ALASKA REGIONAL HAZE STRATEGY

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1.0 INTRODUCTION

1.1 Background

The Clean Air Act visibility protection program was implemented to protect Class I areas from impairment due to anthropogenic air pollution under sections 169A, 169B, and 110(a)(2)(j). Regional Haze Rule provisions were promulgated under the CAAA in 1990 to protect visibility in 156 national parks and wilderness areas across the country. In 1999, the Regional Haze Rule was finalized. The final rule requires States to develop long-term plans for reducing pollutant emissions that contribute to visibility degradation and within the plans establish goals aimed at improving visibility in the Class I areas. The Regional Haze Rule establishes specific State Implementation Plan (SIP) requirements and strategies in Title 40, Part 51, §308 of the Federal Regulations for the States to adopt when implementing a plan. Each state must execute a plan that will address the impacts of regional haze on Class I areas within their jurisdiction or contributes to visibility impairment in a Class I area in another state. This strategy document has been developed by the Alaska Department of Environmental Conservation (ADEC) to look at the regional haze rule requirements and options for developing a plan that protects visibility and meets the intent of the regional haze rule.

Visibility measurements will be used in future years to determine the effectiveness of the Regional Haze Rule[1]. Interagency Monitoring of Protected Visual Environments (IMPROVE) monitors were placed in forty-five Class I areas across the country measuring the ambient concentrations of atmospheric particles between 1987 and 1998. The IMPROVE monitor sites measure visibility at the forty-five selected areas. The National Park Service (NPS) established an IMPROVE site at Denali National Park. Denali is the only Class I area in Alaska where air quality data is currently available. The other three Class I sites in Alaska, Tuxedni, Simeonof, and Bering Sea, are remote and only accessible by boat or plane therefore, it is difficult to collect data at these locations. Two IMPROVE sites are being installed near Tuxedni and Simeonof so that data can be collected for these areas.

There are several seasonal trends in the composition of the haze in Alaska. Emissions from forest fires are highest in the summer months, although wood-burning stoves' emissions are similar and they peak in the winter. Also in the winter, for the Denali Class I area, there are the unique arctic conditions lacking both liquid water and sunlight. This eliminates photochemical reactions and aqueous phase chemistry. Nitrogen oxides (NOx) are not converted to particulate nitrate or nitric acid nor are sulfates formed from sulfur dioxide. This creates a spike in these compounds in late winter and early spring as the light and water return. As a result of snow and ice, contributions from soil and marine sources are also reduced to nearly zero in the winter.

[1] Visibility in Federal Class I National Parks and Wilderness Areas: Second Report to Congress Draft. May 2000, Science Applications International Corporation.

1.2 Description of Class I Areas in Alaska

Alaska has four Class I areas that are impacted by the Regional Haze Rule: Denali National Park, Tuxedni Wilderness Area, Simeonof Wilderness Area, and Bering Sea Wilderness Area. The following map shows Alaska's Class I areas.

Denali National Park and Preserve

Denali National Park lies 240 miles north of Anchorage in the center of the Alaska Range. The park area totals more than 6 million acres. Denali, the highest mountain in North America standing 20,320-feet, is a prominent feature in the park and throughout Alaska. Denali is the only Class I site in Alaska that is easily accessible, connected to the road system and accommodates a wide variety of visitor uses.

IMPROVE monitoring data is available from the Denali IMPROVE site from March of 1988 to present.

Tuxedni Wilderness Area

Tuxedni Wilderness Area is located in southcentral Alaska, in western lower Cook Inlet at the mouth of Tuxedni Bay. Tuxedni is comprised of two Islands, Chisik and Duck, totaling 6,402 acres. Most of the wilderness area lies on Chisik. Duck is a small rocky island, only 6 acres, with little or no vegetation. Tuxedni Wilderness Area is only accessible by small boats and planes, weather permitting.

At this time, the Fish and Wildlife Service (FWS) is working to install an IMPROVE monitor in the area. Currently, the IMPROVE Program is working to install a fine particle monitor within an inholding near Lake Clark National Park. This site is on the west side of Cook Inlet, approximately 5 miles from the Tuxedni Wilderness Area. The site is expected to be operational in the fall of 2001 and is meant to represent regional haze conditions for the wilderness area.

Simeonof Wilderness Area

Simeonof Wilderness Area consists of 25,141 acres located in the Aleutian Chain 58 miles from the mainland. It is one of 30 islands that make up the Shumagin Group on the western edge of the Gulf of Alaska. Access to Simeonof is difficult due to its remoteness and the unpredictable weather.

The Fish and Wildlife Service has placed an IMPROVE monitor in the community of Sand Point, a more accessible island, approximately 60 miles north west of the Simeonof Wilderness Area. The monitor went on line in August 2001. We expect this location will provide representative data for regional haze conditions at the wilderness area.

Bering Sea Wilderness Area

The Bering Sea Wilderness Area is located off the western coast of Alaska approximately 275 miles southwest of Nome. The Class I area consists of 41,113 acres and is made up of the St. Matthew Island group (which totals approximately 81,340 acres). The Bering Sea Wilderness Area is one of the most isolated landmasses in America with few if any visitors.

No IMPROVE monitoring is currently planned in this area. However there is a potential that drum impactors (described in detail in section 6.0), a type of monitor suitable for remote locations, will be placed in the Bering Sea Wilderness Area for short term monitoring.

1.3 Timeline

The timeline for submittal of a regional haze SIP is predicated on the states attainment status for the new fine particulate ($PM_{2.5}$) standard. If Alaska's $PM_{2.5}$ data is available in 2002, which is when the 3 years of data collecting is expected to be complete, Alaska will have one year to submit to EPA a designation recommendation for $PM_{2.5}$. EPA will then have one year to act upon Alaska's recommendation. If Alaska is found in attainment for $PM_{2.5,}$ the state will have 12 months after the date of designation to submit a SIP for Regional Haze. The likely SIP deadline will be between 2004 and 2006. If Alaska is found in non-attainment for $PM_{2.5}$, Alaska would have to submit a plan within 3 years of EPA's designation, or no later than December 31, 2008.

Once the original regional haze SIP is submitted, periodic revisions are required. Alaska will continue planning efforts in accordance with Section 51.308(f) requiring revisions and submittal of the regional haze implementation plan to EPA by July 31, 2018 and every ten years thereafter. Alaska will also submit a progress report describing progress towards the goals every 5 years in accordance with section 51.308(g).

ISSUE

Currently, Alaska anticipates that the state will be in attainment for $PM_{2.5}$ and that the regional haze SIP could be due as early as 2004. At this time Alaska cannot opt-in to regional planning as it can not demonstrate an effect by emissions from another state nor a contribution to visibility impairment in a Class I area outside the state. This means Alaska will not be able to synchronize the SIP timeline with the Western Regional Air Partnership (WRAP) timeline, which could have a deadline as late as 2008. Consequently, Alaska is in the position of having to work alone in the development of emission inventories and subsequent modeling for the regional haze submittal, with little funding and inadequate staffing to complete these expensive, labor intensive technical activities. If Alaska's SIP deadline could be made consistent with the WRAP timeline we could take advantage of the technical support that the WRAP is providing to other western states.

APPROACH

Alaska has communicated to EPA its desire for a deadline consistent with the WRAP. Alaska has also petitioned for membership in the WRAP to allow for formal involvement in the WRAP process. In the event that Alaska can not correlate the timeline with that of the WRAP, Alaska will take a stepped approach in completing the technical and policy requirements for the SIP. That is, data will be incorporated and updated in the SIP as findings improve and become more certain.

