APPENDIX 10

DEVELOPMENT OF PRELIMINARY MOVES-BASED REASONABLE FURTHER PROGRESS ON-ROAD MOBILE SOURCE EMISSIONS INVENTORIES FOR THE DALLAS-FORT WORTH NONATTAINMENT AREA

Preliminary MOVES-Based On-Road Mobile Source Emissions Inventories, Control Strategy Reduction Estimates and Contingency Estimates

Dallas-Fort Worth Nine County Nonattainment Area
2002, 2008, 2011, 2012 and 2013

April 2011

This page intentionally left blank

TABLE OF CONTENTS

LIST OF ACRONYMS

ABY	Adjusted Base Year
DFW	Dallas-Fort Worth
EPA	United States Environmental Protection Agency
FCAA	Federal Clean Air Act
FMVCP	Federal Motor Vehicle Control Program
HDDV	Heavy Duty Diesel Vehicles
HPMS	Highway Performance Monitoring System
I/M	Inspection and Maintenance
MOVES	Motor Vehicle Emission Simulator
MSPT	Mobile Source Programs Team
NAAQS	National Ambient Air Quality Standard
NCTCOG	North Central Texas Council of Governments
NO_X	Nitrogen Oxides
psi	pounds per square inch
RFG	Reformulated Gasoline
RFP	Reasonable Further Progress
RVP	Reid Vapor Pressure
SIP	State Implementation Plan
SUT	Source Use Type
TCEQ	Texas Commission on Environmental Quality (commission)
TDM	Travel Demand Model
tpd	Tons per Day
TxLED	Texas Low Emission Diesel
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds

LIST OF TABLES

INTRODUCTION

The 1990 Federal Clean Air Act (FCAA) Amendments, 42 United States Code §7410, require states to submit state implementation plan (SIP) revisions that contain enforceable measures to achieve the National Ambient Air Quality Standards (NAAQS). The FCAA also requires states with nonattainment areas classified as moderate or above to submit plans showing reasonable further progress (RFP) toward attainment of the ozone standard. The Texas Commission on Environmental Quality (TCEQ), in response to these requirements, is planning a reasonable further progress (RFP) SIP revision for the Dallas-Fort Worth (DFW) ozone nonattainment area. The DFW RFP SIP revision will be used to demonstrate that ozone precursor emissions, nitrogen oxides (NO_X) and volatile organic compounds (VOC) will be reduced by 15% between 2002 and 2008, by 9% between 2008 and 2011, by 3% in 2012, and by 3% in 2013 for contingency purposes.

The timing of the release of the United States Environmental Protections Agency's (EPA) Motor Vehicle Emission Simulator (MOVES) model did not allow for its inclusion with this proposed SIP revision; therefore, on-road mobile emissions inventories were developed using the EPA's MOBILE model. The timing of the release of MOVES would allow for preliminary MOVES-based on-road mobile source emissions inventories, a preliminary RFP demonstration, and preliminary motor vehicle emissions budgets (MVEB) based on the MOVES model, to allow the TCEQ to take comment on using on-road mobile emissions inventories based on MOVES for the DFW RFP SIP submitted for adoption. The TCEQ contracted with the North Central Texas Council of Governments (NCTCOG) to develop SIP-quality MOVES-based on-road mobile inventories that will be completed in time to be included in an adopted SIP. In the event that MOVES-based emissions inventories are used to determine RFP demonstration for the adopted SIP revision, link based MOVES inventory values being developed by NCTCOG will be used, and it is expected that the final emissions figures and RFP results will be different than those reported in this SIP proposal. An inventory method based on link level vehicle miles traveled (VMT) is likely to produce inventory values from 4% to 20% higher than a method based upon the highway performance monitoring system (HPMS) VMT.

This report documents the development of the preliminary MOVES-based on-road mobile inventories and control strategy reductions.

MODELING APPROACH

In March 2010, the EPA replaced the MOBILE6 model with MOVES as the official emission factor model for developing on-road mobile source category emissions inventories. The primary approach to developing an on-road mobile inventory may be the same with either MOVES or MOBILE6. Both models are used to produce emission rates for subsets of the on-road fleet. The resulting emission rates are multiplied by the activity level of each vehicle type or source use type. Although MOVES represents a new approach to assessing on-road emissions, the opportunity to use local inputs for meteorological conditions, control programs and fleet characteristics is the same.

Unlike MOBILE6, MOVES can also be run in a mode that calculates emissions rather than emissions rates. When link based inventories are developed, MOVES is run in emissions rate mode and the calculation of emissions is done outside the model by multiplying the emissions rates by corresponding VMT. For the preliminary MOVES-based analysis, the model was run in emissions mode. Aggregated VMT values, equal in total to the values used for the MOBLIE6 analysis done by NCTCOG, were put into MOVES formats and uploaded to the MOVES database. Other local inputs used in the MOBILE6 analysis were reformatted for MOVES and used in the preliminary MOVES analysis. The local inputs used include: hourly humidity and temperature; fuel properties; the federal reformulated gasoline (RFG) program; and inspection

and maintenance (I/M) programs. When run in emissions mode, the output from MOVES is emissions rather than emissions rates.

To support the development of an RFP SIP revision, the emissions estimates that are needed include:

- a 2002 base year inventory;
- 2002, 2008, 2011 and 2012 adjusted base year (ABY) inventories;
- 2008, 2011 and 2012 uncontrolled inventories;
- 2008, 2011 and 2012 post-control inventories;
- RFP control reductions for 2008, 2011 and 2012; and
- contingency control reductions for 2013.

In terms of MOVES, these scenarios relate to a set of VMT and control scenarios based upon the EPA guidance for the development of RFP SIP emissions. For the control scenarios, MOVES was run with all controls on, and all controls off. This produced emissions results for the uncontrolled and post-control scenarios and allowed for the calculation of the amount of reduction from the on-road control bundle. The controls were not individually assessed for control reduction, so only the total control is reported.

