

APPENDIX K

Summary of Corrections Made to 2002 and 2007 Onroad Mobile Emission Inventories

In March of 2005, an error was discovered concerning the development and future projection of input data used for the DIESEL FRACTIONS command with the MOBILE6.2 model. This error had been incorporated into the onroad inventories which were originally developed in the Summer of 2004 and had been included in the November 17, 2004 DFW 5% IOP SIP proposal. The TCEQ worked with NCTCOG staff to correct the problem and revised 2002 and 2007 onroad emission inventories were developed in April 2005. Appendices L-O each contain electronic input and summary output files which were used by NCTCOG in the development of both the 2002 and 2007 onroad emission inventories for the 9-County DFW nonattainment area. Appendices L and M contain the electronic files for the 2002 and 2007 onroad inventories, respectively, which were included in the November 17, 2004 submission. Appendices N and O contain the electronic files for the current 2002 and 2007 onroad inventories, respectively.

Tables 1 and 2 contain 2002 9-County summaries of VMT, NO_x, and VOC emissions for both the former and current onroad emission inventories. In a similar fashion, Tables 3 and 4 contain 2007 9-County summaries of VMT, NO_x, and VOC emissions for both the former and current onroad emission inventories. A comparison of Tables 1 and 2 indicates that there is no difference in the VMT data between the former and current 2002 onroad inventories. Due to the fact that 2002 is an “historical” year, no new data were available which would indicate that VMT estimates should change. The overall 2002 NO_x and VOC emissions decreased slightly because the MOBILE6.2 output emission rates decreased as a result of the corrected diesel fraction and registration distribution inputs.

Table 1 - Summary of 2002 9-County DFW Onroad Inventory Developed in Summer 2004

<i>County</i>	<i>VMT</i>	<i>NO_x</i>	<i>VOC</i>
<i>Collin</i>	13,713,166	27.76	15.05
<i>Dallas</i>	68,716,968	142.33	71.52
<i>Denton</i>	12,751,302	27.95	13.71
<i>Ellis</i>	3,762,648	18.72	4.42
<i>Johnson</i>	2,923,574	10.89	4.25
<i>Kaufman</i>	3,322,618	12.67	4.28
<i>Parker</i>	2,724,922	12.05	3.70
<i>Rockwall</i>	1,718,001	7.60	1.71
<i>Tarrant</i>	43,046,382	89.90	42.78
<i>9-County Total</i>	152,679,581	349.87	161.42

Table 2 - Summary of 2002 9-County DFW Onroad Inventory Developed in April 2005

<i>County</i>	<i>VMT</i>	<i>NO_x</i>	<i>VOC</i>
<i>Collin</i>	13,713,166	27.30	13.36
<i>Dallas</i>	68,716,968	140.77	69.65
<i>Denton</i>	12,751,302	27.71	12.45
<i>Ellis</i>	3,762,648	18.21	4.41

<i>Johnson</i>	2,923,574	10.64	4.26
<i>Kaufman</i>	3,322,618	12.36	4.28
<i>Parker</i>	2,724,922	11.74	3.70
<i>Rockwall</i>	1,718,001	7.40	1.70
<i>Tarrant</i>	43,046,382	89.31	42.53
9-County Total	152,679,581	345.44	156.34

Conversely, a comparison of Tables 3 and 4 indicates that both VMT and MOBILE6.2 emission rates changed between the former and current 2007 onroad emission inventories. Overall VMT decreased slightly between the former and current inventories, yet overall emissions increased slightly. This increase was due to the incorrect manner in which the most recently available vehicle registration data were projected to future years for use with the DIESEL FRACTIONS command.

Table 3 - Summary of 2007 9-County DFW Onroad Inventory Developed in Summer 2004

County	VMT	NO_x	VOC
<i>Collin</i>	17,799,196	17.54	10.39
<i>Dallas</i>	75,812,042	82.51	48.12
<i>Denton</i>	16,420,371	17.05	9.49
<i>Ellis</i>	4,254,776	9.84	2.68
<i>Johnson</i>	3,127,803	5.60	2.49
<i>Kaufman</i>	3,864,163	6.96	2.72
<i>Parker</i>	2,929,800	6.08	2.14
<i>Rockwall</i>	1,937,945	3.68	1.02
<i>Tarrant</i>	48,525,014	51.68	28.77
9-County Total	174,671,110	200.94	107.82