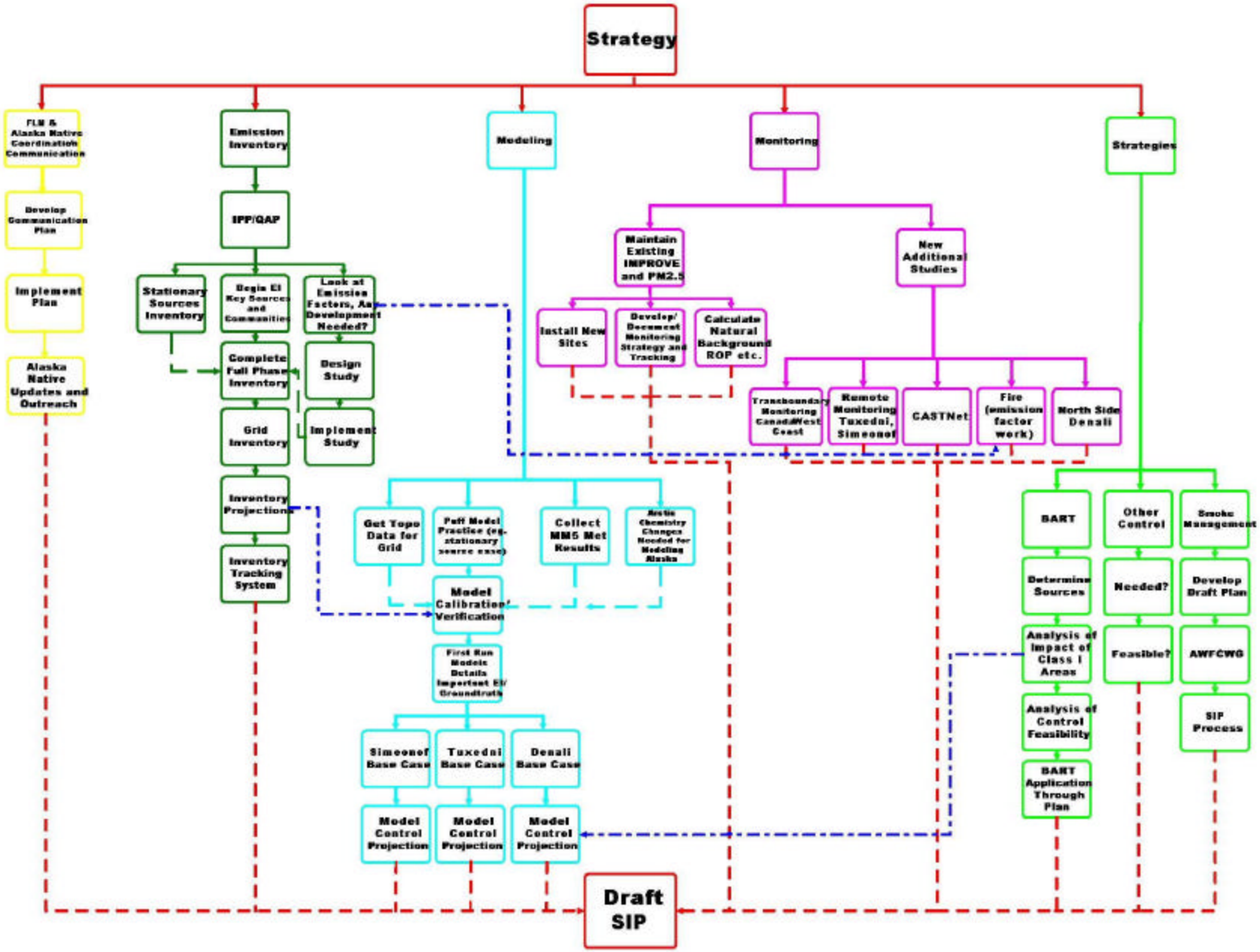
1.4 Core Planning Requirements

Alaska is required to address regional haze in each Class I area within the state. The required SIP will contain plan elements and supporting documentation for all necessary analyses at each Class I area that are discussed in this plan. This plan is organized into ten sections. Each section discusses a specific requirement including details on any issues or problems that we anticipate with the requirement or analyses, the approach that will be taken to successfully complete the requirement, and necessary tools and resources. A summary timeline and budget is contained in the final section. The timeline and budgets are estimated based on current knowledge.

Since Alaska Class I areas are close to natural conditions, a first SIP strategy approach could focus on monitoring, data assessment, and BART provisions. These elements could be the bulk of demonstrating reasonable progress and preventing future impairment within the first SIP. Refinements to the natural conditions, 60-year glide path and statewide source coverage could then be worked in with each minor and major SIP revision, as envisioned by the regional haze rule. If a phased approach for SIP strategies is developed some of these pathways in the flow chart may be more important and key to the first SIP submittal. The first round of air quality modeling might be simplified in sources, strategies, and geographic scope by focusing technical efforts to assure adequate performance for assessment of BART strategies and smoke management plans. This would leave more complicated area source issues for future SIP work. For a phased approach to be feasible, agreement will be needed with EPA on the expected content of the first SIP submittal.

The following flow chart illustrates the major efforts that will be made to meet the final goals and objectives leading to an approvable regional haze SIP.

Alaska Regional Haze SIP Development



2.0 REASONABLE PROGRESS GOALS

Alaska will establish reasonable progress goals that provide reasonable progress towards achieving natural visibility conditions for each of the state's four Class I areas. The purpose of these goals is to improve visibility on the 20% worst visibility days over the next 10 or 15 years and ensure no degradation in visibility for the 20% least impaired days. Alaska will monitor the progress made in improving visibility over time. Visibility changes and targets will be tracked in terms of the "deciview".

Because there may be minimal differences between natural and current conditions, Alaska will work with Federal Land Managers and the EPA to address any special issues that could arise in the tracking of such small increments of improvement. Alaska will work closely with the other agencies to set goals and methods for tracking progress that make sense for the Alaskan situation.

Alaska will submit the following statutory factors when establishing a reasonable progress goal for any Class I area:

- the costs of compliance
- the time necessary for compliance
- the energy and non-air quality environmental impacts of compliance
- the remaining useful life of any potentially affected sources, and
- a demonstration showing how these factors were taken into consideration in selecting the goal

Alaska will analyze and determine the rate of progress needed to attain natural visibility conditions by the year 2064. To calculate this requires the following four steps:

1) Compare baseline visibility conditions to natural visibility conditions in the Class I area.
2) Determine the uniform rate of visibility improvement (measured in deciviews) that would need to be maintained during each implementation period in order to attain natural visibility conditions by 2064.
3) Identify the amount of progress that would result if this uniform rate of progress were achieved during the period of the first regional haze implementation plan.
4) Identify and analyze the emissions measures that would be needed to achieve this amount of progress during the period covered by the first long-term strategy, and to determine whether those measures are reasonable based on the statutory factors listed above.

If Alaska determines the rate of progress is not reasonable to reach natural conditions, rationale and supporting documentation must be supplied to the EPA. Alaska will also submit the requirements to reach natural conditions for public review.

3.0 REGIONAL HAZE MODELING

While modeling is only explicitly referenced in two sections of the regional haze rule (308(c)(ii) and 308 (d)(3)(iii)), it is a critical technical step in meeting many of the planning requirements under the rule. Models will be needed for control strategy development and optimization, analysis of incremental impacts of individual source categories, and analysis of cumulative impacts. In order for modeling analysis to be relevant to Alaskan planning, it is important that the models used are capable of adequately characterizing the unusual conditions found in Alaska, such as a lack of light and low humidity at Denali National Park in the winter months.

ISSUES

1) Models are used to determine reasonable progress goals, to forecast future emissions, and to determine what sources are impacting Class I areas. ADEC does not have the staff or resources available to devote to modeling nor any regional modeling expertise. The modeling requirements for the SIP are expensive and labor intensive. Currently, due to timing issues, Alaska can not follow along with the WRAP workgroup who can provide technical support and assist in determining what model Alaska should use.
2) It is important that the transport models used for Alaskan planning appropriately handle arctic chemistry. For example, winters in interior and northern Alaska are both dark and dry. There is very little photochemistry or aqueous-phase chemistry occurring. It is not clear that the current transport models are programmed to take this into account.

APPROACH

The WRAP is currently planning on providing modeling for states with 308 SIP's, assuming a 2006-2008 deadline. The WRAP is developing a phased modeling approach and plans to use several models to produce an "understanding" of regional haze causes and transport. As mentioned this suite of early tools may still not provide Alaska with all the needed support given its unique conditions (arctic meteorology, chemistry, etc.). It is likely that Alaska will need to have its modeling completed earlier than 2006 to meet an earlier SIP deadline. Because Alaska does not readily impact the other western states and has a large modeling domain, it is not apparent that the WRAP will be willing to expend resources addressing Alaska's needs, particularly on an accelerated schedule. Given the likelihood that the WRAP will be unable to meet Alaska's modeling needs, an alternative approach is suggested.

The alternative approach proposed here relies heavily on the use of expertise found at the University of Alaska Fairbanks (UAF). The general concept would be to build capacity for regional modeling at UAF, rather than at ADEC. This would build on the expertise already available at UAF. An agreement between ADEC, UAF, and EPA may be needed to establish not only the funding mechanisms, but also expectations for long term assistance for regional air modeling. Alternatively, ADEC could also use private-sector contractors to fulfill some or all of the regional haze modeling needs. The

approach described here assumes that UAF will be involved in the effort. The steps to be taken to meet SIP modeling requirements are discussed in more detail below.

1. Model Inputs: There are several key data inputs needed to complete regional modeling, including meteorological information and emissions information. Emissions inventory development is discussed in more detail in the emission inventory section of this report.

The beginnings of a meteorological modeling capability currently exist at UAF. Dr. Jeff Tilley of the Geophysical Institute has been working with the MM5 meteorological model, studying problems with relevance to air quality including the ability of MM5 to simulate the Arctic stable boundary layer. He has coupled the MM5 model with the RADM2 model, which has some similarities to the CMAQ model. With sufficient funding, Dr. Tilley could hire additional staff to get the MM5 model running in both an operational mode and a diagnostic mode for regional haze analyses.

