# AMENDMENTS TO VOLUME II, SECTION III

# AREAWIDE POLLUTANT CONTROL PROGRAM

# SUBPART D "PARTICULATE MATTER"

## 3. Control Plan for Mendenhall Valley of Juneau

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5/12/93

## EXECUTIVE SUMMARY

The Mendenhall Valley Air shed is located within the boundaries of the City and Borough of Juneau. The Borough contains over 3100 square miles and is the largest community area in Southeast Alaska. The airshed contains about 12,000 acres of Borough land and is the largest residentially developed area for the region. It extends from the northern boundary of the Juneau Airport north through the Valley to the southern edge of Mendenhall Glacier near Nugget Creek. The Easterly and Westerly boundaries are bounded by steep ridge crests that rise more than 1,000 feet above the Valley floor. The uniqueness of the Valley's climate and geographic features magnify and obscure the source of the PM10 problem for this region. This Airshed Boundary designation by the State has been accepted by the Environmental Protection Agency (EPA).

The Mendenhall Valley airshed has consistently exceeded the short term state and federal PM10 standard ($150\mu g/m^3$ --24 hr avg ) over the last three years of monitoring. Several of these violations have been deemed exceptional events mainly due to strong winds in the Valley but sufficient numbers remain to classify the area non-attainment. In addition to posing a threat to public health, it is generally understood that these exceedances may contribute to vegetative damage, reduce visibility, and impact the overall quality of life.

The State is required, under the Amendments to the Federal Clean Air Act of 1990 (CAA), to prepare an attainment plan for airborne particles with an aerodynamic diameter of 10 micrometers or less. The Amendments classified all PM10 non-attainment areas, including the Mendenhall Valley as "moderate". The moderate designation requires the adoption and implementation of a PM10 State Implementation Plan (SIP). The Plan must demonstrate attainment with the Air Quality Standard by December 31, 1994. In addition the plan must include:

1. Implementation of Reasonably Available Control Measures (RACM)
2. Progress towards attainment and demonstration of attainment with the standards
3. Quantitative milestones that show progress every three years;
4. Contingency Measures;
5. Maintenance Demonstration; and
6. Monitoring and record keeping.

This SIP has been prepared to satisfy the requirements of the Federal Clean Air Act as amended.

In order for the State to develop effective control programs for PM10, it is necessary to characterize existing and anticipated emissions in terms of both mass emission rate and the spatial distribution of the sources. Such an

inventory was developed by Engineering Science (E & S) in 1988 for the Valley airshed.

Despite the importance of fugitive dust sources of PM10 in achieving air quality goals, past emission inventories for the Valley focused on a limited group of sources, that being wood smoke emissions. Unlike "traditional" sources of particulate matter, such as manufacturing, mineral processing, and power generation, there is often relatively little information available to air pollution regulatory agencies to characterize the open and line source contributions. As a result, the road dust sources in the Valley were given a lower priority in the State's regulatory program. Additionally, public awareness focused on the wood smoke emissions and concurrent ambient monitoring in the Valley indicated the wood smoke program was the most effective.

A limited road dust abatement program was implemented in 1983 and was progressing at reducing these emissions. Monitoring in 1990--92 had several days in excess of the 24-hour standard of 150$\mu g/m^3$. This required a much larger and more expedited emissions reductions program to be developed. The availability of federal Congestion Mitigation and Air Quality Improvement program (CMAQ) dollars allow this plan to show attainment by the December 1994 deadline. The road maintenance programs of both ADOT and CBJ will ensure maintenance of the standard for three years or greater. Sufficient funding was not available to the State or Borough to have an effective program in place by the original compliance date of 1992.

Studies (E & S-1988) have indicated that a large portion of the PM10 in the Valley is a result of road dust entrainment, commonly referred to as "fugitive dust". Several of the control measures contained in this SIP are intended to limit anthropogenic (man-made) fugitive dust emission originating from unpaved roads. Specifically a program of paving roads is outlined in Tables 10--13 and the SIP presents the specific actions to be implemented. The State and Borough has developed this proposal and will carry out these control measures as described. A Memorandum of Agreement (MOA) between Alaska Department of Environmental Conservation (ADEC), Alaska Department of Transportation and Public Facilities (ADOT &PF) and the City and Borough of Juneau (CBJ) was entered into on December 7, 1992 committing these agencies to solving the Mendenhall Valley PM10 violation problems.

The projected emission reductions of over eighty percent, described in the SIP, are part of a demonstration of compliance with Federal and State standards. As will be discussed in greater detail in subsequent sections, the current version of the SIP does not specify actions for the reduction of fugitive dust enabling compliance by December, 1994. It is important to note that the proposed road paving program only applies to the Mendenhall Valley.

## GLOSSARY OF TERMS

**Ambient Concentration**--A measure of the amount of a pollutant in the air to which people are exposed. Air quality is frequently used to refer to ambient concentrations. Ambient concentrations are expressed as a ration of the units of pollutant per volume of air such as micrograms of pollutant per cubic meter of air. Ambient concentrations of PM10 comprise primary particles and secondary particles.

**Area Designation**--The classification of an area with respect to its status for attaining each of the regulated pollutant standards. Four designations are possible: attainment designation, nonattainment designation, nonattainment-transitional designation, and unclassified designation.

**Attainment Designation**--Classification indicating that the standard(s) for a pollutant was not exceeded during the previous three years.

**Control Measure**--The application of one or more control methods, usually affecting a common type of emission source. For example, a control measure may include the detailed specification for the control equipment or the new material, the time schedule for implementation, and the emission sources to which the control method must be applied.

**Control Method**--The specific process or practice that reduces emissions. This is the most basic element of the control effort and generally represents the technology that is used.

**Control Strategy**--A comprehensive program that will result in the maximum reductions of the ambient concentrations of a pollutant. A control strategy typically includes a number of control measures which apply to different emission sources and contain specific control methods.

**Emissions**--the released of pollutants from a source into the atmosphere. The amount of emissions released is usually expressed as a weight per unit of time such as tons of pollutant per day. The two types of emissions are direct emissions and precursor emissions.

**Eulerian Coordinates**--Any system of coordinates in which properties of a fluid are assigned to points in space at each given time, without attempt to identify individual fluid parcels from one time to the next.

**Direct Emissions**--Emissions of a pollutant that keep their chemical form in the atmosphere. Soil particles and hydrogen sulfide gas are examples of directly emitted pollutants.

**Exceptional Event**--An event that causes an exceedance of a standard because of a specific cause such as an act of nature or unusual human activity. Examples include volcanic eruptions and forest fires, unusual traffic congestion resulting from construction and mechanical failures at industrial facilities.

**Extreme Concentration Event**--An event that causes an exceedance of a standard but cannot be specifically identified. Unusual meteorology is one of the potential causes.

**Fickian Diffusion Equation**-- In meteorology, the exchange of fluid parcels (and hence the transport of conservative properties) between regions in space, in the apparently random motions of a scale too small to be treated by the equation of motion.

**Gaussian Distribution**--The fundamental frequency distribution of statistical analysis. A continuous variate X is said to have a normal distribution (Gaussian) or to be normally distributed if it can be depicted by the bellshaped curve.

**Highly Irregular or Infrequent Event**--Certain events that cause an exceedance of a pollutant standard. Such events are not reasonable to control and therefore, the exceedances they cause are not considered in determining the area designations. There are two types of highly irregular or infrequent events: an exceptional event and an extreme concentration event.

**Lagrangian Coordinates**--A system of coordinates by which fluid parcels are identified for all time by assigning them coordinates which do not vary with time. An example of such a coordinate is the positions in space of the parcels at some arbitrarily selected moment.

**Microclimate**--The fine climatic structure of the air space which extends from the very surface of the earth to a height where the effects of the immediate character of the underlying surface no longer can be distinguished from the general local climate.

**Nonattainment Designation**--Classification indicating that the standard(s) for a pollutant was exceeded during the previous three years.

**Nonattainment-Transitional Designation**--A subcategory of the nonattainment designation which indicates that the standard(s) for a pollutant was exceeded three or fewer times during the previous three years and that air quality has either improved or stabilized. Applies only to pollutants with a standard averaging time less than or equal to 24 hours.

**PM10**--means particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers as measured by a method specified in 18 AAC 50.510.

**Precursor Emissions**--Emissions of gases that undergo a physical or chemical change in the atmosphere after they are emitted, thereby forming another pollutant. An example is oxides of nitrogen emission that are transformed in the atmosphere into nitrate particles.

**TSP**--total suspended particulates

**Stagnation Pressure**--Usually, same as total pressure.

**Synoptic**--In general, pertaining to or affording an overall view. In meteorology, this term has become somewhat specialized in referring to the use of meteorological data obtained simultaneously over a wide area for the purpose of presenting a comprehensive and nearly instantaneous picture of the state of the atmosphere.

**Total Pressure**--The sum of the static pressure and the dynamic pressure when these concepts are applicable. Since this is the pressure at the stagnation point of a streamline, it is measured by an ideal Pitot tube directed exactly upstream.

**Unclassified Designation**--Classification indicating that data are not sufficient to determine an attainment or nonattainment designation.

## I. INTRODUCTION

**This information is provided to indicate the necessity of a PM10 attainment program which will eventually be part of the State Implementation Plan submitted to the EPA. The intent is to notify the Environmental Protection Agency of the ability of the Mendenhall Valley airshed to reach attainment by 1994 according to the "moderate" designation.**

This section of the Air Quality Control Plan addresses the Mendenhall Valley of the City and Borough of Juneau (CBJ). Since the late 1970s, elevated 24-hour exposures of particulate matter have been observed on a seasonal basis. The plan addresses particulate as PM10 (particulate matter of 10 micrometers or less in diameter). The control plan of 1983, discussed actions to correct elevated levels of wood smoke pollution. It was generally effective in accomplishing the goal of controlling these emissions to a level that would protect public health. For the three-year winter period between 1986 and 1989, concentrations of particulate matter measured as PM10 did not exceed the 24-hour or annual ambient air quality standards. **Only one exceedance of the 24-hour average (150 $\mu$g/m3) is allowed each year** for an area to be considered in attainment.

**To address EPA Region 10 concerns regarding woodsmoke "hotspots" and other fugitive dust sources in residential neighborhoods, the Department initiated a microscale monitoring program in the fall of 1989. Resulting monitoring data identified numerous violations of the particulate standard primarily from roadway-fugitive dust sources. A revised control strategy was developed in 1993 to correct and control this emission source category of particulate emissions in the Mendenhall Valley.**

In consideration of the **success of the wood smoke control strategy and effectiveness of the scheduled CBJ fugitive dust abatement program**, this portion of the STATE AIR QUALITY CONTROL PLAN is based upon the fact that "attainment" with the applicable standards **will again be achieved** in the airshed of the Mendenhall Valley by December 31, 1994. **The 1993 attainment strategy is based on a Valley-wide street paving project, initiated by the CBJ in 1991. The success of this strategy is based on the availability of an additional $2 million in federal Dept. of Transportation (CMAQ) funding which became available to the State and local governments in the Spring of 1992. Without the Federal funding, the CBJ would not have been able to meet the New Clean Air Act attainment deadline of December 31, 1993.**

**This amendment will address the needs of a "moderate" PM10 problem through a plan that includes: a) implementation of reasonably available control measures (RACM) in 1993; b)progress towards attainment; c) demonstration of attainment with the standards; and d) quantitative milestones that show progress every three years. The established road maintenance program for the Valley ensures maintenance of the standard. Monitoring near a residential area with paved roads supports this finding as no exceedances of the standard have occurred at**

**that site in the last three years. Many of the control measures contained in the 1982 and 1987 SIP were proposed for retention; some with revisions. This plan has been prepared to satisfy the requirements of the federal Clean Air Act.**

## II. PHYSICAL SETTING

Juneau, is situated along the inland waters of southeastern Alaska. The area is characterized by narrow channels and waterways, steep mountains, glaciers, fiord, and river Valleys. This geography results in limited flat terrain, making river Valleys the most desirable areas for residential dwellings. **Dramatic geography which transitions rapidly from sea-level to 3000 ft. mountains helps produce the numerous days of wet weather experienced by the area. In fact, Juneau is classified as a rainforest with typical rainfall of over 75 inches per year.**

The city of Juneau is at the base of two very steep mountains allowing only limited space for human habitation (see Figure III.D.3 -1). Pockets of flat terrain along the Gastineau Channel and Douglas Island provide space for residential, commercial, and light industrial activity. The boundaries of the City and Borough of Juneau are extremely large **(over 3100 square miles)**. They incorporate all of the above-mentioned area as well as nearby islands and portions of the Juneau Icefield. The principle employers in the area are federal, state, and local governments with tourism, fishing, and mining providing other jobs.

Monitoring of particulate matter as total suspended particulate (TSP) was initiated during the mid-1970s at downtown Juneau. During the latter part of the decade monitoring began in the Mendenhall Valley in response to **public concern for the** seasonal observations of wood smoke. Increased reliance on wood as a fuel source caused emissions of particulate to increase while temperature inversions trapped the pollutants during the winter months. Violations of the TSP ambient standards were first measured in 1982.

The Mendenhall Valley is located nine miles northwest of downtown Juneau. The Valley is oriented NNE-SSW and has sidewalls that rise sharply 2,000 to 4,000 feet with the Mendenhall Glacier creating a barrier to the north. The **Valley is fairly well** sheltered from the dominant southeasterly or occasionally northerly winds, and receives very limited solar heating during winter months due to low sun angle and high mountain ridges. **These same ridges also allow for the channeling of winds and the increasing of wind velocities as storm fronts pass the area.** The Valley contains over 5,000 dwellings, housing more than half of Juneau's 29,000 residents.

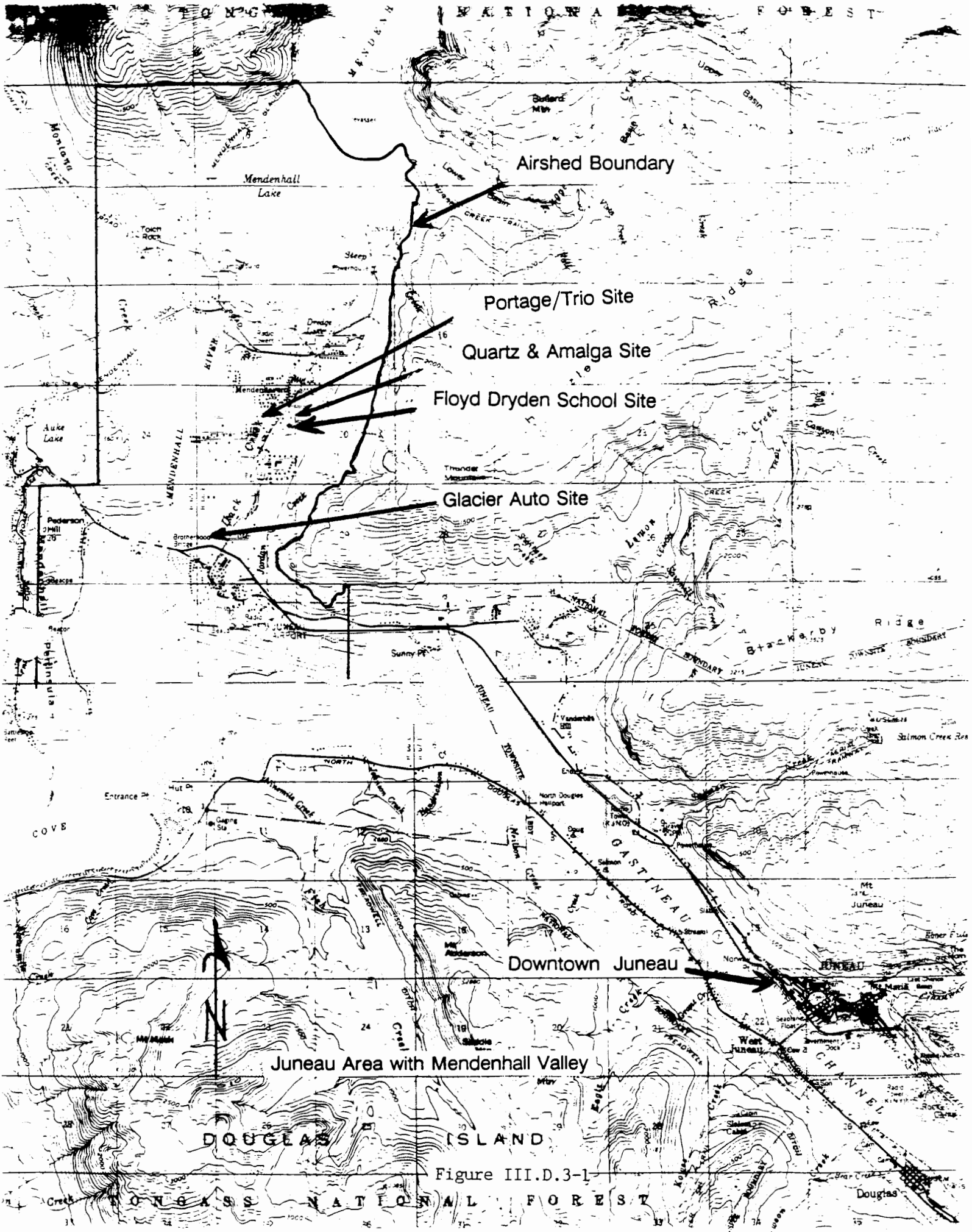


Figure III.D.3-1

## III. BASIS FOR GROUP I DESIGNATION

Prior to the new PM10 ambient standards, the U.S. Environmental Protection Agency performed a state by state ranking evaluation based upon the existing ambient monitoring data. In part this ranking was performed to enable states to minimize their control efforts to those locations most likely to exceed the standard. This ranking of "probability to exceed" was further incorporated into the regulations. Group I areas were estimated at a probability to exceed the standard of greater than 95 percent. These areas were required to develop a comprehensive control plan adequate to reduce emissions and reach attainment by July of 1990. Group II areas' probability to exceed were estimated to be between 20 and 95 percent. These areas are required to perform additional monitoring and develop a control plan only if investigations show a violation of the standard. The third area, Group III, is generally assumed to be in compliance with the standard.

At the time of rulemaking, monitoring of particulate as PM10 had only just been initiated in the Mendenhall Valley. The probability of exceedance was based solely upon particulate data measured as Total Suspended Particulate (TSP) and assuming a generalized correlation between TSP and PM10. Table III.D.3-1 presents the TSP data measured at the downtown Juneau site and the Floyd Dryden School site.

Review of this information indicates high particulate values in the winter season although, concentrations after 1984 were diminishing. Concentrations of particulate matter at the downtown Juneau site appeared to be a margin below the applicable Alaska TSP 24-hour standard of 150 micrograms per cubic meter of air ($\mu g/m^3$). In light of these facts, the U.S. Environmental Protection Agency (EPA) classified Juneau as Group I anticipating that the area would exhibit PM10 concentrations above the standard. The State presents no argument to the decision in consideration of the information available at the time.

**Subsequent monitoring data confirmed EPA's decision to classify the State Group I. Although not anticipated as an active major contributor, fugitive dust sources add significantly to the particulate loading. A joint agency report of PM10 emissions for the Mendenhall Valley was prepared by Engineering-Science in February, 1988, accounting for the higher contribution of roadway generated fugitive dust.**

Table III.D.3-1

PM10 TRENDS AT JUNEAU, ALASKA

| Year | High | 2nd High |
|---|---|---|
| 1980[1] | 86 | 82 |
| 1981[1] | 397 | 90 |
| 1982[1] | 306 | 256 |
| 1983[1] | 597 | 576 |
| 1984[1] | 817 [(2)] | 585 |
| 1985[1] | 180 | 151 |
| 1986[1] | 338 | 348 |
| 1987[3] | 100 | 86 |
| 1988[3] | 102 | 80 |
| 1989[3] | 115 | 85 |
| 1990[3] | 257 | 218 |
| 1991[3] | 948 [(a)] | 617 [(a)] |
| 1992[3] | 586 [(a)] | 496 [(a)] |

[1] TSP Values (**standard = 150$\mu g/m^3$; 24-hour avg**)
[2] High Wind; October 31, 1984
[3] PM10 Values(**standard = 150 $\mu g/m^3$;24-hour avg**)
[(a)] exceptional event/extreme winds

Somewhat later, monitoring was initiated in the Lemon Creek Valley of Juneau, which is located between downtown Juneau and the Mendenhall Valley. This monitoring began in 1984 at the Mountain Avenue site for two winter seasons, then was relocated to the Pine Street location, which is currently operating. This project was begun to investigate impacts from residential wood combustion. Monitoring was originally performed for TSP, switching to PM10 in 1987. A summary of the **PM10** data is presented in Table III.D.3-2. In general, particulate concentrations have been well within the State PM10 24-hour standard. **Monitoring data for the last three years from the Lemon Creek site has not exceeded the PM10 standard. The maximum**

**24-hour concentration in 1992 was 72$\mu g/m^3$.** These reductions are believed to be directly attributable to the significant decrease in fugitive dust emissions after paving of local streets had been completed.

Table III.D.3-2

24-HOUR PARTICULATE CONCENTRATIONS[4]
AT LEMON CREEK Valley OF JUNEAU
PM10 conc. ($\mu g/m^3$)

| Year | Highest | 2nd High |
|---|---|---|
| 1987[1] | 52 | 38 |
| 1988 | 162 [2] | 64 |
| 1989 | 112 | 105 |
| 1990 | 119 | 108 |
| 1991 | 120 | 76 |
| 1992 | 72 [3] | 72[3] |

1 Fourth Quarter 1987 PM10 measurements only. Prior measurements were TSP
2 Receptor modeling of the sample indicates > 95 percent contribution from nearby road dust
3 **Lemon Creek road paving completed**
4 **standard = 150$\mu g/m^3$ 24-hour avg.**

## IV. IDENTIFICATION OF PM10 PROBLEM ZONE

During the **initial air sampling program**, high TSP exposures, were recognized by local citizens and the Department to occur almost exclusively in the Mendenhall Valley location. Even within the Valley, **visible** pockets of smoke tended to be exhibited in the more densely populated area of the east Valley. As evident **in a comparison of downtown and Valley** TSP monitoring data, particulate exposures demonstrated a dramatic difference over the nine-mile distance. Even when area-wide stagnation occurred, minor air movement **at most** locations would remove air contaminants slowly from the remainder of the Borough. However, the Valley location would exhibit persistent high particulate exposures. As illustrated by the Lemon Creek Valley data, particulate concentrations do not reach a level of potential danger under the identical overall synoptic weather patterns. **Extensive paving activities completed in the summer of 1992 in Lemon Creek significantly reduced (see Table III.D.3-2) the major source of fugitive emissions in this area.**

Several topographical and meteorological features contribute to the relatively severe stagnation (calm flows) that occur in the Mendenhall Valley. Principally these include: steep Valley side walls, a geographical formation that exhibits a relatively narrow Valley mouth, growing wider towards the upper reaches. Additionally a glacier at the Valley head is a flow restrictor and a major cold air source, providing a dense cold air drainage below a tempered marine air mass. A primary factor is the north/south Valley orientation with an eastern wall which restricts winter solar heating of the Valley floor to only a few hours each day. On limited occasions this same geography exhibits a funneling effect with accompanying higher wind flows.

