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Chicago 8-Hour Ozone and $PM_{2.5}$ Maintenance Plan
Transportation Conformity
Motor Vehicle Emissions Budget Documentation

TRANSPORTATION CONFORMITY

This section describes the development of the Chicago nonattainment area motor vehicle emissions budgets associated with the revised Maintenance Plans for the 1997 8-hour ozone and fine particulate ($PM_{2.5}$) National Ambient Air Quality Standards (NAAQS). For the Ozone NAAQS, average summer weekday motor vehicle emissions budgets are being proposed for the attainment year 2008 and for the Maintenance Plan end year 2025 for the ozone precursor pollutants volatile organic material (VOM) and oxides of nitrogen (NOx). These budgets were developed consistent with the motor vehicle activity assumptions and emissions control strategies incorporated into the Chicago 8-hour ozone Attainment Demonstration analysis and associated Reasonable Further Progress demonstration as well as the original 8-hour ozone NAAQS Maintenance Plan developed and submitted to the U.S. EPA in 2010.

For the $PM_{2.5}$ NAAQS, annual motor vehicle emissions budgets are being proposed for the attainment year 2008 and for the Maintenance Plan end year 2025 for direct $PM_{2.5}$ and particulate matter precursor NOx. These budgets were developed consistent with the motor vehicle activity and emissions control strategies incorporated into the Chicago PM2.5 Maintenance Plan submitted to the U.S.EPA in 2010.

The enclosed budgets were developed using the inventory method of the United States Environmental Protection Agency's (U.S.EPA) MOVES2010 (MOVES) model. The MOVES model incorporates local inputs such as annual vehicle miles of travel, vehicle fleet characteristics, meteorological conditions and vehicle and fuel emission control programs.

Background

Section 176(c)(4) of the Clean Air Act Amendments of 1990 requires that transportation plans, programs, and projects which are funded or approved under Title 23 of the United States Code (USC) must be determined to conform with State or Federal air implementation plans. A motor vehicle emissions budget is that portion of the total allowable emissions allocated to highway and transit vehicle use that are defined in the implementation plan for a certain year. Section 93.101 of the rule defines a "control strategy [State] implementation plan revision" as a "plan which contains specific strategies for controlling the emissions and reducing ambient levels of pollutants in order to satisfy Clean Air Act (CAA) requirements of reasonable further progress and attainment." In order to demonstrate conformity to the motor vehicle emissions budget, emissions from the implementation of a transportation plan or a transportation improvement program (TIP) must be less than or equal to the budget level (40 CFR § 93.118(a)).

Transportation conformity will be determined based on these proposed on-road motor vehicle emissions budgets after the U.S. Environmental Protection Agency (U.S. EPA) determines that the budgets meet the adequacy criteria of the transportation conformity rule under §93.118(e). The motor vehicle emissions budgets in this submittal are adequate as each of the six criteria under §93.118(e) is satisfied. These six criteria include:

1. The submitted control strategy implementation plan revision or Maintenance Plan was endorsed by the Governor (or his or her designee) and was subject to a State public hearing.

2. Before the control strategy implementation plan or Maintenance Plan was submitted to U.S. EPA, consultation among federal, State, and local agencies occurred; full implementation plan documentation was provided to U.S. EPA; and U.S. EPA's stated concerns, if any, were addressed;

3. The motor vehicle emissions budgets(s) is clearly identified and precisely quantified;

4. The motor vehicle emissions budget(s), when considered together with all other emissions sources, is consistent with all applicable requirements for reasonable further progress, attainment, or maintenance (whichever is relevant to the given implementation plan submission);

5. The motor vehicle emissions budget(s) is consistent with and clearly related to the emissions inventory and the control measures in the submitted control strategy implementation plan revision or Maintenance Plan, and

6. Revisions to previously submitted control strategy implementation plans explain and document any changes to previously submitted budgets and control measures, impacts on point and area source emissions; any changes to established safety margins; and reasons for the changes (including the basis for any changes related to emissions factors or estimates of vehicle miles traveled).

This State Implementation Plan (SIP) and the associated motor vehicle emissions budgets have been developed by the Illinois Environmental Protection Agency (Illinois EPA), the designated air quality agency for the State of Illinois. The required public hearing to accept public comment on the proposed 8-hour ozone Maintenance Plan and associated motor vehicle emissions inventory was held on December 16, 2008 in Room 9-031 of the James R. Thompson Center in downtown Chicago. Notification of this hearing was printed in the Chicago Sun Times on November 15, 2008. Comments on the proposed attainment demonstration and motor vehicle emissions budgets were accepted for 30 days after the public hearing. A "Responsiveness Summary" which addresses the written comments received was prepared and is included in the final submission.

Notification of the revised 8-hour ozone Maintenance Plan and associated MOVES-based motor vehicle emissions budgets will be placed in local area newspapers and on the Illinois EPA's web site. Comments will be accepted for 30 days. A public hearing will be held if requested. All comments will be addressed in a "Responsiveness Summary" which will be included in the final submission to the U.S. EPA.

