# Alaska Department of Environmental Conservation

# Amendments to:

# State Air Quality Control Plan

## Vol. III: Appendices

(Appendices to:
Volume II, Section III.A Statewide Carbon Monoxide Control Program &
Volume II, Section III.B Anchorage Transportation Control Program)

Adopted

August 5th, 2009

The State of Alaska's State Air Quality Control Plan Volume III, Appendix to Volume II of this plan, is amended to include the following documents:

Volume II, Section III.A Statewide Carbon Monoxide Control Program, Appendix III.A is amended by removing the following regulations:

- 18 AAC 52 Emissions Inspection and Maintenance Requirements for Motor Vehicles, as amended through May 17, 2008; and

replacing them with the following regulations:

- 18 AAC 52 Emissions Inspection and Maintenance Requirements for Motor Vehicles, as amended through August 5th, 2009.

Volume II, Section III.B Anchorage Transportation Control Program, adopted by the Anchorage Assembly May 26, 2009, and adopted into the State Air Quality Control Plan August 5th, 2009 is amended as follows:

- Appendix III.B.1 is amended by adding the following document:
    - Anchorage Assembly Resolution No. 2009-144, dated May 26, 2009, a resolution of the Municipality of Anchorage adopting the Anchorage Carbon Monoxide Maintenance Plan.
- Appendix III.B.3 is amended by adding the following document:
    - Anchorage 2007 Carbon Monoxide Emission Inventory and 2007-2023 Emission Projections, prepared by the Municipality of Anchorage, dated April 2009.
- Appendix III.B.6 is amended by adding the following document:
    - Analysis of Probability of Complying with the National Ambient Air Quality Standard for Carbon Monoxide in Anchorage between 2007 and 2023, prepared by the Municipality of Anchorage, dated April 2009.
- Appendix III.B.8 is amended by adding the following documents:
    - South Central Clean Air Ordinances AMC 15.30 and 15.35.
- Appendix III.B.9 is amended by adding the following document:
    - Municipality of Anchorage Ordinance No. 2008-84(S), adopted by the Anchorage Assembly July 15, 2008, which repeals Anchorage Assembly Ordinance No. 2007-122(S), and reinstates Anchorage Municipal Code Chapter 15.80 Vehicle Inspection and Maintenance Program; Chapter 15.85 Requirements, Specifications, and

Procedures for Motor Vehicle Emission Inspection and Maintenance (I/M) Program; and section 9.30.155E of this code.

- Appendix III.B.10 is amended by adding the following documents:
  - Estimation of Background Carbon Monoxide Concentrations for Anchorage Project-Level Conformity Analyses, no date; and
  - Affidavit of Oral Hearing.

# Alaska Department of Environmental Conservation

# Amendments to:

# State Air Quality Control Plan

Vol. III: Appendices

Appendix III.A
"18 AAC 52 Emissions Inspection and
Maintenance Requirements for Motor Vehicles"

Adopted

August 5th, 2009

# DEPARTMENT OF

# ENVIRONMENTAL CONSERVATION

## 18 AAC 50
## Air Quality Control

## 18 AAC 52
## Emissions Inspection and Maintenance Requirements for Motor Vehicles

## Adopted

## August 5, 2009

**Sean Parnell**
**Governor**

**Larry Hartig**
**Commissioner**

The lead in language of 18 AAC 50.030 is amended to read:

**18 AAC 50.030. State air quality control plan.** Volumes II and III of the *State Air Quality Control Plan* for implementing and enforcing the provisions of AS 46.14 and this chapter, as amended through **August 5, 2009** [FEBRUARY 20, 2009], are adopted by reference. The plan includes the following documents which are also adopted by reference:

**• • •**

(Eff. 1/18/97, Register 141; am 6/21/98, Register 146; am 9/4/98, Register 147; am 1/1/2000; Register 152; am 12/30/2000; Register 156; am 9/21/2001, Register 159; am 1/27/2002, Register 161; am 3/2/2002, Register 161; am 5/3/2002, Register 162; am 2/20/2004, Register 169; am 6/24/2004, Register 170; am 10/1/2004, Register 171; am 12/14/2006, Register 180; am 12/30/2007, Register 184; am 5/17/2008, Register 186; am 7/25/2008, Register 187; am 11/9/2008, Register 188; am 5/6/2009, Register 190; am__/__/____, Register ___)

**Authority:** AS 46.03.020 AS 46.14.030 Sec. 30, ch. 74, SLA 1993
AS 46.14.020 AS 46.14.140

18 AAC 52.005(c)(1)(A)(ii) amended to read:

(ii) the vehicle is a model year (MY) **2006** [2004]or newer;

if the vehicle is a model year **2006 or** [2004 OR] newer, the vehicle's first inspection is due when the current calendar year equals the vehicle model year plus **six** [FOUR] years; subsequent inspections are due every two years after the year the vehicle's first inspection is due;

18 AAC 52.005(f) is amended to read:

(f) The I/M requirements of this chapter do not apply to

(1) a 1967 or older motor vehicle;

(2) repealed 02/18/2006;

(3) a gasoline-powered motor vehicle that has an unladen weight of 12,001 pounds or heavier;

(4) a test vehicle for which the department has issued a written exemption;

(5) a military tactical vehicle such as a tank;

(6) a motorcycle, golf cart, all-terrain vehicle, snow machine, and motor-driven cycle (moped);

(7) a motor vehicle that has been or will be in Alaska for less than 30 days; [OR]

(8) an electric vehicle**;**

**(9) a motor vehicle for which the Division of Motor Vehicles has issued historic vehicle plates; or**

**(10) a motor vehicle for which the Division of Motor Vehicles has issued custom collector vehicle plates.**

(Eff. 2/1/94, Register 129; am 6/24/94, Register 130; am 1/4/95, Register 133; am 1/1/97, Register 140; am 1/1/98, Register 144; am 1/1/2000, Register 152; am 3/27/2002, Register 161; am 02/18/2006, Register 177; am 5/17/2008, Register 186; am__/__/____, Register ___)

**Authority:** AS 46.03.010 AS 46.14.030 AS 46.14.510

AS 46.03.020

18 AAC 52.060(d)(1)(A) is amended to read:

(A) the motorist's adjusted gross income, as computed for the preceding year and reported to the United States Department of the Treasury, Internal Revenue Service (IRS), is at or below the poverty level as determined under the United States Department of Health and Human Services poverty guidelines for this state published at **74 Fed. Reg. 4199-4201(January 23, 2009)** [73 FED. REG. 3971 – 3972 (JANUARY 23, 2008)], adopted by reference in this chapter; for a time extension under this subparagraph, the motorist must submit a copy of the motorist's federal income tax return filed for the year preceding the extension request; or

• • •

(Eff. 2/1/94, Register 129; am 6/24/94, Register 130; am 1/4/95, Register 133; am 1/1/97, Register 140; am 1/1/98, Register 144; am 1/1/2000, Register 152; am 3/27/2002, Register 161; am 02/18/2006, Register 177; am 5/17/2008, Register 186; am__/__/____, Register ___)

**Authority:** AS 46.03.020 AS 46.14.030 AS 46.14.510

18 AAC 52.990(78) is amended to read:

(78) "new vehicle" means a vehicle

(A) that is a **2006** [2004] model year vehicle or newer; and

(B) with a model year number that is no lower than the number of the current calendar year minus **six** [FOUR].

18 AAC 52. 990 is amended by adding new paragraphs to read:

(79) “historic vehicle” has the meaning given in 13 AAC 40.010.

(80) “custom collector vehicle” has the meaning given in AS 28.90.990.

(Eff. 2/1/94, Register 129; am 6/24/94, Register 130; am 1/1/97, Register 140; am 1/1/98, Register 144; am 1/1/2000, Register 152; am 12/30/2000, Register 156; am 3/27/2002, Register 161; am 02/18/2006, Register 177; am__/__/____, Register ___)

**Authority:** AS 46.03.010 AS 46.14.030 AS 46.14.510

AS 46.03.020

# Alaska Department of Environmental Conservation

# Amendments to:

# State Air Quality Control Plan

Vol. III: Appendices

Appendix III.B.1

"Anchorage Assembly Resolution No. 2009-144"

Adopted

August 5th, 2009

Submitted by: Chair of the Assembly at the Request of the Acting Mayor
Prepared by: Department of Health and Human Services
For reading: May 26, 2009

CLERK'S OFFICE
APPROVED
Date: 5-26-09

ANCHORAGE, ALASKA
AR No. 2009-144

A RESOLUTION OF THE MUNICIPALITY OF ANCHORAGE ADOPTING REVISIONS TO THE ANCHORAGE CARBON MONOXIDE MAINTENANCE PLAN.

WHEREAS, Anchorage prepared and submitted a Carbon Monoxide Maintenance Plan that was incorporated into the Alaska State Implementation Plan for Air Quality and approved by the Environmental Protection Agency in July 2004; and

WHEREAS, in July 2008, the Anchorage Assembly enacted changes in the motor vehicle inspection and maintenance (I/M) program that extend the new car exemption from four to six years and exempts vehicles with historic or classic vehicle license plates; and

WHEREAS, the Maintenance Plan must be amended to reflect these changes to I/M and the revised Plan must demonstrate that these changes do not jeopardize Anchorage's prospects for continued compliance with federal clean air standards; and

WHEREAS, such amendments to the Maintenance Plan were prepared in accordance with the transportation planning process required under Section 114 of Title 23 of the United States Code and Section 110 of the Clean Air Act, and

WHEREAS, the amended Maintenance Plan was released for public comment, reviewed by the AMATS Air Quality Advisory Committee, and recommended for approval by the AMATS Technical Advisory Committee; and

WHEREAS, the AMATS Policy Committee approved the amended CO Maintenance Plan during their May 28, 2009 meeting; now, therefore,

THE ANCHORAGE ASSEMBLY RESOLVES:

**Section 1.** That the amended CO Maintenance Plan be forwarded to the Alaska Department of Environmental Conservation for inclusion in the State Implementation Plan for air quality and for approval by the Environmental Protection Agency.

**Section 2.** This resolution shall be effective immediately upon passage and approval by the Assembly.

PASSED AND APPROVED by the Anchorage Assembly this 26th day of May, 2009.

Chair

ATTEST:

Municipal Clerk

# MUNICIPALITY OF ANCHORAGE

# ASSEMBLY MEMORANDUM

No. AM 304-2009

Meeting Date: May 26, 2009

**From:** **ACTING MAYOR**

**Subject:** **A RESOLUTION OF THE MUNICIPALITY OF ANCHORAGE ADOPTING REVISIONS TO THE ANCHORAGE CARBON MONOXIDE MAINTENANCE PLAN.**

The Federal Clean Air Act requires a community that has come into compliance with federal clean air standards to have a plan to maintain compliance with the standard. Anchorage attained the federal standard for carbon monoxide (CO) in 1996 and has remained in compliance since then. The current Maintenance Plan was adopted locally by AMATS and the Assembly in 2003. It includes a commitment to the continued operation of the vehicle inspection and maintenance program (I/M), the carpool and vanpool program and the promotion of engine block heaters to reduce CO emissions. The Anchorage CO Maintenance Plan is included in the State Implementation Plan (SIP) for air quality. The Environmental Protection Agency approved the Anchorage CO Maintenance Plan as an amendment to the SIP in July 2004.

In July 2008, the Anchorage Assembly enacted changes to I/M. These changes extended the "new car test exemption" from four to six years and an exemption was added for vehicles with historic and classic license plates. Annually, an estimated 17,000 vehicles will be newly exempted from I/M testing requirements as a result of the Assembly action. This is about 20% of the vehicle fleet previously subject to testing. Because I/M is a committed CO control measure in the SIP, a revised Maintenance Plan had to be prepared to demonstrate that these changes would not jeopardize Anchorage's prospects for continued compliance with the CO standard.

New analysis in the revised Plan suggests that the impact of these changes on the effectiveness of I/M in reducing CO is small and will have a negligible impact on Anchorage's prospects for continued compliance with the federal CO standard. The Plan shows that, even with anticipated growth in vehicle travel, airport activity and other CO emission sources, the probability of compliance is estimated to be 99% or higher each year between now and 2023.

The Plan was released for 30-day public comment and reviewed by the AMATS Air Quality Advisory Committee. A number of recommendations from the Air Quality Committee were incorporated. The AMATS Policy Committee approved the revised Plan on May 28, 2009.

In addition to accommodating the aforementioned modifications to the I/M Program, the revised CO Maintenance Plan includes:

- Updated CO emissions estimates for the period 2007 through 2023 that are based on more recent information about projected motor vehicle traffic volumes and projected activity levels of other CO sources such as Ted Stevens Anchorage International Airport.

- New analysis and estimates of the statistical probability of continued compliance with the CO standard through 2023.

- A new contingency plan that addresses what will be done if Anchorage violates the CO standard in the future. The draft Maintenance Plan lays out a "menu" of possible controls, one or more of which could be readily implemented if a violation occurs. The menu includes:

    - increasing public awareness efforts to encourage use of transit, carpooling and vanpooling.
    - curtailing or limiting the use of fireplaces, wood stoves and other wood burning appliances when high CO is predicted.
    - promoting transit through fare subsidies offered through employers.
    - reinstating the block heater installation subsidy.
    - reinstating the ethanol-blended gasoline program.

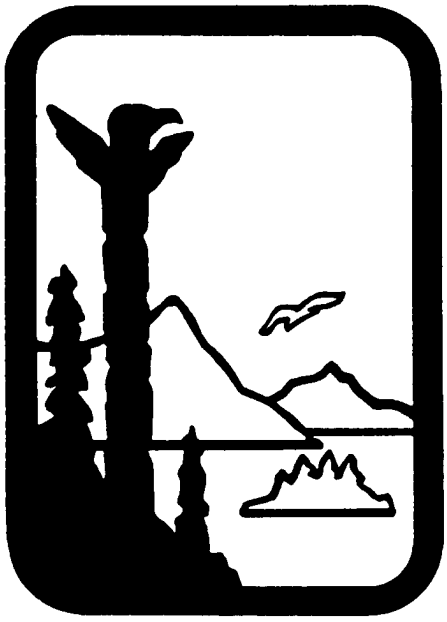
- A revised CO emission budget based on updated air quality monitoring data. The new emission budget will be used in future conformity determinations on the LRTP and TIP.

As part of their action in July 2008, the Assembly directed the Department of Health and Human Services (DHHS) to work with the Alaska Department of Environmental Conservation (ADEC) to remove I/M as a commitment in the SIP, making it a "local option." Thus, if a local decision were made to discontinue the program it would not require a SIP modification or the approval of the State or EPA. DHHS is currently working with ADEC and DMV to make the changes to State regulations and the SIP necessary to allow local option I/M in Anchorage. A revised SIP reflecting I/M as a local option is expected for consideration by the Assembly in early 2010. Once adopted by the Assembly, the subsequent State and EPA approval process takes 18 to 24 months.

**THE ADMINISTRATION RECOMMENDS APPROVAL OF A RESOLUTION OF THE MUNICIPALITY OF ANCHORAGE ADOPTING REVISIONS TO THE ANCHORAGE CARBON MONOXIDE MAINTENANCE PLAN.**

Prepared by: Stephen S. Morris, Department of Health and Human Services
Concur: Diane Ingle, Director, Department of Health and Human Services
Concur: James N. Reeves, Municipal Attorney
Concur: Michael K. Abbott, Municipal Manager
Respectfully submitted: Matt Claman, Acting Mayor

# Alaska Department of Environmental Conservation



# Amendments to:

# State Air Quality Control Plan

Vol. III: Appendices

Appendix III.B.3

"Anchorage 2007 Carbon Monoxide Emission Inventory and 2007-2023 Emission Projections"

Adopted

August 5th, 2009

# Anchorage 2007 Carbon Monoxide Emission Inventory and 2007 – 2023 Emission Projections

Municipality of Anchorage
Air Quality Program
Environmental Services Division
Department of Health and Human Services
April 2009

# Preface

This document discusses the methodology used to prepare the base year 2007 CO emission inventory and emission projections for the 2007 – 2023 period covered by the Anchorage maintenance plan.

Table of Contents

**INTRODUCTION** ..... **1**

**OVERVIEW HYBRID EMISSION ESTIMATION METHODOLOGY** ..... **1**

**INVENTORY BOUNDARY** ..... **1**

**ANCHORAGE TRANSPORTATION MODEL AND INVENTORY GRID SYSTEM** ..... **3**

**TIME-OF-DAY ESTIMATES OF CO EMISSIONS** ..... **5**

**MOTOR VEHICLE EMISSIONS** ..... **6**

Estimation of Warm-up Idle Emissions ..... 7

Estimation of On-Road Travel Emissions ..... 13

**AIRCRAFT OPERATION EMISSIONS** ..... **18**

**RESIDENTIAL WOOD BURNING EMISSIONS** ..... **20**

**EMISSIONS FROM NATURAL GAS COMBUSTION FOR SPACE HEATING** ..... **22**

**OTHER MISCELLANEOUS SOURCES** ..... **23**

Use of NONROAD to Estimate Emissions from Snowmobiles, Snow Blowers, Welders, Air Compressors and Other Miscellaneous Sources ..... 23

Railroad Emissions ..... 25

Marine Vessel Emissions ..... 26

**EMISSIONS FROM POINT SOURCES** ..... **27**

Source Descriptions and Emission Estimation Information ..... 28

Summary of Point Source Emissions ..... 28

**EMISSIONS SUMMARY** ..... **29**

2007 Base year Area-wide CO Inventory 29

Projected Area-wide CO Emissions (2007-2023) ..... 29

**COMPILATION OF MICRO-AREA INVENTORY FOR TURNAGAIN MONITORING STATION** . **31**

**REFERENCES** .....

**Attachment 1** Warm-up Idle Emission Calculations

**Attachment 2** Sample Calculation of On-road Travel Emissions and MOBILE6 Input Files for 2002 and 2004

**Attachment 3** Marine Vessel Emission Calculation

**Attachment 4** 2002 Emission Inventory Results by Grid

## List of Figures

Figure 1 Anchorage Nonattainment Boundary Compared with Expanded Inventory Area....2

Figure 2 Anchorage Inventory Grid System....4

Figure 3 MOBILE6 Emission Factors as a Function of Speed and Thermal State.... 16

Figure 4 Projected Area-wide CO Emissions (2007 -2023) .... 30

Figure 5 CO emissions distribution in Anchorage .... 32

Figure 6 Aerial photo of Turnagain micro-inventory area boundary .... 33

Figure 7 Projected CO Emissions in Turnagain CO Micro-inventory Area 2007 – 2023 .... 35

Figure 8 CO emission rate by time-of-day in Turnagain CO micro-inventory area (2007).... 36

## List of Tables


| | | |
|---|---|---|
| Table 1 | CO Emission Inventory Time Periods and Apportionment of Characteristic Source Activity | 5 |
| Table 2 | Factors involved in computation of thermal state of vehicle at critical points in a vehicle trip. | 7 |
| Table 3 | Assumed warm-up idle duration by trip purpose and origin | 8 |
| Table 4 | Average soak time prior to trip start | 9 |
| Table 5 | Idle emission look up table for calendar year 2000 | 10 |
| Table 6 | Idle CO adjustment factors | 11 |
| Table 7 | Block heater plug-in rates (%) by time-of-day, trip origin and trip purpose after media campaign promoting block heater use | 12 |
| Table 8 | Estimated warm-up idle emissions by time-of-day Anchorage inventory area | 13 |
| Table 9 | Speed Adjustment Factors | 15 |
| Table 8 | Transportation Model VMT Estimates and Projections | 13 |
| Table 9 | VMT Categories Generated for Each Grid | 13 |
| Table 10 | Soak distributions used in MOBILE6 modeling with comparable operating mode fractions used in MOBILE5b/Cold CO modeling | 16 |
| Table 11 | On-road travel emissions by time-of-day | 18 |
| Table 12 | 24-hour CO emissions estimates from aircraft at ANC and Merrill Field in 2002 | 19 |
| Table 13 | Projected aircraft operations and CO emissions at ANC | 19 |
| Table 14 | Projected Aircraft Operations and CO Emissions at Merrill Field Airport | 20 |
| Table 15 | Estimation of residential wood burning CO emission factors for Anchorage | 21 |
| Table 16 | Estimated Anchorage-wide 24-hour CO emissions from residential wood burning | 21 |
| Table 17 | Methods of Home Heating in Anchorage (ASK Marketing & Research, 1990) | 22 |
| Table 18 | Peak winter season natural gas consumption rates and CO emission rates in Anchorage (1990) | 22 |
| Table 19 | CO Emissions from natural gas combustion (excludes power generation) | 23 |
| Table 20 | Estimation of NONROAD CO emissions in 2007 | 24 |
| Table 21 | CO emissions from NONROAD sources (2007-2023) | 25 |
| Table 22 | Alaska Railroad emission estimates 2007-2023 | 26 |
| Table 23 | Estimated CO emissions from the Port of Anchorage | 27 |
| Table 24 | Point Source CO Emissions Summary | 28 |
| Table 25 | Sources of Anchorage CO emissions in 2007 base year in Anchorage inventory area | 29 |
| Table 26 | Total CO emitted during typical 24-hour winter day in the Anchorage bowl inventory area | 30 |
| Table 27 | Sources of CO Emissions in Turnagain Micro-inventory Area 2007 Base Year | 34 |
| Table 28 | Total CO emitted during typical 24-hour winter day when CO is elevated in Turnagain micro-inventory area | 34 |

## Introduction

This document provides technical support and justification for the methods used to prepare the maintenance demonstration for Anchorage, submitted as a revision to the Alaska State Implementation Plan (SIP).

As part of the plan revision, a comprehensive inventory of the sources of CO emissions for base year 2007 was compiled. Historically, violations of the CO NAAQS have occurred most often on winter weekdays, therefore a 24-hour inventory was prepared that reflects ambient temperatures, traffic volumes and other emission source activity levels experienced on a typical winter "design day" in 2007.

In April 2007 an air quality conformity analysis was prepared when the Anchorage Long Range Transportation Plan was amended to include the Knik Arm Crossing. The most recent population, employment, and land use assumptions and forecasts were used in the development of this analysis. Specific forecasts were developed for analysis years 2007, 2017 and 2027. This demographic data was used to generate the 2007 base year CO inventory for the maintenance plan revisions. In addition this data was used directly or interpolated to generate forecasts for 2009, 2011, 2013, 2015, 2017, 2019, 2021 and 2023.

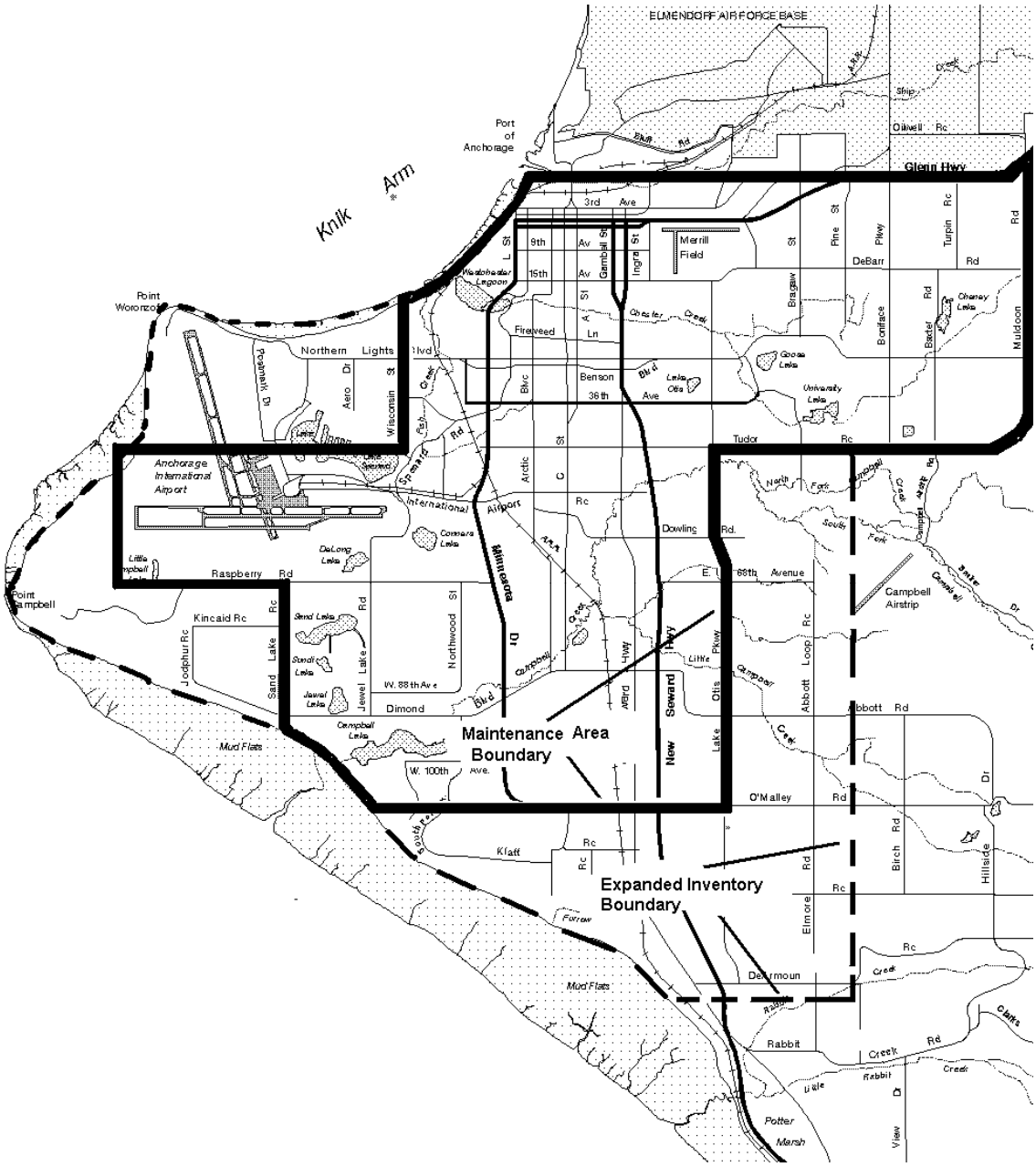
The methodology employed to develop the 2007 base year emission inventory and projections through 2023 was very similar to that employed to develop previous emission inventories for the CO attainment plan in 2000 and the maintenance plan in 2004.

## Inventory Boundary

The Anchorage nonattainment area boundary was established in 1978. Upon EPA's approval of the maintenance plan in 2004, the area encompassed by this boundary became the maintenance area. The inventory boundary contains this maintenance area plus some additional area to the south and west where significant residential and commercial growth has occurred over the past two decades. For this reason, the inventory area was expanded slightly to encompass areas not included in the nonattainment area. The boundary of the maintenance area is shown along with the expanded inventory area in Figure 1. The inventory area encompasses approximately 200 square kilometers of the Anchorage Bowl.

Figure 1.

Anchorage Maintenance Area Boundary with Expanded Inventory Area



## Anchorage Transportation Model and Inventory Grid System

The CO inventory was based in large part on traffic activity outputs from the Anchorage Transportation Model. The Anchorage Transportation Model is used by AMATS* and the Municipality of Anchorage to evaluate transportation plans and programs. It was validated against measured traffic volumes in base year 2002 and utilizes the latest planning assumptions to forecast future travel activity.. The model was developed using TransCAD travel demand modeling software. Because TransCAD is a GIS-based model, post-processing software could be used to overlay a grid system on the inventory area. The post-processor was used to disaggregate the inventory area into grid cells, each one square kilometer in size.

Transportation activity estimates (e.g., vehicle miles of travel, number of trip starts, and vehicle speeds) were produced for each of the cells. The grid location of every roadway link in the transportation network is known. Thus, the attributes of a particular roadway link (e.g., traffic volume, speed, and prior travel time) could be assigned to a particular grid. If a roadway link crossed the boundary between two or more grids, its attributes were assigned to the appropriate grid in relation to the proportion of the length of link contained in each grid. In other words, if 80% of a roadway link lies within a particular grid, 80% of the vehicle travel is assigned to that grid and 20% to the other grid.

Demographic information (population, number of dwelling units, income, and employment information) is collected by census tract. Because most census tracts in Anchorage are larger in size than the one-kilometer grids, the demographic characteristics of a particular grid had to be estimated from lower resolution census tract data. If, for example, a particular census tract was comprised of three one kilometer grids, the population and employment in that census tract was divided equally among the three grids contained in the census tract. This demographic information was helpful in developing gridded estimates of non-vehicular source activities, like wood burning and space heating where the amount of activity (i.e. wood burning or residential space heating) was assumed to be related to the number of dwellings in a grid.

Emissions from other area sources such as Ted Stevens Anchorage International Airport, Merrill Field, marine vessel operations at the Port of Anchorage and railroad activity in the rail yard and haul routes were assigned to the grids where the activity takes place. Similarly, emissions from point sources such as electrical power plants were assigned to the grid where the source is located.

The Anchorage emission inventory grid system is shown in Figure 2.

* AMATS stands for Anchorage Metropolitan Area Transportation Solutions. AMATS is the designated metropolitan planning organization for the Municipality of Anchorage. It is responsible for prioritizing federal transportation funding. It is also responsible for air quality planning in the Municipality.

Appendix to Section III.B.3

Figure 2

Anchorage Inventory Grid System

## Overview of Hybrid Emission Estimation Methodology

Between 1997 – 2003, the Municipality of Anchorage (MOA), Fairbanks North Star Borough and Alaska Department of Environmental Conservation (ADEC) invested a great deal of effort quantifying the sources of CO emissions in Anchorage and Fairbanks, particularly those from cold starts and warm-up idling. Sierra Research, working under contract with ADEC, performed cold temperature emission tests on 35 vehicles in Anchorage and Fairbanks during the winters of 1998-99 and 2000-2001. This testing showed that cold start /warm-up idle emissions are a very important source of CO emissions and using engine block heaters is an effective way to reduce emissions.

MOBILE6 alone would ordinarily be used to quantify vehicle emissions. However, a conventional MOBILE6 approach to computing vehicle emission rates does not adequately address the emissions impact of extended warm-up idling at the beginning of a trip nor does it provide a means to estimate the emission reductions resulting from engine block heater use. To address these limitations, a "hybrid" approach was developed to quantify motor vehicle emissions. This hybrid approach utilizes idle emissions data generated from the Sierra Research emission testing [1] to estimate warm-up idle emissions while MOBILE6 is used to estimate the emissions that occur during the travel mode.

The MOBILE6 model was run with supplemental speed (SFTP) correction factors disabled. The purpose of the SFTP speed correction factors is to reflect the increase in emissions that occur during aggressive driving (e.g. hard accelerations and decelerations). During the winter of 1999-2000, Sierra Research performed a study in Anchorage and Fairbanks that showed that winter driving in Alaska had almost none of the high speed, high acceleration rate driving that is represented by the SFTP speed correction factors. [2] For this reason, MOBILE6 was run with these correction factors disabled

## Time-of-Day Estimates of CO Emissions

Separate estimates of mobile CO emissions were prepared for the morning commute (7 a.m. – 9 a.m.), the evening commute (3 p.m. – 6 p.m.) and combined off-peak periods (6 p.m. – 7 a.m. and 9 a.m. – 3 p.m.). These estimates relied on time-of-day activity estimates (e.g., number of trip starts and VMT) generated by the Anchorage Transportation Model. A 24-hour inventory was compiled by summing the separate emission contributions from each time period.

Activity estimates for non-vehicular sources were available on a 24-hour basis only, however. Time-of-day estimates had to be developed from these 24-hour values. For some sources (e.g. airport, natural gas combustion), activity was assumed to be continuous throughout the day and emissions were apportioned accordingly. Fireplace and wood stove usage is more likely to occur in the evening after 6 p.m. For this reason, 90% of all wood burning activity was assumed to take place during the off peak time period.

Table 1 shows the specific time periods inventoried and gives examples of the types and levels of activity characteristic of those time periods. (Note that the 2-hour AM peak comprises 8.3% of a 24-hour day, the 3-hour PM peak comprises 12.5% of the day, and the 19-hour off peak period comprise 79.2% of the day.)

**Table 1.**
**CO emission inventory time periods and apportionment of characteristic source activity**
**% of activity occurring within each time period**

| Source Category | AM Peak. 7 a.m. – 9 a.m. | PM Peak. 3 p.m. – 6 p.m. | Off-Peak periods 9 a.m. – 3 p.m. 6 p.m. – 7 a.m. | Comments |
|---|---|---|---|---|
| motor vehicle idle and travel emissions | From model (~16%) | From model (~27%) | From model (~57%) | Travel activity higher in AM and PM peak periods |
| Residential wood burning | 3.0% | 7.0% | 90.0% | Most burning in evening |
| space heating | 8.3% | 12.5% | 79.2% | Evenly distributed through day |
| Ted Stevens Int'l Airport | 8.3% | 12.5% | 79.2% | Evenly distributed through day |
| Merrill Field | 8.3% | 12.5% | 79.2% | Evenly distributed through day |
| Miscellaneous / Other * | 8.3% | 12.5% | 79.2% | Evenly distributed through day |
| Point Sources | 8.3% | 12.5% | 79.2% | Evenly distributed through day |

* Miscellaneous/other emissions are comprised largely of sources related to construction and industrial activity like generator sets, welding activities, and pumps.

## Motor Vehicle Emissions

A great deal of effort was devoted to developing a credible highway motor vehicle emissions inventory that reflected real world conditions and driver behavior in Anchorage. Unlike the inventories prepared as part of previous air quality attainment plans, this inventory explicitly quantifies the CO emissions that occur during cold starts and lengthy warm-up idles that precede many vehicle trips. Separate estimates were made of the emissions associated with the initial warm-up idle period and the after-idle, "on-road" trip period. Sample calculations for warm-up idle emissions can be found in Attachment 1. Attachment 2 contains a sample calculation of "on-road" emissions along with copies of MOBILE6 input files used to compute on-road emission factors for analysis years 2007 and 2017.

As discussed earlier, a hybrid approach utilizing locally-generated cold temperature idle emission data in combination with the MOBILE6 model was employed to compute motor vehicle emissions. An essential element of this hybrid approach is the use of "thermal state tracking" to determine how warmed up a vehicle is at three critical points in the vehicle trip. These three critical points and the important factors involved in computing the thermal state of the vehicles operating in each of these three points in the trip are described in Table 2.

**Table 2.**
**Factors involved in computation of thermal state of vehicle at critical points in a vehicle trip.**

| Critical point in trip | Factors involved in computation of thermal state of vehicle |
|---|---|
| 1. Immediately prior to start-up | How long, and at what temperature the vehicle has been parked before it was started (i.e. length of cold soak) |
| 2. After warm-up idle, immediately prior to travel portion of trip | Length of cold soak and subsequent idle |
| 3. During travel portion of trip (within grid of interest) | Duration of prior cold soak and warm-up idle, length of trip (miles) and average speed. |

Intuitively, the effect of each of the three factors on the thermal state or degree of warmth of a vehicle is fairly obvious. One would expect that vehicles that are parked for long periods of time would be in a colder thermal state than those parked for short periods; a long warm-up idle period would result in a warmer thermal state than a short idle; and long travel time at a high rate of speed would result in a warmer vehicle than a short trip at slow speeds. An elaborate spreadsheet was developed that incorporates the results of the thermal state calculations described above along with post processor outputs from the Anchorage Transportation Model, outputs from the MOBILE6 model, warm-up idle emission data from research conducted in Anchorage and Fairbanks and from locally-derived information on driver idling behavior. This spreadsheet allowed for separate computation of warm-up idle emissions and on-road trip emissions.

## Estimation of Warm-up Idle Emissions

Three key sources of information were required to estimate idle emissions: (1) the duration of the idle period preceding the trip; (2) the amount of time since the vehicle last operated and has been cooling or "soaking" in ambient conditions; and (3) the idle emission rate. The idle emission rate is largely a function of engine and catalyst temperature and thus is dependent on idle duration and soak time.

