Alaska's 2013 Air Monitoring Network Plan

Appendices and Glossary

Air Quality Division

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&
Quality Assurance
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APPENDIX A:

Designations

Non-attainment: any area that does not meet, or that contributes to poor ambient air quality in a nearby area that does not meet, the national primary or secondary ambient air quality standard for any pollutant on the national ambient air quality standards list.

Attainment: any area that meets the national primary or secondary ambient air quality standard for the pollutant.

Unclassifiable: any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

Maintenance: any area that is going through the transition from being designated a non-attainment area to attainment.

Note: Further information regarding designation can be found at:

http://epa.gov/air/oaqps/greenbk/define.html
http://www.epa.gov/air/caa/

APPENDIX B:

Siting Criteria

The Federal Environmental Protection Agency (EPA) Region 10 requested that the Alaska Department of Environmental Conservation (DEC) staff provide a table which demonstrates that each monitoring site complies with siting criteria identified in 40 CFR Part 58 Appendix E. Included are two tables: one for CO sites and one for PM sites. Certain sites have been found to have had their monitoring scale incorrectly designated. A discussion of the monitoring scale changes follows each table.

Carbon Monoxide Sites

Carbon monoxide (CO) inlet probes should be at least 1 meter away, both vertically and horizontally, from any supporting structure or wall. For microscale sites the probe height must be between 2.5 and 3.5 meters, whereas for other scale sites the probe must be between 3 and 15 meters high.

A probe must have unrestricted airflow for at least 270 degrees, or 180 degrees if it is located on the side of a building. Obstructions must be a minimum distance away equal to twice the distance by which the height of the obstruction exceeds the height of the probe. Trees should not be present between the dominant CO source or roadway and the inlet probe.

The following is a list with definitions on monitoring site scaling;

Microscale—defines the concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters.

Middle Scale—defines the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometer.

Neighborhood Scale—defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range.

Urban Scale—defines the overall, citywide conditions with dimensions on the order of 4 to 50 kilometers. This scale would usually require more than one site for definition.

The following table (Table B-1) lists all CO monitoring sites in Anchorage and Fairbanks (including SPM) and how they fit the siting criteria from Appendix E of 40 CFR Part 58.

Table B-1 CO monitoring sites in Anchorage and Fairbanks.

Site Name	Monitoring Scale	Probe Distance from Wall (meters)	Height (meters)	Unrestricted Air Flow	Spacing from Roadway (meters)	Trees
Garden	Neighborhood	1	3	180 degrees unobstructed	7	Yes
Turnagain	Neighborhood	1	3	180 degrees unobstructed	12 from 500 VPD roadway	Yes
DHHS	Neighborhood	1	3	270 degrees unobstructed	28	None
Parkgate	Neighborhood	1	2.5	180 degrees unobstructed	22	None
Old Post Office	Microscale	1	3	180 degrees unobstructed	3	None

Particulate Matter (PM_{10} and $PM_{2.5}$) Sites

For microscale sites particulate matter inlets must be between 2 and 7 meters from ground level. For other siting scales the probe must be between 2 and 15 meters high.

A sampler must have at least 2 meters separation from walls, parapets, penthouses, etc… A sampler must have unrestricted airflow for at least 270 degrees, or 180 degrees for street canyon sites. Obstructions must be a minimum distance away from the sampler with the separation equal to twice the distance by which the height of the obstruction exceeds the height of the sampler inlet.

Microscale sampler inlets must be located between 5 and 15 meters from the nearest traffic lane for traffic corridor sites, and between 2 and 10 meters for street canyon sites. The minimum separation distance between the probe and nearest traffic lane for middle, neighborhood, or urban scale sites depends upon the number of vehicles per day (VPD) that use the roadway according to a rather complicated table in Appendix E of 40 CFR Part 58. TableB-2 lists all PM monitoring sites in Alaska (including SPM) and how they fit the siting criteria from Appendix E of 40 CFR Part 58.

