DC98 Enhanced I/M Mobile 5.a.h Modeling Methodology and Documentation

Attached is a summary of the Mobile 5.a.h mobile modeling runs for Davis County. The complete package of mobile modeling runs is located in Volume 15, Section 6.1 of the Technical Support Document for the Ozone Maintenance Plan, which was proposed by the Air Quality Board on October 9, 1996.

DAVIS COUNTY: On-Road Mobile VOC, CO, and NOx Emissions during a SUMMER WEEKDAY (with Davis Co Health Dept Performance Standard I/M beginning 1998).

September 18, 1996 edition

Calendar Year	ROAD TYPE	Yr-rd Avg Weekday VMT	Summer Weekday VMT	Daily FF Fraction	Daily CG Fraction	Free-Flow (FF) Traffic Conditions Speed mph	VOC g/vmt	CO g/vmt	NOx g/vmt	Congested (CG) Traffic Conditions Speed mph	VOC g/vmt	CO g/vmt	NOx g/vmt	VOC T/Summer Weekday	CO T/Summer Weekday	NOx T/Summer Weekday	
*1994	Freeway & Ramp	2,436,927	2,568,521	0.82	0.18	51.5	2.17	18.30	3.09	41.7	2.37	19.23	2.66	6.24	52.24	8.52	
*1994	Arterial & Collector	1,809,905	1,844,294	0.82	0.18	37.3	2.52	20.59	2.61	24.4	3.29	28.65	2.55	5.40	44.77	5.28	
*1994	Local	682,093	695,053	0.82	0.18	20.0	3.74	33.59	2.56	20.0	3.74	33.59	2.56	2.86	25.71	1.96	
*1994	SUM	4,928,925	5,107,867											14.50	122.72	15.76	SUM
1995	Freeway & Ramp	2,451,752	2,584,146	0.82	0.18	51.2	2.06	16.51	2.97	41.4	2.25	17.52	2.58	5.96	47.50	8.25	
1995	Arterial & Collector	1,882,213	1,917,975	0.82	0.18	37.3	2.40	18.74	2.54	24.1	3.15	26.62	2.48	5.35	42.58	5.34	
1995	Local	702,984	716,341	0.82	0.18	20.0	3.56	31.05	2.50	20.0	3.56	31.05	2.50	2.81	24.50	1.97	
1995	SUM	5,036,949	5,218,462											14.12	114.58	15.57	SUM
1996	Freeway & Ramp	2,466,576	2,599,772	0.82	0.18	51.0	1.90	15.26	2.87	41.1	2.10	16.33	2.51	5.54	44.24	8.03	
1996	Arterial & Collector	1,954,521	1,991,657	0.82	0.18	37.4	2.23	17.39	2.47	23.8	2.98	25.08	2.42	5.19	41.18	5.40	
1996	Local	723,875	737,628	0.82	0.18	20.0	3.34	29.01	2.43	20.0	3.34	29.01	2.43	2.71	23.57	1.97	
1996	SUM	5,144,972	5,329,057											13.44	108.99	15.40	SUM
1997	Freeway & Ramp	2,481,401	2,615,397	0.82	0.18	50.8	1.82	14.08	2.75	40.8	2.02	15.24	2.42	5.35	41.16	7.75	
1997	Arterial & Collector	2,026,828	2,065,338	0.82	0.18	37.4	2.13	16.20	2.39	23.6	2.87	23.79	2.34	5.15	39.96	5.42	
1997	Local	744,765	758,916	0.82	0.18	20.0	3.21	27.43	2.35	20.0	3.21	27.43	2.35	2.68	22.93	1.96	
1997	SUM	5,252,995	5,439,651											13.18	104.04	15.13	SUM