MOVES does not allow for the assessment of Texas low emission diesel (TxLED). The effects due to TxLED were therefore done by post processing the emissions. A description of the control scenarios is provided in Table 1: *Emissions Inventory Scenarios*. The following sections describe the VMT, speeds, and control programs used to model the preliminary MOVES-based emissions inventories.

Table 1: Emissions Inventory Scenarios

On-Road Mobile Emissions Inventory Strategies	Adjusted Base Year (ABY)	MOVES Uncontrolled	MOVES Post-control	Post Processed
Pre-1990 Federal Motor Vehicle Control Program (FMVCP)	×	×	×	
1992 Federal Controls on Gasoline Volatility	×	×	×	
Tier 1 FMVCP			×	
RFG in the core counties only			×	
I/M in Dallas and Tarrant Counties			×	
National Low Emission Vehicle Program			×	
Expanded I/M			×	
Tier 2 FMVCP			×	
2007 heavy duty diesel FMVCP			×	
On-road TxLED				×

Vehicle Miles Traveled

For major metropolitan areas, VMT is estimated using travel demand models (TDM). The local council of governments has primary responsibility for running the TDM and developing VMT estimates for their area. The TDM VMT output provides information for each roadway link in the local roadway network. For a large metropolitan area, the roadway network may contain 10,000 to 40,000 links. The VMT establishes the traffic volume on each link, which can be used

to calculate the link speed. Speed is a primary input for determining emission rates. For SIP inventories, the link speeds are used to develop link emission rates, which are used in conjunction with the link VMT to develop link-based inventories. In order to allow for public comment on the MOVES inventories and how they may integrate into a possible DFW RFP demonstration, preliminary MOVES-based inventories were developed using a less detailed method than the link-based process.

The link file output from the TDM, in addition to link VMT, also includes a roadway categorization for each link. The VMT can be summed using the roadway type categories to produce a summary file with total VMT for each roadway category. The corresponding link speeds can be averaged using a VMT weighted method to produce an average speed for each roadway type. The NCTCOG, as part of the development of link-based MOBILE6 on-road mobile inventories for the RFP SIP proposal, developed link VMT and link speed estimates. The VMT and speeds developed by the NCTCOG and used in the development of the link-based, MOBILE6 inventory estimates were summarized and averaged by road type to calculate road type based values. The VMT summaries and average speeds were developed for each RFP analysis year, for each DFW county, and processed into MOVES input formats. A summary of the on-road mobile source VMT and speeds used to develop the uncontrolled, post-control and ABY NO_X and VOC emissions levels, the same total VMT as used for the MOBILE6 inventories, are presented in Table 2: *DFW RFP Ozone Season Weekday On-Road Mobile Source VMT*. Attachment B: *D-FW RFP Inventories, Control Strategy Reductions, and Contingency Estimates for 2002, 2005, 2006, 2008, 2011, 2012, and 2013* of Appendix 8: *Development of Reasonable Further Progress On-Road Mobile Source Emissions Inventories Based on the MOBILE6.2 Model for the Dallas-Fort Worth Nonattainment Area* of the proposed DFW RFP SIP revision contains the NCTCOG report documenting the development of the VMT and speeds that were aggregated and averaged for the MOVES analysis.

Table 2: DFW RFP Ozone Season Weekday On-Road Mobile Source VMT (miles per day)

RFP Analysis Year	Adjusted Base Year	Uncontrolled Emissions Inventory	Post-control Emissions Inventory
2002	138,880,000	138,880,000	138,880,000
2008	138,880,000	167,851,000	167,851,000
2011	138,880,000	185,075,000	185,075,000
2012	138,880,000	188,162,000	188,162,000

Vehicle-Miles-of-Travel Mix

The VMT Mix is the percentage distribution of the total number of miles traveled by the MOVES source use types. In the emissions inventory development process, the total link or facility type VMT is multiplied by the VMT mix to distribute the VMT into VMT for each vehicle subset or MOVES source use type (SUT). VMT mix is particular to location, roadway facility type, and time of day. For the preliminary MOVES-based emissions inventory development, the same VMT mixes for the NCTCOG MOBILE6 inventories were used. Attachment B of Appendix 8 describes the development of the VMT mixes used.

Speeds

The average speeds used in the preliminary MOVES analysis are derived from the NCTCOG MOBILE6-based inventory development. The NCTCOG speeds were processed to produce VMT weighted average speeds. Attachment B of Appendix 8 documents complete details on the development of the link speeds that were averaged to obtain the speeds used in the preliminary MOVES-based analysis. The file AvgSpeedDistribution.csv contains the speed distributions used

for the preliminary MOVES analysis. The file is available in electronic format, upon request, from the TCEQ Mobile Source Programs Team (MSPT).

Inspection and Maintenance Program

The MOVES model allows for modeling of local I/M programs. The MOVES default database includes a default I/M program for each DFW county. To assure the most recent DFW I/M program parameters are used, the default database was updated with I/M program parameters used in the NCTCOG MOBILE6 inventory development, and consistent with the DFW I/M program. For the uncontrolled scenarios, both the MOVES default local I/M program and the user-specified local DFW program, were turned off. For the post-control scenarios, the MOVES default local I/M program was turned off and the user-specified local program parameters were turned on. The electronic files used for the MOVES analyses are available, upon request, from the TCEQ MSPT.

Fuel Programs

The preliminary MOVES-based analysis included two fuel program scenarios. The default MOVES database tables were modified to model the DFW fuel programs for the uncontrolled and post-control scenarios. For fuel programs, the nine DFW counties are divided into two primary groups: (1) the four counties that were designated nonattainment under the one-hour ozone NAAQS; and (2) the five counties added to the nonattainment area under the eight-hour ozone NAAQS. The two county groups were subject to different federal Reid Vapor Pressure (RVP) standards under the low RVP rule that went into effect in 1992. Although the low RVP rule did not become effective until 1992, the rule was adopted before 1990. Since the RVP rule was adopted prior to the 1990 FCAA Amendments, the effects are not creditable for RFP and therefore the rule sets the RVP level for the uncontrolled scenarios. For the post-control scenarios, the four one-hour counties are covered by the federal RFG rule, but the five new counties are not. The five new counties are included under the Texas regional low RVP rule setting the maximum RVP to 7.8 for east Texas counties. A summary of the uncontrolled and control fuel parameters used in the MOVES analyses are presented in Table 3: *Fuel Program Summary*.