Table 4 - Summary of 2007 9-County DFW Onroad Inventory Developed in April 2005

County	VMT	NO_x	VOC
<i>Collin</i>	17,652,555	17.86	8.96
<i>Dallas</i>	75,393,434	85.71	47.40
<i>Denton</i>	15,936,158	16.82	8.16
<i>Ellis</i>	4,339,574	9.80	2.67
<i>Johnson</i>	3,147,239	5.75	2.35
<i>Kaufman</i>	3,847,531	6.82	2.57
<i>Parker</i>	2,941,389	6.11	2.01
<i>Rockwall</i>	1,916,177	3.64	0.99
<i>Tarrant</i>	48,261,186	54.21	29.03
9-County Total	173,435,243	206.72	104.14

Due to the fact that 2007 is a “future” (as opposed to “historical”) year, new demographic and travel network data are constantly being collected which cause VMT projections to constantly change. A standard requirement for SIP emission inventory development is that the “latest planning assumptions” be used at the time an onroad inventory is developed. For the purposes

of correcting the diesel fraction inputs in the 2007 onroad inventory, NCTCOG staff used the most recent planning assumptions as of April 2005. Even though the former 2007 inventory was originally developed in the Summer of 2004, TCEQ feels it would have been inconsistent with the “latest planning assumptions” requirement for NCTCOG to have corrected the 2007 inventory in April of 2005 with projected VMT data from the Summer of 2004.

For a “composite” vehicle type (i.e., gasoline and diesel vehicles grouped by weight), the diesel fraction represents the percent contribution of diesel vehicles sold/registered by model year. When developing inventories for future years, EPA guidance recommends that the diesel fraction for the most recently available model year be kept constant for all future years. For example, a July 2004 query of the TxDOT registration database indicated that 85.903% of the 2004 model year HDV4 vehicles in the 9-County DFW area are powered with diesel fuel, implying that the remaining 14.097% are powered with gasoline. Therefore, when developing the 2007 inventory, a diesel fraction input of 0.85903 should be applied to the four model years from 2004-2007. In this case, the diesel fraction inputs for 2003-and-older model year vehicles are simply calculated straight from the registration data and do not need to be projected. When MOBILE6.2 is run for a specific calendar year, emission rates are calculated and weighted for a 25 model-year “rolling window”. For example, if 2007 is the calendar year being modeled, MOBILE6.2 needs input data and calculates emission rates for every model year from 1983-2007. For space purposes, Table 5 only summarizes diesel fraction inputs from 1999-2007.

Table 5 - 1999-2007 Diesel Fraction Inputs for 9-County DFW Area Based on July 2004 TxDOT Registration Data

<i>Vehicle Type</i>	<i>2007</i>	<i>2006</i>	<i>2005</i>	<i>2004</i>	<i>2003</i>	<i>2002</i>	<i>2001</i>	<i>2000</i>	<i>1999</i>
<i>LDV</i>	0.00090	0.00090	0.00090	0.00090	0.00090	0.00090	0.00090	0.00090	0.00090
<i>LDT1</i>	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
<i>LDT2</i>	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
<i>LDT3</i>	0.01260	0.01260	0.01260	0.01260	0.01260	0.01260	0.01260	0.01260	0.01260
<i>LDT4</i>	0.01260	0.01260	0.01260	0.01260	0.01260	0.01260	0.01260	0.01260	0.01260
<i>HDV2b</i>	0.84727	0.84727	0.84727	0.84727	0.69532	0.64265	0.61885	0.41651	0.48262
<i>HDV3</i>	0.78193	0.78193	0.78193	0.78193	0.60455	0.59394	0.55439	0.63595	0.60036
<i>HDV4</i>	0.85903	0.85903	0.85903	0.85903	0.67667	0.65217	0.67877	0.66369	0.57269
<i>HDV5</i>	0.89474	0.89474	0.89474	0.89474	0.92735	0.84783	0.81818	0.92084	0.89398
<i>HDV6</i>	0.90835	0.90835	0.90835	0.90835	0.89621	0.95732	0.84753	0.87034	0.83791
<i>HDV7</i>	0.96257	0.96257	0.96257	0.96257	0.98925	0.91279	0.84698	0.90566	0.93906
<i>HDV8a</i>	0.95238	0.95238	0.95238	0.95238	0.94624	0.97814	0.93448	0.94576	0.94763
<i>HDV8b</i>	0.96479	0.96479	0.96479	0.96479	0.93939	0.96364	0.97674	0.99799	0.97806
<i>HDBS</i>	0.95850	0.95850	0.95850	0.95850	0.95850	0.95850	0.95850	0.95850	0.95850