**1998	Freeway & Ramp	2,496,226	2,631,022	0.82	0.18	50.6	1.68	12.48	2.59	40.6	1.85	13.65	2.27	4.96	36.77	7.33	
**1998	Arterial & Collector	2,099,136	2,139,020	0.82	0.18	37.5	1.95	14.44	2.25	23.4	2.67	21.74	2.22	4.91	37.11	5.28	
**1998	Local	765,656	780,204	0.82	0.18	20.0	2.97	24.97	2.23	20.0	2.97	24.97	2.23	2.55	21.46	1.91	
**1998	SUM	5,361,019	5,550,246											12.41	95.34	14.51	SUM
1999	Freeway & Ramp	2,511,051	2,646,648	0.82	0.18	50.4	1.53	10.58	2.38	40.3	1.70	11.77	2.10	4.55	31.46	6.79	
1999	Arterial & Collector	2,171,444	2,212,701	0.82	0.18	37.5	1.74	12.44	2.12	23.3	2.42	19.44	2.08	4.54	33.39	5.15	
1999	Local	786,547	801,491	0.82	0.18	20.0	2.71	22.42	2.09	20.0	2.71	22.42	2.09	2.40	19.79	1.84	
1999	SUM	5,469,042	5,660,840											11.48	84.64	13.78	SUM
2000	Freeway & Ramp	2,525,876	2,662,273	0.82	0.18	50.2	1.40	9.72	2.30	40.0	1.58	11.00	2.06	4.19	29.17	6.62	
2000	Arterial & Collector	2,243,752	2,286,383	0.82	0.18	37.5	1.71	11.63	2.04	23.1	2.30	19.49	2.01	4.57	32.85	5.12	
2000	Local	807,438	822,779	0.82	0.18	20.0	2.62	21.22	2.02	20.0	2.62	21.22	2.02	2.37	19.23	1.83	
2000	SUM	5,577,065	5,771,435											11.14	81.25	13.57	SUM
2001	Freeway & Ramp	2,540,701	2,677,898	0.82	0.18	50.0	1.37	8.79	2.23	39.8	1.53	10.21	2.03	4.12	26.68	6.47	
2001	Arterial & Collector	2,316,059	2,360,064	0.82	0.18	37.6	1.64	10.77	1.98	22.9	2.28	17.66	1.98	4.56	31.22	5.15	
2001	Local	828,328	844,067	0.82	0.18	20.0	2.53	20.22	1.94	20.0	2.53	20.22	1.94	2.35	18.80	1.80	
2001	SUM	5,685,088	5,882,030											11.03	76.69	13.42	SUM
2002	Freeway & Ramp	2,555,525	2,693,524	0.82	0.18	49.8	1.29	8.42	2.17	39.5	1.47	9.87	1.96	3.92	25.75	6.33	
2002	Arterial & Collector	2,388,367	2,433,746	0.82	0.18	37.6	1.57	10.39	1.96	22.7	2.24	17.43	1.94	4.54	31.25	5.24	
2002	Local	849,219	865,354	0.82	0.18	20.0	2.43	19.87	1.95	20.0	2.43	19.87	1.95	2.31	18.94	1.86	
2002	SUM	5,793,112	5,992,624											10.77	75.93	13.43	SUM
2003	Freeway & Ramp	2,570,350	2,709,149	0.82	0.18	49.6	1.24	7.78	2.08	39.2	1.43	9.31	1.95	3.80	24.03	6.14	
2003	Arterial & Collector	2,460,675	2,507,428	0.82	0.18	37.6	1.55	9.72	1.94	22.6	2.14	16.62	1.86	4.57	30.27	5.32	
2003	Local	870,110	886,642	0.82	0.18	20.0	2.37	18.92	1.90	20.0	2.37	18.92	1.90	2.31	18.47	1.86	
2003	SUM	5,901,135	6,103,219											10.68	72.78	13.31	SUM
2004	Freeway & Ramp	2,585,175	2,724,775	0.82	0.18	49.4	1.19	7.22	2.02	39.0	1.37	8.72	1.91	3.68	22.48	6.00	
2004	Arterial & Collector	2,532,983	2,581,109	0.82	0.18	37.7	1.43	9.08	1.89	22.4	2.04	15.76	1.85	4.39	29.23	5.35	
2004	Local	891,001	907,930	0.82	0.18	20.0	2.25	17.75	1.87	20.0	2.25	17.75	1.87	2.25	17.75	1.87	
2004	SUM	6,009,158	6,213,813											10.31	69.45	13.22	SUM

