

National Capital Region Transportation Planning Board

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MEMORANDUM

June 11, 2009

To: Transportation Planning Board

From: Jane Posey
Senior Transportation Engineer

Subject: Air Quality Conformity Assessment for the 2009 Update of the Constrained Long Range Plan (CLRP) and FY2010-2015 Transportation Improvement Program (TIP)

INTRODUCTION

This memo documents summary results of the air quality conformity assessment of the 2009 CLRP and the FY2010-2015 TIP with respect to ozone season and fine particle (PM_{2.5}) pollutants, and wintertime carbon monoxide (CO). The results have been presented to the TPB Technical Committee for review and comment. A public comment period for the Plan, TIP, and conformity assessment begins at the June 11, 2009 TPB Citizens Advisory Committee meeting and ends on July 11, 2009.

Conformity assessment criteria vary by pollutant. Tests include adherence to mobile source emissions budgets in the case of ozone season pollutants (VOC and NO_x) and CO, and a demonstration that forecast year PM_{2.5} (including both directly emitted PM_{2.5} and precursor NO_x) emissions are not greater than base year 2002 emissions. One hour ozone precursor mobile emissions budgets are taken from the Metropolitan Washington Air Quality Committee (MWAQC)'s Severe Area State Implementation Plan (SIP) (1-hour ozone non-attainment area) document, Plan to Improve Air Quality in the Washington, DC-MD-VA Region, February 19, 2004. In addition, in 2007 MWAQC completed the development of the 8-hour ozone SIP with new mobile emissions budgets, which also correspond to a different geographic area (relevant planning areas are shown in Exhibit 1). Similarly, in March 2008 MWAQC approved, and the state air agencies subsequently submitted to EPA, the region's PM_{2.5} Attainment Plan. Adherence to both the 8-hour ozone and PM_{2.5} budgets is also documented in this report, even though EPA has not yet acted upon them.

BACKGROUND

On February 18, 2009 the TPB approved the scope of work and the project submissions for inclusion in the conformity analysis for the year 2009 update of the CLRP and FY2010-2015 TIP. Key technical inputs to the analysis included: Round 7.2 Cooperative Forecasts; the Version 2.2 Travel Demand Model utilizing the new project submissions and reflecting updated transit service; and EPA's Mobile6.2 Emissions Factor Model with use of new 2008 vehicle registration data for all jurisdictions.

Staff proceeded with the technical analyses described below to ascertain whether the draft plan and program would meet the specific conformity criteria.

WORK ACTIVITIES

Technical work activities for the conformity assessment of the 2009 CLRP and FY2010-2015 TIP included the preparation of volatile organic compound (VOC), nitrogen oxide (NO_x), PM_{2.5}, and wintertime carbon monoxide (CO) emissions inventories for specified forecast years associated with the plan and program (forecast years: 2010, 2020 and 2030). While ozone season pollutants (VOC and NO_x) and wintertime CO are inventoried for average weekday conditions, precursor NO_x and direct PM_{2.5} are inventoried to reflect emissions on a yearly total basis. Accordingly, staff applied seasonal adjustment factors to convert daily travel (annual average weekday traffic or AAWDT) to annual values.

These inventories address a primary conformity assessment criterion to demonstrate that emissions associated with the plan and program adhere to the established mobile source emissions levels. In anticipation of possible emissions increases associated with implementation of the plan and program, staff (in conjunction with the TPB Technical Committee and its Travel Management Subcommittee) conducted parallel analyses of committed and potential new transportation emissions reduction measures (TERM)s, and documented emissions benefits for each analysis year.

Plan Amendments and Program Elements

There have been some new projects and changes advanced for the CLRP / TIP in this year's approval cycle. Attachment A presents an excerpt from the February 8, 2009 TPB item listing the major changes to the conformity project inputs since the 2008 CLRP and the FY2009-2014 TIP.

Land Activity Forecasts

On January 14, 2009 COG's Metropolitan Development Policy Committee approved Round 7.2 Cooperative Forecast totals to be used for testing purposes in analysis of the CLRP and TIP. The Round 7.2 data, summarized in Attachment B, reflect not only the forecast small area land use distributions throughout the Washington area, but also the latest planning assumptions for areas outside the Washington region. For example, the Baltimore land use input to Round 7.2 reflects the Baltimore Metropolitan Council's 'Round 7-A' adopted figures, whereas their previous input to the COG Round 7.1 forecasts was their 'Round 7' figures.

Travel Modeling Process

For this conformity analysis staff used TPB's travel demand model, Version 2.2, with updated tolling processes and a modified post-processor. Using the Version 2.2 model, COG/TPB staff prepared travel demand forecasts for each of the required forecast years. Exhibit 1 presents the geographic areas for travel modeling and for emissions reporting for each non-attainment area. Exhibit 2 presents the resulting average weekday transit trips, vehicle trips, and vehicle miles traveled (VMT) results through time for each conformity analysis year, for the full modeled area.

Emissions Factors

Staff developed motor vehicle emissions factors through execution of EPA's MOBILE6.2 emissions factor model. This year's factors were updated to reflect the new 2008 vehicle registration data, which were developed using VIN decoder software. The 2008 registration data show an increase in

the number of hybrid vehicles and a decrease in the rate of SUV purchases. Both trends tend to reduce emissions. However, the data also show that fewer new vehicles are being purchased, which results in an aging of the region's vehicle fleet. The older fleet increases emissions, and has a greater impact than the trends reducing emissions, thus resulting in an overall increase in emission factors.