In compliance with criterion #2 above, a Tier 2 Conformity Consultation Team meeting was held on January 30, 2009 to discuss the proposed 8-hour zone Maintenance Plan and associated motor vehicle emissions budgets. The Consultation Team includes representatives from the Federal Highway Administration, Federal Transit Authority, U.S. EPA, Chicago Metropolitan Agency for Planning, Illinois Department of Transportation (IDOT), Regional Transportation Authority, and the Illinois EPA. In addition, the development of the Maintenance Plan was discussed at

length by the LADCO Project Team, which includes a representative from the U.S. EPA Region V office. The draft Maintenance Plan was also forwarded to the Region V representative for his review and comment. A follow-up meeting of the Tier 2 Conformity Consultation Team to discuss the revised MOVES-based motor vehicle emissions budgets will be held at the offices of the Chicago Metropolitan Agency for Planning on June 28, 2011.

The required public hearing to accept public comment on the proposed PM2.5 Maintenance Plan and associated vehicle emissions inventory was held at 1:00 PM, on July 14, 2010 in Room 9-040 of the James R. Thompson Center in downtown Chicago. Notification of this hearing was printed in the Chicago Sun Times on June 11, 2010. Comments on the proposed attainment demonstration and motor vehicle emissions budgets were accepted for 30 days after the public hearing. A "Responsiveness Summary" which addresses the comments received was included in the final submission.

In compliance with adequacy criterion #2, an interagency consultation meeting was held with members of the CMAP Tier 2 Consultation Team on June 25, 2010 in Chicago. At this meeting, the Illinois EPA representative discussed the requirements for the maintenance plan as they relate to transportation conformity and explained the derivation of the proposed motor vehicle emissions budgets. A follow-up meeting of the Tier 2 Conformity Consultation Team to discuss the revised MOVES-based motor vehicle emissions budgets will be held at the offices of the Chicago Metropolitan Agency for Planning on June 28, 2011.

The motor vehicle emissions budgets proposed and described herein were, in compliance with adequacy criterion #5, developed consistent with the methodology and control strategy assumptions used in the Chicago 1997 8-hour Ozone Attainment Demonstration and associated Reasonable Further Progress (RFP) plan. The effects of these controls are incorporated into the emissions estimates produced by the MOVES model. In response to adequacy criteria #4 and #6, the narrative of the Chicago 8-hour Ozone and $PM_{2.5}$Maintenance Plan discusses the emissions estimates from other sectors and any changes in regulations. Following, in response to adequacy criteria #3, is a discussion of the inputs and assumptions incorporated into the development of the proposed Maintenance Plan motor vehicle emissions budgets.

Vehicle Miles Traveled: The proposed Chicago 8-hour Ozone Maintenance Plan attainment year 2008 motor vehicle emissions budgets were developed using actual annual 2008 county-level vehicle miles travelled (VMT) data from the IDOT. The 2008 annual VMT for the 6-county, three township Chicago 8-hour ozone nonattainment area was 58.76 billion miles. This figure was projected to the Maintenance Plan end year, 2025, using an annual growth rate of 1.5 percent, yielding an annual VMT of 75.68 billion. These annual VMT figures are inputs to the MOVES model and are converted to summer weekday levels.

Meteorological Data: U.S. EPA guidance for the use of the MOVES model requires the use of local temperature and absolute humidity data. Average 2008 maximum and minimum monthly temperatures for the region were obtained from the National Weather Service observations for O'Hare International Airport. Corresponding absolute humidity levels were

determined for the observed temperatures. These 2008 temperatures and absolute humidity values, identified below, were used in the year 2025 emissions modeling.

2008 Minimum and Maximum Temperatures for Chicago, from O'Hare NWS Data												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Min, (^{o}F)	15	16	27	39	45	61	64	64	57	47	32	14
Max, (^{o}F)	32	30	43	60	66	81	84	82	75	62	46	32

2008 Absolute Humidity Corresponding to the Temperatures Above												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
AH, grains/lb	17	14	21	34	41	73	83	74	71	39	25	15

Motor Vehicle Emissions Controls: Beyond the U.S. EPA's federal motor vehicle control program emissions standards, the primary local motor vehicle emissions control programs that were in place in the Chicago NAA in 2008, and are projected to still be required in 2025 are a vehicle inspection and maintenance (I/M) program and the required use of reformulated gasoline (RFG).

Inspection and Maintenance (I/M): The Illinois I/M program in effect since 2007 requires biennial On-Board Diagnostics II (OBD) testing on all model year (MY) 1996 and newer (MY96+) light-duty gasoline vehicles, and biennial exhaust idle and gas cap testing on MY96+ heavy duty gasoline vehicles including gasoline-powered buses, registered in the I/M testable area. Motorcycles and diesel vehicles are not subject to I/M. The program includes a 4-year grace period for new vehicles. This post-2007 I/M program was established when the Illinois legislature amended the Illinois Vehicle Inspection law in 2005 to (a) end dynamometer testing of vehicles, (b) require an OBD-based program beginning in February 2007, and (c) remove the requirement for testing compliant pre-MY96 vehicles.