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2005	Freeway & Ramp	2,600,000	2,740,400	0.82	0.18	49.2	1.18	6.89	1.99	38.7	1.33	8.48	1.87	3.65	21.66	5.94	
2005	Arterial & Collector	2,600,000	2,649,400	0.82	0.18	37.7	1.34	8.73	1.89	22.2	1.97	15.41	1.82	4.25	28.98	5.48	
2005	Local	900,000	917,100	0.82	0.18	20.0	2.16	17.25	1.86	20.0	2.16	17.25	1.86	2.18	17.42	1.88	
2005	SUM	6,100,000	6,306,900											10.09	68.06	13.30	SUM
2006	Freeway & Ramp	2,620,000	2,761,480	0.82	0.18	49.0	1.15	6.72	2.00	38.5	1.32	8.40	1.87	3.58	21.36	6.01	
2006	Arterial & Collector	2,670,000	2,720,730	0.82	0.18	37.7	1.33	8.60	1.89	22.1	1.96	15.46	1.85	4.33	29.47	5.64	
2006	Local	930,000	947,670	0.82	0.18	20.0	2.15	17.28	1.86	20.0	2.15	17.28	1.86	2.24	18.03	1.94	
2006	SUM	6,220,000	6,429,880											10.16	68.86	13.59	SUM
2007	Freeway & Ramp	2,640,000	2,782,560	0.82	0.18	48.8	1.16	6.60	1.97	38.3	1.35	8.34	1.86	3.67	21.19	5.98	
2007	Arterial & Collector	2,740,000	2,792,060	0.82	0.18	37.7	1.32	8.45	1.86	22.0	1.98	15.45	1.79	4.43	29.86	5.68	
2007	Local	960,000	978,240	0.82	0.18	20.0	2.13	17.12	1.85	20.0	2.13	17.12	1.85	2.29	18.44	1.99	
2007	SUM	6,340,000	6,552,860											10.39	69.49	13.65	SUM
2015	Freeway & Ramp	2,800,000	2,951,200	0.82	0.18	47.4	1.05	6.12	1.94	36.6	1.28	8.32	1.84	3.56	21.18	6.25	
2015	Arterial & Collector	3,300,000	3,362,700	0.82	0.18	37.9	1.30	7.94	1.85	21.2	1.94	15.91	1.80	5.25	34.72	6.82	
2015	Local	1,200,000	1,222,800	0.82	0.18	20.0	2.04	17.05	1.85	20.0	2.04	17.05	1.85	2.74	22.96	2.49	
2015	SUM	7,300,000	7,536,700											11.55	78.86	15.56	SUM
2016	Freeway & Ramp	2,820,000	2,972,280	0.82	0.18	47.2	1.06	6.07	1.92	36.4	1.31	8.28	1.84	3.63	21.17	6.24	
2016	Arterial & Collector	3,370,000	3,434,030	0.82	0.18	37.9	1.27	7.88	1.84	21.1	1.96	15.88	1.78	5.29	35.25	6.92	
2016	Local	1,230,000	1,253,370	0.82	0.18	20.0	2.04	16.90	1.86	20.0	2.04	16.90	1.86	2.81	23.33	2.57	
2016	SUM	7,420,000	7,659,680											11.73	79.75	15.72	SUM
2017	Freeway & Ramp	2,840,000	2,993,360	0.82	0.18	47.0	1.03	6.05	1.92	36.2	1.30	8.23	1.82	3.57	21.24	6.27	
2017	Arterial & Collector	3,440,000	3,505,360	0.82	0.18	37.9	1.23	7.79	1.82	21.0	1.95	15.82	1.78	5.26	35.65	7.00	
2017	Local	1,260,000	1,283,940	0.82	0.18	20.0	2.00	16.76	1.84	20.0	2.00	16.76	1.84	2.82	23.70	2.60	
2017	SUM	7,540,000	7,782,660											11.65	80.59	15.87	SUM

* 1994 summer weekday VMT are HPMS-based (actual) mileage reported by UDOT. Mileage during other years are modeling-based projections by WFRC.

** 1998 emission factors account for the phase-in period of a new I/M program inherent with monthly vehicle expirations and renewals.

ON-ROAD MOBILE EMISSIONS FOR A 1998 SEASON DAY

DAVIS COUNTY: ADJUSTMENT TO ACCOUNT FOR PHASE-IN EFFECTS OF ENHANCED I/M PROGRAM IN 1998.

