Carbon Monoxide Maintenance Plan For the Denver Metropolitan Area

Revision to the Maintenance Plan Previously Approved
By the U.S. Environmental Protection Agency
On December 14, 2001

Approved by:
Colorado Air Quality Control Commission
June 19, 2003

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REVISED MAINTENANCE PLAN

CARBON MONOXIDE MAINTENANCE PLAN
FOR THE DENVER METROPOLITAN AREA

Revision to Maintenance Plan Previously Approved
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The State of Colorado, in coordination with the Regional Air Quality Council, is submitting this Carbon Monoxide (CO) Maintenance Plan Revision to revise the motor vehicle emissions inventories and budget based on EPA's mobile source emissions estimating model, MOBILE6, which was officially released in January 2002.

The previously approved Denver Metro Area Carbon Monoxide Maintenance Plan, which was submitted by the Governor on May 10, 2000, was formally approved by the EPA (66 FR 64751) on December 14, 2001 (effective date January 14, 2002). In that action the Denver Metro Area was redesignated by the EPA from a "serious" CO non-attainment area to attainment of the CO National Ambient Air Quality Standard (NAAQS). In addition, revisions to Air Quality Regulations No. 11 (Inspection/Maintenance) and No. 13 (Oxygenated Fuels), Ambient Air Quality Standards Regulation and the CO transportation conformity (motor vehicle emissions) budget were approved in that action

In January 2002, EPA issued policy guidance for states and local areas to use when developing SIP revisions using MOBILE 6 *("Policy Guidance on the Use of MOBILE6 for SIP Development and Transportation Conformity," January 18, 2002*). The guidance allows areas to revise their motor vehicle emissions inventories and budgets using MOBILE6 without revising the entire SIP or completing additional modeling if :

1) the SIP continues to demonstrate attainment or maintenance when the MOBILE5-based motor vehicle emission inventories are replaced with MOBILE 6 base year and attainment/maintenance year inventories; and,
2) the State can document that the growth and control strategy assumptions for non-motor vehicle sources continue to be valid and any minor updates do not change the overall conclusion of the SIP.

This proposed revision is based on the procedures outlined in this guidance. The revised maintenance plan merely replaces the existing MOBILE5 maintenance plan motor vehicle emissions inventories with MOBILE6 base (attainment) and maintenance year inventories, while maintaining the strategies reflected in the previously approved maintenance plan. The resultant maintenance year and interim year inventories continue to be lower than the base (attainment) year inventory, thereby demonstrating continued maintenance of the standard as required by the guidance. The non-motor vehicle source emissions estimates remain unchanged in this revision and the growth and control assumptions for these sources remain valid.

Since this revision to the Denver area SIP is an update to a previously approved maintenance plan, the 2013 maintenance year contained in the previously approved maintenance plan remains the appropriate maintenance year for this revision.

The most recent three years (2000-02) of monitored data which are presented in Section A, show the Denver area has maintained attainment of the standard since the redesignation was approved.

Finally, the following sections contain the core elements EPA has established as necessary for approval of maintenance plans:

1. Description of the control measures for the maintenance period
2. Emission inventories for current and future years
3. Maintenance demonstration
4. Mobile source emissions budget
5. Approved monitoring network
6. Verification of continued attainment
7. Contingency plan
8. Subsequent maintenance plan revisions

This maintenance plan revision follows the same format as the previously approved maintenance plan. Most sections noted above remain unchanged or only slightly changed. Only sections 2, 3 and 4 listed above contain substantive revisions based on the introduction of MOBILE6 emission inventories.

A. CONTINUED ATTAINMENT OF THE CARBON MONOXIDE STANDARD

Attainment of the national ambient air quality standard for carbon monoxide is demonstrated when two consecutive years of monitoring data for each site show no more than one exceedance per year of the 8-hour (9 ppm) and 1-hour (35 ppm) standards. Monitoring data for 2001-02 demonstrates that the Denver metropolitan area continues to attain/maintain the national standard for carbon monoxide as required by 40 CFR 50.8. Data from 2000 is provided to demonstrate continual attainment/maintenance since the previously approved Maintenance Plan was adopted. This is based on quality assured monitoring data representative of the location of expected maximum concentrations of carbon monoxide in the area (downtown Denver).

The current carbon monoxide ambient monitoring network consists of 7 sites operated by the Colorado Air Pollution Control Division. The sites are listed along with summary data from 2000 and 2002 in Tables 1, 2 and 3.

The monitoring data presented in Tables 1, 2 and 3 verify that the Denver area continues to attain the national standard for carbon monoxide. Data recovery rates for the monitors exceed the 75% completeness requirements for all years, and all state and federal quality assurance procedures have been complied with, further substantiating their validity as indicators of ambient carbon monoxide levels in the Denver metropolitan area. Figure1, Historical Monitoring Data for the CO NAAQS by Monitor Site, includes long term monitoring records of each monitoring site

which demonstrate that the Denver area has been in attainment with the national ambient air quality standard for carbon monoxide since 1996 and has had a continuous downward trend in CO levels since 1992. Figure 2 shows the geographic distribution of the monitors.

Table 1
2000 Carbon Monoxide Data Summary for the Denver Metropolitan Area
Standards: 1-hour: 35 ppm*; 8-hour: 9-ppm**

Site Name	1-Hour		8-Hour	
	Maximum ppm	2nd Maximum ppm	Maximum ppm	2nd Maximum ppm
Welby, 78th Ave & Steele St.	4.3	4.3	3.0	2.9
Boulder, 2150 28th St	10.0	9.6	6.8	4.3
Denver CAMP, 2105 Broadway***	17.1	12.8	8.5	5.4
Denver, NJH, 14th Ave. & Albion St.	8.7	7.6	4.8	4.7
Denver Carriage, 23rd Ave & Julian St.	5.8	5.6	4.1	3.4
Denver Speer & Auraria, Firehouse #6	9.3	8.6	5.0	4.6
Arvada, 57th Ave. & Garrison St.	7.1	6.2	3.9	3.8

* Due to mathematical rounding, a value of 35.5 ppm or greater is necessary to exceed the standard.
** Due to mathematical rounding, a value or 9.5 ppm or greater is necessary to exceed the standard.
*** Site was closed for reconstruction part of the year.

Table 2
2001 Carbon Monoxide Data Summary for the Denver Metropolitan Area
Standards: 1-hour: 35 ppm*; 8-hour: 9-ppm**

Site Name	1-Hour		8-Hour	
	Maximum ppm	2nd Maximum	Maximum	2nd Maximum ppm
Welby, 78th Ave & Steele St.	6.1	5.8	3.4	3.3
Boulder, 2150 28th St	9.1	6.8	4.5	3.4
Denver CAMP, 2105 Broadway	14.4	9.3	4.4	4.1
Denver, NJH, 14th Ave. & Albion St.	9.7	8.5	4.0	3.9
Denver Carriage, 23rd Ave & Julian St.	7.1	6.5	3.8	3.7
Denver Speer & Auraria, Firehouse #6	7.8	7.0	4.6	4.0
Arvada, 57th Ave. & Garrison St.	6.2	5.0	3.1	3.0