The emission factors also include the use of the Maryland Department of the Environment's (MDE) data reflecting the adoption of Phase I of California's Low-Emission Vehicle II (LEV II) program in Maryland. These data include the reduction in ozone season pollutants expected from the adoption of this program. These rates for each pollutant, shown using Fairfax County data as an illustration in Exhibits 3 and 4, were developed following execution of the model in one mph speed increments, by jurisdiction, for each analysis year. The chart shows significantly reduced rates through time, primarily due to the impacts of having cleaner fuel and vehicles in the fleet. Exhibit 5 presents direct PM_{2.5} emissions rates through time for each of the three seasons; data are arrayed in a bar chart since these emissions rates do not vary by vehicle speed.

Post Processor

The Post Processor was revised to reflect the Version 2.2 model table lookup speeds and capacities, and speed flow relationship. The Post Processor now better reflects speeds observed in travel time studies within the region.

Emissions Analyses

Mobile Emissions Inventories

Ozone Season and Wintertime CO – Daily Emissions

Prior to calculation of daily mobile source emissions, the above (AAWDT) travel forecasts produced through the travel demand modeling process were first factored by seasonal adjustments (a 1.05 ozone season factor or a 0.97 winter season factor) to yield VMT appropriate to each season being analyzed. Staff then applied the appropriate Mobile6.2 emissions factors to the travel demand forecasts to prepare mobile source emissions inventories for each forecast year. These emissions results for ozone season pollutants are summarized in Exhibits 6 - 9 and indicate total VOC and NO_x emissions for each analysis year. The charts show dramatic reductions throughout the period. Historical emissions reductions from the clean air act amendments 1990 base have been well documented in the past; 2030 VOC and NO_x emissions represent about 13 percent and less than 10 percent, respectively, of their 1990 levels. The results reflect the impact of the cleaner fuel / fleet and related programs, in conjunction with slowing VMT growth rates through time.

The 2010 emissions forecasts are much closer to the budget levels than in recent analyses. This is due to an increase in emission factors that reflects the region's aging fleet, as reported in the 2008 vehicle registration data. An increase in emissions due to the older vehicle fleet is offset somewhat by a decrease in vehicle miles traveled (VMT). This VMT decrease is associated with lower households and job forecasts in the Round 7.2 Cooperative Forecasts, as compared to Round 7.1 for 2010, and the deferral of some highway and transit projects beyond 2010. However, the overall effect is an emissions increase that severely diminished the "adherence margin" for emission budgets for the 2010 forecast year.

PM_{2.5} – Yearly Emissions

To develop the yearly total PM_{2.5} emissions, travel and emissions were estimated throughout the year by applying (three) seasonal factors to the primary travel data, followed by applying emissions rates for each of the seasons, and summarizing to obtain yearly totals. Direct PM_{2.5} and precursor NO_x emissions, shown in the Exhibit 10 bar chart, exhibit similar dramatic reductions through time despite increases in vehicle trips and VMT in the forecast years. These reductions are also largely attributable to Tier II vehicle standards, cleaner fuels, and the heavy duty engine rule, and continue to generate additional emissions reductions through time as fleet turnover replaces older vehicles / truck engines with much cleaner ones. As with the ozone season emissions, the effects of the older vehicle fleet are reflected as higher PM_{2.5} emissions compared to last year.

Plan and Program Emissions Versus Emissions Budgets

Reference to Exhibits 6-10 provides a comparison of emissions levels associated with the CLRP and TIP to the maximum allowable for each pollutant. Net emissions for each forecast year are shown in comparison to emissions budgets, and are seen to be within the mobile budgets for all forecast years. Wintertime CO emissions (contained in a full technical report but not summarized here) follow these same general trends and are easily within the CO emissions budget level.

Exhibit 10 shows that both direct PM_{2.5} and precursor NO_x emissions are much lower than base year 2002 conditions and are within the new mobile budgets, for all forecast years, satisfying this additional conformity assessment criterion for PM_{2.5}. In view of the fact that estimated emissions are within the required mobile source emission levels for each pollutant, no additional transportation emissions reduction measures are required to demonstrate conformity.

Net Emissions Analysis

The emissions inventory data contained in Exhibits 6-10 reflect total mobile source network and off-network emissions. However, there are also emissions benefits associated with certain other transportation programs and projects. These benefits, estimated on an off-line basis, are also creditable in conformity analyses. Attachment C represents a summary table of these transportation emissions reduction measures, or TERMS, which have been previously planned or programmed by the TPB. They are arrayed in a 'Tracking Sheet' format to document the implementation status of each, with part A of the table documenting ozone season and part B documenting PM_{2.5} pollutants. The summary result of these measures, shown as the bottom line for each section of the table, amounts to additional reductions in 2010 of better than 2 tons per day of VOC and almost 5 tons per day of NO_x, and approximately 25 and 1260 tons per year of direct PM_{2.5} and precursor NO_x, respectively. Only those projects which have been affirmed by the implementing agency as having been completed, or are on a realistic schedule towards implementation, are being credited in this emissions analysis. Combining the emissions results in Exhibits 6-10 with the additional reductions from TERMS would further improve the emissions margins for each pollutant.

SUMMARY

The analytical results described in this air quality assessment provide a basis for a determination by the TPB of conformity of the 2009 CLRP and the FY2010-2015 TIP.