2. Topographic grid: In order to conduct regional modeling it will be necessary to establish the topographic grid for the modeling domain. This domain would need to cover all of Alaska as well as parts of Northwestern Canada.

3. Initial Stationary Source Modeling: While Alaska continues to work toward development of the capability for full-scale, complex regional modeling. More simplistic modeling will be initiated for many of the more important sources near the Class I areas. This modeling could be accomplished using established models such as ISC and CalPuff. This will help to assess potential regional haze impacts from stationary sources near the Class I areas. In particular the initial focus would be on potential Best Available Retrofit Technology (BART)-eligible sources, since these sources will require more extensive analyses as part of the SIP development process. Some of the initial stationary source modeling could be conducted using the MM5-RADM coupled model.

4. Modeling Back-Trajectories: In order to assist in a basic understanding of where haze generating pollutants are originating, it is proposed that back trajectory modeling will be undertaken for selected pollutant events monitored at the Class I areas. Back trajectory modeling may allow for a better understanding of the sources and areas that generate pollution coming into the Class I areas. Standard models, such as HYSPLIT, would be used for this analysis. MM5 can also be used in generating back trajectories.

5. Emission Modeling: In order to generate a gridded emission inventory for the entire state, ADEC anticipates using several EPA-approved models including: MOBILE, Non-Road, BEIS, and SMOKE. The use of these models will be determined based on need and will be included in the emission inventory preparation plan and development efforts. Emission inventory development is addressed separately in this strategy.

6. Full-Scale Regional Modeling: Because ADEC does not have the resources to develop a comprehensive air quality modeling capability within the agency, this proposed approach relies on developing that capability at UAF. If funding is found, UAF

could be tasked with building the modeling capability that will allow Alaska to meet its SIP development needs. Resources for air quality modeling may need to be focused on key SIP element strategies for the first SIP (BART, “urban” mobile, large industry with Title 5 permits, etc). Then as the SIP revision process continues, over time a refined statewide strategy can be built into the model. Also, more detailed meteorology and chemistry modules specific to Alaska could be added. Alaska will work with the NPS, FWS, EPA, and UAF in addressing the scope and complexity needed to address key modeling issues for the initial SIP.

Initially, work would need to be completed to select a suitable model for use in Alaska. At this time the likely candidates are the Regulatory Modeling System for Aerosols and Deposition (REMSAD) and EPA’s Community Multi-Scale Air Quality (CMAQ) model. This initial work will need to look at whether or not the models are capable of handling typical conditions found in Alaska. These conditions could include lack of sunlight in the winter, abundance of sunlight in the summer, dry climate areas, terrain, international transport of pollutants, etc. If the models have deficiencies, a decision would need to be made whether to proceed with the analysis or to conduct work to improve the models to correct the problems. The model evaluation would be completed by UAF. Any revisions needed to the model(s) would need to be addressed collaboratively with EPA.

Once the initial model inputs are developed and an appropriate model is selected, UAF would be tasked with conducting an initial run of the selected regional model using the meteorological and emission information developed previously. This initial run will be used to look for important emission sources and to ground truth the reasonability of the model under Alaskan conditions. The model will undergo calibration and verification. Following any refinements, a base case will be run for each of Alaska’s Class I areas. Once the base cases have been completed, the model will be run to project the impacts of controls over the required time period. This will provide the information needed to demonstrate how the Alaska control plan meets the reasonable progress goals. There will likely be several iterations of these modeling runs as control strategies are considered and assessed.

4.0 CALCULATIONS OF BASELINE AND NATURAL VISIBILITY CONDITIONS

For each Class I area, Alaska will determine the following visibility conditions (expressed in deciviews):

Baseline visibility is determined at the time regional haze is established. The baseline visibility conditions will be calculated using available monitoring data by establishing the average degree of visibility impairment for the most and least impaired days for each calendar year from 2000 to 2004. The values are calculated by determining the average deciview value for the 20 percent most (or least) impaired days for the each of the 5 years (2000-2004) and next averaging those 5 values.

A SIP that is submitted by 2003 will use the most recent 5-year period for which monitoring is available to determine baseline conditions for the Class I area. For Class I areas without onsite-monitoring data, baseline values will be determined using the most representative available monitoring data.

Natural visibility is the condition that would be experienced in the absence of human caused impairment estimated for the 20 percent worst and best days. Conditions will be calculated based on the following:

- available monitoring information and appropriate data analysis techniques by estimating the degree of visibility impairment existing under natural conditions for the most impaired and least impaired days
- for the first SIP addressing the requirements of the long-term strategy plan for regional haze and BART, the number of deciviews by which baseline conditions exceed natural visibility conditions for the most impaired and least impaired days and for all future SIP revisions, the number of deciviews by which current conditions exceed natural visibility conditions for the most impaired and least impaired days

Current Conditions. At the time of any SIP revision, Alaska will determine current visibility conditions for the most and least impaired days for each Class I area. This is based on the five most recent years of monitoring data available at the time SIP revisions are initiated. Current condition will be calculated by averaging the 20 percent worst days for each of the five most recent years of quality assured data available and next calculating the average of those five values.

ISSUE

Depending on how “natural background” is defined will determine if Alaska is at natural visibility conditions or how much above natural background Alaska is. Little improvement may be needed for Alaska to reach natural background, which may be difficult to achieve.

APPROACH

Alaska plans to follow EPA guidance in completing the calculations for baseline and natural visibility conditions. EPA recently released this guidance in a draft form. In order to address Alaska specific issues, ADEC may need to apply refined approaches as allowed for under the proposed guidance.

5.0 LONG-TERM STRATEGY FOR REGIONAL HAZE

Alaska will submit a long-term strategy plan that addresses regional haze visibility impairment for each Class I area within the State. The long-term strategy will include enforceable emissions limitations, compliance schedules, and other measures necessary to achieve the reasonable progress goals.

When developing its long-term strategy, Alaska will consider all types of anthropogenic sources including stationary, minor, mobile, and area sources. Alaska will review all such sources in identifying the emission reduction measures to be included in the strategy.

Alaska will include in the SIP, mobile source emission inventories representing current conditions and compare them to forecasted future emissions for the end of the long-term strategy. Emission inventories will also need to be developed for point and area sources.

Factors that must be considered when developing a long-term strategy:

- emission reductions due to ongoing air pollution control programs, including measures to address reasonably attributable visibility impairment
- measures to mitigate the impacts of construction activities
- emissions limitations and schedules for compliance to achieve the reasonable progress goal
- source retirement and replacement schedules
- smoke management techniques for agricultural and forestry
- enforceability of emissions limitations and control measures
- the anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the period addressed by the long-term strategy

<u>ISSUE</u>
Emission data available for Alaska is limited and the size of Alaska makes it very difficult and expensive to inventory the entire state. Currently, little data has been collected for Alaska and the cost for an emission inventory may reach as high as $800,000. Remote locations also make data collection difficult in Alaska. The quality of the emission data will also impact modeling efforts, since the modeling output will only be as good as the inputs. Additionally, emission factors may become an issue for certain sources, e.g. biogenics.

<u>APPROACH</u>
Alaska will conduct the emission inventory by a phased approach. Section 7 addresses emission inventory issues in greater detail.

Fire Emissions

Alaska will determine the degree to which fire emissions cause or contribute to anthropogenic visibility impairment and its contribution to natural background conditions. Alaska plans to coordinate with the Alaska Wildland Fire Coordinating Work Group and federal agencies to address issues related to fire. Additional work may be needed on emissions for Alaska fuel types.

ISSUE

International transport will have to be accounted for when looking at the natural background. It may be difficult collecting emission inventory data for international transport.

Transboundary Emissions from Sources Outside the United States

Alaska will evaluate the impacts of current and projected emissions from international sources in the regional haze program.

6.0 MONITORING STRATEGY AND OTHER SIP REQUIREMENTS

Alaska will include in the SIP a monitoring strategy for measuring, characterizing, and reporting regional haze visibility impairment that is representative of all Class I areas within the State. Compliance with this requirement may be met through participation in the IMPROVE network.

Alaska will work with EPA and FLMs to ensure that monitoring networks provide monitoring data that are representative of visibility conditions in each affected Class I area within the State.

Other requirements:

- Alaska will include in the regional haze SIP a monitoring strategy that is specific to a given representative site.
- The monitoring strategy is due with the first regional haze SIP submission and it must be reviewed every 5 years.
- Determine if additional monitoring sites or equipment are needed to establish if progress goals are being achieved.
- Provide procedures that determine the contribution of emissions from a Class I area.
- A statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any Class I area is required which includes emissions for a baseline year, emissions for the most recent year for which data are available, estimates of future projected emissions, and a commitment to update the inventory periodically.

Only the monitoring requirements are discussed in this section, the emission inventory requirement is addressed in Section 7.0.