Table B-2: PM monitoring sites in Alaska

Site Name	Monitoring Scale	Height (meters)	Spacing from Obstructions (meters)	Spacing from Roadway (meters)	Traffic (VPD)	Trees
Garden	Neighborhood	10	12m to 5m tall penthouse	10	< 5,000	None
Tudor	Microscale	3.3	None	7	46,900	
DHHS	Middle	3	None	28	15,120	None
Parkgate	Neighborhood	6	13m to 4m tall penthouse	44	11,000	None
Harrison Court	Neighborhood	4	> 8	150	Unknown, probably < 5,000	None
Palmer	Neighborhood	4	> 8	18	Unknown, probably < 5,000	None
Wasilla	Neighborhood	4	> 8	20	16,494	None
State Office Building	Neighborhood	6	30m to 3.75m tall penthouse	20	7,400	1 tree at 10m away
NCore	Neighborhood	4	75 m to 12 m building	~ 100	3559	32 m to 10 m tall trees
North Pole Elementary	Neighborhood	4	>20	~ 300 to Richardson Highway	10,400	Several to east > 30m
North Pole Fire #3	Neighborhood	4	none	23 to Hurst Rd	3730	> 30 m
Floyd Dryden	Neighborhood	6	Furnace flue @ 20m, 4m penthouse @ 15m	65	12,770	12 meter tall @ 25m away
Soldotna	Neighborhood	4	None	~ 30	< 5320	10 m to group of 6 m tall trees

APPENDIX C:

Network Site Summary

State Code	County Code	Site ID	Parameter Code	POC	Method Code	Unit Code	Frequency	Parameter Description	Instrumentation	City Name	Site Name	Notes
02	020	0018	81102	1	063	001	1/6	PM10 Total 0-10um Stp	Anderson Hi-Vol,	Anchorage	GARDEN ST	
02	020	0018	42101	1	055	007	cont	Carbon Monoxide	Thermo 48iTLE	Anchorage	GARDEN ST	Oct - Mar
02	020	0018	44201	1	087	008	cont	Ozone	Teledyne AP1 400E	Anchorage	GARDEN ST	Apr - Oct, (Began 2010)
02	020	0018	88101	3	170	105	cont	PM2.5 - Local Conditions	Met One BAM 1020X	Anchorage	GARDEN ST	
02	020	0018	81102	3	122	001	cont	Pm10 - Stp	Met One BAM 1020X	Anchorage	GARDEN ST	
02	020	0044	81102	2	063	001	1/6	PM10 Total 0-10um Stp	Anderson Hi-Vol	Anchorage	TUDOR RD	Discontinued 01/31/2012
02	020	0044	81102	3	122	001	cont	PM10 – Local Conditions	Met One BAM 1020X	Anchorage	TUDOR RD	Reported since 07/01/2010
02	020	0048	42101	1	054	007	cont	Carbon Monoxide	Thermo 48C	Anchorage	TURNAGAIN ST	
02	020	0050	42101	1	054	007	cont	Carbon Monoxide	Thermo 48C	Anchorage	DHHS	
02	020	0050	88101	3	170	105	cont	PM2.5 - Local Conditions	Met One BAM 1020X	Anchorage	DHHS	
02	020	0050	85101	3	122	001	cont	PM10 - Stp	Met One BAM 1020X	Anchorage	DHHS	
02	020	0051	14129	1	191	001	1/6	TSP - Pb	Anderson Hi-Vol	Anchorage	MERRILL FIELD	Reported since 10/18/2011
02	020	0051	14129	2	191	001	1/6	TSP - Pb	Anderson Hi-Vol	Anchorage	MERRILL FIELD	Reported since 10/18/2011
02	020	1004	85101	1	063	105	1/6	PM10 - Lc	Anderson Hi-Vol	Eagle River	PARKGATE	Discontinued 01/31/2012
02	020	1004	81102	1	063	001	1/6	PM10 - Stp	Anderson Hi-Vol	Eagle River	PARKGATE	Discontinued 01/31/2012
02	020	1004	42101	1	054	007	cont	Carbon Monoxide	Thermo 48C	Eagle River	PARKGATE	
02	020	1004	88101	3	170	105	cont	PM2.5 - Local Conditions	Met One BAM 1020X	Eagle River	PARKGATE	
02	020	1004	85101	3	122	001	cont	PM10 - Stp	Met One BAM 2010X	Eagle River	PARKGATE	
02	020	1004	81102	1	063	001	1/6	PM10 Total 0-10um Stp	Anderson Hi-Vol	Eagle River	PARKGATE	Discontinued 01/31/2012
02	090	0002	42101	1	054	007	cont	Carbon Monoxide	Thermo 48C	Fairbanks	OLD POST OFFICE	