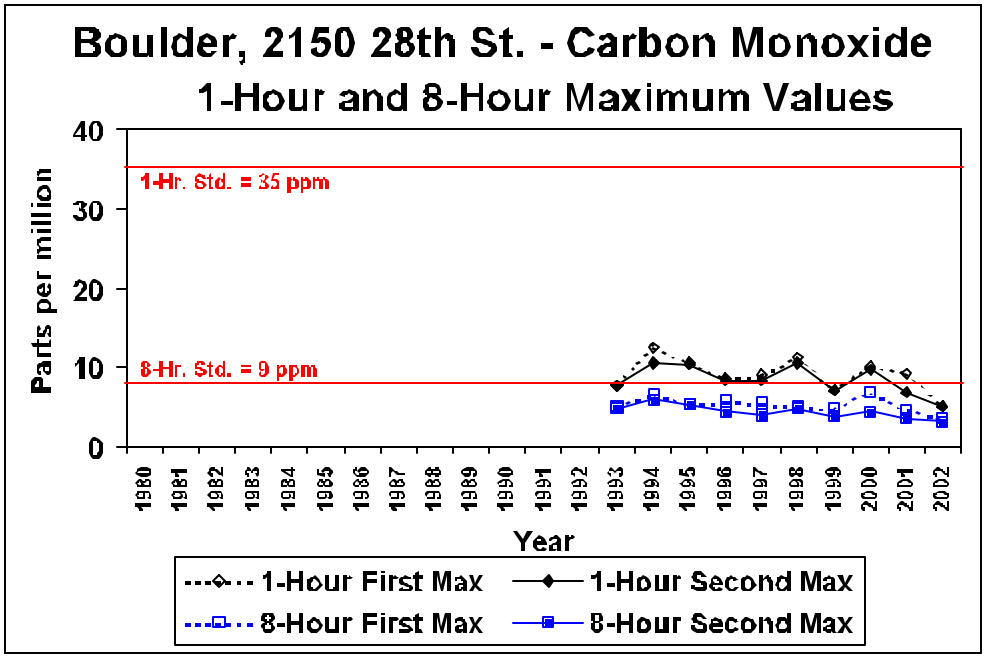
* Due to mathematical rounding, a value of 35.5 ppm or greater is necessary to exceed the standard.
** Due to mathematical rounding, a value or 9.5 ppm or greater is necessary to exceed the standard.

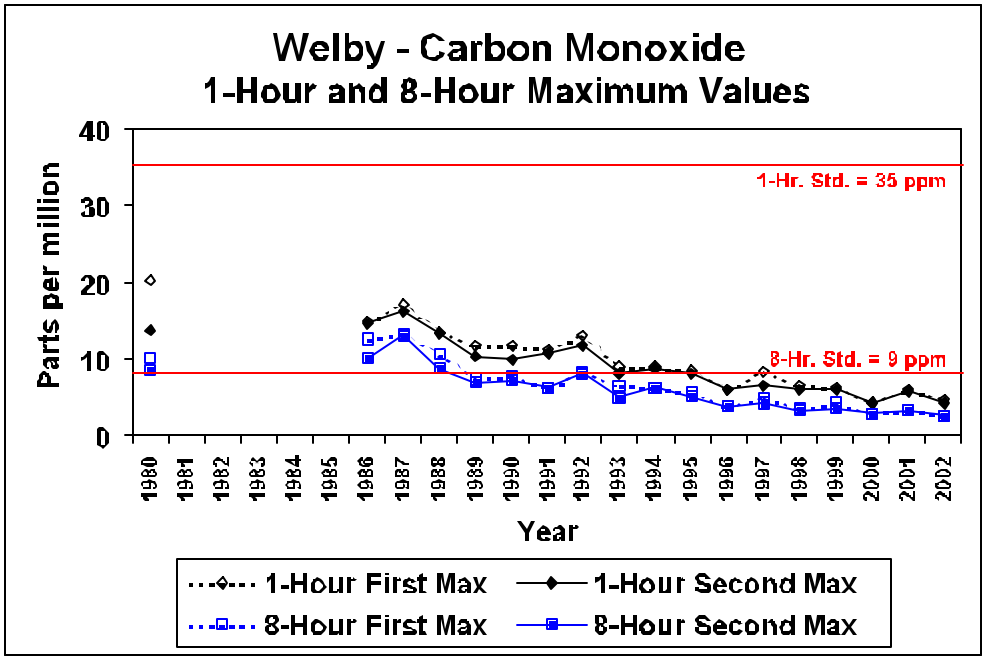
Table 3
2002 Carbon Monoxide Data Summary for the Denver Metropolitan Area***
Standards: 1-hour: 35 ppm*; 8-hour: 9-ppm**

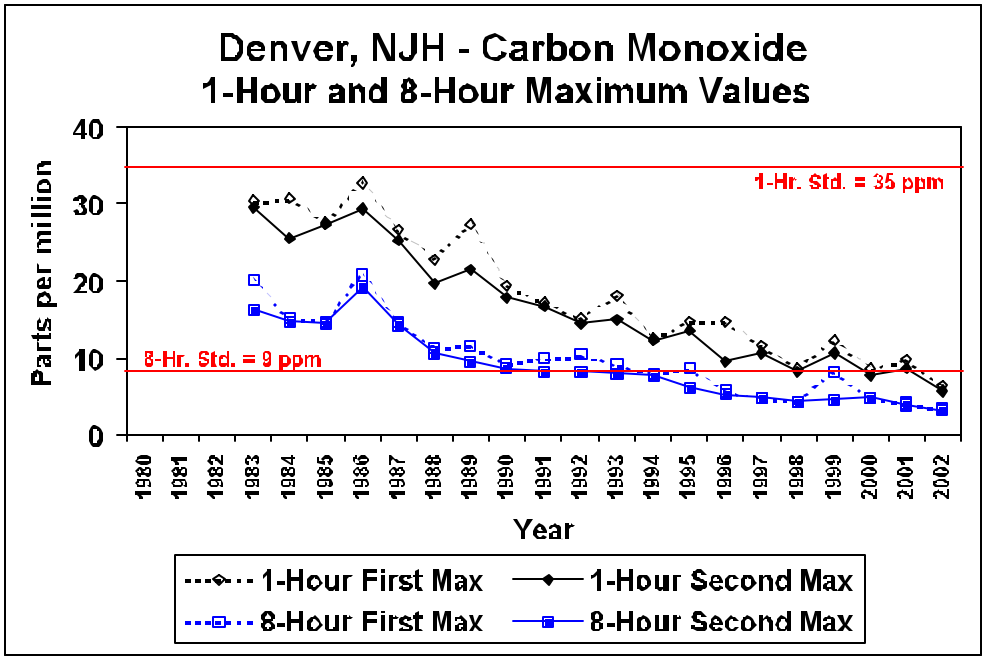
Site Name	1-Hour		8-Hour	
	Maximu	2nd Maximum	Maximu	2nd Maximum ppm
Welby, 78th Ave & Steele St.	4.8	4.4	2.8	2.6
Boulder, 2150 28th St	5.0	5.0	3.5	3.0
Denver CAMP, 2105 Broadway	7.4	7.4	3.7	3.7
Denver, NJH, 14th Ave. & Albion St.	6.3	5.6	3.5	3.1
Denver Carriage, 23rd Ave & Julian St.	4.9	4.6	3.7	2.7
Denver Speer & Auraria, Firehouse #6	8.5	7.5	3.9	3.6
Arvada, 57th Ave. & Garrison St.	4.9	4.7	3.0	2.6