**Fugitive dust generated by increased vehicular traffic along paved and unpaved roadways is the largest contributor to ambient PM10 concentrations in the Mendenhall Valley. During the heating season, a substantial reliance on wood as a fuel source has caused emissions of particulate from wood stoves to increase dramatically. Temperature inversions that trap wood smoke in the lower atmosphere are a condition for elevated ambient levels. The 1988 study identified (see Table III.D.3-3), annual fugitive dust from paved streets. They account for about 46 percent of the PM10 emissions (see details below) in the Valley and emissions from unpaved streets are approximately 40 percent. The compounding effect of unpaved roads on paved roads (track out) increases the paved road emissions. By comparison and a reflection of previous control strategies, fireplace/wood stove and windblown dust emissions account for approximately 10 percent of the annual PM10 emissions in the Valley. The balance is composed of other small sources that total about 4 percent.**

**The State has conducted several field investigations of the paved and unpaved roadway system in the Valley. Field condition assessment concludes that a significant portion of fugitive dust material included in the "paved emissions " category, originates from the "unpaved road" in the form of "track-out material". Also, reported emissions data in the California Methods for Assessing Area Source Emissions, September, 1991 indicates the emission factors for the paved**

**emissions/sand materials may be overestimated. In general terms, it is expected that the RACM defined in the Plan will significantly reduce the loading from unpaved roads onto paved road surfaces.**

Table III.D.3-3
ANNUAL EMISSIONS
Mendenhall Valley
Tons/Year of PM10

| | 1988 | 1993-SIP rev. |
|---|---|---|
| Paved Sts | 804 | 874[1] |
| Unpaved Sts | 698 | 0 |
| Windblown | 39 | 39 |
| Woodstoves | 149 | 120[2] |
| Other | 43 | 43 |
| TOTAL | 1733 | 1076 |

[1] **increase due to winter sanding and new paved streets**
[2] **new stove change out est. 20%**

Source: Engineering Science, Feb. 1988

Based upon the airshed principal, the control of PM10 impacts in the Valley has and will continue to address the area bounded by the physical boundaries of the airshed. This boundary is shown in figure 1. This boundary has been utilized since the first wood smoke regulations were adopted in 1983 and has shown to be adequate. The remainder of this control plan will focus exclusively on the Mendenhall Valley airshed emissions as contained within the geographical area shown in Figure III.D.3-1.

## V. PM10 AIR QUALITY MONITORING DATA

Juneau area air quality monitoring for particulate matter as PM10 began in October, 1985. The dichotomous samplers which were initially employed suffered numerous sample line freeze-up. Surface icing on the collection media caused air blockage and subsequent premature shutdown of the sampling devise. High volume size selective inlet samplers were acquired and deployed in February 1986. These have been utilized ever since. Minor manufacturer improvements have been made to these samplers periodically.

Instruments have operated at two monitoring locations in the Valley since the early 1980s. **The State replaced the TSP samplers with PM10 monitors in 1985 to conform with the revised federal PM10 particulate standard.** PM10 data collection has occurred at both **Floyd Dryden** and Glacier-Auto sites since February 1986. The Floyd Dryden School site is a mid-Valley neighborhood location. It is adjacent to a high density subdivision with a heavy reliance on wood heat . The Super Bear/Glacier Auto site is located near the Valley mouth in a commercial district with nearby residential neighborhoods. The Glacier Auto site is also considered to be a **good representation of background.** It reflects a middle scale for mobile and fugitive dust impacts and a neighborhood scale site for wood smoke impacts. In early 1987 the monitors were moved approximately 100 meters from the Super Bear market to the Glacier Auto building. Source impact characteristics at these two locations are considered identical. There have been no significant changes in the buildings, land use, or traffic patterns in the immediate vicinity of these sites. **The Glacier Auto site has not measured an exceedance of the PM10 standard (150 $\mu$g/m3--24-hr avg.) since initial operation. Two microscale monitoring sites were established in 1989/90 at locations which were more representative of the Valley's residential community. The Portage and Trio site remains operational. However, the Quartz and Amalga site ceased operations after one year due to a land ownership issue.**

A complete listing of all PM10 measurements from the **four Valley** sites **(1990-92)** is available on the National AIRS **data base and may be requested from the Department or EPA Region 10.** A summary of the data is presented below in Table III.D.3-4.

**Table III.D.3-4**
SUMMARY OF MENDENHALL Valley AIR QUALITY DATA
MEASURED AS PM10 in ($\mu g/m^3$)
1986-1992

| | | SuperBear/Glacier Auto | | | Floyd Dryden | | |
|---|---|---|---|---|---|---|---|
| Year | Qtr | Mean[1] | High[2] | 2nd High[3] | Mean | High | 2nd High |
| 1986 | 1 | 21 | 121[a] | 119[a] | ** | 240 | 188 |
| | 2 | 17 | 45[a] | 45[a] | ** | ** | ** |
| | 3 | 20 | 77[a] | 50[a] | 21 | 45 | 37 |
| | 4 | 24 | 106[a] | 98[a] | 26 | 83 | 78 |
| | Annual | 21 | 121[a] | 119[a] | 29 | 240 | 188 |
| 1987 | 1 | 33 | 94 | 86 | 31 | 79 | 70 |
| | 2 | 10 | 41 | 21 | 11 | 46 | 41 |
| | 3 | 11 | 27 | 25 | 14 | 43 | 35 |
| | 4 | 17 | 91 | 61 | 18 | 100 | 65 |
| | Annual | 18 | 94 | 91 | 19 | 100 | 79 |
| 1988 | 1 | 36 | 83 | 71 | 26 | 83 | 76 |
| | 2 | 15 | 56 | 30 | 11 | 24 | 23 |
| | 3 | 10 | 29 | 20 | 13 | 29 | 28 |
| | 4 | 17 | 96 | 73 | 21 | 102 | 80 |
| | Annual | 16 | 96 | 83 | 18 | 102 | 83 |
| 1989 | 1 | 34 | 85 | 82 | 31 | 115 | 85 |
| | 2 | 20 | 86 | 69 | 18 | 40 | 39 |
| | 3 | 13 | 30 | 29 | 19 | 46 | 43 |
| | 4 | 16 | 54 | 54 | 17 | 85 | 58 |
| | Annual | 21 | 86 | 85 | 21 | 115 | 85 |
| 1990 | 1 | 20 | 69 | 53 | 22 | 79 | 74 |
| | 2 | 14 | 37 | 28 | 16 | 36 | 35 |
| | 3 | 11 | 23 | 22 | 15 | 42 | 36 |
| | 4 | 24 | 82 | 65 | 29 | 105 | 101 |
| | Annual | 17 | 82 | 69 | 21 | 105 | 101 |
| 1991 | 1 | 28 | 104 | 81 | 32 | 116 | 98 |
| | 2 | 17 | 43 | 41 | 17 | 57 | 48 |
| | 3 | ** | ** | ** | 13 | 40 | 31 |
| | 4 | 20 | 65 | 50 | 33 | (387)[b] | (327)[b] |
| | Annual | 22 | 104 | 81 | 24 | (387)[b] | (327)[b] |

**revised Table III.D.3-4 (continued)**

| Year | Qtr | SuperBear/Glacier Auto Mean[1] | SuperBear/Glacier Auto High[2] | SuperBear/Glacier Auto 2nd High[3] | Floyd Dryden Mean | Floyd Dryden High | Floyd Dryden 2nd High |
|---|---|---|---|---|---|---|---|
| 1992 | 1 | 18 | 80 | 56 | 24 | (241)[b] | (207)[b] |
| | 2 | ** | ** | ** | 14 | 39 | 38 |
| | 3 | ** | ** | ** | 12 | 32 | 30 |
| | 4 | 19 | 100 | 52 | 22 | 89 | 85 |
| | Annual | 18 | 100 | 80 | 20 | (241)[b] | (207)[b] |

| Year | Qtr | Trio Street Mean | Trio Street High | Trio Street 2nd High | Quartz Street Mean | Quartz Street High | Quartz Street 2nd High |
|---|---|---|---|---|---|---|---|
| 1989 | 1 | ** | ** | ** | ** | ** | ** |
| | 2 | ** | ** | ** | ** | ** | ** |
| | 3 | ** | ** | ** | ** | ** | ** |
| | 4 | 23 | 85 | 68 | ** | ** | ** |
| | Annual | 23 | 85 | 68 | ** | ** | ** |
| 1990 | 1 | 30 | 102 | 99 | ** | ** | ** |
| | 2 | 35 | 211 | 187 | 20 | 51 | 47 |
| | 3 | 34 | 257 | 218 | 25 | 113 | 95 |
| | 4 | 34 | 143 | 122 | 21 | 58 | 55 |
| | Annual | 34 | 257 | 218 | 22 | 113 | 95 |
| 1991 | 1 | 39 | 199 | 169 | 22 | 66 | 65 |
| | 2 | 42 | 302 | 204 | 42 | 277 | 213 |
| | 3 | 21 | 171 | 136 | ** | ** | ** |
| | 4 | 51 | (948)[b] | (617)[b] | ** | ** | ** |
| | Annual | 38 | (948)[b] | (617)[b] | 32 | 277 | 213 |
| 1992 | 1 | 37 | (586)[b] | (496)[b] | ** | ** | ** |
| | 2 | 27 | 159 | 145 | ** | ** | ** |
| | 3 | 17 | 102 | 70 | ** | ** | ** |
| | 4 | 27 | 138 | 113 | ** | ** | ** |
| | Annual | 27 | (586)[b] | (496)[b] | ** | ** | ** |

1 mean: arithmetic average
2 high: highest measured 24-hour concentration
3 2nd high: second highest measured 24-hour concentration
** site not in operation
(a) TSP values
(b) exceptional event

**Annual Standard = 50$\mu g/m^3$**
**24-hour Standard = 150$\mu g/m^3$**

Monitoring at the Super Bear/Glacier Auto site was performed on a **regular** basis for the duration of the data collection. Starting the 4th quarter of 1986, monitoring at the Floyd Dryden site has been on a daily **basis in the winter months**. Floyd Dryden frequency for the 2nd and 3rd quarters of **some years** were reduced to a **lesser amount** due to seasonal variations of particulate matter at this site. A daily sampling frequency at the site of primary impact (Super Bear) was maintained during these quarters. Data capture rate: percent of collected data vs. scheduled data collection, at the Super Bear/Glacier Auto site exceeded the 75 percent requirement for all quarters except the first quarter and the third quarter of 1986. Electrical problems and operator errors resulted in a 68-percent capture rate during the third quarter. During the first quarter, sampling didn't begin until mid-February. At the Floyd Dryden site, data capture failed to achieve the 75 percent requirement for quarters 1 and 4 of 1986. Quarter 1 failed since site operation wasn't started until mid-February. Quarter 4 failed since the changeover from a one-in-six sampling frequency to every day was not accomplished until mid-quarter. **The Glacier Auto and Floyd Dryden sites have met the 75 percent data capture requirement. The Trio site became operational in the fourth quarter of 1989 and remains operational. The Quartz site was installed in the third quarter of 1990 and ceased operating at the end of the second quarter of 1991. These two new sites met the 75 percent requirement for all quarters of operation.**

## VI. SEASONAL AIR QUALITY TRENDS

**The observed pattern in seasonal variation in PM10 is strongly influenced by location and meteorology.** As evident from the above table, elevated 24-hour exposures occur **primarily** during the 1st and 4th calendar quarters of the year. Since no stationary industrial sources of air pollutants exist in the Valley, seasonally elevated PM10-particulate concentrations **tend** to occur **mainly** during the winter season. atmospheric thermal inversions are frequently **strong** at this time and emissions from area sources such as wood stoves are at a maximum. **To a lesser degree, infrequent periods of cold, clear weather have created opportunities for road dust to become entrained into the air causing PM10 exceedances. Impacts from unpaved roadways and paved surfaces are only enhanced in the summer months. At this time major construction activities along traffic corridors in and out of the Valley produce increases in fugitive dust.**

The predominant southerly air flow produces an abundance of precipitation which effectively maintains particulate concentrations at levels **below the PM10 standard.** Infrequently, when arctic high pressure ridges build eastward across northern Alaska and into western Canada, Juneau experiences clear skies and **extremely variable** winds. In exposed locations **such as downtown Juneau, winds in excess of 70 mph have been measured (1992). Strong gusts occur occasionally in the Valley. However, a more frequent event is the development of a strong high pressure ridges over S.E. Alaska.** It is these conditions that produce strong radiation inversions **with associated weak flow** and elevated **woodsmoke** particulate levels. **On many of these weak flow days road dust may be a significant contributor.** This

clear weather condition also represents the colder periods of the Juneau winter accentuating the demand for residential heat. In effect, the winter weather swings from warm periods with precipitation ( low particulate concentrations) to that of colder dry weather. This transition is many times accompanied by inversions and high particulate levels.

Historically, the climatological patterns indicate that dryer cool weather can occur as early as mid to late October. Temperature inversions appear to be the most severe during the 8-to-12-week period centered about the winter solstice when solar heating is at a minimum. By mid-February solar heating is again sufficient to break daytime inversions resulting in lower **24-hour** particulate concentrations. Wood smoke impacts are considerably reduced during February and March even when heating demands cause high emissions. Fugitive dust impacts caused primarily by roadway sources can be significant in February and March **as well as other months when a significant reduction in normal precipitation occurs. This particulate source is also impacted by high wind and dry weather conditions.**

As evident from prior TSP/PM10 data , **elevated PM10 values can occur any quarter of the year. However,residential woodsmoke mainly occurs during the 1st and 4th quarters of the year.** The control strategies presented in this text **are split to** focus on the reduction of acute 24-hour particulate emissions **from woodsmoke sources and road dust.**

## VII. SOURCES OF PM10 EMISSIONS

### A. PARTICULATE MATTER SOURCES

The air quality management of particulate matter in the Mendenhall Valley began in 1982. **Studies indicate that over fifty-percent of the PM10 emissions are a result of soil dust entrainment, commonly referred to as " fugitive dust". A listing of all potential PM10 emission sources in the Valley are:**

**Residential and commercial oil-fired furnaces**
**Residential wood-fired heating devices**
**Open burning of construction/residential waste**
**Tailpipe and tire and brake wear emissions from surfaces**
**Jet and propeller-driven aircraft exhaust emissions**
**Wind-generated fugitive dusts from exposed soils/roadways**
**Vehicle-generated fugitive dusts from paved/unpaved roadways**
**Marine aerosols**
**Road sanding for winter driving**

**Significant atmospheric dust arises from the mechanical disturbance of granular material exposed to the air. Dust generated from these open sources is termed "fugitive" because it is not discharged to the atmosphere from a confined flow stream such as an "exhaust stack." Common sources of fugitive dust include**

**paved and unpaved roads. For these categories of fugitive dust sources, the dust generation process is caused by two basic physical phenomena:**

1. **Pulverization and abrasion of surface materials by application of mechanical force through implements (wheels, blades, ...etc.).**

2. **Entrainment of dust particles by the action of turbulent air currents, such as wind erosion of an exposed surface to high winds.**

**The air pollution impact of a fugitive dust source depends on the quantity and drift potential of the dust particles injected into the atmosphere. Large dust particles tend to settle out near the source and may create a local nuisance. Whereas, fine particles (PM10) are emitted and dispersed over a much greater distance from the source.**

B. INVENTORY OF EMISSIONS

**Previous wood combustion studies conducted in 1982 involved a telephone survey based on 10 percent of the Valley residents. This survey was repeated in 1985 to evaluate trends and changes in wood use habits and the emissions from the new, more technically advanced wood stoves.**

In 1988,Engineering Science, Inc. under contract to the U.S. Environmental Protection Agency performed an emission inventory of all sources in the Mendenhall Valley . In recognition of the measured PM10 concentrations observed prior to the initiation of the inventory, the principal focus of the study was to adequately quantify spring and fall emissions. The monitoring data had shown that elevated PM10 concentrations were essentially limited to those periods. **The latest PM10 data set supports this theory even though the earliest TSP data set, 1982 through 1985 did not identify this seasonal pattern.**

The TSP and PM10 data of 1987 demonstrated the impacts on ambient PM10 measurements from wood smoke **had been significantly reduced under CBJ wood smoke ordinance # 91-52,January 6, 1992. This data indicated that spring and fall particulate concentrations tended to show a high level of uncertainty relative to emission sources and quantities. Based on these findings, the contractor focused the Valley study towards assessing the short-term periods of elevated PM10 exposures. The contractor was able to develop an inventory of annual emissions and an inventory of maximum seasonal 24-hour emissions.**

1. Evaluation of Emission Factors

Recognizing uncertainties and low reliability of emission factors for several fugitive emission source categories, a joint task force between the contractor, EPA, and the State was established. This group reviewed and selected appropriate emission factors for the inventory. A discussion of the possible emission factors for each of the local sources and the rationale for the selected factors are presented in Reference Document

#1 entitled, Proposed Methodology for the Development of TSP and PM-10 Emission Inventories for the Mendenhall Valley and Eagle River, Alaska **to the 1990 revision of the PM10 Plan.**

A comprehensive emissions inventory was conducted for the Mendenhall Valley by Engineering Sciences in 1988. There have been no major industrial developments nor major increases in residential development in the Valley since this document was developed. The assumptions and conclusions on emission factors in the 1988 study will be used in this 1993 SIP revision. The closure of the Greens Creek Mine in 1993 has adjusted residential growth in the Valley to not exceed 5 percent.

Various field studies have indicated that dust emissions from paved and unpaved roads are a major component of atmospheric particulate matter in developed areas. The quantity of dust emissions from a given segment of road varies linearly with the volume of traffic. In addition, field investigations have shown that emissions depend on correction parameters such as,road surface silt content, surface dust loading, average vehicle weight, and vehicle traffic. The 1988 study has developed specific predictive emission factor equations and emission rate tables for both paved and unpaved road classifications. These emission factors are listed below in Table III.D.3-5.

**Table III.D.3-5**
**EMISSION FACTORS**
**Fugitive Dust-Roadways**
**PM10 in lb/1,000 VMT**

| Street Type | Pollutant (PM10) |
|---|---|
| | **24-hour** |
| **Paved-Arterial** | **330** |
| **Paved-Collector** | **330** |
| **Paved-Local** | **18.9** |
| | **Annual** |
| **Paved-Arterial** | **41.5** |
| **Paved-Collector** | **42.3** |
| **Paved-Local** | **4.6** |
| | **24-hour** |
| **UnPaved-Arterial** | **na** |
| **UnPaved-Collector** | **2155** |
| **UnPaved-Local** | **1078** |
| | **Annual** |
| **UnPaved-Arterial** | **na** |
| **UnPaved-Collector** | **526** |
| **UnPaved-Local** | **263** |

Visual observations during the spring of the year indicated that paved roadways could be a major source of fine particulate. Winter sanding material which was allowed to accumulate on the road surface is subject to grinding by wheel action. This process generates a large amount of dust emission in the months of February through April **until** road icing ends and the road is cleaned. **The elevated 24-hour PM10 levels in Table III.D.3-4 are typically associated with "high wind entrainment" including substantial amounts of man made or naturally produced PM10. Technical agreement on an accurate emission factor to qualify the emissions from a paved source category was not conclusive. However, the best choice of the Task Force was the use of the industrial paved road emission factor in AP-42. While there is no mandate to reduce or control naturally produced PM10, efforts are needed to curtail additional man-made PM10 emissions.**

There are currently many unpaved residential streets in the Valley which contribute to the seasonally high particulate emissions. **Dust plumes produced by vehicles traveling on unpaved roads are a familiar sight on dry winter days when the road surfaces are not covered with snow and ice. When a vehicle travels on a dry unpaved road, the force of the wheels on the road surface causes pulverization and lifting of surface material. Particles dropped from the rolling wheels, and stirred from the road surface are exposed to strong turbulent air currents**

produced by the moving vehicle. The turbulent wake behind the vehicle continues to act on the roadway after the vehicle has passed. The quality of the emission factor for this activity is relatively good. However, accurate information for daily vehicle counts is limited and only existing for a few number of selected Valley roads. The contractor performed peak hour counts on a limited number of roads. Emission rates were estimated from daily values for both selected roads and nonselected roads based upon housing density. Annual emissions estimates incorporated the relatively high frequency of precipitation for the area.

For estimating annual and 24-hour wood smoke emissions, the 1985 survey served as the basis for the calculations. The most recent emission factors determined for the northwestern states is included in this document.

In general, elevated PM10 concentrations tend to occur during stagnant meteorological regimes, when the transport of pollutants out of the Valley is at a minimum and carryover within the Valley is at a maximum. The quantity of dust emissions from a given segment of unpaved road varies linearly with the volume and speed of traffic. Dust emissions from unpaved roads have been found to vary in direct proportion to the fraction of silt (particles smaller than 75 micrometers in diameter) in the road surface materials. The silt content of a rural dirt road will vary with location and it should be measured. Well traveled unpaved roads have a hard nonporous surface that usually dries quickly after a rainfall. Wind-generated emissions occurring from road surfaces and exposed soils can be a significant source during specific weather conditions. The contractor, upon the advice of the committee, chose the industrial wind erosion factor incorporated in the EPA AP-42 emissions manual.

Other emission factors for more traditional sources were also used as necessary for the inventory. These factors as well as those mentioned above are discussed more thoroughly in the emission inventory report submitted as Reference Document #2 for the 1990 revision of the PM10 Plan.

Overall, the greatest level of uncertainty is associated with the factor used to estimate emissions from paved roads during the spring and fall. During the fall the same factor was used since sanding occurs in October when night-time icing of the road occurs. A subsequent study indicates a considerable amount of fall season emissions may be caused by vehicle track-out of mud. This process includes the addition of fine particulate from adjoining gravel roads onto paved roads. As evident in the following section, this emission category in the 1988 Engineering-Science document was accountable for the majority of emissions in the spring and the fall.

