

Appendix S
Extrapolation of 2006 Onroad Mobile Source Inventory for the
3-County Beaumont/Port Arthur Nonattainment Area
From Existing 2005 & 2007 Link-Based Inventories

On May 26, 2004, the TCEQ proposed an attainment demonstration State Implementation Plan (SIP) for the new 8-hour ozone standard for the Beaumont/Port Arthur (BPA) nonattainment area. The 2000 and 2007 onroad mobile source inventories included in this proposed SIP were developed under contract by the Texas Transportation Institute (TTI) in the Spring of 2004 based on the latest available travel demand model output from the Texas Department of Transportation (TxDOT). After the receipt and evaluation of public comment, this SIP was adopted by the TCEQ on October 27, 2004. Table 2.6-2 of this SIP established a 2007 motor vehicle emissions budget (MVEB) for the 3-County BPA area of 24.32 NO_x tons-per-day and 10.55 VOC tons-per-day.

In November of 2004, the TCEQ was informed by both TxDOT and the Southeast Texas Regional Planning Commission (SETRPC) that improvements had been made to the travel demand model networks since the Spring of 2004. These improvements resulted in the allocation of more vehicle miles traveled (VMT) on freeway segments at higher rates of speed. The net increase in modeled NO_x emissions would make it impossible for the BPA area to pass conformity using the 2007 MVEB which had been established based on the “older” network. Consequently, TTI was contracted to develop a revised 2007 onroad mobile source inventory for the BPA area based on the improved travel demand model network. This updated 2007 onroad mobile source inventory was included in the BPA SIP proposed by TCEQ on May 11, 2005. EPA commented in a June 17, 2005 letter to TCEQ that “In any case, the conformity budgets established for 2007 are not acceptable for a marginal area ozone attainment SIP. Potentially budgets for 2005 or 2006 could be extrapolated from these budgets.” However, no guidance was provided by EPA detailing specific extrapolation methods which would be acceptable for establishment of an MVEB for an alternate year.

In order to extrapolate a 2006 inventory, TCEQ staff relied on the following onroad mobile source inventories which were recently developed by TTI for both conformity and attainment demonstration SIP purposes:

- 2005 onroad inventory for the 1-hour conformity determination developed by TTI in December of 2004 with a total 3-County VMT of 11,550,646 for the Wednesday August 30th episode day; and
- 2007 onroad inventory for the 8-hour attainment demonstration developed by TTI in January of 2005 with a total 3-County VMT of 11,734,089 for the Wednesday August 30th episode day.

The first step in the extrapolation of a 2006 onroad inventory was to linearly interpolate 2006 VMT by both vehicle type and county between the 2005 and 2007 inventories referenced above. The following tables summarize the results of this process.

Interpolation of 2006 24-Hour VMT for Hardin County

<i>Vehicle Type</i>	<i>Calendar Year</i>		
	<i>2005</i>	<i>2006</i>	<i>2007</i>
<i>LDGV</i>	794,025	803,332	812,640
<i>LDGT1</i>	117,890	119,260	120,630
<i>LDGT2</i>	392,454	397,011	401,568
<i>LDGT3</i>	81,179	82,111	83,042
<i>LDGT4</i>	37,333	37,761	38,189
<i>HDGV2b</i>	10,941	11,066	11,191
<i>HDGV3</i>	5,417	5,479	5,542
<i>HDGV4</i>	1,903	1,925	1,946
<i>HDGV5</i>	1,269	1,283	1,298
<i>HDGV6</i>	4,255	4,303	4,352
<i>HDGV7</i>	1,084	1,096	1,108
<i>HDGV8a</i>	1,506	1,523	1,541
<i>HDGV8b</i>	53	54	54
<i>LDDV</i>	1,066	941	816
<i>LDDT12</i>	290	191	92
<i>HDDV2b</i>	25,537	25,830	26,123
<i>HDDV3</i>	8,330	8,426	8,521
<i>HDDV4</i>	4,097	4,144	4,191
<i>HDDV5</i>	3,414	3,453	3,492
<i>HDDV6</i>	10,310	10,429	10,547
<i>HDDV7</i>	4,097	4,144	4,191
<i>HDDV8a</i>	12,495	12,639	12,782
<i>HDDV8b</i>	81,211	82,044	82,877
<i>MC</i>	1,611	1,630	1,648
<i>HDGB</i>	813	742	670
<i>HDDBT</i>	2,277	2,303	2,330
<i>HDDBS</i>	3,947	4,070	4,193
<i>LDDT34</i>	2,511	2,575	2,639
<i>Total</i>	1,611,314	1,629,764	1,648,214