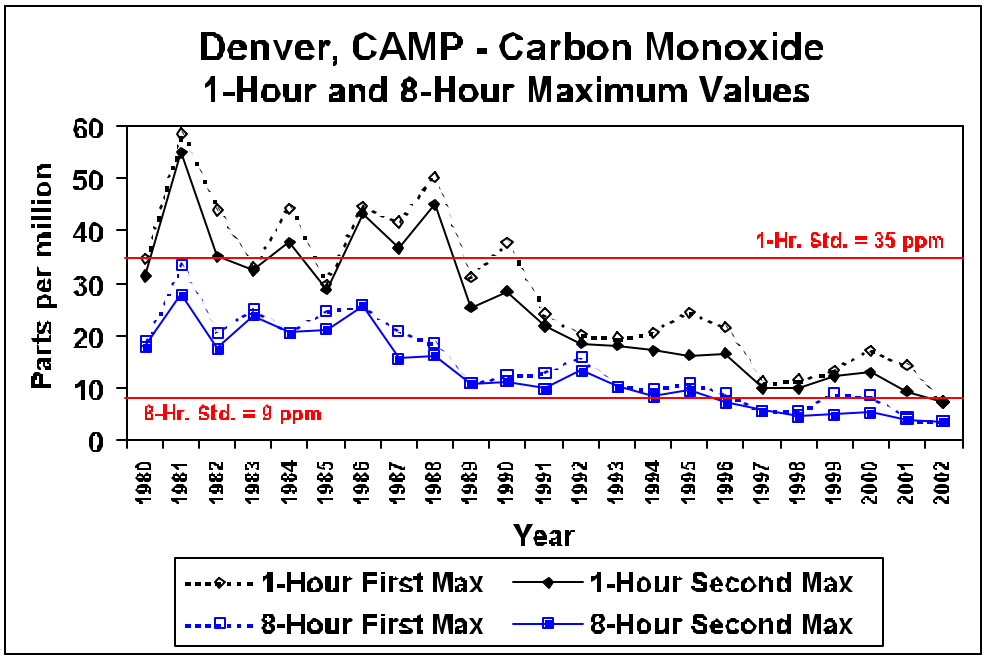
* Due to mathematical rounding, a value of 35.5 ppm or greater is necessary to exceed the standard.
** Due to mathematical rounding, a value or 9.5 ppm or greater is necessary to exceed the standard.
*** Preliminary data.

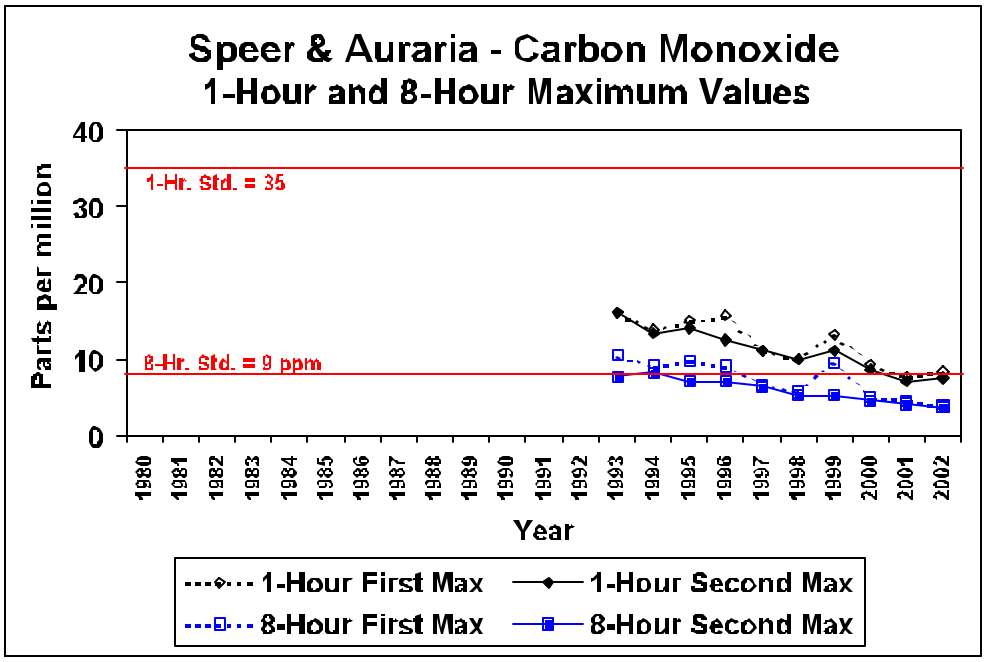
Figure 1
Historical Monitoring Data for the CO NAAQS by Monitor Site