### Idle Duration

Idle duration was quantified by the MOA Air Quality Program during the winter of 1997-98 as part of the Anchorage Driver Behavior Study.[3] The objective of this field study was to observe and document winter season driver idling behavior prior to the beginning of a trip. Over 1300 start up idles were observed and documented at various times and locations in Anchorage. In addition to documenting the duration of each of the idles, the trip origin (e.g., home, work, shopping, etc.), time of day, ambient temperature, weather and windshield icing conditions were also recorded. One important objective of the study was to develop estimates of median idle duration by trip purpose* and time-of-day. Because drivers were not questioned, the trip purpose was not known. Nevertheless, a methodology was developed to use data collected in the study to estimate idle duration for home-based work (HBW), home-based other (HBO) and non home-based (NHB) trips for each time-of-day. The methodology used to develop these estimates is described in Appendices A and C of the Anchorage Driver Behavior Study. The idle duration assumptions used to develop CO inventories for 2007, 2009, 2011, 2013,

* The Anchorage Transportation model now categorizes all travel into eight trip purposes instead of three. The original three trip categories (HBW =:home-based work , HBO =home based other , and NHB = non home-based have been expanded into seven separate categories. The model now provides estimates of the number of trip starts in the following categories: (1) HBW = home-based work, (2) HBSCH = home-based school, (3) HBS = home-based shopping, (4) HBO = home-based other, (5) NHBW = non home-based work, (6) NHBNW = non home-based non-work ; and (7) TRK = truck .

2015, 2017, 2019, 2021 and 2023 are shown in Table 3. The longest idle duration was associated with home-based trips (work, school and shopping) during the 7 a.m. – 9 a.m. time period.*

**Table 3.**
**Assumed warm-up idle duration by trip purpose and origin (in minutes)**

| Trip Type | Trip origin | AM Peak 7 a.m. – 9 a.m. | PM Peak 3 p.m. – 6 p.m. | Off-Peak Periods 9 a.m. – 3 p.m. 6 p.m. – 7 a.m. |
|---|---|---|---|---|
| Home-based work | home | 7 | 3 | 3 |
| | work | 3 | 1 | 3 |
| Home-based school | home | 7 | 2 | 2 |
| | school | 1 | 1 | 1 |
| Home-based shopping | home | 7 | 2 | 1 |
| | shopping | 1 | 1 | 1 |
| Home-based other | home | 7 | 2 | 2 |
| | other | 1 | 1 | 1 |
| Non home-based work | NA | 3 | 3 | 2 |
| Non home-based, non-work | NA | 1 | 1 | 1 |
| Truck | NA | 3 | 3 | 1 |

It should be noted that during the ten years since this survey data was collected, a number of changes have occurred that could have changed idling behavior among Anchorage drivers. One change of particular note is the increasing proliferation of remote "auto start devices" that allow drivers to start their vehicles remotely. Recent survey data suggest that approximately 27% of Anchorage vehicles are now equipped with such devices. The effect of auto starts on idle times in Anchorage has not been studied. Even if the use of auto starts has increased average idle duration, the effect on overall CO emissions is likely small. A 2001 study performed by Sierra Research examined the effect of idle duration on the CO emissions that occur over the course of a typical vehicle trip of 7.3 miles.[4] Sierra found that overall CO emissions for trips preceded by a 2-minute idle (281.4 grams) were greater than those preceded by a 15-minute idle (246.7 grams). Thus, it is possible that the use of remote starters may actually *reduce* overall CO emissions is the idle time following a cold start is limited to 15 minutes or less. Overall trip emissions would increase, however, if idle times following an auto start were extended to 20 minutes or more. More recently Sierra examined the possible impact of auto starts on CO emissions in Fairbanks, Alaska where the proportion of vehicle equipped with these devices approaches 50%. They concluded that if drivers opted to use these devices for extended idling (20 minutes or longer) CO emissions could increase by 0.18 tons per day. This amounts to an increase of about 0.5% in total CO emissions in Fairbanks.

Soak Time

Vehicle emissions of CO are highest just after startup and decrease rapidly as the engine warms. The emissions that occur during start up are largely a function of how long the engine has been shut off and cooling at ambient temperatures. Because these data suggest that soak time is a critical factor in determining vehicle CO emissions, it was important to develop credible estimates of soak times in Anchorage as part of the CO emission inventory preparation.

Fortunately, information was available from a local travel survey that allowed average vehicle soak times to be estimated for the a.m., mid-day, p.m. and night periods by trip purpose. Hellenthal and Associates

* 35% of home-based trips were assumed to begin with cars parked in garages and 65% outside. Warm-up idle time for cars parked inside was not quantified in the idling study but was assumed to be 30 seconds. The idle times shown in Table 3 reflect the weighted average of idle times for garage and outside-parked vehicles.

conducted a household travel behavior survey of 1,548 Anchorage households between February 25 and April 12, 1992.[5] Soak times were estimated by examining travel logs from the survey. Drivers recorded the time when each trip began and ended. The time elapsed between the end of one trip and the beginning of the succeeding trip was presumed to be equal to the soak time for that driver's vehicle. Estimates of average soak times derived from the Hellenthal travel behavior survey are shown in Table 3. Morning home-based trips for work, school and shopping have the longest average soak time (12 hours) while NHB trips and home-based trips originating at locations other than home have the shortest average soak time (one hour).

**Table 4.**
**Average soak time prior to trip start (in hours)**

| Trip Type | Trip origin | AM Peak 7 a.m. – 9 a.m. | PM Peak 3 p.m. – 6 p.m. | Off-Peak Periods 9 a.m. – 3 p.m. 6 p.m. – 7 a.m. |
|---|---|---|---|---|
| Home-based work | home | 12 | 3 | 3 |
| | work | 5 | 5 | 5 |
| Home-based school | home | 12 | 2 | 2 |
| | school | 0.5 | 0.5 | 0.5 |
| Home-based shopping | home | 12 | 2 | 2 |
| | shopping | 1 | 0.5 | 0.5 |
| Home-based other | home | 12 | 2 | 2 |
| | other | 1 | 1 | 1 |
| Non home-based work | NA | 4 | 5 | 3 |
| Non home-based, non-work | NA | 1 | 1 | 1 |
| Truck | NA | 2 | 2 | 2 |

Estimation of Idle Emissions as a Function of Idle Duration and Soak Time

Emission data from the testing Sierra Research conducted in Anchorage and Fairbanks during the winters of 1998-99 and 2000-2001 were used to construct a lookup table that provided an estimate of the warm-up idle emissions (in grams CO per start) as a function of idle duration and soak time. CO and HC emissions were measured during the first 20 minutes following a cold start. The values in the look-up table were revised slightly from those used in the Year 2000 attainment plan to reflect the supplemental data collected by Sierra Research in the winter of 2000-2001. The revised lookup table is shown in Table 5. The values were utilized in the emission inventory spreadsheet to compute idle emissions.

No data were collected from commercial trucks during the idle study. These comprise a small part of the total vehicle population and are largely low-emitting heavy-duty diesel vehicles (HDDV). These vehicles were assumed to emit CO at 30% the rate of the average light duty vehicles (LDVs) that make up the majority of the Anchorage vehicle population. This assumption is roughly consistent with MOBILE6 model estimates for HDDV versus LDV emission factors.

Appendix to Section III.B.3

**Table 5.**
**Idle emission look up table for calendar year 2000 (with ethanol-blended gasoline)**
CO emissions (in grams per start) as a function of soak time and idle duration

| Pre-Soak Time | Revised Year 2000 Idle Emissions (assumes 2.7% EtOH and Year 2000 Anchorage I/M) Initial Idle Time (min) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (hrs) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 0.00 | 1.6 | 3.2 | 4.8 | 6.4 | 8.0 | 9.5 | 11.1 | 12.7 | 14.3 | 15.9 | 17.4 | 19.0 | 20.6 | 22.2 | 23.8 |
| 0.17 | 1.9 | 3.5 | 5.1 | 6.7 | 8.3 | 9.9 | 11.4 | 13.0 | 14.6 | 16.2 | 17.8 | 19.4 | 20.9 | 22.5 | 24.1 |
| 0.25 | 2.4 | 4.0 | 5.6 | 7.2 | 8.7 | 10.3 | 11.9 | 13.5 | 15.1 | 16.7 | 18.2 | 19.8 | 21.4 | 23.0 | 24.6 |
| 0.50 | 4.8 | 6.4 | 8.0 | 9.6 | 11.1 | 12.7 | 14.3 | 15.9 | 17.5 | 19.1 | 20.6 | 22.2 | 23.8 | 25.4 | 27.0 |
| 1.00 | 11.1 | 14.3 | 15.9 | 17.5 | 19.1 | 20.7 | 22.3 | 23.8 | 25.4 | 27.0 | 28.6 | 30.2 | 31.7 | 33.3 | 34.9 |
| 1.50 | 16.4 | 23.8 | 26.1 | 27.7 | 29.3 | 30.8 | 32.4 | 34.0 | 35.6 | 37.2 | 38.8 | 40.3 | 41.9 | 43.5 | 45.1 |
| 2.00 | 20.8 | 32.6 | 36.7 | 38.5 | 40.1 | 41.7 | 43.3 | 44.9 | 46.4 | 48.0 | 49.6 | 51.2 | 52.8 | 54.4 | 55.9 |
| 2.50 | 24.5 | 39.9 | 46.6 | 49.1 | 50.7 | 52.3 | 53.9 | 55.5 | 57.1 | 58.7 | 60.2 | 61.8 | 63.4 | 65.0 | 66.6 |
| 3.00 | 27.5 | 45.9 | 55.3 | 58.9 | 60.6 | 62.2 | 63.8 | 65.4 | 67.0 | 68.6 | 70.1 | 71.7 | 73.3 | 74.9 | 76.5 |
| 4.00 | 32.0 | 55.0 | 68.8 | 74.8 | 77.5 | 79.1 | 80.7 | 82.3 | 83.8 | 85.4 | 87.0 | 88.6 | 90.2 | 91.8 | 93.3 |
| 5.00 | 35.1 | 61.1 | 78.0 | 86.3 | 90.0 | 91.9 | 93.5 | 95.1 | 96.6 | 98.2 | 99.8 | 101.4 | 103.0 | 104.6 | 106.1 |
| 6.00 | 37.2 | 65.3 | 84.3 | 94.4 | 99.1 | 101.2 | 102.8 | 104.4 | 106.0 | 107.6 | 109.2 | 110.7 | 112.3 | 113.9 | 115.5 |
| 7.00 | 38.6 | 68.2 | 88.6 | 100.0 | 105.3 | 107.8 | 109.5 | 111.0 | 112.6 | 114.2 | 115.8 | 117.4 | 119.0 | 120.5 | 122.1 |
| 8.00 | 39.6 | 70.1 | 91.5 | 103.8 | 109.7 | 112.5 | 114.1 | 115.7 | 117.3 | 118.9 | 120.4 | 122.0 | 123.6 | 125.2 | 126.8 |
| 9.00 | 40.3 | 71.4 | 93.5 | 106.4 | 112.7 | 115.6 | 117.3 | 118.9 | 120.5 | 122.1 | 123.7 | 125.3 | 126.8 | 128.4 | 130.0 |
| 10.00 | 40.7 | 72.3 | 94.8 | 108.2 | 114.7 | 117.8 | 119.6 | 121.2 | 122.7 | 124.3 | 125.9 | 127.5 | 129.1 | 130.6 | 132.2 |
| 12.00 | 41.2 | 73.4 | 96.4 | 110.3 | 117.0 | 120.4 | 122.1 | 123.7 | 125.3 | 126.9 | 128.5 | 130.1 | 131.6 | 133.2 | 134.8 |

The cold temperature idle data collected by Sierra Research provides a "snapshot-in-time estimate" of cold start emissions from the fleet in 2000-2001. Since this data was collected, a number of changes have occurred that have and will continue to change fleet-wide idle emissions factors. The ethanol-blended gasoline program, in place at the time that Sierra Research collected this idle emission data, was discontinued in 2003. The fleet is being continually replaced with newer and presumably cleaner vehicles. The net effect of this fleet turnover is a continual reduction in the idle CO emission rate over time. In 2010 the new car test exemption for the Vehicle Inspection and Maintenance (I/M) Program will be extended from four to six years. This will presumably increase the idle emission rate *very* slightly relative to the current four-year exemption period.*

The effect of all these changes on idle emissions can be modeled using MOBILE6. Conformity analysis guidance recommends using MOBILE6 emission factors at 2.5 mph to estimate idle emissions. Thus, predicted reductions in the MOBILE6 emission factor at 2.5 mph were used to adjust the initial 2000-2001 idle data from Sierra. MOBILE6 can be used to estimate the idle CO reduction from fleet turnover on overall idle CO emission rates over time relative to the 2000-2001 period when the Sierra data was collected. MOBILE6 can also be configured to help estimate the effect of CO controls such as the ethanol-blended gasoline program (which was discontinued in 2003) and of the I/M program on idle emissions. The hybrid model utilizes a look-up table derived from MOBILE6 model runs that contains adjustment factors that account for fleet turnover, and changes in ethanol gasoline and I/M requirements. These adjustment factors are shown in Table 6. For example, in order to determine the idle emission factor for a cold start trip (soak time > one hour) in the year 2011 (assuming that the I/M program remains in place the ethanol-blended gasoline program is not reinstituted), the data and Table 5 would be multiplied by an adjustment factor of 0.52 to yield the idle emission rate.

Thus, idle emissions for a trip with a 3 minute idle following a 10-hour cold soak is computed as follows:

*2011 idle EF = (Yr 2000 Idle EF for 3 min idle after 10 hr cold soak) x (adj factor for 2011)*

*= 94.8 grams x 0.52 = 49.3 grams*

* Extending the new car grace period from four to six years is expected to diminish the effectiveness of I/M in reducing CO emissions during idling by less than 2%.

**Table 6.**
**Idle CO adjustment factors**
**Estimation of idle CO based on 2000-2001 Sierra Data**

| Warm Start Idle (Cold Soaks < one hour) | | | |
|---|---|---|---|
| Year | w IM & oxy | w IM, no oxy | no IM, no oxy |
| 2000 | **1.00** | 1.15 | 1.39 |
| 2007 | 0.64 | **0.70** | 0.82 |
| 2008 | 0.58 | **0.63** | 0.74 |
| 2009 | 0.55 | **0.59** | 0.71 |
| 2010 | 0.53 | **0.57** | 0.68 |
| 2011 | 0.51 | **0.54** | 0.65 |
| 2012 | 0.49 | **0.52** | 0.62 |
| 2013 | 0.47 | **0.50** | 0.60 |
| 2014 | 0.45 | **0.48** | 0.58 |
| 2015 | 0.44 | **0.47** | 0.57 |
| 2016 | 0.43 | **0.46** | 0.55 |
| 2017 | 0.42 | **0.45** | 0.54 |
| 2018 | 0.41 | **0.44** | 0.53 |
| 2019 | 0.40 | **0.43** | 0.52 |
| 2020 | 0.39 | **0.42** | 0.51 |
| 2021 | 0.39 | **0.41** | 0.50 |
| 2022 | 0.38 | **0.41** | 0.49 |
| 2023 | 0.38 | **0.41** | 0.49 |

| Cold Start Idle (Cold Soaks >= one hour) | | | |
|---|---|---|---|
| Year | w IM & oxy | w IM, no oxy | no IM, no oxy |
| 2000 | **1.00** | 1.15 | 1.39 |
| 2007 | 0.61 | **0.64** | 0.83 |
| 2008 | 0.55 | **0.61** | 0.75 |
| 2009 | 0.52 | **0.57** | 0.72 |
| 2010 | 0.50 | **0.55** | 0.69 |
| 2011 | 0.48 | **0.52** | 0.66 |
| 2012 | 0.46 | **0.50** | 0.63 |
| 2013 | 0.44 | **0.48** | 0.61 |
| 2014 | 0.43 | **0.46** | 0.59 |
| 2015 | 0.41 | **0.45** | 0.58 |
| 2016 | 0.40 | **0.44** | 0.56 |
| 2017 | 0.39 | **0.43** | 0.55 |
| 2018 | 0.38 | **0.42** | 0.53 |
| 2019 | 0.37 | **0.41** | 0.52 |
| 2020 | 0.36 | **0.40** | 0.51 |
| 2021 | 0.36 | **0.39** | 0.51 |
| 2022 | 0.35 | **0.39** | 0.50 |
| 2023 | 0.35 | **0.39** | 0.49 |

Note: Shaded cells in table above reflect adjustment factors used to model actual or anticipated changes in implementation of ethanol-blended gasoline and I/M programs. Ethanol was discontinued in 2003 and I/M is slated to continue indefinitely.

Modeling the Effect of Engine Block Heater Usage on Warm-up Idle CO Emissions

Quantifying the benefits of engine block heater use was a principal objective of emission studies conducted by Sierra Research in 1998-1999 and 2000-2001. This research showed that in the year 2000, engine block heaters reduced CO emissions by an average of 86 grams after a cold start.

For the purpose of estimating the effect of block heater use on CO emissions in this inventory, the absolute benefit of block heater use on CO reductions was presumed to proportional to the average idle CO emission rate of the fleet. Thus the absolute reductions from block heater usage were expected to decline over time as the fleet is replaced with newer, lower emitting vehicles. To account for idle emission changes resulting from fleet turnover, and from changes in ethanol-blended gasoline and I/M requirements that have or are slated to occur, discount factors were used to adjust the 86 gram per start CO reduction estimated from block heater usage in 2000-2001. These discount factors are shown in Table 6.

An example of how these discount factors are used along with the 2000-2001 Sierra data to compute idle emissions is shown in the example below for analysis year 2013.

Compute block heater reduction in 2013:

Year 2000 block heater CO reduction = 86 grams pr cold start

Year 2013 *cold start idle discount factor (assume I/M with no oxy gasoline) = 0.48*

*Year 2013 block heater reduction = 86 g x 0.48 = 41.2 grams per cold start*

Between 1999 and 2008, the municipality hired a public opinion research firm to perform annual telephone surveys to estimate engine block heater plug-in rates among Anchorage drivers at ambient temperatures below 15 °F.[6] The survey firm estimated at-home plug-in rates before and after the MOA and ADEC began a television, radio and print media campaign aimed at increasing plug-in rates among Anchorage drivers. For morning trips that begin at home initial survey data suggested that plug-in rates increased from about 10% in October 1999 to about 20% after the campaign. Since the initial survey, the MOA and ADEC have had on-going public awareness and incentives programs to encourage block heater use. Survey data suggest that some additional increases in plug-in rates may have occurred, however, for the purpose of the maintenance demonstration, the plug-in rate was assumed static at 20%.

In Anchorage almost all block heater usage occurs at home because electrical receptacles are not generally available at work places and other locations. For this reason, the emission inventory spreadsheet was configured to assign plug-in benefits only to trips that begin at home during the 7 a.m. – 9 a.m. period and for the first portion (9 a.m. – 3 p.m.) of the off-peak period. Trips beginning at work, shopping centers, and other "non-home" locations were assumed to have a zero plug-in rate.

Home-based morning trips comprise a small fraction of all trips taken over the entire day. When this is considered, the overall plug-in rate for all trips taken during the day is about 2%. The plug-in rate assumptions used to model block heater benefits in the spreadsheet are shown in Table 7.

**Table 7.**
**Block heater plug-in rates by time-of-day, trip origin and trip purpose after media campaign promoting block heater use**

| Trip Type | Trip origin | AM Peak 7 a.m. – 9 a.m. | PM Peak 3 p.m. – 6 p.m. | Off-Peak Periods 9 a.m. – 3 p.m. 6 p.m. – 7 a.m. |
|---|---|---|---|---|
| Home-based work | home | **20%** | 0% | **10%** |
| | work | 0% | 0% | 0% |
| Home-based school | home | **20%** | 0% | 0% |
| | school | 0% | 0% | 0% |
| Home-based shopping | home | **10%** | 0% | 0% |
| | shopping | 0% | 0% | 0% |
| Home-based other | home | **20%** | 0% | **5%** |
| | other | 0% | 0% | 0% |
| Non home-based work | NA | 0% | 0% | 0% |
| Non home-based, non-work | NA | 0% | 0% | 0% |
| Truck | NA | 0% | 0% | 0% |

The transportation model post-processor provides data on the number of trips generated within each grid cell for a particular time period for each of the seven trip purposes. The emission inventory spreadsheet uses this data along with user-supplied data on idle duration (Table 3), soak time (Table 4), per start idle emission estimates (Table 5), idle emission adjustment factors (Table 6) and block heater

usage rates (Table 7) to estimate total idle emissions for each grid cell. A spreadsheet algorithm was developed that utilizes post-processor employment and household data from each grid cell to estimate the proportion of trips that originate at home versus work or "other" locations for each of the seven trip purposes. The largest plug-in benefits were accrued in grid cells with large numbers of morning home-based trips because plug-ins rates are the highest for those trips.

Summary of Warm-up Idle Emissions Estimates for 2007-2023

Results of the spreadsheet calculation of warm-up idle emission estimates are summarized in Table 8. These estimates include estimated reductions resulting from block heater use.

**Table 8.**
**Estimated warm-up idle emissions by time-of-day**
**Anchorage inventory area - (all values in tons per day)**

| **Calendar Year** | AM Peak 7 a.m. – 9 a.m. | PM Peak 3 p.m. – 6 p.m. | Off-Peak Periods 9 a.m. – 3 p.m. 6 p.m. – 7 a.m. | **Total 24-hour Idle Emissions** |
|---|---|---|---|---|
| **2007** | 5.56 | 3.68 | 7.11 | **16.35** |
| **2009** | 4.81 | 3.19 | 6.19 | **14.19** |
| **2011** | 4.45 | 2.95 | 5.73 | **13.13** |
| **2013** | 4.15 | 2.75 | 5.35 | **12.25** |
| **2015** | 3.95 | 2.62 | 5.10 | **11.67** |
| **2017** | 3.80 | 2.52 | 4.90 | **11.21** |
| **2019** | 3.65 | 2.45 | 4.77 | **10.87** |
| **2021** | 3.54 | 2.42 | 4.69 | **10.65** |
| **2023** | 3.47 | 2.41 | 4.67 | **10.54** |

## Estimation of On-Road Travel Emissions

On-road travel emissions were estimated on a grid-by-grid basis using travel outputs (vehicle miles traveled or VMT and speed by road facility category* and trip purpose). The post processor also provided information that was used to indirectly develop grid-by-grid estimates of the thermal state†. of vehicles operating on each facility type These estimates of the travel activity and characteristics were used in conjunction with emission factor estimates generated by MOBILE6 with supplemental FTP speed correction factors disabled to better reflect winter season driving behavior in Alaska.

### VMT Estimation

The Anchorage Transportation Model and its post-processor were used to estimate VMT within each of the grids in the inventory area. The transportation model was validated against 2002 traffic data and

* The post-processor developed estimates of VMT and speeds for five facility categories which include (1) freeways and ramps; (2) major arterials; (3) minor arterials; (4) collectors; and (5) local roads. In addition, the post-processor estimated "intrazonal" VMT, travel that occurs within a traffic analysis zone and not explicitly accounted for by the travel demand model.

† The thermal state of a vehicle mode is dependent on the soak time, idle duration, and the amount of time spent traveling on the road before arriving in the grid of interest. Warm engines emit less CO than cold ones.

meets FHWA standards.[7] Past model estimates of VMT have agreed closely with count-based estimates from the Highway Performance Monitoring System (HPMS).[8] Transportation model estimates

and projections of VMT are shown in Table 8. No adjustments were made to transportation model estimates because of their close agreement with previous HPMS-based VMT estimates.

For the maintenance projections prepared for this plan, transportation model runs were made for 2007, 2017, and 2027. VMT for intervening years (2009, 2011, 2013, 2015, 2019, 2021, and 2023) was estimated by interpolation.

Because there are 5 facility categories and 7 trip purposes, the VMT in each one-kilometer grid was separated into 35 (5 x 7) different categories, each with potentially different travel activity characteristics. The number of VMT categories grows to 36 when intrazonal VMT is considered. (Intrazonal trips are defined as trips that begin and end within the same transportation analysis zone in the Transportation Model. All intrazonal VMT was presumed to be on local roads.)

The travel accrued within each of these seven purposes was assigned a different operating mode depending on the idle duration, soak time, and prior travel time associated with each. Thus, freeway travel accrued by home-based work trips was likely assigned a different CO emission rate than freeway travel accrued by non home-based work trips. Thus, the VMT within a single one-kilometer grid could be disaggregated into 36 different operating modes (and emission rates) depending on the trip purpose and facility type.

Vehicle Speed Estimation

The Anchorage Transportation Model and its post-processor provide estimates of vehicle speeds by facility category and time-of-day. Thus for each grid, the post-processor generates an estimate of the average speed of vehicles traveling on freeways, major arterials, minor arterials, collectors and local streets. The speed estimates for these facility categories are average speeds and include periods when vehicles are stopped at signals or in traffic. Thus speed estimates generated by the model change in relation to the amount of congestion on the network. If network capacity is not expanded in relation to growth in VMT, slower speeds result.

Because the primary purpose of the transportation model is to evaluate the capacity needs of the roadway and transit network, the speed outputs generated by the model are not considered to be as important as VMT. Unlike VMT, modeled speed estimates are usually not reconciled to observed network values. Thus modeled vehicle speed estimates can deviate substantially from observed speeds. Indeed, the vehicle speed estimates generated by the Anchorage Transportation Model were significantly higher than those measured in a recent travel time study conducted by the Municipality and the Alaska Department of Transportation in October – November 1998.[9]

Because speed is an important variable in the estimation of CO emissions, the emission inventory spreadsheet was used to apply linear speed adjustment factors to the speed outputs from the model to bring them into closer agreement with speeds observed in the travel time study. In the travel time study, average vehicle speed was measured on freeways and major arterials during the AM, PM and off peak periods. Because data were not available for minor arterials and collectors, speed adjustment factors for these facility categories were assumed to be identical to the adjustment factors determined for major arterials. The speed adjustment factors incorporated into the emission inventory spreadsheet are shown in Table 9.

**Table 9.**
**Speed Adjustment Factors**

| Facility Category | Time Period | Observed Average Speed Oct – Nov 1998 MOA travel time study (MPH) | Predicted Average Speed Anchorage Transportation Model (1996) (MPH) | Speed Adjustment Factor |
|---|---|---|---|---|
| Freeways | AM Peak. | 56.6 | 49.2 | 1.0 |
| Freeways | Off-peak | 61.2 | 48.0 | 1.0 |
| Freeways | PM Peak. | 57.8 | 49.2 | 1.0 |
| Major Arterials | AM Peak. | 29.7 | 40.2 | 0.74 |
| Major Arterials | Off-peak | 29.4 | 35.1 | 0.84 |
| Major Arterials | PM Peak. | 24.7 | 39.5 | 0.63 |
| Minor Arterials | AM Peak. | --- | 38.7 | 0.74 |
| Minor Arterials | Off-peak | --- | 36.2 | 0.84 |
| Minor Arterials | PM Peak. | --- | 38.5 | 0.63 |
| Collectors | AM Peak. | --- | 30.1 | 0.74 |
| Collectors | Off-peak | --- | 28.7 | 0.84 |
| Collectors | PM Peak. | --- | 29.8 | 0.63 |

Note that model output freeway speeds were significantly different from observed speed but they were not adjusted (i.e., adjustment factor = 1.0). The travel time study did not include ramps in the estimation of observed freeway speed. However, the transportation model included on-ramps and off-ramps in the model as part of the freeway category. The higher speeds observed in the travel time study were presumed to be the result of not including ramps in speed measurements. The freeway speed outputs from the model were deemed reasonable and no adjustment was applied.

A default speed of 15 miles per hour was assigned to all VMT on local roadways and 25 miles per hour for intrazonal travel.

Estimation of Vehicle Thermal State

One of the most important variables in the estimation of vehicle CO emissions during the travel mode is the thermal state of the engine. Cold vehicles emit significantly more CO. The thermal state of the vehicle at any given point in a trip is a function of its soak time (the time since the engine was last running and start-up), the amount of time it was warmed-up prior to the trip, and the amount of prior travel time:

$$\textit{Operating mode} = f(\textit{soak time, idle duration, prior travel time})$$

MOBILE6 allows the user to supply assumptions regarding the soak distribution of the vehicles started by time-of-day and emission factor estimates are very sensitive to these assumptions. Modeled emissions are significantly higher when a large proportion of vehicles are assumed to have had long soak times.

Sierra Research developed a method that allowed the computed thermal state of the vehicle with a given soak, idle and travel time to be translated into the operating mode fractions used to model on-road emission factors for the MOBILE5b/Cold CO-based Anchorage attainment plan. However, MOBILE6 no longer uses the operating mode fraction as a model input. Instead, Sierra identified six soak distributions that correspond to the bag fractions used in the attainment plan.

Table 10 compares the bag fraction approach used in the attainment plan to the soak distribution approach used in the maintenance plan. To develop the maintenance inventory, the VMT accrued by a particular trip type (e.g. home-based work trips beginning at home) was assumed to be characterized by one of six possible thermal states. For example, if transportation model outputs indicated that this VMT was in the coldest thermal state, MOBILE6 was run with a soak distribution in which 41.8% of the vehicles were assumed have a soak time of 10 minutes and 58.2% of vehicles a soak time of 12 hours or more. If transportation model outputs indicated that the VMT was in the hottest thermal state, 94% of the VMT was accrued by vehicles with a soak time of 10 minutes and just 6% by vehicles with a soak time of 12 hours or more. MOBILE6 emission factors for "cold VMT" were significantly higher than "hot VMT."

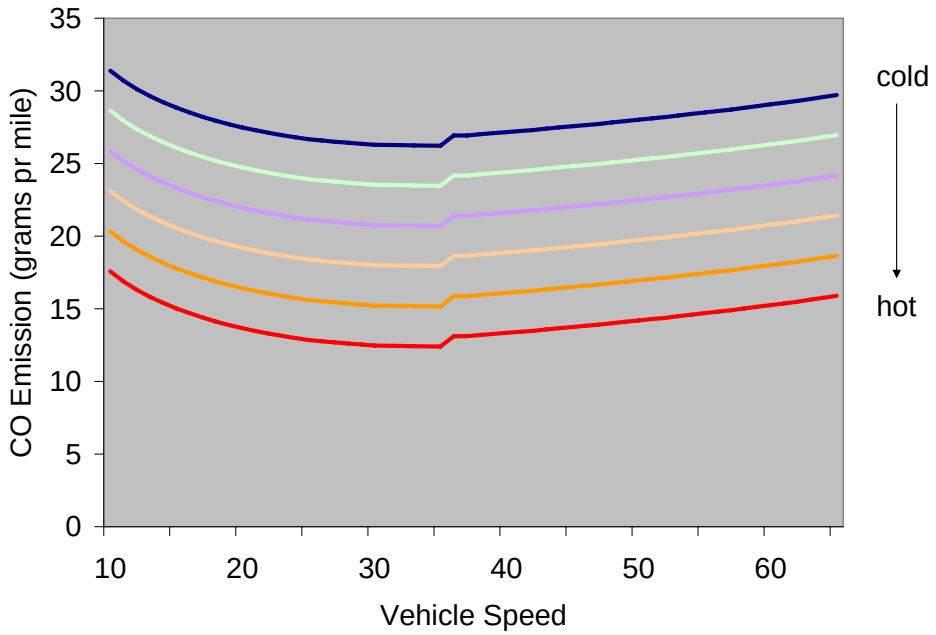
**Table 10.**

**Soak distributions for MOBILE6 with comparable operating mode fractions used in MOBILE 5b/Cold CO Model**

| Thermal State | Operating Mode Fraction (input for MOBILE5b/Cold CO Model) PCCN / PCHC / PCCC* | Soak Distribution % of vehicles soaked for 10 min vs. 12 hours (input for MOBILE6 Model) |
|---|---|---|
| Cold | 27.9 / 20.0 / 27.9 | 41.8% 10 min, 58.2% 12 hours |
| ↓ | 22.9 /25.0 / 22.9 | 52.2% 10 min, 47.8% 12 hours |
| | 17.9 / 30.0 / 17.9 | 62.7% 10 min, 37.3% 12 hours |
| | 12.9 / 35.0 / 12.9 | 73.1% 10 min, 26.9% 12 hours |
| | 7.9 / 40.0/ 7.9 | 83.6% 10 min, 16.4% 12 hours |
| Hot | 2.9 / 45.0 / 2.9 | 94.0% 10 min, 6.0% 12 hours |

**Figure 3**

**MOBILE6 On-road emission factor as a function of speed and thermal state 2007 Anchorage emission inventory**




* PCCN = % of VMT accrued by non-catalyst-equipped vehicles operating in cold start mode, PCHC = % of VMT accrued by catalyst and non-catalyst vehicles operating in hot start mode; and PCCC = % of VMT accrued by catalyst-equipped vehicles operating in cold start mode. The sum of these % do not add to 100%. The unspecified portion is the % of VMT accrued by vehicles in the hot-stabilized mode. (If PCCN/PCHC/PCCC = 22.9 /25.0 / 22.9, then the % VMT accrued in the hot stabilized mode would be 100 – (22.9+25.0) = 52.1%.

Note: The discontinuities at 15 and 35 mph in Figure 3 reflect a change in the facility type inputs to MOBILE6. All VMT accrued at speeds above 35 mph was assumed to be on freeways and all local road VMT was assigned a default speed of 15 mph. All other VMT was assumed to be accrued on arterials.

An extensive look-up table was then developed for the emission inventory spreadsheet that allowed one of the six soak distributions in Table 10 to be assigned on the basis of the various possible soak times, idle durations, and prior travel times. Soak time and idle duration were supplied as user inputs in the spreadsheet and were based on the local driver behavior studies discussed in the earlier section on estimation of idle emissions. These user inputs varied by time-of-day and trip purpose.

The third variable necessary in the estimation of operating mode was the average prior travel time of the vehicles traveling within the grid of interest. If vehicles had long prior travel times they were likely to be in a fully warm state, and hence, a large proportion of the VMT accrued in the grid would be in the hot fraction. Anchorage Transportation Model post-processor outputs were used to estimate prior travel time. The post-processor provides separate estimates of the amount of VMT accrued by vehicles that began their trips less than 505 seconds ago and more than 505 seconds ago. A spreadsheet algorithm was then developed to estimate average prior travel time for the VMT accrued within each grid by facility type and trip purpose.

The end result of this work was a spreadsheet look-up table that allowed the assignment of a particular soak distribution or thermal state for each the 36 different categories of VMT in each grid. Separate assignments were provided by facility category and for the trip purposes within each facility category. Because the emission factor is a function of the soak distribution, different emission factors were assigned to the VMT within each grid depending on the time-of-day, trip purpose, and facility type.

MOBILE6 Model

The MOBILE6 emission factor model was used to estimate travel emissions. MOBILE6 was run with Supplemental Federal Test Procedure (SFTP) speed correction factors disabled. The SFTP speed correction factors are used to model the so called “aggressive driving component” of the drive cycle used to compute emission factors. The effects of SFTP were disabled in the model to reflect observed drive cycle behavior in Alaska. Sierra Research conducted studies in Anchorage and Fairbanks to characterize the behavior of Alaskan drivers in the winter. As one might expect, they found a low proportion of driving in hard acceleration or hard deceleration modes when roads are often icy. They determined that the old FTP, without the so-called “aggressive driving supplement”, fairly approximated the winter drive cycle in Alaska. The primary effect of excluding the SFTP was to reduce emission factors computed for the on road portion of trip emissions. However, disabling the SFTP emission component in MOBILE6 has the secondary effect of reducing the benefits of fleet turnover on future emissions. In other words, using MOBILE6 with SFTP disabled provides a more pessimistic maintenance forecast than the “default” version of the model with SFTP factors enabled.

Vehicle registration distributions were based on data from detailed parking lot surveys conducted by ADEC during the winters of 1999 and 2000. The assumptions about the age distribution of vehicles were compared to parking lot survey data collected in 2007. There was very little difference in the age distributions determined in 1999 and 2001 and the more recent data. All these surveys indicated that the in use vehicle population is newer than suggested by vehicle registration data.