The problem with the 2007 inventory developed in the Summer of 2004 is that the most recently available model year diesel fraction was not kept constant for all future years. At the time, the July 2004 TxDOT data were not yet available, so the July 2003 TxDOT data were used. As mentioned previously, the diesel fraction inputs for 2007 should cover the 25 model years from 1983-2007. However, diesel fractions spanning the 25 model years from 1979-2003 were used to represent the 25 model years from 1983-2007. Instead, the 1983-2003 fractions should have been mapped directly to the 1983-2003 input locations, while the 2003 fraction should have been kept constant for 2004-2007. Table 6 summarizes the 1999-2007 diesel fraction inputs which

were included with the Dallas County MOBILE6.2 input files for the Summer 2004 development of the 2007 onroad inventory. Note that the 2003-2007 heavy-duty vehicle diesel fractions in Table 6 were not kept constant.

Table 6 - 1999-2007 Diesel Fraction Inputs for Dallas County Based on July 2003 TxDOT Registration Data

<i>Vehicle Type</i>	<i>2007</i>	<i>2006</i>	<i>2005</i>	<i>2004</i>	<i>2003</i>	<i>2002</i>	<i>2001</i>	<i>2000</i>	<i>1999</i>
<i>LDV</i>	0.00090	0.00090	0.00090	0.00090	0.00090	0.00090	0.00090	0.00060	0.00130
<i>LDT1</i>	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
<i>LDT2</i>	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
<i>LDT3</i>	0.01260	0.01260	0.01260	0.01260	0.01150	0.01110	0.01450	0.01150	0.01290
<i>LDT4</i>	0.01260	0.01260	0.01260	0.01260	0.01150	0.01110	0.01450	0.01150	0.01290
<i>HDV2b</i>	0.53911	0.62245	0.51461	0.38147	0.43487	0.24303	0.19369	0.27911	0.11406
<i>HDV3</i>	0.62575	0.60566	0.52072	0.60096	0.58872	0.44785	0.47436	0.36293	0.33482
<i>HDV4</i>	0.76847	0.75128	0.67842	0.68729	0.57778	0.75542	0.73211	0.67381	0.44918
<i>HDV5</i>	0.87413	0.87500	0.82427	0.91379	0.92053	0.63529	0.82143	0.90960	0.45059
<i>HDV6</i>	0.91495	0.96591	0.83943	0.85397	0.86707	0.83494	0.87231	0.83850	0.59519
<i>HDV7</i>	0.99512	0.81768	0.84766	0.90351	0.97015	0.92605	0.77957	0.83051	0.41880
<i>HDV8a</i>	0.97727	0.96667	0.91775	0.92195	0.94386	0.97490	0.91053	0.90498	0.63085
<i>HDV8b</i>	0.95395	0.97170	0.97537	0.99143	0.99123	0.99026	0.98204	1.00000	0.85586
<i>HDBS</i>	0.95850	0.95850	0.95850	0.95850	0.88570	0.85250	0.87950	0.99000	0.91050

The reason for this error is that the vehicle age distributions input with the MOBILE6.2 REG DIST command do rely on a “frozen” 25 model year profile. EPA guidance recommends that the latest available age distribution profiles be kept constant for all future years because they are a set of 25 fractions for each vehicle type that must add to 1. Conversely, an individual diesel fraction for a specific model year can span from 0 to 1.

A secondary error was also detected with the diesel fraction inputs which were used. The 2002 and 2007 onroad inventories from the Summer of 2004 relied on diesel fractions which were developed by grouping TxDOT registration data into Dallas/Tarrant, Collin/Denton, and Ellis/Johnson/Kaufman/Parker/Rockwall categories. The result was that an insufficient sample of registration data was available to obtain representative diesel fractions and, consequently, “0 fraction” anomalies appeared for certain vehicle type and model year combinations. For example, the Collin/Denton diesel fractions used for the 2007 inventory resulted in a HDV8b diesel fraction of 0 for the 1985, 1987, and 1988 model years. This “0 value” for the HDV8b category directs MOBILE6.2 to assume that all 1985, 1987, and 1988 “18 wheelers” are powered by gasoline, which is obviously incorrect.