Table 3: Fuel Program Summary

Control Scenario	RVP (psi)	Federal RFG
Five New Counties Uncontrolled	9.0	No
Four Core Counties Uncontrolled	7.8	No
Five New Counties Post Control	7.8	No
Four Core Counties Post Control	6.8	Yes

Temperatures and Humidity

Hourly temperature and humidity data for the DFW area are processed and used in the development of the MOBILE6-based inventory development. The same data were processed into MOVES-based formats and used for the nine DFW counties to develop the preliminary MOVES emissions. Since the temperature and humidity are based on regional data, the values are the same for all nine counties. A summary of the temperatures and humidity values used in the MOVES analysis are provided in Table 4: *Hourly Temperature and Humidity for the DFW Nine County Area*. These values were used to replace the data in the MOVES default data table zonemonthhour. The file with user-defined temperatures and humidity is available upon request from the MSPT. Complete documentation of the temperature and humidity data are provided in Attachment B of Appendix 8.

Table 4: Hourly Temperature and Humidity for the DFW Nine County Area

Month ID	Hour ID	Temperature	Relative Humidity
6	1	81.0917	67.9296
6	2	80.3184	70.5746
6	3	79.4509	72.0215
6	4	78.3316	74.8411
6	5	77.5201	75.2286
6	6	76.7882	77.3045
6	7	77.0683	76.7544
6	8	79.5283	69.7291
6	9	82.8766	59.9203
6	10	85.5168	54.0024
6	11	88.0642	47.6511
6	12	90.3858	42.2415
6	13	92.4698	37.6833
6	14	94.0042	34.6583
6	15	95.2308	31.7915
6	16	95.8389	31.1628
6	17	96.0642	30.499
6	18	95.0599	32.4632
6	19	93.4801	35.6646
6	20	91.105	40.8288
6	21	89.2208	44.5588
6	22	87.7216	48.4042
6	23	86.5234	51.9256
6	24	84.7259	56.2678

County

As part of uploading user defined control program information, user defined data tables were set up that reflect the county information in the table MOVESDB20100830.county in the MOVES default database. The values in the tables were set to values consistent with each of the nine DFW counties. The nine files with county information are available upon request from the MSPT. A summary of the inputs is provided in Table 5: *MOVES Analysis County Data Table.*

Table 5: MOVES Analysis County Data Table

County	State ID	County ID	Altitude
Collin	48	48085	L
Dallas	48	48113	L
Denton	48	48121	L
Ellis	48	48139	L
Johnson	48	48251	L

County	State ID	County ID	Altitude
Kaufman	48	48257	L
Parker	48	48367	L
Rockwall	48	48397	L
Tarrant	48	48439	L

Calendar Year and Month

The values in two MOVES default database tables, dayofanyweek and monthofanyyear, were set to model one day in June for each of the four RFP analysis years. The month used was set to June for all scenarios. The values in the user-defined local database were set to assure that the daily VMT values in other data tables would be interpreted as daily rather than monthly or annual VMT. A summary of the scenarios modeled is provided in Table 6: *MOVES Analysis Calendar Year and Month*.

Table 6: MOVES Analysis Calendar Year and Month

Scenario	Calendar Year	Month
2002 Base Year	2002	6
2008 Milestone Year	2008	6
2011 Milestone Year	2011	6
2012 Milestone Year	2012	6

MOVES PRELIMINARY EMISSIONS ESTIMATES

The MOVES model was executed for uncontrolled and post-control scenarios. A summary of the scenarios is provided in Table 1 of this appendix. The MOVES model was run in emissions mode. The output is in tons per day. The emission factors are not output when using the model in this mode. The output files have emissions rather than emission factors. Summaries from the output are provided in the last section of this document, *Summary of Uncontrolled and Post-Control Emissions and RFP Control Reductions*. All MOVES output files are available in electronic format upon request from the TCEQ MSPT. The emissions summaries by source use type are provided in last section of this document, *Summary of Uncontrolled and Post-Control Emissions and RFP Control Reductions*.

Post-Procesing

The MOVES model does not model the effects of the TxLED program; therefore, the emissions outputs from the MOVES model were post processed to account for the effects of TxLED. The TxLED program applies only to diesel powered vehicles. The TxLED emissions benefit for 2001 and older vehicles is 6.2%. The TxLED benefit for 2002 and newer vehicles is 4.8%. Since the age distribution defines the percentage of vehicles for each model year, it can be used to determine the percentage of vehicles with the 6.2% and 4.8% benefit levels. The age distribution in MOVES is thirty years, with model year vehicles 30 and older all assigned to the 30 years old age group. The age distributions and emissions are source use type specific. The overall TxLED benefit for each MOVES source use type, for each RFP analysis year, were calculated using a weighted average based on the percentage of vehicles with a 6.2% benefit and a 4.8% benefit. The weighted average benefit was then applied to the emissions for each MOVES SUT. The total TxLED benefit is calculated by summing the benefit for all the SUTs. Table 7: *Preliminary MOVE-Based DFW RFP TxLED NO_X Reduction Factor by Source Use Type* provides a

summary of the TxLED NO_X reduction factor applied for the preliminary MOVES-based emissions assessment. A summary of the TxLED benefit is provided in the section that follows: *Summary of Uncontrolled and Post-Control Emissions and RFP Control Reductions*.