Odometer measurements collected by the Anchorage I/M program allowed mileage accumulation rates of vehicles subject to I/M requirements to be estimated. Default mileage accumulation rates were used for diesels and other I/M exempt vehicles.

MOBILE6 was configured to reflect the fact that new car I/M test exemption period will be extended from four to six years beginning in January 2010. Thus, the MOBILE6 input files reflect the four-year new car exemption in place in Anchorage in analysis years 2007 and 2009. For 2011 and beyond, , the input files MOBILE6 reflect a six year new car exemption. When the CO reduction provided by I/M in analysis years 2007 and 2009 was modeled with MOBILE6, an I/M program effectiveness of 85% and compliance rate of 90% among non-OBD vehicles was assumed. The compliance rate for OBD-

equipped vehicles was assumed to be slightly higher, 93%. Attachment 2 contains copies of the input files used to generate emission factors for the 2007 base year inventory and for 2011. Copies of input files for 2009, 2013, 2015, 2017, 2019, 2021 and 2023 are available upon request.

Calculation of On Road CO Emissions

An Excel spreadsheet was developed to assemble the information necessary to calculate CO emissions from on road travel in each grid cell. As discussed earlier, the spreadsheet was used to compute the emission contributions of 36 possible different categories of travel, with varying speeds and operating modes. The emissions from these various categories of travel were then summed to determine on-road emissions in each grid using the following formula:

$$\textit{On-road emissions} = \sum_{i=1}^{36} (VMT_1 \times EF_1) + (VMT_2 \times EF_2) \ldots\ldots\ldots\ldots (VMT_{21} \times EF_{36})$$

Summary of On-road Travel Emissions Estimates for 2007-2023

Results of the spreadsheet calculation of travel emissions are shown by time of day in Table 11. Note that emissions increase slightly between 2009 and 2011 due to the termination if the I/M program and then decline slowly thereafter.

**Table 11.**
**On road travel emissions by time-of-day (all values in tons per day)**

| **Calendar Year** | AM Peak 7 a.m. – 9 a.m. | PM Peak 3 p.m. – 6 p.m. | Off-Peak Periods 9 a.m. – 3 p.m. 6 p.m. – 7 a.m. | **Total 24-hour Travel Emissions** |
|---|---|---|---|---|
| **2007** | 8.01 | 14.27 | 28.76 | **51.04** |
| **2009** | 7.03 | 12.53 | 25.39 | **44.95** |
| **2011** | 6.72 | 11.95 | 24.15 | **42.82** |
| **2013** | 6.34 | 11.24 | 22.73 | **40.32** |
| **2015** | 6.09 | 10.77 | 21.78 | **38.64** |
| **2017** | 5.89 | 10.34 | 21.12 | **37.35** |
| **2019** | 5.77 | 10.21 | 20.72 | **36.70** |
| **2021** | 5.65 | 10.05 | 20.41 | **36.11** |
| **2023** | 5.60 | 10.01 | 20.39 | **36.01** |

## Aircraft Operation Emissions

In June of 2005 Sierra Research, Inc. prepared the "Alaska Aviation Inventory" for the Western Regional Partnership (WRAP).[10] They compiled air pollutant emission estimates for airports across Alaska including Ted Stevens Anchorage International Airport (ANC) and Merrill Field Airport in Anchorage. Both summer and winter CO emissions associated with aircraft operation for various pollutants were estimated for the year 2002. Sierra collaborated with CH2MHill to collect the specific information on aircraft operations at ANC and Merrill Field necessary for input into the Federal Aviation Administration's EDMS Model (Version 4.2). EDMS was used to generate estimates of CO emissions from aircraft and aircraft support equipment. In EDMS, aircraft support equipment includes both ground support equipment (GSE) and on-board auxiliary power units (APUs) that are used to provide power to aircraft

when on the ground. Winter season CO emissions estimates for ANC and Merrill are shown in Table 12.

**Table 12.**
**24-hour CO emissions estimates from aircraft at ANC and Merrill Field in 2002**

| | Aircraft Support Equipment APU and GSE (tons per day) | Aircraft (tons per day) | TOTAL |
|---|---|---|---|
| **ANC** | 8.21 | 3.32 | **11.53** |
| **Merrill** | 0.00 | 0.63 | **0.63** |

ANC is currently revising their master plan. The draft Master Plan contains an analysis of historical trends in aircraft operations and projections through 2027. The draft Plan projects an average annual growth rate of 2.4% between 2005 and 2027. Historical data on total operations in 2002 when Sierra prepared their emissions estimates were used along with the growth projections in the draft Master Plan to project future emissions from ANC. Emissions were presumed to grow in direct proportion to total operations. Results are shown in Table 13.

**Table 13**
**Projected aircraft operations and CO emissions at ANC**

| Calendar Year | Estimated or Projected Annual Aircraft Operations | CO Emissions (tons per day) |
|---|---|---|
| 2002 (base year of Sierra inventory) | 309,236 | **11.53** |
| 2007 | 331,708 | **12.37** |
| 2009 | 347,845 | **12.97** |
| 2011 | 363,982 | **13.57** |
| 2013 | 379,810 | **14.16** |
| 2015 | 395,327 | **14.74** |
| 2017 | 410,845 | **15.32** |
| 2019 | 435,440 | **16.24** |
| 2021 | 460,036 | **17.16** |
| 2023 | 484,631 | **18.07** |

Winter CO emissions from Merrill Field were computed in a similar manner. Sierra's 2002 CO emissions estimate (0.633 tons/day) was scaled upward in proportion to the projected increase in aircraft operations at Merrill. The Merrill Field Master Plan (2000) contains growth projections for the period 1997 through 2020. Annual operations are projected to increase from 187,190 in 1997 to 270,800 in 2020. Assuming linear growth, CO emissions can be projected for the period 2007-2023. These projections are shown in Table 14.

**Table 14**

**Projected Aircraft Operations and CO Emissions at Merrill Field Airport**

| Calendar Year | Estimated or Projected Aircraft Operations | CO Emissions (tons per day) |
|---|---|---|
| 1997 | 187,190 | |
| 2002 (base year of Sierra inventory) | 205,366 | **0.633** |
| 2007 | 223,542 | **0.689** |
| 2009 | 230,813 | **0.711** |
| 2011 | 238,083 | **0.734** |
| 2013 | 245,353 | **0.756** |
| 2015 | 252,624 | **0.779** |
| 2017 | 259,894 | **0.801** |
| 2019 | 267,165 | **0.823** |
| 2021 | 274,435 | **0.846** |
| 2023 | 281,706 | **0.868** |

## Residential Wood Burning Emissions

The basic assumptions used in the preparation of emission estimates from residential wood burning were not changed from those used in the Year 2000 Anchorage Attainment Plan. Assumptions regarding wood burning activity levels (i.e. the number of households engaging in wood burning on a winter season design day) were corroborated by a telephone survey conducted by Ivan Moore Research (IMR) in 2003. IMR asked approximately 600 Anchorage residents whether they had used their fireplace or woodstove during the preceding day. The survey was conducted when the preceding day had a minimum temperature between 5 and 15 degrees F. Survey results were roughly consistent with the assumptions used in the attainment plan inventory. The basic assumptions used to estimate wood burning were based on data from a telephone survey[11] performed by ASK Marketing and Research in 1990.

The ASK survey asked Anchorage residents how many hours per week they burned wood in their fireplace or wood stove.[*] Because the AP-42 emission factors for fireplaces and wood stoves are based on consumption in terms of the amount of wood (dry weight) burned, hourly usage rates from the survey had to be converted into consumption rates. Based on discussions between MOA and several reliable sources (OMNI Environmental Services, Virginia Polytechnic Institute, Colorado Department of Health), average burning rates (in wet weight) of 11 pounds per hour for fireplaces and 3.5 pounds per hour for wood stoves were assumed for the Anchorage area. Residential wood burning assumptions are detailed in Table 15.

[*]A previous telephone survey attempted to quantify wood consumption directly by asking residents how much wood (e.g., cords) they burned each winter. Many residents had difficult quantifying their consumption in this manner, for this reason the 1990 survey asked about hours of usage per week.

**Table 15.**
**Estimation of residential wood burning CO emission factors for Anchorage**

| Device | Average use per weekday (hours per household per day) | Average dry weight of wood consumed (lbs per hour)* | Average amount of wood burned per household (dry lbs / day) | Estimated wood burning CO emissions per household (lbs/day) |
|---|---|---|---|---|
| Fireplaces | 0.156 | 7.15 lbs/hr | 1.11 | 0.141 |
| Wood Stoves | 0.032 | 2.275 lbs/hr | 0.073 | 0.006 |
| TOTAL Fireplaces + woodstoves | 0.188 | ------ | 1.18 | **0.147** |

* The moisture content of wood burned was assumed to be 35%. Thus, dry burning rates were 65% of wet rates.
** The wood stove emission factor was determined by assuming that the wood stove population in Anchorage is comprised of equal proportions of conventional, catalyst, and non-catalyst stoves. The emission factor above was calculated as the weighted average of the AP-42 emission factors for each stove type. AP-42, 5th Edition (Oct 1996)

Survey results suggest wood burning rates are relatively low in the Anchorage area. The vast majority of wood burning is "pleasure burning;" very few residents need to burn wood for primary or supplemental heat. If the average fire in the fireplace and/or woodstove is assumed to last three hours, Table 15 suggests that about 1 in every 16 households in Anchorage burns wood on a typical winter weekday.

The Anchorage Transportation Model post-processor provided information on the number of households in each grid. The calculated CO emission rate of 0.147 lbs of CO per day was assigned to each household in a grid. Thus wood burning emissions were highest in grids with high housing density.

Projecting future trends in wood heating in Anchorage is difficult. On one hand, anecdotal evidence suggests that fewer wood burning appliances are being installed in new homes in Anchorage. This is consistent with trends being observed nationally. On the other hand, increases in natural gas prices could result in increases in wood heating. For the purpose of this inventory, residential wood burning was assumed to increase in direct proportion with the number of households in the Anchorage inventory area. Area-wide wood burning emissions for the period 2007 - 2023 are shown in Table 16.

**Table 16.**
**Estimated Anchorage-wide 24-hour CO emissions from residential wood burning**

| Calendar Year | Number of Households in Inventory Area | 24-Hour Emissions (tons) |
|---|---|---|
| **2007** | 84,936 | 6.24 |
| **2009** | 86,582 | 6.36 |
| **2011** | 88,229 | 6.48 |
| **2013** | 89,875 | 6.60 |
| **2015** | 91,522 | 6.72 |
| **2017** | 93,168 | 6.84 |
| **2019** | 94,045 | 6.91 |
| **2021** | 94,923 | 6.97 |
| **2023** | 95,800 | 7.04 |

## Emissions from Natural Gas Combustion for Space Heating

The methodology used to compute natural gas space heating emissions for the maintenance demonstration is identical to that used in the Year 2000 Anchorage CO Attainment Demonstration and the 2004 Anchorage CO Maintenance Plan. A telephone survey conducted by ASK Marketing and Research in 1990[12] indicated that natural gas is the fuel used for virtually all space heating in Anchorage. ASK survey results are shown in Table 17.

**Table 17.**
**Methods of Home Heating in Anchorage (ASK Marketing & Research, 1990)**

| | |
|---|---|
| Natural gas | 88.2% |
| Electricity | 9.2% |
| Fuel oil | 0.2% |
| Wood / other | 1.3% |
| Don't know | 1.1% |
| **Total** | **100.0%** |

Enstar distributes natural gas to Kenai, Anchorage and other parts of Southcentral Alaska. According to Enstar, in 1996 approximately 80% of their gas sales were to Anchorage.[13] Table 19 indicates that about 88% of all homes in Anchorage are heated with natural gas. A small fraction of homes are heated by wood or fuel oil. Wood heating has already been quantified separately in the inventory. The consumption of fuel oil for space heating was small in 1990 and likely even smaller in 2007. Calculated area-wide CO emissions from space heating with fuel oil are negligible (less than 25 pounds per day) and are not included in the inventory. Finally, the emissions associated with electrical heating occur at the generation plant. These emissions are accounted for separately in the point source inventory.

A detailed report of natural gas sales to residential, commercial and industrial customers was available for calendar year 1990* for Southcentral Alaska.[14] Peak winter usage rates were estimated for residential customers and for commercial/industrial customers from this report. Demographic data (i.e. number of households, number of employees) were used to estimate per household consumption rates for residential customers and per employee consumption for commercial/industrial customers. The most recent AP-42 CO emission factors (July 1998) for uncontrolled residential furnaces (40 lbs CO/ $10^6$ $ft^{3)}$) and small boilers (84 lbs CO/ $10^6$ $ft^{3)}$) were used to characterize residential and commercial space heating emission. Calculated peak natural gas consumption and emission rates are shown in Table 18.

**Table 18**
**Peak winter season natural gas consumption rates and**
**CO emission rates in Anchorage (1990)**

| | Consumption Rate per Day | AP-42 Emission Factor (lbs. per $10^6$ $ft^3$) | CO Emission Rate (lbs per day) |
|---|---|---|---|
| Residential | 658 $ft^3$ per household | 40 | 0.0263 per household |
| Commercial/ Industrial | 434 $ft^3$ per employee | 84 | 0.0364 per employee |

* Although data from more recent years was available, the reporting format had changed and less detailed data were available. Unlike the 1990 report, natural gas consumption was not reported separately for residential, commercial/industrial, and power generation customers.

On an area-wide basis, CO emissions from natural gas combustion were calculated by multiplying the CO emission rates in Table 19 by the number of households and employees in the inventory area. Table 19 presents the results of this calculation for the period 2007 – 2023. Emissions resulting from the combustion of natural gas for power generation are excluded. These emissions are accounted for separately in the point source inventory.

**Table 19**
**CO Emissions from natural gas combustion (excludes power generation)**

| Calendar Year | Number of Households in Inventory Area | Number of Employees in Inventory Area | Calculated Total Natural Gas Consumption (mcf) | CO Emissions from Natural Gas Combustion (tons/day) |
|---|---|---|---|---|
| 2007 | 84,936 | 145,516 | 119,127 | 3.77 |
| 2009 | 86,582 | 146,755 | 120,749 | 3.82 |
| 2011 | 88,229 | 147,994 | 122,372 | 3.86 |
| 2013 | 89,875 | 149,234 | 123,994 | 3.91 |
| 2015 | 91,522 | 150,473 | 125,617 | 3.95 |
| 2017 | 93,168 | 151,712 | 127,238 | 3.99 |
| 2019 | 94,045 | 153,731 | 128,693 | 4.04 |
| 2021 | 94,923 | 155,750 | 130,148 | 4.09 |
| 2023 | 95,800 | 157,769 | 131,602 | 4.14 |

CO emissions from natural gas combustion were also calculated on a grid-by-grid basis by multiplying the emission rate per household or per employee by the number of households or employees in each grid. Thus, grid cells with a large number of households and/or employees were assigned the greatest emissions.

## Other Miscellaneous Sources

### Use of NONROAD to Estimate Emissions from Snowmobiles, Snow Blowers, Welders, Air Compressors and Other Miscellaneous Sources

As a starting point for this analysis, the EPA NONROAD model (version 2005) was run for base year 2007. The model provides estimates of non-road equipment types and activity levels for Anchorage. These model outputs were reviewed carefully to assess whether or not nonroad equipment populations and usage (i.e., hours per year) were reasonable. The NONROAD model uses a top-down approach in which state-level equipment populations are allocated to counties on the basis of activity indicators that are specific to certain equipment types. Anchorage is the major wholesale and retail distribution center for the state. Because the NONROAD model activity indicator is based on the number of businesses within a particular SIC code, the model has a tendency to over-allocate the equipment to Anchorage and ignore usage that occurs outside the Anchorage area. For example, the NONROAD estimate for generator sets is likely heavily skewed by sales to non-Anchorage customers who come to Anchorage to purchase a generator for use in areas outside of the power grid.

The default model outputs are given in terms of average monthly, year-round use. These outputs were adjusted to reflect the fact that activity levels for non-road sources would be expected to be reduced on

a typical midwinter exceedance day when ambient temperatures are near 0 °F. The activity levels of all-terrain vehicles, motorcycles, pressure washers, air compressors and pumps are likely substantially reduced in midwinter. Pressure washer activity, for example, was assumed to be 10% of that estimated by NONROAD. Other sources were also adjusted significantly from the NONROAD model's default outputs. These local adjustment factors are shown in Table 20. It is important to note, that without adjustment, the NONROAD model's estimate of CO emissions from the sources listed in the table is 120.8 tons per day in 2007, whereas total motor vehicle emissions (idle plus travel) are estimated to be just 67.1 tons per day. Given what is known about the CO problem in Anchorage, clearly something is amiss. After the activity adjustment factors are applied to the NONROAD model estimates, the total contribution from the sources listed in the table is 9.1 tons per day.

Default output emissions from commercial and residential snowblowers were also reduced. Anchorage climatological records indicate that CO exceedances are typically preceded by cold, clear weather without snow. Thus, snowblower activity is likely to be lower on elevated CO days. For this reason the NONROAD estimate of residential and commercial snowblower activity was cut by 50%.

The NONROAD model default estimate for the snowmachine population in Anchorage is 34,985. Although there are a considerable number of snowmobiles in Anchorage, virtually all use occurs outside of the nonattainment area. Snowmobile use in Anchorage is banned on public land throughout the Anchorage nonattainment area because of safety and noise issues. Although there is some use in surrounding parklands, (i.e., Chugach State Park) these areas are located at least three miles from the emission inventory area boundary. However, there is likely to be some small amount of engine operation for maintenance purposes, etc. This was assumed to average about 0.1 hours per unit per month inside the inventory area. This usage rate is about 50 times lower than the NONROAD default value.

Finally, some of the NONROAD model outputs were clearly unreasonable. For example, there is no commercial logging activity in the Anchorage bowl. For this reason, the NONROAD model's estimate of CO emissions from logging equipment chain saws was disregarded. The NONROAD estimate of "other" chainsaw use was cut by 80% to reflect that little garden or home wood cutting activity is likely to take place in mid-winter.

**Table 20**
**Estimation of NONROAD CO emissions in 2007**

| | Number of Units | EPA NONROAD Model Estimate of CO emissions (unadjusted) | Activity Adjustment Factor | Revised CO Inventory Estimate (tons/day) |
|---|---|---|---|---|
| air compressors | 251 | 0.83 | 0.50 | 0.42 |
| ATVs | 14,481 | 0.90 | 0.02 | 0.02 |
| chainsaws | 6,159 | 0.56 | 0.20 | 0.14 |
| concrete saws | 144 | 0.60 | 0.25 | 0.15 |
| forklifts | 94 | 0.41 | 1.00 | 0.41 |
| generator sets | 4,758 | 7.13 | 0.25 | 1.78 |
| pressure washers | 1,898 | 3.08 | 0.10 | 0.31 |
| pumps | 1,227 | 1.73 | 0.25 | 0.43 |
| snowblowers commercial | 864 | 2.26 | 0.50 | 1.13 |
| snowblowers residential | 9,517 | 1.02 | 0.50 | 0.51 |
| snowmobiles | 34,985 | 96.73 | 0.02 | 1.93 |
| welders | 419 | 2.10 | 0.50 | 1.05 |
| other | 91,767 | 3.47 | varies | 0.84 |
| **TOTAL NONROAD** | | **120.83** | | **9.12** |

In order to estimate future year emissions (2009 through 2023) the sources listed in Table 20 were increased in proportion to growth in households or employment. If the nonroad road source was primarily related to household activities, the growth in emissions was assumed to be proportional to the projected growth in the number of households in the inventory area. These household- related sources include snowmobiles, motorcycles and generator sets. If the nonroad source was primarily related to commercial activity, growth in emissions was assumed to be tied to growth in employment. Commercial or employment-related sources include welders, pumps and air compressors.

The emissions from the sources listed above were apportioned among the grid cells that make up the inventory area by using the number of households or employment in the grid as a surrogate for source activity. Activities that would normally primarily occur in residential areas (snowmobiles, residential and commercial snowblower use, ATVs and motorcycles) were apportioned on the basis of the number of households in each grid. Activities that would normally occur in commercial or industrial areas (welders, pumps, and air compressors), were apportioned on the basis of the amount of employment in each grid.

**Table 21**
**CO emissions from NONROAD sources (2007-2023)**

| Calendar Year | CO Emissions from NONROAD Sources (tons/day) |
|---|---|
| 2007 | 9.12 |
| 2009 | 9.24 |
| 2011 | 9.35 |
| 2013 | 9.47 |
| 2015 | 9.59 |
| 2017 | 9.70 |
| 2019 | 9.82 |
| 2021 | 9.93 |
| 2023 | 10.04 |

Railroad Emissions

Because railroad emissions are a relatively insignificant source of CO, no changes have been made to the estimates or methodology employed in the 2004 CO Maintenance Plan. The Alaska Railroad (ARR) supplied data on line haul and switchyard fuel consumption to the Alaska Department of Environmental Conservation for calendar year 1999. Total fuel consumption in the Anchorage switchyard was estimated to be 370,000 gallons during calendar year 1999. ARR also provided data on line haul fuel consumption between milepost 64 and 146. Annual fuel consumption along this 82-mile section of track was estimated to be 771,000 gallons. Only 14 miles of track (roughly MP 104 through MP 118) are inside the emission inventory area. The proportionate share of consumption within the inventory area was estimated to be 131,600 gallons. Twenty-four hour consumption rates were calculated by dividing annual totals by 365.

EPA guidance[15] provides separate emission factors for yard and line haul emissions. These factors, expressed on a gram per gallon basis, were applied to ARR fuel consumption estimates to compute emissions.

Railroad fuel consumption and emissions are summarized in Table 22. Switchyard emissions were distributed to the three grid cells that encompass the rail yard in the Ship Creek area of Anchorage. The rail route in Anchorage crosses 15 grids cells in the Anchorage inventory area. Line haul emissions were distributed equally among these 15 grid cells.

**Table 22**
**Alaska Railroad emission estimates 2007-2023**

| | Consumption (gal/year) | Consumption (gal/day) | Locomotive Emission Factor (grams/gal) | CO emissions (tons/day) |
|---|---|---|---|---|
| Yard | 370,000 | 1,014 | 38.1 | 0.04 |
| Line Haul | 131,634 | 361 | 26.6 | 0.01 |
| **Total** | **501,634** | **1,375** | | **0.05** |

Although railroad activity is expected to increase in future years, above the activity levels reported in 1999, the emissions increases that might be expected from this growth are likely to be offset by improvements in locomotive control technology. The Alaska Railroad recently replaced 28 of their 62 locomotives with new models that produce less pollution and are more fuel efficient. In addition, between 2002 and 2007, the railroad equipped two-thirds of their locomotives with devices that reduce the amount of time locomotives idle in the Anchorage switchyard and reduce fuel consumption. For the purpose of this analysis, CO emissions from the ARR were assumed to remain the same through 2023. Although this is a crude assumption, the significance of ARR emissions is very small. Hence, refining these future year projections would have a negligible effect on the overall inventory.

### Marine Vessel Emissions

The Port of Anchorage serves primarily as a receiving port for goods such as containerized freight, iron, steel and wood products, and bulk concrete and petroleum. Commercial shipping lines, including Totem Ocean Trailer Express and Horizon Lines bring in four to five ships weekly into the Port. The Port is currently undergoing a significant expansion that is intended to modernize the facility and double its size. In 2005, over 5 million tons of commodities moved across the Port's docks.

Despite the magnitude of this activity at the Port, CO emissions are relatively small. In June 2005, Pechan and Associates prepared an emission inventory for the ADEC that estimated winter and summer season CO emissions from the Port for the year 2002.[16] This report provided an estimate of total emissions that occur from all four modes of commercial marine activity for the winter (defined as October through March). These four modes include cruise, reduced speed zone (RSV), maneuvering, and hotelling. However, as defined for modeling purposes, the cruise and RSV modes occur far from Port. Cruise mode activity occurs more than 25 miles form Port and the RSV mode occurs 2 miles or more from Port. Because cruise and RSV mode CO emissions occur so far from Port and therefore have little or no influence on CO concentrations in the Anchorage CO maintenance area, these emissions were excluded from this inventory.[*] In addition to the 2002 inventory, the Pechan inventory also includes a forecast of winter CO emissions for 2005 and 2018. Interpolation and extrapolation was used to estimate CO emissions from Port of Anchorage marine activity from 2007 – 2023. These estimates are shown in Table 23.

[*] Cruise and RSV emissions account for about 56% of total winter CO emissions. Therefore only 44% of the emissions in the Pechan inventory were included in this inventory.

**Table 23.**
**Estimated CO emissions from the Port of Anchorage**

| Year | Estimated CO emissions (tons per day) |
|---|---|
| 2007 | 0.09 |
| 2009 | 0.10 |
| 2011 | 0.11 |
| 2013 | 0.12 |
| 2015 | 0.12 |
| 2017 | 0.13 |
| 2019 | 0.13 |
| 2021 | 0.13 |
| 2023 | 0.13 |

## Emissions from Point Sources

Point source emissions estimates for the year 2005 served as the basis for the 2007 base year point source emission inventory prepared for this maintenance plan and projections through 2023. Point source emissions were expected to grow in relation to the number of households. Thus the emission estimates for 2005 were adjusted upward in proportion to the growth in the number of households in the inventory boundary area.

ADEC is responsible for issuing operating permits to all stationary sources that have fuel-burning equipment with a combined rating capacity of greater than 100 million Btu per hour. The MOA also issues operating permits to all point sources in Anchorage with a combined rating capacity of greater than 35 million Btu per hour. The ADEC and MOA permit systems were used to inventory all stationary sources that are required to obtain such permits in the Anchorage non-attainment area. In addition, point sources that produce more than 10 tons per year (TPY) of CO (minor sources) were individually quantified to achieve a more precise estimate of the minor source contribution to the overall emission inventory from stationary sources.

The identification of minor sources was accomplished by contacting fuel distributors in Anchorage. We determined whether any facilities consumed sufficient quantities of fuel to exceed the annual 10 TPY of CO threshold. Using EPA's emission factors, AP-42 (fifth edition), fuel quantities equivalent to 10 TPY of CO were compared to sales of fuel to large users. This identified potential 10+ TPY of CO point sources. This approach determined that only permitted sources in Anchorage emitted more than 10 TPY of CO.

The ADEC point source computations were based on annual information provided by the source. The emission factors were from the most current version of AP-42. The ADEC calculated daily point source emissions for a typical wintertime day during the peak CO season by dividing the annual activity levels by the number of days per year. Actual facility operating information was available for 2005. Source emission estimates were based on actual fuel consumption and operations rather than permit allowable emissions.

Based on ADEC-issued air quality permits, there are six point sources in the Anchorage non-attainment area. Estimated annual emissions from each source for 2005 and projected daily emissions for the 2007-2023 period are listed in the table at the end of this section. Three of the six point sources identified in the Anchorage inventory were gas-fired (primarily natural gas) electrical generating facilities. Other sources include a sewage sludge incinerator, and two bulk fuel storage facilities.

Appendix to Section III.B.3

## Source Descriptions and Emission Estimation Information

There are three point sources that are located outside the non-attainment area. Two are located on military bases at Elmendorf Air Force Base and Fort Richardson. These facilities were excluded from the base year inventory because the CO emissions on these two military facilities are not considered significant contributors to the Anchorage attainment problem. The third facility is Anchorage Municipal Light and Power Sullivan Power Plant. It is located approximately two kilometers east of the northwest corner boundary of the nonattainment area. Even though this source is located outside the boundaries of both the attainment area and emission inventory area, it is included in the inventory. Emissions from the Sullivan Plant were assigned to the furthest northwest grid in the inventory area. This grid is located approximately 2 kilometers west of the power plant.

The ADEC used facility-reported information and AP-42 emission factors to estimate emissions for each of the six point sources. The methodology and emission factors used to estimate actual emissions at each facility is available upon request.

The ADEC Operating Permit system results in the collection of the emission information through requirements for annual and triennial emission reports, on-site inspections, the reporting of source test data and quarterly production levels and fuel usage, and interactions with each source. In addition, there was no CO emission control equipment identified on any of the sources included in the inventory. Therefore, 100% of the emission estimates resulting from the application of the AP-42 factors identified above was assumed for the inventories.

Based on the above information, the application of a Rule Effectiveness factor did not appear to be appropriate and was not included for any of the point sources included in this inventory.

## Summary of Point Source Emissions

The estimates of actual emissions for a typical winter day (in tons per day) at each point source for the year 2005 and the projections for 2007 through 2023 are provided in Table 24.

**Table 24**
**Point Source CO Emissions Summary (tons per day)**

| | Projected Daily CO Emissions based on growth in number of households | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Owner** | **2005** | **2007** | **2009** | **2011** | **2013** | **2015** | **2017** | **2019** | **2021** | **2023** |
| Tesoro Alaska Petroleum Company, Anchorage Terminals I & II | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Anchorage Water & Wastewater Utility, Point Woronzof, John Asplund Wastewater Treatment Facility | 0.26 | 0.27 | 0.27 | 0.28 | 0.28 | 0.29 | 0.30 | 0.30 | 0.30 | 0.30 |
| Chugach Electric Association, International Station Power Plant | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Anchorage Municipal Light & Power, George Sullivan Plant Two | 0.93 | 0.95 | 0.97 | 0.99 | 1.00 | 1.02 | 1.04 | 1.05 | 1.06 | 1.07 |
| Anchorage Municipal Light & Power, Hank Nikkels Plant One | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.08 | 0.08 | 0.08 | 0.08 |
| Flint Hills Resources Alaska, LLC | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| **TOTAL POINT SOURCE EMISSIONS** | **1.28** | **1.31** | **1.33** | **1.36** | **1.38** | **1.41** | **1.43** | **1.45** | **1.46** | **1.47** |

## Emissions Summary

### 2007 Base Year Area-wide CO Inventory

Based on the methodology outlined in the previous section, total CO emissions from all sources in the inventory area were calculated for a typical winter weekday in 2007, when conditions are conducive to elevated CO concentrations. Total area-wide CO emissions are estimated to be 100.7 tons per day. Motor vehicles account for an estimated 65.1% of these area-wide emissions.

**Table 25**
**Sources of Anchorage CO emissions in 2007 base year in Anchorage inventory area**

| Source Category | CO Emitted (tons per day) | % of total* |
|---|---|---|
| Motor vehicles | 67.4 | 66.7% |
| Aircraft – Ted Stevens Anchorage International and Merrill Field Airport Operations | 13.1 | 12.9% |
| Wood burning – fireplaces and wood stoves | 6.2 | 6.2% |
| Space heating – natural gas | 3.8 | 3.7% |
| Miscellaneous (snowmobiles, snow removal, welding, rail, marine, etc.) | 9.3 | 9.2% |
| Point sources (power generation, sewage sludge incineration) | 1.3 | 1.3% |
| **TOTAL** | **101.0** | **100.0%** |

### Projected Area-Wide CO Emissions (2007-2023)

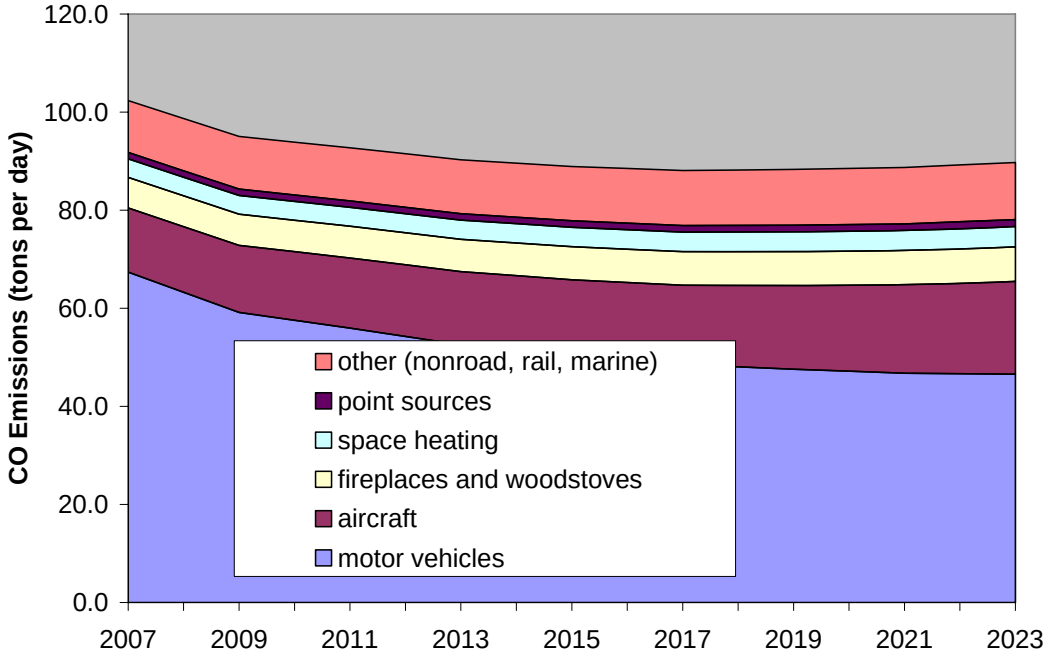
As described in the previous sections, CO emissions for the Anchorage inventory area were projected for each of the source categories for a 24-hour day in 2007, 2009, 2011, 2013, 2015, 2017, 2019, 2021 and 2023. Results are tabulated in Table 26. Area-wide CO emissions for the period 2007-2023 are plotted in Figure 4. CO emissions decline over time due to expected improvements in emission controls on newer vehicles. Total area-wide CO emissions are expected to increase slightly because of the growth of other sources such as Ted Stevens Anchorage International Airport. Nevertheless, total CO emissions projected for 2023 (88.3 tons per day) are approximately 12.5% lower than emissions in base year 2007 (101.0 tons per day).

**Table 26**
**Total CO emitted during typical 24-hour winter day in the Anchorage bowl inventory area (tons per day)**

| | motor vehicles | | aircraft | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| year | idle mode | travel mode | Stevens Int'l Airport | Merril Field | wood burning | space heating | rail/ marine | nonroad | Point Sources | TOTAL CO EMISSIONS |
| **2007** | 16.3 | 51.0 | 12.4 | 0.7 | 6.2 | 3.8 | 0.2 | 9.1 | 1.3 | **101.0** |
| **2008** | 15.3 | 48.0 | 12.7 | 0.7 | 6.3 | 3.8 | 0.2 | 9.2 | 1.3 | **97.4** |
| **2009** | 14.2 | 45.0 | 13.0 | 0.7 | 6.4 | 3.8 | 0.2 | 9.2 | 1.3 | **93.7** |
| **2010** | 13.7 | 43.9 | 13.3 | 0.7 | 6.4 | 3.8 | 0.2 | 9.3 | 1.3 | **92.6** |
| **2011** | 13.1 | 42.8 | 13.6 | 0.7 | 6.5 | 3.9 | 0.2 | 9.4 | 1.3 | **91.4** |
| **2012** | 12.7 | 41.6 | 13.8 | 0.7 | 6.5 | 3.9 | 0.2 | 9.4 | 1.3 | **90.2** |
| **2013** | 12.2 | 40.3 | 14.1 | 0.8 | 6.6 | 3.9 | 0.2 | 9.5 | 1.3 | **88.9** |
| **2014** | 12.0 | 39.5 | 14.4 | 0.8 | 6.7 | 3.9 | 0.2 | 9.5 | 1.3 | **88.3** |
| **2015** | 11.7 | 38.6 | 14.7 | 0.8 | 6.7 | 4.0 | 0.2 | 9.6 | 1.3 | **87.6** |
| **2016** | 11.4 | 38.0 | 15.0 | 0.8 | 6.8 | 4.0 | 0.2 | 9.6 | 1.3 | **87.2** |
| **2017** | 11.2 | 37.3 | 15.3 | 0.8 | 6.8 | 4.0 | 0.2 | 9.7 | 1.3 | **86.7** |
| **2018** | 11.0 | 37.0 | 15.8 | 0.8 | 6.9 | 4.0 | 0.2 | 9.8 | 1.3 | **86.8** |
| **2019** | 10.9 | 36.7 | 16.2 | 0.8 | 6.9 | 4.0 | 0.2 | 9.8 | 1.4 | **87.0** |
| **2020** | 10.8 | 36.4 | 16.7 | 0.8 | 6.9 | 4.1 | 0.2 | 9.9 | 1.4 | **87.1** |
| **2021** | 10.6 | 36.1 | 17.2 | 0.8 | 7.0 | 4.1 | 0.2 | 9.9 | 1.4 | **87.3** |
| **2022** | 10.6 | 36.1 | 17.6 | 0.9 | 7.0 | 4.1 | 0.2 | 10.0 | 1.4 | **87.8** |
| **2023** | 10.5 | 36.0 | 18.1 | 0.9 | 7.0 | 4.1 | 0.2 | 10.0 | 1.4 | **88.3** |

**Figure 4.**

**Projected Area-wide CO Emissions in Anchorage (2007-2023)**



## Compilation of Micro-Area Inventory for Turnagain Monitoring Station

The area-wide CO inventory discussed in the previous section will be necessary to prepare the motor vehicle emission budget for use in future region-wide air quality conformity determinations. However, this "area-wide view" of emissions is not very useful in analyzing the factors leading to high CO concentrations at particular locations in Anchorage. Monitoring data, including a saturation monitoring study conducted in 1997-98 have demonstrated that CO concentrations vary widely throughout Anchorage and that some areas are more prone to high concentrations and have a greater potential to violate the national ambient air quality standard.