Following: Exhibits 1-10
Attachments A - C

EXHIBIT 1

Washington, D.C. - Maryland - Virginia Planning Areas

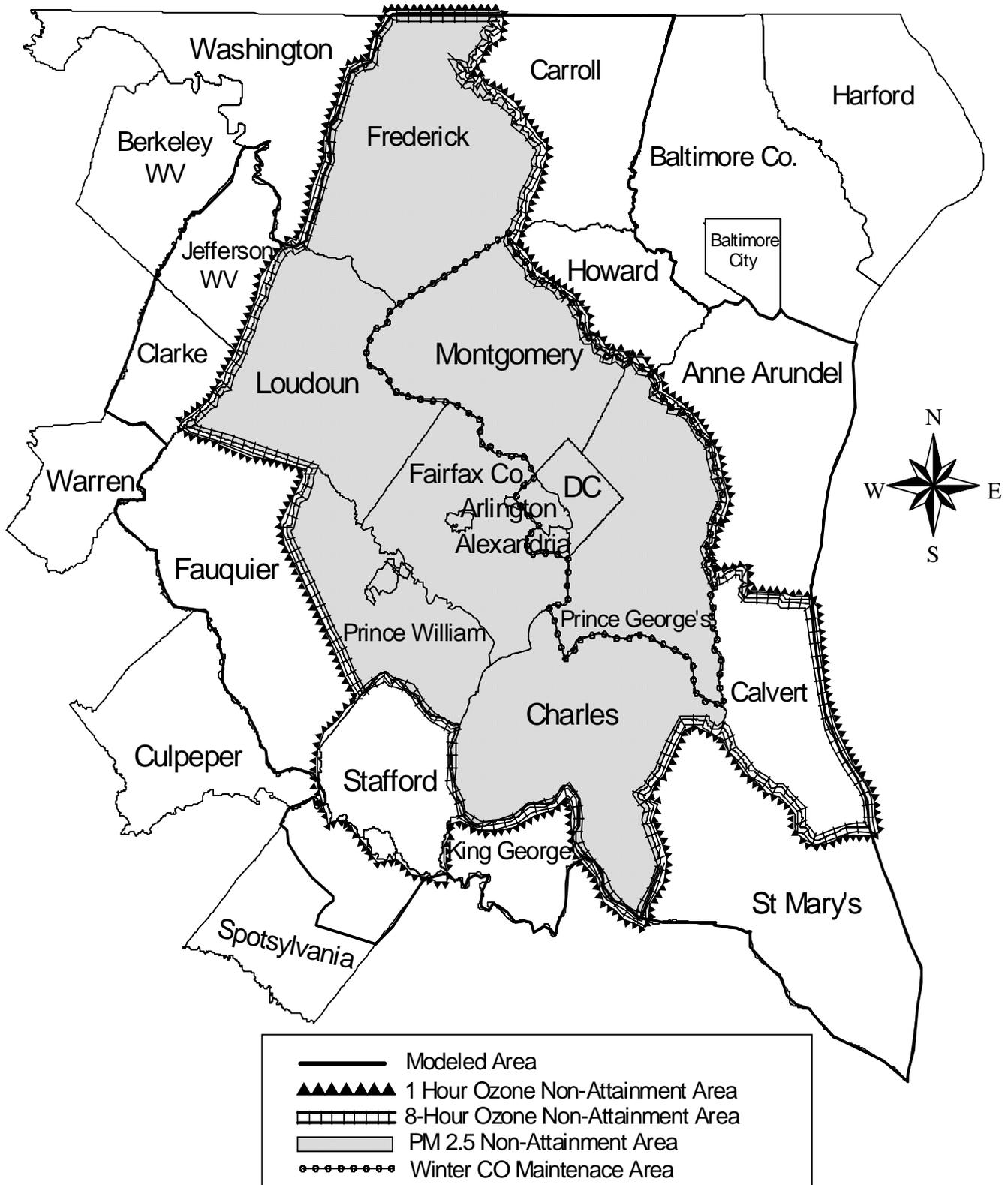


Exhibit 2

Travel Demand Summary Modeled Area Trips and Vehicle Miles Traveled (000's) Average Weekday Traffic (AWDT)

	<u>2002</u>	<u>2010</u>	<u>2020</u>	<u>2030</u>
Transit Trips	1,055.7	1,161.9	1,518.4	1,652.0
Vehicle Trips	19,535.7	22,092.7	24,906.9	27,287.1
VMT	145,504.9	160,913.4	182,831.8	197,574.5

Adjustment Factors to Convert AWDT to Appropriate Season:

Ozone Season AWDT: 1.05

Winter Season AWDT: 0.97

PM2.5 Annual:

Season (ADT)	Factor
Season 1 (Jan- Apr)	0.9216
Season 2 (May- Sept)	0.9873
Season 3 (Oct- Dec)	0.9282