Since the expiration of vehicle emissions inspections are spread throughout the year, about one-twelfth of the vehicle fleet is tested monthly. In theory, the effect of this distribution is the same as if the entire fleet were under Basic I/M the first half year (January-June) and under Enhanced I/M the second half year (July-December). The tables on this page report the emissions of each and averages them. The results, as shown in Table C, are the effective impact to the collective fleet at mid-year 1998.

PHASE-IN PERIOD: Effectively, all vehicles are under Basic I/M from January 1, through June 30, 1998.

Table A

						Free-Flow (FF) Traffic Conditions				Congested (CG) Traffic Conditions				VOC	CO	NOx	
Calendar Year	ROAD TYPE	Yr-rd Avg Weekday VMT	Summer Weekday VMT	Daily FF Fraction	Daily CG Fraction	Speed mph	VOC g/vmt	CO g/vmt	NOx g/vmt	Speed mph	VOC g/vmt	CO g/vmt	NOx g/vmt	T/Summer Weekday	T/Summer Weekday	T/Summer Weekday	
1998	Freeway & Ramp	2,496,226	2,631,022	0.82	0.18	50.6	1.73	12.95	2.65	40.6	1.93	14.18	2.35	5.12	38.17	7.52	
1998	Arterial & Collector	2,099,136	2,139,020	0.82	0.18	37.5	2.03	15.04	2.32	23.4	2.77	22.63	2.28	5.10	38.65	5.45	
1998	Local	765,656	780,204	0.82	0.18	20.0	3.08	26.01	2.29	20.0	3.08	26.01	2.29	2.65	22.35	1.97	
1998	SUM	5,361,019	5,550,246											12.86	99.16	14.94	SUM

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PHASE-IN PERIOD: Effectively, all vehicles are under Enhanced I/M from July 1, through December 31, 1998.

Table B

Calendar Year	ROAD TYPE	Yr-rd Avg Weekday VMT	Summer Weekday VMT	Daily FF Fraction	Daily CG Fraction	Free-Flow (FF) Traffic Conditions Speed mph	VOC g/vmt	CO g/vmt	NOx g/vmt	Congested (CG) Traffic Conditions Speed mph	VOC g/vmt	CO g/vmt	NOx g/vmt	VOC T/Summer Weekday	CO T/Summer Weekday	NOx T/Summer Weekday	
1998	Freeway & Ramp	2,496,226	2,631,022	0.82	0.18	50.6	1.63	12.01	2.52	40.6	1.778	13.12	2.19	4.80	35.38	7.13	
1998	Arterial & Collector	2,099,136	2,139,020	0.82	0.18	37.5	1.88	13.84	2.17	23.4	2.56	20.84	2.15	4.71	35.57	5.10	
1998	Local	765,656	780,204	0.82	0.18	20.0	2.86	23.93	2.16	20.0	2.86	23.93	2.16	2.46	20.56	1.86	
1998	SUM	5,361,019	5,550,246											11.97	91.51	14.09	SUM

AVERAGE WEEKDAY EMISSIONS MID-YEAR 1998.

This is Table C; the mean average of Tables A and B.

Calendar Year	ROAD TYPE	Yr-rd Avg Weekday VMT	Summer Weekday VMT	Daily FF Fraction	Daily CG Fraction	Free-Flow (FF) Traffic Conditions Speed mph	VOC g/vmt	CO g/vmt	NOx g/vmt	Congested (CG) Traffic Conditions Speed mph	VOC g/vmt	CO g/vmt	NOx g/vmt	VOC T/Summer Weekday	CO T/Summer Weekday	NOx T/Summer Weekday	
1998	Freeway & Ramp	2,496,226	2,631,022	0.82	0.18	50.6	1.68	12.48	2.59	40.6	1.85	13.65	2.27	4.96	36.77	7.33	
1998	Arterial & Collector	2,099,136	2,139,020	0.82	0.18	37.5	1.95	14.44	2.25	23.4	2.67	21.74	2.22	4.91	37.11	5.28	
1998	Local	765,656	780,204	0.82	0.18	20.0	2.97	24.97	2.23	20.0	2.97	24.97	2.23	2.55	21.46	1.91	
1998	SUM	5,361,019	5,550,246											12.41	95.34	14.51	SUM

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