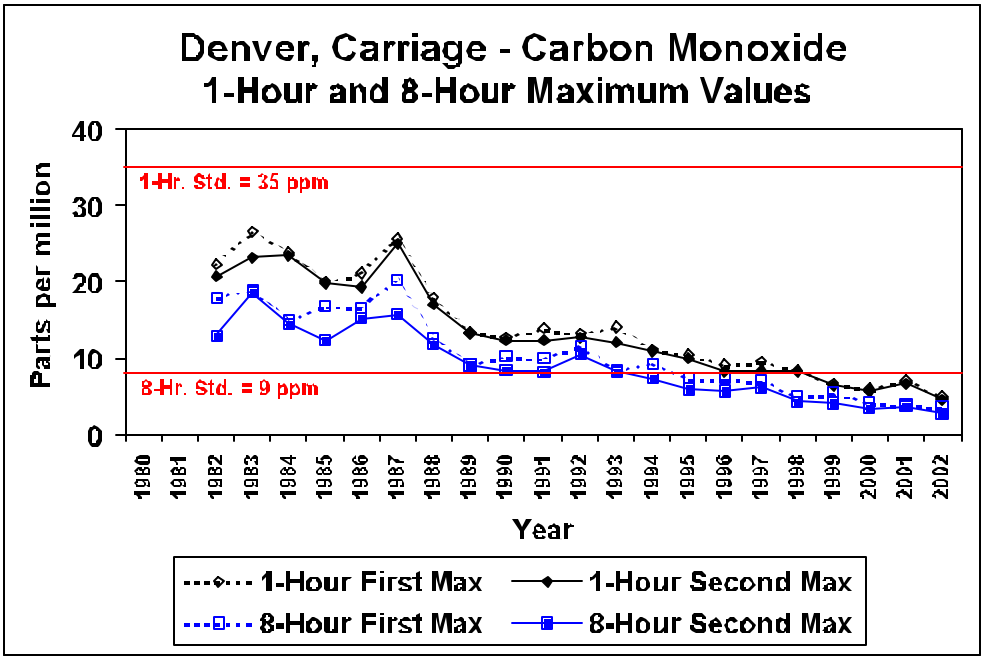


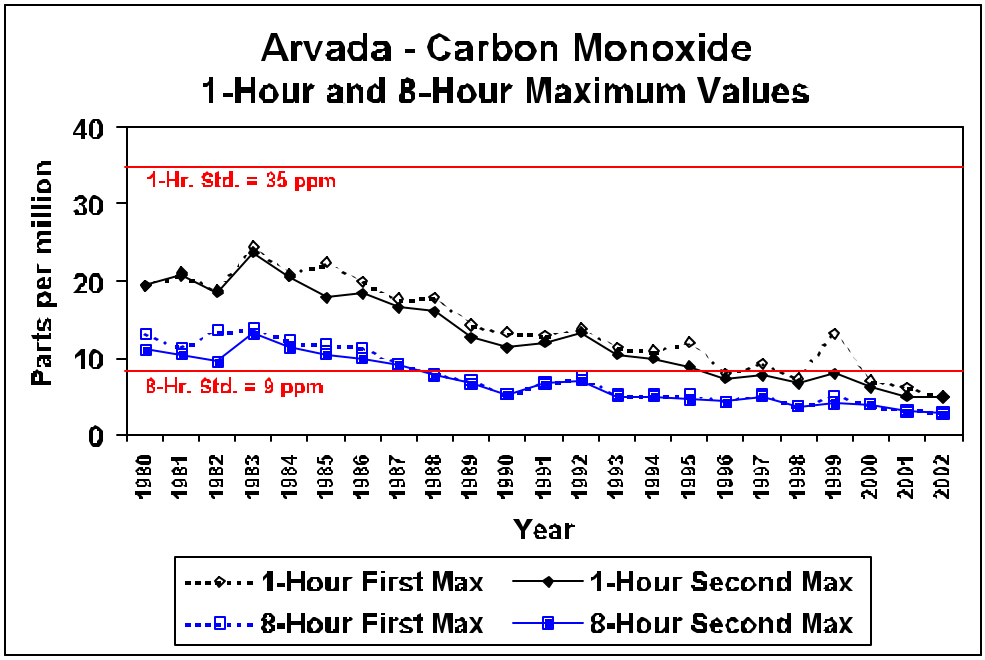



Denver, NJH - Carbon Monoxide
1-Hour and 8-Hour Maximum Values
Parts per million
40
30
20
10
0
1-Hr. Std. = 35 ppm
8-Hr. Std. = 9 ppm
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Year
1-Hour First Max
1-Hour Second Max
8-Hour First Max
8-Hour Second Max


Denver, CAMP - Carbon Monoxide
1-Hour and 8-Hour Maximum Values
Parts per million
60
50
40
30
20
10
0
1-Hr. Std. = 35 ppm
8-Hr. Std. = 9 ppm
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Year
1-Hour First Max
1-Hour Second Max
8-Hour First Max
8-Hour Second Max


Speer & Auraria - Carbon Monoxide
1-Hour and 8-Hour Maximum Values
Parts per million
40
30
20
10
0
1-Hr. Std. = 35
8-Hr. Std. = 9 ppm
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Year
1-Hour First Max
1-Hour Second Max
8-Hour First Max
8-Hour Second Max


Denver, Carriage - Carbon Monoxide
1-Hour and 8-Hour Maximum Values
Parts per million
40
30
20
10
0
1-Hr. Std. = 35 ppm
8-Hr. Std. = 9 ppm
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Year
1-Hour First Max
1-Hour Second Max
8-Hour First Max
8-Hour Second Max



B. MAINTENANCE PLAN CONTROL MEASURES

The Denver metropolitan area will continue to rely on the control programs contained in the Maintenance Plan approved on December 14, 2001 to demonstrate maintenance of the carbon monoxide standards through 2013. No substantive changes have been made to these programs or their implementing regulations.

No emission reduction credit has been taken in the maintenance demonstration for any other current State or local control programs and no other such programs, strategies, or regulations shall be incorporated or deemed as enforceable measures for the purposes of this maintenance demonstration.

Specific programs and requirements that ceased to be part of the State Implementation Plan upon redesignation and approval of Maintenance Plan by EPA on December 14, 2001 are: 1) the contingency measures included in the 1994 attainment SIP; 2) the requirement for VMT tracking; and 3) the requirement for periodic emission inventories. The Clean Fuels Fleet Program is not necessary to maintain the carbon monoxide standard and no credit for the program was taken in this maintenance demonstration. The State replaced the Clean Fuels Fleet Program with a substitute program through a separate submittal, which was also approved by the EPA on December 14, 2001.

The specific enforceable control measures that continue to be a part of the Maintenance plan are listed below.

1. Federal tailpipe standards and regulations, including those for small engines and non-road mobile sources. Credit is taken for these federal requirements but they are not part of the Colorado SIP.

2. Air Quality Control Commission Regulation No. 11 -- covering the Automobile Inspection and Readjustment (A.I.R.) Program. The Maintenance plan revision makes no changes to this regulation.

   Implementation Update: The implementation of the Clean Screen element of the A.I.R Program has not met the schedule defined in the regulation noted above nor assumed in the previously approved mobile source modeling with MOBILE5. However, the Clean Screen program results in a disbenefit (lowering estimated reductions) to the Denver metro area motor vehicle emissions and therefore its lack of implementation does not negatively impact the motor vehicle emissions inventory calculation.

3. Air Quality Control Commission Regulation No. 13 -- covering the oxygenated gasoline program. This Maintenance plan makes no revisions to this regulation.

   Implementation Update: The schedule within the regulation has been maintained and is reflected in the motor vehicle emissions estimates.

4. Air Quality Control Commission Regulation No. 4 -- covering wood burning control programs. The Maintenance plan makes no revisions to the wood burning control programs.

5. Air Quality Control Commission Regulations No. 3, No. 6 and Common Provisions – covering industrial source control programs. The Common Provisions, and Parts A and B of Regulation No. 3, are already included in the approved SIP. Regulation No. 6, and Part C of Regulation No. 3, implement the federal standards of performance for new stationary sources and the federal operating permit program. The Maintenance plan makes no revisions to these regulations. This reference to Regulation No. 6 and Part C of Regulation No. 3 shall not be construed to mean that these regulations are included in the SIP.

6. In accordance with State and federal regulations and policies, the State and federal nonattainment New Source Review (NSR) requirements in effect for the Denver area reverted to the State and federal attainment Prevention of Significant Deterioration (PSD) permitting requirements once EPA approved the redesignation request and maintenance plan. This maintenance plan revision makes no changes to these PSD permitting requirements.

C. EMISSION INVENTORIES

This section presents the emission inventories portion of the maintenance plan. Emission inventories are provided for the 2001 attainment year, the 2006 interim year, and the 2013 maintenance year (see Table 4).

The 2001 inventory from the 1994 Denver Nonattainment SIP Element incorporates the nonattainment control measures described in that SIP element. The 2006 and 2013 inventories incorporate the maintenance plan control measures described above. The mobile source control measures from 2001, 2006 and 2013 for this revision to the maintenance plan have been included in the revised MOBILE6.2 motor vehicle emissions estimates.

All of the inventories are for the Denver metropolitan area carbon monoxide attainment/maintenance area (see Figure 2) and provide emissions estimates for a weekday during the winter carbon monoxide season (November through February). The carbon monoxide attainment/maintenance area is somewhat smaller than the modeling domain. The carbon monoxide attainment/maintenance area is used to establish the mobile source emissions budgets for the region as discussed in subsequent sections of this plan.

All of the inventories were developed using EPA-approved emissions modeling methods and the demographics data from the maintenance plan previously approved on December 14, 2001. A comparison with Denver Regional Council of Governments' (DRCOG's) latest demographics data based on the 2000 census have been included to show that the growth assumptions in the previously approved maintenance plan continue to be valid for use in this revised Maintenance Plan. The transportation data for this revised Maintenance Plan has been updated with the most recently available data sets from DRCOG used for the 2025 Regional Transportation Plan (adopted in April 2002). The technical support document for this revised maintenance plan summarizes information on the assumed methodology, growth surrogate and/or control assumptions for each non-motor vehicle (point and area) source category. The area, non-road mobile and point source inventories in the previously approved plan remain valid as discussed below and are not changed in this revision.