Interpolation of 2006 24-Hour VMT for Jefferson County

<i>Vehicle Type</i>	<i>Calendar Year</i>		
	<i>2005</i>	<i>2006</i>	<i>2007</i>
<i>LDGV</i>	3,332,384	3,348,266	3,364,149
<i>LDGT1</i>	470,312	472,496	474,681
<i>LDGT2</i>	1,565,659	1,572,919	1,580,178
<i>LDGT3</i>	318,579	320,005	321,432
<i>LDGT4</i>	146,508	147,163	147,819
<i>HDGV2b</i>	47,182	47,402	47,623
<i>HDGV3</i>	23,363	23,472	23,582

<i>HDGV4</i>	8,206	8,244	8,282
<i>HDGV5</i>	5,470	5,496	5,522
<i>HDGV6</i>	18,348	18,434	18,520
<i>HDGV7</i>	4,673	4,695	4,716
<i>HDGV8a</i>	6,496	6,527	6,557
<i>HDGV8b</i>	228	229	230
<i>LDDV</i>	4,474	3,927	3,379
<i>LDDT12</i>	1,156	759	362
<i>HDDV2b</i>	109,413	109,924	110,435
<i>HDDV3</i>	35,691	35,858	36,024
<i>HDDV4</i>	17,553	17,635	17,717
<i>HDDV5</i>	14,628	14,696	14,764
<i>HDDV6</i>	44,175	44,381	44,587
<i>HDDV7</i>	17,553	17,635	17,717
<i>HDDV8a</i>	53,537	53,786	54,036
<i>HDDV8b</i>	637,743	641,453	645,163
<i>MC</i>	6,930	6,962	6,995
<i>HDGB</i>	3,399	3,083	2,766
<i>HDDBT</i>	9,519	9,570	9,621
<i>HDDBS</i>	16,504	16,909	17,314
<i>LDDT34</i>	10,016	10,200	10,384
Total	6,929,699	6,962,126	6,994,554

Interpolation of 2006 24-Hour VMT for Orange County

Vehicle Type	Calendar Year		
	2005	2006	2007
<i>LDGV</i>	1,444,136	1,463,712	1,483,288
<i>LDGT1</i>	203,090	205,814	208,538
<i>LDGT2</i>	676,084	685,146	694,209
<i>LDGT3</i>	137,396	139,214	141,031
<i>LDGT4</i>	63,186	64,021	64,857
<i>HDGV2b</i>	20,494	20,772	21,050
<i>HDGV3</i>	10,148	10,286	10,423
<i>HDGV4</i>	3,564	3,613	3,661
<i>HDGV5</i>	2,376	2,408	2,441
<i>HDGV6</i>	7,970	8,078	8,186
<i>HDGV7</i>	2,030	2,057	2,085
<i>HDGV8a</i>	2,822	2,860	2,898
<i>HDGV8b</i>	99	100	102
<i>LDDV</i>	1,939	1,715	1,490
<i>LDDT12</i>	499	329	159
<i>HDDV2b</i>	47,503	48,147	48,790
<i>HDDV3</i>	15,496	15,706	15,915

<i>HDDV4</i>	7,621	7,724	7,827
<i>HDDV5</i>	6,351	6,437	6,523
<i>HDDV6</i>	19,179	19,439	19,699
<i>HDDV7</i>	7,621	7,724	7,827
<i>HDDV8a</i>	23,244	23,558	23,873
<i>HDDV8b</i>	286,680	291,176	295,671
<i>MC</i>	3,010	3,051	3,091
<i>HDGB</i>	1,475	1,349	1,223
<i>HDDBT</i>	4,132	4,192	4,251
<i>HDDBS</i>	7,164	7,408	7,651
<i>LDDT34</i>	4,325	4,444	4,562
Total	3,009,633	3,050,478	3,091,321