Table 7: Preliminary MOVES-Based DFW RFP TxLED NO_X Reduction Factor by Source Use Type

Source Use Type	SUT ID	2008	2011	2012	2013
Passenger Car	21	5.01%	5.07%	5.02%	4.94%
Passenger Truck	31	5.55%	5.37%	5.32%	5.24%
Light Commercial Truck	32	5.48%	5.33%	5.29%	5.24%
Intercity Bus	41	5.90%	5.82%	5.80%	5.77%
Transit Bus	42	5.87%	5.79%	5.77%	5.75%
School Bus	43	5.84%	5.78%	5.76%	5.73%
Refuse Truck	51	5.78%	5.72%	5.69%	5.64%
Single Unit Short-Haul Truck	52	5.17%	5.07%	5.04%	5.00%
Single Unit Long-Haul Truck	53	5.21%	5.10%	5.08%	5.04%
Motor Home	54	5.65%	5.56%	5.53%	5.50%
Combination Short-Haul Truck	61	5.68%	5.54%	5.47%	5.42%
Combination Long-Haul Truck	62	5.69%	5.53%	5.45%	5.39%

Summary of Uncontrolled and Post-Control Emissions and RFP Control Reductions

The preliminary MOVES-based uncontrolled on-road mobile source emissions inventories for each RFP milestone year were developed using emissions that reflect only control strategies implemented prior to 2002. The latest version of MOVES, MOVES2010a, was used to develop the emissions inventories for this proposed SIP revision. The activity levels were updated to include the latest output from the DFW TDM, and summed by HPMS roadway type. The pre-2002 controls include pre-1990 Federal Motor Vehicle Control Program (FMVCP) controls, the 1992 RVP control, fleet turnover to Tier 1 FMVCP, RFG, and the DFW vehicle I/M program. The activity levels used to calculate the emissions inventory reflect the milestone roadway network, with milestone year VMT and speeds.

The preliminary MOVES-based post-control on-road mobile emissions inventories for each RFP milestone year were developed using emissions that reflect both the control strategies implemented prior to 2002 and the control strategies used to demonstrate compliance with post-2002 RFP requirements. Those controls include: pre-1990 FMVCP; fleet turnover to Tier 1 of the FMVCP; fleet turnover to Tier 2 of the FMVCP; the 2007 heavy duty diesel vehicle (HDDV) FMVCP; summer RFG; the DFW vehicle I/M program; the anti-tampering program; and TxLED. Control scenario inventory values include both the post-control emissions inventory and the level of reductions for each control strategy. A summary of the uncontrolled on-road mobile emissions inventory, the on-road mobile control reductions, and the resulting post-control on-road mobile emissions inventory for each milestone year are summarized in Table 8: *Preliminary MOVES-Based 2011 DFW RFP Ozone Season Weekday On-Road Mobile Source NO_X and VOC Emissions and Control Strategy Reductions* and Table 9: *Preliminary MOVES-Based 2012 DFW RFP Ozone Season Weekday On-Road Mobile Source NO_X and VOC Emissions and Control Strategy Reductions*. For the preliminary MOVES assessment, the model was run only with all creditable controls on and all creditable controls off; therefore, the summary does not individually quantify the modeled control reductions. Emissions summaries by source use type are provided in Table 9, Table 10: *Preliminary MOVES-Based DFW RFP*

Ozone Season 2002 Weekday On-Road Mobile Source VOC Emissions (tons per day), Table 11: *Preliminary MOVES-Based DFW RFP Ozone Season 2002 Weekday On-Road Mobile Source NO_X Emissions (tons per day)*, Table 12: *Preliminary MOVES-Based DFW RFP Ozone Season 2008 Weekday On-Road Mobile Source VOC Emissions (tons per day)*, Table 13: *Preliminary MOVES-Based DFW RFP Ozone Season 2008 Weekday On-Road Mobile Source NO_X Emissions (tons per day)*, Table 14: *Preliminary MOVES-Based DFW RFP Ozone Season 2011 Weekday On-Road Mobile Source VOC Emissions (tons per day)*, Table 15: *Preliminary MOVES-Based DFW RFP Ozone Season 2011 Weekday On-Road Mobile Source NO_X Emissions (tons per day)*, Table 16: *Preliminary MOVES-Based DFW RFP Ozone Season 2012 Weekday On-Road Mobile Source VOC Emissions (tons per day)*, and Table 17: *Preliminary MOVES-Based DFW RFP Ozone Season 2012 Weekday On-Road Mobile Source NO_X Emissions (tons per day).*

Table 8: Preliminary MOVES-Based 2011 DFW RFP Ozone Season Weekday On-Road Mobile Source NO_X and VOC Emissions and Control Strategy Reductions

On-Road Mobile Emissions Inventory Strategies	NO_X (tons per day)	VOC (tons per day)
2011 uncontrolled inventory	831.11	266.18
Tier 1 FMVCP, RFG, I/M Program, anti-tampering program, Tier 2 FMVCP, 2007 HDDV FMVCP	604.20	184.75
On-road TxLED	6.00	0.00
2011 post-control inventory	220.90	81.43

Table 9: Preliminary MOVES-Based 2012 DFW RFP Ozone Season Weekday On-Road Mobile Source NO_X and VOC Emissions and Control Strategy Reductions

On-Road Mobile Emissions Inventory Strategies	NO_X (tons per day)	VOC (tons per day)
2012 uncontrolled inventory	844.71	259.18
Tier 1 FMVCP, RFG, I/M Program, anti-tampering program, Tier 2 FMVCP, 2007 HDDV FMVCP	642.07	187.62
On-road TxLED	5.29	0.00
2012 post-control inventory	197.34	71.56

Table 10: Preliminary MOVES-Based DFW RFP Ozone Season 2002 Weekday On-Road Mobile Source VOC Emissions (tons per day)

Source Use Type	Fuel Type	Uncontrolled Emissions Inventory	Post-control Emissions Inventory	RFP MOVES Model Control Reductions
Passenger Car	Gasoline	152.00	93.96	58.05
Passenger Truck	Gasoline	64.62	41.75	22.87
Light Commercial Truck	Gasoline	20.13	13.30	6.83
Intercity Bus	Gasoline	0.00	0.00	0.00
Transit Bus	Gasoline	0.00	0.00	0.00
School Bus	Gasoline	0.25	0.23	0.03
Refuse Truck	Gasoline	0.02	0.01	0.01
Single Unit Short-Haul Truck	Gasoline	2.91	1.69	1.23
Single Unit Long-Haul Truck	Gasoline	0.33	0.20	0.14