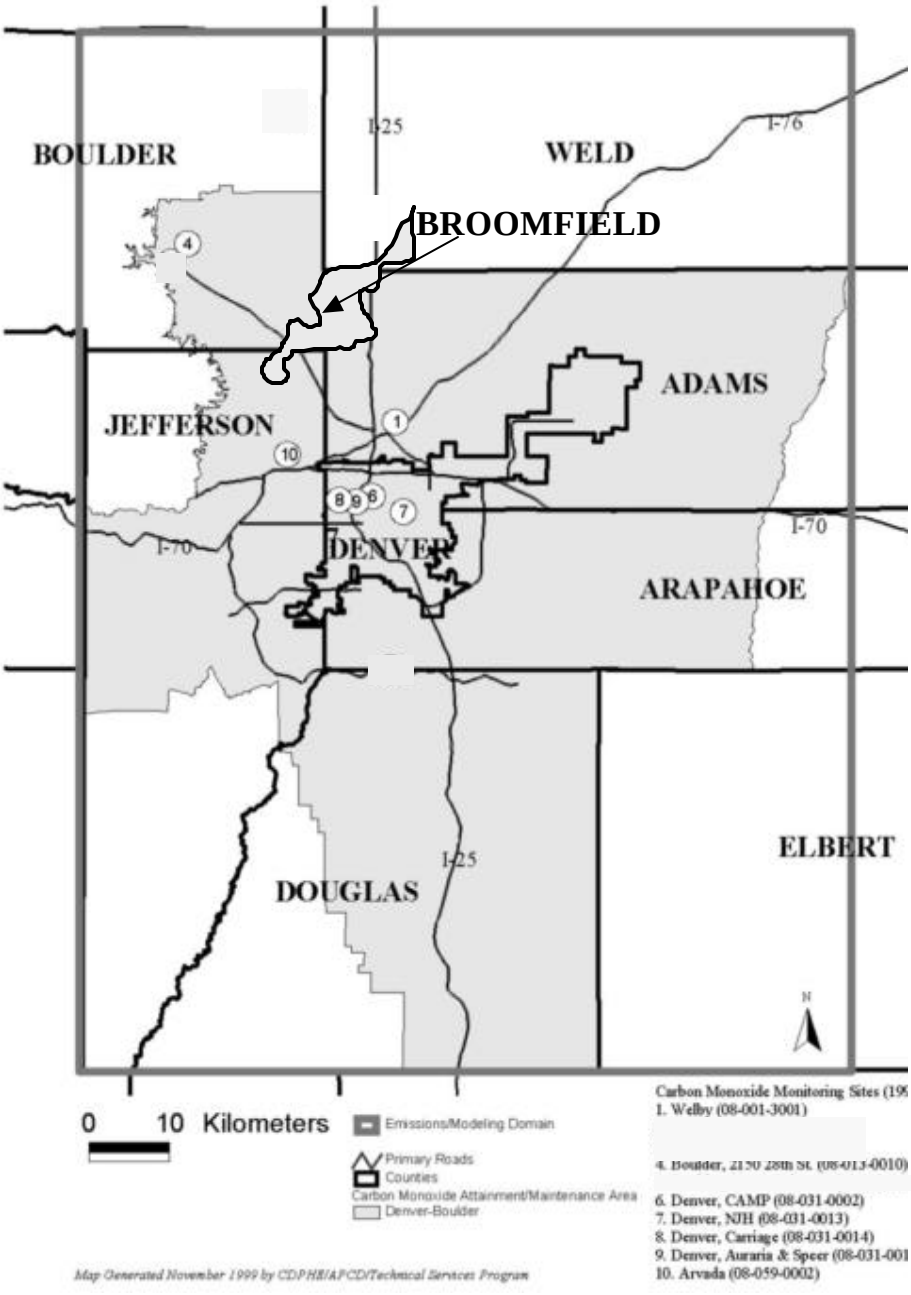
Section 2.5.1 of the previously approved Technical Support Document, dated January 10, 2001 specifically discusses emissions estimates for the Denver International Airport (DIA). In that section, the Air Pollution Control Division specifically identifies and accounts for DIA emissions in the previously approved Maintenance Plan. Therefore, for the purposes of general conformity demonstration DIA should use the emissions inventory from Table 16 of the previously approved Technical Support Document. There have been no changes in future emission estimates for DIA and therefore estimates contained in the previously approved maintenance plan remain valid and are not changed in this revision.

Table 4
Emission Inventories for the Denver
Carbon Monoxide Attainment Area
Carbon Monoxide Emissions (tons/day)

Source Category	2001 Attainment Inventory	2006 Interim Year Inventory	2013 Maintenance Year Inventory
Point Sources[(1)]	31.6	25.6	25.6
Wood burning	46.5	29.0	22.4
Natural Gas	6.6	8.3	9.3
Structural Fires	3.6	4.7	5.2
Agriculture Equip.	0.0	0.0	0.0
Airport - Aircraft	15.3	21.6	23.7
Airport Service Equip.	7.6	7.2	7.7
Construction Equip.	9.4	7.4	7.7
Industrial Equip.	23.0	20.9	21.7
Light Commercial Equip.	129.0	118.9	123.9
Helicopters	0.3	0.3	0.3
Railroads	0.3	0.3	0.3
POINT & AREA SOURCE SUBTOTAL	273	244	248
MOBILE6 On-Road Mobile	1638	1614	1125
REVISED SIP TOTAL	**1911**	**1858**	**1373**

(1) Point source reduction is due to use of actual instead of allowable emissions for non-elevated sources.
Note: The significant figures in this table are used to show the small contribution of certain source categories. They are not intended to indicate a level of accuracy in the inventories. Totals may not add due to rounding.

Figure 2
Map of Denver Metropolitan Attainment/Maintenance Area, Modeling Domain, and Location of Carbon Monoxide Monitors



1. Demographic and Transportation Data

The previously approved maintenance plan (December 14, 2001) was developed based on the latest available information from DRCOG. Table 5 shows the 2006 and 2013 demographic data used to develop the previously approved maintenance plan emission inventories.

Table 5
Demographic Data Used to Develop Emission Inventories
For the Denver Carbon Monoxide Inventory/Modeling Domain
Used in the Previously Approved Maintenance Plan
And this Revised Maintenance Plan

Period	Population	Households	Employment
2001	2,364,000	970,000	1,415,500
2006	2,616,000	1,097,000	1,568,000
2013	2,889,000	1,244,000	1,718,000

Since development of the previously approved Maintenance plan, the 2000 census was completed and updated demographic (Table 6) and transportation (Table 7) data sets were generated and used by DRCOG to develop the recent 2025 Regional Transportation Plan. Inspection of the data for 2013, shown below in Table 6 indicates that the household and employment estimates are slightly less in the latest (2025 RTP) data set than the above data set used in the previously approved maintenance plan. Population estimates are slightly higher (approximately 0.5%), but population is only used for approximately 0.5% (10 tpd) of the total inventory. Therefore, since the growth and demographic data used in the previously approved maintenance plan are consistent with updated estimates, the non-mobile source category emissions estimates from the previously approved maintenance plan are still valid and are used to establish the attainment area inventory in this revision.

