokane urban area.

Figure 10.



4. The Role of Forest Products and Other Manufacturing in the Kalispel Reservation Economic Area

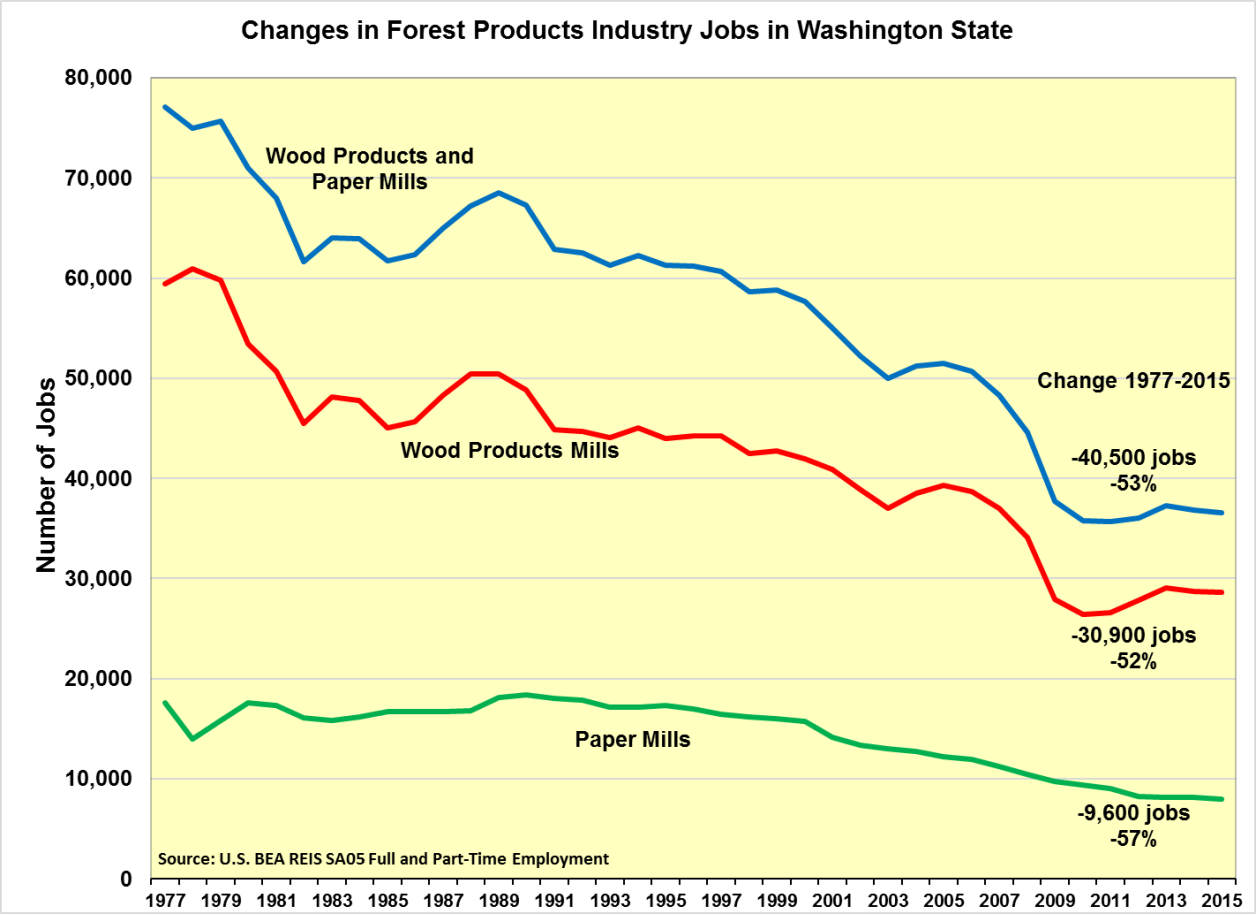
Forest products manufacturing (paper, plywood, lumber, and other wood fiber building materials mills) has historically played an important role in the Kalispel Reservation Economic Area. [40] A newsprint paper mill is located in Usk, just across the river from the Kalispel Reservation. There are several forest product facilities in the Colville-Kettle Falls area of Stevens County as well as a wood-fired electric generator. There are also a paper mill and numerous forest products manufacturing firms in the Greater Spokane area. The forests and economic activities supported by those forests were important to

[40] *Forest products manufacturing* is defined here to include lumber and wood products mills and paper mills as well as loggers who harvest the trees and deliver them to the mills. "Forest Products" do *not* include products manufactured from the wood and paper. For instance, wood furniture manufacturing is not included nor are the corrugated boxes made from the Kraft paper produced by paper mills. The reason for not including the downstream manufacture of wood and paper products is that that economic activity does not have to take place at a lumber or paper mill. It can take place anywhere by importing the wood and paper to the manufacturing facility.

the original European-American settlement of northeastern Washington and continue to play an important role in the regional economy

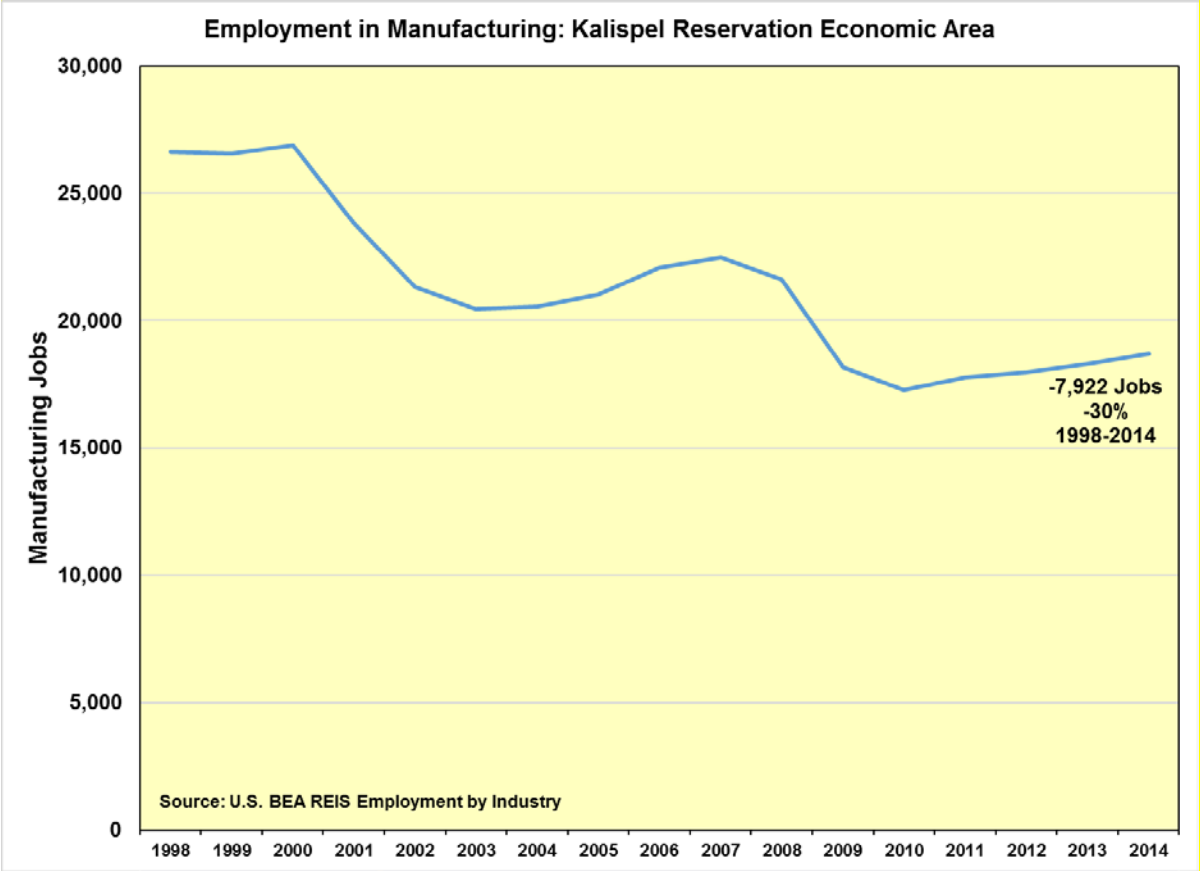
Forest products manufacturing, however, has been a declining source of employment and income across the United States and Washington state for at least the last forty years. Between 1977 and 2015, Washington forest products jobs were more than cut in half, shedding 40,500 jobs. That included a loss of 30,900 jobs at wood products mills and the associated logging and a loss of 9,600 jobs at paper mills. See Figure 11 below.

Figure 11.



Reliable forest products manufacturing job and payroll data at the *county* level is not readily available for long historical time periods because of changes in the way that various industries have been defined. However, data for the 1998-2014 period for the Kalispel Reservation Economic Area shows that forest products manufacturing employment fell by about 20 percent while total employment in all manufacturing activity fell by 30 percent. The manufacturing job losses totaled almost 8,000 jobs. See Figure 12 below.

Figure 12.

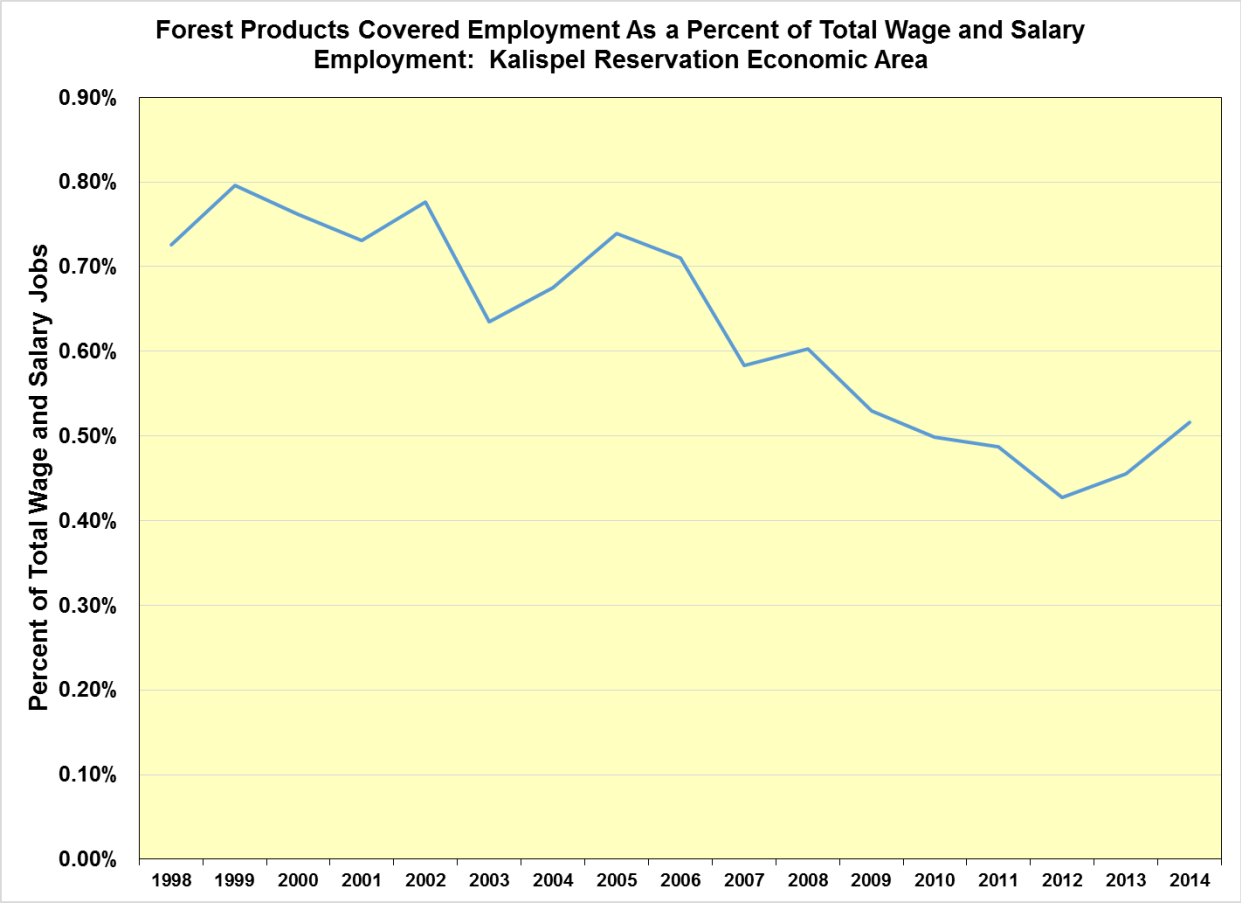


It is important to note that forest products manufacturing was the source of relatively few jobs across the entire Kalispel Reservation Economic Area, about *eight-tenths of one percent* in 1999 and about *one-half of one percent* in 2014. See Figure 13 below.

This very small direct share of total jobs in the Kalispel Reservation Economic Area is partially due to the large and very diverse economy within the Spokane urban area. Forest products were the direct source of only 0.25 percent of jobs in Spokane County but the source of seven percent of jobs in Pend Oreille County and about six percent of jobs in Stevens County.[41]

[41] Forest products employment information is not readily available at the county level because release of that data may reveal confidential production or wage information about individual firms. This leads the federal government to not disclose such economic information in rural areas where there may be only one or a few large companies. The data used come from *County Business Patterns* information published by the U.S. Department of Commerce. The U.S. Bureau of Land Management and the U.S. Forest Service have funded the development of the Economic Profile System (EPS) that is maintained by the consulting firm Headwaters Economics. (https://headwaterseconomics.org/tools/economic-profile-system/) The EPS system uses various data sources and algorithms to estimate the economic data for rural areas that is not disclosed by the U.S. Bureau of Economic Affairs (BEA). For the forest products sectors, the EPS employment information is for jobs covered by unemployment insurance. It does not include government, agricultural, railroad, or self-employment jobs. The percentage importance of forest products jobs is

Figure 13.



Source: U.S. BEA REIS and Headwaters Economics EPS.

No forest products firms are found among Spokane's 60 largest private employers, but the Ponderay Newsprint Company in Usk is among the largest private employers in Pend Oreille County. In Stevens County, three lumber or plywood firms are among the top 10 private employers. Forest products are an important source of employment in the two rural counties of the economic area.

The decline in the relative importance of the forest products industry is due both to the decline in employment in those sectors and the ongoing growth of the rest of the economy despite the declines in forest products and other manufacturing.[42]

calculated by using total employment less self-employment as the measure of total employment that is consistent with excluding self-employed forest products workers.

[42] As discussed in an earlier footnote, our "forest products" sector includes lumber and paper mills which are part of manufacturing as well as workers who plant, cultivate, and harvest trees who are classified as "forestry," *not* manufacturing. Previous to the year 2000, logging was treated as part of "lumber and wood products" manufacturing. This is one of the changes in federal industry definitions that makes it difficult to compare particular types of economic activity before and after the year 2000.