Source Use Type	Fuel Type	Uncontrolled Emissions Inventory	Post-control Emissions Inventory	RFP MOVES Model Control Reductions
Motor Home	Gasoline	0.35	0.24	0.12
Combination Short-Haul Truck	Gasoline	0.05	0.05	0.01
Combination Long-Haul Truck	Gasoline	0.00	0.00	0.00
Passenger Car	Diesel	0.04	0.03	0.01
Passenger Truck	Diesel	0.34	0.31	0.03
Light Commercial Truck	Diesel	0.71	0.65	0.06
Intercity Bus	Diesel	0.13	0.12	0.01
Transit Bus	Diesel	0.04	0.04	0.00
School Bus	Diesel	0.11	0.11	0.00
Refuse Truck	Diesel	0.07	0.07	0.00
Single Unit Short-Haul Truck	Diesel	1.64	1.53	0.11
Single Unit Long-Haul Truck	Diesel	0.19	0.18	0.01
Motor Home	Diesel	0.03	0.03	0.00
Combination Short-Haul Truck	Diesel	2.16	2.01	0.15
Combination Long-Haul Truck	Diesel	5.91	5.66	0.25
9 County Total	All	252.05	162.13	89.92
5 New County Total	All	28.08	23.24	4.85
4 Core County Total	All	223.97	138.89	85.07

Table 11: Preliminary MOVES-Based DFW RFP Ozone Season 2002 Weekday On-Road Mobile Source NO_X Emissions (tons per day)

Source Use Type	Fuel Type	Uncontrolled Emissions Inventory	Post-control Emissions Inventory	RFP MOVES Model Control Reductions
Passenger Car	Gasoline	244.21	123.72	120.48
Passenger Truck	Gasoline	120.39	69.36	51.02
Light Commercial Truck	Gasoline	36.63	21.86	14.77
Intercity Bus	Gasoline	0.00	0.00	0.00
Transit Bus	Gasoline	0.00	0.00	0.00
School Bus	Gasoline	0.36	0.28	0.08
Refuse Truck	Gasoline	0.05	0.03	0.02
Single Unit Short-Haul Truck	Gasoline	7.60	4.98	2.62
Single Unit Long-Haul Truck	Gasoline	0.83	0.56	0.27
Motor Home	Gasoline	0.73	0.50	0.23
Combination Short-Haul Truck	Gasoline	0.13	0.11	0.03
Combination Long-Haul Truck	Gasoline	0.00	0.00	0.00
Passenger Car	Diesel	0.17	0.19	-0.02
Passenger Truck	Diesel	2.57	2.35	0.21
Light Commercial Truck	Diesel	5.68	5.17	0.51

Source Use Type	Fuel Type	Uncontrolled Emissions Inventory	Post-control Emissions Inventory	RFP MOVES Model Control Reductions
Intercity Bus	Diesel	4.59	4.03	0.55
Transit Bus	Diesel	1.07	0.93	0.14
School Bus	Diesel	2.03	1.74	0.29
Refuse Truck	Diesel	2.86	2.09	0.77
Single Unit Short-Haul Truck	Diesel	28.22	19.13	9.09
Single Unit Long-Haul Truck	Diesel	2.99	2.08	0.91
Motor Home	Diesel	0.53	0.36	0.17
Combination Short-Haul Truck	Diesel	92.17	71.59	20.57
Combination Long-Haul Truck	Diesel	129.38	105.17	24.21
9 County Total	All	683.19	436.24	246.95
5 New County Total	All	93.92	84.06	9.85
4 Core County Total	All	589.27	352.17	237.10

Table 12: Preliminary MOVES-Based DFW RFP Ozone Season 2008 Weekday On-Road Mobile Source VOC Emissions (tons per day)

Source Use Type	Fuel Type	Uncontrolled Emissions Inventory	Post-control Emissions Inventory	RFP MOVES Model Control Reductions
Passenger Car	Gasoline	155.11	57.76	97.35
Passenger Truck	Gasoline	65.62	26.46	39.16
Light Commercial Truck	Gasoline	20.02	8.43	11.59
Intercity Bus	Gasoline	0.00	0.00	0.00
Transit Bus	Gasoline	0.00	0.00	0.00
School Bus	Gasoline	0.17	0.14	0.03
Refuse Truck	Gasoline	0.02	0.00	0.01
Single Unit Short-Haul Truck	Gasoline	2.61	1.03	1.57
Single Unit Long-Haul Truck	Gasoline	0.30	0.12	0.18
Motor Home	Gasoline	0.33	0.14	0.19
Combination Short-Haul Truck	Gasoline	0.01	0.01	0.00
Combination Long-Haul Truck	Gasoline	0.00	0.00	0.00
Passenger Car	Diesel	0.06	0.03	0.03
Passenger Truck	Diesel	0.36	0.30	0.06
Light Commercial Truck	Diesel	0.97	0.82	0.15
Intercity Bus	Diesel	0.18	0.16	0.02
Transit Bus	Diesel	0.05	0.05	0.00
School Bus	Diesel	0.18	0.16	0.02
Refuse Truck	Diesel	0.07	0.05	0.02
Single Unit Short-Haul Truck	Diesel	1.78	1.16	0.62
Single Unit Long-Haul Truck	Diesel	0.21	0.14	0.07

Source Use Type	Fuel Type	Uncontrolled Emissions Inventory	Post-control Emissions Inventory	RFP MOVES Model Control Reductions
Motor Home	Diesel	0.05	0.03	0.02
Combination Short-Haul Truck	Diesel	2.53	1.87	0.66
Combination Long-Haul Truck	Diesel	6.66	5.34	1.32
9 County Total	All	257.28	104.20	153.07
5 New County Total	All	34.98	13.39	21.60
4 Core County Total	All	222.29	90.82	131.47