The Turnagain monitoring station, located in a Spenard-area neighborhood, has the highest CO concentrations of all the monitoring stations in Anchorage. Maximum 8-hour concentrations are typically 10 to 20% higher than the next highest site called Garden in east Anchorage. During the 1997-98 CO Saturation Study 8-hour CO concentrations at Turnagain were the highest among the 20 sites included in the study.[17] An analysis of the probability of exceeding the national ambient air quality standard has been performed for both the Turnagain and Garden sites. This analysis suggests that the probability of violating the standard at Turnagain at current CO emission levels is about 1 in 50 while the probability of violating at the Garden station is less than 1 in 1,000.[18] For this reason, it was decided that the Turnagain site should be used for the maintenance demonstration. In order to perform this demonstration, CO emissions in the area immediately surrounding the Turnagain site must be known for base year 2007 and projected through 2023.

Because the Anchorage inventory data is disaggregated into one-kilometer$^2$ grids, CO emissions can be analyzed in the area immediately surrounding the Turnagain station. A nine-square kilometer area including and surrounding the Turnagain site was selected for analysis. The area selected is shown in Figure 5. As can be seen in the figure, the emissions in the nine grids comprising this analysis area are among the highest in the inventory area. Figure 6 shows that precise location of the Turnagain monitoring station in relation to the area selected for the micro-inventory.

In 2007, this nine square kilometer area contained an estimated population of 19,776. Total estimated employment was 9,005. This area is one of the most densely populated areas in the Anchorage bowl.

**Figure 5**
**CO emissions distribution in Anchorage**
**(Turnagain micro-inventory area boundary noted with red border)**

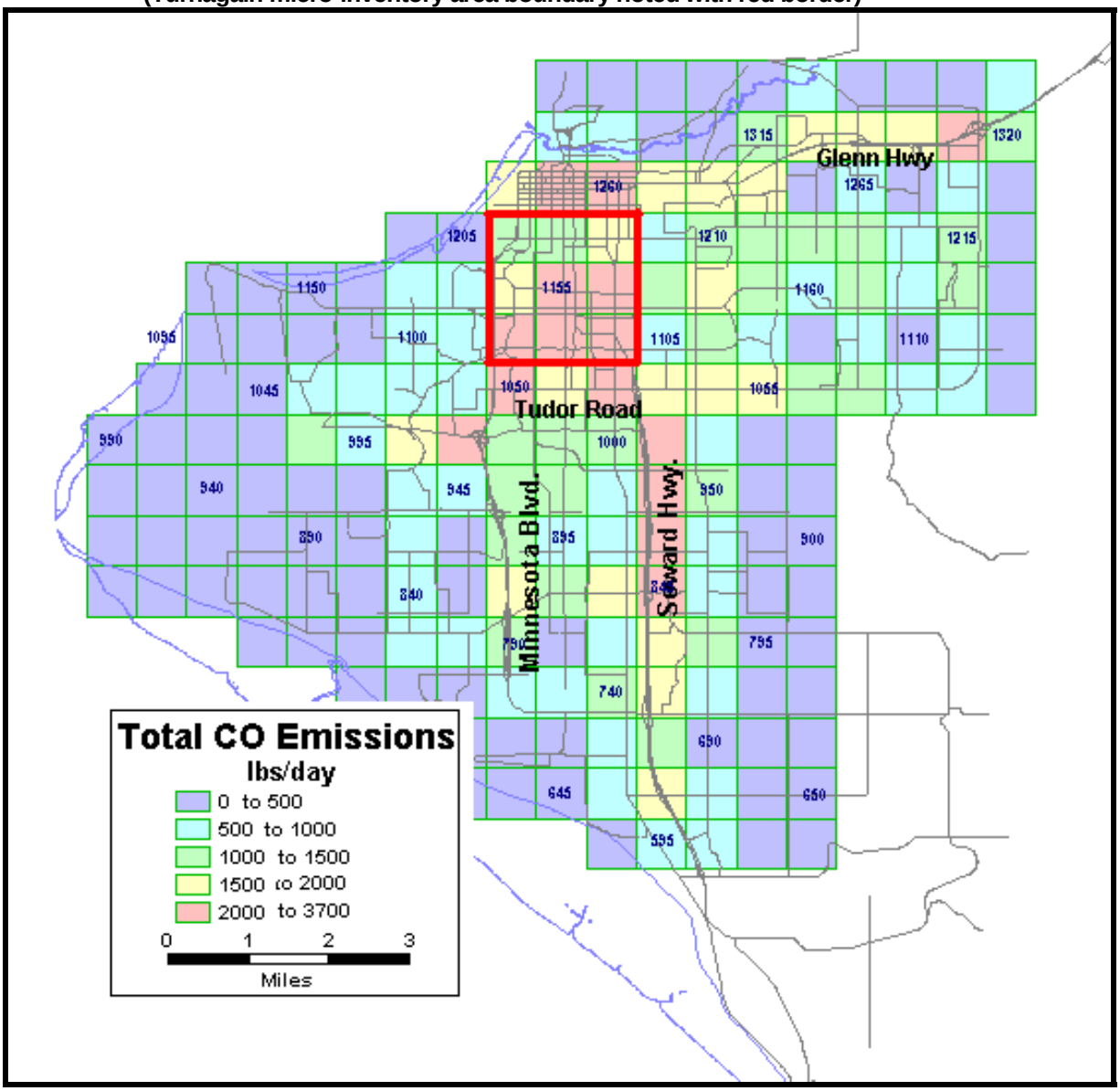


**Figure 6**
**Aerial photo of Turnagain micro-inventory area boundary**

2007 Base Year CO Micro-Inventory for Turnagain Site

Results of the 2007 base year micro-inventory for the nine-kilometer$^2$ area surrounding the Turnagain station are shown in Table 26. Total CO emissions in the micro-inventory area are estimated to be 6.01 tons per day. Motor vehicles account for an estimated 73.4% of the emissions in the area. Note that there is no contribution from aircraft operations or point sources in the area.

Appendix to Section III.B.3

**Table 27**
**Sources of CO Emissions in Turnagain Micro-inventory Area**
**2007 Base Year**

| Source Category | CO Emitted (tons per day) | % of total |
|---|---|---|
| Motor vehicles | 4.42 | 73.4% |
| Aircraft – Ted Stevens Anchorage International and Merrill Field Airport Operations | --- | --- |
| Wood burning – fireplaces and wood stoves | 0.62 | 10.3% |
| Space heating – natural gas | 0.28 | 4.6% |
| Miscellaneous (snowmobiles, snow removal, welding, rail, marine, etc.) | 0.70 | 11.7% |
| Point sources (power generation, sewage sludge incineration) | | --- |
| **TOTAL** | **6.01** | **100.0%** |

## Projected CO Emissions in the Turnagain Micro-Inventory Area (2007-2023)

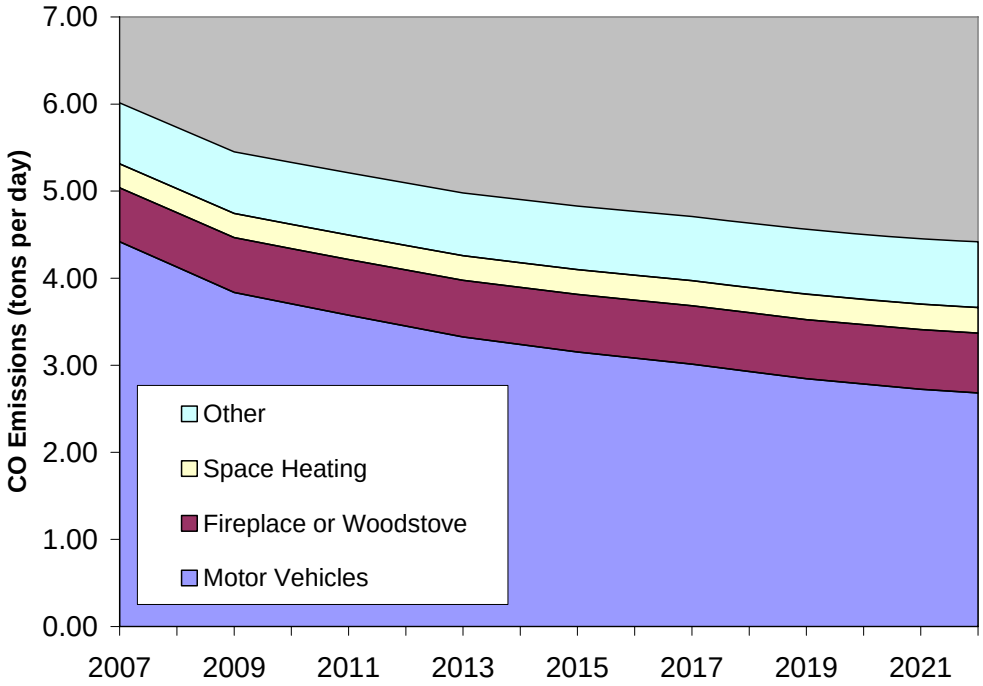
Projected emissions in the Turnagain micro-inventory area are tabulated for the period 2007-2023 in Table 27. CO emissions decline steadily between 2007 and 2023. By 2023 CO emissions in the Turnagain area are projected to decline by about 20% from the 2007 base year.

**Table 28**
**Total CO emitted during typical 24-hour winter day when CO is elevated in Turnagain micro-inventory area (tons per day)**

| | Motor Vehicles | | Area Sources | | | |
|---|---|---|---|---|---|---|
| | idle mode | travel mode | wood burning | space heating | other | TOTAL CO EMISSIONS |
| 2007 | 1.16 | 3.26 | 0.62 | 0.28 | 0.70 | **6.01** |
| 2009 | 1.08 | 3.04 | 0.62 | 0.28 | 0.70 | **5.73** |
| 2011 | 1.00 | 2.83 | 0.63 | 0.28 | 0.71 | **5.45** |
| 2013 | 0.96 | 2.74 | 0.63 | 0.28 | 0.71 | **5.33** |
| 2015 | 0.92 | 2.65 | 0.64 | 0.28 | 0.71 | **5.21** |
| 2017 | 0.89 | 2.56 | 0.65 | 0.28 | 0.72 | **5.10** |
| 2019 | 0.86 | 2.47 | 0.65 | 0.28 | 0.72 | **4.98** |
| 2021 | 0.83 | 2.40 | 0.66 | 0.28 | 0.72 | **4.90** |
| 2023 | 0.81 | 2.34 | 0.66 | 0.29 | 0.73 | **4.83** |

**Figure 7**

**Projected CO Emissions in Turnagain CO Micro-Inventory Area 2007-2023**




Time-of-Day Inventory at Turnagain

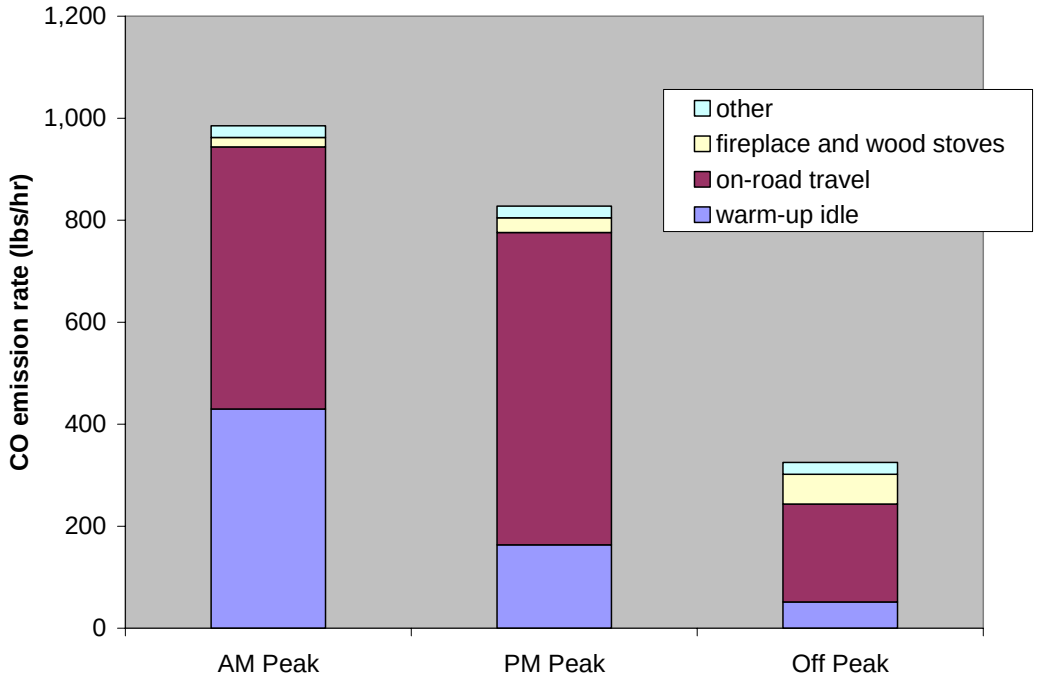
CO sources vary by time-of-day. For example, idle emissions are an important source of CO during the morning commute hours but less so during other times of day. For this reason, separate estimates of CO emissions were generated for each of the 200 grid cells that comprise the Anchorage inventory area for the AM Peak (7 AM – 9 AM), the PM Peak (3 PM – 6 PM) and Off Peak (6 PM – 7 AM, 9 AM – 3 PM) periods. Time-of-day emission results by grid for base year 2007 are summarized in Attachment 4. Results for other analysis years through 2023 are available by request.

Figure 8 shows that CO emission rates vary considerably by time-of-day in the Turnagain micro-inventory area. Time-of-day modeling suggests that CO emission rates are highest during the AM Peak (7 AM – 9 AM). CO concentrations at the Turnagain site are typically highest during morning hours, corresponding with this period of peak emissions.

Appendix to Section III.B.3

**Figure 8**

**CO emission rate by time-of-day in Turnagain CO micro-inventory area (2007)**



## References

[1] "Analysis of Alaska Vehicle CO Emission Study Data," prepared by Sierra Research for the Municipality of Anchorage, February 3, 2000.

[2] Cold Temperature Driving Cycle Development and Emission Testing, prepared for the Alaska Department of Environmental Conservation by Sierra Research, 2000.

[3] "Winter Season Warm-up Driver Behavior in Anchorage," Air Quality Program, Municipality of Anchorage, June 2001.

[4] Fairbanks Cold Temperature Vehicle Testing: Warm-up Idle, Between-Trip Idle, and Plug-In, prepared for the Alaska Department of Environmental Conservation by sierra Research, Inc., July 2001

[5] "Anchorage Travel Survey," prepared by Hellenthal & Associates for the Municipality of Anchorage, 1992.

[6] Anchorage Air Quality Telephone Survey reports, prepared annually by Ivan Moore Research for the Municipality of Anchorage, 1999 - 2007.

[7] Anchorage Travel Model Calibration and Validation Report , February 2005

[8] 1997 and 1998 Vehicle Miles of Travel in the Anchorage Bowl, prepared by Alaska Department of Transportation and Public Facilities and the Municipality of Anchorage, January 2000.

[9] Anchorage Travel Time Study, November 1998.

[10] Alaska Aviation Emission Inventory, prepared for the Alaska Department of Environmental Consearvation, June 2005.

[11] "Air Quality Survey of Anchorage Residents," prepared by ASK Marketing & Research for the Municipality of Anchorage, April 1990.

[12] Ibid.

[13] Personal communication with Dan Dieckgraff, Enstar Natural Gas, March 22, 2001.

[14] FERC Form No. 2 (ED 12-88), submitted by ENSTAR Natural Gas Company, 1991.

[15] EPA Technical Highlights Document, EPA420-F-97-051, December 1997.

[16] Commercial Marine Inventories for Select Alaska Ports, prepared for the Alaska Department of Environmental Conservation by E.H. Pechan and Associates, June 2005.

[17] Winter 1997-98 Anchorage Carbon Monoxide Saturation Study, Municipality of Anchorage Department of Health and Human Services, September 1998.

[18] Analysis of the Probability of Exceeding the CO Standard between 2007 and 2023, Municipality of Anchorage Department of Health and Human Services, April 2009.

# Alaska Department of Environmental Conservation

# Amendments to:

# State Air Quality Control Plan

Vol. III: Appendices

Appendix III.B.6

"Analysis of Probability of Complying with the National Ambient Air Quality Standards for Carbon Monoxide in Anchorage between 2007 and 2023"

Adopted

August 5th, 2009

**Appendix to Section III.B.6, Anchorage CO Maintenance Plan**

Air Quality Program
Municipality of Anchorage
Department of Health and Human Services
April 2009

# Analysis of the Probability of Complying with the National Ambient Air Quality Standard for CO in Anchorage between 2007 and 2023

## Background

In July 2008, the Anchorage Assembly voted to modify the vehicle inspection and maintenance (I/M) program in Anchorage. The most notable change made was extending the new car I/M testing exemption from four to six years. As a result, the Anchorage CO Maintenance Plan must be revised, incorporated into the Alaska State Implementation Plan (SIP) for air quality and approved by the EPA. As part of these revisions, a new probabilistic maintenance demonstration must be prepared. This demonstration must include the effect of any changes to the CO control measures proposed in the revised Plan. In particular, the impact of the new six I/M testing exemption on prospects for future compliance with the national ambient air quality standard (NAAQS) must be assessed.

Prior to the preparation of the previous Anchorage CO Maintenance Plan in 2004, the Municipality of Anchorage (MOA), the Alaska Department of Environmental Conservation (ADEC) and EPA Region 10 staff agreed that a probabilistic approach should be used in the Anchorage maintenance demonstration. The MOA, ADEC and EPA agreed that this demonstration must show a 90% or greater probability of meeting the national ambient air quality standard (NAAQS) in each year during the 2007-2023 lifetime of the Maintenance Plan.

The MOA is using the same methodology used in the 2004 Plan in this revised maintenance demonstration. This methodology relies on conventional statistical methods to estimate the probability of complying with the NAAQS in the year 2007, the base year for the analysis. The "roll forward" technique, used in the previous maintenance demonstration, is used to estimate probability of complying with the standard in future years. This technique relies on CO emissions projections for years 2008 through 2023 to help estimate the probability of complying with the NAAQS during this time period.

## Method

*Estimating the Probability of Complying with the NAAQS in Base Year 2007*

The NAAQS for CO is set at 9 ppm for an 8-hour average not to be exceeded more than once per year. Because the NAAQS effectively disregards the highest 8-hour average in determining compliance, *the measure of whether a community meets the standard is determined by the magnitude of the second highest 8-hour average, or second maximum*. For this reason, this analysis focuses on the probability of the second maximum being above or below the 9 ppm NAAQS.

Standard regression analysis techniques can be used to estimate the probability of complying with the CO NAAQS in 2007. By definition, a violation occurs when the second maximum concentration is higher than 9 ppm. The probability that this will or will not occur can be computed using the prediction interval. The prediction interval is defined mathematically as follows:

***Equation 1*** $y_p = y_h + t_{(\alpha;\, n-2)} \cdot s\{pred\}$

*where* $$s\{pred\} = \sqrt{MSE[1 + \frac{1}{n} + \frac{(X_k - \bar{X})^2}{\sum (X_i - \bar{X})^2}]}$$

In this circumstance, we are interested only in the upper limit of the prediction interval*. In this case we want to compute the value corresponding to the upper 90th percentile interval in base year 2007. If 2007 could be "repeated" numerous times, with the "normal" variety of meteorological conditions and other variables that effect CO concentrations, the second maximum concentration would fall at or below this value 90% of the time. This value is the base year 2007 design value (2007 $DV_{90\%}$).

Over the past 30 years, CO monitoring has been conducted at ten permanent CO stations† and at numerous additional temporary stations throughout Anchorage and Eagle River. Data suggest that the Turnagain monitor, located in a residential area in west Anchorage, has the highest CO concentrations of the four monitors in the current network. (See analysis in the Attachment at the end of this report.) Although it is difficult to compare recent data from Turnagain with data collected from other sites a decade or more earlier, studies suggest that the CO concentrations at Turnagain are likely representative of the highest ambient CO concentrations encountered in Anchorage. For this reason, Turnagain was selected as the site for the maintenance demonstration.

First and second maximum 8-hour CO concentrations measured at Turnagain are shown in Table 1.‡

**Table 1**
**1st and 2nd Maximum CO Concentrations at Turnagain Station (1999-2008)**

| | Highest 8-hour average CO Concentration (ppm) | 2nd Highest 8-hour average CO Concentration (ppm) |
|---|---|---|
| 1999 | 10.1 | 7.6 |
| 2000 | 7.2 | 5.5 |
| 2001 | 9.8 | 7.7 |
| 2002 | 6.5 | 5.9 |
| 2003 | 8.3 | 6.7 |
| 2004 | 8.1 | 7.9 |
| 2005 | 5.7 | 4.6 |
| 2006 | 6.5 | 6.1 |
| 2007 | 5.5 | 5.3 |
| 2008 | 6.3 | 5.4 |

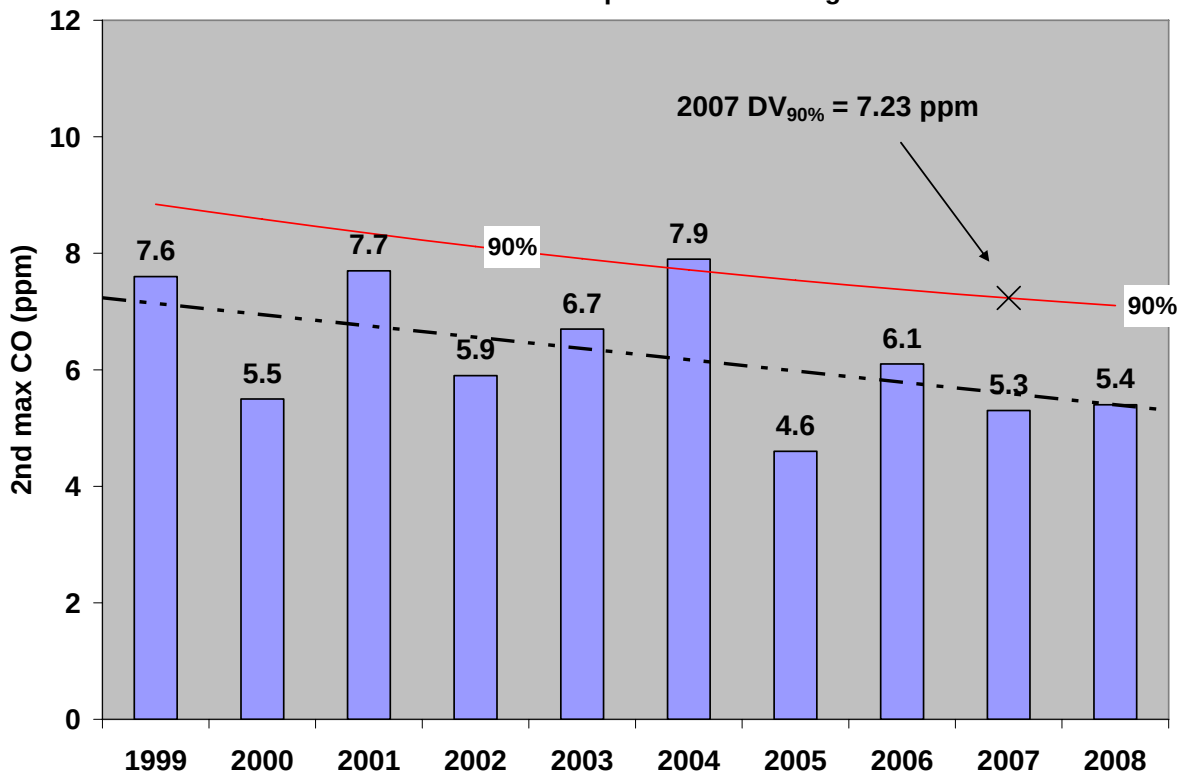
* This is known as a one-sided prediction interval. In this case we use the one-sided t-statistic when using Equation 1.

† For the purposes of this discussion, we define a permanent monitoring station as one that has employed Federal Reference Method monitors over the course of at least one CO season. Temporary monitoring was conducted with bag samplers in the 1980's and more recently with portable industrial hygiene-type CO monitors. Temporary monitoring has been conducted at more than 30 locations in the Municipality.

‡ The Turnagain station began operation October 16, 1998; thus 1999 was the first complete year of data collected at this site.

An Excel spreadsheet was used to compute the upper 90th percentile prediction interval from the second maximum concentrations at Turnagain using Equation 1. The results of this computation are plotted in Figure 1. Figure 1 shows that there was a 90% probability that the base year 2007 value would be less than or equal to 7.23 ppm. This computed concentration will serve as the base year 2007 design value for the roll forward analysis discussed later in this report.

**Figure 1**
**90th Percentile Prediction Interval Computed from Turnagain 2nd Maximum**




The precise probability of complying with the 9 ppm NAAQS in 2007 was also estimated with the spreadsheet. The probability associated with a second maximum of less than or equal to 9.0 ppm can be estimated through iteration. The one sided t-statistic associated with various probabilities can be used in Equation 1 until the desired 9.0 ppm value is bracketed within two prediction intervals (see Table 2). In this case the desired 9.0 ppm value falls very nearly at the 99.0% interval. Thus, the probability of complying with the NAAQS in 2007 was estimated to be approximately 99%. The chance of violating the NAAQS in 2007 was about 1-in-100.

**Table 2**
**Second Maximum CO Concentration Associated with Various Upper Bound Prediction Intervals**

| Probability that 2007 CO Concentration will be less than Computed 2nd Max Concentration | Computed Second Maximum CO Concentration (ppm) |
|---|---|
| 80.0% | 6.64 |
| 90.0% | 7.23 |
| 95.0% | 7.78 |
| 97.5% | 8.30 |
| ***99.0%*** | ***8.99*** |
| 99.9% | 10.88 |

*Estimating the Probability of Complying with the NAAQS between 2007 - 2023*

One assumption implicit in using the roll forward method is that the second maximum CO concentration in any future year will be proportional to the magnitude of the CO emissions in that year relative to base year emissions in 2007. In other words, if CO emissions in a future year are projected to decrease by 10% relative to base year 2007, the expected CO concentration in that future year will also decrease by 10%. If this occurs, there will be concurrent increase in the probability of complying with the NAAQS in that year.

CO emissions were estimated for the 9 kilometer$^2$ area surrounding the Turnagain CO monitoring station for base year 2007 using EPA-prescribed models such as the MOBILE6, NONROAD, AP-42 and the FHWA model EDMS to estimate CO emissions.[§]

CO emissions in 2007 were estimated to be 5.99 tons per day (tpd) in the "micro-inventory area" surrounding Turnagain. The computed 90$^{th}$ percentile concentration or 2007 $DV_{90\%}$ was 7.23 ppm. If one assumes that CO concentrations increase in direct proportion to emissions, the amount of CO that could be emitted in the Turnagain area and retain a 90% probability of complying with the standard can be computed as follows:

*Amount of CO emissions associated with a 90% probability of complying with the NAAQS* = *(9.0 ppm / 2007 $DV_{2007}$) x CO emissions in 2007*

= *(9.0 ppm/7.23 ppm) x 6.01 tpd =* ***7.48 tpd***

This computation suggests that if CO emissions in the Turnagain area increased from 6.01 tpd to 7.48 tpd, the probability of complying with the NAAQS would be 90%. In the same manner as shown above, the amount of emissions corresponding with other probabilities of compliance (i.e. 90%, 95%, 99%, etc.) can be readily computed with the spreadsheet. The spreadsheet was used to create a lookup table listing probabilities along with corresponding quantity of emissions. Table 3 shows the results of these spreadsheet computations. As would be expected, the probability of complying with the NAAQS increases with lower emission rates.

[§] MOBILE6 is used to estimate vehicle emissions, NONROAD us used to estimate various nonroad sources such as snowmobiles and portable electrical generators, EDMS is used for airport operations and AP-42 is used to estimate various area sources such as natural gas space heating, fireplaces and wood stoves. These models and emission inventory procedures are described more fully in the *Anchorage CO Emission Inventory and Emission Projections 2007-2023,* included as Appendix A of the Anchorage SIP submittal.

**Table 3**
**CO Emission Rates Associated with Varying Probabilities of Compliance with the NAAQS at the Turnagain Station**

| Probability that 2nd Max CO Concentration will be less than 9.0 ppm | Corresponding CO Emission Rate (tpd) |
|---|---|
| 99.9% | 4.97 |
| 99.5% | 5.39 |
| 99.3% | 5.63 |
| 99.0% | 6.02 |
| 98.0% | 6.35 |
| 97.0% | 6.60 |
| 96.0% | 6.78 |
| 95.0% | 6.96 |
| 94.0% | 7.06 |
| 93.0% | 7.16 |
| 92.0% | 7.26 |
| 91.0% | 7.37 |
| 90.0% | 7.48 |

In addition to estimating base year 2007 CO emissions in the 9 kilometer$^2$ area surrounding Turnagain, emissions were projected through the year 2023. Projections were prepared using the aforementioned MOBILE6, NONROAD, AP-42, and EDMS modeling procedures. Population and employment forecasts prepared by the University of Alaska Institute of Economic and Social Research (ISER) were used to estimate key parameters necessary to estimate growth in vehicle travel[**], space heating, fireplace and woodstove use and other CO emission sources. The MOBILE6 model was configured to reflect that the four-year new car exemption will be extended to six years beginning January 2010.

The results of this "micro-inventory" and forecast of CO emissions in the Turnagain area are shown in Table 4. The probability of complying with the NAAQS at the level of emissions projected for each year was determined from the lookup table (Table 3).

[**] The Anchorage Transportation Model was used to provide information on vehicle travel. It relies in large part on ISER projections in the development of travel forecasts.

**Table 4**
**Projected CO Emissions and Probabilities for Compliance with the NAAQS (2007-2023)**

| | CO Emissions from Various Sources in the 9 $km^2$ Area Surrounding the Turnagain Station (all emissions in tons per day) | | | | | |
|---|---|---|---|---|---|---|
| **Year** | Motor Vehicles | Fireplace or Woodstove | Space Heating | Other | **TOTAL CO EMISSIONS** | **Probability of Compliance** |
| 2007 | 4.42 | 0.62 | 0.28 | 0.70 | 6.01 | 99.0% |
| 2008 | 4.13 | 0.62 | 0.28 | 0.70 | 5.73 | 99.3% |
| 2009 | 3.84 | 0.63 | 0.28 | 0.71 | 5.45 | 99.5% |
| 2010 | 3.71 | 0.63 | 0.28 | 0.71 | 5.33 | 99.6% |
| 2011 | 3.58 | 0.64 | 0.28 | 0.71 | 5.21 | 99.7% |
| 2012 | 3.45 | 0.65 | 0.28 | 0.72 | 5.10 | 99.8% |
| 2013 | 3.33 | 0.65 | 0.28 | 0.72 | 4.98 | 99.9% |
| 2014 | 3.24 | 0.66 | 0.28 | 0.73 | 4.90 | >99.9% |
| 2015 | 3.15 | 0.66 | 0.29 | 0.73 | 4.83 | >99.9% |
| 2016 | 3.08 | 0.67 | 0.29 | 0.73 | 4.77 | >99.9% |
| 2017 | 3.01 | 0.67 | 0.29 | 0.74 | 4.71 | >99.9% |
| 2018 | 2.93 | 0.68 | 0.29 | 0.74 | 4.63 | >99.9% |
| 2019 | 2.85 | 0.68 | 0.29 | 0.74 | 4.56 | >99.9% |
| 2020 | 2.79 | 0.68 | 0.29 | 0.75 | 4.51 | >99.9% |
| 2021 | 2.72 | 0.68 | 0.29 | 0.75 | 4.45 | >99.9% |
| 2022 | 2.68 | 0.69 | 0.29 | 0.75 | 4.42 | >99.9% |
| 2023 | 2.64 | 0.69 | 0.30 | 0.76 | 4.38 | >99.9% |

Table 4 suggests that there is a very high likelihood of complying with the NAAQS at the Turnagain station. Although not shown here, a similar analysis was performed for the Garden station. That analysis indicated that there is an even greater likelihood of compliance at that site. The probability of compliance was greater than 99.9% each year between 2007 and 2023.

## Sensitivity Analysis

The roll forward probability analysis presented in the last section relies on modeled projections of future emissions. What happens to the estimated probabilities if these projections underestimated the growth in CO emissions between 2007 and 2023?

This sensitivity analysis investigates the sensitivity of the probability estimates presented in Table 4 to assumptions regarding:

1. future growth in vehicle miles traveled (VMT), vehicle starts and idling, and;
2. future growth of wood stove and fireplace use.

For the purpose of this analysis, we will adjust initial assumptions regarding VMT, and wood stove and fireplace use and re-compute the estimated probability of complying with the NAAQS during the 2007-2023 period. The manner in which each of these assumptions was revised is described in the next section.

*Revised Assumptions Used in Sensitivity Analysis:*

*Future Growth in VMT, Vehicle Starts and Idling*

Imbedded in these emission computations is the assumption that amount of vehicle miles traveled (VMT) on streets in the 9 kilometer$^2$ area surrounding the Turnagain station will grow by about than 4% from 2007 levels. Although this appears to be a sensible assumption because the Turnagain area is an older area with little opportunity for significant growth in population, in this sensitivity analysis we will assume that the growth in VMT will be three times that projected by the Anchorage Transportation Model. In other words, we will assume that VMT and vehicle starts and idling will grow by 12% between 2007 and 2023 and determine how this affects the probability of compliance.

*Future Growth in Wood Stoves and Fireplace Use*

Woodstove and fireplace emissions were assumed to grow in proportion to the growth in the number of households in the Turnagain micro-inventory area. During the 2007-2023 inventory period, wood heating emissions were projected increase by about 11%. Although recent telephone data suggest that Anchorage households do not plan to change their habits with regard to wood burning, there is a possibility that wood burning rates could increase in the next decade if households decide to heat with wood to avoid rising costs of heating with natural gas. For the purpose of this analysis we will assume that wood heating will grow 2% per year per household during the inventory period.

*Results of Sensitivity Analysis*

The two revised assumptions used in this sensitivity analysis are summarized in Table 5. The *combined* impact of these revised assumptions on CO emissions in the Turnagain micro-inventory area and the consequent effect on probabilities of compliance during the 2007-2023 maintenance plan period is shown in Table 6.

Table 6 suggests that even when the assumptions used in the sensitivity analysis are combined to create a "worst case scenario", the probability of compliance with NAAQS is well above 90% each year. Even with higher rates of growth in vehicle travel and wood burning, CO emissions continue to decline. The probability of compliance remains at 99% or higher even with these higher growth rates. By 2018 the probability of compliance is near 100%.