In 2013, the Tri-County Economic Development District, which includes Pend Oreille, Stevens, and Ferry Counties, recognized this shift in the economies of these rural northeastern Washington Counties:

> The region has transitioned to an economic base led by the services industry sector, as seen by the sector's increasing importance with respect to total employment and income shares. Historic job losses in the timber and wood products industry combined with more current stricter federal and state regulations of logging and resource industries has resulted in more recent closures and downsizing.
>
> The logging industry consisted of tree harvesting that provided logs for sawmills and wood chips for pulp mills, and has been hard hit by a number of factors. The more recent [2013] job losses have been caused by the collapse of the home building industry. Additionally, declining log and pulp prices coupled with increasing fuel and transportation costs, have also caused profit margins to drop, resulting in logging companies to exit the industry. [43]

Changing market conditions within the United States and Canada have also had an impact on the viability of forest products activity in northeastern Washington. The rise of the internet and cable television as sources of news and information have impacted the production runs of the nation's newspapers and their demand for newsprint paper. That is one of the reasons that Ponderay Newsprint in Usk faces an uncertain economic future. That facility is partially owned by several large newspaper chains in the U.S. whose demand for paper is declining. In 2016 Ponderay indicated that it had "solid orders for newsprint through 2016 as a result of recent paper mill closures on the West Coast, but future demand for the plant's product was unclear."[44] Ponderay informed its electric power supplier that its electricity demand for 2017 might decline dramatically.[45]

According to the county history posted on the Pend Oreille County website: "Over the years, more than 250 sawmills operated at various times in Pend Oreille County, ranging from gigantic operations to small single-family businesses." The last large lumber mill in Pend Oreille County, the Vaggen Brothers mill in Ione, shut down in 1995.[46] Labor-displacing technological change and economies of scale systematically worked towards the consolidation of small mills into larger operations and also led to a reduction in the size of the labor force needed to harvest and process any given volume

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[43] Op. cit. "Tri-County Economic Development District Comprehensive Economic Development Strategy 2013-2017." Page 8.

[44] Kramer, B. *Spokesman Review.* Cutbacks at Usk newsprint operation would hurt rural utility, officials say. January 8, 2016, http://www.spokesman.com/stories/2016/jan/08/cutbacks-at-usk-newsprint-operation-would-hurt-rur/

[45] Ibid.

[46] The history was written by Arksey, L. http://pendoreilleco.org/pend-oreille-county-history/ Accessed 12/4/2016.

of wood fiber. The result has been an ongoing decline in employment and payroll associated with forest products manufacturing.

Whatever the explanations are for the decline in the relative importance of forest products manufacturing in the Kalispel Reservation Economic Area, the long historical importance of these industries has led to concern that the loss of part of the region's "economic base" is likely to depress local economic vitality and well-being.

The empirical evidence thus far, suggests that this is not the case. The other positive economic forces discussed above that have been leading the expansion of the regional economy appear to be maintaining the vitality of the economic region.

In the analysis below the "traditional" economic base of the Kalispel Reservation Economic Area is represented by the aggregation of agriculture, forestry, mining, forest products and other manufacturing. Looking back over the last four decades it can be seen that employment in those export sectors *declined* modestly, by about 5 percent at the same time that employment in the rest of the economy *increased* by 156 percent.[47] Between 1970 and 2014 jobs in the export sectors *declined* by over 1,000 jobs while almost 167,000 jobs were *added* in the rest of the economy.[48] That is, each lost export sector job was replaced by 151 other jobs outside of the traditional export sectors. See Figure 14 below.

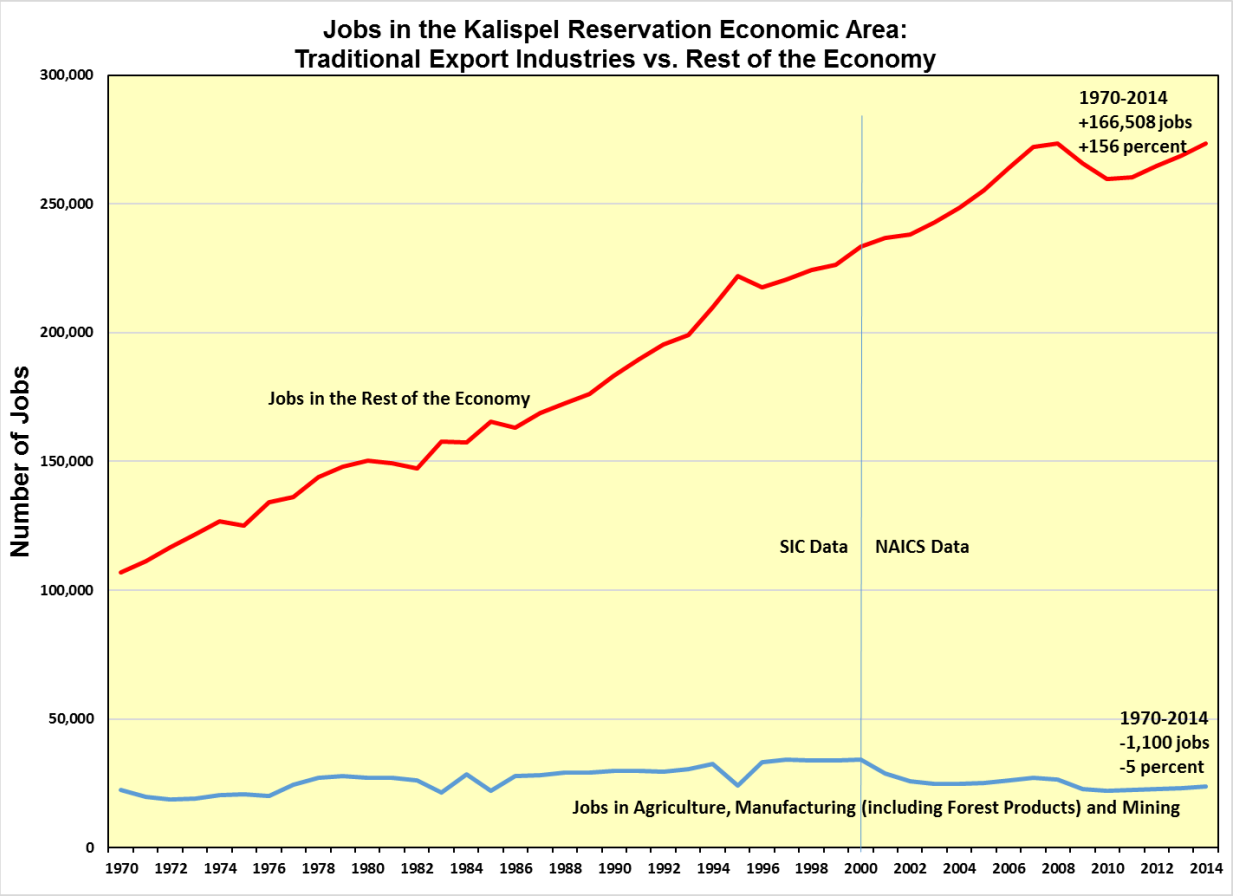
The real earnings paid to workers by export-oriented firms in the Kalispel Reservation Economic Area were largely flat when averaged over the 1970 through 2014 period, growing at an *average* annual rate of about one-half of one percent. That allowed total real earnings in the export-oriented sectors to increase by 26 percent over those 44 years. But that overall slow growth was the result of a 58 percent *increase* in real export industry earnings during the first ten years, 1970-1980, followed by 34 years, 1980-2014, during which real export industry labor earnings *declined* by 20 percent. During that 34-year period of declining export-industry earnings, income from other sources increased by 122 percent.

In Figure 14 below, the impact of the Great Recession on jobs can be seen in the upper right of the figure. Jobs outside of the export base declined from 2008-2010 and had only regained the 2008 level in 2014. The label "great" for that recession is well

[47] These sectors have been labeled the "traditional export sectors" because they are the sectors that are usually mentioned when an area's "economic base" is discussed. Most economic observers today would go beyond these "traditional" sectors to include economic activity associated with visitors ("tourists"), educational institutions serving primarily non-residents, and specialized services being provided to clients outside of the local economy. As a result, the residual "rest of the economy" includes some economic activity aimed at customers outside the local economy. This will be discussed later in this report.
[48] All economic statistics, unless otherwise indicated, come from the U.S. Department of Commerce's Regional Economic Information System. Income figures are converted to 2014 dollars using the CPI. The 1969 starting point is the first year for which this local economic data is available for all U.S. counties.

deserved if one compares the employment decline in 2008 with that of the recessions of 1974, the early 1980s, and the early 2000s.[49]

Figure 14.

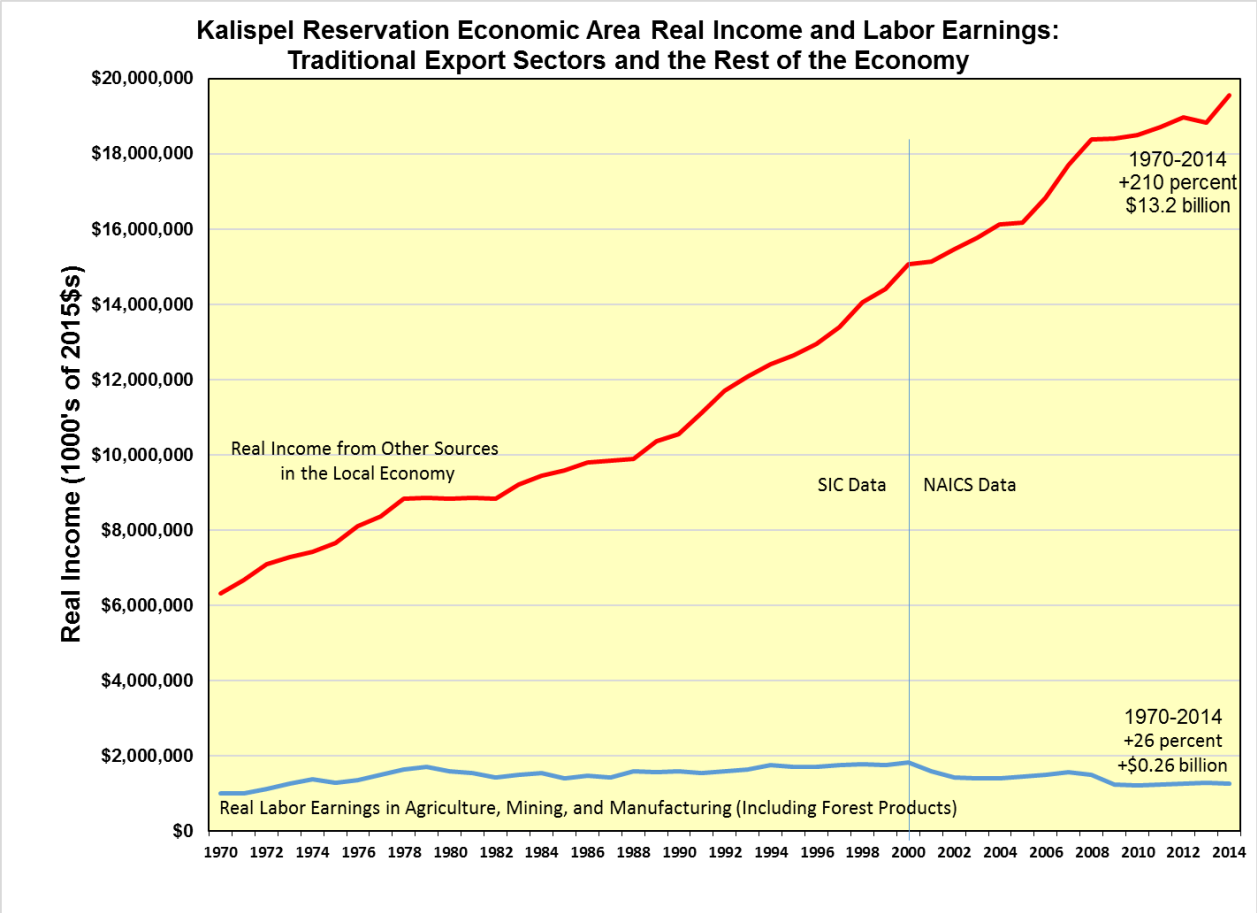


Real income from other, non-export, sources more than tripled across the entire 44-year period. While the export sectors were able to boost payrolls to workers by $264 *million*, the real income received from other sources increased by $13.2 *billion***.** For each dollar increase in payrolls in the traditional export base, $51 of additional real income was obtained from other sectors of the economy. While the traditional export base remained nearly stagnant, growing at an average annual rate of one-half of one percent, income flowing into the local economy from other sources was increasing at 2.6 percent per year, five times as fast. See Figure 15 below.

Again, the overall economy was showing considerable economic vitality despite the stagnation or decline in traditional export earnings. There was significant autonomous economic vitality that allowed the economy to continue to expand.

[49] On both Figure 7 and Figure 8 there is a vertical line at the year 2000 that warns that in that year the U.S. BEA changed the definitions of many industries to match the classifications being used in Canada and Mexico. The employment and labor earnings by industry on either side of that date cannot be strictly compared. For large aggregations of industries, as here, this is less of a problem.