State Code	County Code	Site ID	Parameter Code	POC	Method Code	Unit Code	Frequency	Parameter Description	Instrumentation	City Name	Site Name	Notes
02	090	0010	88101	1	117	105	1/3	PM2.5 - Local Conditions	Partisol 2000	Fairbanks	STATE OFFICE BUILDING	
02	090	0010	88101	2	117	105	1/6	PM2.5 - Local Conditions	Partisol 2000	Fairbanks	STATE OFFICE BUILDING	
02	090	0010	88501	3	733	105	cont	PM2.5 - Local Conditions	Met One BAM FEM	Fairbanks	STATE OFFICE BUILDING	
02	090	0010	88502	6	810	105	1/3	PM2.5 - Local Conditions	Met One SASS	Fairbanks	STATE OFFICE BUILDING	
02	090	0010		6			1/3	PM2.5 - Local Conditions	URG 3000N Speciation Monitor	Fairbanks	STATE OFFICE BUILDING	
02	090	0010	61101	1	061	011	cont	Wind Speed	RM Young Windbird 05305	Fairbanks	STATE OFFICE BUILDING	Not reported to AQS
02	090	0010	61102	1	024	014	cont	Wind Direction	RM Young Windbird 05305	Fairbanks	STATE OFFICE BUILDING	Not reported to AQS
02	090	0034	88101	3	170	105	cont	PM2.5 Total 0-2.5um Lo	Met One BAM 1020X	Fairbanks	NCORE	
02	090	0034	85101	3	122	105	cont	PM10 Total 0-10um lo	Met One BAM 1020X	Fairbanks	NCORE	
02	090	0034	88502	6	810	105	1/3	PM2.5 - Local Conditions	Met One SASS	Fairbanks	NCORE	Not (yet) reported to AQS
02	090	0034	42401	1	560	008	cont	SO_2	Thermo 43I,TLE	Fairbanks	NCORE	
02	090	0034	42601	1	074	008	cont	NO	Thermo 42i,TLE	Fairbanks	NCORE	
02	090	0034	42612	1	574	008	cont	NO_Y	Thermo 42i-Y	Fairbanks	NCORE	
02	090	0034	42604	1	051	008	cont	NH_3	Thermo 17i	Fairbanks	NCORE	
02	090	0034	42101	1	054	008	cont	CO	Thermo 48I,TLE	Fairbanks	NCORE	
02	090	0034	44201	1	087	008	cont	O_3	Teledyne/API 403E	Fairbanks	NCORE	
02	090	0034	To be determined	1			cont	Wind speed/ Direction		Fairbanks	NCORE	
02	090	0034	To be determined	1			cont	Ambient Temperature		Fairbanks	NCORE	
02	090	0034	To be determined	1			cont	Barometric Pressure		Fairbanks	NCORE	
02	090	0033	88101	1	117	105	1/3	PM2.5 - Local Conditions	Partisol 2000	North Pole	NORTH POLE ELEMENTARY SCHOOL	Not (yet) reported to AQS
02	090	0033	88502				cont	Black Carbon	Met One SASS	North Pole	NORTH POLE ELEMENTARY SCHOOL	Not (yet) reported to AQS
02	090	0033	88502	6	810	105	1/3	Pm2.5 - Local Conditions	Met One SASS	North Pole	NORTH POLE ELEMENTARY SCHOOL	Not reported to AQS
02	090	0033	61101	1	061	011	cont	Wind Speed	Met One 50.5H Sonic Anemometer	North Pole	NORTH POLE ELEMENTARY SCHOOL	Not reported to AQS
02	090	0033	61102	1	024	014	cont	Wind Direction	Met One 50.5H Sonic Wind Sensor	North Pole	NORTH POLE ELEMENTARY SCHOOL	Not reported to AQS
02	090	0033	62101	1	NA	017	cont	Ambient Temperature	Met One BX 592-2 Temperature Sensor	North Pole	NORTH POLE ELEMENTARY SCHOOL	Not reported to AQS