## C. EMISSION ESTIMATES

Annual emission quantities of particulate matter are **shown in Table III.D.3-7** while seasonal 24-hour maximum emission estimates are shown in Table III.D.3-6. **This emissions estimate is based on using the same 1988 E&S inventory that is part of the 1990 revision to the SIP. Preparation of an emissions estimate requires consideration of many variables: population growth, industrial activity, resources development and emissions control legislation. This means an emission prediction is made as a result of other predictions, making the whole process susceptible to inaccuracies when formulating conclusions. However, regardless of the potential for inaccuracies, the estimate presented is the best possible the State could project for future conditions.**

Table III.D.3-6
WORST-CASE 24-HOUR EMISSIONS BY SEASON
Mendenhall Valley
(tons/day)

| Source Category | Spring | | Summer | | Fall | | Winter | |
|---|---|---|---|---|---|---|---|---|
| | PM10 | TSP | PM10 | TSP | PM10 | TSP | PM10 | TSP |
| Paved streets-Fugitive dust | 21.45 | 51.36 | 0.49 | 1.24 | 21.45 | 51.36 | 0.49 | 1.24 |
| Unpaved streets - Fugitive Dust | 0.08 [1] | 0.23 | 9.13 | 20.28 | 0.08 [1] | 0.23 | 0.08 [1] | 0.23 |
| Windblown dust | 11.51 | 0.23 | 5.75 | 11.50 | 11.51 | 23.00 | 5.75 | 11.5 |
| Woodstoves and Fireplaces | N | N | N | N | N | N | 1.32 | 1.32 |
| Others | 0.33 | 0.68 | 0.21 | 0.24 | 0.21 | 0.24 | 0.21 | 0.24 |
| TOTAL | 33.37 | 52.50 | 15.58 | 33.26 | 33.25 | 74.83 | 7.85 | 14.53 |

N Negligible
[1] **ambient monitoring data suggests these values vary substantially/meteorology**

**Table III.D.3-7**
**Activity Levels and Emissions**
**Mendenhall Valley, Annual Values**
**modified 1988 data base**

| Activity | Total | Units | Tons per year |
|---|---|---|---|
| Mobile Sources | 45,531 | 1,000 VMT | 13.5 |
| Paved Arterials-Fug. dust | 33,957 | 1,000 VMT | 704 |
| Paved Collectors | 4,624 | 1,000 VMT | 97.9 |
| Paved Locals | 939 | 1,000 VMT | 1.8 |
| Unpaved Collectors | 1,905 | 1,000 VMT | 501.1 |
| Unpaved Local | 1,501 | 1,000 VMT | 197.3 |
| Windblown dust (all) | 368 | ACRES | 38.5 |
| Woodburning (all) | 15,207,790 | lbs. | 149.2 |
| Resd. & Comm. fuel use | 2441 | 1,000 gal. | 3.0 |
| Airport-Jet exhaust | 3871 | LTO | 1.5 |
| Airport-sanding | 36.0 | VMT | .3 |
| Red Sam Const. | 1.0 | lbs. | 1.0 |
| Assoc. Sand & Gravel | 1.0 | lbs. | 0 |
| AEL & P | 1.0 | lbs. | 15.8 |
| Glac. Hwy. Elect. | 1.0 | lbs. | 1.8 |
| Channel Landfill Inc. | 1.0 | lbs. | 5.6 |

VMT = vehicle miles traveled
LTO = landing and takeoff

## VIII. SOURCE CONTRIBUTIONS TO AMBIENT IMPACT LEVELS

This section focuses upon identifying and quantifying the relative contribution of each of the possible pollution sources towards the total measured PM10 impact. A general term for this source category is area sources. Area sources by definition are those sources that individually emit relatively small quantities of air pollutants, but collectively result in significant emissions. In previous inventories, sources emitting less than 25 tons per year of any criteria pollutant (except carbon monoxide, for which the threshold was 250 tons per year) were considered to be area sources. This is basically a culpability analysis to learn which of the sources are most responsible for unhealthful air quality conditions. Effective control measures can only be implemented after this information is ascertained. **Table III.D.3-8 summarizes the 24-hour particulate matter emissions by source category. This inventory presents a projected maximum, worst-case daily emissions for each source category analyzed in the 1988 Engineering-Science document. No significant additions in emission sources have occurred in the Valley in the past three years. Therefore, changes have been minimal to both this table and the annual emissions** Table III.D.3-7.

Table III.D.3-8
**Activity Levels and Emissions**
**Mendenhall Valley, 24-hour Values**
**modified 1988 data base**

| Activity | Total | Units | lbs per day (PM10) |
|---|---|---|---|
| Mobile Sources | 141.72 | 1,000 VMT | 95.3 |
| Paved Arterials-Fugitive dust | 114.29 | 1,000 VMT | 37,715.3 |
| Paved Collectors | 15.56 | 1,000 VMT | 5,135.6 |
| Paved Local | 2.57 | 1,000 VMT | 48.1 |
| Unpaved Collectors | 6.41 | 1,000 VMT | 13,817.8 |
| Unpaved Local | 4.11 | 1,000 VMT | 4,433.4 |
| Windblown dust (all) | 368.00 | ACRES | 23,011.2 |
| Woodburning (all) | 134843.00 | lbs. | 2,633.1 |
| Resd. & Comm. fuel use | 10.01 | 1,000 gal. | 24.3 |
| Airport-Jet exhaust | 15.0 | LTO | 12.0 |
| Airport-sanding | 12.0 | VMT | 240.0 |

**Table III.D.3-8 (cont.)**
**Activity Levels and Emissions**
**Mendenhall Valley, 24-hour Values**
**modified 1988 data base**

| Activity | Total | Units | lbs. per day (PM10) |
|---|---|---|---|
| Red Sam Const. | 1.0 | lbs. | 25.0 |
| Associated Sand and Gravel | 1.0 | lbs. | 12.0 |
| AEL&P | 1.0 | lbs. | 1,583.0 |
| Glac. Highway Electric | 1.0 | lbs. | 212.0 |
| Channel Landfill Inc. | 1.0 | lbs. | 43.0 |

## A. ASSESSMENT METHODS

**One of the first steps in projecting the air quality of future years is to make an environmental assessment of the present conditions affecting air quality. This assessment takes the form of an analysis of local meteorological data, and gathering information on what pollutants are being emitted into the air. Since emissions are directly related to air quality, it is extremely important to have a detailed air pollutant emission inventory. Generally there are two accepted approaches to quantifying the relative impacts of various emission sources.** The more traditional method is to perform a dispersion simulation mimics the manner in which a known pollutant is dispersed in the air as a function of emission characteristics and atmospheric conditions. The second method is to perform selected **chemical speciation** analyses on an actual field sample taken from an ambient PM10 sampler to determine which sources generated the pollution at the specific location of the sampler. The first approach is called dispersion modeling while the second is referred to as receptor modeling. Each technique has specific advantages and disadvantages. These are discussed in the following paragraphs as well as the logic for their respective use in the remainder of this planning document.

### 1. Dispersion Modeling

A multitude of dispersion models have been developed to simulate pollutant dispersion. **These tools are used to make a demonstration that new and existing sources of air emissions do not cause or contribute to a violation of the ambient air quality standards.** Most of this category of models are based upon a Gaussian distribution of emitted pollutants as they are transported by the wind away from the release point, **(i.e. a stack).** Measurements of an air molecule that has been tagged and followed as it moves through the turbulent field are called Lagrangian measurements. Clearly the diffusion of pollutants is a Langrangian process which

unfortunately must be estimated by using a fixed point Eulerian measurement (i.e. the anemometer on the met-tower). **The Gaussian model is the basic workhorse for dispersion calculations. Model results replicate within accepted limitations of experimental data. Mathematical operations are relatively easy to perform and output is consistent with the random nature of turbulence. As a result, the model has found its way into most governmental guidebooks as an approved analytical method.** For accurate simulations, it is necessary to know specific parameters concerning the manner of release of the pollutant as to the atmosphere. This includes the wind field and atmospheric stabilities for the area of interest and duration of interest. Dispersion models are the **primary analytical** tool for projecting the impact of a pollution source which doesn't currently exist. Some of the critical attributes and shortfalls are listed below:

Attributes:

a) capable of estimating impacts at multiple locations of interest;

b) can simulate multiple sources at one facility location and handle numerous facilities in one simulation;

c) most accurate for estimating exposures over a long-term period such as a season or a year;

d) ease of evaluating the relative change in ambient impacts for selected changes in emission rates, locations, or **source** characteristics.

Shortfalls:

a) need for accurate and representative meteorological data for the location of simulation;

b) unable to **adequately** simulate dispersion when wind speeds are below 1 meter per second (2 mph);

c) difficult to accurately simulate impacts in locations of complex terrain or where meteorological conditions are not widely uniform;

**d)** emission rates must generally remain uniform over the time averaging period of the simulation;

e) depending upon the quality of input data, **dispersion** models can compute impact values in error of actual impacts. This is especially true when estimates are compared for time and place exposure periods.

2. Receptor Modeling

As the name implies, receptor modeling relies upon knowledge acquired at the actual location of impact: the receptor. Specific chemical and physical analyses are

performed with selected samples collected from a monitoring location to discern the source(s) of pollution contributing to the measured pollution concentration.

The most commonly applied receptor model is the Chemical Mass Balance model. This model separates source impacts principally upon the unique chemical features of sources and the chemical features of the field samples. For this approach to be successful it is necessary that the investigators identify all potential sources and that each of these sources can be found to have a unique chemical fingerprint. Once the fingerprint of each of the sources and selected ambient samples is determined, computerized regression analyses are performed. This determines the relative contribution of each of the sources toward the measured ambient concentration.

This modeling assessment has many advantages and disadvantages which are quite different from those of dispersion modeling. The primary disadvantages are that the assessment is only evidence of field conditions that have already existed. Additionally, the model is premised upon data collected at a limited number of field locations. Hence, the model is of no value for projecting a future situation or in quantifying impacts that may occur at other locations where ambient monitors don't exist.

Additional characteristics of receptor modeling are enumerated below.

Attributes:

a) accuracy of results is not dependent upon use of meteorological data or emission rate data;

b) analysis can accommodate multiple stack and ground release sources.

c) accuracy can be excellent and far superior to dispersion modeling results provided all sources are chemically unique;

d) modeling can be performed for periods of air stagnation **(calm winds).**

Shortfalls:

a) modeling results are indicative of pollution conditions at the location of the monitors. Extrapolation to a larger physical area is dependent upon how well site conditions represent conditions in the larger proximal area;

b) model cannot be used to project ambient conditions if and when source emissions change

c) The chemical characteristics of separate sources may be too similar to uniquely identify the impacts of each source.

B. PREFERRED ASSESSMENT METHOD

In recognition that each of the described modeling approaches have unique attributes and deficiencies, it is often desirable to use both tools and then reconcile the differences between the results based upon best professional judgement. In the case of the Valley, several facts have led to the determination that dispersion modeling is not **feasible at the present time. Additionally, there would not be an acceptable performance of predicted model concentrations.**

The above statement is made on the basis of the following facts:

a) Elevated PM10 concentrations, **from woodsmoke sources,** occur when wind speeds within the Valley are **light and variable;**

**b) Elevated PM10 values from crustal (soil) sources occur throughout the Valley during periods of high winds and no precipitation. In addition, localized microscale impacts have been reported at several sites in the Valley when winds were light and no rain had occurred over several days;**

c) **The nearest recording meteorological data site is the airport which is** located near the Valley mouth. This site does not **represent** conditions indicative of the flow in the inner Valley where the monitors are located;

d) Topographically induced micro-meteorological conditions are wide-spread and non-uniform within the Valley especially during pollution episodes;

e) Assembly of a meteorological data base adequate to accomplish reliable dispersion modeling requires a substantial commitment of time and resources outside the limit of the **woodsmoke** control plan. **The effect of the original plan reduced the reliance on meteorological data as well as eliminated the need to upgrade the failing meteorological site at Kennedy-Adair Memorial Park.**

f) Emission rates from residential heating devices and road fugitive emissions vary tremendously with time **and local traffic flow patterns.** The current inventory is not sufficiently accurate to quantify these emission rates for projecting 24-hr exposures by **computer** dispersion models.

In general, **dispersion model performance would not be acceptable due to** the uncertainties associated with source emission rates and a lack of meteorological data. In addition, to acquire the quality of data necessary to perform dispersion modeling with a level of **acceptance** that could approach that of the receptor modeling, a more

comprehensive meteorological and emission inventory **would need to be accomplished.** Furthermore, a non-gaussian three dimensional grid-cell model such as a modified version of the Urban Air Shed Model (UAM-STAR) would have to be applied to accommodate multiple wind field data where wind speeds are regularly below 1 meter per second. **Grid models are based on a stationary two or three-dimensional array of grid cells within which pollutants are emitted. They are also transported from cell to cell, diffused by turbulence, altered by chemical reactions, and removed from the grid region by adsorption and meteorological means. A number of sensitivity field runs would be necessary to assess the performance of the modified UAM and determine which parameters influence predictions.**

Recognizing the Valley is a rather simple airshed **only** from the point of view of the number of potential sources. **It was concluded that** receptor modeling offered a far greater level of confidence in assessing relative impacts **from woodsmoke**. The monitoring network of two long-term locations within the Valley provides a level of confidence that values observed represent maximum area-wide **woodsmoke** pollution levels. It also provides an adequate data set to judge any significant **trends** in air quality.

**To confirm areawide maximum impacts, two additional microscale monitoring sites were installed between 1989-90. While the woodsmoke impacts remained low, unanticipated levels of crustal material caused numerous exceedances of the State PM10 standard. Low nephelometer readings supported the preliminary findings that impacts were dust related. Based on the Department's experience with particulate monitoring in the Mendenhall Valley and the results of mid-1980 filter chemical mass balance (CMB) analytical work, the Department concluded that the material on the new filters was almost entirely crustal material. CMB analyses confirmed that single source identification would be almost impossible between the different sources of particulate in the Valley.**

C. SOURCE IMPACTS

**1983 Assessment**

Receptor modeling has been used as a tool for air quality management in the Juneau airshed since 1982. The first report entitled PRELIMINARY SOURCE APPORTIONMENT OF WINTER PARTICULATE MASS IN JUNEAU, ALASKA, June 13, 1983 (attached as Reference Document #3 **to the 1990 revision of the PM10 Plan).** was based upon particulate as TSP. This report reflects maximum TSP exposures prior to the implementation of a control program. All other studies were conducted in winter periods when wood stove shut-downs frequently occurred to reduce maximum potential exposures.

The study focused upon 24-hr periods of maximum exposure during the fall and winter while also compositing of samples through the month of December to closely examine

average winter exposures. Several specific weather regimes were evaluated to discern changing source patterns as a function of temperature, weather and precipitation. Table III.D.3-9 illustrates that winter exposures of particulate matter are strongly dominated by residential wood combustion sources when snow cover or precipitation minimizes fugitive dust. This is normally the case for the December-to-February period. Fugitive dust impacts can be dominant and highly elevated during dry calm periods of the fall. Residential wood combustion devices were found to be responsible for maximum 24-hr concentrations between 100 and 230 $\mu g/m^3$ TSP on cold, calm winter days. Dust impacts on dry fall days could be greater than 300 $\mu g/m^3$ of total suspended particulate.

Table III.D.3-9
1983 SOURCE APPORTIONMENT SUMMARY
TSP

| SAMPLE | μg/M³ | SOURCE CONTRIBUTION; PERCENT RWC[1] | DUST[2] | TRANS[3] | SULFT[4] | OTHER | UNEXPL[5] |
|---|---|---|---|---|---|---|---|
| Highest Winter Days | 281 | 79 | b.d.[6] | 1.7 | 3.7 | 3.8 | 12 |
| Highest Fall Days | 537 | 33 | 54 | 0.6 | 1.0 | 1.4 | 10 |
| 1981 Dec. Composite Floyd Dryden Site | 104 | 90 | 3.4 | 1.6 | 4.5 | 0.8 | 0 |
| 1981 Dec. Composite Super Bear Site | 56 | 87 | 3.1 | 4.6 | 4.7 | 0.9 | 0 |
| 1982 Dec. Composite Floyd Dryden Site | 87 | 84 | b.d. | 3.2 | 5.4 | 1.0 | 6.8 |
| 1982 Dec. Composite Super Bear Site | 61 | 86 | b.d. | 6.4 | 6.8 | 1.1 | 0 |

[1] RWC: residential wood combustion
[2] DUST: fugitive dust; wind-blown or generated by vehicle action
[3] TRANS: transportation sources
[4] SULFT: sulfate
[5] UNEXPL: unexplained
[6] below detection levels

In later years when TSP samplers were operating during the same period as PM10 samplers. It was shown that during the period of November 1986 through February 1987, 92 percent of the measured TSP concentration is detected as PM10. This information provides additional clarification to the values presented in the above table. The correlation would not be anticipated to hold in periods such as the Highest Fall Days shown above.

## 1. 1984 Assessment

Receptor modeling by the use of glass fiber TSP samples yields several uncertainties due to the impurities of the glass fiber. Consequently, a follow-up study was conducted in the winter of 1983/84 whereby dichotomous PM10 samplers were deployed and operated during the period January and February of 1984. These samplers used Teflon filters, which are a much purer substrate for the subsequent chemical analyses.

The study period happened to be an exceptionally mild winter, resulting in lower particulate concentrations in comparison to the previous month and the previous winter. Except for one day, TSP concentrations were less than 160 $\mu g/m^3$. Only four days exhibited values greater than 100 $\mu g/m^3$. The results generally reinforced earlier receptor modeling results in demonstrating that the principal component of winter season particulate matter was from residential wood combustion. On average, 80 percent of the winter particulate in the fine particle fraction (less than 2.5 micrometers) was from wood combustion. For most sampling days, the coarse particle fraction was a small percent of the total PM-10 concentration. Usually the coarse particle fraction (less than 10 micrometers but greater than 2.5) was composed primarily of fugitive dust. However, when fine particle loading was high, the coarse fraction indicated a higher level than expected of wood smoke impacts. This may have resulted from a fine particle filter overload.

The project report entitled CHARACTERIZATION OF AIR QUALITY IMPACTS FROM RESIDENTIAL WOOD COMBUSTION IN JUNEAU AND FAIRBANKS, ALASKA, June 20, 1984, was attached as Reference Document #4 **to the 1990 revision of the PM10 Plan.**

## 2. 1987 Assessment

The final receptor modeling study was conducted in 1988 utilizing PM10 samples collected during 1986 and 1987 at the two Mendenhall Valley sites. These samples were collected by the use of size-selective inlet, high volume samplers (SSI). Filter media is high-purity quartz fiber. The focus of this study was to evaluate all PM10 samples where the measured concentration was greater than 100 $\mu g/m^3$. Since, compliance with the annual ambient standard has never been a problem, project resources were dedicated to short term periods of high exposure. For the calendar years of 1986 and 1987, only two calendar periods showed high exposures of PM10. These occurred in the spring and fall. Low winter season exposures reflect upon the success of the then existing management control plan for wood smoke pollution. The project report entitled SOURCE APPORTIONMENT BY CHEMICAL MASS BALANCE TECHNIQUE OF PM10 SOURCES IN EAGLE RIVER AND JUNEAU, ALASKA, May 23, 1988, was attached as Reference Document #5 **to the 1990 revision of the PM10 Plan.**

Two episode periods occurred in late February 1986 and late October 1986. The climatological records of February, 1986 had unusually mild weather with **no**

**measurable precipitation**. This event lasted for nine days prior to the episode and **no ground snow cover** was noted during the entire month. The event started with a rapid drop in temperatures and atypical **high winds within the Valley**. Toward the latter part of the episode, Valley winds subsided while temperatures remained cold. **Observations of strong wind-blown dust were common** in the first two days of the period. Table III.D.3-10 below provides the apportionment of source samples for each of the elevated days during these events. Modeling for the February 21st was not performed because the measured concentration was 65 $\mu g/m^3$. The modeling of the episode days indicated a general dominance of fugitive dust with wood smoke impacts increasing to 21 percent on the last day before a weather change. The entire episode was an unusual event since several factors combined to produce overall high PM10 concentrations. Home heating demands were also high due to cold temperatures.

The October 31, 1986, incident resulted in one day when exposures exceeded 100 $\mu g/m^3$. This was a dry, cold, fall day with calm winds. The receptor modeling indicates an almost equal distribution between fugitive dust and wood smoke impacts.

Table III.D.3-10
1987 SOURCE APPORTIONMENT
TSP

| | | SOURCE CONTRIBUTION; PERCENT | | | | | |
|---|---|---|---|---|---|---|---|
| SAMPLE | $\mu g/M^3$ | RWC | RDDUST | TRANS | SULFT | OTHER | UNEXPL |
| WINTER 1986 EPISODE* | | | | | | | |
| Floyd Dryden Site: | | | | | | | |
| 2/19/86 | 188 | 3.8 | 93 | 0.5 | 0.9 | 0 | 1.8 |
| 2/22/86 | 240 | 9.6 | 74 | 1.5 | 2.0 | 0 | 13.0 |
| Super Bear Site: | | | | | | | |
| 2/19/86 | 119 | 5.8 | 88 | 3.3 | 3.0 | 0 | 0 |
| 2/20/86 | 108 | 8.0 | 78 | 6.2 | 2.7 | 4.9 | 0 |
| 2/22/86 | 121 | 21 | 60 [1] | 5.4 | 5.2 | 5.8 | 3.0 |
| FALL 1986 EPISODE** | | | | | | | |
| Super Bear Site | | | | | | | |
| 10/31/86 | 106 | 34 | 25 | 12 | 7.4 | 0 | 22 |

* February 19, 1986, to February 22, 1986
** October 31, 1986
[1] **avg of RDDUST contribution = 79 percent**

## IX. DESIGN VALUE CONCENTRATION/ATTAINMENT DEMONSTRATION

## ATTAINMENT OF THE PM10 STANDARD

### A. PM10 DESIGN CONCENTRATION

**To develop a successful fugitive dust control strategy, a PM10 design concentration is needed. This baseline is used for emission projections and the effectiveness of strategies to control emissions to the standard. The PM10 SIP Development Guideline, EPA-June, 1987, provides guidance on how states can develop control programs for attaining and maintaining ambient PM10 standards.** The attainment criterion is normally based upon a three-year period of monitoring, which is available for the Mendenhall Valley. With the PM10 annual and 24-hour standards, two separate design concentrations, one for each standard, are needed per site. Attainment of the annual NAAQS requires that the expected annual PM10 concentration be less than or equal to the annual limit. Attainment of the 24-hour standard requires that the expected number of exceedances of the standard be less than or equal to one per year.

### B. COMPLIANCE WITH ANNUAL STANDARD

**The annual design concentration is the expected arithmetic mean determined from** Appendix K of 40 CFR 50. **Table III.D.3.11 presents a summary of the most recent four years of PM10 data collection within the Mendenhall Valley. Overall, annual PM10 values are declining at Valley sites where continuous data records have been maintained.**

**In general, the four years worth of collected data indicates that annual PM10 measurements have been less than sixty-percent of the standard of 50$\mu g/m^3$. The highest impacted area is in the vicinity of the Portage and Trio microscale site. Later discussions of this site in the 24-hour standard analysis, present the influence of the nearby unpaved roadways. The annual mean PM10 concentration averaged over the 1990-92 monitoring period at the Floyd Dryden site is 21.67 $\mu g/m^3$; the Glacier-Auto site is 19.0 $\mu g/m^3$; at Quartz Street it is 27.0 $\mu g/m^3$; and at Portage and Trio it is 33.0 $\mu g/m^3$. These four Valley sampling sites had over 2500 valid sample days during the period of 1990 through 1992. Using these four sites and their respective annual mean values, the expected annual mean for the Mendenhall Valley is about 25.2 $\mu g/m^3$.**

In summary, the air quality monitoring of PM10 concentrations in the Mendenhall Valley for the last **four** years demonstrates that annual average exposures are well below the established ambient air quality standard of 50 $\mu g/m^3$.