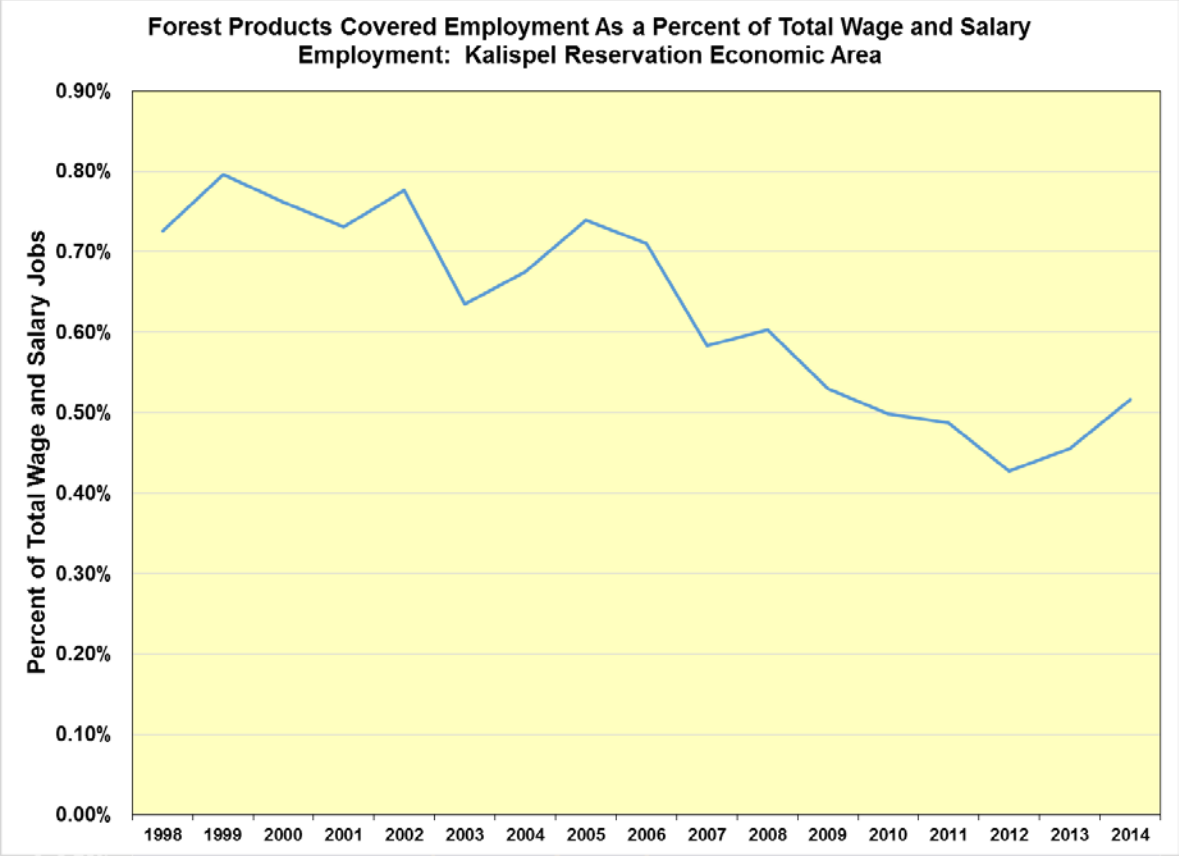
Figure 15.



It is important to realize that this divergence between a declining traditional export base and an expanding overall economy is not a unique feature of the Kalispel Reservation economic area. This pattern can be found in most areas for the simple reason that our economies have been changing dramatically over the last decade. The land- and goods-based economic activity that was associated with the original European-American settlement of most of the nation, while remaining important, has shrunk in relative importance as our local economies have diversified as economic activities providing us with important services such as medical care and new durable consumer goods, such as computers and communications technology, have grown in relative importance. Looking at the economic activities that dominated our economies in the past is not necessarily a reliable guide to either our current economies or our future economies.

As a result of the slow growth or decline in the traditional export sectors while the rest of the economy expanded, the relative importance of those export sectors as a source of labor earnings declined from 16 percent in 1979 to 6 percent in 2014. See Figure 16.

Figure 16.



6. The Economic Importance of Amenities in the Kalispel Reservation Economic Area

The previous sections of this report have documented why it is important in local economic analysis to look at *all* of the sources of jobs and income in the local economy, both the export-oriented sectors as well as those sectors serving local demand for goods and services. Both economic theory and empirical economic research underline the importance of not focusing on a pre-determined set of economic activities as key or basic, but rather to look closely at the whole of the evolving economy. In addition, it is important to recognize the importance of locally oriented economic activity in helping to hold and circulate the income that does flow into the local economy. That is the source of the “ripple” or “multiplier” impacts. Finally, people do not just passively follow jobs. Jobs also follow people because people’s preferences for what they perceive to be higher quality living environments help determine the location of the labor force and local markets for goods and services. Both of these are important determinants of the location of economic activity.

In that sense the attractiveness of the Kalispel Reservation Economic Area as a place to live, work, and do business is not *just* a subjective attitude or preference that some residents may have that may be of sociological or cultural interest. Those evaluations of

the positive and negative values associated with living in a particular area are also important to the economic vitality of cities and more rural areas. The local quality of life, a general term used for how local social, cultural, human-built, and environmental amenities are valued by residents, potential residents, and visitors, are of direct relevance to local economic vitality.

This has been recognized by local governments as well as civic and economic development organizations within the Kalispel Reservation Economic Area. For instance, in 2003, the Downtown Spokane Partnership adopted a slogan to be used in promoting Spokane as a place to live, operate a business, or visit. It chose “Near Nature. Near Perfect.” The point was to emphasize the attractive natural settings within and surrounding Spokane as well as the attractive urban amenities found in the Spokane area. In 2007 the Spokane City Council, alluding to that slogan, unanimously approve a “Near-Nature Quality of Life Initiative.” The focus of this initiative was summarized in the following terms:[50]

> The City of Spokane's civic slogan - *"Near Nature. Near Perfect'* - demonstrates the essence of the exceptional quality of life for Spokane and its residents and visitors. This resolution provides that the City of Spokane is committed to continuing and expanding its efforts to sustain the community's quality of life and the natural assets upon which the quality of life is based. This resolution further provides that the City Council will support the Mayor and City's programs described in the Near Nature Quality of Life Initiative, which includes actions to protect water quality and quantity, curb greenhouse gases, improve air quality, lead to sustainable growth and development, and encourage healthy lifestyle options such as outdoor recreation and alternative modes of transportation.

The Tri-County (Pend Oreille, Stevens, and Ferry) Economic Development District also noted in its 2013-2017 Comprehensive Economic Development Strategy: “The region's natural beauty and outdoor recreational resources and lower costing real estate, increasingly attract elderly retired persons as visitors and as in-migrants, who spend money in the area.[51]

Local environmental quality and location-specific attractive amenities support local economic vitality in many different ways including:

A. Attracting and Holding Businesses

Businesses have to be concerned about the availability of workers with the skills and experience they need to operate or expand operations. The *cost* of attracting the quality of workers that businesses need also matters. If an area is one in which workers and

[50]Spokane City Council Resolution 2007-0009, February 12, 2007.
[51]Tri-County Economic Development District Comprehensive Economic Development Strategy 2013-2017, p. 8.

their families would rather not live, firms will have to pay the equivalent of "battle pay" to attract and hold the workers they need in that area. On the other hand, if the area, because of the local social, cultural, natural, and human-created amenities, is quite attractive to workers and their families, firms will have no difficulty obtaining the quality workforce they need without paying a premium to "bribe" workers into moving to the area or staying in the area. Businesses accordingly have a financial incentive to locate and stay in areas with desirable amenities because it can reduce one of the major costs they face, their payroll.

B. Attracting and Holding Working-Age Residents

The in-migration of working-age individuals and their families can have a stimulating impact on the local economy. In-migrating families typically bring with them capital in the form of savings, including the income they received from the sale of their previous residence. In the process of setting up a household and seeking jobs, the in-migrants spend money that stimulates the local economy. Empirical estimates indicate that a working age in-migrant can have an impact that creates the equivalent of one new job. In addition, ongoing in-migration creates expanded markets for goods and services that allow increased specialization and expansion of the local business infrastructure that, in turn, allows the economy to capture and hold more of the income generated by reducing income leakage out to fund imported goods and services. In-migration can also increase the labor supply, somewhat reducing the pay levels for workers of all skills, making the area an attractive location for new firms.

Between 2000 and 2015 the population of the Kalispel Reservation Economic Area expanded by over 50,000 due to net in-migration. Total population of the three-county area increased by just over 77,000. Thus, net in-migration was responsible for about 65 percent of the population growth. Most of the population increase took place in Spokane County, which is nine times larger than the two rural counties together, where the population increased over 17 percent. Population growth in the two rural counties together was about 10 percent due almost entirely to net in-migration.[52] So people, "voting with their feet," were largely the source of the population growth.

C. Attracting and Holding Retirees

Those reaching retirement age can partially choose their residential location independent of the employment opportunities an area may provide. Their retirement income follows them wherever they go. Retirees, therefore, can focus more on where they would *like* to live and what the amenities are that various alternative locations have to offer. Some straightforward economic considerations are still important including the local cost of living and, in particular, the local cost of housing, easy access to high quality health care, and the potential for part-time employment to supplement retirement income. But local quality of life and the myriad of local amenities are also very

[52] The source of the population data was the Economic Profile System developed for the U.S. Forest Service and Bureau of Land Management by Headwaters Economics. Pages 1 and 2. https://headwaterseconomics.org/tools/economic-profile-system/

important. The spending of in-migrating retirees stimulates the local economy in the same way that export sectors draw money into the community where those export oriented facilities are located. As that income circulates locally it puts others to work generating additional income. To the extent that the retirees are entirely out of the labor market, they do not indirectly fill the local jobs they themselves create.

As pointed out earlier, Pend Oreille and Stevens Counties both have been identified as "retirement destination" counties by the federal government because of the increased settlement there by retirement-aged people. As shown in Figure 12 above, retirement-related income (Social Security, Medicare, military pensions and health care, the part of investment income flowing to retirees, etc.) is a major source of income to residents of the Kalispel Reservation Economic Area. That retirement-related income in 2014 was almost five times as large as the labor income from the traditional export-base industries (forest products manufacturing, other manufacturing, forestry, mining, and agriculture). Retirement-related income was over five times as large as the labor income from all of manufacturing, three times as large as the payroll associated with medical services, and twice as large as all government payrolls in the Kalispel Reservation Economic Area.[53]

D. Developing a Sustainable Visitor Economy around Local Amenities

High quality social, cultural and natural amenities not only attract new permanent residents but also visitors. The "visitor economy" includes a wide variety of different types of visitors from professional and business meetings to those focused on outdoor recreation to those seeking unique cultural experiences. Of course, there are also people who come in from smaller towns and rural areas to shop, attend sports events, and/or enjoy an evening of entertainment at Spokane's restaurants, theaters, music venues, resorts, and casinos.

Communities, recognizing that tourism can be a threat as well as an economic benefit, have tried to become more discriminating in the type of tourism they have encouraged. A variety of different names have come to be applied to types of more focused and sustainable visitor economies that are consistent with sustaining and not degrading the unique aspects of a community: ecotourism, community-based tourism, cultural visitors, heritage traveler, etc. The term that seems to have been adopted to represent all of these types of tourism that explicitly seek not to threaten the unique qualities that are drawing the visitors to an area is *geotourism*. It has been defined as "tourism that sustains or enhances the geographical character of a place—its environment, culture, aesthetics, heritage, and the well-being of its residents."[54]

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[53] Calculations based on BEA REIS data on labor income by industry and county, investment income (dividends, rent, and interest), and payments to individuals and households by federal retirement and income support programs.

[54] See Stokes, A., Cook, D., and Drew, D. Geotourism: The New Trend in Travel. *National Geographic and Travel Industry Association of America.* 2003..
http://www.egret.us/clinton/Geotourism%20The%20New%20Trend%20in%20Travel.pdf . Also see
http://en.wikipedia.org/wiki/Geotourism

The development of sustainable tourism and its embrace by the Travel Industry Association of America reflects the negative connotation that has come to be associated over the years with conventional "industrial scale" tourism. Instead of disrupting communities and creating mostly part-time low-paid jobs for in-migrating young people, the focus is on visitors and activities that are specifically compatible with local characteristics and that maximize local economic benefits. The cultural diversity and richness of the Kalispel Reservation Economic Area, its combination of small city and rural lifestyles with a sophisticated urban center, and its surrounding mountains, rivers, lakes, and protected public lands lay the basis for a productive expansion of geotourism in the Kalispel Reservation economic area.

Travel and tourism already play an important role in the Kalispel Reservation Economic Area. As the Tri-County Economic Development District said in its Comprehensive Economic Development Strategy for 2013-2017:[55]

> Travel and tourism industry in the region employs close to 1,600 people directly or indirectly. This is approximately 16 percent of the total regional private sector employment, making travel and tourism more of a significant component of the private industry sectors in the Region.

The Washington Recreation and Conservation Office commissioned an "Economic Analysis of Outdoor Recreation in Washington State" which was published in January 2015.[56] That study estimated the economic impact of outdoor recreation in each of the counties in Washington by evaluating how expenditures on outdoor recreational activities circulated through the state and county economies. The IMPLAN input-output model developed originally by the U.S. Forest Service was used to track these economic relationships. The estimated economic contribution of outdoor recreation in the Kalispel Reservation Economic Area was $1.3 billion in income, 14,400 jobs, and $140 million in tax revenues to state and local governments. See Table 5 below.

Despite the fact that the visitor economy is significantly broader than outdoor recreation, the economic contribution of outdoor recreation to the Kalispel Reservation Economic Area is still significant. The job impacts represent 6 percent of employment in Pend Oreille County and 11 percent of employment in Stevens County. For the whole of the Kalispel Reservation Economic Area, the employment impact is about 5 percent of total jobs.[57] The impact on personal income in the economic area is similar, about 6 percent of total personal income. In Stevens County, the income impact is about 9 percent and in Pend Oreille County about 5 percent. The approximate relative size of the impact on

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[55] Op. cit. June 26, 2013. Page 8. Recall that the "tri-county" referred in the title of this organization and economic development strategy includes Pend Oreille and Stevens Counties, as does the economic area, but it also includes Ferry County which is adjacent to the west and does not include Spokane County. Because this "tri-county" region is made up of three rural counties and excludes Spokane urban area, the percentage impact of the travel and tourism industry is larger. With Spokane included that percentage impact would be less than 11 percent. It would be closer to 5 percent as discussed below.

[56] Briceno, T., and Schundler, G. Earth Economics. Tacoma, Washington. January, 2015.http://www.rco.wa.gov/documents/ORTF/EconomicAnalysisOutdoorRec.pdf

[57] U.S. BEA REIS employment information used.

state and local tax collections was about 9 percent for the Kalispel Reservation Economic Area, 10 percent for Pend Oreille County, 21 percent for Stevens County, and 8 percent for Spokane County.[58]

Table 5.

The Economic Contribution of Outdoor Recreation on the Kalispel Reservation Economic Area			
County	**Economic Contribution**	**Job Impact**	**Impact on State and Local Taxes**
Pend Oreille	**$19,736,000**	**250**	**$2,829,000**
Stevens	**$125,812,000**	**1,719**	**$18,133,000**
Spokane	**$1,177,345,000**	**12,460**	**$118,766,000**
Three-County Area	**$1,322,893,000**	**14,429**	**$139,728,000**
Source: See text. All dollar values are expressed in 2014$s. Data is from many different studies dating from 2002 to 2013.			

Although this type of economic analysis allows one to compare the full linked impacts of a particular economic activity on a state or county economy, it represents a relatively narrow view of the importance of outdoor recreation. In this approach the initial measure of the importance of different types of outdoor recreation is the expenditures that participants make in the process of enjoying that activity. These expenditures are then traced through the economy to see how other sectors of the economy are affected and these net combined effects are carefully summed up.

There is an economic logic to this. People's expenditures on something provide an indication of how important that activity is to them. The *costs* of participating in outdoor activity in that sense can be used as the measure of the *benefits* of that outdoor activity to those participating. In some economic settings, this is entirely appropriate, but when many of the inputs to an economic activity are provided as public goods for which no charge is made, this can lead to a significant underestimation of the value of that activity. In the case of outdoor recreation where the quality of the natural landscape is an important "input" and where that landscape or at least the surrounding landscape is publicly owned, the problem of relying on expenditures to measure economic value is even more severe.