State Code	County Code	Site ID	Parameter Code	POC	Method Code	Unit Code	Frequency	Parameter Description	Instrumentation	City Name	Site Name	Notes
02	090		88101	1	117	105	1/3	PM2.5 - Local Conditions	Partisol 2000	North Pole	NORTH POLE-FIRE STATION	Not reported to AQS
02	090		85101	3	733	105	cont	PM2.5 - Local Conditions	Met One BAM 1020	North Pole	NORTH POLE FIRE STATION	Not (yet) reported to AQS
02	090		88502	6	810	105	1/3	PM2.5 - Local Conditions	Met One SASS	North Pole	NORTH POLE FIRE STATION	Not (yet) reported to AQS
02	090		61101		061	011	cont	Wind Speed	Met One 50.5H Sonic Anemometer	North Pole	NORTH POLE FIRE STATION	Not reported to AQS
02	090		61102		024	014	cont	Wind Direction	Met One 50.5H Sonic Wind Sensor	North Pole	NORTH POLE FIRE STATION	Not reported to AQS
02	090		62101		NA	017	cont	Ambient Temperature	Met One BX 592-2 Temperature Sensor	North Pole	NORTH POLE FIRE STATION	Not reported to AQS
02	110	0004	81101	3	170	105	cont	PM2.5 Local Conditions	Met One BAM FEM	Juneau	F DRYDEN	
02	110	0004	85101	1	126	105	1/6	PM10 – Local Conditions Primary	Partisol 2000	Juneau	F DRYDEN	
02	170	0008	88501	1	122	105	cont	PM2.5 Total 0-2.5um Lo	Met One BAM	Mat-Su Valley	BUTTE	
02	170	0008	85101	1	122	105	cont	PM10 Total 0-10um lo	Met One BAM	Mat-Su Valley	BUTTE	
02	170	0008	88101	1	117	105	1/6	PM2.5 - Local Conditions	Partisol 2000	Mat-Su Valley	BUTTE	
02	170	0008	81102	1	126	105	1/6	PM10 – Std Conditions	Partisol 2000	Mat-Su Valley	BUTTE	
02	170	0012	88101	1	170	105	cont	PM2.5 - Local Conditions	Met One BAM 1020X	Mat-Su Valley	PALMER	
02	170	0012	85101	1	122	105	cont	PM10 – Local Conditions	Met One BAM 1020X	Mat-Su Valley	PALMER	
02	170	0013	88101	1	170	105	cont	PM2.5 - Local Conditions	Met One BAM 1020X	Mat-Su Valley	WASILLA	
02	170	0013	85101	1	122	105	cont	PM10 – Local Conditions	Met One BAM 2010X	Mat-Su Valley	WASILLA	
02	170	0013	88101	1	117	105	1/6	PM2.5 - Local Conditions	Partisol 2000	Mat-Su Valley	WASILLA	
02	170	0013	44201	1	087	008	cont	Ozone	Teledyne AP1 400E	Mat-Su Valley	WASILLA	
02	122	0008	88101	1	170	105	count	PM2.5 - Local Conditions	Met One BAM 1020X	Kenai Peninsula	SOLDOTNA	Not (yet) reported to AQS
02	122	0008	85101	1	122	105	count	PM10 – Local Conditions	Met One BAM 1020X	Kenai Peninsula	SOLDOTNA	Not (yet) reported to AQS

APPENDIX D:

Glossary

Air Quality Index (AQI) - The AQI is an index for reporting daily air quality and what associated health concerns the public should be aware of. The AQI focuses on health effects that might happen with in a few hours or days of breathing polluted air. The AQI rates the air quality in 6 steps from good to hazardous.