Table 7 - 1983-1991 Diesel Fraction Inputs for Collin County Based on July 2003 TxDOT Registration Data

<i>Vehicle Type</i>	<i>1991</i>	<i>1990</i>	<i>1989</i>	<i>1988</i>	<i>1987</i>	<i>1986</i>	<i>1985</i>	<i>1984</i>	<i>1983</i>
<i>LDV</i>	0.02410	0.05100	0.07060	0.03900	0.02690	0.01140	0.00930	0.01370	0.01550
<i>LDT1</i>	0.02230	0.06560	0.06160	0.04390	0.03160	0.02590	0.00000	0.01870	0.10380
<i>LDT2</i>	0.02230	0.06560	0.06160	0.04390	0.03160	0.02590	0.00000	0.01870	0.10380
<i>LDT3</i>	0.02090	0.02560	0.00130	0.00060	0.00110	0.00010	0.00000	0.00000	0.00000
<i>LDT4</i>	0.02090	0.02560	0.00130	0.00060	0.00110	0.00010	0.00000	0.00000	0.00000
<i>HDV2b</i>	0.00000	0.15152	0.12903	0.11111	0.00000	0.09091	0.00000	0.00000	0.00000

<i>HDV3</i>	0.40000	0.46154	0.18182	0.50000	0.50000	0.33333	0.00000	0.00000	0.00000
<i>HDV4</i>	0.00000	0.50000	0.25000	0.33333	0.33333	0.50000	0.00000	0.00000	0.06250
<i>HDV5</i>	0.40000	0.40000	0.57143	0.50000	0.75000	0.00000	1.00000	0.00000	0.05263
<i>HDV6</i>	0.59259	0.46154	0.45714	0.54167	0.50000	0.57143	0.27778	0.11111	0.02222
<i>HDV7</i>	0.66667	0.61111	0.60000	0.72727	0.75000	0.60000	1.00000	0.60000	0.00000
<i>HDV8a</i>	0.81250	0.84211	0.82143	0.90476	0.75000	0.93333	0.77778	0.61538	0.54839
<i>HDV8b</i>	1.00000	0.00000	1.00000	0.00000	0.00000	1.00000	0.00000	1.00000	1.00000
<i>HDBS</i>	0.32380	0.32600	0.26390	0.05940	0.04600	0.02910	0.02400	0.00860	0.00870

This “0 fraction” anomaly was corrected by extracting the diesel fractions for the heavy-duty vehicle categories from a 9-County DFW area grouping of the registration data. Table 8 is an extract of the 1983-1991 diesel fraction inputs which were extracted from the July 2004 TxDOT registration data and applied to all 9 Counties for the 2007 inventory developed in April 2005. Please note that the TxDOT database does not have a sufficient number of fields to extract diesel fractions for the LDV, LDT1-4, and HDBS categories. For these vehicle types, the MOBILE6.2 default values are used which “freeze” nationwide diesel fraction data from July 1996 for all future years.

Table 8 - 1983-1991 Diesel Fraction Inputs for 9-County DFW Area Based on July 2004 TxDOT Registration Data

<i>Vehicle Type</i>	<i>1991</i>	<i>1990</i>	<i>1989</i>	<i>1988</i>	<i>1987</i>	<i>1986</i>	<i>1985</i>	<i>1984</i>	<i>1983</i>
<i>LDV</i>	0.00130	0.00040	0.00040	0.00010	0.00270	0.00320	0.00970	0.01620	0.02410
<i>LDT1</i>	0.00000	0.00000	0.00000	0.00000	0.00070	0.00330	0.00480	0.01200	0.02230
<i>LDT2</i>	0.00000	0.00000	0.00000	0.00000	0.00070	0.00330	0.00480	0.01200	0.02230
<i>LDT3</i>	0.01290	0.00960	0.00830	0.00720	0.00820	0.01240	0.01350	0.01690	0.02090
<i>LDT4</i>	0.01290	0.00960	0.00830	0.00720	0.00820	0.01240	0.01350	0.01690	0.02090
<i>HDV2b</i>	0.27734	0.26407	0.29592	0.16000	0.09848	0.16594	0.10651	0.20118	0.15385
<i>HDV3</i>	0.50000	0.59893	0.43836	0.27922	0.13182	0.23718	0.09730	0.18333	0.37500
<i>HDV4</i>	0.82677	0.56000	0.77500	0.17582	0.10127	0.05952	0.04828	0.20000	0.30769
<i>HDV5</i>	0.87805	0.61314	0.62879	0.25263	0.21101	0.09091	0.15044	0.12121	0.58333
<i>HDV6</i>	0.68675	0.79535	0.79902	0.59864	0.68715	0.57353	0.50299	0.47154	0.42466
<i>HDV7</i>	0.79730	0.80606	0.95238	0.84211	0.81481	0.83750	0.73770	0.65455	0.85185
<i>HDV8a</i>	0.91880	0.93697	0.95067	0.91878	0.93252	0.92188	0.89017	0.93233	0.88679
<i>HDV8b</i>	1.00000	0.90000	1.00000	1.00000	1.00000	0.92308	0.88889	0.77778	0.95000
<i>HDBS</i>	0.91050	0.87600	0.77100	0.75020	0.73450	0.67330	0.51550	0.38450	0.32380