**Table III.D.3-11**
**Annual Mean Concentrations**
**Mendenhall Valley**
**PM10 Concentrations--($\mu g/m^3$)**

| YEAR | Floyd Dryden | Glac. Auto | Portage & Trio | Quartz Street[1] |
|---|---|---|---|---|
| 1989 | 21 | 21 | 23 | *** |
| 1990 | 21 | 17 | 34 | 22 |
| 1991 | 24 | 22 | 38 | 32 |
| 1992 | 20 | 18 | 27 | *** |

[1] Site began operation 4/15/90 and discontinued 6/30/91

C. COMPLIANCE WITH 24-HOUR AMBIENT STANDARD

**The 24-hour PM10 design concentration is influenced primarily by the few highest measured or estimated concentrations at a sampling station. Availability of the highest concentrations makes it possible to construct a simple table-look-up procedure to determine the design concentration. The number of available 24-hour concentrations determines which of the highest concentrations is chosen as the design concentration. The Valley monitoring sites would be classified as comprehensive. The past four years of data collection have provided an average of 649 valid days (Table III.D.3-12) of 24-hour measurements. Using the EPA 1987 SIP Guideline, the control strategy has been developed following the tabular approach found in Table 6.1. The Mendenhall Valley has multiple monitoring sites. Therefore, the highest PM10 concentration at each site is considered and a design concentration established for each location. The controlling design concentration for the Valley with four sites, would be the highest of the second-highest values.**

**Table III.D.3-12**
**Total days Monitored**
**Mendenhall Valley Sites**
**1990-1992**

| | |
|---|---|
| Floyd Dryden | 919 days |
| Glacier Auto | 398 days |
| Portage & Trio | 1078 days |
| Quartz Street[1] | 201 days |

[1] site operational for approx 1 yr.
ave = 649

The highest value recorded at a Valley site during the period of record was 948 $\mu g/m^3$. This value, as well as several other elevated concentrations, were flagged as occurring when high winds were observed in the Valley (Table III.D.3-13). Using the EPA Guideline on the Identification and Use of Air Quality Data Affected by Exceptional Events dated July, 1986, each of these were classified as an "exceptional event". Table III.D.3-13 below presents the 24 hour standard design concentrations. Based on the SIP tabular estimation criteria, the Valley design value has been determined to be 277 $\mu g/m^3$ as measured at the Quartz Street site. This concentration will be used as a design value for assessing the 24-hour attainment of PM10.

Table III.D.3-13
Maximum 24-hour Values[3]
Mendenhall Valley
$\mu$g/m3

| Year | Site | measured value |
|---|---|---|
| 1990 | Floyd Dryden | 105, 101, 91, 80 |
| 1991 | Floyd Dryden | 387[1], 327[1], 139, 123, 116 |
| 1992 | Floyd Dryden | 241[1], 207[1], 98, 89 |
| 1990 | Glacier-Auto | 82, 69, 65, 63 |
| 1991 | Glacier-Auto | 104, 81, 68, 65 |
| 1992 | Glacier-Auto | 100, 80, 56, 53 |
| 1990 | Portage & Trio | 257, 218, 216, 211 |
| 1991 | Portage & Trio | 948[1], 617[1], 302, 209[1] |
| **1992** | **Portage & Trio** | **586[1] , 496[1] , 210[1], 176[1]** |
| **1990** | **Quartz & Amalga** | **113, 95, 82, 78** |
| **1991[2]** | **Quartz & Amalga** | 277, 213, 176, 107 |
| 1992 | **Quartz & Amalga** | no data |

**[1] this data has been designated as an "exceptional event"**
**[2] limited data from the site, operations terminated in 1991**

In summary, previous monitoring periods for the 1990 SIP (April 1, 1986, through March 31, 1989) produced no measured 24-hour concentrations of PM10 greater than 150 $\mu g/m^3$. **However, monitoring data in Table III.D.3-13 indicates significant emissions changes have occurred in the Valley in the latest three year period.**

Recognizing data collection requirements specified in Appendix K of 40 CFR 50 for demonstrating attainment, it was evident the Mendenhall Valley was in attainment with the 24-hour PM10 ambient air quality standard. Based upon this determination, it was not felt necessary to reduce other particulate emission sources in the airshed beyond that achieved by the **wood smoke abatement plan.** It was, however, believed necessary to maintain good air quality through continued operation of the current management plan.

**To explore the possibility of microscale woodsmoke particulate "hotspots", additional monitoring sites were added in 1989 and 1990. The forecast indicated that given the Valley woodstove controls in effect before 1990 and the expected limited growth in the Valley (approx. 5 percent) , emissions from other sources of PM10 would continue to increase. These many sources including: spills from haul trucks, construction mud/dirt carryout , winter road sanding, entrainment from unpaved areas adjacent to paved roadways, erosion from storm water washing onto streets, and wind erosion from outdoor storage of PM10.**

The remaining sections of this document identify the details of the current management plan. Fugitive dust control measures feasible to implement **are identified specific to emissions from paved and unpaved roads in the Valley.**

## X. CONTROL PROGRAM DESIGN AND IMPLEMENTATION

### A. WOOD SMOKE POLLUTION

#### 1. Initial Strategy Design

Several key factors concerning the **initially defined** wood smoke phenomena, the public reaction and the motivation of the governing agency guided the direction and development of the wood-smoke management plan. The importance of the factors becomes evident throughout the evolution of the wood smoke management plan and are apparent in the present program. These factors were:

- Short-term meteorological events caused extreme elevations in ambient pollutant levels;
- Individual stove operator practices accounted for out-of-stack emission fluctuations which ranged one to two orders of magnitude;
- Strong public opposition was anticipated for any regulation affecting residential wood heating;
- Exceedance of ambient standards occurred for only the 24-hour period, not the annual period.

Any agency, when assessing the array of potential control strategies, must operate within certain restrictions, either economic, political, or legal in origin. These boundaries of operation often must be interpreted by staff to determine which potential control plans will be "acceptable" to both the agency and the public. It is of the utmost importance to truly assess the limits of these perceived boundaries at the onset to prevent undue restriction of the management plan. In the case of the Juneau program, three policy directives were responsible for guiding the program. The first was a mandate to not unduly regulate an entire statewide or city-wide population when the problem was restricted to a single **geographical** locale. The second was a limited source of agency resources could not allow a program which would be

manpower-intensive or expensive. The third being any selected control plan must maintain simplicity to minimize the potential for confusion or frustration by the regulation individuals.

2. Strategy Development

The strategy assessment performed in 1982 was not comprehensive. At the time, agency staff did not believe that significant pollution reductions were necessary. The monitoring data indicated that a maintenance plan with occasional reductions would be all that was necessary. Consequently, the management plan was to focus upon communicating to the public the health dangers of acute wood-smoke pollution and to instill a level of responsibility with individual stove operators as generators of harmful air pollutants. Adopted regulations set a wood heater exhaust opacity limit of 75 percent during announced air alerts. During alerts the agency requested voluntary wood use curtailment.

The public education program was initiated through as many media outlets as possible. To our benefit, the air pollution problem was of great concern to media officials, was a good news item, and information was in demand by the public. Radio, TV, and newspaper interviews were also common throughout the fall and winter. A mass mailing of wood stove brochures was accomplished as well as the drafting of several articles for newspaper publication on woodcutting and curing, air pollution and meteorology, wood stove operation, etc. Videotapes were prepared on proper stove operation and how to read opacity. These tapes were then aired on public television as a public service announcement. Numerous speeches were made at schools, civic organizations such as the Rotary Club, brown-bag lunch sessions, etc.

The opacity standard allowed agency staff to work with residents on a one-to-one basis toward reducing stack emissions. The potentially antagonistic visit of an air pollution officer to a home concerning stove emissions was quite effectively defused. The enforcement event was changed into a public service occurrence, wherein the officer discussed the pollution problem such as the stove operation. This "enforcement" activity was relatively manpower intensive for the first two winters (approximately 40-60 man-days each winter). It did, however, set a groundwork for a much-reduced enforcement effort in later years.

By action of an emergency order, the Commissioner of the Department of Environmental Conservation could proclaim an Air Quality Emergency. His action temporarily shut down all wood stoves on three separate occasions during the winter of 1982/83. This very overt action not only set a precedent for the future episodic curtailment program, but pointedly alerted the citizenry of the imminent health danger. The emergency proclamations and other events curtailed staunch opposition to an effective pollution control plan. Concerned citizens organized a grassroots "clean air coalition" to work toward achieving better air quality through government control. The grassroots organization ultimately was assimilated into a local government advisory committee with wood stove retailers and government staff also involved. The advisory committee was highly motivated to accomplish its goal.

The first season of the program proved to be a failure in achieving emission and ambient pollution reductions. However, the program was quite successful in nurturing the main components responsible for the success of the program today. A communications pathway between government and citizens was established. Wood stove operators became aware of their responsibilities as polluters. The public health dangers were made known to proponents of the issue. A citizens' grassroots organization assisted in developing solutions to the public health problem.

3. Control Strategy Evolution

In recognition of the high pollutant exposures and number of public health complaints, it was evident that an effective control program had to be designed. Although the state government and local government were proceeding on independent regulatory paths, the program design was essentially the same. The all-important objective was to reduce periods of high-pollutant exposures. The mayoralty appointed citizens' advisory committee conducted several work sessions to evaluate alternative management plans. Almost simultaneously, the state was conducting public hearings on a management plan which was substantially revised through the public participation forum. Upon the conclusion of these efforts in the late summer/early fall of 1983, a city ordinance and state regulations were adopted which were essentially identical. A Memorandum of Understanding was signed which specified in detail how the local government would administer the program as well as the technical support to be provided by the state agency. Essentially, the control plan had three components:

a) All wood-fired devices must meet a 50-percent opacity at the point of emission,

b) For the wood smoke area of Mendenhall Valley, air emergencies would be proclaimed to prohibit the use of stoves and fireplaces when particulate levels would reach or be anticipated to reach 260 $\mu g/m^3$ (24-hour average),

c) All open burning of materials was prohibited from November 1 through March 31 within the wood smoke area.

B. **Primary** Control Strategy-**Wood smoke**

After each **wood-heating** season, regulation changes were considered which would fine-tune **the wood smoke** program. Based on the results of the winter of 1983/84, **the CBJ lowered the threshold** for Air Emergencies from 260 $\mu g/m^3$ to 150 $\mu g/m^3$ in response to concerns by the public that health dangers still existed.

Secondly, several improvements were made to keep an open line with the public. Fold-up roadway signs were installed to notify the public of no-burn days. Additionally, telephone lines were installed to convey a recorded message to the public and allow complaints or questions.

In the fall of 1985 some very significant changes were made to the program. The most significant change was the establishment of emission standards for all new wood

stoves sold in Juneau. As of January 16, 1986, all new wood stoves, either sold or installed in Juneau, had to be certified as emitting less than six grams of particulate per hour as measured under the State of Oregon testing procedures. The public was given an incentive to use the certified, clean burning stoves through the adoption of a two-stage air episode plan. During the first stage of an air episode (called an "air alert"), only certified wood stoves could be used. The second stage (air emergency) required all wood stove users, including those with certified wood stoves, to halt burning. It has not yet been necessary to invoke the second stage **level of the plan to date.**

Another significant change to the control strategy was the lowering of the air quality alert level from 150 $\mu g/m^3$ TSP to 100 $\mu g/m^3$ TSP. The regulations retained the provision which prohibits open burning from November 1 through March 31.

Following the December 1988 adoption of CBJ Ordinance No. 88-59 the level for air quality alert changed from 100 $\mu g/m^3$ TSP to 92 $\mu g/m^3$ PM-10. This ordinance replaced the six-gram/hour stove emission limitation with the emissions limits specified under the New Source Performance Standards of 40 CFR 60. **The CBJ again acted on the Woodsmoke Control Code in December 1991 following several public hearings, changing the level that an alert can be designated from 92 $\mu g/m^3$ to 75 $\mu g/m^3$. The 1992 action authorized the City Manager to declare an air alert according to certain qualitative criteria, CBJ Ordinance No. 91-52, January 6, 1992 (see Appendix A). The ordinance as amended in 1992 increased several of the fines for offenses of the woodsmoke code.** Table III.D.3-14 presents a chronological sequence of the Juneau wood-smoke control plan as it has evolved since 1982.

1. Episode Implementation

Real-time monitoring of air pollution levels is conducted with a nephelometer which is located at the Floyd Dryden School site in the Mendenhall Valley. The data is transmitted to the CBJ offices as well as the offices of the Alaska Department of Environmental Conservation.

During the **numerous** heating seasons, **under the CBJ woodsmoke ordinance,** the CBJ staff has gained a good working knowledge of the interrelationships of wood-smoke (PM-10) levels and weather patterns. This knowledge and experience is useful in deciding when to declare air episodes and prohibit wood burning.

Air episodes can be legally declared at any time of the day. However, it is the policy of the CBJ staff to restrict the timing to between the hours of 8 a.m. and 5 p.m. The actual timing is dependent upon how long it takes to make an accurate weather forecast for the next 12 hours. The Borough has found that declaring an air episode after 5 p.m. will usually not achieve any meaningful reductions in wood-smoke levels for the day.

Once an air episode is declared, the police department is notified to change the message on the 24-hour hot line and to be ready for possible enforcement action. The public is notified through taped radio and television messages as well as the VHF radio weather broadcasts. Roadside signs placed in strategic Mendenhall Valley locations are uncovered to indicate an air alert. If the episode is declared before 1 p.m., the daily newspaper also prints the message.

Table III.D.3-14
History of Regulatory Program

| | |
|---|---|
| Summer 1982 | State regulations adopted;<br>75 percent opacity standard during announced air alerts |
| Summer/Fall 1983 | State and city regulations adopted;<br>wood smoke control area set; |
| | 50 percent opacity limit for all periods; |
| | No open burning November through March; air emergency shuts down all devices; |
| | Air emergency level set at 260 $\mu g/m^3$ TSP; |
| | 2-year waiver to replace wood as sole heat in homes; |
| Fall 1984 | City reduces air emergency level to 150 $\mu g/m^3$ |
| Winter 1985/86<br>(Effective Fall 1986) | City ordinance revised; 2-stage episode plan adopted;<br>Air alerts shut down all but Class I stoves; |
| | Air emergencies shut down all devices;<br>Class I stoves must meet 6 $\mu g/m$ hr limit (Oregon test proc.); |
| | Class I stoves to meet 10 percent opacity during alerts; |
| | Air alert level set at 100 $\mu g/m^3$ TSP; |
| | Air emergency level set at "anticipated to exceed" 100 $\mu g/m^3$ following an alert |
| | Retained: no open burning in winter / 50 percent opacity limit . |
| Fall 1988 | City ordinance revised for PM10;<br>Air Alert level set at 92 $\mu g/m^3$ PM10; |
| | Air emergency set for > 92 $\mu g/m^3$ PM10 following an Alert |
| | Stove emission limit (Class I permit) set at NSPS standard. |
| **Winter 1992** | **City ordinance revised for PM10: Air Alert set at 75 $\mu g/m^3$ ;**<br>**Class I wood stove permit to expire July 1, 1997;**<br>**Fines for violations of ordinance increased;** |

2. Enforcement

Enforcement of the wood smoke regulations was initially assigned to the CBJ Canine Control Officers. The two officers were certified in opacity reading. However, in 1986 the enforcement was turned over to the police department. The advantages of using police enforcement are 1) a 24-hour dispatcher to handle complaints; 2) police are trained to deal with potentially belligerent people; and 3) a large number of officers are available for enforcement. The most obvious disadvantage of using police for enforcement is that wood smoke complaints are often their lowest priority for enforcement.

The penalties for burning during an air episode are **$100** for the first offense and a mandatory court appearance for the second offense. Penalties for open burning out of season or excessive smoke density are **$100** for the first offense and **$300** for the second offense. **Penalties for excessive smoke density have been amended to $50 for a first offence and $75 for a second. The CBJ hired two woodsmoke enforcement officers for the 1992-93 burning season and it is anticipated this program will continue in future burning seasons.**

Although the regulations do not have specific provisions for issuing warnings to violators, warnings were commonly given during the early development of the program to help gain public support. As the public became more familiar with the program, citations were used to keep the situation under control. **The smoke control program has been in effect for sufficient time that the use of warnings is not a typical part of the enforcement program.**

C. Contingency Measures

In addition to the many facets of the wood smoke regulations, other regulations and programs were developed to help provide further improvements to air quality. One strategy was to try to reduce the need for burning wood through increased energy-efficient homes. Juneau had no requirements for home insulation. As a result, many people burned wood because alternative electric power and oil bills were high. The CBJ Building Code has now been amended to require minimum insulation standards of R-30 ceilings and R-19 walls and floors. Formulas were also adopted for the percentage of window coverage allowed. Regulations were adopted by the CBJ to disallowed wood stoves as a sole source of heat. These also required a backup system capable of heating the living areas of a house to 70 degrees Fahrenheit.

1. **PM10 Contingency Control Measures for Residential Wood Burning:**

**Residential wood burning is a source of PM10 in the Valley that is currently regulated. However, the following control measures are suggestions as to which route the Department may select to take in regard to that source:**

- Establish additional public information programs to inform and educate citizen about stove sizing,installation, proper operation and maintenance;

- general health risks from wood smoke, new technology stoves, and alternatives to wood heating.

- Encourage improved performance of woodburning devices such as providing voluntary dryness certification programs for dealers and or making inexpensive wood moisture checks available to wood burners;

- Evaluating and encouraging, as appropriate, the accelerated changeover of existing devices to new source performance standard or other new technology stoves (pellet stoves) by such approaches as subsidized stove purchases tax credits or other incentives;

- Provide inducements that would lead to reductions in the stove and fireplace population and/or use by:

    1. Slowing the growth of woodburning devices in new housing units by taxes, installation permit fees, or other incentives;

    2. Encouraging a reduction in the number of wood stoves (i.e., removing or disabling the devices) through tax credits or other incentives;

    3. Discouraging the resale of used stoves through taxes, fees, or other incentives;

    4. Discouraging the availability of free (or very inexpensive) firewood by increasing cutting fees or limiting the cutting season.

## D. FUGITIVE DUST CONTROL

### 1. Methodology

**The emissions inventory prepared by Engineering Science , (February, 1988) was used as a baseline to determine Valley-wide PM10 emissions. To this emissions baseline, growth projections were applied to obtain emission estimates for 1993. The levels of primary PM10 due to emission increases are determined by multiplying the present level of ambient PM10 concentrations with the rate of increases from different source types. This constitutes the linear rollback approach. The estimate of control for this SIP revision will, however, be based on a "proportioning method".** The contribution of PM10 from various source categories to the ambient levels is needed to estimate the effects of emissions changes in the future. Hence, the estimates of emission contributions to ambient PM10 of different types is obtained from Chemical Mass Balance receptor modeling performed by Engineering Science.

In addition, the expected decrease in emissions due to proposed emission control measures are applied to future estimates of emissions. Using the **proportional** roll-back model, the benefits of these proposed emission reductions are evaluated.

**From the PM10 design concentration a proportioning method will be used to estimate the control requirements for the SIP. This method differs from simple rollback in that the source contributions are determined from receptor or dispersion modeling and not directly from the emissions as in simple rollback. This can be described by the following:**

**TR ($\mu g/m^3$) = PM10 design concentration - PM10 standard**

**To accomplish the needed reduction a single source or several individual sources may be required to reduce emissions. The individual source reductions (ISR) desired are usually selected on such factors as, the technical feasibility of achieving a given reduction or additional reduction at the source. The amount is normally expressed as a percent reduction.**

**PM10 source contributions during exceedances of the 24-hour standard have been analyzed during specific episodes. The 1987 receptor modeling study presented in Table III.D.3-10 shows the significant role of road dust resulting from; a lack of snowcover (precipitation), atypical high winds, and high deposition of sanding materials on the roads. Visual observation of filters collected near unpaved roads with exceedances between 1990 and 1992 appears to have this same degree of road dust material. The 1987 analysis has been used to set the percent of source contribution for the 1993 SIP revision. The controlling monitor site (Quartz-Amalga) for the Design PM10 value is located in a residential portion of the Valley. There are no nearby paved roads and based on the best professional judgement of ADEC it has been assumed that impacts from other sources are minimal. However, to complement the SIP**

control strategy, this plan presents control techniques for paved road dust reductions and expected 30 percent or greater effectiveness. Therefore, the majority of emission credits are based on reductions gained by changing the primary fugitive dust source, unpaved roads.

It was assumed that the emission factors of Table III.D.3-5 for an unpaved vs paved road surface would be the component of contribution . This resulted in a relative distribution of about 60 percent and 30 percent for the unpaved subcategories of local and collectors. As there are no other major sources (ie. industrial or commercial) the remaining 10 percent was distributed between sources contributing to wind blown and wood smoke emissions. The assumptions for this analysis are presented in Table III.D.3-15 as follows:

Table III.D.3-15
Source Category Contributions
to Ambient Design Concentrations
(Design Conc. 277$\mu g/m^3$)

| Source | Percent | Ambient Conc. | ISC |
|---|---|---|---|
| Unpaved Collector | 61 [2] | 242 $\mu g/m$ | *148* $\mu g/m^3$ |
| Unpaved local | 30 [2] | *242* " | *73* $\mu g/m^3$ |
| Woodburning | 8 | *242* " | *19* $\mu g/m^3$ |
| Cleared Areas | 1 | *242* " | *2* $\mu g/m^3$ |
| Background | na | 35[1] " | 35$\mu g/m^3$ |
| TOTAL | | | *277* $\mu g/m^3$ |

[1] avg. 24-hour samples at Glacier Auto site (90-92) for event days
[2] Engineering Science/ADEC-CBJ-1993
ISC = Individual Source Contribution

The Glacier-Auto site has been chosen as the representative data base for background levels in the design calculations. The area near this site reflects emissions from a predominance of paved roadway emissions. All roads within a mile radius of the site are paved roads. This site has been in existence for several years and has an established record of performance as well as depth of data.

A comparative analysis of event days that had ambient values greater than the PM10 standard is found in Table III.D.3.15.1. This table correlates the background site (Glacier-Auto) with Valley sites on days when samples were greater than 150$\mu g/m^3$ An average of the measured values at Glacier-Auto for

these days is about 35 $\mu g/m^3$. This value has been used as the background for the compliance computations in the tables below.