BAM 1020: Beta Attenuation Monitor Model 1020 continuous particulate monitoring instrument manufactured by Met-One Inc. This sampler can be configured to sample either course or fine particulate matter. Often a pair of the BAM monitoring are configured to simultaneously measure both PM_{10} and $PM_{2.5}$, and then calculate the PM_{Coarse}.

Clean Air Act (CAA) – Enacted by Congress in 1970, the CAA defines EPA's responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer. Congress amended the CAA twice, the first time in 1977 and again in 1990. The 1977 amendment added authority to regulate industrial emissions for the prevention of significant deterioration to existing ambient air quality referred to as PSD. The 1990 amendments added authority to regulate hazard air pollutants (HAPs), often referred to as air toxics.

Hazardous Air Pollutants (HAPs) – A list of 186 toxic air pollutants established in the 1990 amendments to the CAA

Microgram per cubic meter ($\mu g/m^3$) – Unit of measurement often used to quantify air pollutant concentrations. Since the concentration involves the volumetric measurement of a gas, the units may be corrected to standard conditions for pressure and temperature or expressed at local conditions for the actual pressure and temperature at the time of measurement.

National Air Monitoring Station (NAMS) - NAMS are a subset of the SLAMS network with emphasis on urban and multi- source areas. There are no current NAMS-designated monitors in the monitoring network.

National Ambient Air Quality Standards (NAAQS) – Under authority of the original Clean Air Act of 1970, the EPA established standards for ambient air quality concentrations to protect public health and welfare. Standards were developed for six *criteria pollutants* which included; particulate matter (PM), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), and lead (Pb). Over the years, the EPA has amended the NAAQS based on scientific evaluation of air pollutant levels as correlated human health effects and damage to the environment.

Particulate matter ($PM_{2.5}$) – particulate matter in a particle size range less than or equal to 2.5 micrometers

Particulate matter (PM_{10}) – particulate matter in a particle size range less than or equal to 10 micrometers in size

Particulate matter (PM_{Coarse}) – particulate matter in a particle size range greater than 2.5 micrometers but less than 10 micrometers

Particulate matter (TSP) – particulate matter as total suspended particulate typically in a particle size range equal to or less than 40 micrometers. The measurement is now associated with the NAAQS for lead referred to as (TSP-Pb)

Parts per million (ppm) - Unit of measurement used to often to quantify air pollutant concentrations. The units may be expressed based on volumetric measurements or mass units.

Special Purpose Monitors (SPM) - Special Purpose monitors are not permanently established and can be adjusted to accommodate changing needs and priorities for special studies needed by the State and local agencies. The SPM are used to supplement the fixed monitoring network as circumstances require.

State and Local Air Monitoring Station (SLAMS) - The SLAMS consist of a network or roughly 4000 monitoring station nation-wide. Distribution depends largely on the needs of the State and local air pollution control agencies to meet their respective State Implementation plan (SIP) requirements. The SIPs provide for the implementation, maintenance and enforcement of the NAAQS in each air quality control region with in a state. The State of Alaska monitoring network currently has 8 SLAMS sites for carbon monoxide and PM.

U.S. Environmental Protection Agency (EPA) - The mission of EPA is to protect human health and the environment. The EPA is responsible for establishing regulations to implement, uphold, and enforce federal environmental laws such as the CAA.