NOTE: AWDT reflects a five day average
ADT reflects a seven day average

Exhibit 3

2002-2030 VOC COMPOSITE MOBILE6.2 ARTERIAL RUNNING EMISSION RATES FOR FAIRFAX COUNTY

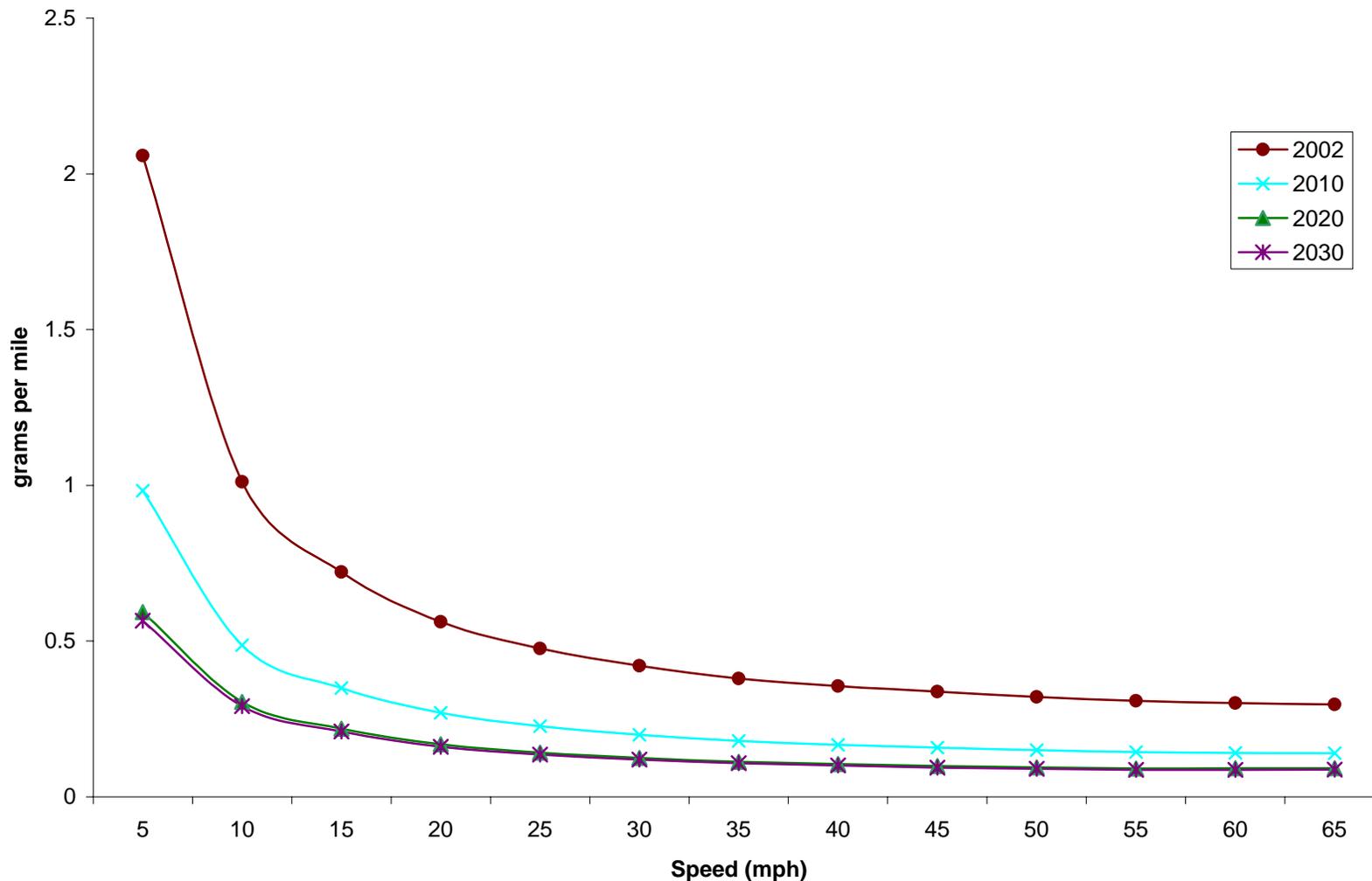


Exhibit 4 2002-2030 NOx COMPOSITE MOBILE6.2 ARTERIAL RUNNING EMISSION RATES FOR FAIRFAX COUNTY