**Table III.D.3.15.1**
**Exceedance Correlation**
**Mendenhall Valley**
**24-Hour PM10 Concentrations ($\mu g/m^3$)**

| Violation Date | Trio Street | Floyd Dryden | Quartz Street | Glacier Auto |
|---|---|---|---|---|
| 06/02/90 | 166 | 25 | ** | 16 |
| 06/12/90 | 183 | 31 | ** | 15 |
| 06/13/90 | 211 | 36 | ** | ** |
| 06/29/90 | 187 | 26 | ** | ** |
| 06/30/90 | 167 | 28 | 41 | 20 |
| 07/03/90 | 160 | 25 | ** | ** |
| 07/05/90 | 216 | 34 | ** | ** |
| 07/19/90 | 207 | 26 | ** | ** |
| 07/20/90 | 218 | 31 | | 18 |
| 07/21/90 | 257 | ** | ** | ** |
| 07/23/90 | 160 | ** | ** | ** |
| 03/02/91 | 199 | 116 | | ** |
| 03/03/91 | 169 | 85 | 65 | 60 |
| 05/24/91 | 58 | 28 | 213 | 25 |
| 06/17/91 | 91 | 19 | 176 | 13 |
| 06/19/91 | 142 | 38 | 277 | 22 |
| 06/21/91 | 204 | 57 | 87 | 43 |
| 06/22/91 | 302 | 47 | ** | ** |
| 06/23/91 | 165 | 31 | 49 | 21 |
| 06/24/91 | 163 | 34 | ** | ** |
| 06/25/91 | 172 | 36 | 53 | 25 |
| 06/26/91 | 161 | 36 | ** | ** |
| 08/07/91 | 171 | ** | ** | ** |
| 10/25/91 | 173[1] | 123[1] | ** | 50 |
| 10/26/91 | 209[1] | 139[1] | ** | ** |
| 10/27/91 | 617[1] | 327[1] | ** | 65 |

| Violation Date | Trio Street | Floyd Dryden | Quartz Street | Glacier Auto |
|---|---|---|---|---|
| 10/28/91 | 948[1] | 387[1] | ** | ** |
| 10/29/91 | 184[1] | 85[1] | ** | 33 |
| 2/9/92 | 176[1] | 59[1] | ** | ** |
| 2/10/92 | 496[1] | 207[1] | ** | 80 |
| 2/11/92 | 586[1] | 241[1] | ** | ** |
| 2/12/92 | 210[1] | 98[1] | ** | 56 |
| 6/29/92 | 159 | 31 | ** | ** |

** no valid sample collected/site not in operation

[1] exceptional event

**24-hour Standard = 150 $\mu g/m^3$**

The emissions reductions from the proposed control measure are based on reducing the deposition of particles on road surfaces. The efficiency is directly proportional to the percentage of material prevented from being deposited on the road surface. For the paving of unpaved roads, the EPA (1988) has estimated the PM10 control efficiency at 90 percent. Therefore, the required emission reductions to accomplish the total needed control is the sum of the individual source decreases and the control technology percent reduction. The following reductions for the Mendenhall Valley sources concentrations are listed in Table III.D.3-16.

**Table III.D.3-16**
**Individual Source Impact (ISI)**
**Road Paving Control Measure**

| Source | Percent Control | ISI |
|---|---|---|
| **Unpaved Coll.** | **90%[1]** | **133 $\mu g/m^3$** |
| **Unpaved Local** | **90%** | **66 $\mu g/m^3$** |
| **Total** | | **199 $\mu g/m^3$** |

[1] **source EPA/South Coast Air Quality Management District**

**To achieve the ambient PM10 standard attainment goal of 150$\mu g/m^3$ or less, the Department in concert with ADOT and the CBJ propose a set of emission-reduction strategies. The primary method of fugitive dust reductions would be paving of unpaved roads. These strategies are described in a joint Memorandum of Agreement found in Appendix A of this Plan. From the above analysis it has been determined that an overall reduction of sixty-six percent**

**(66%) is necessary to demonstrate attainment. The percent reduction credit from paved roads is about 90-percent. Table III.D.3-17 summarizes the effect of these control measures. The following details of the emission reduction strategy indicates attainment would be reached at the conclusion of the 1994 construction season. The implementation of RACM indicates maximum ambient concentrations should be reduced to about 77 $\mu g/m^3$. These levels are 48 percent less (73 $\mu g/m^3$) than the federal and state 24-hour PM10 standard.** The projected 5 percent growth in the Valley yields an ambient level of about 81 $\mu g/m^3$ that is significantly below the PM10 standard. **However, the SIP contains additional RACM that the State will implement to ensure compliance.**

**Table III.D.3-17**
**Expected PM10 Emissions (1994) Due to**
**Emission Control Measures in the Mendenhall Valley**

| | |
|---|---|
| **Pave Collectors** | **15 $\mu g/m^3$** |
| **Pave Local Rds.** | **6 $\mu g/m^3$** |
| **Cleared Areas** | **2 $\mu g/m^3$** |
| **Woodburning** | **19 $\mu g/m^3$** |
| **Background** | **35 $\mu g/m^3$** |
| **Total** | **77 $\mu g/m^3$** |

In consultation with EPA Region 10 an alternate approach to the attainment analysis for the fugitive dust control efficiency is presented. This methodology will complement the original ADEC compliance strategy. This method uses emission characteristics in the Emission and Annual Activity Levels of Table III.D.3-7. This strategy uses the 1988 data base with exclusions of sources known to not exist in the Mendenhall Valley such as; airport-Jet exhaust, airport sanding, power plants and commercial gravel operations. Using the same design ambient PM10 concentration of 277$\mu g/m^3$ a second analysis of the effects of the fugitive dust control strategy has been completed.

Table III.D.3-18
Fugitive Dust Control
Mendenhall Valley, Annual Values
Activity Levels and Emissions

| Activity | Total | Units | Tons per year |
|---|---|---|---|
| Unpaved Sources | 3406 | 1000VMT | 698.4 |
| Windblown dust | 368 | Acres | 38.5 |
| Woodburning | 15,207,790 | lbs. | 149.2 (119[1]) |
| Resd. Fuel use | 2441 | 1000-gals. | 3.0 |
| Industrial | 0 | 0 | 0 |
| Commercial | 0 | 0 | 0 |
| Total | | | 858.5 |

[1] new stove replacement est. 20% less

Table III.D.3-19
Source Category Contributions
Activity Levels
Design Conc. 277$\mu g/m^3$

| Source | Percent | Ambient Conc. | ISC |
|---|---|---|---|
| Unpaved Sources | 81.3 | 242 | 196$\mu g/m^3$ |
| Woodburning | 14.0 | 242 | 34$\mu g/m^3$ |
| Windblown | 4.4 | 242 | 10$\mu g/m^3$ |
| Resd. fuel | .3 | 242 | 2$\mu g/m^3$ |
| Background | na | 35[1] | 35$\mu g/m^3$ |
| **TOTAL** | | | 277$\mu g/m^3$ |

[1] Glacier Auto monitoring site (90-92)
ISC Individual Source Contribution

The modified compliance analysis uses the same EPA guide emission reductions resulting from the application of road paving as assumed earlier. The efficiency is estimated at 90 percent. In conjunction with the previously noted improvement in wood burning units, smoke emission reductions are assumed and the following emissions forecast is compiled.

Table III.D.3-20
PM10 Emissions (1994) due to
Emission Control Measure in the Mendenhall Valley
Activity Level basis

| | |
|---|---|
| Unpaved Roads | 20$\mu g/m^3$ |
| Woodsmoke | 34$\mu g/m^3$ |
| Windblown | 10$\mu g/m^3$ |
| Resd. Fuel | 2$\mu g/m^3$ |
| Background | 35$\mu g/m^3$ |
| TOTAL | 101$\mu g/m^3$ |

As previously discussed an emissions reductions of about 66 percent is needed for compliance with the 24-hour PM10 standard. Ambient concentrations from the Valley control strategy under the modified Region 10 analysis (Table III.D.3-20) anticipates a PM10 concentration that is about 67 percent of the ambient standard. This level is about 36 percent less than the federal and state 24-hour PM10 standard (49 $\mu g/m^3$). It is also about 12 percent greater than the ADEC analysis. The anticipated 5 percent growth in the Valley will increase the projected ambient value to about 106 $\mu g/m^3$.

**To build on the current PM10 control strategy, the State is proposing to develop a comprehensive and reasonable program to control "fugitive dust". Fugitive dust impacts have historically been a component of the Juneau particulate matter problem from both a TSP and a PM10 perspective. On the basis of 24-hour exposures as well as chemical apportionment, the program has justifiably focused upon wood smoke sources. Prior to the implementation of the "wood smoke control plan" fugitive sources were believed to play a minor role in causing violations of the PM10 ambient air standard. Assessment of microscale PM10 filters indicates a significant portion of the particulate emissions is a result of soil dust entrainment, commonly referred to as "fugitive dust." This reflects the trend of emissions from wood smoke sources being controlled, thus the relative contribution of fugitive dust sources has increased.**

**In general fugitive dust sources are not a major portion of the PM10 values during the middle of the winter season as snow cover or frozen road surfaces bind these materials. Fugitive dust impacts can be significant during the late fall and early spring at the two ends of the heating season, when strong, arctic ridges limit precipitation and the ground is not snow covered. Similar dusty conditions also occur during the summer under extended periods of dry weather. Summer impacts are normally microscale in nature and exacerbated by road traffic over unpaved streets. Except for the localized elevated impacts**

attributable to adverse meteorology, the summer season impacts are minor. This is due to relatively good atmospheric dispersion and frequent precipitation.

## 2. Emission Characteristics

The most effective control programs can be developed only when there is adequate information on the nature and extent of the emissions sources. The annual estimated activity levels and emissions rates have been presented in Table III.D.3-7. It is important to relay several salient facts about the sources and the prepared estimates in this section of the plan.

First and foremost, there are several important underlying uncertainties with the emission inventory. For many of the primary sources such as seasonal paved road emissions and wind blown dust, assumptions rather than factual data had to be used for certain important values in the equations. The calculations used for the table assumed that precipitation or snow cover in the other seasons would eliminate higher rates, when in actuality, the higher rates can occur in any season when dry conditions prevail or strong winds are persistent. The values include wind-blown dust emissions from road surfaces. Consequently, when the table is examined, the three major emission sources are from vehicular activities or wood smoke combustion.

Engineering Science developed, a comprehensive emissions inventory for the initial control strategy development process in February, 1988. To account for the occurrence of higher volumes of emissions over relatively short time periods, a worst-case 24-hour emission inventory for the Valley was calculated. Table III.D.3-8 summarizes the 24-hour particulate matter emissions by source category. These identified source categories may not emit at these rates concurrently. For example, maximum woodsmoke emissions are likely to occur during the winter, while sanded street fugitive dust emissions increase in the dryer 3-7 day periods of the year. A hypothetical worse-case 24-hour particulate value has been estimated by season and presented in Table III.D.3-6.

The 1988 Engineering Science inventory addressed all identifiable PM10 sources in the Valley. Traffic-generated emissions, including exhaust particulate matter and fugitive dust emitted from roadway surfaces, contribute to fine particulate loading. Combustion of fuels (wood, oil, natural gas) used for residential and commercial heating also contribute to the atmospheric loading of fine particulate. Windblown dust generated during dry, windy conditions adds to ambient particulate matter levels. Emission factors developed by EPA and presented in AP-42 address the majority of the source categories discussed above.

Even though the 1988 inventory identified the major source of particulate matter as being related to vehicular traffic activities, the initial control strategy focused on the control of point sources (residential wood heaters). As technological improvements were introduced into the wood stove commercial market and

anticipated emission reductions could be estimated with relative accuracy, other PM10 sources were assessed. The PM10 sampling data of 1990, 1991 and 1992 has caused the CBJ to alter this control strategy to include vehicular related sources, more specifically the fugitive road dust factors. The lack of significant residential or commercial development within the Valley since the 1988 inventory, allows that data base (Table III.D.3-7 ) to be used as the foundation for this control strategy. The recent (1993) closure of a major mine supports the previously assumed maximum 5 percent growth factor for Valley emissions.

Assessment of recent PM10 sampling data in conjunction with the 1987 source apportionment analysis, (Table III D. 3-10) indicates fugitive emissions and not wood stoves are the principle source of concern. Prior to the 1987 study (E&S, 1988), receptor modeling demonstrated that fugitive emission sources were only a secondary player in episodic particulate levels. This usually occurred with inversions, high winds, or dry periods in the winter heating season. At the conclusion of the assessment and subsequent SIP revision, no violations had occurred during late spring through early fall when wood smoke emissions are negligible and fugitive sources are at a maximum.

### 3. Determining Emission Limits

Receptor modeling is based on the idea that the total mass at the receptor (mass collected on a filter in ambient monitoring) is the sum of the contributions from the individual sources and the background level of the pollutant. Each source has a unique chemical composition profile ("fingerprint"). Knowing the chemical profile of an ambient sample and contributing sources allows estimation of (using the method of least squares estimation) the fraction of each source's contribution to the total ambient mass. This method of estimation is called receptor modeling. It bases its analysis of an air pollution scenario on the information gathered at the receptor.

In determining the control requirements for the 24-hour standard, the PM10 design concentration and individual source contributions for each site, as well as background concentrations, must be available. However, for this short term average, it is most probable that a single high concentration is dominated by a relatively few sources whose contributions vary with meteorological conditions (i.e. high winds on dry days).

This appears to be the case for the Mendenhall Valley. To avoid lengthy computations and added uncertainty with the limited data base, an alternative strategy has been developed. This strategy is based on emission limits resulting from a specific source category developed under a modified rollback model. It is believed this method provides the best technological, most cost effective, and most enforceable set of emission controls for the Mendenhall Valley airshed.

## E. POTENTIAL CONTROL STRATEGIES

The Research Section of Alaska Department of Transportation and Public Facilities performed a study to evaluate the cost effectiveness of selected roadway dust control methods. The project final report entitled Cost Effectiveness of Selected Roadway Dust Control Methods for the Mendenhall Valley, Juneau, Alaska, is incorporated as Reference Document #6 to this air quality control plan. For this project all potential control options were initially investigated with a subsequent detailed evaluation of six of the most promising control methods. The interim Progress Report for the project (Reference Document #7 **in the 1990 revised plan)** presents potential control methods. Of the six, three focused upon unpaved roads. These were:

- the use of surface application of asphalt emulsion ("road oiling"),
- the use of calcium chloride for dust control, and
- roadway paving

Three other methods focused upon existing paved roadways:

- the paving of areas adjacent to paved roads to reduce "mud track-out" of particulate matter to the paved road,
- using cleaner sand for a winter traction aid, and
- a combination of less sand and more effective spring cleanup.

Table III.D.3-21
COSTS AND BENEFITS OF SELECTED ROADWAY PM-10
EMISSION CONTROL TECHNIQUES FOR MENDENHALL Valley
PM10 Emissions

| | Technique | Reduction (tons/year) | Cost ($/year) | Cost Per Ton ($) |
|---|---|---|---|---|
| Unpaved Streets | | | | |
| 1. | Paving - 2" hot asphalt pavement (per mile) (Note 1) | 50.7 | 25,360 | 500 |
| 2. | Paving - Bituminous surface treatment (per mile) (Note 2) | 50.7 | 19,700 | 389 |
| 3. | Oiling streets (per mile) (Note 2) | 20.5 | 4,700 | 229 |
| 4. | Calcium chloride application (per mile) | 20.5 | 2,860 | 140 |
| Paved Streets | | | | |
| 1. | Paving driveways, lots, and streets approaches (Note 3) | 230.0 | 31,300 | 136 |
| 2. | Use of cleaner sand (Note 4) | 10 | 5,000 | 30 |
| 3. | Reduced sanding/better cleanup (Note 4) | 5 | 5.000 | 100 |

Notes:

1. Figures are based on paving higher traffic (collector) roads. Cost effectiveness would be reduced for paving of additional, less-traveled roads.
2. Figures are based on the use of CSS-1 emulsified asphalt.
3. Figures for paving areas adjacent to the Glacier Highway, Riverside Drive, and Mendenhall Loop (excluding the "Back Loop") only. See text for details.
4. The potential benefits are considered small, however to maximize reduction potential, ADOT will investigate the use of coarse grade sand and sand removal on a limited section of Mendenhall Loop Rd. in the 1993 winter season.

In consideration of site-specific conditions, the costs for each of the selected options were developed and compared to the benefits derived in emission reductions. These values are presented in Table III.D.3-21.

1. Implemented Strategies

**Normal community progression has resulted in numerous roadway improvements. By the application of "Reasonably Available Control Measures" (RACM) a reduction in the emissions of particulate matter will be accomplished. These techniques and procedures prevent or reduce the airborne transport of fugitive dust. They include, but are not limited to; a) application of dust suppressants, b) use of coverings or enclosures, c) paving, d) enshrouding, e) planting, f) reduction of vehicle speeds and g) other measures as specified by the air regulatory authority. Whatever the primary purpose, air quality improvement have in general been accomplished. The following discussions present the actions that have been implemented as well as those that have been eliminated.**

**The road system in the CBJ, like many others in urban and rural environments is maintained by two separate government agencies. All residential and arterial roads are maintained by the City and Borough of Juneau. The Egan Highway, Glacier Highway, and Mendenhall Loop Road are serviced by the state ADOT. The Egan Highway, Mendenhall Loop Road, and Riverside Drive are principle Valley thoroughfares.**

2. Paved Roads - Sanding Material Specifications

The research performed by ADOT revealed that the local sanding material is currently meeting the highest practical level of performance. Table III.D.3-22 below presents the current sand specifications. The City and Borough uses pea gravel for sanding, which has a specification of 0.5 percent to pass a #200-mesh screen. ADOT uses a finer material to reduce windshield damage on the higher speed roads it services; however, fines are restricted to less than 5 percent. The supplier to both agencies had to wash the material to achieve the specification. In the professional opinion of the research engineer it would be of little benefit to attempt to achieve a yet higher level of performance. **Workshops between ADEC, ADOT and CBJ have reassessed this finding with the conclusion that alternate materials may be appropriate on a limited basis.**

An additional alternative would be to use a higher application of de-icier and a lower volume of sand. The City and Borough has conducted trials using urea and calcium magnesium acetate, which have been shown to perform poorly in cold weather. Work with another alternative called "quick salt" has been quite successful and the city has increased the use of this material. Quick salt is a salt material combined with a wood pulp by-product called PCI.

In general, during the last five years ADOT has reduced its application of salt to reduce vehicle corrosion problems. Consequently, since approximately 1983 a higher

rate of sand use has occurred on the major roadways. The City and Borough of Juneau is also concerned about vehicle corrosion. These concerns are responsible for the trials of alternative de-icing substances. Currently, the city in general relies most upon de-icier while ADOT strongly favors the use of sand.

**Control techniques for paved roads are designed to either prevent deposition of material on the surface or to remove material which has been deposited in the driving lanes. Estimated PM10 control efficiencies for paved road controls such as; water flushing, water flushing followed by sweeping, improved sweeping or use of suppressants range from about 30 percent to over 90 percent (EPA-Control of Open Fugitive Dust Sources-1988).**

**Monitoring data for the Valley reflects the effects of winter snow control programs and their adverse impact on ambient PM10 concentrations. Studies have indicated that road sanding may produce early spring silt loading several times higher than the mean loadings of the area. Appropriate controls include: (a) clean-up as soon as practical, (b) the use of improved materials, and (c) improvements in planning or application methods.**

**Mechanical street cleaners employ rotary brooms to remove surface materials from roads and parking lots. Their operation is quite noticeable and as such lends credence to claims that this operation is as much a source as it is a control of particulate. However, in the case of the Valley's meteorology that causes short term dry spells, sweeping appears to be a viable option for cleanup of excess sand. There is the additional element of public safety that ADOT and CBJ will provide expert opinions on as this program is being investigated.**

Table III.D.3-22
SAND SPECIFICATIONS - MENDENHALL Valley

| Sieve Size | Percent Passing City/Borough | Percent Passing DOT/PF |
|---|---|---|
| 3/8" | 90-100 | 100 |
| #4 | 40-80 | |
| #8 | 8-12 | |
| #16 | | 0-50 |
| #200 | -0- | 0-5 |

Note: The openings on #200 sieve are about 75 microns

3. Paved Roads - More Effective Spring Clean-up

Upon investigation, it became evident that early spring clean-up of the sanding debris is **a critical element of normal roadway maintenance for both the City and the State.** The cleaning operation is limited to two parameters. First, the safety of drivers cannot be jeopardized by removal of the traction aid until freezing and icing is over for the winter season. Second, since most of the sweepers are wet devices to control dust entrainment, cleaning can only occur when temperatures are above freezing. These two parameters usually mean that street cleaning does not begin until early to mid April requiring 3 to 5 weeks to complete. Recent conversations with ADOT indicate that **a limited number** of their sweeper fleet are vehicles with dry sweeping systems. **ADOT and CBJ , in consultation with ADEC,will investigate funding sources (ie. CMAQ monies) to allow more efficient sweepers to be added to their inventory.**

4. Paving of Gravel Roads

**The focus of this SIP revision is to have the Valley in compliance with the PM10 standard by December 31, 1994 and to improve air quality for Valley residents. This strategy will enable the State to avoid a "serious" classification by EPA. Based on *the* requirement *to have monitored values below 150µg/m$^3$*, additional planning in the form of a more comprehensive nonattainment plan *was needed.* This requires the addressing of areas such as:**

**a. the influences of heavy sanding material on road surfaces during "all" extended dry periods within the Mendenhall Valley;**

**b. the influence of new control measures that are being investigated by the ADOT;**

c. **the influences of additional restrictions on activities that add to fugitive dust generating material(s) upon the road surfaces and potential for cost-effective alternatives that might lead to reduced emissions;**

d. **paving of unpaved roads in the Valley;**

**In 1991 the City and Borough of Juneau initiated a pilot paving project in the Lemon Creek area to test potential "quick fix" solutions for Juneau's unpaved roads. Based on the success of the Lemon Creek test, the CBJ embarked on an LID-based paving project for the Mendenhall Valley in the summer of 1992. The cost competiveness of a new "hot-mix" asphalt surface has amended the quick fix method to a more effective and lower maintenance road surface. This process appears to be the solution to the dust problem in the Valley and is the basis for this amendment to the SIP.**

Information collected at the time of the emission inventory indicates that approximately 27 of the 47 road miles in the Valley are not paved. Since the particulate control program began in 1983, 3.6 miles of roadway have been paved. Of the 3.6 miles, 0.8 were completed since the start of PM10 air quality monitoring. **The remaining 27 miles of unpaved road is split into various sections of the Valley. The portion of the Valley responsible for the PM10 exceedances involves about 85,000 feet of unpaved road and is located in the eastern half of the Valley. The CBJ implemented a "Local Improvement District (LID) tax assessment program to supplement a dedicated gas tax used for paving needs in the CBJ. The new paving is accomplished through a joint funding arrangement between adjacent property owners and the city government. This LID program has resulted in the completion of paving of about 20,000 additional feet of road during the summers of 1991 and 1992.**

A list of remaining unpaved roads in the Valley (approx. 65,000 feet) has been tabulated by the Engineering Department of the CBJ (1993). This list has been confined to roads within the Mendenhall Valley airshed (see Figure III.D.2) and corresponds with the Engineering Science emissions inventory document. Based on the design criteria the percent reduction for compliance with the 24 hour ambient PM10 standard is about 66-percent. As evidenced by the ambient measurements at the Glacier/Auto site, compliance is possible when roads are paved in a sector of the Valley. Given this condition, the State and CBJ proposed to pave a significant portion of the Valley's remaining gravel roads in 1993 and 1994. A complete listing of those roads is found in the following tables.