APPENDIX E

Alaska 2011 Monitoring Plan - PM Design Data for 2009-2011

Alaska Monitoring Design Values for $PM_{2.5}$ as µg/m^3										
	98th Percentile				Weighted Annual Mean				2011-2009 Design Value	
$PM_{2.5}$ Monitoring Sites	2011	2010	2009		2011	2010	2009		24-hour	Annual
Trinity Christian Church (MOA)	17.3	23.2	23.9		5.2	6.1	7.1		21	6.2
DHHS (MOA)	11.6	17.2	15.3		3.9	4.8	5.3		15	4.7
Parkgate Site (MOA)	15.7	17.0	22.4		4.6	5.5	6.3		18	5.4
Harrison Court (Butte)	30.3	37.5	28.8*		6.4	7.5	7.8*		32	7.3
S Gulkana St (Palmer)	9.1	11.6*	*		4.1	4.9	*		10	3.6
100 W Swanson (Wasilla)	15.1				6.3				15	6.3
State Office Building (FNSB)	38.0	51.8	51.0		10.8	13	16.4		47	11.5
809 Pioneer (NCore FNSB)	39.8	50.7	44.1		11.1	12.6	22.7*			
Floyd Dryden Site (Juneau)	24.8	27.3	29.0*		7.1	8.8	7.0*		29	7.6
144 N Binkley (Soldotna)	8.2*				2.9*					

* Annual values not meeting completeness criteria

APPENDIX F:

Visibility and Regional Haze Monitoring Network

In 1977, Congress amended the Clean Air Act to include provisions to protect the scenic vistas of the nation's national parks and wilderness areas. In these amendments, Congress declared as a national visibility goal:

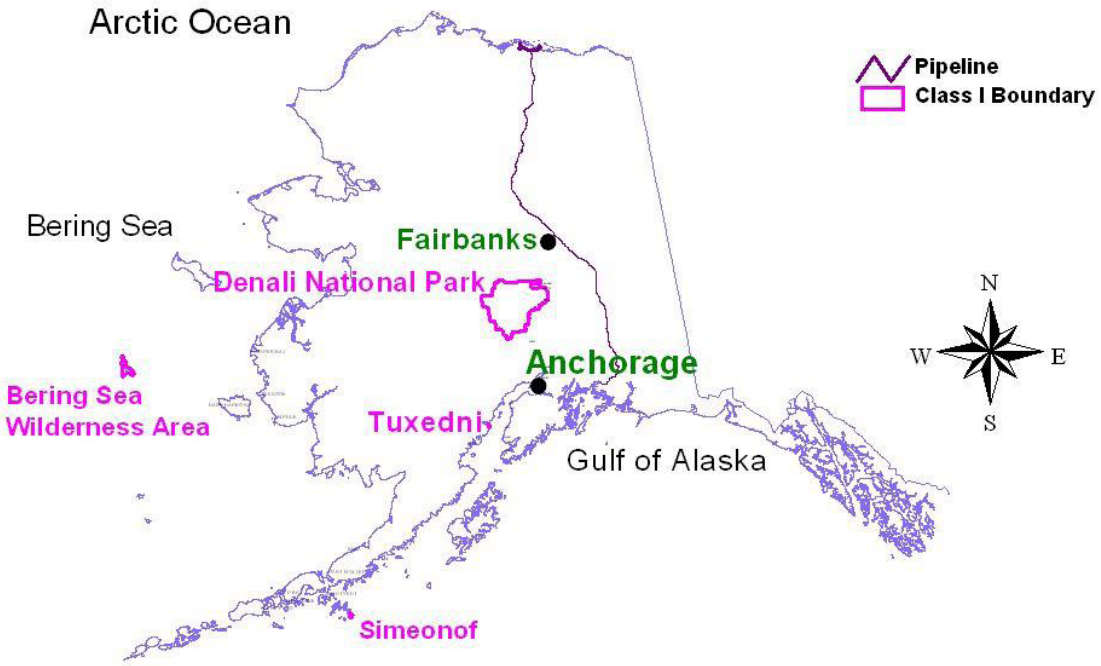
> *The prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas which impairment results from manmade air pollution. (Section 169A)*

At that time, Congress designated all wilderness areas over 5,000 acres and all national parks over 6,000 acres as ―mandatory federal Class I areas. These Class I areas receive special visibility protection under the Clean Air Act.