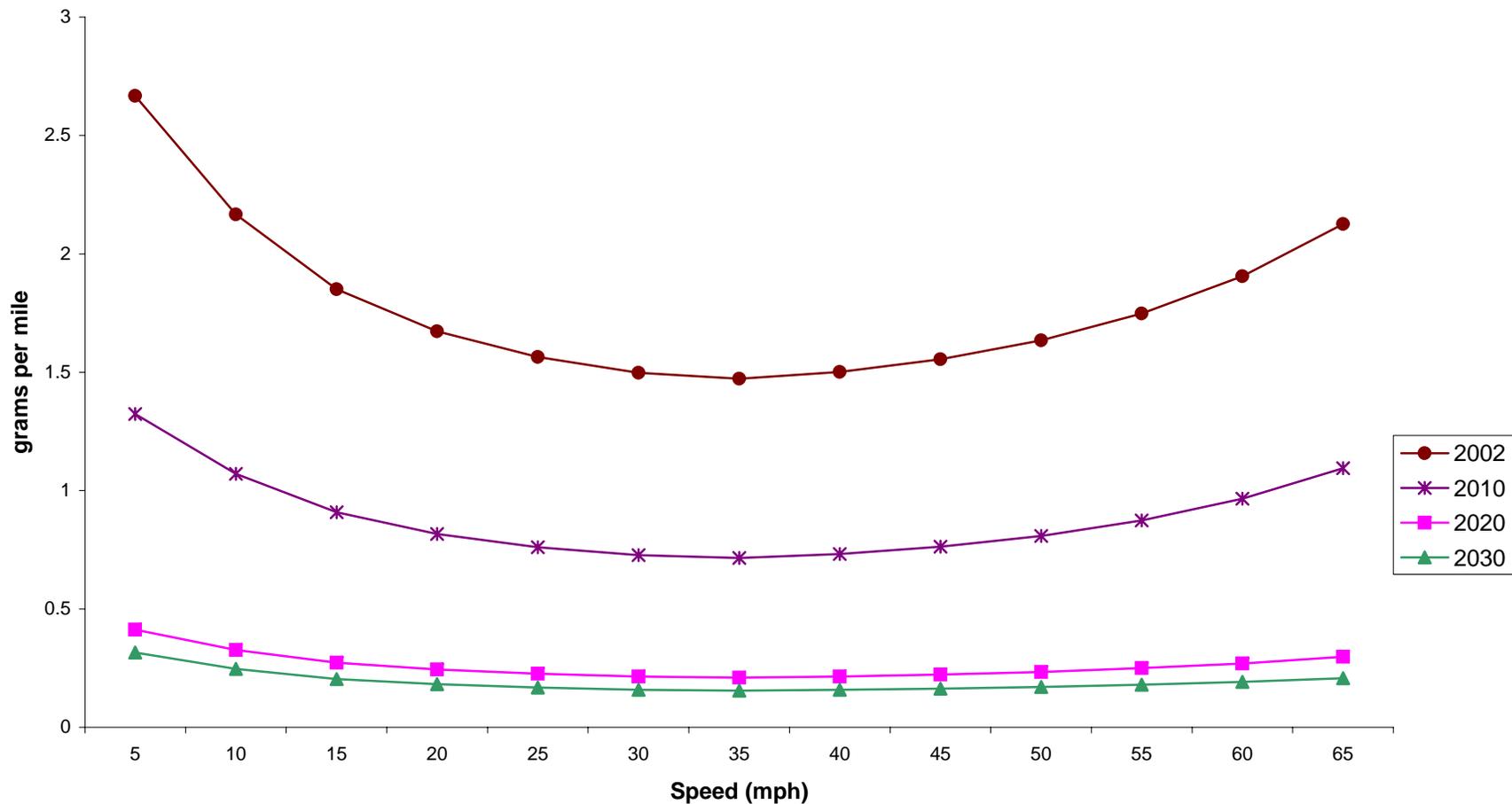


Exhibit 5 DIRECT PM_{2.5} EMISSION RATES FOR FAIRFAX COUNTY (MAJOR ROADS NETWORK)

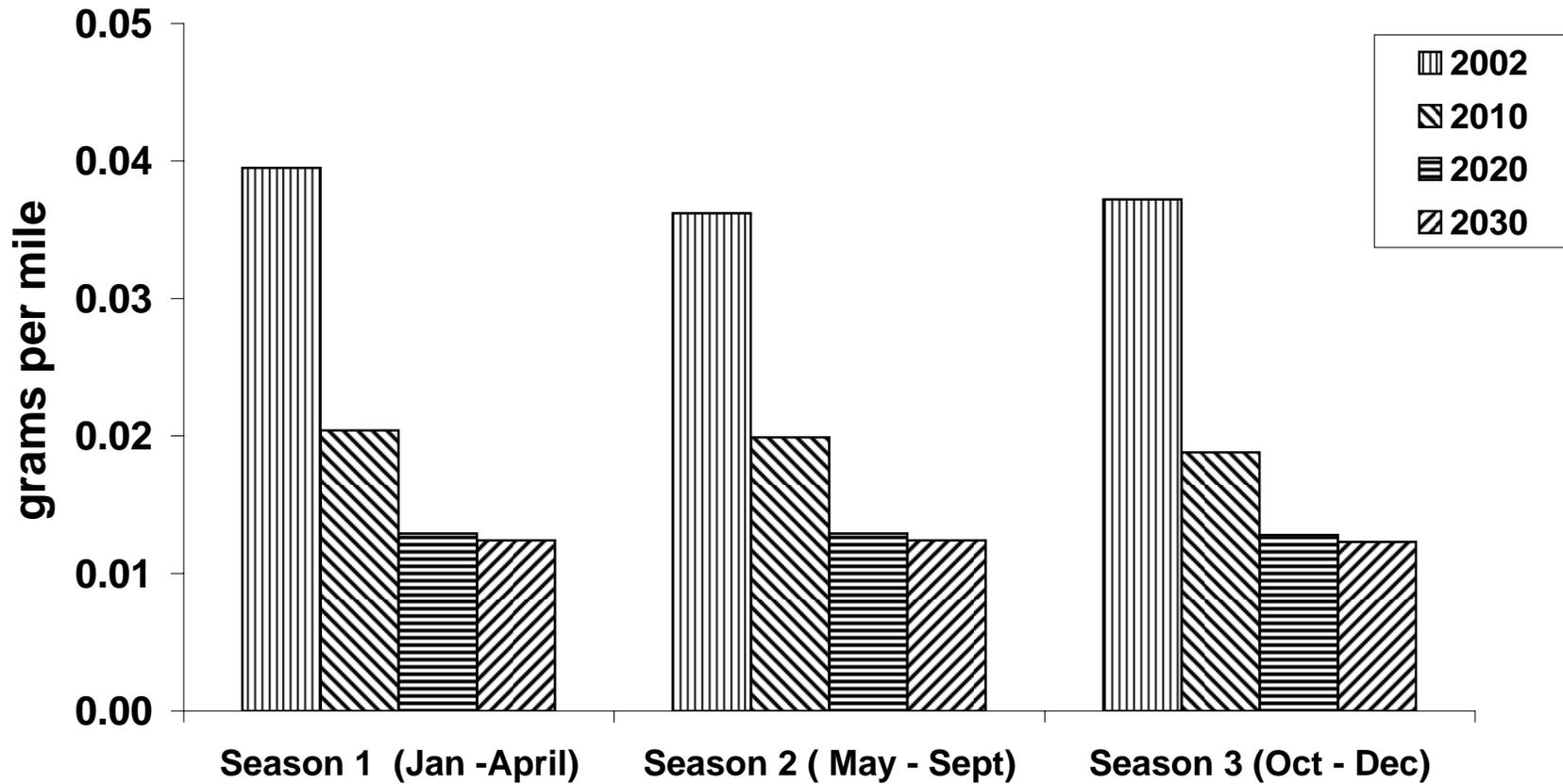


EXHIBIT 6

Mobile Source VOC Emissions for the 1-Hour Ozone Nonattainment Area 2009 CLRP and FY 2010-2015 TIP