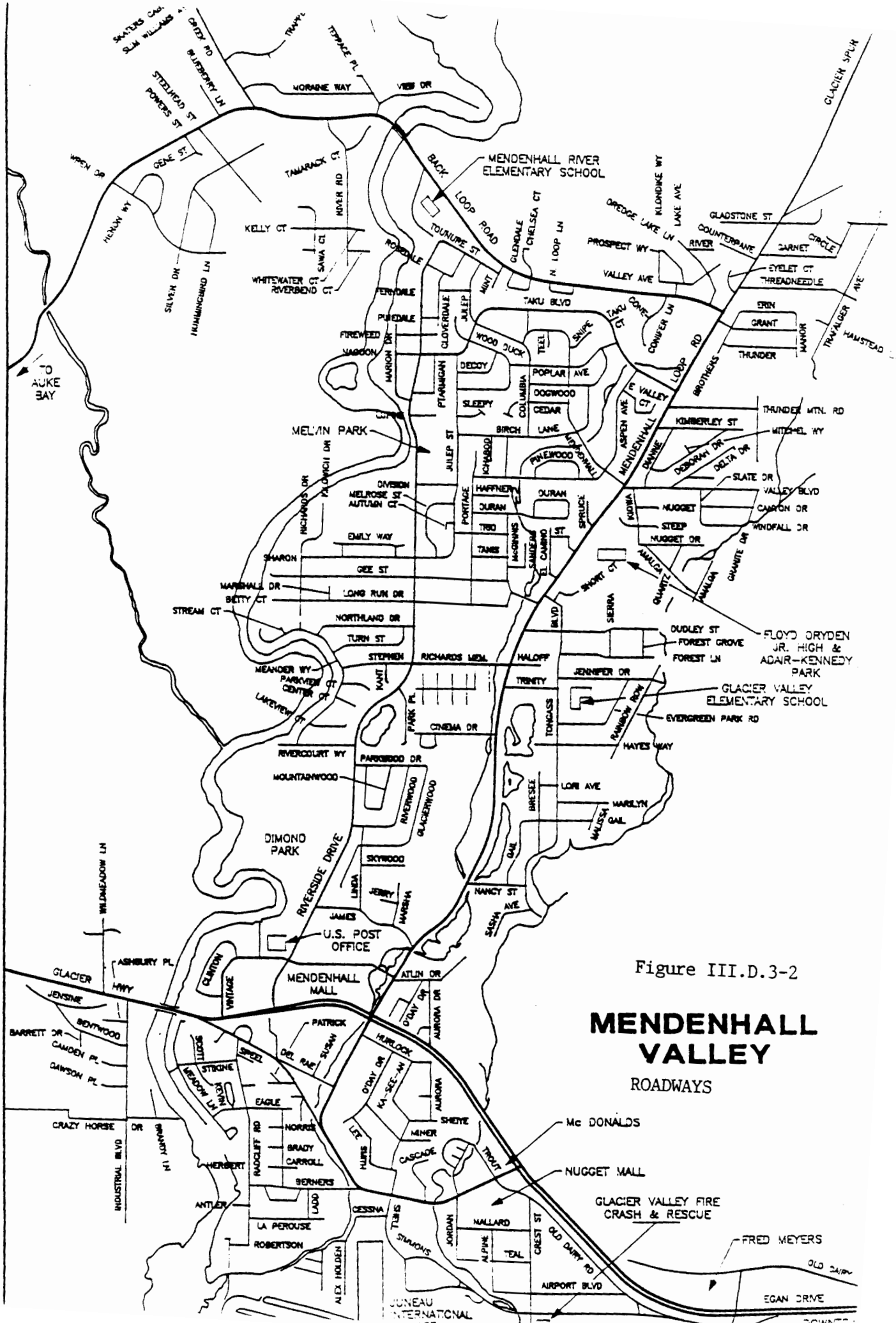


Figure III.D.3-2

Responding to numerous PM10 nonattainment areas, the US Department of Transportation issued a Memorandum. In it is the Policy for Eligibility of PM10 abatement Projects under the Congestion Mitigation and Air Quality Improvement Program (CMAQ). Under guidelines of the policy statement, States were eligible to receive funding for projects and programs which reduce transportation-generated PM10 emissions in a nonattainment area. The Alaska Legislature has authorized this program in 1993 as a PM10 abatement project (paving of roads) for the Mendenhall Valley non-attainment area.

Prior to the availability of CMAQ funding, the City and Borough of Juneau was unable to meet the requirement of the new Clean Air Act and demonstrate attainment for PM10 by December 31,1994. Limited funding, short construction seasons (June--August) and a high frequency of unfavorable meteorological conditions made attainment impossible. Not until the CMAQ monies were made available for PM10 impact mitigation, did the City have the ability to meet the intent of the Act. Additionally, the Department was able to write an effective SIP revision.

**The 1993 construction year (Table III.D.3-23) has a proposed schedule for an additional 13,000 feet of new LID funded paving in the Valley. The 1993 construction year should reduce contributing sources in the area by about 20 percent. Completion of this segment of construction will not reduce the unpaved portion of Valley roadways to a level that compliance with the PM10 standard is achieved. The remaining paving activity would be scheduled for the 1994 construction year. State legislative action in the 1993 year, appropriated funding of about $2 million. This money is expected to enable the completion of up to 40,000 feet (Table III.D.3-24 and 25) of unpaved roads in the Mendenhall Valley. This will bring the 1991 to 1994 total paving for roadway source reductions to about 89 percent. Portions of these unimproved roads will need significant "road-base" improvements as well as major drainage or road utility easement work. Juneau's limited construction season of about 40 to 80 work-days, will be the major factor in this work schedule. For these reasons a portion of the 1994 construction log is identified as possible 1994/95 construction seasons.**

**The remaining 10,000 feet of unpaved roads is part of the long term LID Paving program and is proposed as a contingency element of this PM10 compliance plan. The Mendenhall Contingency Table III.D.3-27, list the roads for this element.**

5. Dust Control on Gravel Roads

**The normally high number of days with measurable precipitation makes routine dust control an infrequently practiced dust suppression measure on local gravel roads.** Frequent local precipitation is usually adequate to minimize citizen complaints **and maintain healthy particulate concentrations.** Extended dry periods do generate public complaints on dust. The city has used calcium chloride on a trial basis for dust control. It was found to be unacceptable because it caused increased

rutting of the road surface by drawing moisture from the roadbed **and making a more hazardous roadway. Frequently, steady precipitation also tends to reduce the effect and longevity of dust suppressant applications.**

## Table III.D.3-23
## MENDENHALL Valley
## STREET SURFACING SCHEDULE
## 1993 CONSTRUCTION

done in 1993

| STREET | LENGTH | REMARKS |
|---|---|---|
| Columbia Blvd. | 430 | 4" depth of aggregated reqd. |
| Dogwood Ave. | 319 | " |
| Sesame St. | 560 | " |
| Aspen Ave. | 782 | " |
| McGinnis Dr. | 1681 | " |
| Long Run Dr. | 1652 | " |
| Tanis St. | 550 | " |
| Trio St. | 637 | " |
| Dudley Street | 1880 | |
| Tongass Blvd. | 1217 | Additional drainage and subbase work reqd. |
| Portage Blvd. | 325 | 4" depth of aggregate reqd. |
| Cloverdale St. | 640 | " |
| Rosedale St. | 730 | " |
| Pinedale St. | 220 | " |
| Firndale | 420 | Additional aggregate and drainage improvements reqd. |
| W. Gladstone St. | 780 | |

NOTE: 1. All streets are to be surfaced with 2-inch hot-mix asphalt.

2. A majority of these roads are within the "Target-Hot Spot" zone of the Valley.

# Table III.D.3-24
# MENDENHALL Valley
# STREET SURFACING SCHEDULE
# 1994 CONSTRUCTION

| STREET | LENGTH | REMARKS |
|---|---|---|
| Portage Blvd. | 1880 | Storm drainage system needs to be installed prior to surfacing |
| Haffner Court | 560 | |
| Gee Street | 660 | Storm drainage system needs to be installed prior to surfacing |
| Sanders Street | 550 | |
| Short Way | 330 | |
| El Camino Street | 830 | |
| Duran Street | 1850 | |
| Thunder Mountain Rd. | 1210 | |
| W. Steep Place | 360 | |
| Nugget Place | 900 | |
| Kiowa Drive | 790 | |
| Amalga Street | 800 | Poor base and high ground water |
| Valley Blvd. | 800 | Poor base and high ground water |
| Haloff Way | 360 | Narrow R/W, drainage required |
| Sierra Street | 360 | |
| Forest Grove Drive | 360 | |
| Forest Lane | 820 | |
| Delta | 1100 | Poor subbase |
| Dianne Road | 900 | |
| Kimberly Street | 1140 | |
| Jennifer Drive | 1350 | |
| Evergreen Park Road | 1360 | |
| Hayes Way | 1230 | |
| Rainbow Row | 1080 | |
| Taku | 840 | |

## Table III.D.3-24 (continued)
## MENDENHALL Valley
## STREET SURFACING SCHEDULE
## 1994 CONSTRUCTION (continued)

| STREET | LENGTH | REMARKS |
|---|---|---|
| Ptarmigan | 820 | |
| Lupin | 390 | |
| Bresse Street | 1000 | |
| Lori | 220 | |

## Table III.D.3-25
## MENDENHALL Valley
## STREET SURFACING SCHEDULE
## 1994/95 CONSTRUCTION

| STREET | LENGTH | REMARKS |
|---|---|---|
| E. Gladstone St. | 450 | |
| Garnet St. | 1570 | Drainage improvements required |
| Circle Dr. | 250 | " |
| Threadneedle St. | 1620 | " |
| Trafalgar Ave. | 2420 | Substantial grading and ditching |
| Hamstead Lane | 210 | |
| Counterpane Lane | 500 | Substantial grading and ditching |
| River Place | 360 | |
| Dredge Lake Road | 1020 | |
| Klondike Way | 380 | Substantial ditching required |
| Valley Avenue | 800 | |
| Lake Avenue | 100 | |
| S. Tongass Blvd. | 390 | |
| Sasha Avenue | 710 | |
| Atlin Drive | 750 | |
| Teslin Street | 850 | Poor Subbase |
| Fireweed Lane | 680 | |
| Marion Drive | 1190 | |
| Haffner Court | 560 | |
| Killewich Drive | 1050 | |
| Sunset Street | 610 | |
| Radcliff Court | 210 | |
| Kevin Court | 800 | |
| Dunn Street | 350 | Narrow R/W, drainage required |
| S. Radcliff Road | 300 | |

Alternative road surface materials have also been examined and applied to reduce maintenance cost. These material changes can also assist in reducing the available silt content of the road. Typically a D-1 material is used for gravel roads. This material compacts well and provides a hard, smooth surface. Recently a more coarse material has been shown to be successful on low volume roads. This coarser rock contains less fines and, consequently, a lower amount of suspendable fine particulate matter. The material, unfortunately, does not hold up well on higher volume, higher speed roads. One control option **initially** examined **but not** implemented in Juneau was the application of suitable **stabilizers** to the road surface. **Regulatory changes has refocused alternative suppressant** research in the field of water quality standards or discharge of potentially toxic materials onto or into waterways or land surfaces. Some of this has been to use non-toxic chemical stabilizers not prohibited by the State or EPA. This **was considered** the most favorable option from a cost and emission reduction potential when considering the unacceptability of calcium chloride use. Another alternative was applying recycled asphalt to gravel roads as used for the Eagle River area to control dust emissions. **This technology was applied on a limited basis in the Juneau area but not found to be cost competitive.**

## F. COMPLIANCE DEMONSTRATION

The 1993 Plan includes the implementation of RACM for sources of PM10 and as proposed would demonstrate attainment by December 31, 1994. Projected ambient PM10 levels resulting from the implementation of these control measures should range from 77 $\mu g/m^3$ to 101 $\mu g/m^3$. The emissions reductions necessary for the Valley to attain the standard were calculated by extrapolation to be about 460 tons/year. Control of emissions from unpaved roads will provide the majority of these reductions with new woodstove technology and paved road controls adding to this need. The emissions inventory prepared by Engineering-Science (1988) was used as a baseline to determine Valley-wide PM10 emissions.

To evaluate long term attainment, growth projections of about 5 percent were applied to the ambient emissions estimates for 1994 and 1997. This growth value was the result of consultations with CBJ and others in the local planning and land development field. The recent closure (1993) of the Greens Creek mine and lose of nearly 400 full time employees will only serve to further reduce estimated growth. Table III.D.3.26 presents the expected reductions (681 tpy from unpaved roads ) in emissions due to the RACM. As an offset to projected decreases, the Valley particulate total may increase by 48 tons/year due to projected growth. This growth would reflect a 4 to 5 $\mu g/m^3$ increase in expected ambient values for PM10. However, the projected ambient PM10 levels will remain significantly below the standard and should remain so into the foreseeable future.

**Table III.D.3.26**
**Expected Reductions in PM10 Emissions Due to Emission Control Measures in the Mendenhall Valley**

| Source | Year | Reductions | Reductions Tons/year | Projected Growth Tons/year |
|---|---|---|---|---|
| Paved Roads[1] | 1993 | 15% of 801 tons/year | 120 | 11 |
| | 1994 | 15% of 681 | 102 | |
| | 1995 | 0% of 579 | 0 | |
| Unpaved Roads | 1993 | 20% x 698 | 140 | 34 |
| | 1994 | 69% x 558 | 385 | |
| | 1995 | 90% x 173 | 156 | |
| Woodstoves[2] | 1993 | 20% x 149 | 30 | 3 |
| | 1994 | 20% x 119 | 24 | |
| | 1995 | 0% x 95 | 0 | |
| Grand Total Reductions | | | 961 tons/year | 48 tons/year |

[1] Track out control and winter sand control
[2] Est. Annual replacement of stoves - USFS/CBJ and ordinance 91-52

## G. CONTINGENCY MEASURES

**The proposed fugitive dust control strategy is anticipated to provide adequate reductions in emissions. These reductions should bring the Valley into compliance with the PM10 standard. The nearly 60,000 feet of new paving is a primary element of the compliance design for this SIP. This amount of road paving is anticipated to reduce the contribution to prior high ambient PM10 values by about 89 percent. However, if the scheduled 1993-94 paving does not allow a demonstration of compliance. The State will complete paving of the following roads listed in Table III.D.3-27. The paving action may require further analysis as the remaining roads are segmented and unevenly distributed in the Valley airshed.**

## Table III.D.3-27
## MENDENHALL Valley (continued)
## STREET SURFACING SCHEDULE
## 1994/95 CONSTRUCTION CONTINGENCY

| STREET | LENGTH | REMARKS |
|---|---|---|
| O'Day Drive | 1150 | |
| Lee Smith Drive | 1110 | |
| Miner Drive | 720 | |
| Alpine Avenue | 880 | Commercial Area |
| Airport Blvd. | 1890 | Commercial Area |
| S. Jordan Avenue | 450 | Commercial Area |
| Teal Street | 1050 | Commercial Area |

NOTES: 1. Lengths are approximate.
2. Additional subsurface investigation is required to determine which streets are to be surfaced with hot-mix asphalt or treated base and chip seal.
3. This list does not represent a paving priority list.

1. PM10 Contingency Control Measures:

**As a result of workshops between the Department, ADOT, and CBJ, a program to evaluate roadway dust control procedures on high traffic arterials of the Valley will be investigated. The purpose is to assess the effect of reducing peak emissions under adverse and abnormal conditions. The methods to be investigated are; 1) use of manufactured sand (coarser sand), 2) target cleaning during dry spells, 3) limited application of chemical deicers, 4) evaluation of chemical stabilizers, and 5) added public awareness. The design goal is to reduce paved roadway contributions to the Design 24-hour PM10 level an additional thirty percent (30%).**

**Many sources contribute to paved road PM10 emissions. The following control measures will be investigated as to which route the State may select to take in regards to these sources:**

- **Spills from trucks hauling particulate materials**
- **Require the installation of liners on truck beds**
- **Require watering of loads when appropriate**

- Require cargo that cannot be controlled by other measures to be covered
- Require trucks to maintain a freeboard
- Construction carryout and entrainment
- Require construction activities to limit and remove the visible accumulation of dust generating materials
- Require the access road to the construction site to be paved
- Require the developer of a construction site to clean soil from access road and public roadway
- Vehicle entrainment from unpaved areas adjacent to paved roadways
- Require stabilization of unpaved areas adjacent to paved roads, such as shoulders
- Erosions from storm water washing onto streets
- Development of adequate storm water control systems
- Use of vegetative stabilization when practical
- Develop programs for the rapid cleanup of street debris after events
- Wind erosion from outdoor storage of loose material that could be direct emitters of PM10
- control the outdoor storage of loose materials that could be direct emitters of PM10
- require wind breaks in vicinity of outdoor storage piles

## XI. EFFECTIVENESS OF IMPLEMENTED PROGRAMS

### A. WOOD SMOKE PROGRAM

The task of evaluating the effectiveness of any control program can be quite difficult if the program has not been implemented for a number of years. In most cases, the use of some qualitative data are necessary since quantitative information directly applicable to the assessment is either difficult or impossible to obtain. In the case of the wood smoke control plan for the Mendenhall Valley, there does exist some quantitative data by which to judge the success of the management plan.

#### 1. Short-Term Improvements

The effectiveness of the program can be illustrated by the examination of changes in air quality. Figure III.D.3-3 illustrates a typical change in short-term air quality conditions when an air emergency was proclaimed by the local government. The hourly air quality data is collected from a continuously operated nephelometer which has a pre-established correlation with winter season TSP and PM10. This figure depicts a November period of 1984. The air quality index is for TSP since PM10 monitoring was not performed at that time. Until 1986, all episodes were air emergencies. The present 2-stage episode structure uses an air alert and emergency, although an air emergency has yet to be called since the 2-stage system was adopted.

The promulgation of a PM10 particulate standard in 1987 changed the measurement criteria for this pollutant. Concurrently the resulting decline of particulate values remained in effect with the wood smoke abatement program. The data indicated a sustained particulate concentration below the newly established standard.

The number of curtailment days varies from year to year as shown in Table III.D.3-28. Local weather patterns are the key factor for determining the number and duration of episodes. The values presented in the table are based upon a 24-hour day. In many cases episodes are announced in the late afternoon and released in the morning. Evening hour episodes frequently occur wherein burning is prohibited only a portion of a day. The values reflected in the table are lower than the actual number of calendar days when wood burning was prohibited.

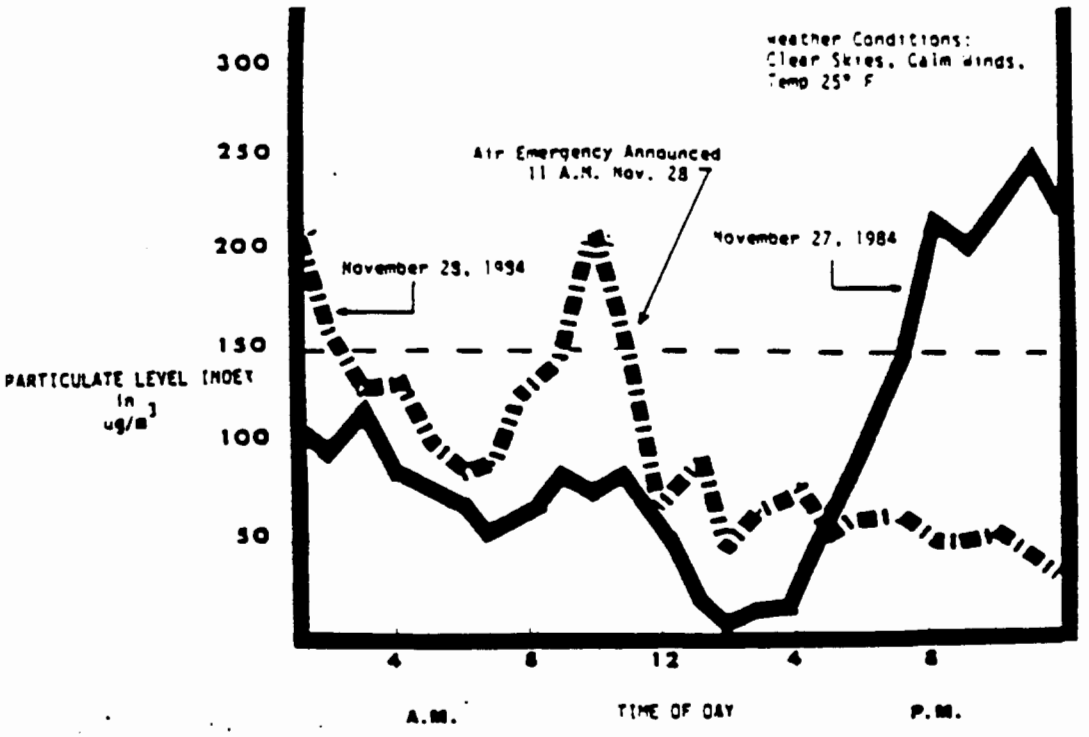


Figure III.D.3-3

Table III.D.3-28

WOOD USE CURTAILMENT DAYS

| WINTER SEASON | No. DAYS |
|---|---|
| 1982/83 | 2.1 |
| 1983/84 | 7.8 |
| 1984/85 | 10.4 |
| 1985/86 | 28.9 |
| 1986/87 | 7.4 |
| 1987/88 | 14.1 |
| 1988/89 | 12.6 |
| 1989/90 | 3.7 |
| 1990/91 | 18.3 |
| 1991/92 | 6.0 |
| 1992/93 | 9.2 |

source: CBJ Land and Resource Management Office, 1993

The continued success of the curtailment program has been strongly dependent upon the application of an appropriate field enforcement program. With the enforcement being accomplished by the city police department, there is an established mechanism for handling telephone complaints as well as the enforcement function. Table III.D.3-29 lists the number of citations issued each year in addition to complaints and written warnings. Verbal warning, which can be numerous, are not recorded.

2. Long-Term Improvements

The principal strategy of the wood smoke control program is to issue air quality episodes when necessary. The success of the program, however, is the result of a multi-faceted program, of which the episodes is one. Effective implementation of all program components is not only responsible for reductions in short-term exposures but also long-term improvements in air quality. These supporting program components such as insulation standards, no sole-heat dependence on wood, and economic incentives to purchase low-emission devices have been discussed in the previous section.