Table 6
Demographic Data Used to Develop
The DRCOG 2025 Regional Transportation Plan
(based on the 2000 census)

Period	Population	Households	Employment
2001	2,414,804	957,780	1,360,814
2006	2,617,645	1,050,166	1,495,791
2013	2,902,912	1,172,902	1,678,079

2. Methodology and Control Assumptions for Source Categories

a) Mobile Sources

The mobile source emission estimates contained in this revised maintenance plan are based on updated 2025 transportation data sets provided by DRCOG (see Table 7). These are the same data sets contained in DRCOG's most recent update of its 2025 Regional Transportation Plan (April 2002). As a result, vehicle miles traveled (VMT) estimates have been revised accordingly.

Table 7
2025 RTP Transportation Data Used
To Develop this Revised Maintenance Plan

Period	Daily VMT	
	Attainment/ Maintenance	Modeling Domain
2001	56,797,068	61,362,264
2006	62,725,758	68,123,584
2013	71,045,166	77,750,300

Mobile source inventories in this proposed revision are based on a full MOBILE6 run, 2025 RTP-based VMT, Denver metro area vehicle registration and vehicle mix numbers and the RSD clean screen utility developed by EPA. The inventories are based on MOBILE6.2 credits for the inspection/maintenance and oxygenated gasoline programs described in the maintenance plan.

The Technical Support Document contains documentation of the modeling methodology using MOBILE6.2.

b) Point Sources

As described in the technical support document of the previously approved plan, the maximum potential to emit for elevated point sources (55% of the modeling domain point source estimate in 2006 and 2013) and the actual ground level point source emissions were used in the dispersion modeling to demonstrate maintenance in 2006 and 2013. Additionally, there is a regulatory mechanism for new sources greater than 50 tons per year in an attainment area, requiring a modeling demonstration of compliance with ambient air quality standards before issuance of a permit. Also, the previous dispersion modeling done for the previously approved plan indicates that point sources because of their location and the direction of plumes on design days has little or no impact of the maintenance demonstration.

Specific information for point sources in the attainment/maintenance area is summarized in the technical support document for this revised maintenance plan ,

including the number of new sources permitted since the previously approved maintenance plan was developed. However, the thoroughness of the original analysis in accounting for potential growth and its lack of impact on ambient concentrations verifies the validity of using the point source estimates from the previously approved plan to establish the attainment/maintenance area point source inventory in this revised plan.

c) **Non-road and Area Sources**

The calculation methodology used in the previously approved plan remains unchanged. The only controls assumed for non-road categories were existing federal regulations, no changes occurred in woodburning controls, and the appropriate demographic-based growth factors as discussed above are slightly lower (3-6%) based on the 2025 RTP demographic data. Therefore, the non-road and area source category estimates from the approved plan are valid for use in this revised plan. The Technical Support Document provides a specific discussion of growth and control strategy assumptions for each source category.

d) **Aircraft and Airport Services**

Substantial effort was made by Denver International Airport staff to develop the emission estimates contained in Table 16 of the original Technical Support Document of the previously approved maintenance plan. Recent discussions with DIA staff indicate that though actual activity is less than projected in the previously approved plan, the future projections remain appropriate. Therefore, the estimated emissions from the previously approved plan are valid for this revised plan.

D. MAINTENANCE DEMONSTRATION

The previously approved maintenance demonstration was made through the use of area-wide dispersion modeling using the 2006 and 2013 emission inventories (including MOBILE5 motor vehicle emissions estimates) along with meteorological data from December 5, 1988 which was the design day for the 1994 Carbon Monoxide SIP, and selected intersection hot-spot modeling. The combined results of the dispersion and intersection modeling showed no 8-hour maximum carbon monoxide concentration greater than or equal to 9.0 ppm anywhere in the modeling domain with the implementation of the proposed control measures. The technical support document for the previously approved maintenance plan describes in detail the assumptions and methodologies used for all modeling work.

EPA's "Policy Guidance on the Use of MOBILE6 for SIP Development and Transportation Conformity," (dated January 18, 2002), indicates that SIP revisions based on MOBILE6 must continue to demonstrate maintenance of the standard when MOBILE5-based motor vehicle emission inventories are replaced with MOBILE6 inventories. The guidance indicates that areas can revise their motor vehicle emissions inventories and budgets using MOBILE6 without revising the entire SIP or completing additional modeling if:

1) the SIP continues to demonstrate attainment or maintenance when the MOBILE5-based motor vehicle emission inventories are replaced with MOBILE6 base year and attainment/maintenance year inventories; and,

2) the State can document that the growth and control strategy assumptions for non-motor vehicle sources continue to be valid and any minor updates do not change the overall conclusion of the SIP.

If both of the above criteria are met, the guidance indicates the State can simply re-submit the original SIP with the revised MOBILE6 motor vehicle emission inventories.

The guidance goes on to indicate that "if a carbon monoxide (CO) maintenance plan relied on either a relative or absolute demonstration [in the original maintenance plan], the first criterion could be satisfied by documenting that the relative emissions reductions between the base year and the maintenance year are the same or greater using MOBILE6 as compared to MOBILE5."

This revised maintenance plan replaces MOBILE5 estimates with MOBILE6.2 estimates, and bases the maintenance demonstration on the showing that the interim (2006) year and maintenance (2013) year emissions are lower than the attainment (2001) year with MOBILE6.2. The maintenance (2013) year emissions with MOBILE6.2 are, in fact, 28.2% lower than the attainment (2001) year, while the comparable total emissions with MOBILE5 used in the dispersion modeling are only 3.9% lower in 2013 as shown below in Table 8.

Table 8
Comparison of Attainment Area Inventory Changes and Percent for Attainment, Interim & Maintenance Years
(tons per day)

Year	2001	2006	2013
Previously Approved SIP Inventory *(based on MOBILE5)*	1083	1020	1041
		-5.8%	*-3.9%*
Revised SIP Inventory *(based on MOBILE6.2)*	1911	1858	1373
		-2.8%	*-28.2%*

Maintenance of Standard During Strategy Phase-In

This maintenance plan revision will become effective upon EPA approval, which is expected to occur after the 2003/2004 winter season and likely by mid-2004. In order to demonstrate that the Denver metro area will continue to stay in compliance with the carbon monoxide standard between the time EPA approves the plan in 2004 and 2006, when the oxygenated gasoline and I/M program changes are fully phased in, APCD generated total emission inventories during that period. Inventories were prepared for the start of the 2004/2005 winter season (November 2004) when further reductions in gasoline oxygen content and increases in RSD coverage targets are in effect.

Inventories were also prepared for January 2005 and January 2006 to reflect emissions during those winter seasons based on the continued phase-in of strategies.

Compared with the revised attainment area inventory for 2001, emission estimates for future interim maintenance periods are less than the level necessary to demonstrate continued maintenance of the standard (1911 tons per day). The results of this analysis are shown below in Table 9.