Table 13: Preliminary MOVES-Based DFW RFP Ozone Season 2008 Weekday On-Road Mobile Source NO_X Emissions (tons per day)

Source Use Type	Fuel Type	Uncontrolled Emissions Inventory	Post-control Emissions Inventory	Post Control and TxLED	RFP MOVES Model Control Reductions	TxLED Reduction
Passenger Car	Gasoline	292.58	101.09	101.09	191.49	0.00
Passenger Truck	Gasoline	126.69	59.92	59.92	66.77	0.00
Light Commercial Truck	Gasoline	37.47	19.43	19.43	18.04	0.00
Intercity Bus	Gasoline	0.00	0.00	0.00	0.00	0.00
Transit Bus	Gasoline	0.00	0.00	0.00	0.00	0.00
School Bus	Gasoline	0.26	0.25	0.25	0.01	0.00
Refuse Truck	Gasoline	0.04	0.03	0.03	0.01	0.00
Single Unit Short-Haul Truck	Gasoline	6.49	5.26	5.26	1.23	0.00
Single Unit Long-Haul Truck	Gasoline	0.71	0.60	0.60	0.12	0.00
Motor Home	Gasoline	0.60	0.49	0.49	0.11	0.00
Combination Short-Haul Truck	Gasoline	0.03	0.03	0.03	0.00	0.00
Combination Long-Haul Truck	Gasoline	0.00	0.00	0.00	0.00	0.00
Passenger Car	Diesel	0.21	0.59	0.56	-0.38	0.03
Passenger Truck	Diesel	2.76	2.97	2.80	-0.20	0.16
Light Commercial Truck	Diesel	6.58	7.45	7.04	-0.87	0.41
Intercity Bus	Diesel	6.00	5.61	5.28	0.38	0.33
Transit Bus	Diesel	1.36	1.23	1.16	0.13	0.07
School Bus	Diesel	2.97	2.80	2.64	0.17	0.16
Refuse Truck	Diesel	2.88	1.25	1.17	1.64	0.07

Source Use Type	Fuel Type	Uncontrolled Emissions Inventory	Post-control Emissions Inventory	Post Control and TxLED	RFP MOVES Model Control Reductions	TxLED Reduction
Single Unit Short-Haul Truck	Diesel	29.94	15.24	14.45	14.70	0.79
Single Unit Long-Haul Truck	Diesel	3.18	1.74	1.65	1.44	0.09
Motor Home	Diesel	0.76	0.44	0.41	0.32	0.02
Combination Short-Haul Truck	Diesel	103.96	54.23	51.15	49.73	3.08
Combination Long-Haul Truck	Diesel	146.13	90.33	85.19	55.80	5.14
9 County Total	N/A	771.62	370.97	360.61	400.65	10.36
5 New County Total	N/A	129.47	49.29	47.48	80.18	1.81
4 Core County Total	N/A	642.15	321.68	313.12	320.47	8.56

Table 14: Preliminary MOVES-Based DFW RFP Ozone Season 2011 Weekday On-Road Mobile Source VOC Emissions (tons per day)

Source Use Type	Fuel Type	Uncontrolled Emissions Inventory	Post-control Emissions Inventory	RFP MOVES Model Control Reductions
Passenger Car	Gasoline	159.99	44.91	115.08
Passenger Truck	Gasoline	68.37	20.84	47.52
Light Commercial Truck	Gasoline	20.72	6.66	14.06
Intercity Bus	Gasoline	0.00	0.00	0.00
Transit Bus	Gasoline	0.00	0.00	0.00
School Bus	Gasoline	0.12	0.10	0.02
Refuse Truck	Gasoline	0.01	0.00	0.01
Single Unit Short-Haul Truck	Gasoline	2.47	0.88	1.59
Single Unit Long-Haul Truck	Gasoline	0.28	0.10	0.18
Motor Home	Gasoline	0.29	0.12	0.17
Combination Short-Haul Truck	Gasoline	0.01	0.01	0.00
Combination Long-Haul Truck	Gasoline	0.00	0.00	0.00
Passenger Car	Diesel	0.08	0.03	0.05
Passenger Truck	Diesel	0.43	0.27	0.16
Light Commercial Truck	Diesel	1.03	0.72	0.31
Intercity Bus	Diesel	0.18	0.14	0.04
Transit Bus	Diesel	0.05	0.04	0.01
School Bus	Diesel	0.18	0.14	0.04

Source Use Type	Fuel Type	Uncontrolled Emissions Inventory	Post-control Emissions Inventory	RFP MOVES Model Control Reductions
Refuse Truck	Diesel	0.08	0.03	0.04
Single Unit Short-Haul Truck	Diesel	1.95	0.80	1.14
Single Unit Long-Haul Truck	Diesel	0.23	0.10	0.13
Motor Home	Diesel	0.06	0.03	0.03
Combination Short-Haul Truck	Diesel	2.68	1.34	1.34
Combination Long-Haul Truck	Diesel	6.96	4.17	2.79
9 County Total	All	266.18	81.43	184.75

Table 15: Preliminary MOVES-Based DFW RFP Ozone Season 2011 Weekday On-Road Mobile Source NO_X Emissions (tons per day)

Source Use Type	Fuel Type	Uncontrolled Emissions Inventory	Post-control Emissions Inventory	Post Control and TxLED	RFP MOVES Model Control Reductions	TxLED Reduction
Passenger Car	Gasoline	333.80	61.27	61.27	272.53	0.00
Passenger Truck	Gasoline	136.10	37.98	37.98	98.11	0.00
Light Commercial Truck	Gasoline	40.09	12.55	12.55	27.54	0.00
Intercity Bus	Gasoline	0.00	0.00	0.00	0.00	0.00
Transit Bus	Gasoline	0.00	0.00	0.00	0.00	0.00
School Bus	Gasoline	0.18	0.13	0.13	0.05	0.00
Refuse Truck	Gasoline	0.04	0.02	0.02	0.02	0.00
Single Unit Short-Haul Truck	Gasoline	6.15	3.60	3.60	2.54	0.00
Single Unit Long-Haul Truck	Gasoline	0.68	0.41	0.41	0.27	0.00
Motor Home	Gasoline	0.55	0.33	0.33	0.22	0.00
Combination Short-Haul Truck	Gasoline	0.01	0.01	0.01	0.00	0.00
Combination Long-Haul Truck	Gasoline	0.00	0.00	0.00	0.00	0.00
Passenger Car	Diesel	0.30	0.45	0.42	-0.15	0.02
Passenger Truck	Diesel	3.29	2.07	1.96	1.22	0.11
Light Commercial Truck	Diesel	7.07	5.10	4.83	1.97	0.27
Intercity Bus	Diesel	5.78	3.19	3.01	2.59	0.19
Transit Bus	Diesel	1.31	0.69	0.65	0.62	0.04
School Bus	Diesel	2.99	1.65	1.56	1.34	0.10