**In January, 1992 the CBJ adopted a more stringent approach to wood stove usage in the Mendenhall Valley. Part of this action was to combat high pollution levels under the strong winter inversions. The amendment included a provision which terminated the current exemption given to certified woodstoves and their use during an " ALERT". This special exemption will expire for certified woodstoves in 1997 and only pellet stoves will be allowed for use during woodsmoke alerts. This action has prompted many Juneau residents to switch to cleaner-burning pellet stoves. These wood burning devices use peanut size**

**nuggets as the fuel and if properly operated emit, very little smoke (particulate matter). According to heating stove retailers in the Juneau area, pellet stove sales are 70 percent of the market and wood stoves are only about 30 percent. It might be concluded that the action of the Borough has reversed the market over previous years. According to the U.S. Forest Service, an event compounding the more stringent CBJ air-quality emission regulations is a decrease in Juneau area wood supply over the past 10 years,**

In summary, the wood smoke control program implemented in 1983 has without doubt improved local air quality on both a 24-hour and seasonal basis. The majority of improvements were accomplished prior to the adoption of the PM10 standard. Maximum 24-hour exposures of TSP were reduced from 600 $\mu g/m^3$ to approximately 100 between 1982 to 1987. **Excluding the exceptional events discussed in this plan, the maximum 24-hour exposures of PM10 have been reduced for the winter season. Concurrently the maximum monitored levels for PM10 have generally declined with the exceptions of high PM10 days caused by elevated road dust, below normal precipitation and strong winds.**

**Table III.D.3-29**
**ENFORCEMENT RECORDS**

| CALENDAR YEAR | COMPLAINTS | WARNINGS | CITATIONS |
|---|---|---|---|
| 1985 | 201 | 19 | 63 |
| 1986 | 64 | 1 | 25 |
| 1987 | 9 | 15 | 0 |
| 1988 | 66 | 3 | 11 |
| **1989** | **40** | **0** | **3** |
| **1990** | **26** | **0** | **2** |
| **1991** | **26** | **0** | **8** |
| **1992** | **35** | **0** | **6** |
| **1993** | **66** | **1** | **41** |

**Source: CBJ Lands and Resources/Juneau Police Dept., 1993**

B. FUGITIVE DUST EMISSIONS

1. **Emissions Projection**

**The State and CBJ have proposed to control fugitive dust sources in the Valley by paving of all unpaved roads. The control measures provided in the Plan are broad and illustrate several options to control emission sources. Reasonably Available Control Measures (RACM) are required to control emissions from fugitive dust sources for moderate areas. Control measures are defined as actions designed to improve air quality by altering the amount, character, time or place of emissions.**

**Table III.D.3-10 is a breakdown of the emissions into percentage contributions from the 1987 source apportionment study. The table demonstrates that "road dust " is the largest contributor, emitting nearly eight times the amount emitted by residential wood combustion, the second largest contributor. From the expected 1994 emissions presented in Table III.D.3-17 or 3-20, it can be concluded that the control of unpaved roads generates adequate emissions reductions. As described earlier, the greatest part of the nonattainment problem occurs because the short term 24-hour standard, (150 $\mu g/m^3$) is exceeded on several occasions. This underlines the uniqueness of the Valley's situation. Conditions that occur regularly are not those that cause large long term exceedances.**

**The emissions reductions from this control measure are based on the reduction in the amount of particles per vehicle unit from a paved surface vs. an unpaved surface. The efficiency should be directly proportional to the percentage of unpaved road completed under the control measure(s). A comparison of AP-42 emission factors for paved and unpaved roads indicates the expected efficiency**

**should result in a ninety percent (90%) reduction in emissions. Continued monitoring at the Valley sampling sites will demonstrate the premise of compliance with the standard.**

## XII. MAINTENANCE OF AIR QUALITY

Normally, one thinks of maintaining current ambient air quality conditions by preventing the growth of emissions from the various sources. Growth of emissions from the two primary sources of concern for the Mendenhall Valley could occur most readily with population increases. Various parts of the previous text relayed how ambient pollutant concentrations are more a function of population density and inversion occurrence than overall population numbers. **Early control programs focused on the theory of strong local stagnation limiting horizontal transport of the emitted pollutants. The pollutant of interest as established by chemical composition analysis of sample filters was woodsmoke. For this pollutant, this control strategy was most effective. However, as more current data has revealed there is a strong influence from local activities on unpaved roadways. This man-made activity coupled with dry surfaces and high winds significantly contributes to high measurements of PM10 in the immediate area. These meteorological and emission source conditions indicate compliance will not be a function of controlling airshed-wide emission qualities. Rather it will be the containment of emission densities within existing or new residential districts.**

The state New Source Review regulations mandate that new or modified sources will not cause or contribute to a violation of the air quality standards or **PSD** increments.

### A. New Residential Developments

A large portion of the Mendenhall Valley is currently undeveloped. Of the remaining area which could be developed, most is located on the western side of the river. Existing local government codes require road paving for all new residential districts. Once established, the Borough will maintain these roads. Federal New Source Performance Standards require that all new wood heating devices meet specified emission limits. The new stove emission rates are generally one-fourth to one-half the rate of most existing wood hearing devices operating in the airshed. Within the structure of the wood smoke ordinance, homeowners could receive a permit for each of the new devices allowing its operating during air alerts when stagnation conditions exist. Depending upon the severity and duration of the stagnation, an ambient particulate problem could be generated. In such a situation, the **CBJ** ordinance allows an air emergency to be declared. This action mandates the shutdown of **nearly** all wood heating devices **(pellet stoves exempted).** The Juneau population has been stagnant for the past several years. No significant home construction has occurred since 1986. In future years as population and construction increase, adjustment of the monitoring resources to address the new residential districts will be in order.

B. Existing Residential Districts

The demonstration of attainment with the new PM-10 ambient standard is based on air measurement data. This data is collected over a period of several years at existing **sampling sites in** residential districts of the Valley. This program of continuous measurement shows improvements have been accomplished **under the PM10 control strategies.** To date, very limited investigations have been conducted to ascertain whether the location of the existing monitors truly represent the maximum pollutant concentrations to which the public is exposed.

Analyzing the density of unpaved roads and the relative distribution of current Class I heating devices, allowed the Department to perform field monitoring of potential high impact zones. This work began in the fall of 1989 by shifting some existing monitoring instruments. **As resources and input data bases are developed, application of EPA air dispersion models will be utilized. The purpose is to evaluate the effectiveness of the control measures of the plan. The PM10 reduction planning process is a continually evolving field of science. There are many unknowns with regards to the sources and causes of PM10. This effort will either reinforce the premises of the presented plan or indicate that additional controls are necessary to protect all Valley residents from the harmful effects of fine particulate matter by maintenance of the air PM10 standard.**

CONCLUSION:

**The Mendenhall Valley is nonattainment for PM10 for the state 24-hour particulate standard of 150$\mu g/m^3$. Because of the level of nonattainment, the area is presently designated as a "moderate" nonattainment region. Based on this designation, the state is required to prepare a PM10 nonattainment plan to show attainment by 1994 through the application of RACM. The PM10 nonattainment area plan that has been presented here was developed around existing knowledge of the sources and source impacts from PM10 in the Valley. While the initial strategy was adequate to demonstrate attainment, funding was not sufficient. Without the availability of CMAQ monies the State and CBJ would not be able to implement a timely program with sufficient reductions to meet the 1994 date.**

The control measures that are proposed and discussed are the most significant measures that have been used to estimate the reductions and effects on PM10 in the Valley. These measures, implemented for paving of unpaved roads are estimated to be sufficient to show attainment by 1994. Due to the limited amount of land available for further growth, expansion potential, an projected industrial growth, a limited increase in particulate emissions is projected for the next three to five years. This coupled with the effective control strategy developed, should allow the CBJ to easily demonstrate attainment of the PM10 standard for the next five to ten years.

The ambient monitoring network for the Valley will continue and will be operated in conformance with EPA Ambient Monitoring Guidelines. The PM10 monitors are

operated to meet Federal requirements in; Appendix A (Quality Assurance), Appendix C (Monitoring Methodology), Appendix D (Network Design), and Appendix E (Probe Siting Criteria) and State ambient monitoring criteria.

# APPENDIX-A

# FISCAL YEAR 1994 CP-1s

PROJECT TITLE: JUNEAU-Air Quality/PM 10 Reductions in the Mendenhall Valley
LOCATION: JUNEAU REGION: SOUTHEAST COMPLETION DATE: 10/30/94 ED -4
APPROPRIATION TO: DOT&PF OMB PROGRAM: TRANSPORTATION
OMB WORK TYPE:

| FUNDING: | CAPITAL REQUEST | OPERATING COSTS | NEW POSITIONS(PFT) |
|---|---|---|---|
| 1002 FEDERAL RECEIPTS | 2,000.0 | | |
| 1003 GENERAL FUND MATCH | | | |
| 1004 GENERAL FUND | | 0.0 | 0 |
| 1005 PROGRAM RECEIPTS | | | |
| 1007 INTER-AGENCY RCPTS | | | |
| 1026 HWCF | | | |
| 1027 IARF | | | |
| 1061 CIP RECEIPTS | | YEAR ALTERNATE | FY |
| TOTAL | 2,000.0 | YEAR EXPECTED | FY '93 |

PROJECT DESCRIPTION: THIS REQUEST WILL PROVIDE FUNDING TO CORRECT EXISTING AIR QUALITY PROBLEMS IN JUNEAU'S MENDENHALL VALLEY ASSOCIATED WITH HIGH CONCENTRATIONS OF PARTICULATE MATTER GENERATED BY TRAFFIC ON LOCAL RESIDENTIAL STREETS.

PROJECT JUSTIFICATION: THE PROJECT IS NEEDED TO CORRECT THE ROAD RELATED AIR QUALITY PROBLEMS IN THE MENDENHALL VALLEY IN COMPLIANCE WITH THE INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT OF 1991 AND THE CLEAN AIR ACT AMENDMENTS OF 1990. COMPLIANCE IS REQUIRED PRIOR TO DECEMBER 1994 IN ORDER TO AVOID THE POTENTIAL FOR ENVIRONMENTAL PROTECTION AGENCY SANCTIONS.

Approved



Presented by: The Manager
Introduced: 12/16/91
Drafted by: J.R.C./S.B.G.

ORDINANCE OF THE CITY AND BOROUGH OF JUNEAU, ALASKA

Serial No. 91-52

AN ORDINANCE AMENDING THE WOODSMOKE CONTROL CODE TO LOWER THE PARTICULATE COUNT THRESHOLD FOR DECLARING AIR ALERTS, TO AUTHORIZE THE MANAGER TO DECLARE AN AIR ALERT ACCORDING TO CERTAIN QUALITATIVE CRITERIA, TO PROVIDE FOR THE EXPIRATION OF ALL EXISTING CLASS I PERMITS ON JULY 1, 1997, TO TERMINATE THE MANAGER'S AUTHORITY TO ISSUE NEW CLASS I PERMITS, AND TO PROHIBIT THE BURNING IN WOODSTOVES OF SUBSTANCES OTHER THAN PAPER, CARDBOARD AND UNTREATED WOOD.

BE IT ENACTED BY THE ASSEMBLY OF THE CITY AND BOROUGH OF JUNEAU, ALASKA:

* Section 1. Classification. This ordinance is of a general and permanent nature and shall become a part of the city and borough code.

* Section 2. Amendment of Section. CBJ 36.40.030(a) is amended to read:

(a) "Solid fuel-fired heating device" or "device" means a device designed for solid fuel combustion so that usable heat is derived for the interior of a building, and includes solid fuel-fired stoves, fireplaces, solid fuel-fired cooking stoves and combination fuel furnaces or boilers which burn solid fuel, but does not include stoves, fireplaces, furnaces, or boilers designed and used exclusively for the combustion of wood pellets having a maximum length of one inch in any dimension.

* Section 3. Amendment of Section. CBJ 36.40.040 is amended to read:

36.40.040 AIR POLLUTION ALERTS AND EMERGENCIES. (a) For the purposes of this section, the manager shall declare an air pollution alert to be in effect whenever the ambient concentration of particulate matter 10 micrometers and less in diameter (Pm-10) within the air pollution zone equals or exceeds 75 micrograms per cubic meter (ug/m3) averaged over a twenty-four hour period and will remain at or above 75 ug/m3 if an alert is not called. The manager may call an alert whenever available scientific and meteorological data indicate that the ambient concentration of Pm-10 within a smoke hazard

area can reasonably be expected to equal or exceed 75 ug/m3 averaged over a twenty-four hour period. When, in the opinion of the manager, meteorological and scientific data indicate that the type of particulate measured is not hazardous, the limit may be adjusted. The manager may call an alert upon a finding that smoke conditions are, or are likely to become, a danger to health or generally objectionable to persons in a smoke hazard area.

(b) Within a smoke hazard area, no person may operate a solid fuel fired heating device during an air pollution alert declared by the manager pursuant to Section 36.40.040(a) unless a Class I permit was issued for that device at that location pursuant to Section 36.40.050 on or before February 5, 1992.

(c) Within a smoke hazard area, no person owning, operating, or in control of a solid fuel fired heating device for which a Class I permit has been issued shall cause, allow, or discharge for a period or periods in excess of twenty minutes in any four hour period, visible emissions which reduce visibility through the exhaust plume by 10 percent or greater from such device during an air pollution alert declared by the manager pursuant to Section 36.40.040(a).

(d) In the event that the manager declares an alert and the average Pm-10 concentrations nevertheless appear likely to continue to exceed 75 ug/m3, the manager may declare an air emergency during which the use of all solid fuel fired heating devices is prohibited, including those for which a Class I permit has been issued.

(e) Notice of an air pollution alert or an air pollution emergency is adequate if published in a newspaper of general circulation within the city and borough, or if given orally at least three times during a six hour period by at least two radio stations operating within the city and borough, or if made available to the general public in the form of a recorded telephone message the telephone number for which is published in the telephone directory or newspaper of general circulation within the city and borough. The prohibition shall be effective from the earlier of the time stated in the notice, six p.m. of the day the notice is published in a newspaper, the time the last required announcement of the notice is given by radio, or two hours after the time the recorded message is first made available by telephone.

Approved

(f) Notwithstanding the provisions of subsections (b) and (d) of this section, solid fuel fired heating devices may be used at any location during a loss of electrical power service to that location. Use of the device may commence no sooner than two hours after the loss of electrical service and shall be terminated as soon as practicable after reestablishment of service.

* Section 4. Amendment of Section. CBJ 36.40.050 is amended to read:

36.40.050 EXPIRATION AND RELOCATION OF CLASS I PERMITS.

(a) No class I permit may be issued for a solid fuel fired heating device after February 5, 1992.

(b) Class I permits issued on or before February 5, 1992, shall expire no later than July 1, 1997. They shall not be transferable from place to place without reapplication. When the permitted device is repermitted the manager may require information to determine if the relocated woodstove remains capable of meeting emission requirements. The manager may require evidence that any non-durable parts have been recently replaced. The holder of a class I permit shall allow an inspection of the device before the device is repermitted. Class I permits are eligible for renewal as long as the woodstove continues to meet the emission standard in effect at the time the permit was originally issued, but no renewal shall be valid past July 1, 1997.

* Section 5. Amendment of Section. CBJ 36.40.080 is amended to read:

36.40.080 SOLID FUEL COMBUSTION AND SMOKE EMISSION STANDARDS. (a) No person shall use a solid fuel-fired heating device for the combustion of any material other than paper, cardboard, or untreated wood.

(b) No person may operate a solid fuel-fired heating device in such a manner that visible emissions reduce visibility through the exhaust effluent by fifty person or greater for more than fifteen minutes in any one hour as determined by a test conducted in substantial compliance with the regulations applicable to the visual determination of stationary source emission opacity promulgated at 40 CFR 60, Appendix A, by the United States Environmental Protection Agency; provided, and notwithstanding any contrary provisions in the regulation, opacity observation shall be made at the point of greatest opacity in any portion of the emissions

plume without regard to the presence or absence of condensed water vapor. The provisions of section 36.40.040 shall apply to the operation of class I devices during air pollution alerts.

* Section 6. Effective Date. This ordinance shall be effective thirty days after its adoption.

Adopted this 6th day of January, 1992.

Mayor

Attest:

Clerk

Approved

Presented by: The Manager
Introduced: 12/16/91
Drafted by: S.B.G.

ORDINANCE OF THE CITY AND BOROUGH OF JUNEAU, ALASKA

Serial No. 91-53

AN ORDINANCE AMENDING THE WOODSMOKE CONTROL FINE SCHEDULE TO INCREASE THE FINES FOR VIOLATIONS OF THE WOODSMOKE CONTROL CODE.

BE IT ENACTED BY THE ASSEMBLY OF THE CITY AND BOROUGH OF JUNEAU, ALASKA:

* Section 1. Classification. This ordinance is of a general and permanent nature and shall become a part of the city and borough code.

* Section 2. Amendment of Section. The woodsmoke control fine schedule set forth in CBJ 03.30.055 is amended to read as follows:

**Woodsmoke Fine Schedule**

| CBJ | Offense | No. of Offenses | Fine |
|---|---|---|---|
| 36.40.040(b) | Burning during smoke hazard condition | 1st | $100.00 |
| | | 2nd & Subseq. | MCA |
| 36.40.040(c) | Excessive smoke density | 1st | 50.00 |
| | | 2nd | 75.00 |
| | | 3rd & Subseq. | MCA |

Woodsmoke Fine Schedule

| CBJ | Offense | No. of Offenses | Fine |
|---|---|---|---|
| 36.40.040(d) | Burning during an Air Emergency (all solid fuel stoves prohibited) | 1st | 100.00 |
| | | 2nd & Subseq. Within 1 Year | MCA |
| 36.40.060(a)-(e) | Open burning within smoke hazard area prohibited from November 1 to March 31; burning without a permit; in violation of a permit; which creates a danger or nuisance, etc. | 1st | 100.00 |
| | | 2nd | 300.00 |
| | | 3rd & Subseq. | MCA |

* Section 3. Effective Date. This ordinance shall be effective thirty days after its adoption.

Adopted this 6th day of January, 1992.

Mayor

Attest:

Clerk

Presented by: The Manager
Introduced: 01/04/93
Drafted by: J.R.C.

ORDINANCE OF THE CITY AND BOROUGH OF JUNEAU, ALASKA

Serial No. 93-01

[redacted] FINDING THAT SUCH LOCAL IMPROVEMENT DISTRICT IS IN THE PUBLIC INTEREST; SETTING THE BOUNDARIES OF SUCH LOCAL IMPROVEMENT DISTRICT; PROVIDING FOR THE IMPROVEMENTS TO BE ACQUIRED, CONSTRUCTED AND INSTALLED CONSISTING OF REGRADING AND SURFACING PORTIONS OF LONG RUN DRIVE, PORTAGE BOULEVARD, MCGINNIS DRIVE, TANIS DRIVE, TRIO STREET, DOGWOOD LANE, COLUMBIA BOULEVARD, SESAME STREET, ASPEN AVENUE, TONGASS BOULEVARD, AND DUDLEY STREET, AT AN ESTIMATED COST OF $752,198 OF WHICH COST AN ESTIMATED $316,099 IS TO BE BORNE BY THE PROPERTY SPECIALLY BENEFITTED AND AN ESTIMATED $436,099 BY THE CITY AND BOROUGH; DIRECTING THAT THE WORK BE DONE, THAT ANY LAND NECESSARY OR USEFUL BE ACQUIRED AND THAT EMINENT DOMAIN INCLUDING USE OF DECLARATION OF TAKING IS AUTHORIZED; CREATING SPECIAL ASSESSMENT FUND NO. 75; AND FINDING THAT SPECIAL BENEFIT TO THE PROPERTY WITHIN THE DESCRIBED DISTRICT EXISTS AND THAT EACH LOT OR TRACT WITHIN THE DISTRICT WILL BE SPECIALLY BENEFITTED IN PROPORTION TO THE AMOUNT ASSESSED.

BE IT ENACTED BY THE ASSEMBLY OF THE CITY AND BOROUGH OF JUNEAU, ALASKA:

* Section 1. Classification. This ordinance is a noncode ordinance.

* Section 2. Finding that L.I.D. is in the Public Interest. The Assembly of the City and Borough of Juneau, having considered all material factors including the deterrence to property development, maintenance of property values, health, safety, and welfare of the businesses, employees, and property owners in the proposed local improvement district, finds that the formation of a local improvement district covering property described in Exhibit "A" attached to this ordinance, to be known as Local Improvement District No. 75 of the City and Borough of Juneau, Alaska, is in the public interest.

* Section 3. Creation and Boundaries. There is created Local Improvement District No. 75 (hereinafter "L.I.D. No. 75"). The boundaries of L.I.D. No. 75 are described in Exhibit "A" attached to this ordinance and made a part hereof.

* Section 4. . Improvements to be Constructed. The improvements to be constructed, consist of regrading and surfacing portions of Long Run Drive, Portage Boulevard, McGinnis Drive, Tanis Drive, Trio Street, Dogwood Lane, Columbia Boulevard, Sesame Street, Aspen Avenue, Tongass Boulevard, and Dudley Street.

* Section 5. Estimated Cost. The estimated cost of construction of the project is $752,198.

* Section 6. Source of Funds. The portion of the construction cost to be met with city and borough funds is estimated to be $436,099. The remainder of the construction cost, will be met from the assessments against the property specially benefitted, said amount estimated to be $316,099.

* Section 7. Direction that Work be Done. The city and borough administration is hereby ordered to do or cause to be done all things necessary or useful to plan, acquire, construct, and install the improvements described in Section 4.

* Section 8. Authorization to Acquire Land. The city and borough is hereby authorized to acquire any lands or rights in land necessary or useful for the project.

* Section 9. Authorization for Eminent Domain. The city and borough administration is hereby authorized to use such eminent domain proceedings, including use of declaration of taking, as may be necessary or useful to acquire property needed for the project. The costs of any property so acquired shall be added to the project cost.

* Section 10. Appropriation. There is hereby appropriated the sum of $752,198 for the cost of the project including the acquisition of property and construction of the improvements described in Section 4.

* Section 11. Special Assessment Fund. There is created within the central treasury a special fund of the city and borough known as Special Assessment Fund No. 75. Such fund shall be used for the purpose of paying the costs of the project. City and borough funds, assessments and all other receipts shall be paid into the fund.

* Section 12. Finding of Special Benefit. The Assembly of the City and Borough of Juneau hereby finds that the property within L.I.D. No. 75 described in Exhibit "A" will be specially benefitted by the improvement and each lot or tract within such district will be specially benefitted by the improvements and each lot or tract within such district will be specially benefitted in proportion to the amount separately assessed to each lot

or tract.

* Section 13. Method of Apportioning Costs. Costs to be borne by the property specially benefitted shall be apportioned at the rate of $1,500 per lot for the first 100 feet of front footage, plus $10 for each foot of front footage thereafter, plus $450 per lot for any lot abutting a street requiring application of aggregate for surface stabilization, plus $384 per lot for any lot abutting Tongass Boulevard or Dudley Street.

* Section 14. Prepayment-in-Full Discount. No prepayment-in-full discount is provided.

* Section 15. Effective Date. This ordinance shall be effective thirty days after its adoption.

Adopted this 8th day of February, 1993.