Table 9
Maintenance of Standard During Strategy Phase-in
(2001 Attainment Area Inventory = 1911 TPD)

Period	Total Emission Inventory (TPD)	Gasoline Oxygen Content	Percent of Fleet Evaluated Using Remote Sensing	Transient Test Cutpoints- g/mi (CO/HC/NOX)[1]
Nov. 15, 2004	1840	1.9%	*60%*	20 /0.8/ 2.0
Jan. 1, 2005	1811	1.9%	*60%*	20 /0.8/ 2.0
Jan. 1, 2006	1858	1.5%	*80%*	10 /0.6/ 1.5

1) 2001 cutpoints are 20/2.0/4.0

E. CARBON MONOXIDE MOTOR VEHICLE EMISSIONS BUDGET

1. Requirements for Establishing Emission Budgets

The transportation conformity provisions of section 176(c)(2)(A) of the CAA require regional transportation plans and programs to show that "...emissions expected from implementation of plans and programs are consistent with estimates of emissions from motor vehicles and necessary emissions reductions contained in the applicable implementation plan..."

EPA's transportation conformity regulation (40 CFR 93.118, August 15, 1997) also requires that motor vehicle emission budget(s) must be established for the last year of the maintenance plan, and may be established for any other years deemed appropriate. If the maintenance plan does not establish motor vehicle emissions budgets for any years other than the last year of the maintenance plan, the conformity regulation requires a "demonstration of consistency with the motor vehicle emissions budget(s) must be accompanied by a qualitative finding that there are no factors which would cause or contribute to a new violation or exacerbate an existing violation in the years before the last year of the maintenance plan." The normal interagency consultation process required by the regulation shall determine what must be considered in order to make such a finding.

For transportation plan analysis years after the last year of the maintenance plan (in this case, 2013), a conformity determination must show that emissions are less than or equal to the maintenance plan's motor vehicle emissions budget(s) for the last year of the maintenance plan.

EPA's conformity regulation (40 CFR 93.124) also allows the implementation plan to quantify explicitly the amount by which motor vehicle emissions could be higher while still demonstrating compliance with the maintenance requirement. The implementation plan can then allocate some or all of this additional "safety margin" to the emissions budget(s) for conformity purposes.

Additionally, however, EPA's "Policy Guidance on the Use of MOBILE6 for SIP Development and Transportation Conformity," (dated January 18, 2002), notes "that regardless of the technique used for attainment or maintenance demonstrations, a more rigorous assessment of the SIP's demonstration may be necessary if a State decides to reallocate possible excess emission reductions to the motor vehicle emissions budget as a safety factor". Since this plan allocates available excess emissions reductions to the motor vehicle emissions budget, the EPA recommended a "more rigorous assessment" to ensure allocation of excess emissions will still demonstrate maintenance in 2013 throughout the region. This methodology is described in more detail below.

2. Emission Budget in Maintenance Plan Approved December 14, 2001

The carbon monoxide motor vehicle emissions budget contained in the maintenance plan approved December 14, 2001, which was based on MOBILE5, was 800 tons per day for the metro Denver attainment/maintenance area for the years 2002 and beyond. No "safety margin" was allocated since maintenance year mobile source emissions were only 1% less than attainment year mobile source emissions. This maintenance plan revision removes the MOBILE5-based emissions budget from the state implementation plan and replaces it with the MOBILE6.2-based emissions budget set out below.

3. Revised Motor Vehicle Emissions Budget for Maintenance Year (2013) and Beyond Using MOBILE6

This maintenance plan establishes a motor vehicle emissions budget for the period from the last year of the maintenance plan (2013) and beyond. The budget is established for the boundaries of the attainment/maintenance area.

As shown in the maintenance demonstration earlier in this plan, the 2013 mobile source emissions inventory for carbon monoxide is 28.2% below the level necessary to demonstrate continued maintenance of the CO standard. As a result, the maintenance plan may allocate some or all of the additional "safety margin" to the emission budget for conformity purposes, consistent with EPA's conformity regulation.

This maintenance plan estimates the available "safety margin" using the EPA recommended "more rigorous assessment" methodology and allocates a portion to the motor vehicle emission budget as illustrated in Table 10 below. This maintenance plan allocates 395 tons of the potential "safety margin" to the motor vehicle emission budget. The remaining 19 tons are reserved to account for future point and area source growth and other modeling uncertainties. Mobile source emissions based on MOBILE6 are expected to continue to decline during this period.

The "more rigorous assessment" includes an intersection modeling analysis similar to that performed in both the original attainment SIP and the previously approved maintenance plan. The intersection modeling analysis utilizes a background concentration combined with CAL3QHC intersection (hot spot) modeling of selected intersections. The six intersections included in the

analysis are the same high-traffic intersections included in the original attainment SIP and the previously approved maintenance plan.

The background concentration for each intersection utilizes the highest second maximum CO concentration at nearby ambient monitors for the period 2000-2002. The CAL3QHC intersection modeling uses 2013 MOBILE6.2 emissions factors and DRCOG traffic data. The background concentration and CAL3QHC modeling value are then combined for each intersection. If the resulting concentration is greater than 9 ppm, the background concentration is reduced by the necessary percentage to bring the total value below 9 ppm. Since it is assumed the background concentrations are influenced by regional emissions of CO, the regional emissions (1911 tons per day in 2001) are reduced by the same percentage to determine the allowable regional emissions. Subtracting the emissions from point and area sources results in the allowable mobile source emissions for purposes for calculating the excess emissions that can be allocated to the motor vehicle emission budget.

Table 11 summarizes the results of the intersection modeling analysis based on allocation of excess emissions and the final motor vehicle emission budget. The only intersection that restricted the allocation of the full amount of the potential excess emissions was the Foothills/Arapahoe intersection in Boulder. The initial background concentration of 4.3 ppm was reduced by approximately seven percent, which then served as the basis for the remaining excess emissions and budget calculations.

This intersection modeling analysis and more rigorous assessment is described in more detail in the Technical Support Document.

The motor vehicle emissions budget of 1520 tons per day for 2013 and beyond will be used to determine whether plans, programs, and projects comply with the SIP in applicable horizon years. This new budget will take effect for future transportation conformity determinations upon EPA approval of this Maintenance plan revision.

Future maintenance plan revisions, including those required periodically by the Clean Air Act, will reevaluate the motor vehicle emissions budget and may make adjustments as necessary based on the most recent information and future emission projections.

Until such time the budget takes effect pursuant to this section, the carbon monoxide emissions budget for the Denver carbon monoxide attainment/maintenance area shall remain at 800 tons per day for the years 2002 and beyond. Upon approval of the emissions budget contained in this maintenance plan revision, the 800 tons per day budget shall expire.