Interpolation of 2006 24-Hour VMT for 3-County BPA Nonattainment Area

Vehicle Type	Calendar Year		
	2005	2006	2007
<i>LDGV</i>	5,570,545	5,615,310	5,660,076
<i>LDGT1</i>	791,293	797,571	803,849
<i>LDGT2</i>	2,634,197	2,655,076	2,675,955
<i>LDGT3</i>	537,154	541,330	545,506
<i>LDGT4</i>	247,027	248,946	250,864
<i>HDGV2b</i>	78,616	79,241	79,865
<i>HDGV3</i>	38,928	39,237	39,546
<i>HDGV4</i>	13,672	13,781	13,890
<i>HDGV5</i>	9,115	9,187	9,260
<i>HDGV6</i>	30,573	30,816	31,058
<i>HDGV7</i>	7,786	7,847	7,909
<i>HDGV8a</i>	10,824	10,910	10,996
<i>HDGV8b</i>	380	383	386
<i>LDDV</i>	7,480	6,583	5,685
<i>LDDT12</i>	1,945	1,279	613
<i>HDDV2b</i>	182,454	183,900	185,347
<i>HDDV3</i>	59,517	59,989	60,461
<i>HDDV4</i>	29,271	29,503	29,735
<i>HDDV5</i>	24,393	24,586	24,779
<i>HDDV6</i>	73,665	74,248	74,833
<i>HDDV7</i>	29,271	29,503	29,735
<i>HDDV8a</i>	89,276	89,984	90,691
<i>HDDV8b</i>	1,005,634	1,014,673	1,023,711
<i>MC</i>	11,551	11,643	11,734
<i>HDGB</i>	5,688	5,173	4,659
<i>HDDBT</i>	15,928	16,065	16,202
<i>HDDBS</i>	27,615	28,387	29,159

<i>LDDT34</i>	16,851	17,218	17,586
<i>Total</i>	11,550,646	11,642,368	11,734,089

From 2005 to 2007, the VMT for the entire 3-County area was estimated to grow by 1.8%. Through this linear interpolation approach, the 2006 VMT is estimated to be 0.6% higher than the 2005 VMT. The second step necessary for the extrapolation of a 2006 onroad mobile source inventory was to modify the existing MOBILE6.2 input files for 2005 and 2007 so that 2006 emission rates in grams-per-mile could be estimated for NO_x, VOC, and CO. As an example, the 2006 MOBILE6.2 input file for Jefferson County is provided below. Various inputs for registration distribution, temperature, humidity, fuel program, etc. are consistent with the 2005 and 2007 input files used by TTI. The primary modifications which were necessary were for the calendar year selection and the diesel fraction inputs.

MOBILE6 INPUT FILE :

```
> Jefferson County - 2006 Wednesday August 30th
> Inventory Development - Extrapolated From TTI Attainment Inventory for 2007 (Dated
January 2005)
```

```
DATABASE OUTPUT      :
WITH FIELDNAMES      :
AGGREGATED OUTPUT    :
```

```
RUN DATA            :
```

```
EXPRESS HC AS VOC    :
NO REFUELING         :
```

```
REG DIST              : c:\mobile62\bpa2000\2007\jeffersn\jeff04.rgd
```

```
* Activity Input Files Based on 2007 TTI Attainment Inventory for 2007
```

```
VMT BY FACILITY      : c:\mobile62\bpa2000\2007\jeffersn\jf07fvmt.wkd
VMT BY HOUR          : c:\mobile62\bpa2000\2007\jeffersn\jf07hvmvmt.wkd
SPEED VMT            : c:\mobile62\bpa2000\2007\jeffersn\jf07svmt.wkd
```

```
* 2006 Statewide Diesel Sales Fractions Estimates
```

```
* HDV fractions are estimated from TxDOT registration data (Mid-year July 2004)
```

```
* LDV, LDT and Bus fractions are EPA defaults
```

```
* One record per vehicle type. The order of vehicle types is: LDV, LDT1, LDT2, LDT3,
LDT4, HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8a, HDV8b, HDBS
```

```
DIESEL FRACTIONS      :
0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090 0.00090
0.00090 0.00060 0.00010 0.00030 0.00060 0.00130 0.00040 0.00040 0.00010 0.00270
0.00320 0.00970 0.01620 0.02410 0.05100
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00070
0.00330 0.00480 0.01200 0.02230 0.06560
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000
0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00070
0.00330 0.00480 0.01200 0.02230 0.06560
0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260
0.01260 0.01150 0.01110 0.01450 0.01150 0.01290 0.00960 0.00830 0.00720 0.00820
0.01240 0.01350 0.01690 0.02090 0.02560
0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260 0.01260
0.01260 0.01150 0.01110 0.01450 0.01150 0.01290 0.00960 0.00830 0.00720 0.00820
0.01240 0.01350 0.01690 0.02090 0.02560
0.88563 0.88563 0.88563 0.81309 0.77966 0.72044 0.59186 0.63002 0.54190 0.46056
0.43055 0.20553 0.38983 0.37310 0.34438 0.35788 0.27757 0.22879 0.18284 0.15413
0.19001 0.17778 0.19679 0.17158 0.16220
0.72198 0.72198 0.72198 0.65470 0.64998 0.63211 0.64506 0.61992 0.49298 0.57222
0.53758 0.33289 0.54565 0.57020 0.61950 0.49214 0.52674 0.46608 0.35632 0.27254
```