Conceptually, economic value is measured by what the participant would be willing to pay for the experience or, if they had been a past participant, what they would require as compensation before they would give up that opportunity. Over the last six decades or so, economists have developed empirical tools for estimating these *non-market economic values.* The Washington economic analysis of outdoor recreation cited above also reports on these non-market values associated with outdoor recreation and the

[58] State and local government tax revenues in the counties in the economic area were approximated by the 2014 state tax collections in each county and the 2013 property tax collections in each county. http://www.ofm.wa.gov/fiscal/expenditures_and_revenues/county_expenditures_revenues.pdf http://dor.wa.gov/docs/reports/2014/Property_Tax_Statistics_2014/PropTx2014.pdf

landscape on which it depends. That report described the non-market economic values that its analysis sought to quantify in monetary term as follows:

> In addition to the monetary contribution [of expenditures] of outdoor recreation to Washington's economy, there are a number of other benefits not accounted for within traditional economic analysis. These benefits include the satisfaction and increase in general quality of life people get from engaging in outdoor recreation and from the ecosystem services recreational lands provide. Trees, water, and animals provide ecosystem goods and services such as swimmable water, habitat, and aesthetic beauty. Washington's 23 million acres of public land provide many of these benefits. [59]

The result of that analysis was summarized as: "The combined total estimated value of these non-market benefits is between $134 billion and $248 billion a year."[60] The economic contribution of outdoor recreation in Washington using recreationists' expenditures was $20.5 billion a year for the whole of the state. These are not strictly comparable because of the different conceptual bases from which they were derived. However, these results underline the important non-market economic values associated with goods and services provided by the natural, social, and cultural environment as opposed to goods and services purchased in commercial markets by outdoor recreationists.

IV. The Potential Economic Costs of Class I Redesignation

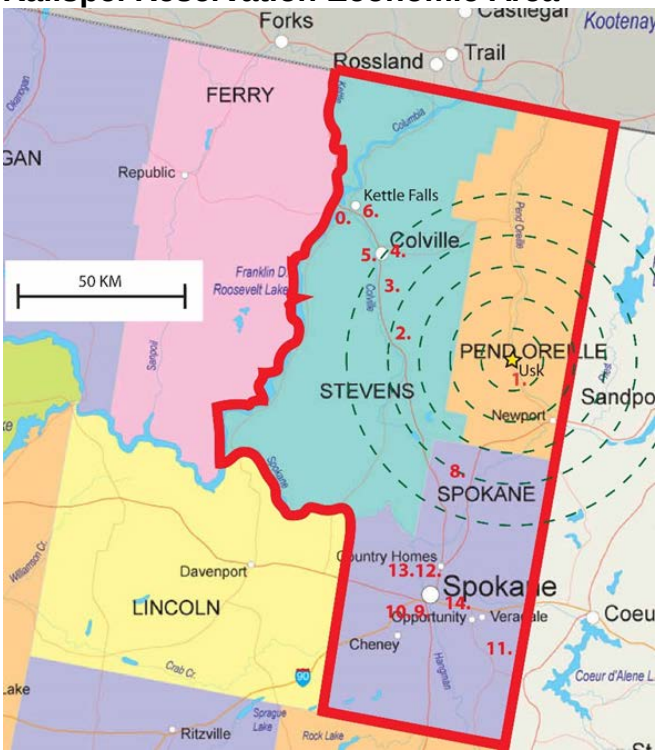
As discussed above there are clear and measurable benefits associated with avoiding the deterioration of air quality. That is why the Kalispel Tribe is pursuing Class I PSD air quality redesignation. Of course, there may also be some potential costs that are associated with those stricter air quality standards. If, for instance, there were a business proposing new air emissions that would violate the Class I but not the Class II air quality standards on the Kalispel Reservation, that business might be blocked by the new, stricter, air quality designation. The blockage of that new business activity could potentially become a cost of the Class I redesignation in the sense that a potential source of additional jobs, income, and tax revenues to local governments would be lost. In this section, we provide a framework for analyzing such potential costs.

[59] Ibid. p. xi.
[60] Ibid.

1. The Economic Activities in the Kalispel Reservation Economic Area with the Largest Air Pollution Emissions

There are industrial facilities within the Kalispel Reservation Economic Area that are the source of significant levels of various air pollutants. Figure 17 below shows the location of these facilities. Table 6 below identifies each of those air pollution sources.

Figure 17.
Kalispel Reservation Economic Area



Red Outline Shows Kalispel Reservation Economic Area

Table 6.
Index to Pollution Sources Identified on Figure 17

Index to Major Air Pollution Sources in the Kalispel Reservation Economic Area					
Index #	**Pollution Source**	**Location**	**Index #**	**Pollution Source**	**Location**
0	Avista Wood-Fired Generator	Kettle Falls	8	Deer Park Airport	Deer Park
1	Ponderay Newsprint	Usk	9	Spokane: Waste to Electricity	Spokane
2	Sand Canyon Airport	Chewelah	10	Spokane International Airport	Spokane
3	Boise Cascade Wood Products	Arden	11	Mutual Materials Brick Mfg.	Mica
4	Colville Municipal Airport	Colville	12	Inland Empire Paper Mill	Millwood
5	Vaagen Brothers Lumber	Colville	13	Fells Field Airport	Spokane
6	Boise Cascade-Lumber Mill	Kettle Falls	14	Kaiser Trentwood Aluminum	Trentwood
7	Boise Cascade-Plywood Mill	Kettle Falls			
Source: U.S. EPA Air Emission Sources, https://www3.epa.gov/air/emissions/where.htm					

Note that six of the fifteen air pollution sources are forest products manufacturing facilities. If the focus is only on pollution from industrial facilities, six of the ten industrial sources of air pollution are involved in forest products manufacturing and another is a wood-fired electric generator. Spokane's waste-fueled electric generator is also on the list. Two other raw-material-based manufacturing facilities, an aluminum rolling mill and fabrication plant and a brick factory are included. Finally, five of the pollution sources are not industrial manufacturing facilities at all but transportation hubs, namely five regional airports.

These major sources of pollution in the Kalispel Reservation Economic Area are listed because the structure of the regional economy could significantly determine the levels and location of air pollution and because regulations to prevent further deterioration of air quality or to actually reduce current levels of air pollution may impose burdens on more heavily polluting industries.

The ongoing decline in forest products manufacturing as a source of jobs and income in the Kalispel Reservation Economic Area documented earlier has two implications for the analysis of the likely impact of Class I redesignation of the Kalispel Reservation. First, new, large forest products mills are unlikely to be built in the region. Economic growth will be driven by the expansion of other sectors of the economy.[61] Those new and growing sectors of the economy are likely to be much less pollution intensive and therefore less likely to be constrained by the Class I air quality redesignation. Second, existing forest products mills at the time of the Class I redesignation will be effectively "grandfathered in" at their current levels of air pollution. If they were shut down in the future, they could be replaced by other economic activities as long as those economic activities were no more polluting than the facilities that shut down.

2. The Economic Impact of Potential Polluting Facilities That Might Be Located Close to the Kalispel Reservation

A. The Implications of Relevant Economic Trends

Section III of this report provided a detailed analysis of the changes that have been taking place in the Kalispel Reservation Economic Area over the last 45 years as well as a close up view of the last decade and a half. Those changes were not unique to northeastern Washington or the Pacific Northwest. Similar changes have taken place across most of the United States. But those economic changes and trends have important implications for the likelihood that the Kalispel Tribe's efforts to protect air quality on its Reservation from deterioration could reduce the economic vitality and well-being in the larger economic region in which the Reservation is embedded.

[61] The interest of HiTest Sands, Inc. in siting a silicon smelter in Usk, WA, just across the Pend Oreille River from the Kalispel Reservation may appear to contradict this statement. But between 2001 and 2014 the Kalispel Reservation Economic Area lost about 5,000 jobs in manufacturing while adding about 36,000 jobs in services and government. See Table 5. The likelihood that new jobs will come from manufacturing in general and highly polluting manufacturing specifically is quite low.

The changes discussed at length in Section III above included the following:

i. The economy has been shifting away from land-based economic activities such as forest products and mining towards lighter manufacturing and services. This also represents a shift from more heavily polluting industries to economic activities with smaller environmental footprints.

ii. That shift has not undermined the regional economy: Employment, income, and population have expanded significantly during this transition. Economic vitality has been maintained.

iii. This was possible because some, but not all, of the new service sector jobs were skilled and well-paid jobs in health care, technical and professional occupations, education, finance, government, utilities, and transportation.

iv. In addition, sources of income not associated with people's jobs increased significantly. These included retirement and investment income.

v. The population of the region increased primarily through the net in-migration of new individuals and families. At least part of that in-migration is associated with individuals and households seeking more attractive places to live, raise a family, or retire.

vi. Site-specific attractive features of an area, local *amenities*, have become increasingly important in determining the geographic distribution of population and economic activities. Regions, explicitly or implicitly, compete with each other to hold onto existing residents and businesses and attract new ones. Spokane's use of the slogan "Near Nature. Near Perfect" is intended to dramatize the quality of life the Greater Spokane Area provides. The choice of many households to locate in the rural parts of the Kalispel Reservation Economic Area while commuting to work in the Spokane urban area is one sign of people "voting with their feet" in the pursuit of natural and social amenities.

vii. The growth and diversification of the Spokane economy has helped the Kalispel Reservation Economic Area as a whole capture and hold income that flows into it, reducing leakage out of the region, and increasing overall economic vitality.

These changes increase the importance of local amenities in supporting local economic vitality and well-being. Protecting those amenities, including clean air, complements economic development efforts rather than undermining economic development. Stated differently, these changes make the Kalispel Tribe's efforts to redesignate their Reservation as a Class I PSD air quality area consistent with larger regional efforts to maintain and improve quality of life as a positive economic strategy as well as an environmental health strategy.

B. Facilities Likely to Violate Class I Status of the Kalispel Reservation

Air Resource Specialists carried out an "Energy Impact Analysis in Support of Class I Redesignation" for the Kalispel Tribe.[62] That analysis modeled the impact of relatively large air pollution sources approximately 50 km south of the Kalispel Reservation in northern Spokane County adjacent to the airport in Deer Park, WA. Two different types of electric generators were used as a hypothetical industrial pollution source.[63] The potential impact of such a facility on Kalispel Reservation Class I PSD allowed pollution increments were estimated. That air quality modeling concluded: "Based on the hypothetical projects evaluated, the air dispersion modeling demonstrated that the hypothetical project emissions would not interfere with maintaining the Class I PSD increments on the Kalispel Reservation."[64]

New industrial activities that produce more intense air pollution and/or that were located closer to the Kalispel Reservation *could*, potentially, violate the stricter Class I limits on the degradation of air quality on the Kalispel Reservation. In that setting, such a facility could not be permitted unless it took steps to reduce its air pollution and/or chose a location that did not cause as much degradation of air quality on the Kalispel Reservation.

As mentioned above, the Class I redesignation of the Reservation would not impact existing air pollution sources in the region around the Reservation unless they *increased* their air pollution significantly enough to violate the Class I limits on the Kalispel Reservation. Also, if those existing facilities were to shut down, new or expanded economic activities could be permitted as long as the pollution from those new or expanded facilities did not have pollution levels above those of the previous facilities. There currently are no proposed facilities seeking air quality permits that might be impacted by Class I redesignation of the Kalispel Reservation. That makes any analysis of how Class I redesignation might or might not limit any particular type of economic activity in the economic region speculative, at best. Evaluation of the actual benefits and costs associated with a new pollution source requires detailed information on the air pollution associated with it, the meteorological patterns connecting the site of the emissions and the Kalispel Reservation, as well as the economic benefits it might offer the local economy. Without that detailed information, it is not possible to evaluate whether there would be net costs or net benefits associated with that proposed new pollution source.[65]

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[62] Revised Draft Technical Report, D. Howard Gebhart, December 2016.
[63] The hypothetical electric generators were a 315 MW combustion turbine or, alternatively, a 50 MW biomass boiler project. Pp. 2-1 and 2-2
[64] Ibid. p. 5-1
[65] HiTest Sand Inc. has indicated that it is exploring locating a silicon smelter in Usk, WA adjacent to the Ponderay Newsprint facility just across the Pend Oreille River from the Kalispel Reservation. This is *one* of the sites HiTest is considering and none of the detailed information on air emissions, air quality modeling, or economic impacts is available. Thomas, P. "State invests $300K to help bring new $300-million silicon smelter, jobs to Pend Oreille County." State of Washington Commerce Department.

Although there have been some news articles about the impending closure of the Ponderay Newsprint Company, it does not currently appear that the paper mill will be closing before the Class I redesignation takes place. This is important because if Class I redesignation takes place before Ponderay Newsprint shuts down, the pollution associated with the current operation of that facility would become part of the base level of pollution to which the Class I increment would be added. That means the Ponderay Newsprint increment of air pollution could be available for use by other industrial operations at that site or elsewhere in the vicinity of the Reservation *after* the Ponderay Newsprint Company closes. If those businesses had similar or lower air emissions, they would not take up any of the Reservation's Class I air emissions increments. In that setting it would be possible to site new industrial facilities adjacent to the Kalispel Reservation without violating the new Class I increments.

C. The Potential Net Economic Benefits or Costs of Class I Redesignation Blocking the Permitting of an Industrial Facility

The purpose of designating or redesignating an area as Class I is clearly stated in the Clean Air Act: "prevention of significant deterioration" of air quality. Class I status limits that extent of further air quality deterioration more than current Class II status does. There would be no point to imposing these stricter limits of air quality deterioration if they did not prevent the permitting of some polluting facilities in some locations.

However, Class I redesignation does not categorically ban any particular type of industrial operation. It focuses instead on whether a facility's emissions would violate Class I increments. Industrial facilities have a broad range of technologies they can deploy for their production processes and to control their air pollution emissions. Industrial facilities also control where they choose to locate and the scale of production they intend to pursue.

Those business choices about a facility will determine the impact that their operations will have on air quality both at the site of the facility and, potentially, for many miles distant from that facility. Complying with regulations restricting air quality impacts is part of the business analysis that guides a business to consider particular technology choices, scale of production, and particular locations for their operations. But those environmental restrictions are just part of a broad range of economic considerations as a new facility is designed and located.

Conceptually one can analyze the economic costs and benefits associated with a relatively large industrial facility that could employ, say, 200 workers that wanted to place its facility close to the Kalispel Reservation. That is the approximate size of the existing Ponderay Newsprint facility and a potential site for the HiTest Sand silicon facility. While it is probably true that a heavily polluting industry would be unlikely to

10.29.2016. http://www.commerce.wa.gov/state-invests-300k-to-help-bring-new-300-million-silicon-smelter-jobs-to-pend-oreille-county/.

locate a facility close to a Class I air quality area, there could be other economic considerations that made such a location especially profitable and might justify the investment in extraordinary pollution controls to meet those stricter emission limits. If that occurred, the community would receive the economic benefits of the new facility while protecting the natural amenities that support a high quality of life.