Table 10
Proposed Motor Vehicle Emissions Budget
2013 and Beyond
Based on allocation of available safety margin

	Tons per Day	**Explanation**
Total Attainment Inventory - 2001	1911	*2001 Baseline Inventory from all sources that establishes attainment level of emissions in the attainment/maintenance area*
Estimated Area & Point Source Emissions - 2013	248	*Total estimated emissions from point and area sources in 2013*
Estimated Mobile Source Emissions - 2013	1125	*Estimated mobile source emissions in 2013 based on MOBILE6 and SIP control strategies*
Total Emission Inventory – 2013	1373	
Potential "Safety Margin" – 2013	548	*Difference between 2001 and 2013 total emission inventories*
Allowable Mobile Source Emissions - 2013	1539	*Total mobile source emissions (after subtracting 2013 area/point source emissions) that would still demonstrate attainment of the standard based upon EPA's recommended "more rigorous assessment"*
Available "Safety Margin"	414	*Difference between allowable mobile source emissions (1539 tpd) and estimated mobile source emissions (1125 tpd), which equals the available "safety margin" that may be allocated to the motor vehicle emissions budget*
Portion of "Safety Margin" reserved	19	*Portion of available "safety margin" that is reserved to account for point/area source growth and other modeling uncertainties*
"Safety Margin" assigned to motor vehicle emissions budget	395	*Difference between available "safety margin' (414 tpd) and "safety margin" reserved (19 tpd), which equals the portion of the "safety margin" assigned to the motor vehicle emissions budget*
Proposed 2013 and Beyond Motor Vehicle Emissions Budget	**1520**	*Total of estimated 2013 mobile source emissions (1125 tpd) and "safety margin" assigned to the budget 395 tpd), which establishes the motor vehicle emission budget for the maintenance year (2013) and beyond, consistent with EPA conformity regulation*

Table 11
Intersection Modeling Results Based on Allocation of Excess Emissions in Motor Vehicle Emission Budget

(Emission Budget = 1520 tons per day)

Intersection	Background ppm	CAL3QHC ppm	Total ppm
Broadway & Champa	5.00	1.47	6.47
Foothills & Arapahoe	3.98	4.97	8.95
1st & University	4.35	4.05	8.40
Hampden & University	3.52	4.83	8.35
Parker & Illiff	3.52	3.29	6.81
Arapahoe & University	3.52	4.62	8.14

F. MONITORING NETWORK / VERIFICATION OF CONTINUED ATTAINMENT

This section remains unchanged from the maintenance plan approved by EPA on December 14, 2001.

Since the Denver metropolitan area has been redesignated to attainment status by EPA, the APCD operates and continues to operate an appropriate air quality monitoring network of NAMS and SLAMS monitors in accordance with 40 CFR Part 58 to verify the continued attainment of the carbon monoxide standard. If measured mobile source parameters (e.g., vehicle miles traveled, congestion, fleet mix, etc.) change significantly over time, the APCD will perform the appropriate studies to determine whether additional and/or re-sited monitors are necessary. Annual review of the NAMS/SLAMS air quality surveillance system will be conducted in accordance with 40 CFR 58.20(d) to determine whether the system continues to meet the monitoring objectives presented in Appendix D of 40 CFR Part 58.

G. CONTINGENCY PROVISIONS

This section remains unchanged from the maintenance plan approved by EPA on December 14, 2001.

Section 175A(d) of the CAA requires that the maintenance plan contain contingency provisions to assure that the State will promptly correct any violation of the carbon monoxide standard which occurs after redesignation to attainment. Attainment areas are not required to have preselected contingency measures, and this plan removes any commitment to contingency measures contained in the 1994 Denver Carbon monoxide nonattainment SIP Element.

The contingency plan must also ensure that the contingency measures are adopted expeditiously once the need is triggered. The primary elements of the contingency plan are: 1) the list of potential contingency measures; 2) the tracking and triggering mechanisms to determine when contingency measures are needed; and 3) a description of the process for recommending and implementing the contingency measures.

The triggering of the contingency plan does not automatically require a revision of the SIP, nor is the area necessarily redesignated once again to nonattainment. Instead, the State will normally have an appropriate time-frame to correct the violation by implementing one or more of the contingency measures. In the event that violations continue to occur after contingency measures have been implemented, additional contingency measures will be implemented until the violations are corrected.

1. List of Potential Contingency Measures

Section 175A(d) of the CAA requires the Maintenance plan to include as potential contingency measures all of the carbon monoxide control measures contained in the SIP before redesignation which were relaxed or modified through the Maintenance plan. For the Denver metropolitan area, this includes the following measures:

a. A 3.1% oxygenated fuels program from November 8 through February 7, with 2.0% oxygen content required from November 1 through November 7.

b. An enhanced vehicle inspection and maintenance program as described in AQCC Regulation No. 11 prior to the modifications adopted on January 10, 2000 as part of this Maintenance plan (*approved by EPA on December 14, 2001).* .

c. Transportation control measures that were included in the 1994 attainment SIP as contingency measures, but were required to be implemented because growth in vehicle miles traveled exceeded SIP projections. These measures include transportation management associations, financial incentives for EcoPass, Auraria transit pass, and improved traffic signalization.[1]

In addition to this list of potential contingency measures, the State may evaluate other potential strategies in order to address any future violations in the most appropriate and effective manner possible.

[1]The 1994 attainment SIP also included as a potential contingency measure the conversion of the Broadway/Lincoln bus lanes to bus/HOV lanes, but this measure was never implemented due to the high volume of buses still using these lanes even after the light-rail line from Broadway and I-25 to downtown became operational.

2. Tracking and Triggering Mechanisms

- **Tracking**

The primary tracking plan for the Denver metropolitan area consists of continuous carbon monoxide monitoring by APCD as described above. APCD will notify EPA, the AQCC, the RAQC, and local governments in the Denver area of any exceedance of the carbon monoxide standard within 30 days of occurrence.

The ongoing regional transportation planning process carried out by the Denver Regional Council of Governments, in coordination with the RAQC, APCD, AQCC, and EPA, will serve as another means of tracking mobile source carbon monoxide emissions into the future.

Since revisions to the region's transportation improvement programs are prepared every two years, and must go through a transportation conformity finding, this process will be used to periodically review progress toward meeting the VMT and mobile source emissions projections in this maintenance plan.

- **Triggering**

An exceedance of the carbon monoxide standard (any value over 9.5 ppm) may trigger a voluntary, local process by the RAQC and APCD to identify and evaluate potential contingency measures. However, the only federally-enforceable trigger for mandatory implementation of contingency measures shall be a violation of the carbon monoxide standard. Specifically, a second value of 9.5 ppm or higher at the same monitor during any calendar year.

3. Process for Recommending and Implementing Contingency Measures

The State will move forward with mandatory implementation of contingency measures under the SIP if a violation (a second exceedance in a calendar year) of the carbon monoxide standard occurs.

No more than 60 days after being notified by the APCD that a violation of the carbon monoxide standard has occurred, the RAQC, in coordination with the APCD and AQCC, will initiate a subcommittee process to begin evaluating potential contingency measures. The subcommittee will present recommendations to the RAQC within 120 days of notification and the RAQC will present recommended contingency measures to the AQCC within 180 days of notification.

The AQCC will then hold a public hearing to consider the contingency measures recommended by the RAQC, along with any other contingency measures the Commission believes may be appropriate to effectively address the violation. The necessary contingency measures will be adopted and implemented within one year after a violation occurs.

H. SUBSEQUENT MAINTENANCE PLAN REVISIONS

As stated earlier, it is required that a maintenance plan revision be submitted to the EPA eight years after the original redesignation request/maintenance plan is approved. The purpose of this revision is to provide for maintenance of the NAAQS for an additional ten years following the first ten-year period. The State of Colorado commits to submit a revised maintenance plan eight years after

redesignation to attainment, as required by the CAA and EPA. Based upon EPA's approval of the maintenance plan on December 14, 2001, a revised maintenance plan demonstrating maintenance for an additional 10-year period will be required no later than December 2009.

The RAQC and the State anticipates conducting a comprehensive reevaluation of control strategies with MOBILE6.2 and revising this plan within the next two years.