0.31264 0.21457 0.23404 0.19136 0.18182
0.81565 0.81565 0.81565 0.72670 0.69889 0.70449 0.71724 0.64706 0.68324 0.74152
0.65808 0.44894 0.67123 0.67488 0.64012 0.72156 0.55718 0.61592 0.29545 0.25161
0.11336 0.12227 0.21429 0.18182 0.14130
0.87557 0.87557 0.87557 0.86605 0.88606 0.85864 0.89074 0.86116 0.70180 0.72335
0.79849 0.47491 0.66552 0.72481 0.65278 0.73464 0.60057 0.59797 0.34050 0.35968
0.23649 0.30435 0.25000 0.30189 0.17176
0.87680 0.87680 0.87680 0.90476 0.91638 0.87145 0.86580 0.82740 0.79135 0.76770
0.80283 0.59535 0.78600 0.77429 0.59492 0.67919 0.73922 0.73063 0.57382 0.65900
0.56172 0.46842 0.46250 0.42308 0.39693
0.94783 0.94783 0.94783 0.98257 0.90545 0.89330 0.90961 0.89110 0.84945 0.78594
0.81909 0.53993 0.82827 0.85079 0.88206 0.86895 0.84016 0.85782 0.81713 0.83038
0.78906 0.75852 0.72185 0.68944 0.65591
0.94693 0.94693 0.94693 0.96067 0.95596 0.94286 0.93528 0.95292 0.95020 0.90000
0.92354 0.73845 0.96314 0.94870 0.95054 0.93254 0.93707 0.94532 0.95140 0.94860
0.91219 0.91164 0.94034 0.90625 0.89824
0.98522 0.98522 0.98522 0.98188 0.98089 0.98964 0.98790 0.97927 0.97708 0.95161
0.99275 0.79417 0.96019 0.98762 0.96552 0.99248 0.93578 0.96970 0.96104 0.97826
0.92188 0.92683 0.96386 0.95000 0.97143
0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850 0.95850
0.95850 0.88570 0.85250 0.87950 0.99000 0.91050 0.87600 0.77100 0.75020 0.73450
0.67330 0.51550 0.38450 0.32380 0.32600

SCENARIO RECORD : Jefferson County, 30AUG2006, Wednesday
CALENDAR YEAR : 2006
EVALUATION MONTH : 7
FUEL PROGRAM : 1
FUEL RVP : 7.8

* Jefferson Wednesday August 30

HOURLY TEMPERATURES: 76.1 76.8 79.5 83.1 87.1 90.6 94.1 96.7 98.9 100.1 100.4 99.7
96.8 91.4 87.8 85.4 83.8 82.6 79.1 78.5 78.0 77.6 76.6 76.2
RELATIVE HUMIDITY : 94.0 85.0 65.0 54.0 43.0 36.0 33.0 30.0 26.0 25.0 31.0 49.0
61.0 77.0 85.0 91.0 94.0 97.0 90.0 94.0 97.0 94.0 96.0 94.0
BAROMETRIC PRES : 29.80
SUNRISE/SUNSET : 7 8

END OF RUN :

Through the use of the SPEED VMT, VMT BY FACILITY, and VMT BY HOUR commands referenced above, it is possible to approximate an hourly link-based inventory analysis with a 24-hour “aggregate” analysis which is much less time consuming. This approach is regularly used by TCEQ staff to quality assure link-based inventory submissions. For the 2005 1-hour conformity inventory developed by TTI in December of 2004, both the link and aggregate analyses are compared in the following tables.