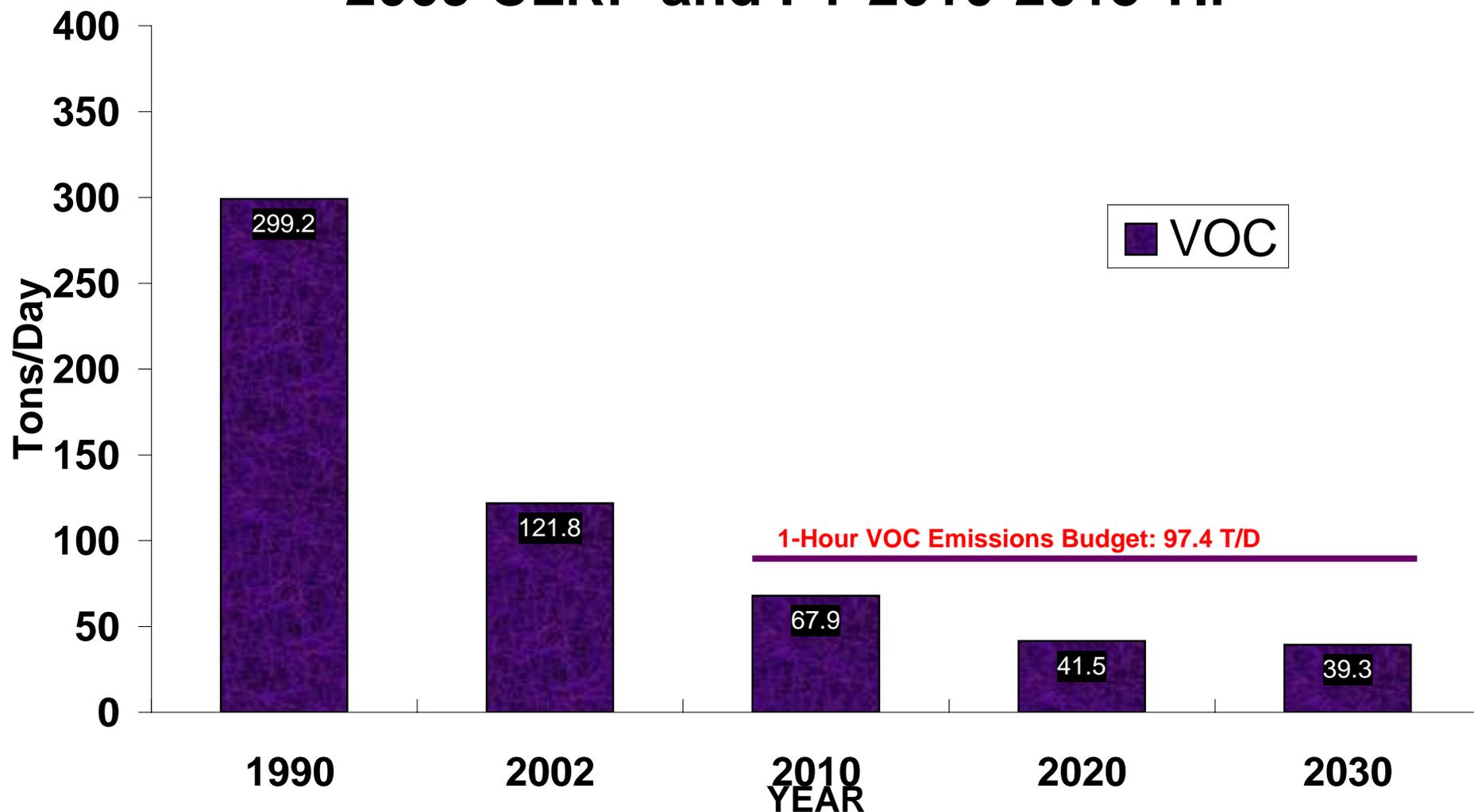


EXHIBIT 7

Mobile Source NOx Emissions for the 1-Hour Ozone Nonattainment Area 2009 CLRP and FY 2010-2015 TIP