The 1990 amendments to the Clean Air Act established a new Section 169(B) to address regional haze. To address the 1990 Clean Air Act amendments, the problem of long-range transport of pollutants causing regional haze, and to meet the national goal of reducing man-made visibility impairment in Class I areas, EPA adopted, the Regional Haze Rule in 1999.

Alaska has four Class I areas subject to the Regional Haze Rule: Denali National Park, Tuxedni National Wildlife Refuge, Simeonof Wilderness Area, and Bering Sea Wilderness Area. They were designated Class I areas in August 1977. Figure 1 shows their locations, with Denali National Park in the Interior, Tuxedni and Simeonof Wilderness Areas as coastal, and the Bering Sea Wilderness Area.

Figure 1-Alaskan Class I Areas



In Alaska, Class I Areas are managed by the National Park Service (NPS) and the U.S. Fish and Wildlife Service (USFWS.)

The IMPROVE Monitoring Network

The Alaska Regional Haze SIP includes a monitoring plan for measuring, estimating and characterizing air quality and visibility impairment at Alaska's four Class I areas. The haze species concentrations are measured as part of the IMPROVE monitoring network deployed throughout the United States. Alaska uses four IMPROVE monitoring stations representing three of the four Class I Areas. Three of these stations were initiated specifically in response to Regional Haze rule requirements. There is no air monitoring being conducted for the Bering Sea Wilderness Area due to its remote location.

Denali National Park and Preserve

Denali National Park and Preserve is a large park in the interior of Alaska. It has kept its integrity as an ecosystem because it was set aside for protection fairly early in Alaska's history. Denali National Park headquarters lies 240 miles north of Anchorage and 125 miles southwest of Fairbanks, in the center of the Alaska Range. The park area totals more than 6 million acres.. Denali is the only Class I site in Alaska that is easily accessible and connected to the road system. Denali has the most extensive air monitoring of Alaska's Class I areas, so more detailed examinations of long-term and seasonal air quality trends are possible for this site.

IMPROVE monitoring sites were established at two locations within or near the boundaries of the National Park and Preserve. The first air monitoring site is located near the eastern end of the park road at the Park Headquarters. A second, newer site, known as ―Trapper Creek, is located to the south of the Park at another site with reliable year-round access and electrical power.

The Denali Headquarters monitoring site (DENA1) is across the Park Road from park headquarters, approximately 250 yards from headquarters area buildings. The site (elevation of 2,125 feet) sits above the main road (elevation 2,088 feet). The side road to the monitoring site winds uphill for 130 yards, providing access to the monitoring site and a single-family residential staff cabin. The hill is moderately wooded, but the monitoring site sits in a half- acre clearing. During the park season, mid-September to mid-May, 70 buses and approximately 560 private vehicles per day traverse the road loaded with park visitors. During the off season, approximately100 passenger and maintenance vehicles pass within 0.3 miles of the monitoring site. Private vehicles are only allowed on the first 14.8 miles of the Park Road.

The Trapper Creek IMPROVE monitoring site (TRCR1) is located 100 yards east of the Trapper Creek Elementary School. The site is located west of Trapper Creek, Alaska and a quarter mile south of Petersville Road. The site is the official IMPROVE site for Denali National Park and Preserve and was established in September 2001 to evaluate the long-range transport of pollution into the Park from the south. The elementary school experiences relatively little traffic during the day, about 4 buses and 50 automobiles. The school is closed June through August. This site was selected because it has year-round access to power, is relatively open and is not directly impacted by local sources.

IMPROVE monitoring data have been recorded at the Denali Headquarters IMPROVE site from March of 1988 to present. The IMPROVE monitor near the park's headquarters was originally

the IMPROVE site. Due to topographical barriers, such as the Alaska Range, it was determined that the headquarters site was not adequately representative of the entire Class I area. Therefore, Trapper Creek, just outside of the park's southern boundary, was chosen as a second site for an IMPROVE monitor and is the official Denali IMPROVE site as of September 10, 2001. The headquarters site is now the protocol site. A CASTNet (Clean Air Status and Trends Network) monitor is located near the Denali Headquarters IMPROVE site.