Source Use Type	Fuel Type	Uncontrolled Emissions Inventory	Post-control Emissions Inventory	Post Control and TxLED	RFP MOVES Model Control Reductions	TxLED Reduction
Refuse Truck	Diesel	2.85	0.64	0.60	2.21	0.04
Single Unit Short-Haul Truck	Diesel	30.57	8.19	7.78	22.38	0.41
Single Unit Long-Haul Truck	Diesel	3.30	0.97	0.92	2.33	0.05
Motor Home	Diesel	0.89	0.27	0.26	0.61	0.02
Combination Short-Haul Truck	Diesel	105.65	31.48	29.76	74.17	1.72
Combination Long-Haul Truck	Diesel	149.52	55.90	52.85	93.62	3.05
9 County Total	All	831.11	226.90	220.90	604.20	6.00

Table 16: Preliminary MOVES-Based DFW RFP Ozone Season 2012 Weekday On-Road Mobile Source VOC Emissions (tons per day)

Source Use Type	Fuel Type	Uncontrolled Emissions Inventory	Post-control Emissions Inventory	RFP MOVES Model Control Reductions
Passenger Car	Gasoline	155.52	39.45	116.06
Passenger Truck	Gasoline	66.36	18.22	48.14
Light Commercial Truck	Gasoline	20.12	5.78	14.34
Intercity Bus	Gasoline	0.00	0.00	0.00
Transit Bus	Gasoline	0.00	0.00	0.00
School Bus	Gasoline	0.11	0.08	0.02
Refuse Truck	Gasoline	0.01	0.00	0.01
Single Unit Short-Haul Truck	Gasoline	2.43	0.82	1.61
Single Unit Long-Haul Truck	Gasoline	0.28	0.09	0.18
Motor Home	Gasoline	0.27	0.10	0.16
Combination Short-Haul Truck	Gasoline	0.00	0.00	0.00
Combination Long-Haul Truck	Gasoline	0.00	0.00	0.00
Passenger Car	Diesel	0.08	0.03	0.05
Passenger Truck	Diesel	0.45	0.23	0.22
Light Commercial Truck	Diesel	1.00	0.62	0.38
Intercity Bus	Diesel	0.18	0.13	0.05
Transit Bus	Diesel	0.05	0.04	0.01
School Bus	Diesel	0.19	0.13	0.05
Refuse Truck	Diesel	0.08	0.03	0.05
Single Unit Short-Haul Truck	Diesel	1.98	0.67	1.31
Single Unit Long-Haul Truck	Diesel	0.24	0.09	0.15

Source Use Type	Fuel Type	Uncontrolled Emissions Inventory	Post-control Emissions Inventory	RFP MOVES Model Control Reductions
Motor Home	Diesel	0.07	0.03	0.04
Combination Short-Haul Truck	Diesel	2.73	1.17	1.56
Combination Long-Haul Truck	Diesel	7.05	3.84	3.21
9 County Total	All	259.18	71.56	187.62

Table 17: Preliminary MOVES-Based DFW RFP Ozone Season 2012 Weekday On-Road Mobile Source NO_X Emissions (tons per day)

Source Use Type	Fuel Type	Uncontrolled Emissions Inventory	Post-control Emissions Inventory	Post Control and TxLED	RFP MOVES Model Control Reductions	TxLED Reduction
Passenger Car	Gasoline	334.79	54.51	54.51	280.28	0.00
Passenger Truck	Gasoline	135.19	34.48	34.48	100.71	0.00
Light Commercial Truck	Gasoline	39.91	11.53	11.53	28.38	0.00
Intercity Bus	Gasoline	0.00	0.00	0.00	0.00	0.00
Transit Bus	Gasoline	0.00	0.00	0.00	0.00	0.00
School Bus	Gasoline	0.17	0.12	0.12	0.05	0.00
Refuse Truck	Gasoline	0.04	0.02	0.02	0.02	0.00
Single Unit Short-Haul Truck	Gasoline	6.30	3.73	3.73	2.57	0.00
Single Unit Long-Haul Truck	Gasoline	0.69	0.43	0.43	0.27	0.00
Motor Home	Gasoline	0.55	0.33	0.33	0.22	0.00
Combination Short-Haul Truck	Gasoline	0.01	0.01	0.01	0.00	0.00
Combination Long-Haul Truck	Gasoline	0.00	0.00	0.00	0.00	0.00
Passenger Car	Diesel	0.30	0.41	0.39	-0.11	0.02
Passenger Truck	Diesel	3.43	1.91	1.81	1.52	0.10
Light Commercial Truck	Diesel	6.97	4.58	4.34	2.39	0.24
Intercity Bus	Diesel	5.97	3.04	2.87	2.92	0.18
Transit Bus	Diesel	1.35	0.65	0.61	0.70	0.04
School Bus	Diesel	3.10	1.59	1.50	1.51	0.09
Refuse Truck	Diesel	2.97	0.54	0.51	2.43	0.03