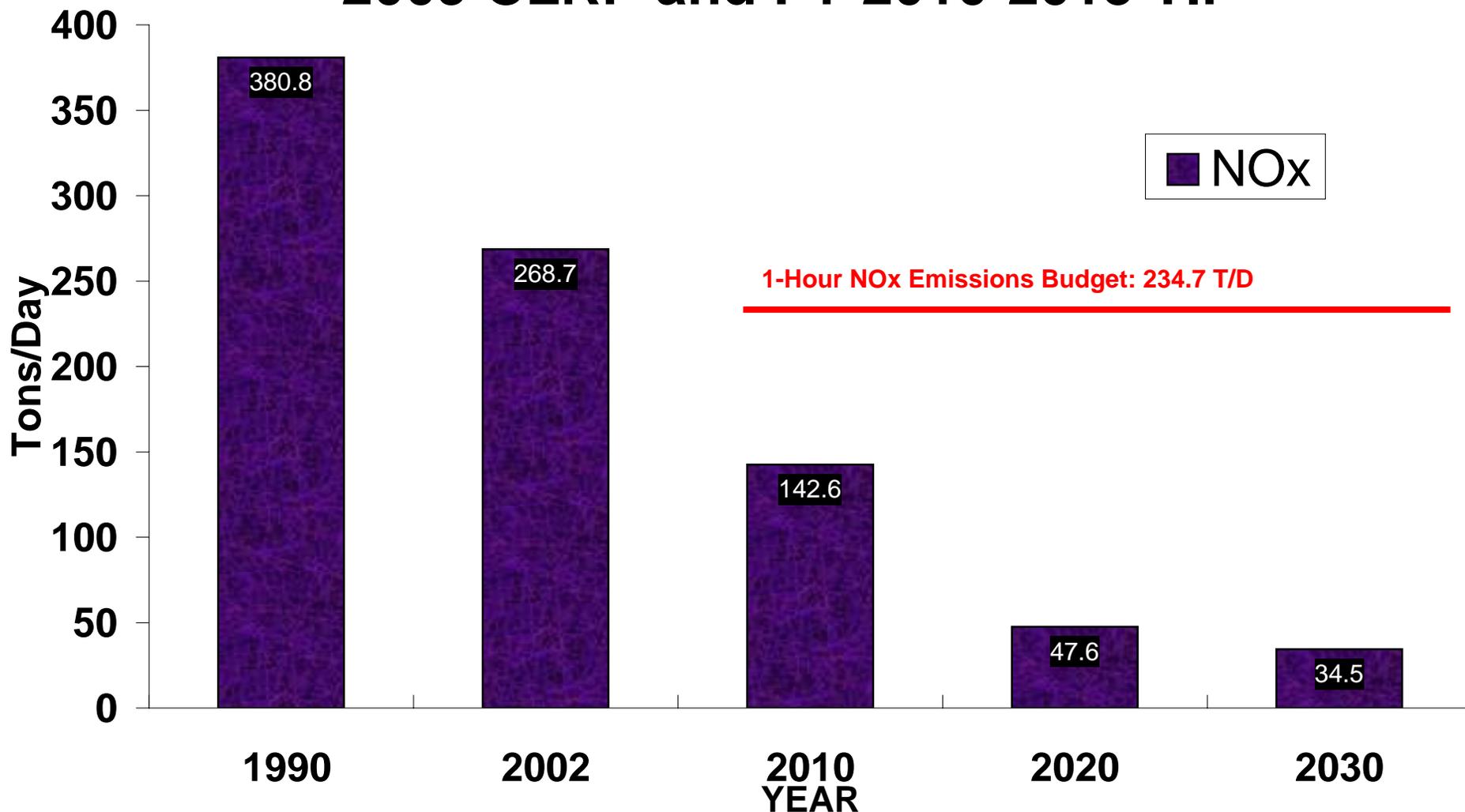


EXHIBIT 8

Mobile Source VOC Emissions for the 8-Hour Ozone Nonattainment Area 2009 CLRP and FY 2010-2015 TIP