**Table 5**
**Comparison of Original Assumptions used in Maintenance Demonstration with Revised Assumptions used in Sensitivity Analysis**

| | **Original Assumptions used in Maintenance Demonstration and Probability Computations** | **Revised "Worst Case" Assumptions Used in Sensitivity Analysis** |
|---|---|---|
| Growth in VMT and Vehicle Starts and Idling | 4% increase between 2007 and 2023 | 12% increase between 2007 and 2023 |
| Fireplace and Woodstove Use | No change in wood burning rates per household between 2007-2023 | 2% growth in wood heating per year |

**Table 6**
**Comparison of CO Emissions and Probabilities of Compliance with the NAAQS**
Original Assumptions used in Maintenance Demonstration vs.
Revised Assumptions used in Sensitivity Analysis

| | Original Assumptions | | Revised Assumptions in Sensitivity Analysis | |
|---|---|---|---|---|
| | **Estimated Total CO Emissions (tpd)** | **Probability of Compliance** | **Estimated Total CO Emissions (tpd)** | **Probability of Compliance** |
| 2007 | 6.01 | 99.0% | 6.01 | 99.1% |
| 2008 | 5.73 | 99.3% | 5.77 | 99.2% |
| 2009 | 5.45 | 99.5% | 5.51 | 99.4% |
| 2010 | 5.33 | 99.6% | 5.43 | 99.5% |
| 2011 | 5.21 | 99.7% | 5.33 | 99.6% |
| 2012 | 5.10 | 99.8% | 5.25 | 99.7% |
| 2013 | 4.98 | 99.9% | 5.16 | 99.8% |
| 2014 | 4.90 | >99.9% | 5.12 | 99.8% |
| 2015 | 4.83 | >99.9% | 5.07 | 99.9% |
| 2016 | 4.77 | >99.9% | 5.04 | 99.9% |
| 2017 | 4.71 | >99.9% | 5.01 | 99.9% |
| 2018 | 4.63 | >99.9% | 4.96 | >99.9% |
| 2019 | 4.56 | >99.9% | 4.92 | >99.9% |
| 2020 | 4.51 | >99.9% | 4.89 | >99.9% |
| 2021 | 4.45 | >99.9% | 4.87 | >99.9% |
| 2022 | 4.42 | >99.9% | 4.86 | >99.9% |
| 2023 | 4.38 | >99.9% | 4.86 | >99.9% |

# Attachment

**Rank-Pair Order Comparison of CO Concentrations at Turnagain with Garden and Seward Highway Monitoring Stations**

Permanent monitoring at Turnagain station began in October 1998 following the completion of a CO Saturation Monitoring Study during the winter of 1997-98. This study monitored CO concentrations at some 20 locations using temporary industrial hygiene-type monitoring devices. The saturation study indicated that the Turnagain site had the highest concentrations of all the sites in the study.

The permanent monitoring stations at Turnagain and Garden are located in older residential neighborhoods with relatively low traffic volumes on the roadways adjacent to the monitoring probe. The Seward Highway station (decommissioned in December 2004) was located at the intersection of two heavily traveled arterials, the Seward Highway and Benson Boulevard. In Anchorage CO monitoring is conducted at these permanent stations during the winter months defined as October through March.

Non-overlapping 8-hour maximum CO concentrations measured at the Turnagain, Garden and Seward Highway monitors were compared in rank-order to determine which site has the highest CO concentrations and the greatest potential for exceeding the national ambient air quality standard (NAAQS) for CO. A rank-order comparison involves sequentially ranking non-overlapping 8-hour average concentrations at the two sites being compared in descending order. In other words, the highest concentration measured at one site is compared to the highest concentration at the other, the second highest at the one site is compared to the second highest at the other, the third highest at one site is compared to the third highest at the other, and so on.

Rank-pair comparisons of data were performed only in time periods when data were available from both sites. In other words, in order to perform a fair comparison between two sites, the data compared was limited to periods when both sites were in operation and collecting valid data. Table 1 show the time periods when paired-data from Turnagain was compared to the other two stations.[††]

**Table A-1**

**Comparison Periods for Rank-Pair Analysis**

| Stations Compared | Comparison Period |
|---|---|
| Turnagain with Garden | 10/16/98 – 12/31/07 |
| Turnagain with Seward Hwy | 10/16/98 – 12/31/05 |

A spreadsheet program was constructed to identify the highest 50 non-overlapping 8-hour maximum CO concentrations at each site for the comparison periods shown in Table 1.

[††] The Turnagain site did not begin operating until October 16, 1998 and monitoring was discontinued at the Seward Highway site on December 31, 2004. Garden has been in more-or-less continuous operation since late 1970's. When data comparisons between two sites were performed the analysis was limited to time periods when both sites were collecting data.

***Comparison of Turnagain and Garden Station CO Concentrations - October 1998 through December 2007***

Results of the rank-order comparison between the Turnagain and Garden CO stations are shown in Figure 1. (Data used to construct this plot can be found at the end of this report.)

**Figure A-1**

**Rank-Order Comparison of Highest Fifty Non-Overlapping 8-hour Average CO Concentrations Measured at the Turnagain and Garden Monitoring Stations October 1998–December 2007**

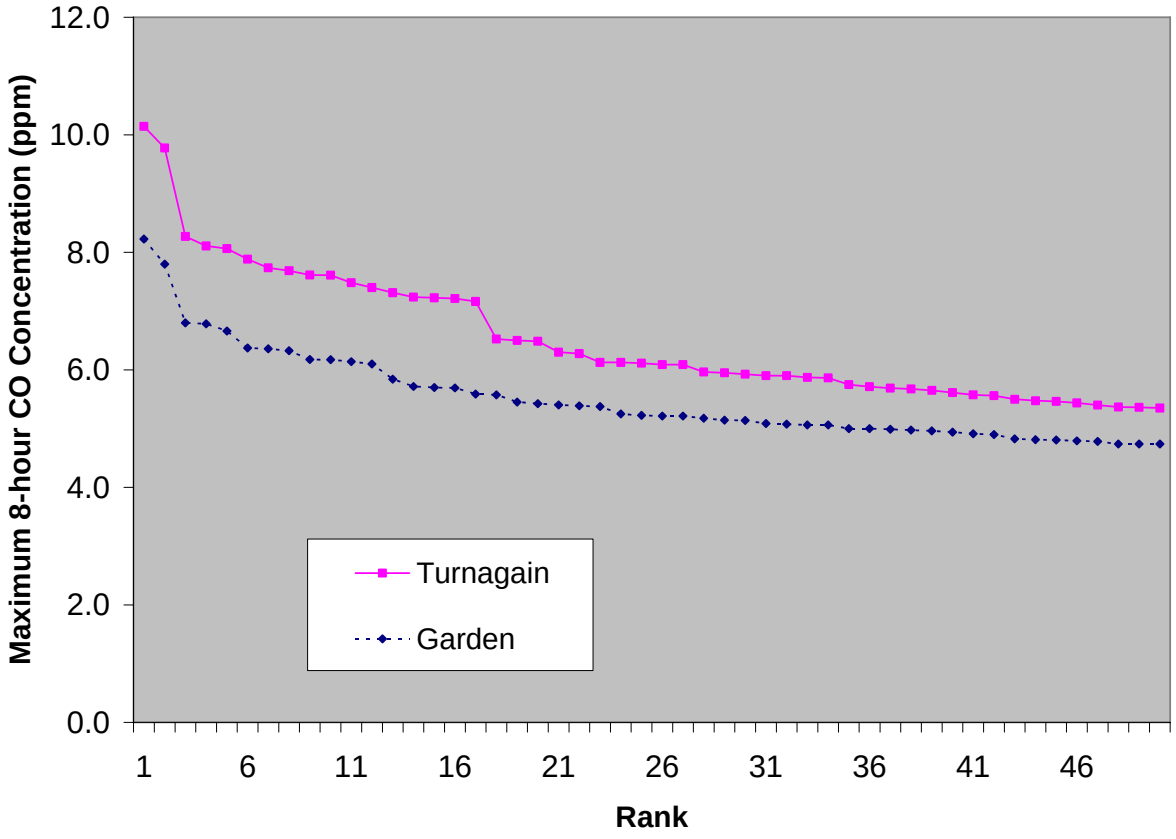


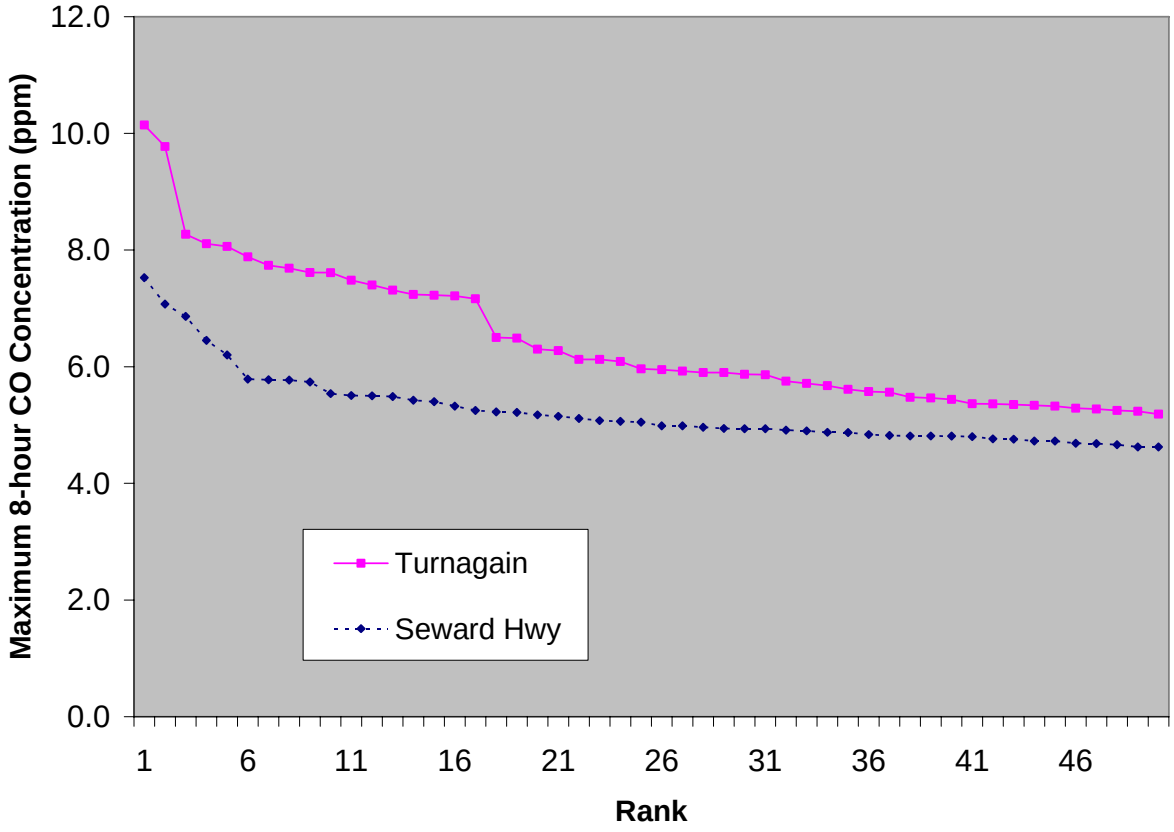

Figure 1 shows that the 50 highest 8-hour average concentrations at the Turnagain station are about 12% to 25% higher than the corresponding rank-pair value at Garden. The greatest differences occur among the highest ranks. For example the highest 8-hour concentration at Turnagain is 23% higher than the highest value at Garden while the 50$^{th}$ highest value at Turnagain is 13% higher than the corresponding 50$^{th}$ highest value at Garden. On a rank-pair basis, the values at Turnagain are significantly and consistently higher than those at Garden. This is particularly true at the extreme (i.e. highest) concentrations. This would suggest that Turnagain has a greater potential of exceeding or violating the NAAQS than Garden. For this reason, data from the Turnagain station were used to perform the probabilistic analysis for the maintenance demonstration.

***Comparison of Turnagain and Seward Highway Station CO Concentrations October 1998 through December 2004***

A similar analysis was performed comparing data from the Turnagain station to Seward Highway. In this case the analysis was confined to the period October 16, 1998 to December 31, 2004 because the Seward Highway station was decommissioned at the end of 2004. The results of this analysis are shown in Figure 2.

**Figure A-2**

**Rank-Order Comparison of Highest Fifty Non-overlapping 8-hour Average CO Concentrations measured at the Turnagain and Seward Highway Monitoring Stations October 1998 – December 2004**




Among the highest 50 paired 8-hour concentrations, concentrations at Turnagain are 12% to 38% higher than Seward. The largest differences between the two sites are observed in the very highest 8-hour concentrations where differences between rank-pairs are typically 30% or more. This would suggest that Turnagain has a considerably greater potential of exceeding or violating the NAAQS than Seward.

***Conclusion***

This analysis demonstrates that the Turnagain site exhibits the highest CO concentrations and greatest potential for violating the NAAQS in the Anchorage network. It is therefore appropriate to use this site for analysis of long-term prospects for continued compliance with the NAAQS.

| Turnagain Oct 1998 – Dec 2007 | | | | Garden Oct 1998 – Dec 2007 | | | | |
|---|---|---|---|---|---|---|---|---|
| **rank** | 8-hr avg (ppm) | date | end hour | **rank** | 8-hr avg (ppm) | date | end hour | % Diff |
| 1 | 10.14 | 1/6/99 | 19 | 1 | 8.23 | 1/6/99 | 18 | 23.3% |
| 2 | 9.78 | 12/16/01 | 20 | 2 | 7.80 | 12/6/99 | 14 | 25.3% |
| 3 | 8.27 | 12/6/03 | 1 | 3 | 6.80 | 12/24/98 | 19 | 21.6% |
| 4 | 8.11 | 1/5/04 | 18 | 4 | 6.78 | 1/13/04 | 21 | 19.5% |
| 5 | 8.06 | 12/24/98 | 23 | 5 | 6.66 | 2/12/99 | 12 | 21.0% |
| 6 | 7.88 | 1/4/04 | 20 | 6 | 6.37 | 2/9/99 | 14 | 23.7% |
| 7 | 7.74 | 11/14/01 | 12 | 7 | 6.36 | 1/3/04 | 21 | 21.7% |
| 8 | 7.69 | 12/16/98 | 24 | 8 | 6.33 | 1/5/04 | 20 | 21.5% |
| 9 | 7.61 | 1/3/04 | 21 | 9 | 6.18 | 1/27/99 | 13 | 23.3% |
| 10 | 7.61 | 2/23/99 | 12 | 10 | 6.17 | 1/4/04 | 21 | 23.3% |
| 11 | 7.48 | 1/1/04 | 22 | 11 | 6.14 | 12/5/03 | 23 | 21.9% |
| 12 | 7.40 | 12/18/01 | 17 | 12 | 6.10 | 12/16/01 | 22 | 21.3% |
| 13 | 7.31 | 2/8/99 | 11 | 13 | 5.84 | 1/1/04 | 23 | 25.2% |
| 14 | 7.24 | 12/6/99 | 14 | 14 | 5.72 | 1/2/04 | 22 | 26.6% |
| 15 | 7.23 | 12/5/01 | 15 | 15 | 5.70 | 11/27/99 | 24 | 26.8% |
| 16 | 7.21 | 1/16/00 | 3 | 16 | 5.69 | 12/20/03 | 19 | 26.7% |
| 17 | 7.16 | 11/28/99 | 1 | 17 | 5.59 | 10/22/98 | 11 | 28.2% |
| 18 | 6.53 | 11/29/06 | 16 | 18 | 5.58 | 12/3/01 | 15 | 17.0% |
| 19 | 6.50 | 2/23/99 | 3 | 19 | 5.45 | 1/15/04 | 14 | 19.2% |
| 20 | 6.49 | 2/6/02 | 12 | 20 | 5.43 | 1/5/99 | 13 | 19.6% |
| 21 | 6.30 | 12/3/01 | 16 | 21 | 5.40 | 1/7/04 | 14 | 16.6% |
| 22 | 6.28 | 12/8/01 | 1 | 22 | 5.39 | 1/13/00 | 14 | 16.5% |
| 23 | 6.13 | 2/18/01 | 6 | 23 | 5.38 | 1/12/00 | 15 | 14.0% |
| 24 | 6.13 | 11/14/01 | 3 | 24 | 5.25 | 3/18/02 | 23 | 16.7% |
| 25 | 6.11 | 1/24/06 | 12 | 25 | 5.23 | 2/22/99 | 12 | 17.0% |
| 26 | 6.09 | 2/11/99 | 9 | 26 | 5.21 | 12/26/98 | 24 | 16.8% |
| 27 | 6.09 | 1/17/06 | 14 | 27 | 5.21 | 2/11/00 | 15 | 16.8% |
| 28 | 5.96 | 2/22/99 | 13 | 28 | 5.18 | 1/15/00 | 24 | 15.2% |
| 29 | 5.95 | 12/4/01 | 16 | 29 | 5.14 | 1/14/99 | 14 | 15.7% |
| 30 | 5.93 | 11/10/99 | 12 | 30 | 5.14 | 2/10/00 | 13 | 15.3% |
| 31 | 5.90 | 1/4/99 | 24 | 31 | 5.09 | 11/29/01 | 15 | 16.0% |
| 32 | 5.90 | 12/1/01 | 5 | 32 | 5.08 | 11/14/01 | 13 | 16.3% |
| 33 | 5.87 | 1/13/04 | 1 | 33 | 5.06 | 2/13/99 | 1 | 16.0% |
| 34 | 5.86 | 1/25/02 | 12 | 34 | 5.06 | 1/17/06 | 14 | 15.8% |
| 35 | 5.75 | 12/27/98 | 4 | 35 | 5.00 | 11/22/99 | 14 | 15.0% |
| 36 | 5.71 | 12/1/01 | 24 | 36 | 5.00 | 1/23/03 | 14 | 14.3% |
| 37 | 5.69 | 1/28/05 | 11 | 37 | 4.99 | 2/10/99 | 12 | 14.1% |
| 38 | 5.68 | 11/15/98 | 24 | 38 | 4.98 | 1/16/00 | 17 | 14.1% |
| 39 | 5.65 | 11/25/06 | 12 | 39 | 4.96 | 12/4/01 | 16 | 13.9% |
| 40 | 5.61 | 2/9/99 | 13 | 40 | 4.94 | 12/14/04 | 20 | 13.6% |
| 41 | 5.58 | 12/14/01 | 15 | 41 | 4.91 | 11/20/98 | 15 | 13.5% |
| 42 | 5.56 | 12/12/99 | 3 | 42 | 4.90 | 1/22/03 | 14 | 13.5% |
| 43 | 5.50 | 12/19/07 | 14 | 43 | 4.83 | 11/10/99 | 13 | 14.0% |
| 44 | 5.48 | 11/7/98 | 2 | 44 | 4.81 | 2/8/99 | 12 | 13.8% |
| 45 | 5.46 | 1/12/00 | 13 | 45 | 4.81 | 1/18/05 | 13 | 13.7% |
| 46 | 5.44 | 2/1/02 | 13 | 46 | 4.79 | 1/27/05 | 14 | 13.5% |
| 47 | 5.40 | 11/25/06 | 3 | 47 | 4.78 | 1/7/04 | 23 | 12.9% |
| 48 | 5.37 | 1/14/04 | 2 | 48 | 4.74 | 2/9/99 | 2 | 13.3% |
| 49 | 5.36 | 12/26/03 | 16 | 49 | 4.74 | 12/18/01 | 16 | 13.2% |
| 50 | 5.35 | 12/27/02 | 15 | 50 | 4.74 | 2/6/02 | 13 | 12.9% |

# Alaska Department of Environmental Conservation

# Amendments to:

# State Air Quality Control Plan

Vol. III: Appendices

Appendix III.B.8
"South Central Clean Air Ordinances AMC 15.30 and 15.35"

Adopted

August 5th, 2009

# Chapter 15.30 SOUTH CENTRAL CLEAN AIR PROGRAM*

***Cross references:** South Central clean air authority commission,§ 4.40.115; environmental protection, AMCRTitle 15.

**State law references:** Local program authorized, AS 46.14.400.

15.30.010 Short title of chapter.
15.30.020 South Central Clean Air Authority.
15.30.030 Definitions.
15.30.035 South Central Clean Air Authority commission.
15.30.040 Director.
15.30.050 Air pollution inspections.
15.30.060 Air pollution episodes.
15.30.070 Confidentiality of records.
15.30.080 Limitations.
15.30.090 Compliance with federal and state law.
15.30.100 Registration of air contaminant sources; notification of completion.
15.30.110 Permit to operate air contaminant source.
15.30.120 Source reports.
15.30.130 Source tests.
15.30.140 Variance criteria.
15.30.150 Judicial review of action on variance.
15.30.160 Other limitations.(Repealed).
15.30.170 Rule-making procedures.(Repealed).
15.30.180 Notice of violation.
15.30.190 Effect of compliance order.
15.30.200 Voluntary compliance.
15.30.210 Administrative hearings.
15.30.220 Appeals.
15.30.230 Enforcement.

## 15.30.010 Short title of chapter.

This chapter may be known and cited as the South Central Clean Air Ordinance.

(AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

## 15.30.020 South Central Clean Air Authority.

A. A regional air pollution control authority called the South Central Clean Air Authority is hereby established within the boundaries of the municipality and the Matanuska-Susitna Borough.

B. Subject to the powers granted by law to member governments, the South Central Clean Air Authority shall have primary responsibility for control of air pollution from all sources within the boundaries of the member governments except where jurisdiction is reserved by law exclusively for the United States or the state, shall adopt and enforce rules and regulations that endeavor to achieve and maintain national and state ambient air quality standards and emission standards, and shall enforce this chapter and any rules and regulations promulgated pursuant thereto.

(AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

## 15.30.030 Definitions.

Unless separately defined in a rule or regulation promulgated pursuant to this chapter or unless the context clearly indicates otherwise, the following terms used in this chapter or any rule or regulation promulgated pursuant thereto shall be defined as follows:

*Air contaminant* means dust, fumes, mist, smoke, fly ash, other particulate matter, vapor, gas or an odorous substance, or a combination of these, but not including water vapor or steam condensate.

*Air contaminant source* means any source whatsoever at, from or by reason of which there is emitted or discharged into the atmosphere any air contaminant.

*Air pollutant* means a material in the atmosphere, either from natural or manmade sources, in a concentration that reaches or exceeds a level that tends to have some adverse effect on human health or welfare, have some deleterious effect on animal or plant life, or damage materials of economic value to society.

*Air pollution* means the presence in the outdoor atmosphere of one or more air pollutants.

*Air quality control plan* means the Alaska Air Quality Control Plan as approved by the administrator of the Environmental Protection Agency pursuant to those provisions of the federal Clean Air Act relative to state implementation plans.

*Alteration* means any addition to, any enlargement of, any replacement of, any major modification of, or any change in the design, capacity, process or arrangement of, or any increase in, the connected loading of equipment or control apparatus that will affect the kind or amount of air contaminant emitted.

*Ambient air* and *atmosphere* mean any unconfined portion of the atmosphere or the outside air.

*Authority* means the South Central Clean Air Authority.

*Best practical technology* means the best system of technology available to correct the emission problem when considering cost of system, efficiency of the process, and commercial availability on the market.

*Borough* means the Matanuska-Susitna Borough.

*Commission* means the South Central Clean Air Authority commission.

*Director* means the director of the South Central Clean Air Authority or his authorized representative.

*Emission* means a release of air contaminants into the environment.

*Equipment* means any stationary or portable device or any part thereof capable of causing the emission of any air contaminant.

*Facility* means a pollutant-emitting source or activity located on one or more contiguous or adjacent properties and which is operated by the same person under common control.

*Indirect source* means a facility, building, structure or installation that attracts or may attract activity that results in emissions of a pollutant for which there is a national ambient air quality standard, including but not limited to highways and roads; parking facilities; retail, commercial and industrial facilities; recreation, amusement, sports and entertainment facilities; airports; office and governmental buildings; apartment and condominium buildings; and education facilities.

*Installation* means the placement, assemblage or construction of equipment or control apparatus at the premises where equipment, as defined in this section, or control apparatus will be used.

*Marine installation* means a movable or fixed petroleum exploration, production or extraction platform, or other offshore facility, in or on the waters located within the municipality, from which the emission of air contaminants occurs.

*Member government* means the municipalities of Anchorage and the Matanuska-Susitna Borough.

*Motor vehicle* means any self-propelled vehicle designed and used for transporting persons or property, but excludes aircraft, vessels operated on water and vehicles operated exclusively on rails.

*National air quality standard* means a national primary or secondary ambient air quality standard promulgated pursuant to the federal Clean Air Act.

*Opacity* means the degree to which emissions reduce the transmission of light and obscure the view of an object in the background.

*Owner* means the person who owns, leases or supervises equipment, control apparatus or a stationary or mobile source of air contaminants.

*Particulate matter* and *particulates* mean finely divided solid or liquid particles in the air or in an emission, including but not limited to dust, smoke, fumes, spray and fog.

*ppm* means parts per million by volume.

*Person* means any individual, trust, estate, firm, corporation, association, partnership or any officer, employee, department, agency, board, bureau or commission of the United States, a state or any political subdivision thereof.

*Regulation* means any regulation, ambient air quality standard, emission standard, limitation or control or subsequently adopted additions or amendments thereto promulgated pursuant to this chapter.

*Standard cubic foot of gas* means that amount of gas that would occupy a cube having dimensions of one foot on each side, if the gas were free of vapor and at a pressure of 14.7 PSIA and a temperature of 70 degrees Fahrenheit.

*Visible emissions* means those gases or particulates, excluding uncombined water, that separately or in combination are visible upon release to the outdoor atmosphere.

(GAAB 16.68.020, 16.70.010; AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70; AO No. 93-131, § 1, 10-26-93)

**Cross references:** Definitions and rules of construction generally,§ 1.05.020.

## 15.30.035 South Central Clean Air Authority commission.

A. A South Central Clean Air Authority commission of six members shall be the governing body of the South Central Clean Air Authority, shall exercise all powers vested in that authority by law, and shall administer the provisions of this chapter within the member governments.

B. The commission shall consist of two assembly members and the mayor or his designee from each member government appointed in the manner provided by the law of that member government. The Anchorage commission members shall consist of the mayor or his designee and two assembly members appointed by the mayor.

C. The term of each commission member shall be equal to the duration of his elected term or until a vacancy occurs. When a vacancy occurs, a new member shall be appointed in the manner provided by the law of that member government for the appointment of commission members.

D. The commission shall meet at least annually and shall elect annually from its membership a

presiding officer and such other officers as it deems appropriate. All officers shall serve terms of one year and may be reelected to their positions.

E. A quorum shall consist of four voting members of the commission. No action of the commission shall be taken or shall be effective except upon concurrence of at least four voting members.

F. The commission shall determine its own rules of procedure, order of business, and meeting places and times.

G. Each commission member shall be compensated for his attendance at official commission meetings in the manner provided by the law of his member government. The Anchorage commission members shall be compensated in the same manner as members of adjudicatory commissions pursuant toSection 4.05.050. Each commission member may also be paid such per diem and travel expenses for meetings outside his member government as may be provided by the law of that member government.

H. In order to effect the powers and duties of the authority, the commission shall:

1. Hear appeals from decisions of the director concerning applications for variances, permits or other entitlements, appeals from compliance orders and other decisions of the director for which appeals are authorized underSection 15.30.220;

2. Advise the mayors and assemblies of member governments regarding enactment or revision of legislation affecting air quality within the authority;

3. Hold such public hearings as it deems necessary for administration and enforcement of rules and regulations of the authority, member government ordinances and state law, compel the attendance of witnesses and the production of evidence, and adopt such rules of procedure as it finds reasonable and necessary for holding public hearings; and

4. Issue such orders in the exercise of its appellate jurisdiction as may be necessary to effect the provisions of this chapter.

(AO No. 80-70)

## 15.30.040 Director.

A. The administrative powers and duties of the authority shall be exercised by the director.

B. The director shall be the director of the Anchorage member government's department of health and human services.

C. The director shall:

1. Grant or deny applications for variances pursuant toSection 15.30.140.

2. Grant or deny applications for permits for which application is made to the authority pursuant to this chapter.

3. Determine the existence of and order curtailment actions for air episodes consistent withSection 15.30.060.

4. Enforce the provisions of this chapter and all regulations, rules, permits, variances or orders pursuant thereto.

5. Serve as a nonvoting, ex officio member and secretary of the commission.

D. The director shall have the power to:

1. Issue such enforcement orders as are necessary to control or reduce fugitive emissions pursuant to the law of a member government.

2. Require the owner or operator of air contaminant sources to install, maintain and operate emission or ambient air monitoring devices or both and to furnish data collected to the director.

3. Gather data concerning air pollution within the authority, conduct research and investigation into the causes and prevention of air pollution and conduct other related and scientific and technical investigations.

4. Render general administrative services to the commission and its member governments and provide such other duties as may be assigned by the commission or required to administer this chapter.

5. Contract for technical, professional, advisory, legal and other services that may be reasonable and proper for the performance of the authority's powers and duties, subject to the provisions of subsection 6 of this subsection.

6. Apply for, receive, administer and expend federal aid, state aid and other funds for the control of air pollution or the development and administration of programs related to that control in accordance with the approved budgets of each member government.

(GAAB 16.70.020, 16.70.050, 16.70.060, 16.70.090; AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

## 15.30.050 Air pollution inspections.

The director or a duly authorized officer, employee or representative may at a reasonable time and upon presentation of a proper search warrant, where required by the constitution of the United States or the state, enter and inspect the property and premises where an air contaminant source is located or is being constructed for the purpose of ascertaining the state of compliance with this chapter and the rules and regulations promulgated pursuant thereto. No person may interfere with such inspection.

(GAAB 16.70.080; AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

## 15.30.060 Air pollution episodes.

A. *Concentration levels.* An air pollution episode shall be declared when in the opinion of the director the concentration of air contaminants in the ambient air has reached or is predicted to reach any of the following levels:

1. *Air alert.*

a. Sulfur dioxide: 365 micrograms per cubic meter of air or 0.14 parts per million (24-hour average).

b. PM-10: 150 micrograms per cubic meter (24-hour average).

c. Carbon monoxide: Ten milligrams per cubic meter or nine parts per million (eight-hour average).

2. *Air warning.*

a. Sulfur dioxide: 800 micrograms per cubic meter of air or 0.3 parts per million (24-hour average).

b. PM-10: 350 micrograms per cubic meter (24-hour average).

c. Carbon monoxide: 17 milligrams per cubic meter or 15 parts per million (eight-hour average).

3. *Air emergency.*

a. Sulfur dioxide: 1,600 micrograms per cubic meter of air or 0.6 parts per million (24-hour average).

b. PM-10: 420 micrograms per cubic meter (24-hour average).

c. Carbon monoxide: 34 milligrams per cubic meter or 30 parts per million (eight-hour average).

B. *Air pollution episode plan.* The director shall, in order to effect the purposes of this section, prescribe and publish an air pollution episode plan that describes the curtailment actions, communication and public notification procedures to be employed when the concentration of air contaminants has reached or is predicted to reach the concentrations set forth in subsection A of this section. The Anchorage Air Pollution Episode Plan is adopted by reference as part of this chapter. Copies of this plan shall be maintained at the mayor's office, department of health and human services, and office of emergency management.

C. *Air quality advisory.* The director or his designee shall issue an air quality advisory when, in his judgment, air quality or atmospheric dispersion conditions exist that may cause injury to public health.

(GAAB 16.70.100; AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70; AO No. 86-111; AO No. 93-131, §§ 2--4, 10-26-93)

## 15.30.070 Confidentiality of records.

Records and information other than emission data in the possession of the municipality which relate to production or sales figures or to processes or production techniques of the owner or operator of an air contaminant source are considered confidential records of the municipality after application by the party that their public disclosure would tend to adversely affect his competitive position.

(GAAB 16.70.120; AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

## 15.30.080 Limitations.

This chapter does not:

A. Grant to the director jurisdiction or authority with respect to air contamination existing solely within commercial and industrial plants, works or shops.

B. Affect the relations between employers and employees with respect to or arising out of a condition of air contamination or air pollution.

C. Supersede or limit the applicability of a law or ordinance relating to sanitation, industrial health or safety.

(GAAB 16.70.130; AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

## 15.30.090 Compliance with federal and state law.

Unless otherwise allowed by law and by this chapter or a regulation promulgated pursuant thereto, no person shall commit any act prohibited by, omit any act required by, or exceed any standard or limitation established by the federal Clean Air Act, as amended, or by ASTitle 46, article 4, as amended, or by any valid rule, regulation, emission standard or limitation, ambient air quality standard or performance standard promulgated pursuant to either the federal or state legislation.

(AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70; AO No. 93-131, § 5, 10-26-93)

## 15.30.100 Registration of air contaminant sources; notification of completion.

A. *Registration required.* Except as otherwise provided in subsection F of this section, no person shall construct, install or establish any of the following air contaminant sources within the territorial limits of the municipality without first registering that source with the director:

1. Any facility requiring a permit to operate pursuant to state or municipal law or regulation for the control of air contaminants.

2. Any facility that can emit into the ambient air, without regard to whether air quality control equipment is operating, carbon monoxide, sulfur oxides or particulate matter in an amount that equals or exceeds five tons per year or hydrocarbons or nitrogen oxides in an amount that equals or exceeds ten tons per year.

3. Rock crushing or screening operations.

4. Coal- or oil-fired equipment having a rating that equals or exceeds 3,000 kilowatts or 10,000,000 Btu's per hour.

5. Incinerators having a rated capacity that equals or exceeds 250 pounds per hour.

6. Storage tanks, reservoirs or containers having a capacity that equals or exceeds 40,000 gallons and are used for the storage of petroleum liquids.

7. Marine installations within the municipality for more than 30 consecutive days in a year.

B. *Registration form; responsibility for registration.* The owner or lessee of an air contaminant source or his agent shall register all facilities subject to registration on forms furnished by the director. The owner of the source shall be responsible for registration and shall verify the correctness of the information submitted.

C. *Inventory of contaminant sources.* The registration of each air contaminant source subject to registration and notification pursuant to subsection A of this section shall include a detailed inventory of contaminant sources and emissions related to such process; provided, however, that separate registration shall not be required for identical units of equipment or control apparatus installed, altered or operated in an identical manner on the same premises.

D. *Notification of completion required.* No person shall operate or cause the operation of an air contaminant source for which registration is required pursuant to this section without first notifying the director of the date upon which such source shall begin to operate.

E. *Inspection.* The director shall, within 30 days of receipt of notice of completion, inspect the facility, and shall issue a notice of violation if he finds that the construction, installation or establishment of the facility is not in accord with the plans, specifications or other information submitted to the director or that the facility is otherwise in violation of this chapter or regulation promulgated pursuant thereto.

F. *Exception.* Neither air contaminant source registration nor notification of completion shall be required for a point source of an air contaminant that has previously registered with the Cook Inlet Air Resources Management District, has previously issued a notice of completion to that district, and has not undergone significant alteration since such registration and issuance of the notice of completion.

(GAAB 16.68.030; AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

## 15.30.110 Permit to operate air contaminant source.

A. *Required for certain facilities.* No person shall operate or cause the operation of a facility capable of emitting into the ambient air, regardless of whether air quality control equipment is operating, an air contaminant from any of the following sources without first applying at least 30 days prior to either purchasing equipment or commencing construction of the facility and without first receiving a permit to operate from the director:

1. Industrial process units having a total design rate, capacity or throughput that equals or exceeds five tons per hour.

2. Fuel-burning equipment having a combined rating that equals or exceeds 35 million Btu's per hour.

3. A facility containing one or more incinerators, with a total combined rated capacity that equals or exceeds 500 pounds per hour.