Source Use Type	Fuel Type	Uncontrolled Emissions Inventory	Post-control Emissions Inventory	Post Control and TxLED	RFP MOVES Model Control Reductions	TxLED Reduction
Single Unit Short-Haul Truck	Diesel	31.70	7.06	6.70	24.64	0.36
Single Unit Long-Haul Truck	Diesel	3.42	0.84	0.80	2.58	0.04
Motor Home	Diesel	0.94	0.25	0.24	0.69	0.01
Combination Short-Haul Truck	Diesel	110.47	26.55	25.10	83.92	1.45
Combination Long-Haul Truck	Diesel	156.43	50.05	47.32	106.38	2.73
9 County Total	All	844.71	202.64	197.34	642.07	5.29

Preliminary MOVES-Based Updated Adjusted Base Year Inventories for the Base and Milestone Years

The RFP planning process includes calculating the adjusted base Year (ABY) emissions inventory, from which required percent emissions reductions are calculated. The ABY emissions inventory is calculated by subtracting non-creditable controls from the base year emissions inventory. As specified by the FCAA, certain on-road mobile source emissions reductions are not creditable toward the required percentage reductions. The non-creditable reductions include reductions from controls that were promulgated prior to the 1990 FCAA Amendments. The two rules that are non-creditable for this proposed SIP revision are pre-1990 FMVCP and pre-1990 promulgated federal fuel volatility regulations (summertime gasoline RVP limits beginning in 1992). Because the defeat device for HDDVs was affecting an FMVCP that was implemented prior to the 1990 FCAA, the HDDV NO_X off-cycle emissions effects and associated mitigation program effects are also considered non-creditable. Therefore, for this proposed DFW RFP demonstration, on-road mobile pre-1990 non-creditable emissions reductions include pre-1990 FCAA Amendments FMVCP, 1992 summertime RVP limits, and HDDV NO_X off-cycle emissions and mitigation programs. All those controls are for on-road mobile sources and are accounted for in the on-road mobile source ABY emissions inventories included in the proposed SIP revision.

In general, an ABY emissions inventory for on-road mobile sources is developed for each milestone year using emission factors from the MOBILE6 model, which reflect only control strategies implemented prior to 1990. By projecting the pre-1990 FMVCP into future years, the effects of additional fleet turnover benefit due to the new standards are reflected in the emission factor. For the preliminary MOVES-based assessment, time did not permit the development of the normal link-based ABY inventories. For the preliminary MOVES assessment, the MOVES model was run in emissions mode. The uncontrolled emissions output by MOVES, which included only the non-creditable controls, was adjusted for the increase in VMT from the base year to the milestone year. This method provides an approximation of the non-creditable reductions. A summary of the preliminary MOVES-based ABY emissions inventories and associated non-creditable emissions reductions is presented in Table 18: *Preliminary MOVES-Based Summary of DFW RFP On-Road Mobile Source Adjusted Base Year NO_X and VOC Emissions (tons per day).*

Table 18: Preliminary MOVES-Based DFW RFP Ozone Season Weekday On-Road Mobile Source Adjusted Base Year NO_X and VOC Emissions (tons per day)

RFP Analysis Year Inventory	ABY NO_X	ABY VOC
2002	683.19	252.05
2008	615.82	204.99
2011	623.66	199.74
2012	623.47	191.30

REFERENCES FOR GUIDANCE DOCUMENTS

EPA, 1992. "Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources." EPA420-R-92-009, December 1992, U.S. Environmental Protection Agency, Emission Planning and Strategies Division, Office of Mobile Sources and Technical Support Division, Office of Air Quality Planning and Standards.

EPA, 1994. "Guidance on the Post-1996 Rate-of-Progress Plan and the Attainment Demonstration," Corrected Version as of February 18, 1994. U.S. Environmental Protection Agency, Ozone/Carbon Monoxide Programs Branch, Office of Air Quality Planning and Standards. Research Triangle Park, NC 27711.

EPA. "Guidance on the Adjusted Base Year Emissions Inventory and the 1996 Target for the 15 Percent Rate-of-Progress Plans." U.S. Environmental Protection Agency, Ozone/Carbon Monoxide Programs Branch, Office of Air Quality Planning and Standards. Research Triangle Park, NC 27711.

EPA, 2002. "Technical Guidance on the Use of MOBILE6 for Emission Inventory Preparation." U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Transportation and Air Quality, January, 2002.

EPA, 2003. "User Guide for MOBILE6.1 and MOBILE6.2." Assessment and Standards Division, Office of Transportation and Air Quality, U.S. Environmental Protection Agency, EPA420-R-03-001, August 2003.

EPA, 2005. "Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations." EPA-454/R-05-001, Issued By: Emissions Inventory Group, Emissions, Monitoring and Analysis Division, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency. Research Triangle Park, NC 27711, August 2005.

EPA, 2009. "Draft Motor Vehicle Emission Simulator (MOVES) 2009, Software Design and Reference Manual." Assessment and Standards Division Office of Transportation and Air Quality U.S. Environmental Protection Agency, EPA420-B-09-007 March 2009.

EPA, 2010. "Motor Vehicle Emissions Simulator (MOVES), User Guide for MOVES2010a." Assessment and Standards Division, Office of Transportation and Air Quality, U.S. Environmental Protection Agency, EPA420-B-10-036, August 2010.

EPA, 2010. "Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity." Transportation and Regional Programs Division, Office of Transportation and Air Quality, U.S. Environmental Protection Agency, EPA420-B-10-023, April 2010.

Federal Register, Monday, June 2, 2003, Part II, Environmental Protection Agency, 40 CFR Part 51, Proposed Rule To Implement the Eight-Hour Ozone National Ambient Air Quality Standard; Proposed Rule.

Federal Register, Friday, April 30, 2004, Part II, Environmental Protection Agency, 40 CFR Parts 50, 51 and 81, [OAR 2003-0079, FRL-7651-7], RIN 2060-AJ99, Final Rule To Implement the 8-Hour Ozone National Ambient Air, Quality Standard-Phase 1.

Federal Register, Tuesday, November 29, 2005, Part II, Environmental Protection Agency, 40 CFR Parts 51, 52, and 80 Final Rule To Implement the 8-Hour Ozone National Ambient Air Quality Standard; Final Rule.