If the Class I redesignation prevented the permitting of the hypothetical facility and such facility could have been permitted if Class II status had been retained, that does not necessarily mean that the Class I redesignation will cost the local economy 200 jobs and the payroll and tax revenues associated with the facility. For instance, if the firm could avoid some of the pollution control costs by locating farther away from the Class I area but within commuting distance of the potential workforce, the economic impact might not be much different between the two sites. Industrial facilities typically draw workers from a broad geographic area, especially if those facilities pay above average wages because the facility requires workers with particular skills and experience. Workers in the Kalispel Reservation Economic Area have already demonstrated their willingness to commute considerable distances from their preferred residences to where their jobs are.

Another and perhaps more likely alternative is that the economic opportunity associated with the hypothetical facility would be replaced by other economic opportunities that are more consistent with the ongoing trajectory of economic growth in the Kalispel Reservation Economic Area. As discussed earlier in this report, job and income growth over the last half-century in the Kalispel Reservation Economic Area has not come primarily from large industrial facilities with significant levels of air pollution. Class I redesignation might actually catalyze investment near the Reservation because it would give entrepreneurs more certainty that the area could not be converted into a polluted industrial site. In any event, Class I redesignation is unlikely to limit the location of the fastest growing sectors of the economy or the most numerous economic activities adjacent to or within the Kalispel Reservation.

As the earlier discussion of the economic and health costs associated with air pollution made clear, reductions in air pollution are valuable to people and enhance the economic vitality of regions. As also discussed above, many of the residents of the Kalispel Reservation Economic Area chose to reside there because of the quality of life, including environmental quality. Protecting that environmental quality can be seen as an important part of an economic development strategy.

The net benefits or net costs of Class I designation comes down to an evaluation of the probability that that stricter protection against air quality deterioration on the Reservation will actually force significant numbers of industrial facilities from locating within the Kalispel Reservation Economic Area and that these lost economic opportunities are not replaced or exceeded by other economic developments. Any economic losses also have to be weighed against the value of keeping air quality from deteriorating as much as it otherwise would have on the Reservation.

Although there is no specific case study at issue at this time for which a detailed analysis could be carried out, the overview of the characteristics of the Kalispel Reservation Economic Area provided in this report indicates that the likelihood of Class I redesignation having a net negative impact of local economic vitality and well-being is quite low. The potential conflicts between economic vitality and environmental quality are small and shrinking as a result of the changes in the sources of economic value, jobs, and income within the regional economy.

Appendix: Defining the Economic Area in Which the Kalispel Reservation Is Embedded

The purpose of this report is to analyze the likely *economic* impact of Class I redesignation of the Kalispel Reservation. For that reason, the relevant study area should make sense from an *economic* perspective, i.e. it should encompass areas that have economic connections with the Kalispel Reservation and Pend Oreille County where the Reservation is located. The primary economic connections between geographic areas are through commuting to work and shopping. In the context of Class I redesignation of the Reservation, there may also be significant economic connections if that redesignation to stricter limits on air quality deterioration constrains economic activities in areas off of the Kalispel Reservation.

The Kalispel Indian Reservation is located in southern Pend Oreille County, WA, which, in turn, is located in the extreme northeast corner of the state of Washington along the Idaho and British Columbian borders. The headquarters of the Kalispel Tribe is located near Usk, Washington, about 50 miles, an hour's drive, north of the city of Spokane, Washington.[1]

A. Federally Defined Economic Areas: Metropolitan Statistical Areas

The U.S. Bureau of Economic Analysis (BEA) provides economic statistics on local economies within the U.S. down to the county level. It also analyzes the economic connections among counties to identify multi-county areas that are linked together by workers residing in one county but commuting to another to work. This economic connection also usually leads to residents of one county commuting to other counties to shop. Such active economic links can create a more or less *integrated local economic area* that stretches across county lines.

Based on actual measured economic linkages between adjacent counties, the BEA has defined an economic area centered on the City of Spokane and Spokane County. That Spokane economic area extends to the north to include Pend Oreille and Stevens Counties in Washington and east to include the Coeur d'Alene, Idaho, area (Kootenai County, ID). This four-county economic area is identified as the Spokane Metropolitan

[1] Ideally, the economy of the Kalispel Reservation itself would be separately analyzed and the impact of Class I redesignation discussed. Unfortunately, reliable socioeconomic data is not available for the Kalispel Reservation. The decennial census (e.g. the 2010 Census) no longer collects such socioeconomic information. Instead, the U.S. Census Bureau collects that type of data annually through the American Community Survey that continuously samples the U.S. population. This provides reliable data for geographic areas such as cities and counties as long as those geographic areas have large populations. The Census Bureau combines several years of data for areas with smaller populations in an effort to improve the reliability of the data, averaging up to five years of data together. Even with that 5-year averaging, the demographic and socioeconomic data estimates for the Kalispel Reservation are unreliable, producing values that often are not statistically different from zero. For that reason, those unreliable estimated values are not presented in this report.

Statistical Area (MSA). The southern end of Stevens County reaches into the suburban areas of Greater Spokane, almost including Country Homes, WA, about 20 minutes from downtown Spokane.

Pend Oreille County has strong economic links to Spokane County to the south. Three-eighths (38 percent) of the workers residing in Pend Oreille County *commute out* of that county to work. This creates an important economic linkage to those other counties where Pend Oreille residents work. Almost a quarter (24 percent) of Pend Oreille's resident workers commute out to work in Spokane County.[2]

Stevens County, adjacent to Pend Oreille County to the west is similarly linked to Spokane County. A third of the workers residing in Stevens County commute out to work. Twenty-eight percent of resident workers in Stevens County commute out to Spokane County. See Table 1-A below. The commuting from Pend Oreille and Stevens Counties to the Coeur d'Alene, ID area is much more limited, 1 to 3 percent. For that reason, the significant economic connections are between Pend Oreille and Spokane Counties and Stevens and Spokane Counties.

Table 1-A.

Commuting Patterns among the Three Counties of the Kalispel Reservation Economic Area			
Total Workers Residing	Workers Commuting Out	Communting Out to Spokane	Working in Home County
Pend Oreille County			
4,134	1,582	1,011	2,552
100%	38%	24%	62%
Stevens County			
15,768	5,245	4,375	10,523
100%	33%	28%	67%
Spokane County			
207,530	9,410	NA	198,120
100%	5%	NA	95%

Source: U.S. Bureau of the Census, County-to-County Commuting Flows, American Community Survey 2009-2013.

These counties are closely linked by both employment connections and purchasing patterns. Wages and salaries flow from Spokane County into Pend Oreille and Stevens Counties, providing an economic stimulus in those rural residential counties. But much of the spending associated with the households living in Pend Oreille and Stevens Counties also flows back into Spokane County, supporting businesses located there.

[2] U.S. Bureau of the Census, County-to-County Commuting Flows, American Community Survey data averaged over 2009-2013.

These three counties are part of a single well-integrated economy which is why BEA includes them as part of the Spokane Metropolitan Area.[3]

B. The Tri-County Economic Development District

The U.S. Economic Development Administration (EDA), part of the U.S. Department of Commerce, supports regional economic development across the nation. Part of the EDA's program encourages groups of counties to work together in planning and implementing joint economic development activities. In northeastern Washington three rural counties, Pend Oreille, Stevens, and Ferry, have formed the Tri-County Economic Development District for that purpose. This grouping of counties does not appear to be tied to economic connections among those counties. Rather, the grouping appears to be based on the fact that these three counties are adjacent to each other and have similar problems as rural counties making a transition from economies based primarily on land-based natural resource activities to more diversified economies.

Data on workers commuting among these three counties indicates few economic connections. For instance, Ferry County has almost no economic connection with Pend Oreille County. No Pend Oreille residents are estimated to work in Ferry County and no Ferry County residents are estimated to work in Pend Oreille County. Stevens County, adjacent to Ferry, has some limited economic connections to Ferry County. An estimated 140 Stevens County workers commute to Ferry to work and 191 Ferry residents commute to Stevens County to work. Given that there are about 18,000 workers residing in these two counties, that is not a strong economic connection. For that reason, it is not appropriate to include Ferry County in the economic study area of which Pend Oreille County is a part.

C. Adjacent *Counties to the West and East: Stevens and Bonner Counties*

Pend Oreille County is bordered on the east by Bonner County, ID, and on the west by Stevens County, WA. Because southern Stevens County almost reaches into the suburbs of Spokane, there is a strong economic connection between Spokane and Stevens Counties. Almost 4,400 residents of Stevens County work in Spokane County, about a third of all the workers who reside in Stevens County. Spokane County also provides over 600 workers to jobs located in Stevens County. Over 6,500 workers participated in this in- and out-commuting between Pend Oreille, Spokane, and Stevens Counties. Of the three-county combinations among Pend Oreille, Stevens, Spokane, and Bonner Counties, this is the highest number of commuting workers. The next largest total of in- and out-commuters is associated with Pend Oreille, Spokane, and

[3] There are, of course, commuting patterns from Spokane County into Pend Oreille and Stevens Counties that links these counties even more. Those flows from Spokane to fill jobs in Pend Oreille and Stevens Counties are much smaller. While 4,375 Stevens County residents commute to Spokane County to work, only 628 workers residing in Spokane commute into Stevens County. Similarly, while 1,011 residents of Pend Oreille County commute into Spokane to work, only 261 workers residing in Spokane commute into Pend Oreille County to work. This out-commuting from Spokane into Pend Oreille and Stevens Counties, however, does strengthen the economic links between them.

Bonner Counties which involve less than half as many commuters, about 2,700. The three-county area including Pend Oreille, Stevens and Bonner counties includes only about 1,600 commuters, and the Pend Oreille, Stevens, Ferry county area would involve only about 570 commuters. See Table 2-A below.

Table 2-A.

Sum of In- and Out-Commuters in Alternative 3-County Areas		
Three-County Areas	**Total Commuters**	**% of Highest**
Pend Oreille-Stevens-Spokane	6,517	100%
Pend Oreille-Bonner-Spokane	2,691	41%
Pend Oreille-Stevens-Bonner	1,552	24%
Pend Oreille-Stevens-Ferry	573	9%
Source: U.S. Bureau of Census, County to County Commuting Flows-ACS 2009-2013, Table 1.		
Ctny to Ctny Commute Flows-ACS 2009-2013 US and Six Ctny Region. Xlsx, Q43:T48		

The three-county area including Pend Oreille, Stevens, and Spokane Counties is the most economically interconnected group of counties in close proximity to Pend Oreille County and the Kalispel Reservation. That is why the BEA has these counties grouped as part of the Spokane Metropolitan Statistical Area.

If, however, we focus on how Pend Oreille County is linked to surrounding counties, the economic connectedness looks a bit different. Much of the reasons why the Pend Oreille-Stevens-Spokane area has so many commuters is not because Pend Oreille County is linked to Stevens County but because of the way Stevens County is linked to Spokane County. There are only about 240 commuters between Stevens and Pend Oreille Counties, but there are 5,000 commuters moving between Stevens and Spokane Counties. This explains why Stevens County is be part of the Spokane economic area, but it does not necessarily mean that Stevens county should be part of an economically interdependent area centered on Pend Oreille County.

The commuting between Pend Oreille and Bonner Counties totals 850, almost three and a half times the commuting between Pend Oreille and Stevens Counties. This is not because Bonner County provides so many more jobs to residents of Pend Oreille County than does Stevens County. There is only a difference of 53 jobs between those two counties' employment support for Pend Oreille County residents. The big difference is that Bonner County sends many more workers, 446, to jobs in Pend Oreille County.

In addition to the commuting to work that economically links counties together, there is another consideration to be taken into account when defining the economic area in which the Kalispel Reservation and Pend Oreille County are embedded. The purpose of this economic report is to understand how Class I redesignation of the Kalispel Reservation might economically impact surrounding areas. It is largely industrial activities (manufacturing and raw materials processing) that individually can lead to a deterioration of air quality. The economic study area should, ideally, include the

locations of the industrial facilities relatively close to the Kalispel Reservation whose expansions might violate Class I air quality standards on the Kalispel Reservation.

There are three industrialized areas within approximately 50 km (31 miles) of the Kalispel Reservation. One is northern Spokane County; another is the Colville-Kettle Falls area of Stevens County; and the third is the Sandpoint area of Bonner County, Idaho. Given prevailing winds, the Kalispel Reservation tends to be downwind from pollution sources in Stevens and Spokane Counties and upwind from pollution sources in Bonner County. For that reason it is more likely that expansions of industrial activities in Pend Oreille, Spokane, and Stevens Counties might threaten air quality on the Kalispel Reservation than expansions of industrial activities in Bonner County to the east of the Reservation and across two mountain ranges.

For that reason, an economic study area around the Kalispel Reservation that includes Stevens County and the Colville-Kettle Falls industrial sites would be more informative than one that included Bonner County (and Sandpoint), Idaho.

As discussed above, twenty-five percent of Pend Oreille County resident workers commute to Spokane County to work economically linking those two counties. Also as documented above, there are almost no economic linkages between Pend Oreille County and Ferry County.

For all of these reasons, therefore, the economic area this study will use is the three contiguous counties: Pend Oreille, Spokane, and Stevens Counties, Washington.

Figure 1-A below provides a map of this economic region centered on the Kalispel Reservation. The three-county area that will be used as the economic area in which the Kalispel Reservation is embedded is outlined in red. The largest circle has a 50-kilometer (31 mile) radius. It reaches to the City of Colville to the northwest and to the northern suburbs of the Spokane urban area to the south.

Figure 1-A
Kalispel Reservation Economic Area
(red outline)

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Appendix C:
Air Resource Specialists Energy Development Analysis

ENERGY IMPACT ANALYSIS IN SUPPORT OF CLASS I REDESIGNATION

FINAL Technical Report

Prepared for

Kalispel Tribe of Indians
Usk, Washington

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Revision 1 – February 23, 2017

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1.0 INTRODUCTION AND EXECUTIVE SUMMARY

1.1 Purpose and Objectives

The Kalispel Tribe of Indians (Tribe) is considering requesting redesignation of tribal lands to "Class I" status under the Clean Air Act Prevention of Significant Deterioration (PSD) program. Only the primary Reservation lands near Usk (about 4,500 acres) are proposed for redesignation to Class I PSD status. Other lands owned by the Tribe external to the primary reservation, such as the Airway Heights hotel and casino property, are not part of the proposed Class I redesignation.