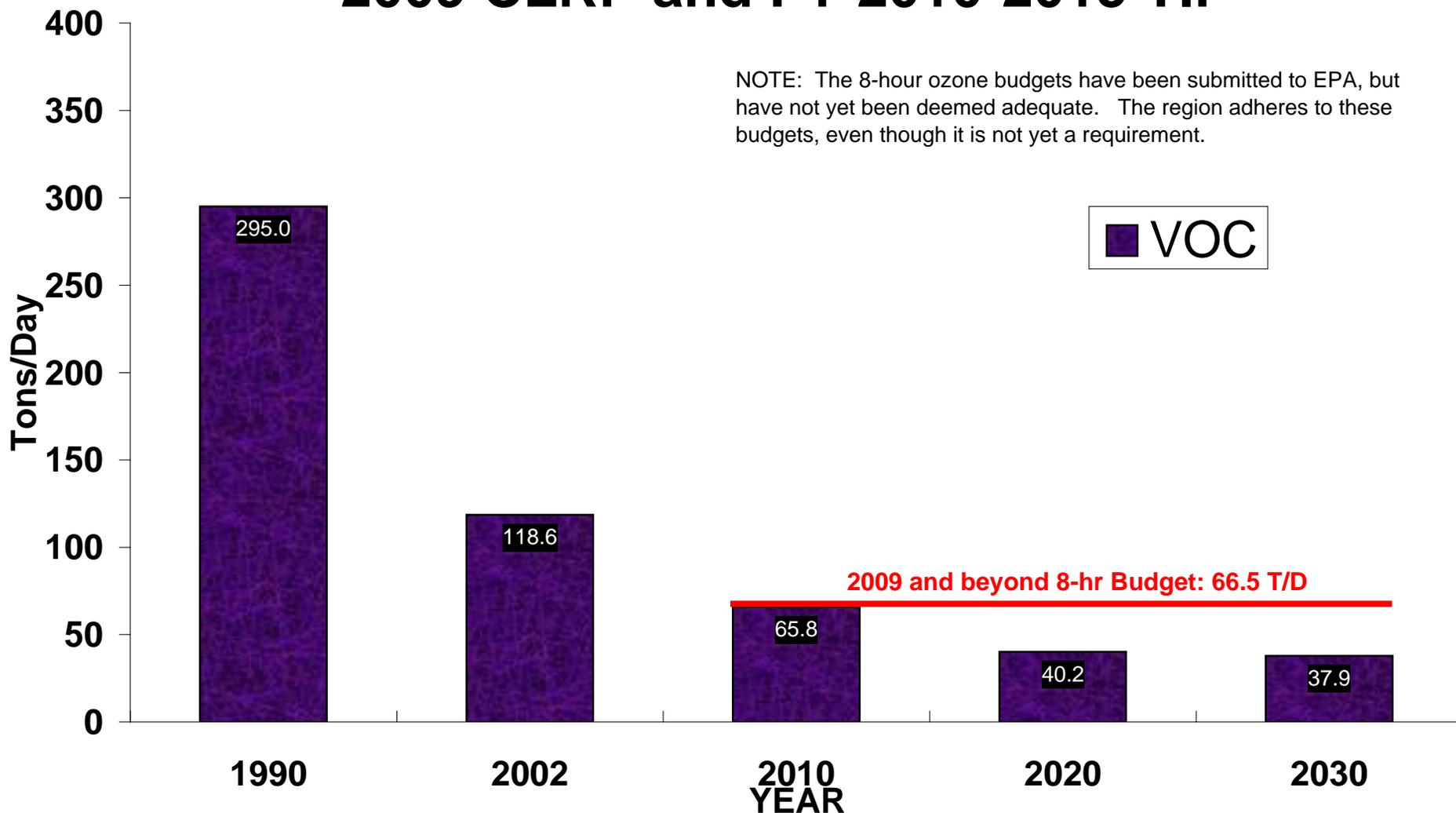


EXHIBIT 9

Mobile Source NOx Emissions for the 8-Hour Ozone Nonattainment Area 2009 CLRP and FY 2010-2015 TIP

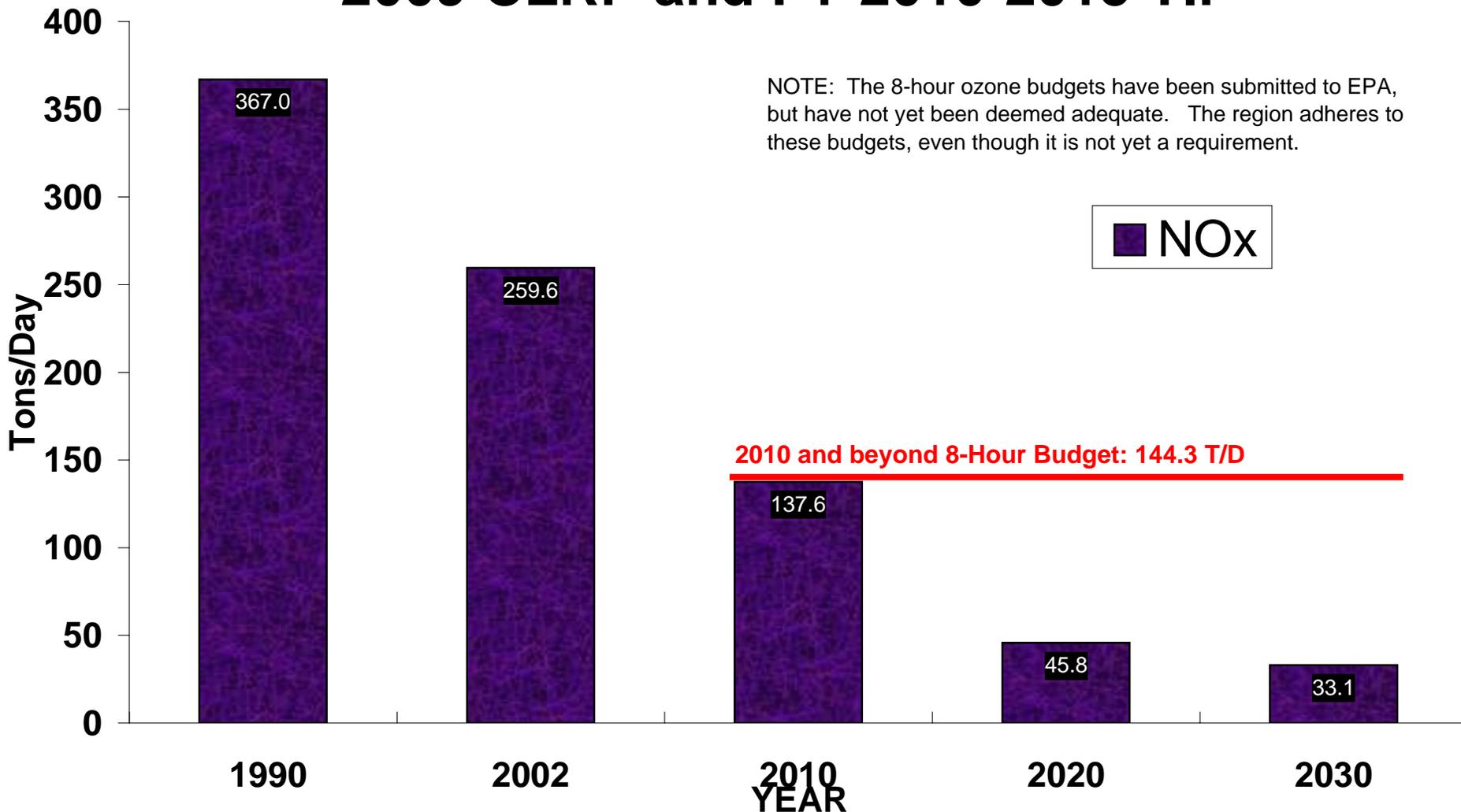


Exhibit 10
Mobile Source Emissions
2009 CLRP and FY 2010-2015 TIP
PM_{2.5} Direct and Precursor NOx



NOTE: The PM_{2.5} budgets have been submitted to EPA, but have not yet been deemed adequate. The region adheres to these budgets, even though it is not yet required.