Summary of 2005 Hourly Link-Based Inventory for 3-County BPA Nonattainment Area

3-County BPA	Emissions (tons per day)		
	NO_x	VOC	CO
<i>Hardin</i>	3.70	1.60	20.74
<i>Jefferson</i>	23.97	6.90	91.45
<i>Orange</i>	11.17	3.01	41.35
Total	38.83	11.52	153.55

Summary of 2005 24-Hour Aggregate Inventory for 3-County BPA Nonattainment Area

3-County BPA	Emissions (tons per day)		
	NO_x	VOC	CO

<i>Hardin</i>	3.69	1.60	20.73
<i>Jefferson</i>	23.79	6.88	91.26
<i>Orange</i>	11.21	3.01	41.41
Total	38.69	11.49	153.40

Relative Difference Between 2005 Aggregate and Link-Based Inventory Analyses

3-County BPA	Relative Difference		
	NO_x	VOC	CO
<i>Hardin</i>	-0.22%	-0.26%	-0.05%
<i>Jefferson</i>	-0.73%	-0.34%	-0.22%
<i>Orange</i>	0.37%	0.06%	0.14%
Total	-0.36%	-0.22%	-0.10%

The following tables compare the link-based and aggregate analyses for the 2007 attainment demonstration inventory which was developed in January of 2005 by TTI and submitted to TCEQ.

Summary of 2007 Hourly Link-Based Inventory for 3-County BPA Nonattainment Area

3-County BPA	Emissions (tons per day)		
	NO_x	VOC	CO
<i>Hardin</i>	2.98	1.39	16.63
<i>Jefferson</i>	18.95	5.96	72.87
<i>Orange</i>	9.02	2.65	33.52
Total	30.95	10.01	123.02

Summary of 2007 24-Hour Aggregate Inventory for 3-County BPA Nonattainment Area

3-County BPA	Emissions (tons per day)		
	NO_x	VOC	CO
<i>Hardin</i>	2.98	1.39	16.62
<i>Jefferson</i>	18.82	5.94	72.72
<i>Orange</i>	9.07	2.65	33.60
Total	30.87	9.98	122.94

Relative Difference Between 2007 Aggregate and Link-Based Inventory Analyses

3-County BPA	Relative Difference		
	NO_x	VOC	CO
<i>Hardin</i>	-0.20%	-0.27%	-0.04%
<i>Jefferson</i>	-0.68%	-0.34%	-0.21%
<i>Orange</i>	0.59%	0.01%	0.22%
Total	-0.26%	-0.24%	-0.07%

In order to obtain a final 2006 onroad inventory, the ratio of 2006/2007 aggregate emission rates were multiplied by the 2007 link-based emission rates by vehicle type and county. The resulting

2006 emission rates were multiplied by the interpolated 2006 VMT figures referenced above. The results of this analysis are provided below.

Extrapolated 2006 Onroad Mobile Source Inventory for 3-County BPA Nonattainment Area

3-County BPA	Emissions (tons per day)		
	NO_x	VOC	CO
<i>Hardin</i>	3.25	1.48	17.73
<i>Jefferson</i>	20.94	6.34	77.97
<i>Orange</i>	9.86	2.79	35.57
Total	34.05	10.61	131.27

The 2006 NO_x results presented above include the benefits of the Texas Low Emission Diesel (TxLED) program. Based on a September 27, 2001 EPA memorandum, the TxLED benefits to be modeled are 6.2% for 2001-and-older diesel vehicles and 4.8% for 2002-and-newer diesel vehicles. For 2006, the TxLED adjustment factors by vehicle type for BPA are provided below.

2006 TxLED Adjustment Factors by Vehicle Type

Diesel Vehicle Type	NO_x Reduction	Adjustment Factor
<i>LDDV</i>	6.14%	0.9386
<i>LDDT12</i>	6.20%	0.9380
<i>HDDV2b</i>	5.13%	0.9487
<i>HDDV3</i>	5.35%	0.9465
<i>HDDV4</i>	5.61%	0.9439
<i>HDDV5</i>	5.38%	0.9462
<i>HDDV6</i>	5.65%	0.9435
<i>HDDV7</i>	5.93%	0.9407
<i>HDDV8a</i>	6.02%	0.9398
<i>HDDV8b</i>	5.84%	0.9416
<i>HDDBT</i>	5.87%	0.9413
<i>HDDBS</i>	5.86%	0.9414
<i>LDDT34</i>	5.53%	0.9447

All of the electronic input, output, reference, and spreadsheet files used in this analysis are provided as separate “zipped” attachments on the TCEQ Web site and at ftp://ftp.tnrc.state.tx.us/pub/OEPAA/TAD/Modeling/Mobile_EI/BPA/m62/2006/

- m62-bpa-2005-aug30-conformity-review.zip;
- m62-bpa-2006-aug30-extrapolation-analysis.zip; and
- m62-bpa-2007-aug30-attainment-review.zip.