Reporting of Monitoring Data

The SIP will require the reporting of all visibility monitoring data to the Administrator at least annually for each Class I area and to the extent possible, electronically.

ISSUES

1. Five years of monitoring data is recommended for generating standards for the SIP (e.g., baseline and natural visibility). This helps to insure that representative data exists for generating these important standards. Monitoring data does not exist for three of the four Class I areas at this time. Monitoring is expensive and difficult in Alaska because of all the remote and inaccessible areas throughout the state.
2. Remoteness of locations causes a problem for power. If the monitors are located at the nearest power source, such as a town, it is also near local sources of emissions, and therefore less likely to be representative of the Class I area. Remote sampling in Class I areas may be needed to verify that data from an off-site IMPROVE monitor is representative. Drum sampling may provide an opportunity to verify impacts at remote Class I areas like Simeonof and Tuxedni.

APPROACH

Alaska will submit a monitoring strategy plan for measuring, characterizing, and reporting regional haze visibility impairment that is representative of all Class I areas in the state. The monitoring will determine levels of visibility impairing pollutants in an area. This will help when developing control strategies and determining what sources are causing the most visibility impairment.

Current monitoring status (IMPROVE/$PM_{2.5}$): Maintaining the $PM_{2.5}$ and IMPROVE monitors currently collecting data are of primary concern in the visibility monitoring strategy for the state of Alaska. Of equally high priority is the expansion of the network to include the other Class I areas. This will take a great deal of consideration due to the remote location of the sites. Currently the federal agencies (NPS and FWS) are responsible for the funding and operation of Alaska's IMPROVE network.

The Fish and Wildlife Service has an IMPROVE monitor online near Simenof and are preparing to place an IMPROVE monitor near Tuxedni in the fall of 2001.

Denali National Park currently has two monitors up and running, one near the park's headquarters and the second just south of the park boundary at Trapper Creek. The IMPROVE monitor near the park's headquarters was the original IMPROVE site, but due to topographical boundaries, such as the Alaska Range, it was determined that this was not adequately representative of the entire Class I area. Therefore, Trapper Creek, just south of the park boundary, was chosen as a second site for an IMPROVE monitor and is now the official Denali IMPROVE site and the headquarters site is now the protocol site. It is hoped this will characterize any transport from the Anchorage area, the most densely populated region in the state.

A monitor should also be placed on the north side of Denali to fully represent pollutant contributions at Denali from the north. This issue is discussed further later in this section. There has also been a CASTNet (Clean Air Status and Trends Network) style monitor located near the Trapper Creek IMPROVE site. Another CASTNet style monitor is located at Poker Flat Research Range north of Fairbanks, and a third is co-located with the Denali National Park headquarters IMPROVE monitor.

Analysis of problem pollutants

The IMPROVE monitor sample filters are analyzed for 47 different compounds including fine mass ($PM_{2.5}$), total mass (PM_{10}), optical absorption, elements (table 1), ions (chloride, nitrate, nitrite, sulfate), and organics (table 2).

Table 1-Elements analyzed in IMPROVE program

Hydrogen	Manganese
Sodium	Iron
Magnesium	Nickel
Aluminum	Copper
Silicon	Zinc
Phosphorus	Arsenic
Sulfur	Lead
Chlorine	Selenium
Potassium	Bromine
Calcium	Rubidium
Titanium	Strontium
Vanadium	Zirconium
Chromium	Molybdenum

Table 2-Organics analyzed in IMPROVE program

Analyte	Description
OCLT	Organic Carbon, low temperature of volatilization from filter
OCHT	Organic carbon, High temperature of volatilization from filter
ECLT	Elemental Carbon, Low temperature of volatilization from filter
ECHT	Elemental Carbon, high temperature of volatilization from filter
O1	Organic carbon, ambient-120°C
O2	Organic carbon, 120°C-250°C
O3	Organic carbon, 250°C-450°C
O4	Organic carbon, 450°C-550°C
OP	Pyrolized carbon
E1	Elemental carbon remains at 550°C
E2	Elemental carbon remains at 550°C-700°C
E3	Elemental carbon remains at 700°C-800°C

Other Monitoring Needs/Strategies

1. Trans-boundary monitoring: Many issues need to be addressed in the visibility monitoring strategy for the State of Alaska. One of these is international transport. Unlike the states in the contiguous U.S., we have no other states on our borders. Instead, we have direct impacts from Russia, other parts of Asia, Europe, and Canada. Since foreign emissions are out of Alaska's control, the effect of these emissions must be isolated and essentially considered background. This can be accomplished by monitoring the boundary areas to determine what is transported into the state.

In consideration of Alaska's international boundaries, there has been some preliminary discussion regarding placement of monitors on the Canadian border and in western Alaska near the Russian border. Modeling will be used to show locations on each border that can provide the most useful information in terms of international emissions transport.

Alaska is also affected by transport from Asia and Eastern Europe. Due to the winter conditions at high latitudes (like Denali), namely a lack of sunlight and liquid water, expected atmospheric chemical reactions do not occur. This causes emissions which have been transported hundreds or thousands of miles to appear in analyses as though from a local source.

2. Remote monitoring Resources at UAF have a monitor suitable for remote locations that the ADEC is considering for use at the less accessible areas. These monitors, called three-stage drum impactors, collect three fractions of particulate matter, 2.5-1.1 μm, 1.1-0.34 μm, and 0.34-0.069 μm. These can be subjected to various analyses as needed, such as organic and elemental composition. The monitors were designed by the University of California-Davis, and built by Integrity Manufacturing. Since they run on either batteries or battery back up for wind or solar power, they require neither power to be run to the site nor a generator that creates local emissions.

There are no plans to install an IMPROVE monitor at Bering Sea Wilderness Area because of accessibility problems. Isolation of the landmass along with poor weather makes it difficult to access the island. In the summer of 2002, there will be a research group in the area, and discussions are in progress to place one of these three-stage drum impactors to take air samples for a six-week duration. As of the last week in July 2001, both the Denali National Park site and the Poker Flat site have had one of the three-stage impactors installed and both are collecting data. These samplers would be useful in any remote areas where monitoring data is desired.

3. CASTNet: The CASTNet style monitors collect data on sulfur dioxide (SO_2), sulfate (SO_4), nitrate (NO_3), nitric acid (HNO_3), and ammonium (NH_4). This sampler consists of three filters, one Teflon®, one nylon, and one Whatman. The Teflon® filter collects the SO_4, NO_3, and NH_4. The nylon filter has two functions; it collects HNO_3 and reacts with sulfur dioxide gas to form SO_4. The Whatman filter also collects SO_2 gas. The three filters collect samples for a one-week period from a height of 10 meters above ground level[2]. Three CASTNet sites have operated in Alaska. The sites are useful because they provide for analysis of criteria visibility-related pollutants which are not collected under the IMPROVE protocol.

4. Fire: Another issue that Alaska must address is forest fire emissions. The fires are predominantly from natural sources, occur randomly, and are in remote locations; consequently, they are beyond reasonable human control. Since fire emissions are such a large contributor to regional haze in Alaska, a thorough emissions inventory in combination with modeling and monitoring is necessary to make discerning natural background possible. The randomness of fire events in modeling will be an important issue. The rate of progress will not be determinable until natural background can be established.

[2] Air Resource Specialist Report

Although some research has been done on the emissions from forest fires in Alaska through a July 1999 research project called FrostFire, the burn was not as extensive as was originally planned. While 2,200 acres were expected to burn only 800 were actually burned. The amount of emissions was insufficient to conduct a reliably informative study. Thankfully, one possible new opportunity to characterize the emissions has recently presented itself. The Geophysical Institute of the University of Alaska, Fairbanks is in the process of building a portable LIDAR (Laser RADAR) which is scheduled to be operational by the summer of 2002. It would be desirable if funding becomes available, to take this LIDAR to an Alaskan forest fire next fire season and look at not only the composition, but also the transport of the emissions.

5. North Side Denali: Although there are two monitors keeping track of pollutant contributions at Denali National Park and Preserve, the terrain and climactic differences of the vast park warrant consideration of more sites. Natural boundaries such as the Alaska Range cause meteorological and pollutant composition differences between the two sides. A boundary such as this can be enough of a barrier that it is unlikely that the composition and extent of the haze on either side is similar, and therefore one or two air samplers are inadequate to monitor the entire Class I area. A site on the north side of the park would assist in characterizing pollutants impacting visibility on the north side of the Alaska Range. If funding is found, it would be important to consider installation and operation of a northern site.

7.0 EMISSION INVENTORY

The emission inventory is a key component of the regional haze rule and will help to determine the goals and strategies needed to implement the regional haze rule. A statewide inventory of emissions is required of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any Class I area.