B. *Approval of plans.* No person may construct, modify, replace or undertake a major alteration of a facility requiring a permit to operate until detailed plans and specifications are submitted to the director and approved. The director shall approve or reject such plans and specifications within 30 days of receipt of a complete set of such plans and specifications unless the director holds a public hearing pursuant to subsection C of this section. These plans and specifications shall include the following information:

1. One set of plans and specifications, clearly indicating the layout of the facility, location of individual pieces of equipment and points of discharge.

2. One set of maps or aerial photographs of a scale of at least one inch to one mile indicating the location and zoning of the proposed facility and, within a one-mile radius of the facility, the land use and zoning of the surrounding area, all homes, buildings, watercourses, roads and other adjacent facilities, and the general topography.

3. An engineering report outlining the proposed methods of operation, the quantity and quality of material to be processed, the proposed use and distribution of the processed material, and a process flow diagram indicating the points of emission, including estimated quantities and types of air contaminants to be emitted.

4. A description and the specifications of all air quality control devices, including design criteria and other information indicating that such equipment is capable of complying with applicable federal, state and municipal emission requirements.

5. An evaluation of the effect on the surrounding ambient air of the emissions from the facility, if requested by the director.

6. Plans for emission reduction procedures during an air pollution episode if requested by the director.

C. *Public hearing.* The director may hold a public hearing concerning any application for a permit to operate if the director determines that public testimony is necessary before approval or rejection of an application for a permit to operate and if the director provides public notice of such hearing not less than 30 days prior to the hearing in a newspaper of general circulation. In such cases the director shall approve or reject the application within five days after conclusion of the public hearing.

D. *Criteria for approval.* Approval to construct a new air contaminant source or modify an existing facility requiring a permit to operate may not be granted unless the applicant shows to the satisfaction of the director that:

1. The new or modified source will not prevent or interfere with the attainment or maintenance of any federal, state or municipal ambient air quality standard.

2. The new or modified source will operate without causing a violation of this chapter or

any regulation, rule, permit or final order issued pursuant thereto.

3. The equipment incorporates the control technology required by federal, state and municipal law or regulation for the kind and amount of air contaminant emitted by the equipment.

E. *Transfer; conditions.* A permit to operate may:

1. Not be transferred without the written consent of the director.

2. Not be issued for a period greater than five years, after which the permit must be renewed for continued operation of the facility.

3. Include a compliance schedule approved by the director approving for the minimum time necessary to install the required control equipment if the facility would or is emitting air contaminants in excess of federal, state or municipal emission standards or limitations; provided, however, that a compliance schedule for any facility emitting air contaminants subject to federal or state regulation may not allow compliance later than the date provided by federal or state regulation. A permit including a compliance schedule must be reviewed and renewed every year of its duration.

4. Require that specific emission reduction procedures be taken during an air pollution episode.

F. *Authority to impose additional requirements.* The director may require an applicant for a permit to operate: to install, use and maintain monitoring equipment; to sample emissions in accordance with methods prescribed by the director at locations, intervals and by procedures as may be specified; to provide source test ports of the size, number and location as may be required and safe access to each port; to provide emission data and information from analysis of any test samples; and to provide periodic reports on process emissions.

G. *Notification of denial.* If an application for a permit to operate is denied, the director shall notify the applicant in writing of the reasons.

H. *Equipment requirements.* Nothing in this section may be construed to authorize the director to require the use of machinery, devices or equipment from a particular supplier or produced by a particular manufacturer if the required emission standards may be met by machinery, devices or equipment available from other sources.

I. *Fee.* A reasonable fee in the amount set by the director will be charged for the issuance of a permit.

J. *Compliance with applicable regulations.* The issuance of a permit to operate shall neither relieve the owner of a facility requiring a permit of the obligation to comply with all applicable federal, state or municipal emission standards and limitations nor prevent the director from issuing other orders pursuant to this chapter and the rules and regulations of the director promulgated pursuant thereto.

K. *Revocation or suspension.* A permit to operate may be revoked or suspended by the director if the conditions of the permit or applicable laws, rules or regulations are violated.

(GAAB 16.68.090, 16.70.070; AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70; AO No. 93-131, § 6, 10-26-93)

## 15.30.120 Source reports.

The air contaminant emission data required bySection 15.30.100or 15.30.110 shall be compiled and submitted to the director at reasonable intervals upon the request of the director.

(GAAB 16.68.050; AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

## 15.30.130 Source tests.

A. The director may conduct or have conducted source testing in order to determine compliance with this chapter or any rule or regulation promulgated pursuant thereto.

B. Testing to determine compliance with provisions of this chapter or any rule or regulation promulgated pursuant thereto shall be by methods of measurement approved by the director and undertaken in such a manner as to characterize the actual discharge into the ambient air.

C. The cost, if any, to the municipality of any such source testing authorized by subsection A of this section shall be a debt due the municipality from the owner or operator of such source and recoverable in any court of competent jurisdiction when such testing shall have proved the emission of air contaminants in violation of this chapter or any rule or regulation promulgated pursuant thereto.

(GAAB 16.68.250; AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

## 15.30.140 Variance criteria.

A. A person who owns or is in control of a plant, building, structure, establishment, process or equipment may apply to the director for a variance from any emission standard or limitation promulgated pursuant to this chapter. The director may grant the variance, but only after public hearing following 30 days' notice, if the director finds that:

1. The emissions occurring or proposed to occur do not endanger human health or safety; and

2. Compliance with the rules or regulations from which the variance is sought would produce serious hardship without equal or greater benefits to the public.

B. No variance may be granted under this section until the director has considered the relative interest of the applicant, other owners of property likely to be affected by the emissions, and the general public.

C. A variance granted under subsection A of this section shall be for periods and under conditions consistent with the reasons for it and within the following limitations:

1. If a variance is granted on the grounds that there is no practicable means known or available for the adequate prevention, abatement or control of the air pollution involved, it shall be effective only until the necessary means for prevention, abatement or control become known and available, subject to the taking of substitute or alternate measures that the director may prescribe.

2. If a variance is granted on the grounds that compliance with the particular requirement from which a variance is sought will necessitate the taking of measures which because of their complexity or cost will involve considerable hardship, it shall be effective for a period of time which in the opinion of the director is necessary and reasonable. A variance granted on this ground shall contain a timetable for compliance with the particular requirement from which a variance is sought in an expeditious manner and shall be for not more than five years.

3. If a variance is granted on the grounds that it is justified to relieve or prevent hardship of a kind other than that provided in subsections C.1 and C.2 of this section, it shall be for not more than one year.

D. A variance granted under this section may be renewed on terms and conditions and for periods which would be appropriate for the initial granting of a variance. If complaint is made to

the director on account of the variance, no renewal of it shall be granted unless, after public hearing on the complaint following the notice, the director finds that renewal is justified. No renewal may be granted except upon application for renewal made at least 60 days before the expiration of the variance. Immediately upon receipt of an application for renewal, the director shall give public notice of it.

E. The grant of a variance or renewal is not a right of the applicant but is within the discretion of the director.

F. No variance or renewal granted under this section may be construed to prevent or limit the air pollution episode provisions of this chapter.

(GAAB 16.70.110; AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

### 15.30.150 Judicial review of action on variance.

A person adversely affected by the grant, denial or renewal of a variance by the director may obtain judicial review of the director's order by filing appeal within 30 days after the date of such order. Judicial review of the grant, denial or renewal of a variance may be had only on the grounds that the grant, denial or renewal was arbitrary or capricious.

(GAAB 16.70.110; AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

### 15.30.160 Other limitations.(Repealed).

(AO No. 80-70)

### 15.30.170 Rule-making procedures.(Repealed).

(AO No. 80-70)

### 15.30.180 Notice of violation.

When the director has evidence that a violation of this chapter or rule or regulation issued under this chapter has occurred, the director shall serve a written notice of violation upon the suspected violator. The notice shall specify the provision believed to be violated and the facts believed to constitute the violation and may include a compliance order that necessary corrective action be taken within a reasonable time.

(GAAB 16.70.140; AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

### 15.30.190 Effect of compliance order.

A compliance order issued pursuant toSection 15.30.180shall become a final order unless within ten days after receipt of service of the notice of violation and compliance order the person named requests in writing a hearing before the director in the manner provided inSection 15.30.210.

(GAAB 16.70.140; AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

### 15.30.200 Voluntary compliance.

The director may make efforts to obtain voluntary compliance through warning, informal conference or other appropriate means.

(GAAB 16.70.140; AO No. 78-140; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

## 15.30.210 Administrative hearings.

A. Upon the written request by any person aggrieved by any decision of the director made pursuant to this chapter or any rule or regulation in force pursuant thereto, including a decision to deny a permit to operate or the issuance of a compliance order, served on the director no later than ten days after that decision, the commission shall conduct a hearing to review the legality, appropriateness or wisdom of that decision. The hearing shall occur not later than 30 days after receipt of service of the request upon the director, and, after considering the evidence presented at the hearing, the commission shall affirm, modify or reverse the decision of the director except as otherwise provided by this chapter or a rule or regulation issued pursuant thereto. The director's decision shall not be stayed pending review by the commission unless the director so orders.

B. If after a hearing held under subsection A of this section the commission finds that a violation of an ordinance, rule, regulation, permit or variance has occurred, it shall affirm or modify the compliance order previously issued or issue an appropriate compliance order for taking corrective action. If the commission finds that no violation has occurred, it shall rescind the previous order, if any. A compliance order issued as a part of a notice of violation or after a hearing may prescribe the date by which the violation shall cease and may prescribe timetables for necessary action in preventing, abating or controlling emissions.

C. In connection with a hearing held under this section, the commission shall have power to, and upon application by a party to the hearing it shall have the duty to, compel the attendance of witnesses and the production of evidence on behalf of all parties.

D. Upon unanimous consent of the commission, the commission may delegate, in writing, the authority to conduct administrative hearings under the provisions of this section to the director of the department for the member government wherein the subject of the administrative hearing arose.

(AO No. 80-70; AO No. 93-131, § 7, 10-26-93)

## 15.30.220 Appeals.

All appeals of any final decision of the commission shall be made to the Superior Court, Third Judicial District, no later than 30 days allowing that decision, pursuant to rule 601 et seq., of the Rules of Appellate Procedure for the state. Review of the court shall be limited to whether the decision of the commission or director is supported by substantial evidence. A final appealable decision by the commission pursuant to this chapter must indicate that it is a final order and that a party disputing the decision has 30 days to appeal.

(AO No. 80-70; AO No. 95-180, § 13, 9-26-95)

## 15.30.230 Enforcement.

A. Notwithstanding any other provision of this chapter or other remedy provided by law, any person who violates any provision of this chapter or any regulation, rule, permit, variance or final order issued pursuant thereto shall be subject to injunctive relief to restrain the person from continuing the violation or threat of violation. Upon application for injunctive relief and a finding

that a person is violating or threatening to violate any provision of this chapter or any rule, regulation, permit, variance or order issued pursuant to this chapter, the court shall grant injunctive relief to restrain the violation.

B. In addition to any other remedy or penalty provided by law, a person who violates any provision of this chapter or any regulation, rule, permit, variance or final order issued pursuant thereto shall be subject to the civil, criminal and administrative remedies or penalties provided by the law of that member government wherein such violation occurred.

(AO No. 80-70)

# Chapter 15.35 SOUTH CENTRAL CLEAN AIR ORDINANCE REGULATIONS

15.35.010 Adoption of regulations.
15.35.020 Availability of copies.
15.35.030 Stationary source emissions--Short title.
15.35.040 Stationary source emissions--General definitions.
15.35.050 Stationary source emissions--Visible emission standards.
15.35.060 Stationary source emissions--Emission standards.
15.35.070 Stationary source emissions--Other emission limitations.
15.35.080 Stationary source emissions--Circumvention.
15.35.090 Stationary source emissions--Fugitive emissions.
15.35.100 Stationary source emissions--Open burning.
15.35.110 Mobile source emissions--Short title.
15.35.120 Mobile source emissions--Application.
15.35.130 Mobile source emissions--Definitions.
15.35.140 Motor vehicle emissions.
15.35.150 Motor vehicle fleet operation.
15.35.160 Motor vehicle inspection.
15.35.170 Motor vehicle owner liability.

## 15.35.010 Adoption of regulations.

The municipality hereby adopts as ordinance the following regulations of the South Central Clean Air Ordinance as set forth in full in Sections15.35.030--15.35.170of this chapter.

A. Regulation 1: Stationary Source Emissions.

B. Regulation 2: Mobile Source Emissions.

(AO No. 78-141; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

## 15.35.020 Availability of copies.

At least five copies of each regulation adopted inSection 15.35.010shall be available for public inspection at the offices of the Anchorage Department of Health and Human Services.

(AO No. 78-141; AO No. 80-2; AO No. 80-70; AO No. 85-8)

## 15.35.030 Stationary source emissions--Short title.

This regulation may be known and cited as South Central Clean Air Ordinance Regulation 1: Stationary Source Emissions.

(AO No. 78-141; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

## 15.35.040 Stationary source emissions--General definitions.

Unless the context clearly indicates otherwise, the following terms used in this regulation shall be defined as follows:

*Anchorage bowl area* means that area within the boundaries of the Municipality of Anchorage enclosed by a border beginning at the intersection of 61 degrees 18 minutes north latitude and 149 degrees 42 minutes west longitude, thence due south to 61 degrees 4 minutes north latitude, thence due west to 150 degrees 5 minutes west longitude, thence due north to 61 degrees 18 minutes north latitude, and thence due east to the point of beginning, 149 degrees 42 minutes west longitude.

*Fire chief* means the Anchorage Fire Chief or his authorized representative.

*Incinerator* means any furnace used in the process of burning solid waste for the purpose of reducing the volume of the waste by removing combustible matter.

*Industrial waste* means any material resulting from a production or manufacturing operation having no net economic value to the source producing it.

*Open burning* means the burning of any matter in such manner that the products of combustion resulting from the burning are emitted directly into the atmosphere without passing through an approved stack, duct, vent or chimney but does not refer to the operation of safety flares for the purpose of protecting human life.

*Open, untreated areas* means land upon which all of the natural vegetation has been removed and no successful measures have been taken to either revegetate or resurface the ground to prevent the emission of dust, vapors or other particulate matter into the atmosphere.

*Smolder* means to burn and smoke without flame.

*Stationary source* means any building, structure, facility, installation or equipment that emits or may emit any air contaminant and that contains apparatus to which this regulation applies.

(AO No. 78-141; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

## 15.35.050 Stationary source emissions--Visible emission standards.

A. No person shall cause, permit or allow the emission of any air contaminant, excluding portions of emissions containing condensed uncombined water vapor from any stationary source including air curtain incinerators to reduce visibility through the exhaust effluent by:

1. Greater than 20 percent for a period or periods aggregating more than three minutes in any one hour, except as provided in subsection 2 of this subsection; or

2. Twenty percent or greater for municipal wastewater treatment plant sludge incinerators.

B. The opacity of an air contaminant shall be determined at the point of emission, except when the point of emission cannot be readily observed, in which case it may be determined at an observable point of the plume nearest the point of emission.

C. This section shall not apply to smoke-generating equipment used by the director for the training, instruction or certification of persons to observe and determine the opacity of air contaminants, nor shall this section apply to smoke-generating equipment used by the fire chief for instruction in firefighting, when such equipment is otherwise operated in compliance with applicable federal and state laws.

(AO No. 78-141; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70; AO No. 93-131, § 8, 10-26-93)

## 15.35.060 Stationary source emissions--Emission standards.

A. Except as otherwise provided in subsection B, no person shall cause, permit or allow emissions of particulate matter into the atmosphere from any stationary source in excess of 0.05 grains per standard cubic foot of exhaust gas.

B. No person may cause, permit or allow emissions into the atmosphere from any single source or emission whatsoever any one or more of the following air contaminants, in any state or combination thereof exceeding the following concentrations at the point of discharge:

1. Sulphur compounds calculated as sulphur dioxide (SO2 ) above 500 parts SO2 per

million parts of exhaust gas;

2. Particulate matter as combustion contaminants calculated to 12 percent of carbon dioxide ($CO_2$):

a. 0.05 grains per standard cubic foot of exhaust gas except as noted in subsections b through g below;

b. 0.04 grains per standard cubic foot of exhaust gas for asphalt batch plants constructed or modified after June 11, 1973;

c. 0.08 grains per standard cubic foot of exhaust gas for incinerators equal to or larger than 2,000 pounds per hour rated capacity;

d. 0.10 grains per standard cubic foot of exhaust gas for those sources in operation prior to July 1, 1972, and for fuel-burning equipment using coal for fuel or for incinerators equal to or larger than 1,000 pounds per hour capacity;

e. 0.15 grains per standard cubic foot of exhaust gas for fuel-burning equipment using more than 20 percent wood waste as fuel;

f. 0.20 grains per standard cubic foot of exhaust gas for incinerators equal to or larger than 200 pounds per hour rated capacity but equal to or less than 1,000 pounds per hour rated capacity;

g. 0.30 grains per standard cubic foot of exhaust gas for incinerators less than 200 pounds per hour rated capacity.

C. No person shall cause, permit or allow the emission of particulate matter from any stationary source that exceeds in any one hour the amount shown in the following table for the process weight rate allocated to such source:

TABLE 1

TABLE INSET:

| Process Weight (lb./hr.) | Emission Standards (lb./hr.) |
|---|---|
| 100--299 | 0.6 |
| 300--499 | 1.2 |
| 500--699 | 1.8 |
| 700--999 | 2.2 |
| 1,000--1,999 | 2.8 |
| 2,000--2,999 | 4.1 |
| 3,000--3,999 | 5.4 |
| 4,000--4,999 | 6.5 |
| 5,000--5,999 | 7.6 |
| 6,000--6,999 | 8.6 |
| 7,000--7,999 | 9.5 |
| 8,000--8,999 | 10.4 |
| 9,000--9,999 | 11.2 |
| 10,000--14,999 | 12.0 |
| 15,000--19,999 | 15.0 |
| | |

| | |
|---|---|
| 20,000--29,999 | 19.2 |
| 30,000--39,999 | 25.2 |
| 40,000--49,999 | 30.5 |
| 50,000--59,999 | 36.0 |
| 60,000--79,999 | 40.0 |
| 80,000--99,999 | 48.0 |
| 100,000--139,999 | 55.0 |
| 140,000 or more | 65.0 |

D. No person shall cause, permit or allow the emission of particulate matter onto the property of others except when such emissions comply with the requirements of Sections15.35.050and15.35.060.A--C.

(GAAB 16.68.130, 16.68.150; AO No. 78-141; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70; AO No. 93-131, § 9, 10-26-93)

### 15.35.070 Stationary source emissions--Other emission limitations.

A. No person shall cause, allow or permit the emission of any air contaminant or water vapor, including but not limited to odorous matter, that tends to be injurious to or adversely affects human health, safety or welfare, animal or plant life, or property or interferes with the normal use and enjoyment of life, property or business.

B. Nothing in this regulation shall be construed to impair any cause of action or legal remedy therefor of any person or the public for injunctive relief, injury or damages arising from the emission of any air contaminant in such place, manner or concentration as to constitute air pollution or a common law nuisance.

C. The director may establish reasonable requirements that a building or stationary source be enclosed and ventilated in such a way that all the air, gases and particulate matter are effectively dispersed or treated for removal or destruction of odorous matter or other air contaminants before emission to the atmosphere.

(GAAB 16.68.160, 16.68.170; AO No. 78-141; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

### 15.35.080 Stationary source emissions--Circumvention.

A. No person shall willfully cause, allow or permit the installation or use of any device or use any means which, without resulting in a reduction in the total amount of air contaminant emitted, conceals an emission of air contaminant which would otherwise violate these regulations.

B. No person shall cause, allow or permit the installation or use of any device or use of any means designed to mask the emission of an air contaminant which causes detriment to health, safety or welfare of any person.

C. No person shall cause, permit or allow the use of air for dilution of emission contaminants without affecting any total decrease in such contaminants as a method to effect compliance with the requirements of this regulation.

D. No person shall cause, permit or allow the use of stack heights that exceed good engineering practice or dispersion techniques to affect the degree of emission limitation required for control of air contaminants.

(GAAB 16.68.180; AO No. 78-141; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70; AO No. 93-131, §

10, 10-26-93)

## 15.35.090 Stationary source emissions--Fugitive emissions.

A. No person shall cause, allow or permit particulate matter to be handled, transported or stored without taking reasonable measures to prevent the particulate matter from becoming airborne.

B. Within the boundaries of the municipality no person shall cause, allow or permit a building or its appurtenances or a road to be constructed, altered, repaired or demolished without taking reasonable measures to prevent particulate matter from becoming airborne.

C. Within the boundaries of the municipality no person shall cause, allow or permit untreated open areas, including but not limited to roads, parking lots or construction sites located within a private or public lot or roadway, to be improved, graded, excavated, repaired, demolished, altered or constructed without taking reasonable measures to prevent particulate matter from becoming airborne.

D. The director shall publish guidelines he determines to be reasonable measures for controlling fugitive emissions, and compliance with such guidelines to the satisfaction of the director shall be deemed to fulfill the requirements of subsections A through C.

(AO No. 78-141; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

## 15.35.100 Stationary source emissions--Open burning.

A. Within the boundaries of the municipality no person shall cause, suffer, permit or allow any open burning except the following unless otherwise prohibited by law:

1. Open burning for pleasure, religious, ceremonial, cooking or like social purposes and open burning from flares, torches, waste gas burners, incense burners and insect pots is allowed.

2. Open burning authorized by the fire chief for the disposal of dangerous materials is allowed, provided no alternate means of disposal is reasonably available.

3. Open burning authorized by the fire chief for instruction in the method of fighting fires or testing fire resistive materials and fire protection equipment is allowed provided that these outdoor fires have prior written approval from the director, and, unless waived by the department, the public shall be notified through the news media of the time, place and purpose of the exercise at least three days in advance of the activity. Prior written approval from the director and public notice shall not be required when such outdoor fires do not exceed 30 inches in diameter.

4. Open burning for the disposal of trees and brush on property being developed for commercial or residential purposes or on property where the trees and brush were grown is allowed provided that:

a. Open burning shall be allowed only outside the Anchorage bowl area and only during the periods from April 1 through May 31 and August 15 through October 31;

b. The person responsible for such open burning shall obtain a written permit for such fire from the fire chief and upon terms and conditions specifically approved by the director and shall comply with all the laws and regulations of the director, the fire chief and all other governmental agencies regarding such fires;

c. Tires or heavy petroleum products may not be used to start or maintain open

burning.

5. Open burning for the disposal of household refuse is allowed in the areas of the municipality where municipal or Alaska Public Utilities Commission sanctioned refuse collection service is not available.

6. The burning of combustible construction debris, trees, brush and other vegetative matter is allowed in a commercial air curtain combustion system properly operated and maintained according to the manufacturer's specifications, provided that the device has been registered with the director, that the operator obtains written approval from the director prior to operation, and that the operation of the device complies with all rules and regulations of the director, the fire chief and all other governmental agencies regarding such equipment.

7. Open burning for the disposal of small quantities of grass, leaves, weeds and other organic debris accumulated during winter months may be allowed without an open burning permit throughout the municipality during a ten-day period in the spring authorized by the mayor upon appropriate terms and conditions that take into consideration those factors described in subsection A.10. of this section.

8. Open burning for the disposal of small quantities of grass, leaves, brush, weeds and other organic debris may be allowed without an open burning permit in the area east of the Bragaw Road/Elmore/Abbot Loop alignment and south of Tudor Road up to 24 days between May 1 and June 14 and up to 14 days between August 15 and October 15, when authorized by the mayor and upon appropriate terms and conditions that take into consideration those factors described in subsection A.10. of this section.

9. The fire chief, with the approval of the air pollution control officer or department, may issue open burning permits for the disposal of small quantities of grass, leaves, brush, weeds and other organic debris at such times and places and upon such terms and conditions as the fire chief and director deem appropriate in consideration of and consistent with those factors described in subsection A.10. of this section.

10. The fire chief, with the approval of the air pollution control officer or the department may issue open burning permits allowed by this section upon appropriate terms and conditions that take into consideration the ambient air quality, the achievement and maintenance of federal, state or municipal ambient air quality standards, meteorological conditions, the suitability of air pollution control devices for large quantities of waste, means of reducing fire hazards, the suitability of disposal by other available means, the amount and nature of waste to be burned, the proximity of the burn site to developed areas and the population density of the surrounding area.

B. The director shall publish the dates during which open burning will be allowed along with appropriate terms and conditions to be followed while burning.

C. The director may suspend or prohibit open burning at any time based on air quality considerations, or, upon consultation with the fire chief, for fire safety reasons.

D. The fire chief, in consultation with the air pollution control officer, and upon appropriate terms and conditions that take into consideration those factors described in subsection A.10 of this section, may issue written permits for the destruction of timber infested with spruce bark beetle during periods outside of the open burn periods designated in this section.

E. The fire chief shall establish guidelines and may establish an appropriate fee schedule for the issuance of written permits authorized under this section.

F. It shall be a rebuttable presumption that the person who owns or controls the property on which open burning occurs has caused or allowed said open burning.

(GAAB 16.68.210; AO No. 78-141; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70; AO No. 93-131, § 11, 10-26-93; AO No. 93-210(S), § 1, 1-18-94; AO No. 95-196(S), §§ 1, 2, 10-17-95; AO No. 96-135(S),

§ 1, 10-22-96)

### 15.35.110 Mobile source emissions--Short title.

This regulation may be known and cited as the South Central Clean Air Ordinance Regulation 2: Mobile Source Emissions.

(AO No. 78-141; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

### 15.35.120 Mobile source emissions--Application.

The provisions of this regulation apply only to mobile sources within the boundaries of the municipality.

(AO No. 78-141; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

### 15.35.130 Mobile source emissions--Definitions.

Unless the context clearly indicates otherwise the following terms used in this regulation shall be defined as follows:

*Mobile source* means a source capable of simultaneous motion and emission of air contaminants.

*Motor vehicle* means any self-propelled vehicle designed and used for transporting persons or property but excludes aircraft, vessels operated on water and vehicles operated exclusively on a rail or rails.

(AO No. 78-141; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

### 15.35.140 Motor vehicle emissions.

A. No person shall operate, drive, cause or permit to be driven or operated any motor vehicle upon a public street or highway that emits any visible emission for a period in excess of five consecutive seconds except for those motor vehicles powered by compression ignition or diesel-powered engines and except when the presence of uncombined water is the only reason an emission fails to meet this requirement.

B. No person shall operate, drive, cause or permit to be driven or operated any diesel-powered motor vehicle that emits for a period in excess of ten consecutive seconds any air contaminant that obscures an observer's vision to a degree greater than 30 percent opacity.

C. No person shall operate, drive, cause or permit to be driven or operated any motor vehicle that violates or exceeds any federal or state law, regulation, emission standard or limitation applicable to such motor vehicle for the control of emissions of carbon monoxide, hydrocarbons or oxides of nitrogen.

(AO No. 78-141; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

### 15.35.150 Motor vehicle fleet operation.

The director by written notice may require the owner of any motor vehicle fleet operation of more than five vehicles to certify annually that its motor vehicles are maintained in good working order

and, if applicable, in accordance with the motor vehicle manufacturer's specifications and maintenance schedules that may or tend to affect visible emissions. The director by written notice may require records pertaining to observations, tests, maintenance and repairs performed to control or reduce visible emissions from individual motor vehicles to be made available for review and inspection by the director.

(AO No. 78-141; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

### 15.35.160 Motor vehicle inspection.

The director by written notice may require the owner of any motor vehicle of a motor vehicle fleet operation or the owner of any motor vehicle that the director has reason to believe may be in violation of this regulation to make such motor vehicle available for testing for compliance withSection 15.35.140of this regulation at a reasonable time and place.

(AO No. 78-141; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

### 15.35.170 Motor vehicle owner liability.

It shall be a rebuttable presumption that the owner of a motor vehicle that violates or exceeds any provision of this regulation has caused or permitted the operation or driving of that motor vehicle.

(AO No. 78-141; AO No. 79-80(AM); AO No. 80-2; AO No. 80-70)

# Alaska Department of Environmental Conservation

# Amendments to:

# State Air Quality Control Plan

Vol. III: Appendices

Appendix III.B.9
"Municipality of Anchorage Ordinance 2008-84(S)"

Adopted

August 5th, 2009

**Submitted by:** ASSEMBLY CHAIR CLAMAN
**Prepared by:** Department of Health and Human Services
**For reading:** July 15, 2008

CLERK'S OFFICE
AMENDED AND APPROVED
Date: 7-15-08

**ANCHORAGE, ALASKA**
**AO NO. 2008–84(S)**

**AN ORDINANCE OF THE ANCHORAGE MUNICIPAL ASSEMBLY REPEALING AO 2007-122(S) IN ITS ENTIRETY; REINSTATING AND AMENDING ANCHORAGE MUNICIPAL CODE CHAPTERS 15.80 AND 15.85, AND SECTIONS 9.30.155E. AND 14.60.030, AND AMENDING TITLE 12 TO ADD A NEW CHAPTER, ALL REGARDING PROCEDURES, FEES AND REQUIREMENTS FOR VEHICLE I/M TESTING AND RELATED INSPECTIONS, LICENSING, REGISTRATION, EXEMPTIONS, I/M PROGRAM CHANGES, AND FINES; AND ESTABLISHING EFFECTIVE DATES.**

**THE ANCHORAGE ASSEMBLY ORDAINS:**

**Section 1.** Assembly Ordinance No. 2007-122(S), passed and approved by the Assembly on November 6, 2007, is repealed in its entirety.

**Section 2.** Anchorage Municipal Code chapter 15.80, Vehicle Inspection and Maintenance Program, is reinstated.

**Section 3.** Anchorage Municipal Code chapter 15.85, Requirements, Specifications, and Procedures for Motor Vehicle Emissions Inspection and Maintenance (I/M) program, is reinstated.

**Section 4.** Anchorage Municipal Code section 9.30.155E. is reinstated to read as follows:

**9.30.155 Vehicle license plates and registration.**

*** *** ***

E. A motor vehicle that is parked, stopped or left standing on a street or private property open to the public for travel or parking, and does not have current registration properly attached as required by subsection A of this section, shall be considered prima facie to not have a current emissions (I.M.) certification as specified in Section 15.80.010.

1. A citation issued under subsection E. of this section, may be dismissed by the parking authority if an I.M. inspection certificate, dated prior to the date of the violation, is provided

within 30 days of the violation, and shall omit the scheduled penalty for the offense. Additionally, if the registered owner does not principally utilize and/or garage the vehicle within the municipality and provides the parking authority with proof of residency, shall omit the scheduled penalty for the offense. Such dismissals shall not apply to any late penalties or collection charges.

2. A motor vehicle ticketed for violating this section shall not be ticketed at the same time for both I.M. and registration violations.

(CAC 9.44.020; AO No. 78-72; AO No. 80-4; AO No. 85-40; AO No. 92-28; AO No. 92-134(S); AO No. 94-68(S), § 16, 8-11-94; AO No. 95-6, § 4, 5-16-95; AO No. 2003-152S, § 3, 1-1-04)

**Section 5.** Anchorage Municipal Code section 14.60.030 is reinstated to read as follows *(the remainder of the section is not affected and therefore not set out)*:

**14.60.030 Fine schedule.**

The fine schedule under this chapter is as follows:

TABLE INSET:

| Code Section | | Offense | Penalty/Fine |
|---|---|---|---|
| *** | | *** | *** |
| 15.80.010 | A. | Vehicle inspection | 200.00 |
| | B. | Vehicle inspection | 200.00 |
| | F. | Improper inspection | 75.00 |
| | H. | Improper advertisement | 75.00 |
| 15.80.040 | I/M compliance | | 75.00 |
| 15.80.050 | A. Non resolution | | 75.00 |
| | B. Other violation | | Up to 300.00 |

*** *** ***

(AO No. 93-167(S-1), § 1, 4-13-94; AO No. 94-108, § 1, 10-5-94; AO No. 94-134, § 2, 9-8-94; AO No. 95-42, § 2, 3-23-95; AO No. 95-67(S), § 9, 7-1-95; AO No. 95-102, § 1, 4-26-95; AO No. 95-118, § 3, 9-1-95; AO No. 95-163(S), § 21, 8-8-95;

AO No. 95-195(S-1), 1-1-96; AO No. 96-51(S-1), § 2, 8-1-96; AO No. 96-96(S-1), § 2, 2-1-97; AO No. 96-126(S), § 3, 10-1-96; AO No. 96-137(S), § 9, 1-2-97; AO No. 97-88, § 3, 6-3-97; AO No. 97-107, § 3, 11-17-97; AO No. 97-133(S), § 1, 11-11-97; AO No. 98-27(S-1), § 2, 11-11-97; AO No. 98-160, § 2, 12-8-98; AO No. 99-13(S), 2-9-99; AO No. 99-91(S), § 4, 7-13-99; AO No. 2000-64, § 1, 4-18-00; AO No. 2000-116(S), § 4, 7-18-00; AO No. 2000-127(S), § 2, 10-14-00; AO No. 2000-129(S), § 26, 11-21-00; AO No. 2001-48, § 1, 3-13-01; AO No. 2001-74(S), § 2, 4-17-01; AO No. 2001-4, § 2, 2-6-01; AO No. 2001-145(S-1), § 11, 12-11-01; AO No. 2003-68, § 1, 9-30-03; AO No. 2003-97, § 4, 9-30-03; AO No. 2003-117, § 2, 1-28-03; AO No. 2003-130, § 8, 10-7-03; AO No. 2003-152S, § 10, 1-1-04; AO No. 2004-1, § 2, 1-1-03; AO No. 2004-99, § 2, 6-22-04; AO No. 2004-100(S-1), § 6, 1-1-05; AO No. 2004-171, § 1, 1-11-05; AO No. 2005-160, § 9, 11-1-05; AO No. 2005-84(S), § 3, 1-1-06; AO No. 2005-185(S), § 35, 2-28-06; AO No. 2005-124(S-1A), § 33, 4-18-06; AO No. 2006-39, § 6, 4-11-06; AO No. 2006-54, § 1, 5-2-06; AO No. 2006-80, § 1, 6-6-06)

**Section 6.** Anchorage Municipal Code section 15.80.010, General Provisions, is amended to read as follows:

**15.80.010 General provisions.**

A. *Inspection and maintenance required.* Every motorist operating [OF (*SIC*)] a vehicle registered, principally located or principally used within the municipality shall have each such vehicle inspected and maintained in accordance with the requirements specified in the I/M program design as amended by AO 96-154, [AND] AO 99-160 and AO 2008-84**(S)**.

Note: Text of sections indexed available from the department of health and human services.

*** *** ***

E. Certification of inspection stations. The I/M program administrator shall certify mechanics, vehicle test and repair facilities (stations) and testing, equipment as necessary to meet all certification requirements specified in the I/M program design.

**1. Beginning January 1, 2010, the I/M administrator shall charge a fee for inspection station certification in accordance with section 15.85.400.**

*** *** ***

(AO No. 84-110; AO No. 85-8; AO No. 87-27; AO No. 87-35; AO No. 88-154(S); AO No. 88-184; AO No. 93-216(S), § 1, 2-15-94; AO No. 94-195, § 1, 10-25-94; AO No. 96-137(S), §§ 1--6, 1-2-97; Ord. No. 96-154, § 1, 1-2-

97; AO No. 99-160, § 1, 1-11-00; AO No. 2000-92, § 1, 8-15-00; AO No. 2003-44, § 1, 3-18-03; AO No. 2006-13, § 1, 2-14-06)
*Editor's note*: The February 14, 2006 effective date of AO 2006-13 was subject to State of Alaska approval of the I/M program amendments pursuant to 18 AAC 52.035, and the state approved on May 15, 2006.