The examples shown above apply to the 2007 inventory. Since the 2002 onroad inventory was developed in the Summer of 2004 with July 2003 TxDOT data, it was unnecessary to “freeze” the most recently available model year diesel fractions. However, the MOBILE6.2 diesel fraction defaults for the LDV, LDT1-4, and HDBS categories had been incorrectly projected from the July 1996 nationwide data. In addition, the “0 fraction” anomaly discussed above was also a problem with the 2002 inventory that was developed in the Summer of 2004.

Finally, the “0 fraction” anomaly also affected the vehicle age distribution data which are used with the REG DIST command in the 2002 and 2007 inventories developed in the Summer of 2004. Similar to the corrective action taken for the diesel fraction inputs, the heavy-duty age distribution profiles for each county relied on a 9-County regional grouping of the raw registration data. However, because of satisfactory sample sizes in the registration data, the

light-duty age distribution profiles used were county specific. The regional age distribution and diesel fraction approach was taken for the heavy-duty vehicles because these vehicle types travel throughout an entire area, but are not necessarily “evenly” registered in every county. Conversely, light-duty vehicles tend to be operated close to where they are registered. In addition, the light-duty vehicle age distributions do not vary as much from county to county as do heavy-duty vehicle age distributions.

For additional information, interested parties can consult the MOBILE6 website, which is located at:

<http://www.epa.gov/otaq/m6.htm>

Additional detail on use of the DIESEL FRACTIONS command can be found in:

- Section 2.8.7.2 on page 97 of the *EPA User’s Guide to MOBILE6.1 and MOBILE6.2, August 2003*;
- Appendix E on page 255 of the *EPA User’s Guide to MOBILE6.1 and MOBILE6.2, August 2003*; and
- Section 3.3 on page 18 of the *EPA Technical Guidance on the Use of MOBILE6.2 for Emission Inventory Preparation, August 2004*; and
- EPA M6.FLT.007 report entitled *Fleet Characterization Data for MOBILE6: Development and Use of Age Distributions, Average Annual Mileage Accumulation Rates, and Projected Vehicle Counts for Use in MOBILE6, September 2001*.

Additional detail on use of the REG DIST command can be found in:

- Section 2.8.7.1 on page 95 of the *EPA User’s Guide to MOBILE6.1 and MOBILE6.2, August 2003*;
- Section 3.1 on page 13 of the *EPA Technical Guidance on the Use of MOBILE6.2 for Emission Inventory Preparation, August 2004*; and
- EPA M6.FLT.007 report entitled *Fleet Characterization Data for MOBILE6: Development and Use of Age Distributions, Average Annual Mileage Accumulation Rates, and Projected Vehicle Counts for Use in MOBILE6, September 2001*.

As referenced earlier, electronic Appendices L-O contain the various MOBILE6.2 input files used by NCTCOG in the development of the 2002 and 2007 inventories in both the Summer of 2004 and April of 2005. Included within each Appendix are the MOBILE6.2 input and external reference files used for commands such as for REG DIST, I/M DESCRIPT FILE, etc. The diesel fraction values are contained within each county-specific input file, while the registration distribution values are contained in separate county-specific external files. Also included within each electronic Appendix are tab-delimited summary output tables which readily load into spreadsheet software such as Excel. For each inventory, these tables provide hourly summaries by county, roadway type, and vehicle type of VMT, NO_x, VOC, CO, VMT mix, average operating speed, and vehicle hours of operation.

Please note that the 2002 and 2007 onroad inventories developed in the Summer of 2004 relied

upon MOBILE6.2.01. The 2002 onroad inventories developed in April of 2005 relied on the latest version of the MOBILE6.2 model which is MOBILE6.2.03. However, assuming all inputs are held constant, the NO_x and VOC emission rates estimated by these two versions of the model are the same. Only the CO emission rates are different between MOBIL6.2.01 and MOBILE6.2.03.