ISSUES

1) Currently Alaska does not possess a coordinated statewide inventory of source specific emission estimates. Instead, emission inventories have been developed as needed to support the development of state implementation plans (SIP's) and related maintenance plans for communities designated as non-attainment for specific criteria pollutants.
2) Due to Alaska's large area of 586,412 square miles, the development of a statewide database is a complex and difficult task. Alaska is approximately one-fifth the size of the lower 48 states. There is currently little information compiled regarding air-polluting activities in Alaska. Because of a lack of readily available data and information, significant effort and cost would be incurred in developing a statewide inventory.

APPROACH

Alaska will conduct a statewide emission inventory of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any of the 4 Class I areas. The pollutants that will be inventoried include volatile organic compounds, nitrogen oxides (NO_x), elemental carbon, organic carbon, fine particulate ($PM_{2.5}$), coarse particulate (PM_{10}), sulfur oxides (SO_x), and carbon monoxide (CO). The initial inventory will be developed using emissions data from 1999 as the baseline year. The steps necessary to meet the SIP emission inventory requirements are discussed in more detail below.

1. Emission Inventory Preparation Plan (IPP): The IPP will provide the basis for developing a statewide emission inventory. The IPP sets out the method for inventory generation and the quality assurance steps that will be needed throughout the process. Given the limited emission information currently available, the size of the state, and lack of resources, it is likely that Alaska will need to complete the statewide emission inventory in phases rather than working on an inventory for the entire state at once.

   One phased approach would be to establish the communities and stationary sources most likely to contribute to haze and that are near the Class I areas. These areas and sources would be inventoried in the initial phase. The areas of the state not in close proximity to sources or Class I areas would be inventoried later. Some of the areas to be assessed in the initial phase could include: Sand Point, near Simeonof Wilderness Area; Healy, near Denali National Park; and Anchorage and Fairbanks, the two largest cities in Alaska which therefore have the potential for contributing to haze in the parks and wilderness areas. Examples of stationary sources to be

inventoried in the initial phase include USAF Clear Air Station and Healy Power Plant, both near Denali.

Alaska will consult with the Federal Land Managers and EPA to finalize what areas need to be inventoried in the first phase and how to continue the emission inventory to include the rest of the state. ADEC internal staff and private-sector contractors will develop the emission inventory. Alaska plans to contact federal agencies and Alaskan native groups to get information on activities conducted on federal or native owned lands.

2. Data collection activity and emission inventory: Alaska will need to collect data on emission-generating activities and emission factors. Specific sources that will be inventoried include mobile sources; stationary sources; area sources, such as road dust, construction activities, fire emissions; and biogenic sources that include natural windblown dust, wild fire smoke, and vegetative emissions. Studies may need to be designed and funded to refine emission factors for certain sources (such as biogenic sources) that have not been inventoried in the past and for which no emission factors exist.

   Trans-boundary emissions also need to be inventoried to determine the emissions from other countries that impair visibility in Alaska's Class I areas. It is anticipated that emissions information for bordering nations will not be made available to Alaska. Therefore, Alaska desires to establish monitoring sites placed strategically on the Alaskan perimeter to capture the contributions from any international sources.

3. Compute emissions: Emissions will be calculated once the emission inventory activity data and emission factors are available for each phase. The inventory will most likely use several EPA-approved models including MOBILE, Non-Road, BEIS, and SMOKE.

4. Grid emissions: Alaska will divide the state into coarse grid sections (e.g. 36 x 36 km) for the emission inventory, beginning with the key communities and sources in the initial phase and continuing with the remaining areas of the state once the information is available. When areas with significant levels of activity and emissions have been identified, the size of the grid cells may be reduced (e.g., 4 x 4) to accurately show emission activities.

5. Inventory projections: Alaska will use 1999 inventory data, which has already been generated for some areas and pollutants, for the baseline year. Changes to point, area and mobile source inventories will be projected using appropriate surrogates (e.g. population) to show future emission changes as a result of population and industry growth, energy and natural resource development, land management, and air pollution control.

6. Inventory tracking system: Once the emission inventory and calculations are complete, staff will continue to track emissions to demonstrate that reasonable progress goals are being met for Class I areas. This emission data will be put into a model to show there has been improvement on the worst days and no degradation on the best days.

The emission inventory approach provided here will likely require modification once the IPP is completed and further details are known about Alaskan emission sources. In addition, consultation with the federal land managers and EPA will inevitably result in further refinement of the approach. Regardless of the approach taken, the lack of resources available will have an impact on the final inventory that is developed. Decisions will need to be made as to whether activity data collection is warranted for various source categories, or whether other "top-down" approaches will suffice. In addition, decisions may be needed regarding which emission factors to use if no specific factor is available. Despite the many concessions and assumptions that will need to be made, it is important that we have a reasonable emission inventory for use in technical analyses. A lack of reasonable data to use in modeling could lead to erroneous conclusions related to controlling emission sources.

8.0 CONTROL STRATEGIES

This early in the regional haze planning process, it is difficult to determine the full extent of controls needed to meet reasonable progress goals. The need for controls will be an outgrowth of technical analyses, such as the emission inventory, modeling, and monitoring efforts. These technical tools will help to pinpoint those sources whose control could assist in meeting air quality goals in the Class I areas.

APPROACH

Section 308 of the regional haze rule has two primary controls that states must address in their SIP: smoke management and regional haze Best Available Retrofit Technology (BART). Currently, Alaska is devising a Smoke Management Plan to address the regional haze requirements and other state air quality needs. A BART implementation plan will be needed to address the regional haze requirements. The purpose of these plans is to help reach the regional haze reasonable progress goals by taking into account emissions from these sources. If technical analyses indicate that further controls beyond regional haze BART and smoke management are warranted, the state will take steps to identify other potential control measures. Based on analyses for impact on regional haze and feasibility, the state will then select and implement additional controls.

BART Strategies

Alaska will submit in the SIP a list of all BART eligible sources within the state. Once a source is determined to be BART-eligible, documentation supporting the BART determination will be made available both during the public review process and the technical support materials with the SIP. Alaska is required to include the source-specific BART determination in the initial SIP revision for the area in which the source is located.

Alaska must also determine emission limitations for each BART-eligible source that may reasonably be anticipated to cause or contribute to any impairment of visibility in a Class I area. Emissions limitations representing BART and schedules for compliance for each BART-eligible source must be included in the SIP. Alaska will take into consideration the technology available along with other specific factors when developing these source-specific emission limits. These factors include the costs of compliance, the energy and non-air environmental impacts of compliance, any existing pollution control technology already in use at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated. Alaska will also be required to analyze the degree of visibility improvement that would be achieved in each Class I area as a result of the combined emission reductions achievable from all sources subject to BART.

Each source subject to BART will be required to install and operate BART as expeditiously as practicable, but in no event later than 5 years after approval of the SIP revision as required by the regional haze rule. They will maintain the control equipment

and establish procedures to ensure such equipment is properly operated and maintained. Alaska will ensure that all necessary emission reductions take place during the period of the first long-term strategy for regional haze. Alaska will base the BART implementation plan on the EPA BART rule and fulfill all the BART requirements.

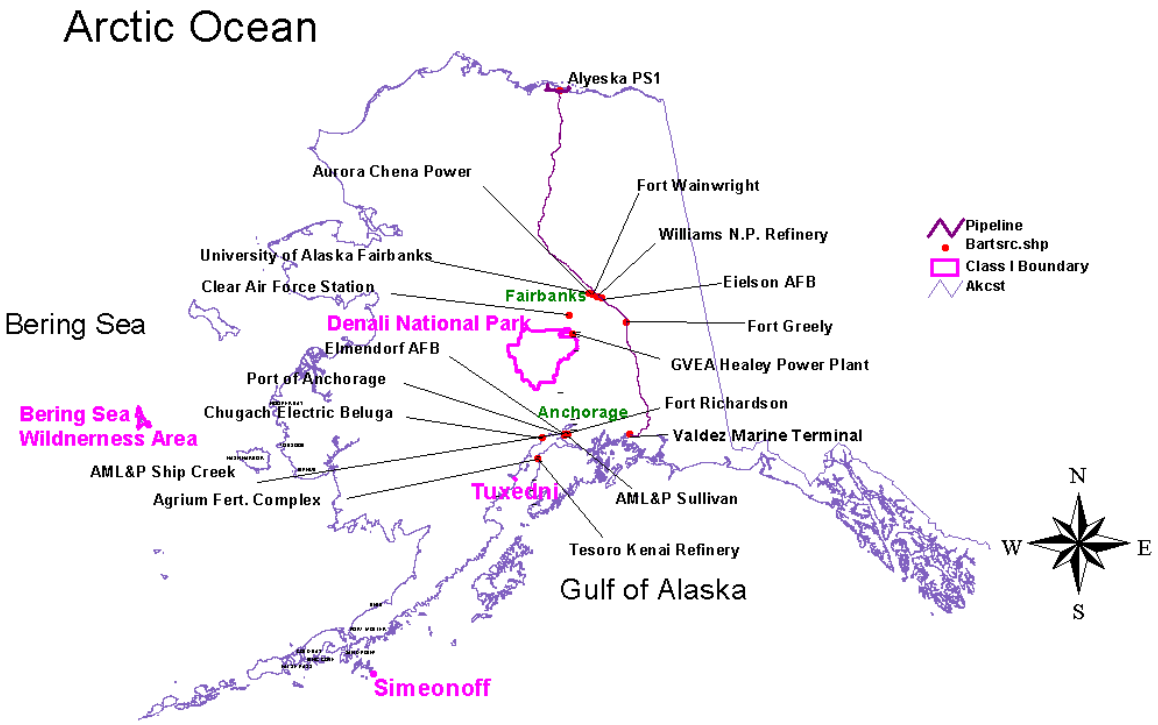
It is unlikely that an isolated state, like Alaska, could reasonably apply a trading program. However, if Alaska considers an emission trading program or alternative measures apply to all BART-eligible sources, Alaska will then demonstrate that the alternative program or measure will work. If Alaska can demonstrate that an emissions-trading program or other alternative will receive greater reasonable progress toward natural visibility conditions, we will use the alternative method.