**Section 7.** Anchorage Municipal Code section 15.85.100, Summary, is amended to read as follows (*portions of section 15.85.100 are set out without amendment for context only*):

**15.85.100 Summary.**

A. This chapter contains the requirements, specifications, and procedures for a motor vehicle emissions inspection and maintenance (I/M) program administered by the municipality under Chapter 15.80. The information contained herein is relatively technical in nature and is principally intended for use by the operators of certified I/M stations, certified mechanics, and departmental or contractor staff involved in administering the I/M program. Separate publications are available from the I/M program administration office that describes more concisely the requirements of the program for the general public. The basis for these requirements can also be found in state regulations under 18 AAC 52.

B. Under the I/M program, owners or operators of non-exempt vehicles are required to have their vehicles inspected for emissions problems at least biennially, upon initial registration of a used vehicle in the state, or upon change of ownership if the vehicle is not currently in compliance. Vehicles must be I/M certified prior to the initial registration or renewal of registration by the state department of administration, division of motor vehicles (DMV).

*** *** ***

(AO No. 99-160, § 7, 1-11-00)

**Section 8.** Anchorage Municipal Code section 15.85.220, Vehicles Requiring Certificate of Inspection, is amended to read as follows (*portions of the section are set out without amendment for context only*):

**15.85.220 Vehicles requiring certificate of inspection.**

A. *Program area.* Vehicles subject to this I/M program are passenger cars and trucks registered, principally used, or principally located, within the following zip codes or any other zip codes assigned to the Municipality of Anchorage by the U.S. Postal Service:

TABLE INSET:

| | | | | | |
|---|---|---|---|---|---|
| 99501 | 99506 | 99511 | 99516 | 99521 | 99567 |
| 99502 | 99507 | 99512 | 99517 | 99522 | 99577 |
| 99503 | 99508 | 99513 | 99518 | 99523 | 99587 |
| 99504 | 99509 | 99514 | 99519 | 99524 | |
| 99505 | 99510 | 99515 | 99520 | 99540 | |

1. A person, including a person in military service, who temporarily resides in Alaska for more than 30 days and who owns or leases a vehicle that is principally located or operated in this I/M area, shall obtain a valid certificate of inspection for that vehicle, even if the vehicle is not required to be registered in Alaska. A temporary resident shall obtain the certificate of inspection within 30 days after entering the state. In addition to the requirements of this section, a motorist who lives in an area where a vehicle emissions inspection and maintenance program (I/M program) is implemented or administered, a motorist whose vehicle is principally located or operated in an I/M area, and a motorist who commutes into the municipality shall use specific maintenance practices for the motor vehicle ECS to reduce air pollution, including the practices described in this chapter.

2. Motorists operating vehicles not subject to the provisions of this section are encouraged to obtain an emission inspection, sticker and repairs as part of the regular maintenance performed on their vehicles.

3. Vehicles powered by diesel engines are required to have a windshield sticker only.

4. New vehicles as defined by B.4. of this section, are required to have windshield stickers

B. *Exemptions.* Notwithstanding the requirements of Section 15.85.220A., the following vehicles are exempt from the requirements of the I/M program:

1. Any 1967 model year or older vehicle [~~**vehicle with a model year 25 years or greater than the current calendar year. In calendar year 2010, 1985 and older model year vehicles are exempt from testing**~~];

2. Any vehicle not principally used or located in the municipality and not certificated by the state;

3. Motorcycles, golf carts, ATV vehicles, snow machines, and mopeds;

4. A model year 2004 or newer vehicle, except these vehicles shall have their first I/M inspection when the current calendar year equals the vehicle model year plus six [FOUR] years, and subsequent inspections every two years thereafter.

5. All vehicles above 12,000 pounds unladen weight.

6. Vehicles that are not registered in the municipality and not operated or located in the municipality for more than 30 cumulative days during the vehicle's registration period.

7. Any vehicle solely powered by electric battery.

**8. Any vehicle with valid historic vehicle or custom collector plates issued by the Alaska Department of Motor Vehicles under AS 28.10.181.**

*** *** ***

(AO No. 99-160, § 7, 1-11-00; AO No. 2000-92, § 5, 8-15-00; AO No. 2006-13, § 5, 2-14-06)

**Section 9.** Anchorage Municipal Code section 15.85.390, Referee Facility, is repealed in its entirety, and renamed and re-enacted to read as follows (*sections without amendments are set out for context only*):

**15.85.390 Referee services.**

**A. The I/M program administrator shall provide referee services.**

These services shall be provided directly, through I/M program staff or through one or more service providers. These services shall include but are not limited to:

1. Determination of whether a repair cost waiver or other special waiver should be issued for a vehicle;

2. Assistance in the resolution of disputes between motorists and certified I/M stations;

3. Inspection of vehicles rejected from testing at certified I/M stations because of engine or fuel changes; and

4. Other services to the general public as delegated by the program administrator.

B. Subject to the approval of the program administrator, a facility contracted to perform referee services may charge a fee of up to $100.00 plus the cost of a certificate, if issued, for referee services.

C. The program administrator shall establish procedures for facilities certified to provide referee services.

1. Facilities shall be equipped with instrumentation and other equipment and supplies necessary to determine whether a vehicle passes or fails an inspection test performed in accordance with Section 15.85.600.

2. Facilities shall be required to re-certify at intervals not more than two years.

3. The I/M administrator shall regularly review the performance of certified referee service providers and may withdraw certification for unsatisfactory performance.

D. The program administrator shall require certification procedures for mechanics performing referee services.

1. Certification procedures may require mechanics to attend training and pass certification tests.

2. Mechanics shall be required to re-certify at intervals not more than two years.

3. The I/M administrator shall regularly review the performance of mechanics certified to provide referee services and may withdraw certification for unsatisfactory performance.

E. *Repair Cost Waiver.* Upon referral by a certified I/M station, a motorist may apply to a certified referee services provider for approval of a repair cost waiver for a vehicle, subject to the provisions of Section 15.85.240B. Upon verification that all applicable requirements have been met, the I/M administrator or certified referee service provider shall approve a waiver and issue a certificate of inspection for the vehicle. The I/M administrator shall monitor the yearly status of a vehicle receiving a repair cost waiver until the vehicle is brought into full compliance with I/M program requirements.

1. A repair cost waiver is valid for one inspection cycle.

F. *Special Waiver.* A motorist may apply to a certified referee services provider for approval of a special waiver for a vehicle, subject to the provisions of Section 15.85.235B. Upon verification that all applicable requirements have been met, the I/M administrator or certified referee service provider shall approve a waiver and issue a certificate of inspection for the vehicle.

1. A special waiver is valid for one inspection cycle.

G. *Motorist disputed results.*

1. In the case of a dispute between a motorist and a certified I/M station or certified I/M mechanic, the motorist may schedule an appointment within to bring a vehicle to the I/M administrator to verify the results of an inspection performed at a certified I/M station.

a. The I/M administrator may utilize the services of a certified referee service provider not involved in the dispute to re-inspect and test the vehicle to verify the results of the initial inspection.

b. If an inspection on the vehicle cannot be performed, the I/M administrator may issue a special circumstances waiver for the vehicle, as provided in Section 15.85.235B.

c. No waiver shall be issued to a vehicle that is untestable due to correctable defects, such as a repairable water pump, fuel leak, or noisy engine condition. The motorist is required to repair such defects before a certified referee services provider performs an emission inspection on the vehicle.

H. *Fuel system modifications.*

1. Upon motorist application, a certified referee service provider shall issue a certificate of inspection for a vehicle converted to dual or alternate fuel use, if the conversion system:

a. Meets the EPA guidelines enumerated in the September 4, 1997 addendum to Mobile Source Enforcement Memorandum 1-A, or any subsequent EPA guidelines; and

b. If the vehicle meets the emission standards adopted by the I/M program for the vehicle in its unmodified configuration, when tested on all fuels that the vehicle has been modified to burn.

c. Where documentation is provided that a conversion system was installed prior to September 4, 1997 and the system met the criteria for certification by the EPA, CARB, or the State of Colorado at the time of installation, the system shall be accepted.

d. Copies of the current EPA guidelines shall be available for public inspection at the I/M administration office.

2. If the vehicle was originally catalyst-equipped, the original catalytic converter, or a replacement catalytic converter approved by the I/M program administrator, must still be on the vehicle and be fully functional.

I. *Engine switching.*

1. Upon motorist application, a certified referee service provider shall issue a certificate of inspection for a vehicle retrofitted with a replacement gasoline engine if the following requirements are met:

   a. The resulting engine-chassis configuration has been certified by either the EPA or the CARB to have the same or lower emissions as the make and model year of the engine-chassis configuration originally installed in the vehicle; and
   b. All emission controls originally installed on the resulting engine-chassis configuration, as certified by EPA or CARB, are retained; and
   c. If the vehicle was originally equipped with one or more catalytic converters, the retrofitted vehicle must be equipped with either:
      i. The catalytic converter(s) certified by EPA or CARB for the resulting engine/chassis combination; or
      ii. A replacement catalytic converter approved by the I/M program administrator; and
   d. If the vehicle was originally equipped with an O2 sensor and an evaporative ECS and/or an EGR system, the evaporative ECS and the EGR system must remain functional on the retrofitted vehicle.

2. In lieu of meeting the above requirements, a motorist may submit the results of an emissions test performed on a retrofitted vehicle using the federal test procedure or an alternate loaded mode mass emissions test procedure previously approved by the program administrator. The program administrator shall issue a certificate of inspection upon the submittal of adequate proof the retrofitted vehicle has the same or lower mass emission rate as the engine-chassis configuration originally installed in the vehicle.

3. When a certified referee service provider is unable to show a vehicle has a non-direct replacement engine, the I/M program administrator shall assume the vehicle has the original engine or a direct replacement engine and not a switched engine. When such an assumption is made, the vehicle shall be tested in accordance with Section

15.85.600.

J. *Engine modifications.*

1. Engine modifications, including the use of aftermarket parts, are allowed provided the modifications are included on a list of approved parts or engine modifications adopted by the program administrator. A current copy of this list shall be available for public review at the I/M program administration office. This list includes all modifications approved for use by the CARB, except those deleted by the program administrator due to cold temperature operational issues.

2. Application for the approval of modifications not included on the list may be made to CARB, subject to the approval of the I/M program administrator.

K. *Kit cars and custom-manufactured vehicles.*

1. All kit cars and custom-manufactured vehicles registered prior to January 1, 1993, are subject to the emission cutpoints for 1974 model year vehicles.

2. All vehicles first registered after December 31, 1992, but before January 1, 1998, are required to use engines and evaporative ECS from vehicles of the same class (e.g., passenger car) certified to meet federal emission standards applicable to 1988 model year vehicles.

3. All vehicles first registered after December 31, 1997, are required to use engines and evaporative ECS from vehicles of the same class (e.g., passenger car) certified to meet federal emission standards, including cold temperature CO standards, applicable to 1996 model year vehicles.

   a. All exhaust emission controls originally intended to be used with the engine (including the computer and feedback control system) must be installed.

   b. The vehicle must also use the same catalyst used with the engine in a certified vehicle, or an aftermarket catalyst approved by the I/M program

administrator for the certified vehicle.

L. *Gray market vehicles.*

1. Except as otherwise provided in this section, a certified referee service provider shall:
   a. Inspect a gray market vehicle in accordance with importation documents issued by EPA or the manufacturers' emission decal; and
   b. Issue a certificate of inspection, if the gray market vehicle passes the visual and functional inspection and the tailpipe emissions standards as required by Part IV of the state I/M program manual as referenced in 18 AAC 52.005(e)(1); and
   c. A certified referee service provider may place a decal on the vehicle to allow it to be tested in the field in the future.
   d. A copy of Part IV of the state I/M program manual referenced 18 AAC 52.005(e)(1) shall be available at the I/M program administration office for public review.

2. If the importation documents or the manufacturers' emissions decal are not available, but the gray market vehicle has a U.S. title and has not been modified to comply with EPA emissions requirements a certified referee service provider shall:
   a. Inspect the vehicle according to the model year of the vehicle and the ECS present on the vehicle at manufacturing; and
   b. Issue a certificate of inspection, if the vehicle passed the tailpipe emissions standards as required by Part IV of the program manual as referenced in 18 AAC 52.005(e)(1); and
   c. A certified referee service provider may place a decal on the vehicle to allow it to be tested in the field in the future.

3. If the importation documents or the manufacturers' emissions decal are not available, but the gray market vehicle has a U.S. title and has been modified to comply with EPA emissions requirements a certified referee service provider shall:

a. Inspect the vehicle according to the model year of the vehicle and the ECS present on the vehicle at inspection; and

b. Issue a certificate of inspection, if the vehicle passed the tailpipe emissions standards as required by Part IV of the program manual as referenced in 18 AAC 52.005(e)(1); and

c. A certified referee service provider may place a decal on the vehicle to allow it to be tested in the field in the future.

1. If the importation documents or the manufacturers' emission decal are not available, and the gray market vehicle does not have a U.S. title, a certified referee services provider shall not inspect the vehicle.

2. This section does not relieve a motorist from any duty to obtain importation documents issued by EPA and the U.S. Department of Transportation.

M. *Repair of non-complying vehicles.*

1. Based on guidance issued by the program administrator, a certified referee service provider shall specify repair procedures for a vehicle that does not comply with the requirements above.

a. For a gray market vehicle, repair of defective emission control components may be required, but retrofit of emission control components not originally installed on the vehicle shall not be required by the municipality.

2. A certified referee service provider shall issue a certificate of inspection when a vehicle has been modified so as to comply with the above requirements, or when an applicable repair cost minimum criteria, as specified in Sections 15.85.240B. or 15.85.240C., has been violated.

3. If a vehicle fails the inspection and does not meet the requirements for a repair cost waiver, a certified referee

**services provider may provide the motorist with an official referee repair form, describing the repairs that must be made within 60 days. If so directed by a certified referee services provider, the motorist shall return the vehicle to a certified referee services provider for verification of the repairs.**

**N.** ***Documented vehicles.***

**1.** **At the discretion of the I/M program administrator, a certified referee service provider may verify and document the status of a vehicle's ECS and emission levels prior to the vehicle being taken by program administration staff or other individuals designated by the program administrator to a certified I/M station for an overt or covert performance audit of the certified I/M station or a certified I/M mechanic.**

**2.** **At the discretion of the program administrator, a certified referee service provider may also determine the results of emission repairs made on a documented vehicle at a certified I/M station. A copy of the description of the alterations performed by a certified referee services provider shall be given to the certified station/mechanic at the completion of the overt or covert audit.**

**O.** ***Warranty assistance.***

**1.** **A vehicle that fails an emission inspection at a certified I/M station, and is covered by a manufacturer's emission warranty, as provided under Sections 207(a) or 207(b) of the Clean Air Act (42 U.S.C.A. § 7541(a) and (b)), may, at the vehicle owner's option, be inspected at a certified referee service provider for verification and documentation of the inspection failure.**

**2.** **The vehicle owner may, at the owner's option, subsequently return to a certified referee service provider for verification that I/M-related repairs were performed properly.**

**[REFEREE FACILITY.**

**A. THE I/M PROGRAM ADMINISTRATOR, EITHER DIRECTLY OR**

**THROUGH A CONTRACTOR, SHALL MAINTAIN AND OPERATE A VEHICLE TEST FACILITY, HEREINAFTER REFERRED TO AS THE REFEREE FACILITY.**

**1. THE REFEREE FACILITY SHALL BE USED TO DETERMINE IF A REPAIR COST WAIVER OR OTHER SPECIAL WAIVER SHOULD BE ISSUED FOR A VEHICLE, AND TO ASSIST IN THE RESOLUTION OF DISPUTES BETWEEN MOTORISTS AND CERTIFIED I/M STATIONS.**

**2. THE REFEREE FACILITY SHALL ALSO BE USED TO INSPECT VEHICLES THAT HAVE BEEN REJECTED FROM TESTING AT CERTIFIED I/M STATIONS BECAUSE OF ENGINE OR FUEL CHANGES, AND TO PROVIDE OTHER SERVICES TO THE GENERAL PUBLIC AS DELEGATED BY THE PROGRAM ADMINISTRATOR. SUBJECT TO THE APPROVAL OF THE PROGRAM ADMINISTRATOR, THE REFEREE FACILITY MAY CHARGE A FEE OF UP TO $50.00 PLUS THE COST OF A CERTIFICATE, IF ISSUED, FOR INSPECTING A VEHICLE NOT PREVIOUSLY INSPECTED.**

**3. THE FACILITY SHALL BE EQUIPPED WITH INSTRUMENTATION AND OTHER EQUIPMENT AND SUPPLIES NECESSARY TO DETERMINE WHETHER A VEHICLE PASSES OR FAILS AN INSPECTION TEST PERFORMED IN ACCORDANCE WITH SECTION 15.85.600.**

**4. A MOTORIST REFERRED TO THE REFEREE FACILITY MAY CALL THE FACILITY TO MAKE AN APPOINTMENT FOR AN EMISSION INSPECTION. INSPECTIONS MAY ALSO BE PERFORMED WITHOUT APPOINTMENT ON A TIME-AVAILABLE BASIS.**

**B. REPAIR COST WAIVER. UPON REFERRAL BY A CERTIFIED I/M STATION, A MOTORIST MAY APPLY TO THE REFEREE FACILITY FOR APPROVAL OF A REPAIR COST WAIVER FOR A VEHICLE, SUBJECT TO THE PROVISIONS OF SECTION 15.85.240.B. UPON VERIFICATION THAT ALL APPLICABLE REQUIREMENTS HAVE BEEN MET, THE REFEREE FACILITY SHALL APPROVE A WAIVER AND ISSUE A CERTIFICATE OF INSPECTION FOR THE VEHICLE. THE REFEREE FACILITY SHALL MONITOR THE YEARLY STATUS OF A VEHICLE RECEIVING A REPAIR COST WAIVER UNTIL THE VEHICLE IS BROUGHT INTO FULL COMPLIANCE WITH I/M PROGRAM REQUIREMENTS. THE WAIVER IS VALID FOR ONE INSPECTION CYCLE.**

C. SPECIAL WAIVER. A MOTORIST MAY APPLY TO THE REFEREE FACILITY FOR APPROVAL OF A SPECIAL WAIVER FOR A VEHICLE, SUBJECT TO THE PROVISIONS OF SECTION 15.85.235.B. UPON VERIFICATION THAT ALL APPLICABLE REQUIREMENTS HAVE BEEN MET, THE REFEREE FACILITY SHALL APPROVE A WAIVER AND ISSUE A CERTIFICATE OF INSPECTION FOR THE VEHICLE. THE WAIVER IS VALID FOR ONE INSPECTION CYCLE.

D. MOTORIST-DISPUTED TEST RESULTS.

1. IN THE CASE OF A DISPUTE BETWEEN A MOTORIST AND A CERTIFIED I/M STATION OR CERTIFIED I/M MECHANIC, THE MOTORIST SHOULD MAKE AN APPOINTMENT TO BRING A VEHICLE TO THE REFEREE FACILITY FOR AN EMISSION INSPECTION, TO VERIFY THE RESULTS OF AN INSPECTION PERFORMED AT A CERTIFIED I/M STATION.
   A. IF THE REFEREE FACILITY IS UNABLE TO PERFORM AN INSPECTION ON THE VEHICLE, A SPECIAL CIRCUMSTANCES WAIVER MAY BE ISSUED FOR THE VEHICLE, AS PROVIDED IN SECTION 15.85.235.B.
   B. NO WAIVER SHALL BE ISSUED TO A VEHICLE THAT IS UNTESTABLE DUE TO CORRECTABLE DEFECTS SUCH AS A REPAIRABLE WATER PUMP, FUEL LEAK, OR NOISY ENGINE CONDITION. THE MOTORIST SHALL BE REQUIRED TO REPAIR SUCH DEFECTS BEFORE THE REFEREE FACILITY PERFORMS AN EMISSION INSPECTION ON THE VEHICLE.
2. IF THE VEHICLE PASSES THE INSPECTION, THE REFEREE FACILITY SHALL COLLECT A FEE TO PAY FOR THE CERTIFICATE OF INSPECTION AND THE COST OF THE INSPECTION, IF APPLICABLE, AND ISSUE A CERTIFICATE OF INSPECTION FOR THE VEHICLE TO THE MOTORIST.
3. IF THE VEHICLE FAILS THE INSPECTION AND DOES NOT MEET THE APPLICABLE REQUIREMENTS FOR A REPAIR COST WAIVER, THE REFEREE FACILITY SHALL PROVIDE THE MOTORIST WITH A REQUIRED REPAIR FORM THAT DESCRIBES THE REPAIRS NECESSARY TO MEET THE APPLICABLE PROGRAM REQUIREMENTS.

E. REFEREE/MOTORIST DISPUTES.

1. IF THE MOTORIST DISPUTES THE RESULTS OF A

FAILING INSPECTION PERFORMED BY THE REFEREE FACILITY, THE REFEREE FACILITY MAY PERFORM ADDITIONAL FUNCTIONAL TESTS TO VERIFY THE REASON FOR FAILURE. THE MOTORIST SHALL BE RESPONSIBLE FOR THE COST OF ANY SUCH ADDITIONAL TESTS.

2. IF THE REFEREE FACILITY IS UNABLE TO RESOLVE THE COMPLAINT, THE MOTORIST SHALL BE GIVEN A REFEREE FACILITY COMMENT/COMPLAINT FORM.
   A. THE MOTORIST MAY COMPLETE THE FORM AND DELIVER OR MAIL IT TO THE I/M PROGRAM ADMINISTRATOR, OR LEAVE IT WITH THE REFEREE FACILITY FOR DELIVERY TO THE I/M PROGRAM ADMINISTRATOR.
   B. IF THE FORM IS LEFT WITH THE REFEREE FACILITY, THE REFEREE FACILITY SHALL SUBMIT THE FORM TO THE I/M PROGRAM ADMINISTRATOR WITH THEIR REFEREE FACILITY ACTION REPORT FOR REVIEW.

F. FUEL SYSTEM MODIFICATIONS.

1. UPON MOTORIST APPLICATION, THE REFEREE FACILITY OR A CERTIFIED STATION THAT HAS BEEN APPROVED BY ADEC TO TEST DUAL-FUEL OR ALTERNATE FUEL VEHICLES SHALL ISSUE A CERTIFICATE OF INSPECTION FOR A VEHICLE THAT HAS BEEN CONVERTED TO DUAL FUEL USE IF THE CONVERSION SYSTEM MEETS THE EPA GUIDELINES ENUMERATED IN THE SEPTEMBER 4, 1997 ADDENDUM TO MOBILE SOURCE ENFORCEMENT MEMORANDUM 1-A, OR IN SUCH SUBSEQUENT MEMORANDA, AND IF THE VEHICLE MEETS THE EMISSION STANDARDS ADOPTED BY THE I/M PROGRAM FOR THE VEHICLE IN ITS UNMODIFIED CONFIGURATION, WHEN TESTED ON ALL FUELS THAT THE VEHICLE HAS BEEN MODIFIED TO BURN. WHERE DOCUMENTATION IS PROVIDED THAT A CONVERSION SYSTEM WAS INSTALLED PRIOR TO SEPTEMBER 4, 1997 AND THE SYSTEM MET THE CRITERIA FOR CERTIFICATION BY THE EPA, CARB, OR THE STATE OF COLORADO AT THE TIME OF INSTALLATION, THE SYSTEM SHALL BE ACCEPTED. COPIES OF THE CURRENT EPA GUIDELINES SHALL BE KEPT AVAILABLE FOR PUBLIC INSPECTION AT THE I/M ADMINISTRATION OFFICE.

**2. IF THE VEHICLE WAS ORIGINALLY CATALYST-EQUIPPED, THE ORIGINAL CATALYTIC CONVERTER, OR A REPLACEMENT CATALYTIC CONVERTER APPROVED BY THE I/M PROGRAM ADMINISTRATOR, MUST STILL BE ON THE VEHICLE AND BE FULLY FUNCTIONAL.**

**3. IF THE VEHICLE FAILS THE TAILPIPE TEST AND THE INSPECTOR FINDS NO OTHER FAULTS, THE INSPECTOR MAY REQUEST THE REFEREE TO EVALUATE THE CATALYTIC CONVERTER FOR EFFICIENCY.**

**G. ENGINE SWITCHING.**

**1. UPON MOTORIST APPLICATION, THE REFEREE FACILITY SHALL ISSUE A CERTIFICATE OF INSPECTION FOR A VEHICLE THAT HAS BEEN RETROFITTED WITH A REPLACEMENT GASOLINE ENGINE IF THE FOLLOWING REQUIREMENTS ARE MET:**

**A. THE RESULTING ENGINE-CHASSIS CONFIGURATION HAS BEEN CERTIFIED BY EITHER THE EPA OR THE CARB TO HAVE THE SAME OR LOWER EMISSIONS AS THE MAKE AND MODEL YEAR OF THE ENGINE-CHASSIS CONFIGURATION ORIGINALLY INSTALLED IN THE VEHICLE;**

**B. ALL EMISSION CONTROLS ORIGINALLY INSTALLED ON THE RESULTING ENGINE-CHASSIS CONFIGURATION, AS CERTIFIED BY EPA OR CARB, ARE RETAINED;**

**C. IF THE VEHICLE WAS ORIGINALLY EQUIPPED WITH ONE OR MORE CATALYTIC CONVERTERS, THE RETROFITTED VEHICLE MUST BE EQUIPPED WITH EITHER**

**(1) THE CATALYTIC CONVERTER(S) CERTIFIED BY EPA OR CARB FOR THE RESULTING ENGINE/CHASSIS COMBINATION; OR**

**(2) A REPLACEMENT CATALYTIC CONVERTER APPROVED BY THE I/M PROGRAM ADMINISTRATOR; AND**

**D. IF THE VEHICLE WAS ORIGINALLY EQUIPPED WITH AN O2 SENSOR AND AN EVAPORATIVE ECS AND/OR AN EGR SYSTEM, THE EVAPORATIVE ECS AND THE EGR SYSTEM MUST REMAIN FUNCTIONAL ON THE RETROFITTED VEHICLE.**

**2. IN LIEU OF MEETING THESE REQUIREMENTS, A MOTORIST MAY SUBMIT THE RESULTS OF AN**

**EMISSIONS TEST PERFORMED ON A RETROFITTED VEHICLE USING THE FEDERAL TEST PROCEDURE OR AN ALTERNATE LOADED MODE MASS EMISSIONS TEST PROCEDURE PREVIOUSLY APPROVED BY THE PROGRAM ADMINISTRATOR. THE PROGRAM ADMINISTRATOR SHALL ISSUE A CERTIFICATE OF INSPECTION UPON THE SUBMITTAL OF ADEQUATE PROOF THAT THE RETROFITTED VEHICLE HAS THE SAME OR LOWER MASS EMISSION RATE AS THE ENGINE-CHASSIS CONFIGURATION ORIGINALLY INSTALLED IN THE VEHICLE.**

**3. WHEN THE I/M PROGRAM REFEREE FACILITY CANNOT SHOW THAT A VEHICLE HAS A NON-DIRECT REPLACEMENT ENGINE, THE I/M PROGRAM ADMINISTRATOR SHALL ASSUME THAT THE VEHICLE HAS THE ORIGINAL ENGINE OR A DIRECT REPLACEMENT ENGINE AND NOT A SWITCHED ENGINE. WHEN SUCH AN ASSUMPTION IS MADE THE VEHICLE SHALL BE TESTED IN ACCORDANCE WITH SECTION 15.85.600.**

**H. ENGINE MODIFICATIONS.**

**1. ENGINE MODIFICATIONS, INCLUDING THE USE OF AFTERMARKET PARTS, ARE ALLOWED PROVIDED THAT THEY ARE INCLUDED ON A LIST OF APPROVED PARTS OR ENGINE MODIFICATIONS ADOPTED BY THE PROGRAM ADMINISTRATOR. A CURRENT COPY OF THIS LIST WILL BE KEPT AVAILABLE FOR PUBLIC REVIEW AT THE I/M PROGRAM ADMINISTRATION OFFICE. THIS LIST INCLUDES ALL MODIFICATIONS APPROVED FOR USE BY THE CARB, EXCEPT THOSE DELETED BY THE PROGRAM ADMINISTRATOR DUE TO COLD TEMPERATURE OPERATIONAL ISSUES.**

**2. APPLICATION FOR THE APPROVAL OF MODIFICATIONS NOT INCLUDED ON THE LIST CAN BE MADE TO CARB, SUBJECT TO THE APPROVAL OF THE I/M PROGRAM ADMINISTRATOR.**

**I. KIT CARS AND CUSTOM-MANUFACTURED VEHICLES.**

**1. ALL KIT CARS AND CUSTOM-MANUFACTURED VEHICLES REGISTERED PRIOR TO JANUARY 1, 1993, ARE SUBJECT TO THE EMISSION CUTPOINTS FOR 1974 MODEL YEAR VEHICLES.**

**2. ALL SUCH VEHICLES FIRST REGISTERED AFTER DECEMBER 31, 1992, BUT BEFORE JANUARY 1, 1998,**

ARE REQUIRED TO USE ENGINES AND EVAPORATIVE ECS FROM VEHICLES OF THE SAME CLASS (E.G., PASSENGER CAR) CERTIFIED TO MEET FEDERAL EMISSION STANDARDS APPLICABLE TO 1988 MODEL YEAR VEHICLES.

3. ALL SUCH VEHICLES FIRST REGISTERED AFTER DECEMBER 31, 1997, ARE REQUIRED TO USE ENGINES AND EVAPORATIVE ECS FROM VEHICLES OF THE SAME CLASS (E.G., PASSENGER CAR) CERTIFIED TO MEET FEDERAL EMISSION STANDARDS, INCLUDING COLD TEMPERATURE CO STANDARDS, APPLICABLE TO 1996 MODEL YEAR VEHICLES.
   A. ALL EXHAUST EMISSION CONTROLS ORIGINALLY INTENDED TO BE USED WITH THE ENGINE (INCLUDING THE COMPUTER AND FEEDBACK CONTROL SYSTEM) MUST BE INSTALLED.
   B. THE VEHICLE MUST ALSO USE THE SAME CATALYST USED WITH THE ENGINE IN A CERTIFIED VEHICLE OR AN AFTERMARKET CATALYST APPROVED BY THE I/M PROGRAM ADMINISTRATOR FOR THE CERTIFIED VEHICLE.

J. GRAY MARKET VEHICLES.

1. EXCEPT AS OTHERWISE PROVIDED IN THIS SECTION THE REFEREE FACILITY WILL:
   A. INSPECT A GRAY MARKET VEHICLE IN ACCORDANCE WITH IMPORTATION DOCUMENTS ISSUED BY EPA OR THE MANUFACTURERS' EMISSION DECAL; AND
   B. ISSUE A CERTIFICATE OF INSPECTION IF THE GRAY MARKET VEHICLE PASSES THE VISUAL AND FUNCTIONAL INSPECTION AND THE TAILPIPE EMISSIONS STANDARDS AS REQUIRED BY PART IV OF THE STATE I/M PROGRAM MANUAL AS REFERENCED IN 18 AAC 52.005(E)(1), AND
   C. THE REFEREE MAY PLACE A DECAL ON THE VEHICLE TO ALLOW IT TO BE TESTED IN THE FIELD IN THE FUTURE.
   D. A COPY OF PART IV OF THE STATE I/M PROGRAM MANUAL REFERENCED 18 AAC 52.005(E)(1) WILL BE MADE AVAILABLE AT THE I/M PROGRAM ADMINISTRATION OFFICE FOR PUBLIC REVIEW.
2. IF THE IMPORTATION DOCUMENTS OR THE

**MANUFACTURERS' EMISSIONS DECAL ARE NOT AVAILABLE, BUT THE GRAY MARKET VEHICLE HAS A U.S. TITLE AND HAS NOT BEEN MODIFIED TO COMPLY WITH EPA EMISSIONS REQUIREMENTS THE REFEREE FACILITY WILL,**

**A. INSPECT THE VEHICLE ACCORDING TO THE MODEL YEAR OF THE VEHICLE AND THE ECS PRESENT ON THE VEHICLE AT MANUFACTURING; AND**

**B. ISSUE A CERTIFICATE OF INSPECTION IF THE VEHICLE PASSED THE TAILPIPE EMISSIONS STANDARDS AS REQUIRED BY PART IV OF THE PROGRAM MANUAL AS REFERENCED IN 18 AAC 52.005(E)(1), AND**

**C. THE REFEREE FACILITY MAY PLACE A DECAL ON THE VEHICLE TO ALLOW IT TO BE TESTED IN THE FIELD IN THE FUTURE.**

**3. IF THE IMPORTATION DOCUMENTS OR THE MANUFACTURERS' EMISSIONS DECAL ARE NOT AVAILABLE, BUT THE GRAY MARKET VEHICLE HAS A U.S. TITLE AND HAS BEEN MODIFIED TO COMPLY WITH EPA EMISSIONS REQUIREMENTS THE REFEREE FACILITY WILL;**

**A. INSPECT THE VEHICLE ACCORDING TO THE MODEL YEAR OF THE VEHICLE AND THE ECS PRESENT ON THE VEHICLE AT INSPECTION; AND**

**B. ISSUE A CERTIFICATE OF INSPECTION IF THE VEHICLE PASSED THE TAILPIPE EMISSIONS STANDARDS AS REQUIRED BY PART IV OF THE PROGRAM MANUAL AS REFERENCED IN 18 AAC 52.005(E)(1), AND**

**C. THE REFEREE FACILITY MAY PLACE A DECAL ON THE VEHICLE TO ALLOW IT TO BE TESTED IN THE FIELD IN THE FUTURE.**

**1. IF THE IMPORTATION DOCUMENTS OR THE MANUFACTURERS' EMISSION DECAL ARE NOT AVAILABLE, AND THE GRAY MARKET VEHICLE DOES NOT HAVE A U.S. TITLE THE REFEREE FACILITY WILL NOT INSPECT THE VEHICLE.**

**2. THIS SECTION DOES NOT RELIEVE A MOTORIST FROM ANY DUTY TO OBTAIN IMPORTATION DOCUMENTS ISSUED BY EPA AND THE U.S. DEPARTMENT OF TRANSPORTATION.**

**K. REPAIR OF NON-COMPLYING VEHICLES.**

**1. BASED ON GUIDANCE ISSUED BY THE PROGRAM ADMINISTRATOR, THE REFEREE FACILITY SHALL SPECIFY REPAIR PROCEDURES FOR A VEHICLE THAT DOES NOT COMPLY WITH THE REQUIREMENTS ABOVE. (FOR A GRAY MARKET VEHICLE, REPAIR OF DEFECTIVE EMISSION CONTROL COMPONENTS MAY BE REQUIRED, BUT RETROFIT OF EMISSION CONTROL COMPONENTS NOT ORIGINALLY INSTALLED ON THE VEHICLE SHALL NOT BE REQUIRED BY THE MUNICIPALITY.)**

**2. THE REFEREE FACILITY SHALL ISSUE A CERTIFICATE OF INSPECTION WHEN A VEHICLE HAS BEEN MODIFIED SO AS TO COMPLY WITH THE ABOVE REQUIREMENTS, OR WHEN AN APPLICABLE REPAIR COST MINIMUM CRITERIA, AS SPECIFIED IN SECTIONS 15.85.240.B OR 15.85.240.C, HAS BEEN VIOLATED.**

**3. IF A VEHICLE FAILS THE INSPECTION AND DOES NOT MEET THE REQUIREMENTS FOR A REPAIR COST WAIVER, THE REFEREE FACILITY MAY PROVIDE THE MOTORIST WITH AN OFFICIAL REFEREE FACILITY REQUIRED REPAIR FORM THAT DESCRIBES THE REPAIRS THAT MUST BE MADE WITHIN 60 DAYS. IF SO DIRECTED BY THE REFEREE FACILITY, THE MOTORIST SHALL RETURN THE VEHICLE TO THE REFEREE FACILITY FOR VERIFICATION OF THE REPAIRS.**

**L. DOCUMENTED VEHICLES.**

**1. AT THE DISCRETION OF THE I/M PROGRAM ADMINISTRATOR, THE REFEREE FACILITY MAY VERIFY AND DOCUMENT THE STATUS OF A VEHICLE'S ECS AND EMISSION LEVELS PRIOR TO THE VEHICLE BEING TAKEN BY PROGRAM ADMINISTRATION STAFF OR OTHER INDIVIDUALS DESIGNATED BY THE PROGRAM ADMINISTRATOR TO A CERTIFIED I/M STATION FOR AN OVERT OR COVERT PERFORMANCE AUDIT OF THE CERTIFIED I/M STATION OR A CERTIFIED I/M MECHANIC.**

**2. AT THE DISCRETION OF THE PROGRAM ADMINISTRATOR, THE REFEREE FACILITY MAY ALSO DETERMINE THE RESULTS OF EMISSION REPAIRS MADE ON A DOCUMENTED VEHICLE AT A CERTIFIED I/M STATION. A COPY OF THE DESCRIPTION OF THE ALTERATIONS PERFORMED BY THE REFEREE FACILITY SHALL BE GIVEN TO THE CERTIFIED**

**STATION/MECHANIC AT THE COMPLETION OF THE OVERT OR COVERT AUDIT.**

**M. WARRANTY ASSISTANCE.**

**1. A VEHICLE THAT FAILS AN EMISSION INSPECTION AT A CERTIFIED I/M STATION, AND THAT IS COVERED BY A MANUFACTURER'S EMISSION WARRANTY, AS PROVIDED UNDER SECTIONS 207(A) OR 207(B) OF THE CLEAN AIR ACT (42 U.S.C.A. § 7541(A) AND (B)), MAY, AT THE VEHICLE OWNER'S OPTION, BE INSPECTED AT THE REFEREE FACILITY FOR VERIFICATION AND DOCUMENTATION OF THE INSPECTION FAILURE.**

**2. THE VEHICLE OWNER MAY, AT HIS OR HER OPTION, SUBSEQUENTLY RETURN TO THE REFEREE FACILITY FOR VERIFICATION THAT I/M-RELATED REPAIRS WERE PERFORMED PROPERLY.]**

(AO No. 99-160, § 7, 1-11-00)

**Section 10.** Anchorage Municipal Code section 15.85.620, Preliminary Inspection and Safety Check, is amended to read as follows:

**15.85.620 Preliminary inspection and safety check.**

*** *** ***

B. The owner or operator of the certified station, or a certified mechanic employed by the station shall inform the motorist that an inspection is not required for

1. A vehicle that is exempt under 15.85.220B.;

2. A vehicle with a registration renewal date more than 90 days in the future [, EXCEPT FOR CHANGE OF OWNERSHIP]; and

3. A vehicle that does not require an I/M test unless requested by the motorist or required by the I/M program administrator because of a pending enforcement action.