The Chicago vehicle testing domain includes the urbanized areas in the Chicago NAA. An "I/M Coverage" percentage was developed based on the amount of VMT from vehicles subject to the inspection program compared to total area VMT. The I/M Coverage percentage for the Chicago 8-hour ozone NAA is 91.5%.

Fuels: The use of federal RFG has been required in the Chicago NAA since 1995. The 8-hour ozone Attainment Demonstration and original Maintenance Plan assumed the use of northern grade RFG in 2008 and beyond. RFG was assumed to contain 10% ethanol.

> **Gasoline Sulfur:** The federal Tier 2 regulations require gasoline sulfur levels to average no greater than 30 parts per million (ppm) with a maximum of 80 ppm beginning in 2007. There are no Illinois gasoline sulfur requirements, therefore, the MOVES default gasoline sulfur levels were used in the emissions modeling.
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> **Diesel Sulfur:** The federal Tier 2 regulations limit the level of sulfur in diesel fuel

requiring on- highway diesel fuel to 15 ppm beginning in 2006. There are no Illinois diesel sulfur requirements, therefore, the MOVES default diesel sulfur levels were used in the emissions modeling.

Fuel Volatility: The volatility of summer RFG, measured as Reid vapor pressure (RVP), is not specifically regulated. However, a fuels' RVP is one of the primary characteristics controlled by refiners in order to meet the RFG performance standards. The MOVES model contains default RVP levels for different seasons of the year based on fuel compliance testing. Therefore, the MOVES default RVP levels were used in the emissions modeling.

Registration Distribution: A Chicago area-specific vehicle registration distribution profile based upon 2008 information data was developed by Illinois EPA's Division of Mobile Source Programs from data provided by the Illinois Secretary of State's Department of Motor Vehicles. This profile is assumed to remain valid for 2025.

Safety Margin

The U.S. EPA's transportation conformity regulations allow for the use of a safety margin in the development of motor vehicle emissions budgets for Maintenance Plans. A Safety Margin is defined as "the amount by which the total projected emissions from all sources of a given pollutant are less than the total emissions that would satisfy the applicable requirement for reasonable further progress, attainment, or maintenance."

8-hour ozone Maintenance Plan

According to table 4.6, VOM and NOx emissions for the end of the maintenance plan year 2025 are 175.60 and 469.65 tons per day, respectively, less than the year 2008 attainment year levels. As year 2025 emissions levels are projected to be substantially less than the attainment year 2008 emissions, a 15% safety margin is being proposed to be added to the 2025 estimated motor vehicle emissions to make up the motor vehicle emissions budget. The 15% increase would equate to an increase of 6.28 tpd of VOM and 16.34 tpd of NOx.

PM2.5 Maintenance Plan

According to table 4.6, PM2.5 and NOx emissions for the end of the maintenance plan year 2025 are 2,484 and 118,437 tons per year, respectively, less than the year 2008 attainment year levels. As year 2025 emissions levels are projected to be substantially less than the attainment year 2008 emissions, a 15% safety margin is being proposed to be added to the 2025 estimated motor vehicle emissions to make up the motor vehicle emissions budget. The 15% increase would equate to an increase of 310 tpy of PM2.5 and 5,768 tpd of NOx.

Motor Vehicle Emissions Budgets

Using the emissions generated by the MOVES model and incorporating the additional emissions from the Maintenance Plan safety margin, following are the proposed attainment year 2008 and Maintenance Plan end year 2025 Chicago 8-hour ozone and Chicago $PM_{2.5}$ motor vehicle

emissions budgets for use in determining transportation conformity.

Proposed Chicago 8-hour Ozone Maintenance Plan
2008 and 2025
Motor Vehicle Emissions Budgets
(tons per ozone season weekday)

	Estimated Emissions		Safety Margin		Motor Vehicle Emissions Budgets	
Year	**VOM**	**NOx**	**VOM**	**NOx**	**VOM**	**NOx**
2008	117.23	373.52	- -	- -	117.23	373.52
2025	41.85	108.93	6.28	16.34	48.13	125.27

Proposed Chicago $PM_{2.5}$ Maintenance Plan
2008 and 2025
Motor Vehicle Emissions Budgets
(tons per year)

	Estimated Emissions		Safety Margin		Motor Vehicle Emissions Budgets	
Year	**$PM_{2.5}$**	**NOx**	**$PM_{2.5}$**	**NOx**	**$PM_{2.5}$**	**NOx**
2008	5,100	127,951	- -	- -	5,100	127,951
2025	2,067	38,456	310	5,768	2,377	44,224