ISSUES

1) BART strategies will be resource intensive and difficult for Alaska to meet. Analyzing and modeling potential controls will be required and, without utilizing the efforts of the WRAP, it will be difficult for Alaska to reach the standards.
2) BART-eligible sources in Alaska will not be able to participate in an emission-trading program.

The BART plan will identify sources potentially subject to the regional haze BART requirements. Emission inventory and other analyses will determine which of those sources significantly affect Class I areas. Once these BART eligible sources are identified, an analysis will be made, in accordance with EPA rules, to determine what, if any, controls are necessary for these sources. Twenty-one potential BART eligible sources have been preliminarily identified. These sources are listed in table 3 and in the following map.

RH BART Eligible Sources



At this time, it is proposed that ADEC staff will perform analyses to determine the best system of continuous emission control technology available and associated emission reductions achievable for each BART eligible source. Efforts will also be made to determine the degree of visibility improvement in each Class I area as a result of emissions reductions from BART sources.

Alaska will need to work closely with each BART-eligible source while performing the required analyses in accordance with EPA rules. It is anticipated, based on the EPA rule for regional haze BART, that this will be an expensive and labor-intensive effort. An alternative would be to allow the sources to develop the BART-related information and analyses, with ADEC being responsible for evaluating the information provided and making the final determination on BART control.

Table 3 - Potential BART Eligible Sources

Fossil-fuel fired steam electric plants of more than 250 million BTU per hour heat input
Aurora Energy Chena Power Plant
Anchorage Municipal Light and Power Plant 2
US Army Ft. Richardson (Scheduled for shutdown 2003)
US Army Ft. Wainwright
US Army Ft. Greely (may be under 250 MMBtu/hr inadequate Juneau records)
USAF Elmendorf AFB
USAF Eielson AFB
USAF Clear Air Station
Anchorage Municipal Light and Power Sullivan
Chugach Electric Beluga (combined cycle waste heat recovery combustion turbine)
University of Alaska Fairbanks
Ship Creek Power LLC., Knik Arm Power Plant (currently shut down and not permitted, but plans are to repower the unit)
Golden Valley Electric Cooperative Healy Power Plant (Note: Unit 2 HCCP went through PSD in 1994)
Petroleum Refineries
Tesoro Kenai Refinery (went through subsequent NSR/PSD permitting for facility modifications)
Williams Alaska North Pole Refinery (went through subsequent NSR/PSD permitting for facility modifications)
Sulfur recovery plants
Tesoro Kenai Refinery
Chemical processing plants
Agrium Nikiski Fertilizer Complex
Fossil-fuel fired boilers of more than 250 million BTU per hour heat input
Agrium Nikiski Fertilizer Complex
(Aggregate) Alyeska Pipeline Service Company Valdez Marine Terminal
Petroleum storage and transfer facilities with a capacity exceeding 300,000 barrels
APSC Pump Station 1
Williams Alaska Petroleum Port of Anchorage
Tesoro Alaska Port of Anchorage (Inadequate permit records)
Defense Fuels Port of Anchorage (Inadequate permit records)
Alyeska Pipeline Service Company Valdez Marine Terminal

Smoke Management Plan

A Smoke Management Plan (SMP) is currently being drafted by ADEC to assist Alaska with smoke and burning issues. The SMP will help determine how to manage smoke-related issues that impact Class I areas, as well as the rest of the state, and what control measures are feasible to manage fire emissions. The SMP will be developed in coordination with the Alaska WildLand Fire Coordinating Work Group (AWFCWG) and FLM fire coordination personnel. The AWFCWG consists of state and federal agencies that work on fire-related issues in Alaska. It is anticipated that, once finalized, this plan will be incorporated into the Alaska SIP. It will also become an integral part of the first regional haze SIP submittal.

Studies related to fire emissions in Alaska could greatly improve the fire emission inventory that will be used in the state's regional haze modeling efforts. They could also be useful in improving the effectiveness of Alaska's smoke management plan. One potential study is the FrostFire project discussed previously in the monitoring section of this report.

Other Strategies

Additional feasible control strategies and goals will be further evaluated during the regional haze process. Once the emission inventory and modeling efforts are complete, ADEC will be able to better determine where and what the problem areas are and how these problems can be controlled.

9.0 SIP DEVELOPMENT AND ADOPTION PROCESS

Once the regional haze SIP requirements have been met, a draft SIP will be developed and available for public comment and review. All interested parties and stakeholders will be provided with a draft SIP for review and comment as well. Alaska will consider and address all comments prior to adopting the SIP regulations. Alaska will confer with Federal Land Mangers and Tribal communities early on in the development of the regional haze SIP and work with them during the entire SIP process.

Coordination with Federal Land Managers

Alaska will consult with FLMs before adopting and submitting their regional haze SIPs. Alaska will provide the FLM with an opportunity for consultation, in person, at least 60 days prior to holding any public hearing on a SIP for regional haze and will include a description of how it addressed any comments provided by the FLM when writing the SIP. This consultation will include the opportunity for the affected FLMs to discuss their assessment of impairment of visibility in any Class I area and recommendations on both the development of the reasonable progress goal and the development and implementation of strategies to address visibility impairment. The SIP will provide procedures for continuing consultation between the State and FLMs on implementation of the visibility protection program, including development and review of SIP revisions and 5-year progress reports.

APPROACH

Alaska desires to have a cooperative approach with the FLMs that allows for their participation throughout the development of the SIP. Therefore, in addition to meeting with the rule requirements for coordination with the FLMs, Alaska proposes to provide the Federal Land Managers with quarterly updates on SIP development efforts. These updates could be in the form of teleconferences, meetings, or written information. More frequent communications could be made during the development process as the agencies work cooperatively on specific issues of mutual interest.

Coordination with Alaska Native Communities

Alaska understands the need to work with Alaska natives when developing the regional haze SIP and will work with interested tribal governments to inform them on regional haze goals and plans for reducing pollutant emissions.

ISSUE

The tribal land distribution is much different than it is in the lower 48. There are over 227 tribes in Alaska, some of which are difficult to visit and can only be reached by plane or boat.

APPROACH

As with the FLMs, Alaska desires to develop the regional haze SIP through a cooperative approach with interested Alaskan native groups. In order to facilitate communication with Alaskan natives, Alaska proposes to develop and implement a communication plan related to regional haze planning efforts. Alaska will need to

identify key interested groups that wish to be involved in the SIP development process and provide for their participation. It is likely that communications will occur both formally and informally. The State will contact WRAP tribal coordinators to discuss conveying issues relating to tribal outreach to a broad and diverse group of tribes.

10.0 COMPREHENSIVE PERIODIC SIP REVISIONS

Alaska will revise and submit its regional haze SIP revision to EPA by July 31, 2018 and every ten years thereafter. In each SIP revision, Alaska will evaluate and reassess all of the core requirements, taking into account: improvements in monitoring data collection and analysis techniques, control technologies, and other factors. The following elements must be addressed:

(1) reasonable progress goals for the next 10-year implementation period
(2) determination of current conditions and review of estimates for natural conditions
(3) a revised long-term strategy, as necessary to achieve the reasonable progress goal for the next 10-year implementation period, and
(4) revised emission inventories, technical analyses and monitoring strategies.