*** *** ***

C. The owner or operator of an I/M station, or a certified I/M mechanic employed by the station, shall refer the following vehicles to the referee facility [FOR INSPECTION, OR] to verify qualification for a waiver under Section 15.85.235:

*** *** ***

5. A vehicle equipped with an engine other than the engine originally installed in the vehicle, except that:

*** *** ***

[C. FOR A 1974 OR EARLIER MODEL YEAR VEHICLE WITH A DIFFERENT ENGINE, THAT VEHICLE MAY BE I/M-TESTED;]

(AO No. 99-160, § 7, 1-11-00; AO No. 2006-13, § 11, 2-14-06)

**Section 11.** Anchorage Municipal Code section 15.85.710, Visual and Functional Checks, is amended to read as follows:

**15.85.710 Visual and functional checks.**

A. **1975 through 1995** [1975 AND LATER] [~~**1995 and older**~~] model-year vehicles for which emission inspections are specified under Section 15.85.720 shall be visually inspected to determine whether vehicles that were originally factory-equipped with the following ECS components have such components properly installed and unmodified:

*** *** ***

B. In addition, **1975 through 1995** ~~**1995 and older**~~ [~~1975~~] [~~**through 1995**~~] [~~1975~~ AND LATER] model-year vehicles for which emission inspections are specified under Section 15.85.720 shall be functionally checked to determine whether the following components are correctly operating on those vehicles that were originally factory-equipped with such components:

*** *** ***

C. Except as provided in section 15.85.650, any vehicle 1975 through 1995 on which any of the above systems are removed, disconnected, modified, or defective, shall fail the visual and/or functional inspections.

*** *** ***

(AO No. 99-160, § 7, 1-11-00)

**Section 12. Anchorage Municipal Code section 15.85.400, Mechanic Certification, is amended to read as follows (*the remainder of the section is not affected and therefore not set out*):**

**15.85.400 Certification procedures.**

*** *** ***

**G. The I/M administrator shall charge a $10,000 fee for the initial certification of a new inspection facility or location. The fee for recertification shall be based on the volume of tests conducted in the preceding two-year certification period in accordance with the following schedule:**

| Number of Tests Conducted by I/M Test Facility in Preceding Two-Year Certification Period | Certification Fee (every 2 years) |
|---|---|
| 10,000 or more | $10,000 |
| More than 2,000 and less than 10,000 | $5,000 |
| 2,000 or less | $2,000 |

(AO No. 99-160, § 7, 1-11-00)

**Section 13 [~~12~~].** The Department of Health and Human Services, through the I/M Administrator, shall submit approved amendments to the ADEC in accordance with applicable regulations of the Alaska Administrative Code.

**Section 14 [~~13~~]. Sections 1 through 7, inclusive, and Sections 10, 11, and 13 of this ordinance shall become effective immediately upon passage and approval by the Assembly.**

**[~~Sections 1 through 5, inclusive, and Section 12 of this ordinance shall become effective immediately upon passage and approval by the Assembly.~~]**

**Section 15 [~~14~~]. Sections 8, 9, and 12 of this ordinance shall become effective on January 1, 2010.**

**[~~Sections 6 through 11 of this ordinance shall become effective thirty (30) days after ADEC provides written notice to the I/M Administrator that ADEC and EPA have duly accepted and approved the amendments.~~]**

**Section 16. The Department of Health and Human Services is directed to work with the State of Alaska to implement the provisions of this ordinance by removing the I/M program as a requirement in the State**

**Implementation Plan (SIP) for air quality, with a stipulation that it be retained as a local option and not be subject to further SIP revision if future local action results in changes to or discontinuation of the program.**

**Section 17.** **By July 1, 2010 the Anchorage Health and Human Services Commission shall review and report to the Assembly of its need to continue the I/M Program as well as other options and then every three years thereafter.**

PASSED AND APPROVED by the Anchorage Assembly this 15th day of July, 2008.

Chair

ATTEST:

Municipal Clerk

# MUNICIPALITY OF ANCHORAGE
## ASSEMBLY INFORMATION MEMORANDUM
**NO.** AIM 58-2008

**Meeting Date:** July 15, 2008

**From:** Assemblymember Claman

**Subject:** Summary of Economic Effects for AO 2008-84(S)

Attached to this memo is the Summary of Economic Effects for Ordinance No. 2008-84(S) AN ORDINANCE OF THE ANCHORAGE MUNICIPAL ASSEMBLY REPEALING AO 2007-122(S) IN ITS ENTIRETY; REINSTATING AND AMENDING ANCHORAGE MUNICIPAL CODE CHAPTERS 15.80 AND 15.85, AND SECTIONS 9.30.155 E. AND 14.60.030, AND AMENDING TITLE 12 TO ADD A NEW CHAPTER, ALL REGARDING PROCEDURES, FEES AND REQUIREMENTS FOR VEHICLE I/M TESTING AND RELATED INSPECTIONS, LICENSING, REGISTRATION, EXEMPTIONS, I/M PROGRAM CHANGES, AND FINES; AND ESTABLISHING EFFECTIVE DATES.

Prepared By: Guadalupe Marroquin, Election & Budget Coordinator
Reviewed By: Barbara E. Gruenstein, Municipal Clerk
Submitted By: Assemblymember Claman

# MUNICIPALITY OF ANCHORAGE
## Summary of Economic Effects -- General Government

2008 JUL -9 PM 3:31

Title: AN ORDINANCE OF THE ANCHORAGE MUNICIPAL ASSEMBLY REPEALING AO 2007-122(S) IN ITS ENTIRETY; REINSTATING AND AMENDING ANCHORAGE MUNICIPAL CODE CHAPTERS 15.80 AND 15.85, AND SECTIONS 9.30.155 E. AND 14.60.030, AND AMENDING TITLE 12 TO ADD A NEW CHAPTER, ALL REGARDING PROCEDURES, FEES AND REQUIREMENTS FOR VEHICLE I/M TESTING AND RELATED INSPECTIONS, LICENSING, REGISTRATION, EXEMPTIONS, I/M PROGRAM CHANGES, AND FINES; AND ESTABLISHING EFFECTIVE DATES..

AO Number: 2008–84(S)

Sponsor: Assemblymember Claman
Preparing Agency: Department of Assembly
Others Impacted: Motor Vehicle Emissions Inspection & Maintenance (I/M) Program

***CHANGES IN EXPENDITURES AND REVENUES:*** **(In Thousands of Dollars)**

| | FY09 | FY10 | FY11 | FY12 | FY13 |
|---|---|---|---|---|---|
| **Operating Expenditures** | | | | | |
| 1000 Personal Services | $ - | $ - | $ - | $ - | $ - |
| 2000 Non-Labor | - | - | - | - | - |
| 3900 Contributions | - | - | - | - | - |
| 4000 Debt Service | - | - | - | - | - |
| **TOTAL DIRECT COSTS:** | **$ -** | **$ -** | **$ -** | **$ -** | **$ -** |
| Add: 6000 Charges from Others | $ - | $ - | $ - | $ - | $ - |
| Less: 7000 Charges to Others | - | - | - | - | - |
| **FUNCTION COST:** | **$ -** | **$ -** | **$ -** | **$ -** | **$ -** |
| **REVENUES:** | **$ (507)** | **$ (507)** | **$ (507)** | **$ (507)** | **$ (507)** |
| **CAPITAL:** | | | | | |
| **POSITIONS: FT/PT and Temp** | | | | | |

**PUBLIC SECTOR ECONOMIC EFFECTS:**

The ordinance will exempt additional vehicles from I/M testing requirements. The new car exemption will be extended from four to eight years and vehicles with historical plates will no longer be tested. For each test, there is an $18 certificate fee; revenues from the fee support the Municipal I/M and Air Quality Programs. DHHS estimates that an additional 34,000 vehicles will be exempted each year from testing requirements as a result of the ordinance. Thus the Municipality will lose 34,000 x $18 = $612,000 in fee revenue. This will be partially offset by new fee revenue from I/M test stations of $105,000 annually. Net effect is $507,000 reduction in revenue. SEE is based on a comparison of the program currently in place.

**PRIVATE SECTOR ECONOMIC EFFECTS:**

According to Health & Human Services, the private sector I/M test and repair industry anticipate business losses due to the the increase in vehicles exempted from testing requirements. Based on an estimate of 34,000 fewer vehicles tested each year with an average inspection cost of $40, income loss is estimated $1.36M per year ($40 x 34,000) from I/M testing. The I/M repair industry is also projected to lose revenues due to decreased repairs with fewer vehicles failing I/M tests. The fail rate among vehicles that will become "newly" exempt is projected to be 4%. Thus, the number of vehicles not be repaired annually is estimated to be (34,000 x 0.04) = 1,360. Assuming an average I/M repair cost of $285 the estimated private sector loss in income from repairs is $285 x 1,360 = $387,600. Estimated combined loss in private sector receipts for Inspections ($1.4M) and repairs ($0.4M) totals $1.4M per year. (Note that, in turn, the general public will realize $1.4M per year in avoided I/M inspection and repair costs.) I/M stations may also lose other business not directly associated with I/M such as windshield wiper, oil and air filter changes and other business. SEE

Prepared by: Guadalupe Marroquin, Election & Budget Coord Telephone: 343-4376

Reviewed by: Linda L. Heim, Deputy Municipal Clerk Telephone: 343-4314

# MUNICIPALITY OF ANCHORAGE
## ASSEMBLY MEMORANDUM
## NO. AM 483–2008

**Meeting Date:** July 15, 2008

**From:** Assembly Chair Matt Claman

**Subject:** **AO 2008–84(S) — AN ORDINANCE OF THE ANCHORAGE MUNICIPAL ASSEMBLY REPEALING AO 2007-122(S) IN ITS ENTIRETY; REINSTATING AND AMENDING ANCHORAGE MUNICIPAL CODE CHAPTERS 15.80 AND 15.85, AND SECTIONS 9.30.155E. AND 14.60.030, ALL REGARDING PROCEDURES, FEES AND REQUIREMENTS FOR VEHICLE I/M TESTING AND RELATED INSPECTIONS, LICENSING, REGISTRATION, EXEMPTIONS, I/M PROGRAM CHANGES, AND FINES; AND ESTABLISHING EFFECTIVE DATES.**

AO 2008-84(S) extends the new car testing exemption to six years and will still require vehicles model year 1968 or newer to be tested unless they have valid historic or classic car plates. Under the modifications proposed in AO 2008-84(S), modeling suggests that the Anchorage I/M Program will provide greater reductions in motor vehicle emissions than AO 2008-84 and AO 2008-67 at a lower cost to the public. Vehicles with classical or historical registration pursuant to state regulations would be exempt from testing, regardless of age.

AO 2008-84(S) incorporates a permit fee for I/M test stations. Those businesses that participate in the I/M testing program will pay costs associated with the Municipality licensing, permitting, and inspecting their operations. This cost-causer/cost-payer approach changes the program by allocating costs of the program to participating businesses. AO 2008-84(S) would establish a biennial certification fee for private I/M testing stations. A sliding scale fee of $10,000, $5,000, or $2,000 would be assessed every two years and is based on the volume of tests performed in the preceding two-year period. DHHS anticipates that it could collect an additional $105,000 in annual revenue from this fee.

AO 2008-84(S) also establishes the flexibility to restructure the way required "referee" services are provided. Currently, services such as reviewing non-stock engine modifications and resolving disputes between stations and clients must be provided by a single referee facility. The current contract cost for these services is $377,000. DHHS hopes to realize $200,000 to $300,000 in cost savings by changing the way these services are provided. DHHS believes that some of these referee services could be provided by specially-certified I/M test facilities at much lower cost.

In reviewing this program, there has been discussion about whether a 6-year or an 8-year exemption is more reasonable for the new car exemption. Table 1 attached compares the two ordinances with the status quo and their associated CO reductions. For 2008-84(S), the table compares a 6-year exemption with an 8-year exemption. With the reduced costs to the program and savings to the Municipality from changing the referee station function, the 6-year exemption results in a program that will not require raising fees paid by vehicle owners for I/M testing and certification, and is projected to eliminate a budget shortfall in the program. Table 2 and Table 3 illustrate 2006 data by age of vehicle.

Respectfully submitted:
Matt Claman, Assemblymember Section 3

## Table 1 – Comparison of of Four I/M Alternatives

| | **Status Quo** 1st test @ 4 yrs, 25 yr+ vehicles not exempted | **AO 2008-67 & 2008-84** 1st test @ 6 yrs exempt 25 yr+ vehicles | **AO-2008-84(S)** 25 yr+ vehicles not exempted except for historic and classic vehicles | |
|---|---|---|---|---|
| | | | 1st test @ 6 yrs | 1st test @ 8 yrs |
| Vehicles 2 years old | Exempt | Exempt | Exempt | Exempt |
| Vehicles 4 year old | Test Required | Exempt | Exempt | Exempt |
| Vehicles 6 years old | Test Required | Test Required | Test Required | Exempt |
| Vehicles 8 years old | Test Required | Test Required | Test Required | Test Required |
| Vehicles 25 years and older** | Test Required | Exempt | Test Required | Test Required |
| Total Number of Vehicles Tested per Year | 90,000 | 71,000 | 74,000 | 56,000 |
| Number of Vehicles Exempted from I/M | 17,000 | 36,000 | 33,000 | 51,000 |
| Projected Fail Rate Among Tested Vehicles | 11.3% | 12.9% | 13.2% | 15.6% |
| Hypothetical Fail Rate Among Exempted Vehicles | 1.5% | 3.5% | 2.2% | 3.2% |
| Estimated Cost to Public | $8.1 M/yr | $6.7 M/yr | $7.0 M/yr | $5.7 M/yr |
| CO Reduced (tons per day) | 9.4 | 7.2 | 8.6 | 7.3 |
| CO reduced per 1,000 vehicles tested (lbs/day) | 210 | 200 | 240 | 260 |
| Amount of CO reduced per $1M (lbs per day) | 2,320 | 2,140 | 2,460 | 2,540 |
| MOA I/M Certification Fee Revenue ($18/cert) | $1.62 M/yr | $1.28 M/yr | $1.31 M/yr | $1.01 M/yr |
| MOA Revenue Loss from Status Quo | --- | $340,000/yr | $310,000/yr | $610,000/yr |

Methods to Address Revenue Shortfall in AO 2008-84(S)

| | | | |
|---|---|---|---|
| Enact permit fee for I/M test stations | | $105,000 | |
| Change Referee Services function | | Assume $200,000 savings | |
| Remaining Shortfall | | ~ $0 | ~$300,000/yr |

** Vehicles model year 1967 and older are exempt under all four alternatives. Under 2008-84(S) vehicles with historical or classical vehicle plates would also be exempt from testing regardless of age.

DHHS
July 11, 2008

## Table 2 – I/M Fail Rate by Age of Vehicle in 2006

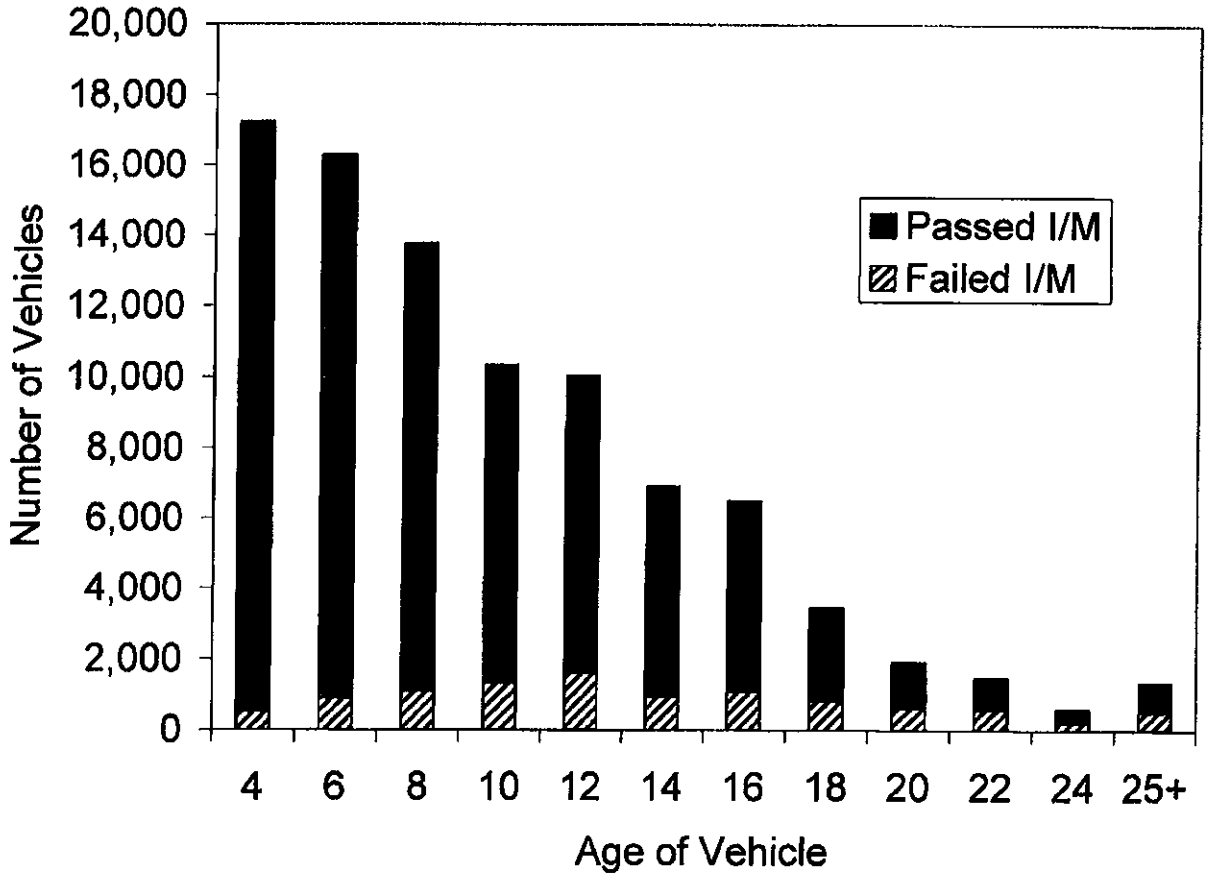
For each category, the table below shows the number of vehicles tested and failed. It also shows the percentage of all failures that occur in each age category.

For example, there were a total of 16,302 vehicles tested in 2006 that were 6 years of age. Of these, 887 failed I/M; a failure rate of 5.4%. The total number of I/M failures among all vehicles tested in 2006 was 10,142. Therefore, 6 year old vehicles accounted for 887/10,142 = 8.7% of all failures.

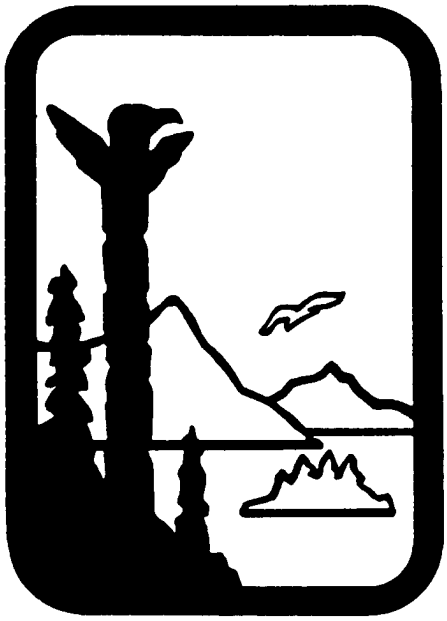
| Age of Vehicle Tested | Number of Vehicles Tested in Age Category | Number Pass | Number Fail | % Failing within Age Category | % of All Failing Vehicles |
|---|---|---|---|---|---|
| 4 | 17,229 | 16,724 | 505 | 2.9% | 5.0% |
| 6 | 16,302 | 15,415 | 887 | 5.4% | 8.7% |
| 8 | 13,767 | 12,692 | 1,075 | 7.8% | 10.6% |
| 10 | 10,333 | 9,029 | 1,304 | 12.6% | 12.9% |
| 12 | 10,030 | 8,429 | 1,601 | 16.0% | 15.8% |
| 14 | 6,903 | 5,958 | 945 | 13.7% | 9.3% |
| 16 | 6,507 | 5,421 | 1,086 | 16.7% | 10.7% |
| 18 | 3,453 | 2,626 | 827 | 24.0% | 8.2% |
| 20 | 1,919 | 1,296 | 623 | 32.5% | 6.1% |
| 22 | 1,494 | 917 | 577 | 38.6% | 5.7% |
| 24 | 607 | 402 | 205 | 33.8% | 2.0% |
| 25+ | 1,335 | 828 | 507 | 38.0% | 5.0% |
| **All** | **89,879** | **79,737** | **10,142** | **11.3%** | **100.0%** |

Table 3 on the next page shows the number of vehicles tested and passed by age category in 2006.

**Table 3 – Number of Vehicles Passing and Failing I/M by Age Category in 2006**



# Alaska Department of Environmental Conservation



## Amendments to:

## State Air Quality Control Plan

Vol. III: Appendices

Appendix III.B.10

"Estimation of Background Carbon Monoxide Concentrations for
Anchorage Project-Level Conformity Analyses"
&
"Affidavit of Oral Hearing"

Adopted

August 5th, 2009

**Appendix to III.B.10**

*Note: In addition to the document below, the State of Alaska will include Appendix III.B.10 containing the Anchorage Assembly Resolution (AR) adopting the revised CO Maintenance Plan and an affidavit of an oral hearing to be held by the State of Alaska. The AR and oral hearing are expected to occur in spring or early summer 2009.*

## Estimation of Background CO Concentration for Anchorage Project-Level Conformity Analyses

Most project-level conformity analyses involve modeling expected CO concentrations from projects related to major intersections with high traffic volumes. CAL3QHC modeling assumes that CO concentrations predicted at roadway receptors are the sum of two sources: (1) emissions from the roadway(s) and/or intersections being modeled; or (2) "background CO" from other roadways and emissions sources not directly accounted for in the model.

Typically, background CO is estimated from background or neighborhood-scale monitors in the vicinity. For example, a background CO estimate might be taken from measurements from a nearby residential neighborhood. Although this might make sense initially, this approach to estimating background CO is not appropriate in Anchorage.

In Anchorage, CO concentrations in some residential areas are substantially *higher* than those near major roadways. A CO monitoring study conducted in 1997-98 showed that CO concentrations measured at the Turnagain and Garden sites, which are located on relatively low volume residential streets were 20% to 50% higher than concentrations measured near major roadway intersections such as the Seward Highway & Benson Boulevard, Old Seward & Dimond, or Lake Otis & Tudor. CO concentrations along these major arterials were lower even though their traffic volumes were an order of magnitude higher than the neighborhood sites.[##]

Thus, using CO values obtained from residential sites like the Garden or Turnagain site yields a background concentration estimate that is unrealistically high for modeling major roadway projects in Anchorage. Because most project level analyses involve major roadways where mechanical turbulence is important in reducing CO concentrations, it is inappropriate to use data from residential sites to estimate the background value.

In order to better determine an appropriate background value for CAL3QHC modeling, CO data from two monitors near the intersection of Seward Highway and Benson Boulevard were examined. The first site, known as the *Seward Highway* site, was located on the southwest corner of the intersection of Seward Highway & Benson Boulevard.[§§] (See Figure 1.) It collected data from this location between 1987 and 2004. Monitoring was also conducted at a second site, approximately 80 meters to the west on Benson Boulevard during the winter of 1997-98. For the purposes of this discussion this monitor will be called *Benson Mid-block*. Because this second monitor was setback further from the

[##] As noted in Section III.B.5, mechanical turbulence from vehicle traffic is believed to provide some localized atmospheric mixing and thus reduce CO levels on days when natural atmospheric mixing is very limited. Because traffic levels are low in residential area, less mechanical mixing occurs and higher CO concentrations result.

[§§] The intersection of Seward Highway and Benson Boulevard is the highest volume intersection in Anchorage. The 1997-98 CO Saturation Monitoring Study showed that concentrations at this intersection were the highest of all intersections monitored. Other monitored intersections included Lake Otis & Tudor, Northern Lights & Boniface, Old Seward & Dimond, and Spenard & Minnesota.

Seward Highway, it was less affected by the emissions from idling traffic queued up on Benson waiting for the red light at Seward Highway.

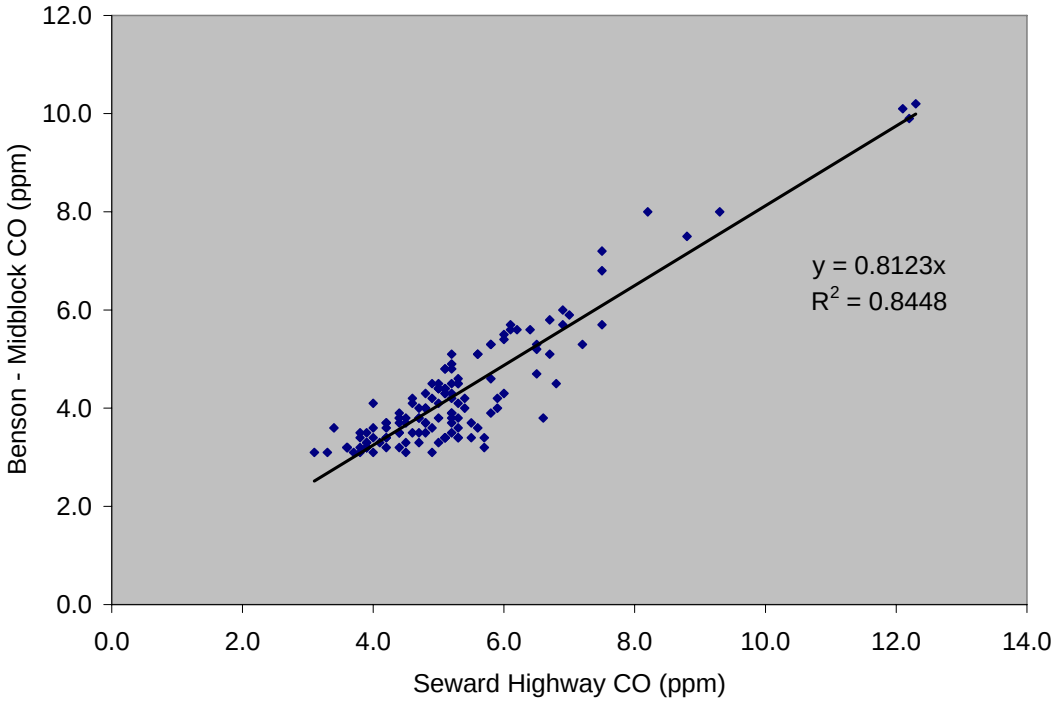
**Figure 1**

**Aerial Photo of Intersection of Seward Highway and Blvd**
**Seward Highway Monitor was located approximately 80 meters east of the Benson Mid-block Monitor**


CO concentrations were approximately 19% lower at *Benson Midblock* than the *Seward Highway* site. The scatter plot in Figure 2 shows the relationship between paired hourly concentrations measured at these two locations. (Hourly values below 3 ppm were disregarded.)

**Figure 2**

**Relationship between hourly CO concentrations measured at the Seward Highway Station and a midblock location 80 meters west (1997-98 data)**

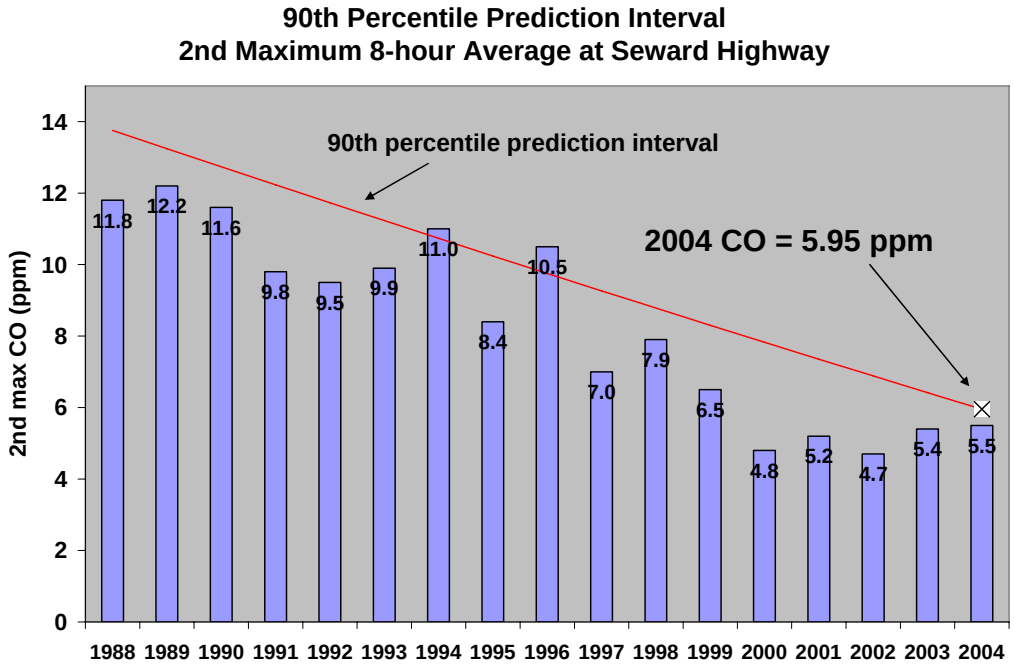



Although concentrations at the *Benson Mid-block* site were lower than those at the *Seward Highway* site, concentrations there were still probably unduly influenced by the heavy traffic on Benson Boulevard to be considered a good background site. The probe for *Benson Mid-block* was located just 10 meters south of nearest traffic lane. If the probe for *Benson Mid-block* were to have been setback 50 or 100 meters from Benson Boulevard a more realistic background value for this busy midtown area might have been obtained. Nevertheless, concentrations at *Benson Mid-block* offer a more reasonable (and lower) estimate of the "true" background concentration near major arterials than values obtained from monitors in Anchorage residential areas.

The *Benson Mid-block* monitor therefore provides a conservative or high estimate of background CO for CAL3QHC modeling. CO monitoring at *Benson Mid-block* was discontinued in the late 1990's. Nevertheless, the present-day background value can be estimated using the regression relationship between the *Seward Highway* and *Benson Mid-block* sites.

The methodology used to estimate the background CO value for 2008 is described below. A statistical approach, relying on the 90$^{th}$ percentile prediction interval, was used to compute the background concentration for 2008 from data collected from the *Seward Highway* and *Benson Mid-Block* monitors. This methodology is similar in many ways to the probabilistic approach used in the Anchorage maintenance demonstration.

1. Use the 90th percentile prediction interval to compute the 90th percentile value of the 2nd maximum 8-hour average at Seward Highway in 2004. (Monitoring was discontinued in December 2004.)




2. Compute the corresponding 90th percentile 8-hour concentration at *Benson Midblock* in 2004 using the slope of the regression relationship shown in Figure 2.

   *Benson Midblock* 2004 (90th percentile) = (5.95 ppm) x 0.8123 = 4.8 ppm
   (This value is the computed background CO concentration for 2004.)

3. Use MOBILE6 to project the background concentration in 2008 from the 2004 level.***

| | MOBILE6 emission factor @ 2.5 mph | 8-hour CO (ppm) | 1-hour CO** (ppm) |
|---|---|---|---|
| 2004 | 45.307 | **4.8** | **6.9** |
| 2005 | 42.525 | 4.5 | 6.5 |
| 2006 | 37.043 | 4.0 | 5.6 |
| 2007 | 35.537 | 3.8 | 5.4 |
| **2008** | **33.722** | **3.6** | **5.1** |

** In accordance with guidance, persistence factor of 0.7 was used to compute the 1-hr concentration from the 8-hr. i.e., 1 hr bkg CO (2008) = 3.6 ppm/0.7 = 5.1 ppm

The computed background CO concentration is therefore:

**Background 8-hour CO = 3.6 ppm**

**Background 1-hour CO = 5.1 ppm**

*** CAL3QHC guidance suggests that the background CO concentration should be adjusted downward over time in proportion to the decline in idle emissions projected by MOBILE6. The MOBILE6 emission factor at 2.5 mph is used as a surrogate for idle emissions.

STATE OF ALASKA )
) ss.
_____JUDICIAL DISTRICT )

AFFIDAVIT OF ORAL HEARING

I, Cynthia Heil, Acting Environmental Program Manager of Department of Environmental Conservation, being sworn, state the following:

On July 13, 2009, at 12:30 pm, in Room A, at 619 Ship Creek Ave, Ste 249, Anchorage Ak, I presided over a public hearing held in accordance with AS 44.62.210 for the purpose of taking testimony in connection with the adoption of changes to 18 AAC 52 which would change 18 AAC 52.005 to increase the time period during which a new model year vehicle is exempt from a vehicle emissions test and exempt vehicles with historic vehicle plates and custom collector plates from having to participate in the vehicle emissions testing program. The proposed changes to 18 AAC 52.060 update the federal reference for poverty guidelines for use in economic hardship waivers. The proposed changes to 18 AAC 52.990 add definitions of categories for exempt vehicles. ADEC is also amending the State Air Quality Control Plan which is adopted by reference in 18 AAC 50.030.

DATE: 7/15/09
Anchorage, Alaska

Cynthia Heil
Acting Environmental Program Manager

SUBSCRIBED AND SWORN TO before me this 15 day of July, 2009.

[NOTARY SEAL]

Notary Public in and for the
State of Alaska
My commission expires: w/Office

*State of Alaska*
NOTARY PUBLIC
Erin D. Dreyer
My Commission Expires With Office