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. Winds are mostly from the north and northwest as part of the midlatitude westerlies. Occasionally winds from Asia blow in from the west.

The island is isolated and the closest air pollution sources are from marine traffic in the Gulf of Alaska and the community of Sand Point.

The Fish and Wildlife Service has placed an IMPROVE air monitor in the community of Sand Point to represent the wilderness area. The community is on a nearby more accessible island approximately 60 miles north west of the Simeonof Wilderness Area. The monitor has been on line since September 2001. The location was selected to provide representative data for regional haze conditions at the wilderness area.

Tuxedni National Wildlife Refuge

Tuxedni National Wildlife Refuge is located on a fairly isolated pair of islands in Tuxedni Bay off of Cook Inlet in Southcentral Alaska. There is little human use of Tuxedni except for a few kayakers and some backpackers. There is an old cannery built near Snug Harbor on Chisik Island which is not part of the wilderness area; however it is a jumping off point for ecotourists staying at Snug Harbor arriving by boat or plane. The owners of the land have a commercial fishing permit as do many Cook Inlet fishermen. Set nets are installed around the perimeter of the island and in Tuxedni Bay during fishing season.

Along with commercial fishing, Cook Inlet has reserves of gas and oil that are currently under development. Gas fields are located at the Kenai area and farther north. The inlet produces 30,000 barrels of oil a day and 485 million cubic feet of gas per day. Pipelines run from Kenai to the northeast and northeast along the western shore of Cook Inlet starting in Redoubt Bay. The offshore drilling is located north of Nikiski and the West McArthur River. All of the oil is refined at the Nikiski refinery and the Kenai Tesoro refinery for use in Alaska and overseas.

The Fish and Wildlife Service has installed an IMPROVE monitor near Lake Clark National Park to represent conditions at Tuxedni Wilderness Area. This site is on the west side of Cook Inlet, approximately 5 miles from the Tuxedni Wilderness Area. The site was operational as of December 18, 2001, and represents regional haze conditions for the wilderness area.

Bering Sea Wilderness Area

The Bering Sea Wilderness is located off the coast of Alaska about 350 miles southwest of Nome. Hall Island is at the northern tip of the larger St Matthew Island.

The Bering Sea Wilderness Area had a DELTA-DRUM sampler placed on it during a field visit in 2002. However, difficulties were encountered with the power supply for the sampler and no

viable data is available from that effort. No IMPROVE monitoring is currently planned for Bering Sea Wilderness Area because of its inaccessibility.

Monitoring data and additional information for the Alaskan IMPROVE sites are available from the EPA website, http://vista.cira.colostate.edu/improve .

Additional Monitoring Considerations

One of the monitoring issues that Alaska has identified is the logistical difficulty of monitoring at remote locations. Remote locations make it challenging to provide power for instrumentation. If a monitor is 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 are representative. DRUM aerosol impactor sampling may provide an opportunity to verify impacts at remote Class I areas like Simeonof and Tuxedni. The challenges for ongoing air and visibility monitoring in Alaska are transportation and site maintenance. Sites are remote, access may be only by air or water, and electrical power may be lacking. In many places winter temperatures are extreme, often dipping well below zero Fahrenheit for weeks at a time.

DELTA-DRUM Samplers have been used at several sites in Alaska for relatively short periods. Researchers have unsuccessfully modified these samplers for remote winter use in Denali Park. Drum samplers were set up at the Denali and Trapper Creek sites as well as in McGrath and Lake Minchumina in February and March 2008. They proved to be quite problematic with mechanical and pump issues in winter conditions. They ran intermittently between February/March 2006 and April 2009.

Alaska will continue to evaluate as resources allow their portable sampling platforms for use in remote environments.