Mayor

Attest:

Clerk

# EXHIBIT "A"

## BOUNDARY DESCRIPTION

## 1993 MENDENHALL VALLEY STREET PAVING PROJECT

## L.I.D. No. 75

Lot 21, Lots 58 through 63, inclusive, lots 84 through 88, inclusive, lots 106 through 109, inclusive and lots 112 through 115, inclusive of Mendenhaven Subdivision, U. S. Survey No.1799; Lots 1, 2, 3, and 4 of Birch Lane Subdivision, U.S. Survey No.1799;

Lots 34, 35, 36 and lots 43 through 47, inclusive of Sleepy Hollow Subdivision No. 2, U.S. Survey No.1799; Lots 1, 2, 3, and 4 of Aspen Subdivision, U.S.Survey No.1799;

Lots 1A, 1B, 1C, 2 and 3 of Block "A"; Lots 2 through 9, inclusive, of Block "B"; Lots 1, 2, 4, 6, 8 and 10 of Block "D"; Lots 1A, 1B and 2B of Block "E"; Lots 1 through 7, inclusive, of Block "G", Lots 1 through 8, inclusive, of Block "H", Lots 2, 4, 6, and 8 of Block "I" and Lot 4, Block "F" of Lu-Re-Co Homes Subdivision, Plat No. 366, U.S. Survey No.3144. Lot 1, Block "J" of Resubdivision of Lots 1 & 2, Block "J", Lu-Re-Co Homes Subdivision, U.S. Survey No.3144.

Lots 1 through 9, inclusive, of Block "A" and Lots 1 through 9, inclusive, of Block "B" of Mountain View Subdivision, Plat No. 691, U.S. Survey No.3144. Lots 1, 2, 3 and 7 of Duck Creek Subdivision, Plat No.400, U.S. Survey No. 3144. Lots 1, 2A, 2B and 4 of Duck Creek Manor Subdivision, U.S. Survey No. 3144.

Lot 12, Block "A" and Lot 1, Block "D" of Mountain View Subdivision No. 2, U.S. Survey No.3144. Lots 1A and 1B of Haffner Subdivision, U.S. Survey No.3144.

Lot 2, Block "D", Field Acres Subdivision, Plat No.238, U.S. Survey No. 2544. Lots A, B, C, D and E of Lot 1, Block "D"; and Lots A, B, C, D and E of Lot 4, Block "B" of a Resubdivision of Field Acres Subdivision, Plat No.61-2157, U.S. Survey No.2544. Lots A, B, C and D of Lot 1, Block "C", Field Acres Subdivision, U.S. Survey No.2544. Lots 1, 2, 3 and 4 of a Resubdivision of Block "C", Field Acres Subdivision, U.S. Survey No.2544.

East half and West half of Lot 1, Block "B", Field Acres Subdivision, Plat No.238, U.S. Survey No.2544. Lots 2B, 3A, 3B, 3C and 3D of De Long Lots Subdivision, Plat No.439, U.S. Survey No.2544. Lot 1 of Resubdivision of Lot 2C, De Long Lots Subdivision, U.S. Survey No.2544. Lots 14 and 15, Evergreen Park Subdivision, Plat No.299, U.S. Survey No.2100.

Lots 3A and 3G, Short Court Subdivision, Plat No.435, U.S. Survey No.2544. Lot 3, Block "A"; Lots 1 through 6, inclusive, Block "B"; Lots 1, 3, 4 and 9, Block "C" of Forest Grove

Subdivision, Plat No.685, U.S. Survey No.3751. Lot 100'X152.83' within the northwest corner of U.S. Survey No.3751, Labeled "Exception" of Forest Grove Subdivision. Lots 1A, 1B, 2A and 2B, of Forest Grove Subdivision Unit II, Plat No.83-5790, U.S. Survey No.3751.

Containing 156 parcels of land.

Presented by: The Manager
Introduced: 03/01/93
Drafted by: A.T.B./J.R.C.

ORDINANCE OF THE CITY AND BOROUGH OF JUNEAU, ALASKA

Serial No. 93-06

AN ORDINANCE CREATING LOCAL IMPROVEMENT DISTRICT NO. 76 OF THE CITY AND BOROUGH; FINDING THAT SUCH LOCAL IMPROVEMENT DISTRICT IS IN THE PUBLIC INTEREST; SETTING THE BOUNDARIES OF SUCH LOCAL IMPROVEMENT DISTRICT; PROVIDING FOR THE IMPROVEMENTS TO BE ACQUIRED, CONSTRUCTED AND INSTALLED CONSISTING OF REGRADING, IMPROVING, AND PAVING PORTIONS OF WEST GLADSTONE, ROSEDALE, CLOVERDALE, PINEDALE, AND FIRNDALE STREETS AT AN ESTIMATED COST OF $227,050 OF WHICH COST AN ESTIMATED $95,802 IS TO BE BORNE BY THE PROPERTY SPECIALLY BENEFITTED AND AN ESTIMATED $131,248 BY THE CITY AND BOROUGH; DIRECTING THAT THE WORK BE DONE, THAT ANY LAND NECESSARY OR USEFUL BE ACQUIRED AND THAT EMINENT DOMAIN INCLUDING USE OF DECLARATION OF TAKING IS AUTHORIZED; CREATING SPECIAL ASSESSMENT FUND NO. 76; AND FINDING THAT SPECIAL BENEFIT TO THE PROPERTY WITHIN THE DESCRIBED DISTRICT EXISTS AND THAT EACH LOT OR TRACT WITHIN THE DISTRICT WILL BE SPECIALLY BENEFITTED IN PROPORTION TO THE AMOUNT ASSESSED.

BE IT ENACTED BY THE ASSEMBLY OF THE CITY AND BOROUGH OF JUNEAU, ALASKA:

* Section 1. Classification. This ordinance is a noncode ordinance.

* Section 2. Finding that L.I.D. is in the Public Interest. The Assembly of the City and Borough of Juneau, having considered all material factors including the deterrence to property development, maintenance of property values, health, safety, and welfare of the businesses, employees, and property owners in the proposed local improvement district, finds that the formation of a local improvement district covering property described in Exhibit "A" attached to this ordinance, to be known as Local Improvement District No. 76 of the City and Borough of Juneau, Alaska, is in the public interest.

* Section 3. Creation and Boundaries. There is created Local Improvement District No. 76 (hereinafter "L.I.D. No. 76"). The boundaries of L.I.D. No. 76 are described in Exhibit "A" attached to this ordinance and made a part hereof.

* Section 4. Improvements to be Constructed. The improvements to be constructed, consist of base and drainage improvements, regrading, and paving on West Gladstone, Rosedale, Cloverdale, Pinedale and Firndale streets.

* Section 5. Estimated Cost. The estimated cost of construction of the project is $227,050.

* Section 6. Source of Funds. The portion of the construction cost to be met with city and borough funds is estimated to be $131,248. The remainder of the construction cost, will be met from the assessments against the property specially benefitted, said amount estimated to be $95,802.

* Section 7. Direction that Work be Done. The city and borough administration is hereby authorized to do or cause to be done all things necessary or useful to plan, acquire, construct, and install the improvements described in Section 4.

* Section 8. Authorization to Acquire Land. The city and borough is hereby authorized to acquire any lands or rights in land necessary or useful for the project.

* Section 9. Authorization for Eminent Domain. The city and borough administration is hereby authorized to use such eminent domain proceedings, including use of declaration of taking, as may be necessary or useful to acquire property needed for the project. The costs of any property so acquired shall be added to the project cost.

* Section 10. Appropriation. There is hereby appropriated the sum of $227,050 for the cost of the project including the acquisition of property and construction of the improvements described in Section 4.

* Section 11. Special Assessment Fund. There is created within the central treasury a special fund of the city and borough known as Special Assessment Fund No. 76. Such fund shall be used for the purpose of paying the costs of the project. City and borough funds, assessments and all other receipts shall be paid into the fund.

* Section 12. Finding of Special Benefit. The Assembly of the City and Borough of Juneau hereby finds that the property within L.I.D. No. 76 described in Exhibit "A" will be specially benefitted by the improvements and each lot or tract within such district will be specially benefitted in proportion to the amount separately assessed to each lot or tract.

* Section 13. Method of Apportioning Costs. Costs to be borne by the property specially benefitted shall be apportioned at the rate of $1,500 per lot for the first 100 feet of front footage, plus $10 for each foot of front footage thereafter, plus $395 per lot, such additional charge being for the application of aggregate for surface stabilization and minor drainage improvements.

* Section 14. Prepayment-in-Full Discount. No prepayment-in-full discount is provided.

* Section 15. Effective Date. This ordinance shall be effective thirty days after its adoption.

Adopted this 5th day of April, 1993.

Mayor

Attest:

Clerk

# EXHIBIT "A"

## BOUNDARY DESCRIPTION

## 1993 MENDENHALL VALLEY STREET PAVING PROJECT
## WEST GLADSTONE, ROSEDALE, PINEDALE, CLOVERDALE AND FIRNDALE STREETS

## L.I.D. No. 76

Lots 1 through 6, inclusive and lots 9 through 12, inclusive, of Glacier Park Subdivision, U.S. Survey No.1530, filed as plat No.237 in the Juneau Recording District, State of Alaska; Also, lot 8A of Plat No. 82-20W being a resubdivision of said Glacier Park Subdivision; Also, lots 8B1 and 8B2 of a resubdivision of said Plat No. 82-20W; Also, lots 13A and 13B of Plat No. 84-127 being a resubdivision of said Glacier Park Subdivision.

Lots 1 through 8, inclusive, of Block "B", Lots 1 and 2 of Block "C", Lots 1 through 6, inclusive, of Block "E", Lots 1 through 8, inclusive, and Lot 15 of Block "F"; of First Addition-Riverdale Heights Subdivision, U.S. Survey No. 2080, Juneau Recording District.

Lots 4, 5 and 6 of Block "D-1" and lots 1, 4, 7, 8, 9 and 10 of Block "D-2" of Plat No. 647, being a Resubdivision of Block D, Riverdale Heights Subdivision.

[lid76.atb]

MEMORANDUM OF UNDERSTANDING
BETWEEN
ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
AND
CITY AND BOROUGH OF JUNEAU

The Alaska Department of Environmental Conservation (ADEC), Alaska Department of Transportation & Public Facilities (ADOT&PF) and the City and Borough of Juneau (CBJ) share responsibility and authority for resolving the Particulate Matter-less-than-ten-microns in-diameter (PM10) Nonattainment problems associated with road dust in the Mendenhall Valley. Recognizing that lines of responsibility need to be established for efficient use of available resources, these three parties hereby enter into this agreement.

Air Quality Attainment Strategy and Planning

The City and Borough of Juneau will continue its effort toward attainment of the State and National Ambient Air Quality Standard for PM10. This effort will include preparation of an Air Quality Attainment Plan for submittal to ADEC. The ADEC will provide technical and administrative assistance to CBJ and ADOT & PF as required to complete the plan and develop the strategy necessary to bring the Mendenhall Valley in compliance with the State and National Ambient Standard for PM10.

The City and Borough of Juneau will work with ADOT&PF to acquire the necessary funding for the engineering and contractual work needed to compete the road surfacing projects to bring the Mendenhall Valley into attainment. Schedule will be as expeditious as possible and will seek a completion date by September 30, 1994. Every effort will be made by ADOT & PF to secure the necessary Federal and Legislative approvals to obtain funding. ADEC will act as environmental and health impact spokesperson where necessary to achieve the common goals for this project. Specific responsibilities are outlined in Appendix A.

Telephone Contact Numbers

| | |
|---|---|
| City and Borough of Juneau<br>Public Works Department | 780-6888 |
| ADEC Central Office | 465-5100 |
| ADOT-PF Southeast Region Planning | 789-6264 |
| ADOT-PF Engineering & Operations Standards | 465-2985 |

The signatories will review the tasks in this document quarterly to assure that the tasks in Appendices A & B are progressing as agreed. Amendments or additional appendices may need to be developed and implemented by mutual agreement at any time, without renegotiating the entire Memorandum of Understanding.

Mark Palesh, Manager
City and Borough of Juneau

12/18/92
Date

John Sandor, Commissioner
Department of Environmental Conservation

12/23/92
Date

for Frank G. Turpin, Commissioner
Dept. of Transportation &
Public Facilities

1/6/93
Date

Appendix A - Air Quality Attainment Strategy and Planning

ADEC will:

* prepare a list of Mendenhall Valley roads in order of Air Quality Priority;

* do the air quality modeling necessary for CBJ and DOT & PF to fulfill their respective engineering and federal approvals;

* assist CBJ and ADOT & PF in their dealings with EPA, particularly in the realm of Reasonable Further Progress and the development of strategies to reduce ambient levels of PM10 in the Mendenhall Valley;

CBJ Will:

* prepare an engineering plan and road maps outlining the road surfacing strategy that will bring the Mendenhall Valley into attainment;

* let the necessary contracts to assure timely completion of this strategy;

* resolve all the easement and right-of-way problems;

* prepare a resolution for the CBJ assembly that sanctions the agreement between the state and the city to bring Mendenhall Valley into compliance with state and national ambient standards;

* complete the necessary documents to establish agreements between CBJ and State DOT to allow ADOT & PF to make application to Federal Highways and/or the legislative budget and audit process;

* prepare and seek approval of Local Improvement Districts (LIDs), providing for at least $1,500 per assessed unit of local money for the project. Develop letters to the public and associated requests to meet the combined attainment goals for the Mendenhall Valley.

* conduct all aspects of the surfacing projects in accordance with federal and ADOT&PF guidelines applicable to the funding

ADOT & PF Will:

* agree to participate with up to $2 million of federal-aid funding for the PM10 Attainment Strategy, provided legislative appropriations are made;

* acquire the necessary state approvals in support of the attainment strategy;

* submit a letter through the Federal Highways to the EPA requesting that a waiver be granted for use of ISTEA or CMAQ funds for this PM10 project in lieu of Carbon Monoxide;

* request and support through the State budgeting process the necessary approvals to fund this attainment strategy.

Presented by: The Manager
Introduced: 12/07/92
Drafted by: J.R.C.

RESOLUTION OF THE CITY AND BOROUGH OF JUNEAU, ALASKA

Serial No. 1612

A RESOLUTION OF THE CITY AND BOROUGH OF JUNEAU ADOPTING A JOINT MEMORANDUM OF UNDERSTANDING WITH THE ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION AND THE ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES TO RESOLVE THE MENDENHALL VALLEY PM-10 (PARTICULATE MATTER) NONATTAINMENT AREA.

WHEREAS, the City and Borough of Juneau, is committed to solve the PM-10 particulate matter nonattainment problem in the Mendenhall Valley, and

WHEREAS, particulate matter levels of more than six times the allowable levels have occurred in the Mendenhall Valley, and

WHEREAS, the main cause of these violations of state and federal air quality standards is unpaved roads, and

WHEREAS, the City and Borough should develop a plan to solve the nonattainment problem in the Mendenhall Valley, and

WHEREAS, the State Department of Transportation and Public Facilities and the State Department of Environmental Conservation have agreed to help solve the PM-10 nonattainment problem;

NOW, THEREFORE, BE IT RESOLVED BY THE ASSEMBLY OF THE CITY AND BOROUGH OF JUNEAU, ALASKA:

1. That the City and Borough of Juneau enter into a Memorandum of Understanding with the State of Alaska to develop a plan that will bring the Mendenhall Valley into attainment with the health standard for PM-10 airborne particulate matter of 150 micro grams per cubic meter.

2. That the City and Borough of Juneau's Air Quality Control Plan detailing plans for bringing the Mendenhall Valley into attainment be submitted through the Alaska Department of Environmental Conservation to the Environmental Protection Agency.

3. Effective Date. This resolution shall be effective immediately upon adoption.

Adopted this 7th day of December, 1992.

Mayor

Attest:

Clerk

STATE OF ALASKA

WALTER J. HICKEL, GOVERNOR

**DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES**

*DIVISION OF ENGINEERING & OPERATIONS STANDARDS*

3132 CHANNEL DRIVE
JUNEAU, ALASKA 99801-7898
PHONE: (907) 465-2985
Fax: (907) 465-2460
Text: (907) 465-3562

November 24, 1992

Phil Smith,
Transportation Planner
Federal Highway Administration
Alaska Division
PO Box 1648,
Juneau, AK 99802

Dear Mr. Smith:

Attached is the Conformity Determination Pertaining to the Mendenhall Valley PM-10 non-attainment area. As indicated in the determination, the primary strategy measure for addressing the transportation-related causative factor of periodic dust emissions is to surface a large fraction of the remaining gravel roads in the residential neighborhoods of the Mendenhall Valley. This measure is described in the update SIP prepared by the Alaska Department of Environmental Conservation (DEC). This department as well as the DEC and the City and Borough of Juneau have agreed to the strategy measure.

The street surfacing will be jointly funded with public funds from the City and Borough of Juneau and the state's federal-aid program. Because of various timing factors, the relatively short construction season, and the large number of streets to be treated this program will require two construction seasons to complete. It is scheduled to occur during the summer periods of 1993 and 1994.

Thank you for your prompt attention to this determination. If additional information or documentation is required, please contact me.

Sincerely,

Roger W. Allington, P.E.
Director and Chief Engineer

By: Jeffery C. Ottesen
Chief, Right-of-Way
& Environment

enclosure

cc: Mike McKinnon, Planning Chief, Southeast Region, MS 2506
Len Verrelli, Chief, Air Quality Mgmt. Section, Dept. of Environ. Conservation, MS 1800
Ernest Mueller, Director, Department of Public Works, City and Borough of Juneau
Ron Lind, Director, PP&B, Headquarters, MS 2500

**Alaska Department of Transportation and Public Facilities**
**Clean Air Act Conformity Determinations**
**Pertaining to:**
**Mendnehall Valley, Juneau, Alaska PM-10**
**November 24, 1992**

Background

A 1987 revision of the National Ambient Air Quality Standard (NAAQS) established a new indicator for suspended particulate matter that includes only those particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers (called PM-10). PM-10 emissions generally consist of particles resulting from heavy industry, domestic wood smoke, road dust (sand and dirt on the road that is stirred up by vehicles), tire wear, brake lining wear and particles from vehicle exhaust.

The June 7, 1991 Environmental Protection Agency (EPA), Department of Transportation (DOT) Guidance for Interim Conformity Procedures requires conformity determinations for all PM-10 non-attainment areas. PM-10 non-attainment areas in Alaska include:

Mendnehall Valley, Juneau, Alaska

Eagle River Valley, Anchorage, Alaska

While the Mendenhall Valley continues to record peak levels that exceed the PM-10 NAAQS federal standard, this is no longer true for the Eagle River Valley.

The assessment supporting conformity determinations must show that transportation plans and transportation improvement programs do not increase the frequency or severity of existing violations of the PM-10 NAAQS requirements. The interim guidance does not specifically address any criteria or procedures for PM-10 conformity determinations. instead deferring guidance to further discussion between EPA and DOT and/or the EPA/DOT rulemaking. Phase I conformity determinations are to be based upon a qualitative assessment jointly agreed upon by the MPO, DOT and EPA.

**Discussion**

The causes for concentrations of particulate matter in both nonattainment areas is generally unrelated to the federal-aid transportation system. In general the causes vary between winter and other seasons, with smoke from wood stoves and fireplaces being the principal cause during winter months, and dust from unpaved local roads, sometimes in combination with dry weather winds, contributing to the violations at other times of year.

Projects arising from the department's transportation plans and programs, when they occur in the nonattainment areas, invariably include paved driving and shoulder surfaces and vegetated embankments.

Maintenance operations, such as the spreading of sand during periods of ice and snow, may be a nominal source of air contaminants to the extent this material remains on the driving surface following the snow season. In such cases the sand, often reduced to finer grain sizes from repeated vehicle passes, can be entrained in the atmosphere under dry and windy conditions.

A related factor to both nonattainment areas is the geological characteristics of the native materials used in road construction and winter sanding. Being in a glacially carved landscaped, and founded upon glacially influenced deposits, there is a very high percentage of extremely fine grained material in local sand and gravel deposits. These super fine materials, comprise a fraction of the surfacing mateial used in local unpaved gravel roads. During dry periods the fines can be readily suspended in the air, and are believed to contribute significantly to the PM-10 problem.

The PM-10 issue was discussed during early coordination meetings involving the Environmental Protection Agency, Federal Highway Administration, Alaska Department of Transportation, Alaska Department of Environmental Quality and the City and Borough of Juneau. The following points were raised during those discussions:

The tools to quantitatively model PM-10 impacts resulting from plan or improvement program changes do not currently exist.

Woodburning (domestic wood stoves) and local, unsurfaced streets are the primary sources of PM-10 problems in Alaska.

Woodburning is not a transportation related factor, and while a comprehensive wood smoke management system exists in both non-attainment areas, there is no interconnection of wood burning with either the current transportation system or potential transportation measures.

Transportation sources are responsible for a relatively small portion of the PM-10 problem in Alaska. Therefore, transportation related solutions offer very limited opportunities for reducing PM-10 violations.

Surfacing local roads in the Mendenhall Valley is the only transportation related strategy contained in Alaska's proposed State Implementation Plan (SIP).

The revised SIP now under development will likely address Alaska's PM-10 problems with non-transportation measures.

If transportation measures are included in a revised SIP, there are very limited PM-10 sources that could be reasonably addressed. These include:

Road dust - this is primarily a unpaved road issue which, in the nonattainment area, involves only local (municipal) or privately owned roads. However, under provisions of the Congestion Management and Air Quality Program, the department has committed to partially funding a project to surface a substantial portion of the local roads in the Mendenhall Valley. This project will be conducted jointly with the City and Borough of Juneau and will surface nearly 70,000 lineal feet of municipally owned and maintained roads. This work is scheduled to begin in the Summer of 1993 and be completed in the summer of 1994. The roads selected for surfacing were jointly selected by the Alaska Department of Environmental Conservation and City and Borough of Juneau.

Winter road sanding - while this contributes to the PM-10 problem, it is not directly related to a transportation plan or improvement program. Any future SIP commitments aimed at reducing the impact of sanding would have to address changes in operations/maintenance policies.

Construction generated emissions - this is typically a short-term problem with localized rather than areawide impacts. However, new requirements of construction for mitigation of storm water pollution requires the control of both road dust and the tracking of sediments from a construction site onto adjoining highways. Standard practice which requires paved or vegetated surfaces and the newly enacted (October 1, 1992) requirements for improved construction management practices should adequately ensure that new construction does not exacerbate the PM-10 problem.

## Conclusion

As indicated above, transportation related sources are responsible for only a limited portion of Alaska's PM-10 problem. However, with the committment to surfacing the Mendenhall Valley roads with CMAQ Program funding it is concluded that the plans and programs in all of Alaska's PM-10 non-attainment areas satisfy the conformity provisions of the 1990 Clean Air Act Amendments.

Roger W. Allington, Chief Engineer
Engineering & Operations Standards
Department of Transportation & Public Facilities

By: Jeffery C. Ottesen
Chief, ROW & Environment