The requirements and procedures for redesignation are outlined in the US Environmental Protection Agency (USEPA) regulations at 40 CFR 51.166. Among the requirements of 40 CFR 51.166 is an "*analysis of the health, environmental, economic, social, and energy effects of the proposed redesignation*." The report here provides the energy impacts analysis described in 40 CFR 51.166.

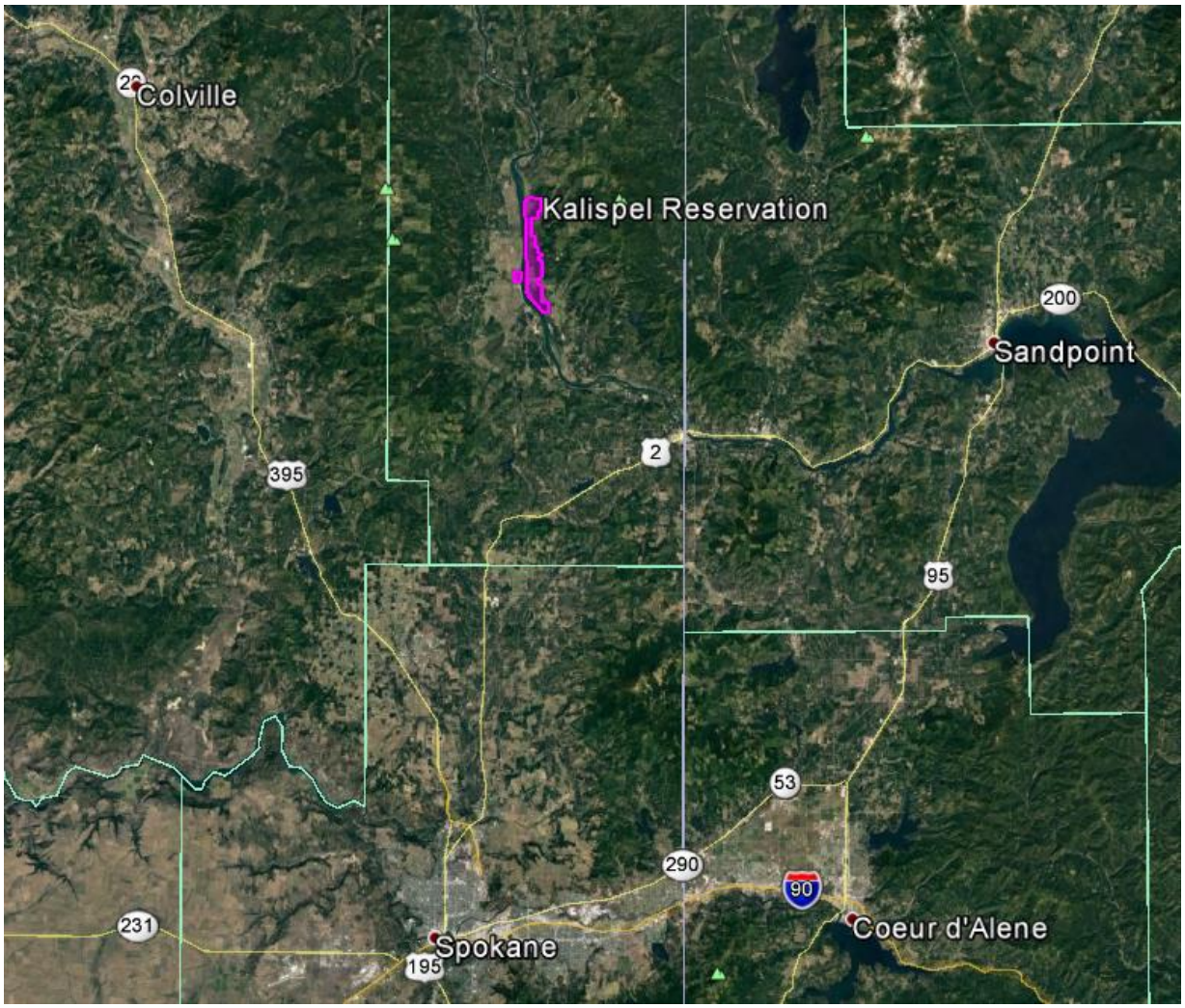
In performing the energy impact assessment for the planned Class I redesignation, air quality dispersion models have been applied to hypothetical energy development projects located outside the Reservation to ascertain whether or not such projects would meet the Class I PSD increments on the Reservation. One of the selected hypothetical energy development projects closely matches future energy development plans for the major electric utility in the region. The Class I PSD increments on Kalispel tribal lands would become enforceable under the Clean Air Act assuming that the proposed redesignation to Class I status were approved. In this manner, the project assesses whether or not redesignation of the Kalispel Reservation lands to Class I under the PSD program would hinder potential future energy development in the region.

The lands selected for reclassification to Class I PSD status are the designated reservation lands, which include about 4,500 acres located in northeastern Washington along the east bank of the Pend Oreille River near the town of Usk (Pend Oreille County). The Reservation is approximately 50 miles north of Spokane, WA, the major population center of the region. Figure 1-1 shows the general location of the Kalispel Reservation.

1.2 Summary of Technical Approach

The Energy Impact Analysis required under 40 CFR 51.166 was conducted by using an air quality dispersion model to evaluate potential energy development projects with respect to compliance with Class I PSD increments on the Kalispel Reservation lands. If the proposed redesignation becomes effective, the Class I PSD increments would become maximum allowable concentration increases enforceable under the Clean Air Act. The Energy Impact Analysis provided here attempts to discover to what extent, if any, the proposed redesignation to Class I would have on restricting future energy development in the region.

Figure 1-1: General Location of Kalispel Reservation



Two energy development projects were evaluated for the Kalispel Reservation study. One project was a hypothetical natural gas/oil-fired turbine electric generating plant and the second project was a hypothetical biomass-fired electric generating plant. Both projects were sited at the same hypothetical location in close proximity to the Reservation (approximately 50 km distant). The hypothetical plants have been modeled after similar projects constructed in Minnesota and Wisconsin [*References 1 and 2*]. Although the projects analyzed for this report are hypothetical in nature, the information used for each hypothetical energy development project was based on "real-world" examples of new energy development in terms of expected emissions and emission release characteristics. The hypothetical energy development projects analyzed for this report are described in Chapter 2.

The hypothetical electric generating projects were assumed to be located approximately 50 kilometers (km) south of the Kalispel Reservation. As such, the dispersion model of choice for the Energy Impact Analysis was the AMS/EPA Regulatory Model or AERMOD [*Reference 3*]. AERMOD is the recommended regulatory air dispersion model by USEPA's "Guideline on Air Quality Models" [*Reference 4*] for the "near-field" receptors within 50 km of the emission source. Based on the energy development plans from the local public utility [*Reference 5*], the likely location for any future electric generating plants would be beyond 50 km from the Kalispel Reservation. As such, the energy impact analysis presented here is more than likely a conservative estimate of the real-world impacts from future energy development, based on current utility planning documents.

The air dispersion modeling utilized for this study followed the technical procedures recommended in USEPA's Guideline on Air Quality Models [*Reference 4*]. The modeling results were compared to the Class I PSD increments, which are shown in Table 1-1.

Table 1-1

Class I PSD Increments
(from 40 CFR 52.21(c))

Pollutant/Averaging Time	**Maximum Allowable Increase (Micrograms Per Cubic Meter)**
$PM_{2.5}$:	
Annual arithmetic mean	1
24-hr maximum	2
PM_{10}:	
Annual arithmetic mean	4
24-hr maximum	8
Sulfur dioxide:	
Annual arithmetic mean	2
24-hr maximum	5
3-hr maximum	25
Nitrogen dioxide:	
Annual arithmetic mean	2.5

Except for the annual average, the maximum allowable increase may be exceeded one time per year at any location. As such, the highest-second-highest (H2H) concentration is used for compliance with short-term PSD increments. The highest modeled concentration is used for compliance with annual average PSD increments.

1.3 Summary of Results

Based on the modeling results for the hypothetical energy development projects evaluated for the Kalispel Tribe Energy Impact Analysis, the expected emissions would not interfere with maintaining the Class I PSD increments. A summary of the dispersion modeling results is provided in Table 1-2.

Table 1-2
Summary of Modeling Results
Kalispel Reservation – Hypothetical Energy Development Project

Pollutant	Averaging Period	Class I PSD Increment	Combustion Turbine - Modeled Concentration ($\mu g/m^3$)	Biomass Boiler - Modeled Concentration ($\mu g/m^3$)
$PM_{2.5}$	24-Hour*	2	0.39	0.13
	Annual**	1	0.041	0.015
SO_2	3-Hour*	25	3.94	0.34
	24-Hour*	5	0.51	0.04
	Annual**	2	0.055	0.004
NOx	Annual**	2.5	0.036	0.049

* H2H Concentration ** Highest Concentration

This modeling study assumed that 100 percent of the Class I increment would be available to each hypothetical energy development project. If the redesignation is approved, new/modified air pollution sources in the region may start to consume part of the available Class I PSD increment and future energy sources might have to compete with non-energy sources for the available increment. Any assessment of cumulative impacts at this time would be speculative and this requires knowledge about existing and future PSD increment consuming sources. Except for PM/PM_{10} and sulfur dioxide (SO_2), the PSD baseline has not yet been triggered for Pend Oreille County.

2.0 SELECTION OF THE HYPOTHETICAL ENERGY PROJECTS

The hypothetical energy projects evaluated for the Kalispel Tribe Energy Impact Analysis were assumed to be located in close proximity to the Reservation (approximately 50 km distant). The hypothetical project location was assumed to be located near the Deer Park, WA Airport (Latitude: 47.97 North, Longitude: 117.42 West). This location was selected for the hypothetical project due to the proximity of the site to both the Kalispel Reservation (approximately 50 km distant) and the source of the meteorological data used for the dispersion modeling (Deer Park Airport).

Each hypothetical plant selected for this study has been modeled after a "real-world" project constructed elsewhere. Although the energy development projects analyzed for this report are hypothetical in nature, the information used for the dispersion modeling has been based on a realistic example of new energy development. The hypothetical energy development projects analyzed for this report are described later in this section.

Although the hypothetical energy development projects used in the Kalispel Tribe Energy Impact Analysis are based on realistic projects, they are still only hypothetical projects developed specifically for the purpose of this study. There are no known plans to actually develop either project and this report should not be interpreted as promoting the energy development projects used for this assessment.

Also, other potential engineering or environmental constraints (water resources, transmission capacity, land use/zoning, etc.) have not been considered in the development and selection of the hypothetical energy development project used for this analysis.

2.1 HYPOTHETICAL COMBUSTION TURBINE PROJECT

The hypothetical gas/oil-fired turbine electric generating plant project is modeled after the Mankato Energy Center, operated by Calpine Corporation in Mankato, Minnesota (Blue Earth County), except that only one of the two twin turbines at Mankato are included in the hypothetical project. Information on the plant was taken from the air emissions permit and associated Technical Support Document (Permit # 01300098-001) issued by the Minnesota Pollution Control Agency (MPCA) [*Reference 1*].

The Mankato Energy Center is a 630 megawatt (MW) electric generating plant consisting of twin Siemens-Westinghouse combined cycle combustion turbine generators (CTGs) fired primarily on natural gas. For the Kalispel Tribe Energy Impact Analysis, a single combustion turbine (315 MW) was modeled based on available public information about possible future energy development projects in the region around Spokane, as described below.

Fuel oil can be used as a back-up fuel when the natural gas supply is interrupted. Each CTG is equipped with a heat recovery steam generator (HRSG) and natural gas-fired duct burners to supply steam to a common steam turbine electric generator. Each CTG also has the capability of power augmentation through steam injection into the CTG just downstream of the combustor. This process increases the CTG mass flow, thereby increasing the power output.

Future energy development plans have been published by the local utility as contained in the Avista Utilities' 2015 Electric Integrated Resource Plan (IRP) on file with the Washington Utilities and Transportation Commission [*Reference 5*]. The Avista IRP concluded that a 286 MW combined cycle combustion turbine may be needed somewhere in the Avista service area around calendar year 2026. The proposed hypothetical energy development project at 315 MW closely matches (and slightly exceeds) the projected future energy development needs.

Table 2-1 summarizes the emissions and stack information for the hypothetical combustion turbine project as taken from the MPCA permit and supporting information for the Mankato Energy Center [*Reference 1*]. Given the level of sulfur dioxide (SO_2) emissions from the MPCA permit, the listed emissions appear to be based on oil-firing. During most operating hours, with firing on natural gas, plant emissions would be lower, especially for SO_2.

Table 2-1

Emissions and Stack Data for Hypothetical Combustion Turbine Project

Stack	**Height (meters)**	**Diameter (meters)**	**Temperature (ºK)**	**Exit Velocity (m/sec)**	**NO_x**	**SO_2**	**PM_{10}**
					lb/hr	**lb/hr**	**lb/hr**
Turbine #1 (SV001)	60.96	5.79	344.26	12.27	63.12	96.77	72.80

Ancillary facilities at the Mankato Energy Center such as an auxiliary boiler, emergency generator and fire pump engines, and cooling tower were not considered in the dispersion modeling analysis as these emissions are minor compared to the combustion turbines.

2.2 HYPOTHETICAL BIOMASS-FIRED BOILER PROJECT

The hypothetical biomass-fired electric generating plant project is modeled after a 50 MW biomass boiler project developed by WE Energies in Marathon County, WI. The information on the plant was taken from the air emissions permit and associated Preliminary Determination (Construction Permit # 10-SSD-058) issued by the Wisconsin Department of Natural Resources (WDNR) [*Reference 2*].

The hypothetical facility is a 50 megawatt (MW) (800 MMBtu/hr) biomass-fired electric cogeneration plant. The boiler would produce electricity for sale plus steam for a nearby industrial site. The primary boiler fuel is woody biomass, which is defined by the air quality permit to exclude any edible food crops, refuse derived fuel, chemically treated wood, municipal solid waste, and/or pathological waste. A biomass-fired boiler project has been chosen for one of the hypothetical Kalispel projects due to the biomass resources of the region and the potential that any new energy project in the area could be fired on biomass fuels as compared to fossil fuels such as coal and/or natural gas. In fact, in the 1980s, the local electric utility (Avista) constructed a similarly sized 50 MW biomass-fired generating station near Kettle Falls, WA.

Pollution controls for the hypothetical biomass-boiler project include a fabric filter baghouse for removal of particulate matter (PM) emissions and selective non-catalytic reduction (SNCR) for NOx emissions control. SNCR works by injecting ammonia and/or urea into the combustion chamber at a location where the flue gas temperature ranges between 1,400 and 2,000 degrees F.

Table 2-2 summarizes the emissions and stack information for the hypothetical biomass-fired boiler project as taken from the WDNR supporting information for the WE Energies cogeneration plant. The only difference from the permitted plant is that the Kalispel modeling analysis restricted the boiler stack height to the deminimis good engineering practice (GEP) stack height of 65 meters. Stack heights greater than 65 meters are permissible only where nearby buildings justify a higher stack height to meet GEP. Since the modeling analysis for the biomass boiler did not address nearby buildings, the deminimis GEP stack height was used.