Five year Progress Reports

Alaska will review and revise their SIP every 5 years to demonstrate ongoing advancement towards the reasonable progress goal for each Class I area and making midcourse corrections in emission strategies. The first progress report is due 5 years from submittal of the initial SIP. The periodic progress report will contain at a minimum the following elements:

- a description of the status of implementation of all measures included in the SIP for achieving reasonable progress goals for Class I areas within the State
- a summary of the emissions reductions achieved throughout the State through implementation of the measures described above
- For each Class I area within the State, the following visibility conditions must be appraised, and changes, with values for most impaired and least impaired days, expressed in terms of 5-year averages of these annual values:
    - the *current visibility conditions* for the most impaired and least impaired days
    - the *difference between current* visibility conditions for the most impaired and least impaired days and *baseline* visibility conditions
    - the *change in visibility impairment* for the most impaired and least impaired days over the past 5 years
- an analysis *tracking the change over the past 5 years* in emissions of pollutants contributing to visibility impairment from all sources and activities within the State. Emissions changes should be identified by type of source or activity. The analysis must be based on the most recent updated emissions inventory, with estimates projected forward as necessary and appropriate, to account for emissions changes during the applicable 5-year period.
- an assessment of any significant *changes in anthropogenic* emissions within the State that has occurred over the past 5 years which limited or impeded progress in reducing pollutant emissions and improving visibility

- an evaluation to decide *whether the current SIP elements and strategies are sufficient* to enable the State to meet all established reasonable progress goals
- a review of the State's visibility *monitoring strategy* and any modifications to the strategy as necessary

Determination of the Adequacy of Existing SIP

Alaska will take one of the following actions at the same time any 5-year progress report is required to be submitted:

- If Alaska determines that the existing SIP requires no further substantive revision in order to achieve established goals for visibility improvement and emissions reductions, Alaska will provide to the Administrator a negative declaration that further revision of the existing SIP is needed.
- If Alaska determines that the SIP is or may be inadequate to ensure reasonable progress due to emissions from sources in another country, Alaska is then required to provide notification, along with available information, to the Administrator.
- If Alaska determines that the SIP is, or may be, inadequate to ensure reasonable progress due to emissions from sources within the State, Alaska is required to revise its SIP to address the plan's deficiencies within one year.

Visibility Change from Baseline Conditions

At the time of any SIP revision, Alaska will evaluate the amount of visibility improvement achieved from baseline conditions and consider the change when developing future reasonable progress goals and strategies. This must be done by comparing "current conditions" for the 5 most recent years of available visibility data to the baseline conditions. Lack of improvement from the baseline conditions must be explained by the State and possible revised progress goals and emission strategies should be considered at that time. Similarly, greater than expected improvements would also lead to revised progress goals and emissions strategies.

Visibility Change Since Last SIP

Alaska will analyze and explain the changes in visibility conditions since the establishment of the previous reasonable progress goal. (This applies beginning in the second SIP revision cycle under the regional haze program.)

Difference Between Current and Natural Conditions

At the time of any comprehensive SIP revision, Alaska will calculate the difference between current conditions and natural conditions for the most impaired and least impaired days.

11.0 SUMMARY TIMELINE AND BUDGET

ID	Task Name	Start	Finish	Resource Names
1	Monitoring	Mon 7/2/01	Mon 12/31/07	
2	IMPROVE Monitoring	Mon 7/2/01	Mon 12/31/07	
3	Denali HQ IMPROVE Site	Mon 7/2/01	Mon 12/31/07	NPS
4	Trapper Creek IMPROVE Site	Fri 8/31/01	Mon 12/31/07	NPS
5	Simeonoff/Sand Point IMPROVE Site	Mon 10/15/01	Mon 12/31/07	FWS
6	Tuxedni/Cook Inlet IMPROVE Site	Wed 10/31/01	Mon 12/31/07	FWS
7	Develop Monitoring Strategy/Assessment	Thu 11/1/01	Fri 6/28/02	DEC/UAF
8	Develop New Monitoring Project Plans	Thu 11/1/01	Fri 6/28/02	DEC/UAF
9	Scope and Find Funding for Projects	Mon 7/1/02	Tue 12/31/02	DEC/UAF
10	Remote Monitoring - Bering Sea	Mon 10/15/01	Tue 4/2/02	UAF
11	Transboundary Monitoring	Mon 7/1/02	Mon 12/31/07	
12	Find Funding	Mon 7/1/02	Mon 3/31/03	DEC/UAF
13	Site Selection	Tue 4/1/03	Mon 6/30/03	DEC/UAF
14	Site Installation	Tue 7/1/03	Tue 9/30/03	DEC/UAF
15	Site Operations	Wed 10/1/03	Mon 12/31/07	DEC/UAF
16	Emission Factor Monitoring/Studies	Mon 10/15/01	Mon 3/31/03	
17	Identify Needs	Mon 10/15/01	Thu 1/31/02	DEC
18	Develop Project Scope	Fri 2/1/02	Fri 3/15/02	DEC/UAF
19	Find Funding	Mon 3/18/02	Fri 6/28/02	DEC/UAF
20	Implement Project	Mon 7/1/02	Tue 12/31/02	DEC/UAF
21	Feed Project Results into EI	Wed 1/1/03	Mon 3/31/03	DEC
22	Additional IMPROVE - North Denali	Tue 7/1/03	Mon 12/31/07	NPS
23	CASTNet Monitoring	Mon 7/2/01	Fri 8/31/01	?
24	Refine Monitoring Strategy for SIP	Fri 4/1/05	Thu 6/30/05	DEC
25	Calculate Baseline, Background, and Rate of Progress	Mon 7/2/07	Mon 12/31/07	DEC
26	Emission Inventory	Mon 7/2/01	Mon 12/31/07	
27	Develop IPP/QAP	Mon 7/2/01	Mon 12/31/01	DEC
28	Emission Inventory Tracking System	Mon 7/2/01	Mon 12/31/07	DEC
29	Initial EI for key sources/communities	Tue 1/1/02	Tue 12/31/02	DEC
30	Assess emission factors	Tue 1/1/02	Fri 6/28/02	DEC
31	Stationary Source Inventory	Tue 1/1/02	Wed 12/31/03	DEC
32	Complete Base EI and Gridding	Wed 1/1/03	Wed 12/31/03	DEC
33	Develop Future Year Projections	Thu 1/1/04	Wed 6/30/04	DEC
34	Modeling	Wed 8/1/01	Sun 12/31/06	
35	Puff Model Practice	Wed 8/1/01	Fri 6/28/02	DEC/UAF
36	Assess Models for Arctic Chemistry and Alaskan Conditio	Mon 7/1/02	Mon 9/30/02	UAF
37	Modeling for Transboundary Monitor Siting	Tue 10/1/02	Wed 1/1/03	UAF
38	BackTrajectory Modeling	Mon 9/10/01	Fri 3/1/02	UAF
39	Develop Topo grid for model domain	Tue 4/1/03	Mon 6/30/03	UAF
40	Collect MM5 Met Results	Tue 4/1/03	Mon 6/30/03	UAF
41	First Run of Model	Tue 4/1/03	Mon 6/30/03	UAF
42	Model Calibration and Verification	Tue 7/1/03	Thu 7/1/04	UAF
43	Model Base Case for each Class I area	Fri 7/2/04	Fri 9/30/05	UAF
44	Model Future Years and Controls for each Class I area	Mon 10/3/05	Sun 12/31/06	UAF
45	Transition to CMAQ Model?	Mon 10/15/01	Mon 10/15/01	UAF
46	Control Strategies	Mon 10/1/01	Fri 12/29/06	DEC
47	Smoke Management Plan	Mon 10/1/01	Wed 12/31/03	DEC
48	Discuss with AWFCWG	Mon 10/1/01	Fri 11/30/01	DEC
49	Develop Plan	Tue 1/1/02	Tue 12/31/02	DEC
50	SIP Amendment to Incorporate SMP	Wed 1/1/03	Wed 12/31/03	DEC
51	BART	Tue 1/1/02	Fri 12/31/04	DEC
52	Determine BART eligible sources	Tue 1/1/02	Tue 9/30/03	DEC
53	BART analysis	Tue 7/1/03	Fri 12/31/04	DEC
54	Other Controls Needed?	Mon 1/3/05	Fri 12/29/06	DEC
55	Develop and analyze Controls	Mon 1/3/05	Fri 12/29/06	DEC
56	SIP Processing	Tue 7/1/03	Mon 12/31/07	DEC
57	Process Smoke Management Plan	Tue 7/1/03	Wed 12/31/03	DEC
58	Potential SIP Submittal Deadline	Thu 7/1/04	Thu 7/1/04	DEC
59	Draft Regional Haze SIP	Mon 1/2/06	Fri 12/29/06	DEC
60	Public Process	Thu 3/1/07	Mon 4/30/07	DEC
61	State Adoption and Legal Review	Tue 5/1/07	Sat 12/15/07	DEC/DOL
62	Submit to EPA	Mon 12/17/07	Mon 12/31/07	DEC
63	Communications	Mon 7/2/01	Mon 12/31/07	DEC
64	Initial outreach to FLM and Alaska Native Groups	Mon 7/2/01	Mon 12/31/01	DEC
65	Develop Communication Plan	Tue 1/1/02	Fri 3/29/02	DEC
66	Quarterly Updates for FLMs	Wed 1/2/02	Wed 10/3/07	DEC
91	Implement Communication Plan for AK Native Groups	Mon 4/1/02	Mon 12/31/07	DEC
92	Public Review Process for Smoke Management Plan	Thu 5/1/03	Thu 7/31/03	DEC
93	Notification to FLM per Rule Requirements	Mon 1/1/07	Mon 1/1/07	DEC
94	Public Review Process for RHaze Plan	Thu 3/1/07	Mon 4/30/07	DEC

The timeline presented does not meet the expected deadline of 2004-2006 for an Alaskan regional haze SIP. It may be possible to shorten the timeline somewhat if agreements are made that reduce the level of technical effort involved in development of the first regional haze SIP. However, the timeline also recognizes that given budget timing, it is likely that additional funding for technical efforts could not be obtained for Alaska regional haze efforts prior to calendar year 2003. This makes it difficult to shorten the timeline.