Table 2-2

Emissions and Stack Data for Hypothetical Biomass-Fired Boiler Project

Stack	**Height (meters)**	**Diameter (meters)**	**Temperature (ºK)**	**Exit Velocity (m/sec)**	**NO_x**	**SO_2**	**PM_{10}**
					lb/hr	**lb/hr**	**lb/hr**
Biomass Boiler	65.0	3.05	415.4	19.38	80	8	24

Ancillary facilities at the hypothetical project such as an auxiliary boiler and material storage/handling sources were not modeled for this study as these emissions are minor compared to the biomass boiler.

In the Avista Utilities' 2015 Electric Integrated Resource Plan (IRP) on file with the Washington Utilities and Transportation Commission [*Reference 5*], there is no discussion of adding any new biomass-fired generating capacity to the fuel mix. The Avista IRP concluded that a 286 MW combined cycle combustion turbine may be needed somewhere in the Avista service area around calendar year 2026 and this option is covered by the hypothetical combustion turbine project described previously.

3.0 AIR MODELING STUDY

This section provides an overview of the technical procedures used to conduct the Kalispel Tribe air quality modeling analysis. Technical options for the AERMOD modeling followed standard regulatory guidance for use of AERMOD in regulatory applications, including EPA's Guideline on Air Quality Models [*Reference 4*] and EPA's AERMOD Implementation Guide [*Reference 6*].

The reader should note that subsequent to the completion of the Kalispel modeling study, EPA issued a revised version of the Guideline on Air Quality Models (40 CFR 51 Appendix W) and also issued updates to the AERMOD modeling system (See: Federal Register, January 17, 2017, pg. 5182). As described below, the Kalispel Tribe modeling used AERMOD/AERMET Version 15181, which were the official regulatory versions of the models at the time the modeling analysis was conducted. The updated AERMOD and AERMET models were not yet available at the time of the Kalispel modeling analysis.

One of the major changes in the recent EPA update to the Guideline on Air Quality Models was to include a new method for calculation of the surface friction velocity (ADJ_U*). The ADJ_U* methods were approved for regulatory use by EPA in cases where the meteorological data inputs did not include any on-site turbulence data. Although the ADJ_U* option was available in AERMOD Version 15181, it was a non-regulatory choice before the recent Guideline update, and as such it was not included in the Kalispel modeling. ADJ_U* corrects for model conservatisms that are believed to exist during certain meteorological conditions, so had the newer versions of AERMOD (Version 16216r) and AERMET (Version 16216) been available at the time of the Kaispel modeling analysis, the model results may have been somewhat less, but the conclusions made from the modeling analysis would not have changed.

3.1 Source Data

Dispersion modeling for near-field receptors (up to 50 km from the emission source) was conducted using the AMS/EPA Regulatory Model (AERMOD - Version 15181). The source parameters for the two hypothetical plant alternatives are outlined in Section 2 (Tables 2-1 and 2-2).

It was assumed that 100% of the Class I PSD increment was available to each hypothetical project. It is not known whether other emission sources may already exist that would compete for PSD increment. However, the presence of nearby sources that would compete for PSD increment in viewed to be unlikely because: 1) the region around the Kalispell Reservation lacks significant industrial development, and 2) the PSD baseline in Pend Oreille County has not been triggered for NOx and $PM_{2.5}$.

Also, because modeled concentrations in the immediate vicinity of the emissions source were not of interest, the AERMOD modeling described here did not consider any downwash effects introduced by plant buildings or other structures. Due to this assumption, the stack release height for the hypothetical sources was restricted to no greater than the deminimis GEP stack height of 65 meters.

3.2 Receptor, Location, and Terrain Data

Figure 3-1 provides the model layout, showing both the proposed Kalispel Reservation Class I area and the hypothetical source location. The hypothetical project location was approximately 30 miles (50 kilometers) south of the Kalispel Reservation adjacent to the Deer Park Airport in Deer Park, WA. The 50 km distance is the accepted limit for the AERMOD dispersion model.

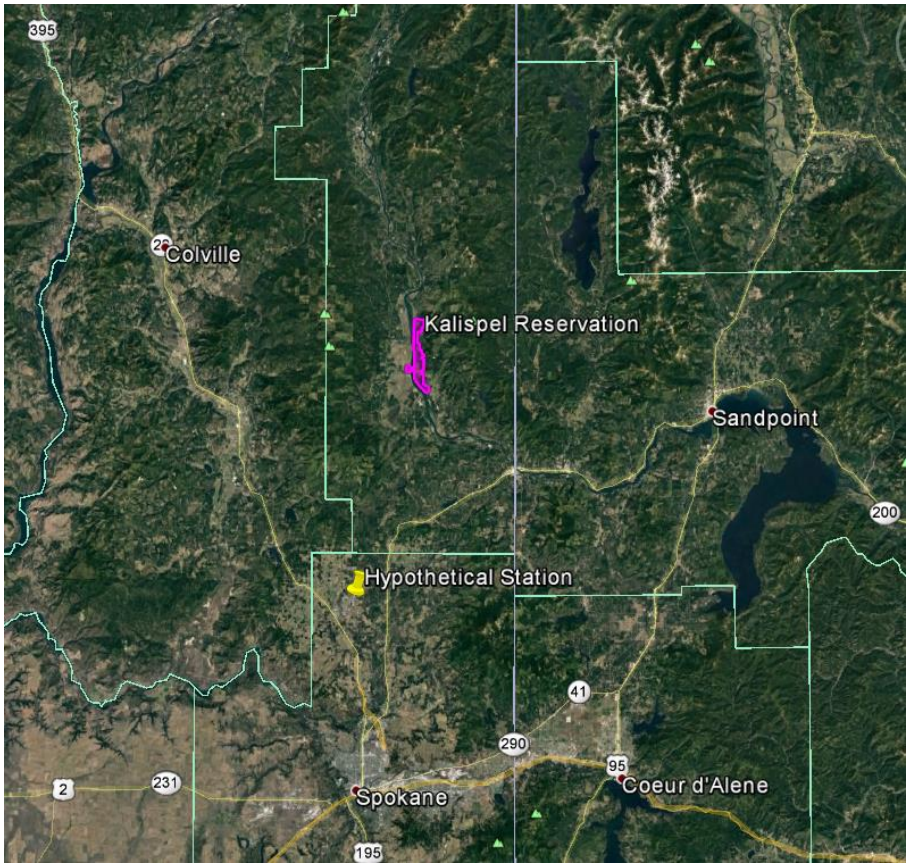


Figure 3-1.
AERMOD Model Layout for the
Kalispel Tribe Energy Impact Analysis

In all probability, a future electric generating plant would most likely be sited at an existing electric generating station operated by the local electric utility company (Avista). At 50 km, the hypothetical source location is closer to the Kalispel Reservation than any existing Avista electrical generating station, which provides some additional conservatism to the modeled impacts. Avista's existing power generation resources in the immediate area are located near Spokane and also at Kettle Falls, WA and Rathdrum, ID. If the actual source were greater than 50 km distant from the Kalispel Reservation, the modeling in this study would likely overestimate the real-world pollutant concentrations. The Deer Park location for the hypothetical project also places the hypothetical source generally upwind of the Kalispel Reservation based on the prevailing wind patterns (see Figure A-1).

The AERMOD receptors used in the dispersion model are shown in Figure 3-2. Receptors were placed along the exterior Reservation boundary along with additional interior receptors placed at intervals of 0.25 kilometer or 250 meters. Also, the AERMOD input data incorporated terrain elevation information for the source and receptor locations as obtained from US Geological Survey (http://landfire.cr.usgs.gov/) digital topographic files.

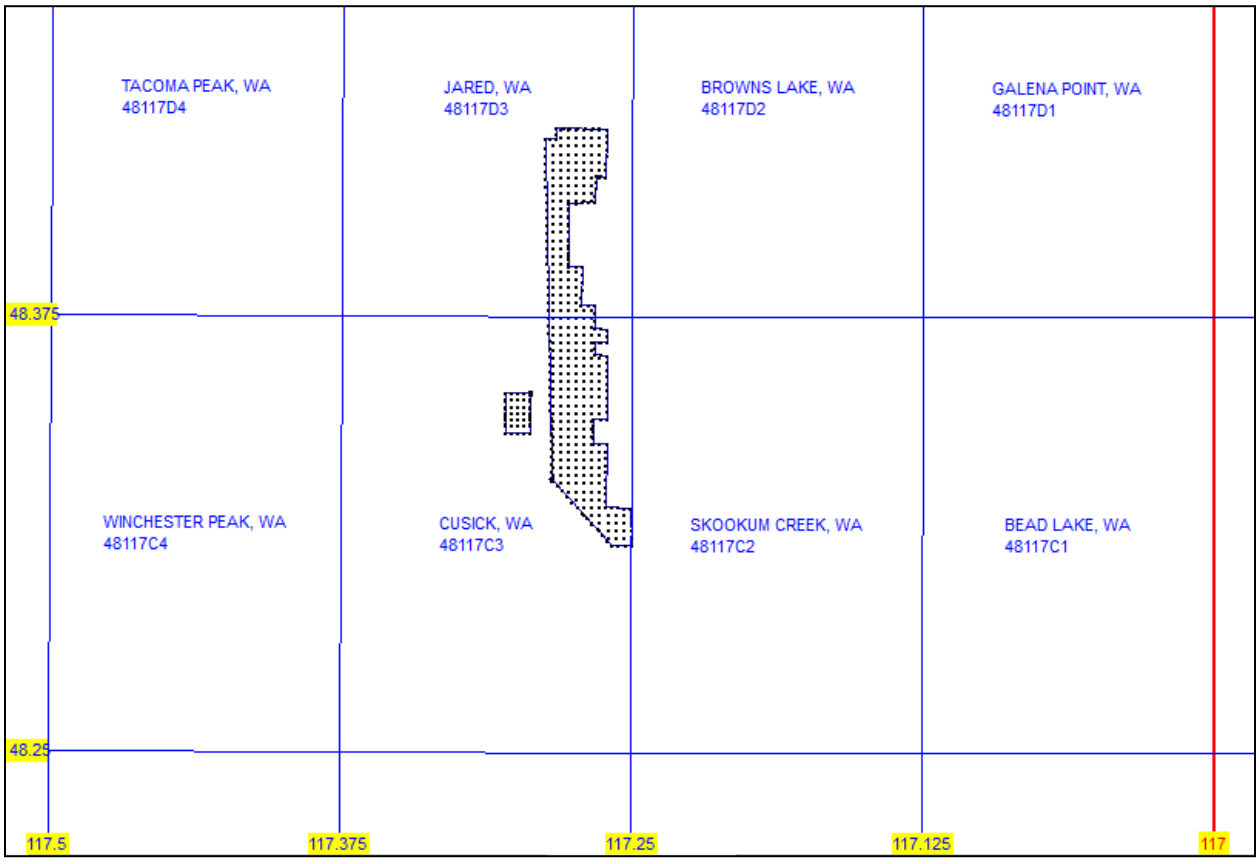


Figure 3-2. Kalispel Reservation AERMOD Receptor Grid

3.3 Meteorological Data

The processing of the raw meteorological data was conducted using the AERMOD Meteorological Preprocessor (AERMET) Version 15181. Surface meteorological data for the model is from the Deer Park Airport located approximately 20 miles north of Spokane, WA. The upper air data required for AERMET is from the nearby Spokane International Airport. These sites are the closest locations to the Kalispel Reservation with publicly available AERMOD-compatible meteorological data.

The National Weather Service (NWS) surface data files and Automated Surface Observation System (ASOS) 1 and 5-minute data files were collected from the National Climatic Data Center website: ftp://ftp.ncdc.noaa.gov/pub/data/noaa/. The NWS upper air data (FSL format) was downloaded from NOAA Earth Systems Research Laboratory Radiosonde Database (http://esrl.noaa.gov/raobs/).

The AERMOD model inputs used five years of raw meteorological data collected for the years 2008 through 2012 inclusive. This time period is the most recent five year period in which there are no significant gaps in the primary Deer Park and Spokane meteorological data files. The five-year time period matches the recommendations from EPA's Guideline on Air Quality Models [*Reference 3*] and provides a reasonably robust data set that assures that the worst-case transport and dispersion conditions are identified.

Additional technical details regarding meteorological data processing can be found in Appendix A.

3.4 PSD Baseline

The magnitude of PSD increment consumption is determined by the magnitude of the emissions increases and decreases that have occurred after the applicable PSD baseline date. Emissions increases "consume" PSD increment and emissions decreases "expand" PSD increment.

The emission changes described below affect PSD increment [*Reference 7*]:

- Actual emissions increases/decreases occurring after the major source baseline date that are associated with a physical change or the change in the method of operation at a major stationary source.

- Actual emission increases/decreases at any stationary source, area source, or mobile source, occurring after the minor source baseline date.

In the State of Washington, PSD baseline dates are set by designated Interstate Air Quality Control Regions (IAQCRs). The Kalispell Reservation lies within the Northern Washington IAQCR. This area comprises the northernmost six counties that are east of the Cascade Range, i.e., Chelan, Douglas, Okanogan, Ferry, Stevens, and Pend Oreille. The PSD baseline dates for the Northern Washington IAQCR are listed in Table 3-1.

Table 3-1
Northern Washington Interstate Air Quality Control Region: PSD Baseline Dates

Pollutant	Major Source Baseline Date	Minor Source Baseline Date
PM/PM_{10}	Jan. 6, 1975	March 20, 1979
$PM_{2.5}$	Oct. 20, 2011	None
SO_2	Jan. 6, 1975	June 28, 1981
NOx	Feb. 8, 1988	None

4.0 AIR MODELING STUDY RESULTS

This section summarizes the modeling results for the hypothetical energy projects evaluated in this study. Electronic copies of the modeling input/output files for AERMOD are provided as Appendix B to the report.

This section summarizes the results of the AERMOD modeling analysis for both the hypothetical combustion turbine project and the hypothetical biomass-fired boiler. Air quality concentrations of particulate matter (PM), NO_X, and SO_2 were addressed as these are the pollutants covered by the Class I PSD increments. All PM emissions were assumed to be as $PM_{2.5}$ (PM sized at less than 2.5 microns) as the $PM_{2.5}$ Class I increments are the most limiting for PM emissions.

For the short-term average PSD increments (24-hours or less), the regulations allow one exceedance per year at any receptor. The modeling addresses this by calculating the "highest-second-highest" (H2H) concentration, which represents the highest concentration overall in the subset of second-highest concentrations at each receptor. For the annual mean, the highest predicted concentration at any receptor is used for comparison.

4.1 PM-2.5 Increment

Table 4-1 shows the modeled AERMOD $PM_{2.5}$ impacts at the Kalispel Reservation from the hypothetical electric generating projects. All five years of modeling results are listed in the table for comparative purposes. As stated above, the applicable $PM_{2.5}$ Class I PSD increment is used for comparison of PM emissions and provides for a conservative worst-case modeling assessment. Because the increments for $PM_{2.5}$ are less than the corresponding PM_{10} increments, compliance with the $PM_{2.5}$ increment also means compliance with the PM_{10} increment. Table 4-1 demonstrates that the modeled impacts from the hypothetical projects are less than the applicable $PM_{2.5}$ Class I PSD increment at the Kalispel Reservation.

Table 4-1

Predicted $PM_{2.5}$ Concentrations at Kalispel Reservation

	Hypothetical Combustion Turbine Project - Modeled Concentration ($\mu g/m^3$)					
Averaging Period	**Class I PSD Increment**	**2008**	**2009**	**2010**	**2011**	**2012**
24-Hour (H2H)	2	0.32	0.34	0.24	0.37	0.39
Annual (Highest)	1	0.037	0.035	0.030	0.040	0.037
	Hypothetical Biomass-Fired Boiler Project - Modeled Concentration ($\mu g/m^3$)					
24-Hour (H2H)	2	0.12	0.12	0.08	0.13	0.13
Annual (Highest)	1	0.013	0.013	0.011	0.015	0.013

The predicted AERMOD impacts for short-term averages (24-hour or less) are specific to the receptor location and worst-case meteorological time period associated with the impact. The PSD increment consumption from multiple sources only becomes additive to the extent that individual source impacts are paired in space and time. The likelihood that air quality impacts would be paired in space and time diminishes as the physical distance between emission sources increases. For an individual emission source that impacts Kalispel Reservation lands at a different location or under different meteorological conditions, most or all of the Class I PSD increment would still be available to that particular emission source.

4.2 Nitrogen Dioxide (NO_2) Increment

Table 4-2 summarizes the dispersion modeling results with respect to the Class I PSD increment for nitrogen dioxide (NO_2). For this modeling, all NOx emissions from each project are conservatively assumed to be in the form of NO_2 (or convert to NO_2 during transport to the receptor). The AERMOD modeling results, as described by Table 4-2, demonstrate that the highest annual average NO_2 concentration will be substantially below the PSD Class I increment.

Table 4-2

Predicted NO_x (NO_2) Concentrations at Kalispel Reservation

	Hypothetical Combustion Turbine Project - Modeled Concentration (μg/m^3)					
Averaging Period	**Class I PSD Increment**	**2008**	**2009**	**2010**	**2011**	**2012**
Annual (Highest)	2.5	0.032	0.031	0.026	0.035	0.032
	Hypothetical Biomass-Fired Boiler Project - Modeled Concentration (μg/m^3)					
Annual (Highest)	2.5	0.044	0.042	0.035	0.049	0.043

4.3 Sulfur Dioxide (SO_2) Increment

The modeled 3-hour, 24-hour, and annual average SO_2 impacts using AERMOD for the hypothetical energy development projects are presented in Table 4-3. As with the other pollutants, the modeling results for each of the five years modeled are shown in the table.

All of the modeled AERMOD concentrations for SO_2 were significantly below the Class I PSD increments. As described previously, impacts from other regional SO_2 emission sources may not be additive unless such impacts are paired in space and time.

Table 4-3

Predicted SO_2 Concentrations at Kalispel Reservation

	Hypothetical Combustion Turbine Project - Modeled Concentration ($\mu g/m^3$)					
Averaging Period	**Class I PSD Increment**	**2008**	**2009**	**2010**	**2011**	**2012**
3-Hour (H2H)	25	3.03	3.58	2.23	3.94	3.72
24-Hour (H2H)	5	0.42	0.46	0.32	0.50	0.51
Annual (Highest)	2	0.049	0.047	0.040	0.054	0.049
	Hypothetical Biomass-Fired Boiler Project - Modeled Concentration ($\mu g/m^3$)					
3-Hour (H2H)	25	0.28	0.31	0.19	0.33	0.34
24-Hour (H2H)	5	0.04	0.04	0.03	0.04	0.04
Annual (Highest)	2	0.004	0.004	0.004	0.005	0.004

5.0 SUMMARY & CONCLUSIONS

The Kalispel Tribe of Indians is considering requesting redesignation of tribal lands to "Class I" status under the Clean Air Act Prevention of Significant Deterioration (PSD) program. The report here provides the energy impacts analysis required by 40 CFR 51.166 for the Tribe's redesignation request.

In performing the Energy Impact Analysis, air quality dispersion modeling has been applied for two hypothetical energy development projects located outside the Reservation to ascertain whether or not these projects would meet the Class I PSD increments on the Reservation. The Class I PSD increments would become enforceable under the Clean Air Act assuming that the proposed redesignation to Class I status were approved. In this manner, the modeling assesses whether or not redesignation of the Kalispel Reservation lands to Class I status under the PSD program would hinder potential future energy development in the region.

The energy projects evaluated for this study included a hypothetical combustion turbine electric generating plant fired on natural gas with fuel oil back-up and a hypothetical biomass-fired electric generating plant. The hypothetical project location was near the Deer Park, WA airport, located about 50 kilometers (km) south of the Kalispel Reservation and generally in the upwind direction from the Kalispel Reservation based on the prevailing winds. As the source location was within 50 km, the dispersion model of choice was the AMS/EPA Regulatory Model or AERMOD.

The air quality impact from each hypothetical project was compared to the applicable Class I PSD increments for the pollutants of concern.

The hypothetical combustion turbine project was a 315 MW electric generating combustion turbine, fired on natural gas with fuel oil as a backup. The project was modeled after one of two combustion turbines located at the Mankato Energy Center in Mankato, MN. The project size for the hypothetical combustion turbine was generally consistent with future energy development plans based on the 2015 Intergrated Resource Plan (IRP) filed by the local electric utility (Avista). The hypothetical biomass-boiler project was a 50 MW plant modeled after a similar plant developed by WE Energies in Wisconsin. At 50 MW, the project size closely matched a biomass-fired electric generating plant constructed in the 1980s by Avista at Kettle Falls, WA. However, the 2015 Avista IRP does not list any future plans to develop a new biomass-fired generating plant.

Based on the hypothetical projects evaluated, the air dispersion modeling demonstrated that the hypothetical project emissions would not interfere with maintaining the Class I PSD increments on the Kalispel Reservation.

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6.0 REFERENCES

1. Minnesota Pollution Control Agency, 2004. Air Emissions Permit Number 01300098-001 issued to Mankato Energy Center LLC.

2. Wisconsin Department of Natural Resources, 2011. Analysis and Preliminary Determination for the Proposed Construction of a Biomass-Fueled Boiler, a Natural Gas Boiler, and associated Fuel Handling Equipment and Analysis and Preliminary Determination for the Operation Permit for WE Energies Biomass-Fueled Cogeneration Facility to be located at 200 Grand Avenue, Rothschild, Marathon County, WI. Construction Permit 10-SDD-058 and Operation Permit 737277040-P01, January 28, 2011.

3. USEPA, 2004. User's Guide for the AMS/EPA Regulatory Model – AERMOD. US Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC. EPA-454/B-03-001.

4. USEPA, 2005. Guideline of Air Quality Models. US Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC. Codified at 40 CFR 51, Appendix W.

5. Avista Utilities, 2015. 2015 Electric Integrated Resource Plan. Available at: https://www.avistautilities.com/inside/resources/irp/electric/Pages/default.aspx

6. USEPA, 2015. AERMOD Implementation Guide. Prepared by AERMOD Implementation Workgroup, US Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC. Revised August 3, 2015.

7. USEPA, 1990. New Source Review Workshop Manual (Draft). Prepared by US Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, October 1990.

Appendix A

Technical Meteorological Processing Report

A.1 Meteorological Data Determination and Acquisition

The most representative meteorological observation station identified for the Kalispel Tribe Energy Impact Analysis dispersion modeling is the Deer Park, WA Airport (WBAN #94119). This station was chosen due to its location relative to the Kalispel Reservation and the availability and completeness for the raw meteorological data. The meteorological observation station at Deer Park Airport is located at approximately 47.97 North Latitude and 117.42 West Longitude. This station was used to gather data and was processed into an AERMOD-ready format using the AERMET meteorological preprocessor.

The National Weather Service (NWS) surface data files and Automated Surface Observation System (ASOS) 1 and 5-minute data files were collected from the National Climatic Data Center website: ftp://ftp.ncdc.noaa.gov/pub/data/noaa/. The NWS surface data was obtained in Integrated Surface Hourly Data (ISHD) format. Due to missing ASOS data files for calendar year 2013, the five year period spanning between 2008 and 2012 inclusive was chosen as this period represents the most recent five consecutive years of data.

The Deer Park Airport data set does not include upper air data, so NWS upper air observations from the nearby Spokane International Airport (WBAN #24157) have been utilized. Additionally, Deer Park Airport hourly surface data from August 2009 to December 2009 were missing and the hourly Spokane International Airport surface meteorological data has been used to fill in the data for for those missing dates. Although the hourly surface data were missing for the period listed above, the 1-minute and 5-minute Deer Park raw data were complete.

The NWS upper air data (FSL format) was downloaded from NOAA Earth Systems Research Laboratory Radiosonde Database (http://esrl.noaa.gov/raobs/). Both ISHD data and FSL data are timestamped in Greenwich Mean Time (GMT) (7 hours difference between local time). Seven hours from the beginning of 2013 were used to complete the last year of data.

The surface characteristic data were also collected for the lands surrounding the Deer Park Airport for input to AERMET. The 1992 Land Cover data was downloaded from the MRLC database (http://www.mrlc.gov/ viewerjs/). Coordinates were chosen in order to cover a wide enough region to properly calculate surface characteristics (Long: 47.675 to 48.324 and Lat: -117.092 to -117.912).

A.2 Meteorological Data Processing Methodology

The raw meteorological data has been processed with the latest version of the AERMOD Meteorological Preprocessor (AERMET Version # 15181). AERMET is run in three stages and is supported by AERMINUTE (Version #15272) and AERSURFACE (Version #13016). The first stage involved extraction and quality assurance of the raw NWS surface and upper data. Stage 2 of AERMET writes the surface and upper air data into 24-hour blocks. For Stage 3 processing, the user must input values for albedo, Bowen ratio, and surface roughness length. With the user-supplied surface characteristics and the raw 24-hour blocks of input data, AERMET creates the hourly planetary boundary layer (PBL) parameters of surface friction velocity, convective velocity scale, vertical potential temperature gradient, convective boundary layer height, mechanical boundary layer height and Monin-Obukhov length. The supporting programs help fill in missing or "calm" data as well as identifying the surface characteristics for Stage 3.

AERMOD does not process hours of missing or "calm" data, which reduces the quality of the model when extensive periods of missing or calm data are encountered. Some of the missing or "calm" data can be replaced with the help of AERMINUTE. ASOS 1-minute and 5-minute data is used in processing to create a "HourlyWinds" file. This file provides wind direction and wind speed which can replace missing or highly variable data.

The user-supplied surface characteristics are generated by the AERSURFACE preprocessor. AERSURFACE reads in 1992 Land Cover Database data and determines albedo, Bowen ratio, and surface roughness length based on the temporal/spatial parameters established by the user. For this particular study, the SEASONAL temporal switch with default seasons was used and 12 30-degree wind sectors were used as the spatial identity. Other switches used identified "YES" this is near an airport and "NO" this area is neither arid nor continuously snow covered for one or more months. In order to determine soil moisture for input to AERSURFACE, 30 years of precipitation data (1986-2015) for Spokane International Airport was downloaded. This data was then sorted from wettest to driest (See: Table A-1). DRY is defined as the 30% of years with the lowest precipitation, AVERAGE as the middle 40%, and WET as the 30% of years with the most precipitation. Using these data, 2008, 2009, and 2011 were assigned as AVERAGE years and 2010 and 2012 were assigned as WET years.

The final AERMET output consisted of the Report and Message files generated in Stages 1-3, plus the AERMOD-ready meteorological files:

2008.SFC (and .PFL)
2009.SFC (and .PFL)
2010.SFC (and .PFL)
2011.SFC (and .PFL)
2012.SFC (and .PFL)

Figure A-1 provides the Deer Park, WA wind rose for the processed 5-year time period (2008-2012). The wind rose depicts the frequency of the measured wind direction (wind direction is the direction that the winds blow <u>from</u>).

Figure A-1
Deer Park Airport, WA Wind Rose
2008-2012

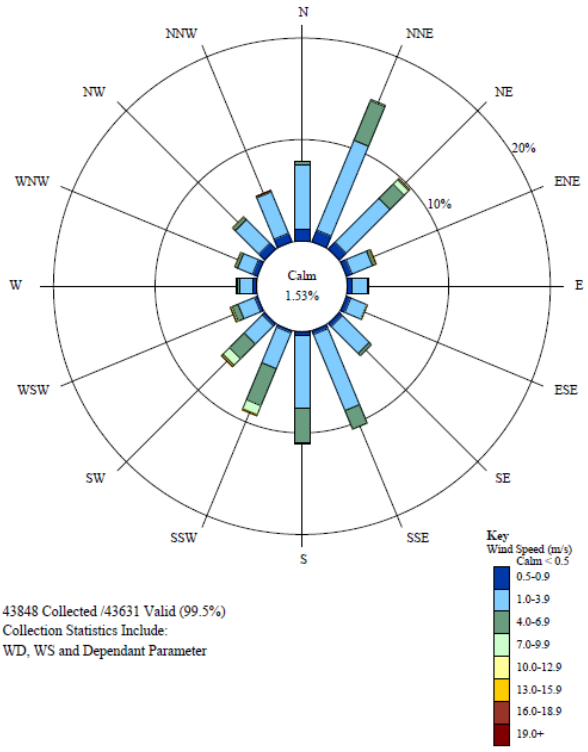

Table A-1: Spokane, WA Annual Precipitation from 1986-2015 (inches per year)

Low Precip Years (DRY)		**Middle Precip Years (AVERAGE)**		**High Precip Years (WET)**	
Year	**Precip**	**Year**	**Precip**	**Year**	**Precip**
2013	11.36	1992	14.52	1997	17.45
1993	13.63	2000	14.67	1987	17.68
2001	13.71	1989	14.71	1998	17.77
1994	13.81	1999	14.79	**2010**	19.03
2002	13.83	2014	14.99	1990	19.61
2007	13.97	2004	15.02	2006	21.13
2015	14.08	1986	15.24	**2012**	21.32
2003	14.41	**2011**	15.40	1995	21.67
1991	14.45	**2009**	15.45	1996	25.23
		2008	16.28		
		1988	16.52		
		2005	17.38		

Appendix B

Modeling Files

Digital files available upon request from the Tribe.

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