Estimated Regional Haze Budget

The estimated budget includes major tasks associated with developing a regional haze SIP and meeting regional haze rule requirements regardless of which agency is responsible for conducting the specified work. The timeline attempts to identify the primary agencies involved in conducting the various work elements. These estimated budgets are based on current knowledge and input received from staff participating in the strategy development process. As details are worked out for various technical tasks, these estimates will likely need to be revised.

PROPOSED BUDGET FOR ALASKA REGIONAL HAZE EFFORTS									
Work Element	Calendar Year								Total
	2001	2002	2003	2004	2005	2006	2007	2008	
Monitoring									
Improve[3]	$109,000	$140,000	$140,000	$186,000	$175,000	$175,000	$175,000	$175,000	$1,275,000
Drum/Met	$5,000		$235,000	$200,000	$200,000	$200,000	$200,000	$200,000	$1,240,000
CASTNet	$40,000								$40,000
Monitoring Strategy	$3,000	$31,500	$3,000	$3,000	$33,000	$3,000	$3,000	$3,000	$82,500
Emission Inventory	$80,000	$60,000	$333,750	$311,250					$785,000
Modeling	$18,000	$26,000	$123,875	$123,875	$89,250	$120,000			$501,000
Control Analysis		$26,250	$44,750	$108,000					$179,000
SIP Processing			$30,000			$47,700	$57,000		$134,700
Communications		$39,600	$39,600	$39,600	$39,600	$39,600	$39,600		$237,600
Total	$255,000	$323,350	$949,975	$971,725	$536,850	$585,300	$474,600	$378,000	$4,474,800

The details for generating the multi-year budget estimates are included in Appendix A.

[3] IMPROVE monitoring costs are estimated and need verification from NPS and FWS. These funds would go to the federal agencies, not the state. Removing IMPROVE costs from the total, reduces the total amount to 3,199,800.

APPENDIX A
MULTI-YEAR BUDGET ESTIMATION

MONITORING

IMPROVE BASE COSTS*:

Operating Costs	$35,000 per year per unit
Equipment Costs	$12,000 per unit
Installation Costs	$25,000 per unit

CASTNET BASE COSTS:

Operation Costs	$40,000 per year per unit

DRUM SAMPLER BASE COSTS:

Operating Costs	$30,000 per year per unit
Equipment Costs	$5,000 per unit

METEOROLOGICAL COSTS:

Operating Costs	$10,000 per year per unit
Equipment Costs	$12,000 per unit

MONITORING STRATEGY: $30,000 total per document developed

COORDINATION WITH FLM: $300 per day

MONITORING CALENDAR YEAR BUDGETS:

2001

IMPROVE

1 Site Operational	$35,000
2 Site Installations	$50,000
2 Equipment Packages	$24,000

Drum/Met

1 Equipment	$5,000

CASTNet

1 Site Operational	$40,000

Monitoring Strategy $0

Coordination with FLM

10 Days	$3,000

* (IMPROVE base costs go to FWS/NPS. FWS/NPS need to verify accuracy)

2002, 2003

IMPROVE	
4 Sites Operational	$140,000
Drum/Met	
5 Drum Equipment	$25,000
5 Met Equipment	$60,000
5 Drum Ops – 0.75 Yr	$112,500
5 Met Ops – 0.75 Yr	$37,500
CASTNet	$0
Monitoring Strategy	$0
Coordination with FLM	
10 Days	$3,000

2004

IMPROVE	
4 Sites Operational	$140,000
1 Site – 3 Months	$9,000
1 Site Installation	$25,000
1 Equipment Package	$12,000
Drum/Met	
5 Drum Operational	$150,000
5 Met Operational	$50,000
CASTNet	$0
Monitoring Strategy	$0
Coordination with FLM	
10 Days	$3,000

2005

IMPROVE	
5 Sites Operational	$175,000
Drum/Met	
5 Drum Operational	$150,000
5 Met Operational	$50,000

CASTNet	$0
Monitoring Strategy	$30,000
Coordination with FLM 10 Days	$3,000

2006, 2007, 2008

IMPROVE 5 Sites Operational	$175,000
Drum/Met 5 Drum Operational 5 Met Operational	$150,000 $50,000
CASTNet	$0
Monitoring Strategy	$0
Coordination with FLM 10 Days	$3,000

EMISSION INVENTORY

Inventory Preparation/Quality Assurance Plan:	$80,000
Data Collection/Calculation:	
Stationary	$135,000
Area	$185,000
Mobile	$75,000
Emission Factor Development:	$100,000
Emission Projections:	$25,000
Database Work:	$75,000
Inventory Gridding:	$50,000

EMISSION INVENTORY CALENDAR YEAR BUDGETS:

2001

Inventory Preparation Plan	$80,000

2002

Initial EI for Key 99 sources/areas (10 weeks at $6,000 per week)	$60,000

2003

Data Collection/Calculation	
Stationary (75%)	$101,250
Area (75%)	$138,750
Mobile (75%)	$56,250
Database Work (50%)	$37,500

2004

Data Collection/Calculation	
Stationary (25%)	$33,750
Area (25%)	$46,250
Mobile (25%)	$18,750
Emission Factor Development	$100,000
Emission Projections	$25,000
Database Work (50%)	$37,500
Inventory Gridding	$50,000

2005, 2006, 2007, 2008

No Concentrated EI Activity

MODELING

Initial Model Evaluation:	$18,000
Assess Chemistry:	$20,000
Obtain Funding:	$6,000 (20 days staff time or 1week contractor)
Regional Model Analysis:	$138,500
Analysis of Controls:	$100,000

MODELING CALENDAR YEAR BUDGETS:

2001

Initial Model Evaluation	$18,000

2002

Obtain Funding	$6,000
Assess Chemistry	$20,000

2003, 2004

Assess Chemistry	$20,000
Regional Model Analysis (75%)	$103,875

2005

Assess Chemistry	$20,000
Regional Model Analysis (50%)	$69,250

2006

Assess Chemistry	$20,000
Analysis of Other Controls	$100,000

2007, 2008

No Concentrated Modeling Activity

CONTROL ANALYSIS

BART Analysis:	$6,000 (20 days staff time or 1week contractor)
Smoke Management Plan:	$35,000
Analysis of Controls:	$100,000

CONTROL ANALYSIS CALENDAR YEAR BUDGETS:

2001

No Activity

2002

Smoke Management Plan (75%)	$26,250

2003

Smoke Management Plan (25%)	$8,750
BART Analysis (25%/24 weeks)	$36,000

2004

BART Analysis (75%/24 weeks)	$108,000

2005, 2006, 2007, 2008

No Concentrated Control Analysis Activity

SIP PROCESSING

Drafting SIP:	$47,700
Public Review:	$34,500
Legal Review:	$15,000
SIP Adoption:	$7,500

SIP PROCESSING CALENDAR YEAR BUDGETS:

2001, 2002

No Activity

2003

Drafting SIP/Public Review	$7,500
Legal Review	$15,000
SIP Adoption	$7,500

2004, 2005

No Activity

2006

Drafting SIP	$47,700

2007

Public Review	$34,500
Legal Review	$15,000
SIP Adoption	$7,500

2008

No Concentrated SIP Processing Activity

COMMUNICATIONS

FLM Coordination:	$300 per person per day
Public Outreach (Staff):	$300 per person per day
Public Outreach (Travel):	$2,000 per trip
Communication Plan:	$6,000 (20 days staff time or 1week contractor)

SIP PROCESSING CALENDAR YEAR BUDGETS:

2001

No Concentrated Activity

2002, 2003, 2004, 2005, 2006, 2007

Communication Plan	$6,000
FLM Coordination (4days /4 people)	$4,800
Public Outreach (Staff) (4 days /4 people)	$4,800
Public Outreach (Travel) (12 trips)	$24,000

2008

No Concentrated Communication Activity